Supplementary Material for
"Comparing Open and Sealed Bid Auctions:
Evidence from Timber Auctions,"
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This documents contains additional analyses and supporting material for the paper.

Appendix A reports additional statistical results comparing open and sealed bid auctions, supplementing the analysis in Section IV of the paper. The additional results include (i) results from samples that are constructed using more and less stringent criteria for trimming on the propensity score; and (ii) results from the Schuster and Niccolucci sub-sample of randomized sales in the Northern Region; (iii) the full specification and coefficient estimates for the OLS regressions reported in Table III in the main paper.

Appendix B includes omitted proofs from the theoretical model in Section II.

Appendix C includes omitted details from the structural model in Section V.

Appendix A: Results from Alternative Samples and Specifications

This appendix presents additional statistical results comparing the outcomes of sealed bid and open auctions using different criteria to select the data sample.

Results from Alternative Samples Based on the Propensity Score

In the main paper, we estimate a logit regression to predict whether an auction was sealed bid as a function of observed sale characteristics. We then construct the propensity score for each sale, and chose as our main sample sales with propensity scores in the [0.075,0.925] interval. This choice involved a trade-off between maintaining the largest possible sample size (which favors no trimming) and ensuring that the data has sufficient "overlap". The trade-off is mainly relevant for the California Region, where many observations have propensity scores close to zero or one due to the heavy reliance on sale size as a determinant of auction method. Crump, Hotz, Imbens and Mitnik (2009) suggest using observations with propensity scores in the interval [0.1,0.9] as a way of dealing with limited overlap. For the main results in the paper, we chose a slightly wider interval so as to maintain a slightly larger sample. This raises the question of whether the estimates are sensitive to the precise sample selection. To examine this, we repeat our analysis for the full (untrimmed) dataset, the [0.075,0.925] sample, a [0.1,0.9] sample, and a [0.2,0.8] sample.

Figures A1 and A2 plot the distribution of propensity scores for both California and the Northern Region, showing where sales fall relative to the cut-off thresholds. Tables A1-A4 duplicate the analysis in Table III of the main paper. Each of the four tables show the results for a separate data sample, where Table A2 shows the same results as Table III in the main paper, but is included for ease of comparison. As in the paper, we report estimates of the effect of the auction being sealed bid, controlling for observed sale characteristics. We also include as a robustness check the results from a median regression that uses the same specification as the OLS regression.

In general, the point estimates are similar across the different samples. The estimated median effect of sealed bidding also is similar to the estimates we obtain of the average effect. The number of observations in the Norther sample shrink from 1233 in the full sample to 667 in the [0.2,0.8] sample and the reduction in California is even more dramatic, from 2064 down to 344. The tables show a corresponding increase in the standard errors.

Results from the Schuster-Niccolucci Randomized Subsample

In their 1994 paper, Schuster and Niccolucci describe the choice of sale method in the Northern Region using interview evidence and report that a subset of sales in the area were randomized (in some cases using colored balls drawn from a sock). We obtained from

Mike Niccolucci a list of forest districts and time periods in which he believes there was randomization. This list includes sales starting in 1987 in the two forests from which our data is drawn: Idaho Panhandle National Forest (Forest 4) and Kootenai National Forest (Forest 14). In Kootenai National Forest, Niccolucci's list includes only Districts 1, 2 and 5.[1] As a robustness check, we re-ran our analysis on the intersection of our sample and the Schuster-Niccolucci sales. This comprises a total of 378 sales.

Table A5 reports summary statistics for the Schuster-Niccolucci subsample. To evaluate whether the sample is consistent with randomization, Table A6 reports a logit regression predicting whether the auction was sealed bid as a function of sale characteristics, including the administrative unit. Figure A3 plots the distribution of estimated propensity scores from the logit model. In looking at Table A5, Figure A3 and the results in Table A6, one point of concern is that the very largest sales appear to have been carried out disproportionately by open auction. This size effect also appears in our broader sample, and can be seen in Table II of the main paper. We do not have a definite explanation, other than to recognize the possibility that some large sales may simply have been designated for open bidding. Because of this, we decided to analyze the effect of sealed bidding in the Schuster-Niccolucci subsample controlling for sale characteristics as in the main paper. (The unconditional comparisons, of course, can be seen in Table A5.) Table A7 reports estimates of the effect of sale outcomes on the Schuster-Niccolucci subsample, replicating Table III in the main paper. We also repeated the analysis using alternative rules for trimming the sample based on the propensity score, so as to match the analysis above, and include these results for completeness in Tables A8-A10.

The estimated effects in the Schuster-Niccolucci subsample are similar to those we find in the main sample. In the sealed bid auctions, we observe greater entry of loggers, little effect on mill entry, a higher revenue. The effects on logger entry and revenue are perhaps a bit more pronounced in the Schuster-Niccolucci subsample, particularly in the trimmed versions (Tables A8-A10). Across the four versions of the Schuster-Niccolucci subsample, we estimate that sealed bidding increases logger entry by 16-26% compared to the estimate of 8-18% reported in Table III of the paper. The revenue of effect of sealed bidding is estimated at 1-17% in the Schuster-Niccolucci subsample (although not that only one point estimate is less than 9%), compared to 8-13% in Table III of the paper. In the reverse direction, the estimated effect on sale allocation in the Schuster-Niccolucci subsample is modest and not significantly different from zero. Overall, however, and in light of the relatively small sample sizes, we view the results as quite similar.

[1] Niccolucci's list also includes sales starting in 1987 in a few smaller Northern Region forests: sales of greater than 10 million board feet in Forest 5, sales in Forests 12 and 16, and sales of less than 10 million board feet in Forest 17. As described in the paper, we decided to focus just on Idaho Panhandle and Kootenai because there is substantial heterogeneity across forests and these two are large and adjacent.

Complete Specification and Results from Main Specification

In Table III of the paper (and in Appendix Tables A1-A4 and A7-A10), we report the estimated effect of sealed bidding, which is the focus of the analysis. For completeness, Tables A11 and A12 report the complete OLS specification and coefficient estimates corresponding to the results reported in the first lines of Table III (Panels A and B). One variable of particular interest is the sale size. Large sales attract more mills and fewer loggers. In the Northern region, prices are also somewhat higher in large sales, while the relationship between price and sale size is more ambiguous in California.

Crump, Richard K., V. Joseph Hotz, Guido W. Imbens, and Oscar A. Mitnik, "Dealing with Limited Overlap in Estimation of Average Treatment Effects," *Biometrika*, 96 (2009), 187-199.

Schuster, Ervin G. and Michael J. Niccolucci, "Sealed-Bid Versus Oral-Auction Timber Offerings: Implications of Imperfect Data," *Canadian Journal of Forest Research*, 24 (1994), 87-91.

Appendix B: Omitted Proofs of the Theoretical Results

Proof of Proposition 1. Let i be a logger and j a mill. Given an entry profile p, let $P(l,m)$ denote the probability that of the bidders $k \neq i,j$, exactly l loggers and m mills enter. Then

$$\Pi_i^\tau(p) = \sum_{n_L,n_M} \left\{\pi_L^\tau(l+1,m+1)p_j + \pi_L^\tau\left(l+1,m\right)\left(1-p_j\right)\right\} P(l,m) \tag{1}$$

and

$$\Pi_j^\tau(p) = \sum_{l,m} \left\{\pi_M^\tau(l+1,m+1)p_i + \pi_M^\tau\left(l,m+1\right)\left(1-p_i\right)\right\} P(l,m) \tag{2}$$

From Li and Riley (1999), the bracketed term in (1) is no greater than $\pi_L^\tau(l+1,m)$, while the bracketed term in (2) is no less than $\pi_M^\tau(l+1,m+1)$. So $\Pi_i^\tau(p) \leq \sum_{l,m} \pi_L^\tau(l+1,m)P(l,m)$ and $\Pi_j^\tau(p) \leq \sum_{l,m} \pi_M^\tau(l+1,m+1)P(l,m)$. Therefore the assumed condition implies that $\Pi_j^s(p) > \Pi_i^s(p)$ for any logger i and mill j and entry profile p. Moreover, Maskin and Riley's (2000) results imply that for any logger i and mill j and entry profile p, $\Pi_i^s(p) \geq \Pi_i^o(p)$ and $\Pi_j^o(p) \geq \Pi_j^s(p)$, so in addition $\Pi_j^o(p) > \Pi_i^o(p)$. It follows that in any entry equilibrium, if some logger enters with positive probability, then every mill strictly prefers to enter and will enter with probability one. The remaining argument is straightforward. *Q.E.D.*

Proof of Proposition 2. The proof makes use of two key facts arising from the analysis of Maskin and Riley (2000) and Li and Riley (1999). First, for any entry strategies p, $\Pi_i^s(p) \geq \Pi_i^o(p)$ for any logger i and $\Pi_j^s(K) \leq \Pi_j^o(p)$ for any mill j. Second, for either auction format $\tau \in \{o,s\}$ and any bidder i, $\Pi_i^\tau(p)$ is decreasing in p.

For a given vector of type-symmetric entry strategies p, let p_L and p_M denote the entry probabilities of loggers and mills, and $\Pi_L^\tau(p_L,p_M)$, $\Pi_M^\tau(p_L,p_M)$ their expected profits from entry. Fix an auction format τ. From above, if (p_L,p_M) and (p'_L,p'_M) are both type-symmetric entry equilibria, and $p'_M > p_M$, then $p'_L < p_L$. So among type-symmetric entry equilibria, there is one with the most mill entry and least logger entry. Finding this equilibrium is straightforward. If $\Pi_L^\tau(0,1) < K$, find the unique equilibrium with $p_L = 0$ and $p_M \geq 0$. If $\Pi_L^\tau(0,1) \geq K$, find the unique equilibrium with $p_L \geq 0$ and $p_M = 1$.

Using the first fact above, it is straightforward to check that the type-symmetric open auction entry equilibrium with the most mill entry and least logger entry will have more mill entry and less logger entry than the type-symmetric sealed auction equilibrium with the most mill entry and least logger entry. This proves the result. *Q.E.D.*

Proof of Proposition 3. Let $\Pi_i^c(p)$ denote the profits of bidder i from entering if mills collude, and similarly for type-symmetric entry profiles define $\Pi_L^c(p_L,p_M)$ and $\Pi_M^c(p_L,p_M)$ as expected bidder profits. We have $\Pi_L^c(p_L,p_M) = \Pi_L^o(p_L,p_M)$ and $\Pi_M^c(p_L,p_M) \geq \Pi_M^o(p_L,p_M)$.

Moreover, $\Pi_i^c(p)$ is decreasing in p for any bidder i. Therefore we can use precisely the argument from the above proof to show that the type-symmetric collusive open auction entry equilibrium with the most mill entry and least logger entry will have more mill entry and less logger entry than the corresponding type-symmetric competitive open auction entry equilibrium. *Q.E.D.*

Li, Huagang and John Riley, "Auction Choice," UCLA Working Paper, 1999.

Maskin, Eric and John Riley, "Asymmetric Auctions," *Review of Economic Studies*, 67 (2000), 413-438.

Appendix C: Omitted Details of the Structural Model

The Likelihood Function

A useful property of Gamma-Weibull models is that the unobserved heterogeneity can be integrated out analytically. This leads to the following log-likelihood for auction t:

$$\begin{aligned}\ln L_t &= (n_{Lt}+n_{Mt})\ln\theta + \ln\Gamma\left(\frac{1}{\theta}+n_{Lt}+n_{Mt}\right) - \ln\Gamma\left(\frac{1}{\theta}\right) \\ &+ \sum_{i=1}^{n_{Lt}+n_{Mt}} \ln\left(p_{it}\lambda_{it}\left(\frac{b_{it}}{\lambda_{it}}\right)^{p_{it}-1}\right) + \left(\frac{1}{\theta}+n_{Lt}+n_{Mt}\right)\ln\left(1+\theta\sum_{i=1}^{n_{Lt}+n_{Mt}}\left(\frac{b_{it}}{\lambda_{it}}\right)^{p_{it}}\right).\end{aligned}$$

Here θ is the Gamma variance, $b_{1t},...,b_{(n_{Lt}+n_{Mt})t}$ are the observed bids in auction t, and λ_{it}, p_{it} are the Weibull parameters for bidder i in auction t. As defined in the text, these are functions of (X_t, N_t, n_t), the unknown parameter vectors β and γ, and bidder i's type — logger or mill.

Truncating the Bid Distributions

Our independent private values model predicts that the equilibrium bid distributions will have finite support. If, for example, there are two bidders of the same type, $\overline{b} = \mathbb{E}[v]$. Therefore, modeling the bid distribution as Weibull implicitly imposes an infinite mean on bidder values. We view this problem as largely technical because it results from a very small fraction of large bids being rationalized with implausibly high values. Our solution therefore is to truncate the estimated bid distributions.[2]

To identify maximum bids at which to truncate, we exploit two facts. First, truncating the bid distribution does not affect the reverse hazard rate g_k/G_K, and hence leaves the estimated inverse bid function $\phi(\cdot)$, defined in (**??**), unchanged for bid values below the truncation. Second, the estimated bid function $\phi^{-1}(\cdot)$ becomes very flat for high bidder values. This means that if we use our prior knowledge of timber auctions to specify a plausible maximum value and use the estimated bid function to locate the implied maximum bid, our resulting truncation point will be relatively insensitive to the precise maximum value we specify.

To make this operational, we observe that values in our model take the form: $v_{it} = \exp(X_t\beta_X + N_t\beta_N)\cdot\xi_{it}$. Let $\overline{X} = \mathbb{E}_{X_t}[X_t]$ and $\overline{N} = \mathbb{E}_{N_t}[N_t]$. We assume that for the "stronger" bidder type in a given auction (i.e. mills if any are present, otherwise loggers)

[2] An alternative would be to specify directly a bid distribution with finite support, but this has serious pitfalls as well because it requires estimating the maximum bid conditional on observed and unobserved covariates. This is a hard problem, and moreover the mean of bidder values will be in close correspondence with the (arguably poor) estimate.

$\exp(\overline{X}\beta_X + \overline{N}\beta_N)] \cdot \xi_{it} \leq 500$, so that for the average tract in our sample, the highest possible value is \$500 per mbf. This assumption implies an upper bound on the value distribution $\overline{v}_t(X_t, u_t, N_t)$:

$$\overline{v}(X_t, u_t, N_t) = 500 \cdot \frac{\exp(X_t\beta_X + N_t\beta_N)}{\exp(\overline{X}_t\beta_X + \overline{N}_t\beta_N)}.$$

For an auction with a set n_t of participants, the bid resulting from this maximum value, $\overline{b}(X_t, u_t, N_t, n_t)$, satisfies:

$$\phi_M(\overline{b}(X_t, u_t, N_t, n_t); X_t, u_t, N_t, n_t) = \overline{v}_k(X_t, u_t, N_t).$$

We calculate $\overline{b}(\cdot)$ numerically for each (X_t, u_t, N_t, n_t) and truncate the bid distribution. If both mills and loggers participate, this truncation also impose an upper bound on logger values, one that may be below $\overline{v}(\cdot)$. In practice, we end up truncating only a very small fraction of the bid distribution. In the auction plotted in Figure 2, for instance, less than 1% of mill bids and 0.001% of logger bids are truncated.

A slight concern with our procedure is that the truncation is imposed *after* we estimate the bid distribution. One way to view what we do is as the first step of an iterative process where we repeatedly estimate the bid distributions, calculate $\overline{b}(X, u, N, n)$, and then re-estimate the bid distributions imposing the new truncation. Because our one-step procedure leads us to truncate such a small fraction of bids, we believe that iterating the procedure would lead to extremely similar estimates.

Table A1. Effect of Auction Method on Sale Outcomes
Unrestricted Propensity Score

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Panel A: Northern Sales (N = 1233 Sales)			
Regression with No Interactions Between Sealed and Covariates[2]						
Sealed Bid Effect	0.086	-0.011	0.053	0.028	0.100	0.063
	(0.034)	(0.030)	(0.015)	(0.025)	(0.038)	(0.031)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.105	0.009	0.051	0.021	0.132	0.083
	(0.034)	(0.031)	(0.015)	(0.026)	(0.039)	(0.033)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.217	-0.102	0.128	0.107	0.160	0.140
	(0.042)	(0.041)	(0.019)	(0.028)	(0.048)	(0.046)
Median Regression[c]						
Sealed Bid Effect on Sample	0.119	-0.010	0.045	0.000	0.076	0.053
	(0.052)	(0.045)	(0.018)	(0.000)	(0.048)	(0.042)
			Panel B: California Sales (N = 2064 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.110	-0.091	0.093	0.083	0.015	0.002
	(0.036)	(0.033)	(0.017)	(0.030)	(0.043)	(0.033)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.087	-0.079	0.083	0.082	-0.008	0.000
	(0.039)	(0.036)	(0.019)	(0.033)	(0.045)	(0.037)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.378	-0.403	0.293	0.277	0.090	0.122
	(0.034)	(0.031)	(0.016)	(0.028)	(0.039)	(0.040)
Median Regression[c]						
Sealed Bid Effect on Sample	0.082	-0.160	0.114	0.000	0.075	-0.007
	(0.050)	(0.061)	(0.022)	(0.001)	(0.045)	(0.044)

Notes: Regression specifications include the same sale controls used in Table II (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest or forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score. Standard errors are computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A2. Effect of Auction Method on Sale Outcomes
Propensity Score in (.075,.925)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Panel A: Northern Sales (N = 1071 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.089	-0.013	0.056	0.040	0.089	0.049
	(0.035)	(0.032)	(0.016)	(0.026)	(0.039)	(0.032)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.096	-0.006	0.057	0.038	0.097	0.057
	(0.035)	(0.032)	(0.016)	(0.027)	(0.040)	(0.033)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.178	-0.064	0.101	0.081	0.133	0.115
	(0.042)	(0.041)	(0.019)	(0.029)	(0.047)	(0.045)
Median Regression[c]						
Sealed Bid Effect on Sample	0.119	-0.018	0.052	0.000	0.068	0.022
	(0.050)	(0.042)	(0.018)	(0.002)	(0.044)	(0.037)
			Panel B: California Sales (N = 707 Sales)			
Regression with No Interactions Between Sealed and Covariates[2]						
Sealed Bid Effect	0.101	-0.026	0.058	0.036	0.027	-0.026
	(0.045)	(0.038)	(0.020)	(0.036)	(0.051)	(0.040)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.099	-0.022	0.056	0.035	0.026	-0.037
	(0.044)	(0.038)	(0.020)	(0.035)	(0.050)	(0.039)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.209	-0.169	0.148	0.103	0.012	0.036
	(0.046)	(0.042)	(0.023)	(0.035)	(0.058)	(0.056)
Median Regression[c]						
Sealed Bid Effect on Sample	0.095	-0.005	0.063	0.060	0.069	-0.049
	(0.077)	(0.055)	(0.027)	(0.046)	(0.075)	(0.066)

Notes: Regression specifications include the same sale controls used in Table II (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest or forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score. Standard errors are computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A3. Effect of Auction Method on Sale Outcomes
Propensity Score in (.1,.9)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Panel A: Northern Sales (N = 984 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.094	-0.027	0.063	0.045	0.080	0.044
	(0.036)	(0.032)	(0.016)	(0.027)	(0.040)	(0.032)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.100	-0.024	0.063	0.044	0.082	0.048
	(0.037)	(0.032)	(0.016)	(0.027)	(0.040)	(0.034)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.189	-0.078	0.106	0.084	0.117	0.099
	(0.043)	(0.040)	(0.020)	(0.029)	(0.046)	(0.047)
Median Regression[c]						
Sealed Bid Effect on Sample	0.125	-0.018	0.037	0.000	0.055	0.007
	(0.049)	(0.044)	(0.018)	(0.002)	(0.045)	(0.041)
			Panel B: California Sales (N = 600 Sales)			
Regression with No Interactions Between Sealed and Covariates[2]						
Sealed Bid Effect	0.096	-0.010	0.052	0.035	0.038	-0.017
	(0.046)	(0.038)	(0.021)	(0.037)	(0.051)	(0.041)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.094	-0.011	0.052	0.034	0.031	-0.033
	(0.046)	(0.039)	(0.021)	(0.036)	(0.051)	(0.040)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.168	-0.123	0.117	0.068	-0.005	0.017
	(0.048)	(0.046)	(0.024)	(0.038)	(0.063)	(0.060)
Median Regression[c]						
Sealed Bid Effect on Sample	0.112	0.005	0.050	0.049	0.074	-0.010
	(0.080)	(0.063)	(0.045)	(0.025)	(0.078)	(0.067)

Notes: Regression specifications include the same sale controls used in Table II (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest or forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score. Standard errors are computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A4. Effect of Auction Method on Sale Outcomes
Propensity Score in (.2,.8)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Panel A: Northern Sales (N = 667 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.06	-0.036	0.048	0.036	0.083	0.058
	(0.043)	(0.035)	(0.018)	(0.031)	(0.045)	(0.037)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.058	-0.034	0.048	0.036	0.082	0.060
	(0.044)	(0.035)	(0.018)	(0.031)	(0.045)	(0.037)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.140	-0.055	0.079	0.079	0.089	0.061
	(0.049)	(0.045)	(0.023)	(0.034)	(0.054)	(0.052)
Median Regression[c]						
Sealed Bid Effect on Sample	0.086	-0.055	0.039	0.000	0.057	0.026
	(0.066)	(0.041)	(0.019)	(0.001)	(0.050)	(0.048)
			Panel B: California Sales (N = 344 Sales)			
Regression with No Interactions Between Sealed and Covariates[2]						
Sealed Bid Effect	0.134	0.001	0.061	0.042	0.040	-0.053
	(0.055)	(0.050)	(0.028)	(0.047)	(0.064)	(0.173)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.128	-0.003	0.060	0.036	0.029	-0.085
	(0.055)	(0.050)	(0.028)	(0.048)	(0.616)	(0.048)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.183	-0.064	0.089	0.041	-0.016	-0.012
	(0.065)	(0.057)	(0.032)	(0.051)	(0.079)	(0.080)
Median Regression[c]						
Sealed Bid Effect on Sample	0.176	0.087	0.013	0.080	0.068	-0.045
	(0.079)	(0.080)	(0.040)	(0.072)	(0.091)	(0.069)

Notes: Regression specifications include the same sale controls used in Table II (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest or forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score. Standard errors are computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A5. Summary Statistics for Northern Sales, Schuster-Niccolucci Subsample

	Open Auctions								Sealed Auctions							
	Full Sample		P.S. in (.075,.925)		P.S. in (.1,.9)		P.S. in (.2,.8)		Full Sample		P.S. in (.075,.925)		P.S. in (.1,.9)		P.S. in (.2,.8)	
N	*235*		*175*		*166*		*107*		*143*		*127*		*116*		*81*	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Auction Outcomes																
Winning Bid ($/mbf)	78.08	46.17	79.09	47.14	79.63	48.14	83.63	51.33	85.14	53.79	85.32	54.38	86.73	55.48	88.32	57.88
Entrants	3.83	2.07	3.93	2.15	3.92	2.17	3.77	2.05	4.33	2.60	4.39	2.64	4.44	2.67	4.38	2.75
# Loggers Entering	1.67	1.82	1.85	1.95	1.83	1.96	1.81	1.81	2.59	2.11	2.61	2.16	2.66	2.18	2.60	2.11
# Mills Entering	2.16	1.80	2.08	1.87	2.09	1.88	1.95	1.92	1.73	2.06	1.78	2.08	1.78	2.06	1.78	1.96
Fraction Loggers Entering	0.44	0.39	0.48	0.39	0.47	0.39	0.51	0.41	0.66	0.36	0.65	0.36	0.65	0.35	0.64	0.34
Logger Wins Auction	0.34	0.47	0.37	0.48	0.37	0.48	0.41	0.49	0.51	0.50	0.50	0.50	0.51	0.50	0.48	0.50
Appraisal Variables																
Volume of timber (hundred mbf)	39.77	42.65	31.29	37.22	30.95	37.11	22.22	24.80	15.90	24.68	15.80	23.82	16.17	24.57	15.10	21.44
Reserve Price ($/mbf)	34.57	27.71	34.64	28.04	34.70	28.60	38.00	31.61	33.99	27.12	34.36	28.30	34.44	29.24	35.41	30.81
Selling Value ($/mbf)	163.19	137.78	166.72	135.94	170.31	135.98	185.61	136.05	162.38	126.99	157.88	129.04	165.38	128.47	176.92	128.19
Road Construction ($/mbf)	5.84	9.11	5.18	9.41	5.06	9.34	4.30	8.97	2.82	7.42	2.66	7.29	2.81	7.54	2.44	7.44
No Road Construction	0.14	0.35	0.11	0.32	0.11	0.31	0.09	0.29	0.13	0.33	0.13	0.34	0.11	0.32	0.10	0.30
Logging Costs ($/mbf)	29.27	52.37	27.32	49.34	28.22	50.02	28.85	50.43	24.11	47.07	24.79	47.78	26.16	48.77	28.45	49.76
Manufacturing Costs ($/mbf)	35.09	61.02	33.51	60.09	34.51	60.73	35.23	61.11	29.47	56.67	30.23	57.46	32.09	58.90	35.92	61.49
Sale Characteristics																
Contract Length (months)	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Species Herfindal	0.52	0.22	0.54	0.22	0.54	0.22	0.55	0.22	0.57	0.23	0.58	0.23	0.58	0.24	0.59	0.24
Density of Timber (mbf/acres)	6.70	6.65	7.12	7.29	7.08	7.05	7.24	7.37	8.48	7.97	8.48	8.29	8.66	8.34	8.66	8.16
Salvage Sale	0.26	0.44	0.30	0.46	0.30	0.46	0.32	0.47	0.45	0.50	0.44	0.50	0.43	0.50	0.40	0.49
Scale Sale	0.49	0.50	0.47	0.50	0.48	0.50	0.45	0.50	0.28	0.45	0.28	0.45	0.26	0.44	0.27	0.45
Quarter of Sale	2.38	0.90	2.41	0.88	2.41	0.88	2.47	0.88	2.53	0.93	2.54	0.90	2.53	0.90	2.51	0.95
Year of Sale	88.45	1.13	88.45	1.11	88.44	1.12	88.44	1.13	88.52	1.11	88.51	1.10	88.46	1.09	88.41	1.08
Housing Starts	1422.21	194.78	1418.82	185.09	1420.87	184.42	1431.69	189.13	1416.99	180.54	1419.53	181.68	1429.80	180.20	1443.56	179.71
Potential Competition																
Logging companies in county	38.01	19.58	39.19	19.61	39.33	19.89	39.42	20.43	43.74	21.92	43.88	22.23	43.70	22.35	43.32	22.35
Sawmills in County	8.20	5.39	8.21	5.35	8.05	5.28	7.61	5.00	7.48	4.52	7.46	4.47	7.48	4.56	7.52	4.66
Active Loggers	13.94	7.32	14.65	7.65	14.81	7.73	15.01	7.88	16.06	6.83	16.43	6.73	16.57	6.77	16.05	6.91
Active Mills	5.91	2.00	6.21	2.06	6.22	2.08	6.43	2.15	7.11	2.08	7.12	2.10	7.02	2.09	6.65	2.04

Notes: Data is from US Forest Service sales held between 1982 and 1990 in Kootenai and Idaho Panhandle National Forests. Data is from the US Forest Service, Timber Data Company, and US Census Bureau. Timber is measured in thousand board feet, or mbf. The selected sample consists of sales with a propensity score, or estimated probability of being sealed bid, between 0.075 and 0.925. An Active Logger or Mill is a firm that has bid in the same forest district in the prior 12 months.

Table A6. Choice of Sale Method for Northern Forest Schuster-Niccolucci Subsample

	coefficient	s.e.
Appraisal Controls		
Ln(Reserve Price)	-0.020	(0.257)
Ln(Selling Value)	-0.100	(0.083)
Ln(Logging Costs)	-1.506	(2.010)
Ln(Manufacturing Costs)	-5.445	(3.959)
Ln(Road Costs)	-0.072	(0.166)
Other Sale Characteristics		
ln(Contract Length/volume)	20.240	(11.836)
Species Herfindal	0.201	(0.816)
Density of Timber (hmbf/acres)	-0.005	(0.022)
Salvage Sale (Dummy)	0.434	(0.357)
Scale Sale (Dummy)	0.625	(0.400)
ln(Monthly US House Starts)	0.803	(2.329)
Volume Controls (Dummy Variables):		
Volume: 1.5-3 hundred mbf	-0.454	(0.665)
Volume: 3-5	-0.487	(0.724)
Volume: 5-8	-0.429	(0.743)
Volume: 8-12	-0.078	(0.762)
Volume: 12-20	-0.739	(0.722)
Volume: 20-40	-1.087	(0.801)
Volume: 40-65	-1.659	(0.861)
Volume: 65-90	-2.889	(0.953)
Volume: 90+	-2.546	(1.044)
Potential Competition		
ln(Loggers in County)	-0.607	(0.758)
ln(Sawmills in County)	1.687	(0.826)
ln(Active Loggers)	-1.053	(0.473)
ln(Active Mills)	1.727	(0.811)
Additional Controls (Dummy Variables)		
Chi-Squared Statistics (p-value in parenthesis)		
Quarters	3.910	(0.272)
Species	16.080	(0.308)
Location	21.770	(0.010)
	N = 378	
	LR chi2 ()	152.26
	P-value	0.00
	Pseudo-R2	0.31

Notes: Estimates are obtained from a logit regression of a sealed bid dummy variable on sale characteristics. Additional controls include dummy variables for each year, quarter, forest-district, and for common species. Robust standard errors in parentheses.

Table A7. Effect of Auction Method on Sale Outcomes
Schuster-Niccolucci Subsample, Unrestricted Propensity Score

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Northern Sales (N = 378 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.161	0.037	0.051	-0.021	0.125	0.066
	(0.065)	(0.056)	(0.030)	(0.048)	(0.067)	(0.058)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.168	0.046	0.052	0.052	0.124	0.066
	(0.062)	(0.058)	(0.030)	(0.030)	(0.066)	(0.058)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.267	-0.054	0.139	0.079	0.148	0.147
	(0.066)	(0.075)	(0.037)	(0.079)	(0.068)	(0.147)
Median Regression[c]						
Sealed Bid Effect on Sample	0.196	-0.017	0.088	0.000	0.016	0.042
	(0.097)	(0.084)	(0.039)	(0.016)	(0.089)	(0.070)

Notes: Regression specifications include the same sale controls used in Tables II and III (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score, with standard errors computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A8. Effect of Auction Method on Sale Outcomes
Schuster-Niccolucci Subsample, Propensity Score in (0.075,0.925)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Northern Sales (N = 302 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.202	0.020	0.072	-0.012	0.138	0.076
	(0.069)	(0.060)	(0.031)	(0.054)	(0.073)	(0.063)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.197	0.020	0.069	-0.010	0.122	0.066
	(0.068)	(0.062)	(0.031)	(0.053)	(0.074)	(0.063)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.240	-0.038	0.119	0.070	0.146	0.144
	(0.071)	(0.082)	(0.040)	(0.056)	(0.075)	(0.073)
Median Regression[c]						
Sealed Bid Effect on Sample	0.260	-0.055	0.106	0.000	0.139	0.048
	(0.101)	(0.090)	(0.038)	(0.040)	(0.105)	(0.079)

Notes: Regression specifications include the same sale controls used in Tables II and III (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score, with standard errors computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A9. Effect of Auction Method on Sale Outcomes
Schuster-Niccolucci Subsample, Propensity Score in (0.1,0.9)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Northern Sales (N = 282 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.192	0.029	0.071	-0.007	0.156	0.093
	(0.073)	(0.063)	(0.033)	(0.059)	(0.075)	(0.065)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.189	0.029	0.066	-0.008	0.150	0.097
	(0.073)	(0.065)	(0.033)	(0.057)	(0.076)	(0.065)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.269	-0.033	0.127	0.082	0.174	0.177
	(0.076)	(0.089)	(0.042)	(0.059)	(0.077)	(0.076)
Median Regression[c]						
Sealed Bid Effect on Sample	0.238	-0.041	0.104	0.000	0.148	0.050
	(0.123)	(0.085)	(0.042)	(0.053)	(0.093)	(0.098)

Notes: Regression specifications include the same sale controls used in Tables II and III (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score, with standard errors computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A10. Effect of Auction Method on Sale Outcomes
Schuster-Niccolucci Subsample, Propensity Score in (0.2,0.8)

Dependent Variable:	(1) ln(Logger Entry)	(2) ln(Mill Entry)	(3) Loggers/Entrants	(4) Logger Wins	(5) ln(Price)	(6) ln(Price)[a]
			Northern Sales (N = 188 Sales)			
Regression with No Interactions Between Sealed and Covariates						
Sealed Bid Effect	0.196	0.094	0.037	-0.075	0.153	0.058
	(0.084)	(0.073)	(0.037)	(0.068)	(0.090)	(0.082)
Regression with Interactions Between Sealed and All Covariates						
Sealed Bid Effect on Sample	0.211	0.096	0.034	-0.078	0.154	0.056
	(0.088)	(0.073)	(0.038)	(0.067)	(0.092)	(0.085)
Matching Estimate[b]						
Sealed Bid Effect on Sample	0.274	-0.014	0.106	0.049	0.096	0.091
	(0.090)	(0.106)	(0.050)	(0.074)	(0.094)	(0.096)
Median Regression[c]						
Sealed Bid Effect on Sample	0.339	0.012	0.070	0.000	0.156	-0.031
	(0.139)	(0.119)	(0.059)	(0.104)	(0.134)	(0.126)

Notes: Regression specifications include the same sale controls used in Tables II and III (Forest Service reserve price and estimates of selling value, logging costs, manufacturing costs and road costs, the contract length per unit volume, a species herfindal, the timber density, indicators for salvage or scale sale, monthly housing starts, indicators for volume categories, and dummy variables for year, quarter, forest district, and common species). Additional notes: (a) Column (6) includes number of entering mills and loggers in addition to sale controls; (b) Matching estimate is computed as in described in the text using closest four matches based on the estimated propensity score, with standard errors computed following Abadie and Imbens (2006); (c) Standard errrors for median regression are computed using a bootstrap with 100 draws.

Table A11. Effect of Sealed Bidding in Northern Forests, Complete OLS Estimates

	(1)		(2)		(3)		(4)		(5)		(6)	
Dependent Variable:	ln(Logger Entry)		ln(Mill Entry)		Loggers/Entrants		Logger Wins		Ln(Price)		Ln(Price)	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Sale Method												
Sealed Bid Auction	0.089	(0.037)	-0.014	(0.030)	0.056	(0.016)	0.039	(0.026)	0.094	(0.038)	0.055	(0.032)
Appraisal Controls												
Ln(Reserve Price)	-0.129	(0.026)	0.022	(0.020)	-0.040	(0.012)	-0.046	(0.018)	0.402	(0.028)	0.452	(0.025)
Ln(Selling Value)	-0.016	(0.025)	0.043	(0.019)	-0.024	(0.011)	-0.031	(0.017)	0.018	(0.026)	0.003	(0.017)
Ln(Logging Costs)	-0.320	(0.109)	-0.381	(0.075)	0.076	(0.045)	0.109	(0.068)	-0.826	(0.119)	-0.482	(0.097)
Ln(Manufacturing Costs)	0.115	(0.154)	0.482	(0.131)	-0.222	(0.078)	-0.082	(0.124)	1.086	(0.160)	0.692	(0.136)
Ln(Road Costs)	-0.063	(0.018)	0.006	(0.016)	-0.023	(0.009)	-0.012	(0.013)	-0.020	(0.020)	0.012	(0.017)
Other Sale Characteristics												
ln(Contract Length/volume)	-2.290	(0.925)	0.844	(0.740)	-0.905	(0.402)	-0.163	(0.591)	-0.063	(1.111)	0.034	(0.804)
Species Herfindal	-0.050	(0.097)	0.001	(0.072)	-0.047	(0.044)	-0.148	(0.068)	-0.080	(0.093)	-0.012	(0.082)
Density of Timber (hmbf/acres)	-0.173	(0.244)	0.190	(0.178)	-0.059	(0.098)	-0.194	(0.169)	-0.329	(0.255)	-0.228	(0.199)
Salvage Sale (Dummy)	0.056	(0.040)	-0.065	(0.030)	0.061	(0.017)	0.075	(0.027)	0.037	(0.042)	0.057	(0.033)
Scale Sale (Dummy)	-0.085	(0.044)	-0.015	(0.034)	-0.010	(0.020)	-0.014	(0.030)	-0.069	(0.047)	-0.039	(0.039)
ln(Monthly US House Starts	0.323	(0.227)	-0.108	(0.180)	0.206	(0.097)	0.371	(0.167)	-0.363	(0.245)	-0.383	(0.195)
Volume Controls (Dummy Variables):												
Volume: 1.5-3 hundred mbf	-0.039	(0.071)	0.202	(0.054)	-0.117	(0.031)	-0.154	(0.046)	0.010	(0.069)	-0.118	(0.054)
Volume: 3-5	-0.054	(0.076)	0.344	(0.061)	-0.192	(0.034)	-0.208	(0.051)	0.161	(0.075)	-0.056	(0.059)
Volume: 5-8	-0.290	(0.081)	0.560	(0.065)	-0.298	(0.038)	-0.326	(0.058)	0.035	(0.078)	-0.123	(0.065)
Volume: 8-12	-0.356	(0.085)	0.702	(0.072)	-0.345	(0.040)	-0.369	(0.060)	0.029	(0.088)	-0.175	(0.073)
Volume: 12-20	-0.418	(0.085)	0.910	(0.071)	-0.447	(0.041)	-0.491	(0.061)	0.085	(0.084)	-0.194	(0.073)
Volume: 20-40	-0.711	(0.096)	1.165	(0.082)	-0.666	(0.048)	-0.743	(0.070)	0.192	(0.099)	-0.101	(0.086)
Volume: 40-65	-0.748	(0.111)	1.179	(0.090)	-0.713	(0.058)	-0.768	(0.080)	0.106	(0.111)	-0.218	(0.096)
Volume: 65-90	-1.000	(0.117)	1.327	(0.100)	-0.826	(0.058)	-0.866	(0.075)	0.289	(0.109)	-0.045	(0.105)
Volume: 90+	-0.999	(0.125)	1.434	(0.104)	-0.842	(0.063)	-0.896	(0.085)	0.356	(0.134)	-0.012	(0.123)
Potential Competition												
ln(Loggers in County)	-0.013	(0.060)	-0.009	(0.041)	-0.012	(0.024)	-0.007	0.0449	0.073	(0.062)	0.081	(0.047)
ln(Sawmills in County)	0.030	(0.072)	-0.008	(0.062)	0.038	(0.033)	0.034	0.0613	-0.131	(0.082)	-0.146	(0.066)
ln(Active Loggers)	0.197	(0.038)	-0.021	(0.034)	0.058	(0.018)	0.022	0.0259	0.043	(0.044)	-0.058	(0.034)
ln(Active Mills)	-0.018	(0.026)	0.029	(0.018)	-0.025	(0.011)	-0.024	0.013	0.020	(0.030)	0.010	(0.021)
Entering Bidders												
Number of Logger Entrants											0.124	(0.008)
Number of Mill Entrants											0.195	(0.013)
Additional Controls (Dummy Variables)												
F-statistics (p-value in parenthesis)												
Years	2.19	(0.004)	7.83	(0.000)	6.47	(0.000)	4.00	(0.000)	5.98	(0.000)	4.32	(0.000)
Quarters	6.55	(0.000)	4.32	(0.005)	0.18	(0.911)	1.79	(0.147)	6.72	(0.000)	1.24	(0.295)
Species	1.84	(0.029)	2.06	(0.012)	1.91	(0.022)	1.29	(0.204)	2.77	(0.001)	2.20	(0.007)
Location	2.33	(0.006)	2.97	(0.000)	3.26	(0.000)	2.73	(0.001)	4.07	(0.000)	4.06	(0.000)
	N=1071		N=1071		N=1071		N=1071		N=1071		N=1071	
	F(73, 997	16.04	F(73, 997	33.43	F(73, 997	40.87	F(73, 997	34.42	F(73, 997	20.87	F(75, 995	33.80
	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000
	R^2	0.50	R^2	0.64	R^2	0.66	R^2	0.50	R^2	0.60	R^2	0.75

Notes: Table reports the complete coefficient estimates from the OLS specification reported in Table III of the paper. Each column contains coefficients from an OLS regressions of the dependent variable on listed covariates. The sample consists of Northern Sales with propensity scores between 0.075 and 0.925. Robust standard errors in parentheses

Table A12. Effect of Sealed Bidding in California Forests, Complete OLS Estimates

	(1)		(2)		(3)		(4)		(5)		(6)	
Dependent Variable:	ln(Logger Entry)		ln(Mill Entry)		Loggers/ # Entran		Logger Wins		Ln(Price)		Ln(Price)	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Sale Method												
Sealed Bid Auction	0.101	(0.045)	-0.026	(0.038)	0.058	(0.020)	0.036	(0.036)	0.027	(0.051)	-0.026	(0.040)
Appraisal Controls												
Ln(Reserve Price)	-0.120	(0.030)	0.131	(0.027)	-0.087	(0.013)	-0.092	(0.025)	0.599	(0.040)	0.602	(0.031)
Ln(Selling Value)	-0.007	(0.022)	-0.003	(0.020)	-0.003	(0.009)	0.001	(0.019)	-0.010	(0.027)	-0.002	(0.021)
Ln(Logging Costs)	-0.629	(0.103)	-0.322	(0.093)	-0.015	(0.047)	-0.028	(0.088)	-0.556	(0.123)	-0.020	(0.103)
Ln(Manufacturing Costs)	0.033	(0.025)	0.113	(0.026)	-0.039	(0.011)	-0.065	(0.020)	0.092	(0.027)	0.005	(0.024)
Ln(Road Costs)	-0.101	(0.022)	0.079	(0.108)	-0.051	(0.011)	-0.057	(0.018)	0.008	(0.024)	0.032	(0.019)
Other Sale Characteristics												
ln(Contract Length/volume)	0.537	(1.091)	-1.148	(0.882)	0.330	(0.483)	0.790	(0.969)	-2.863	(1.193)	-2.794	(0.930)
Species Herfindal	-0.018	(0.086)	0.201	(0.081)	-0.085	(0.039)	-0.235	(0.075)	-0.058	(0.098)	-0.168	(0.078)
Density of Timber (hmbf/acres)	-0.123	(0.113)	-0.101	(0.099)	0.076	(0.047)	0.093	(0.084)	-0.342	(0.170)	-0.268	(0.134)
Salvage Sale (Dummy)	-0.062	(0.049)	-0.049	(0.046)	0.009	(0.024)	-0.015	(0.043)	-0.017	(0.061)	0.068	(0.047)
Scale Sale (Dummy)	0.093	(0.054)	0.166	(0.050)	-0.063	(0.026)	-0.171	(0.046)	0.258	(0.067)	0.113	(0.051)
ln(Monthly US House Starts	0.312	(0.256)	0.063	(0.233)	0.002	(0.113)	-0.022	(0.213)	-0.096	(0.281)	-0.181	(0.227)
Volume Controls (Dummy Variables):												
Volume: 1.5-3 hundred mbf	0.046	(0.122)	0.229	(0.098)	-0.137	(0.050)	-0.153	(0.092)	-0.088	(0.143)	-0.246	(0.105)
Volume: 3-5	0.137	(0.133)	0.466	(0.112)	-0.228	(0.055)	-0.327	(0.101)	0.119	(0.158)	-0.160	(0.118)
Volume: 5-8	0.000	(0.138)	0.539	(0.112)	-0.285	(0.059)	-0.349	(0.106)	0.033	(0.165)	-0.211	(0.121)
Volume: 8-12	0.054	(0.149)	0.611	(0.122)	-0.289	(0.062)	-0.351	(0.116)	-0.104	(0.171)	-0.390	(0.128)
Volume: 12-20	-0.081	(0.153)	0.803	(0.126)	-0.418	(0.065)	-0.448	(0.118)	0.006	(0.177)	-0.315	(0.132)
Volume: 20-40	-0.361	(0.175)	1.011	(0.149)	-0.582	(0.079)	-0.679	(0.139)	-0.222	(0.206)	-0.580	(0.155)
Volume: 40-65	-0.382	(0.194)	1.071	(0.161)	-0.598	(0.085)	-0.628	(0.158)	-0.267	(0.228)	-0.652	(0.174)
Volume: 65-90	-0.552	(0.243)	1.181	(0.180)	-0.754	(0.100)	-0.826	(0.175)	-0.183	(0.267)	-0.558	(0.203)
Volume: 90+	-0.249	(0.273)	1.333	(0.238)	-0.685	(0.115)	-1.043	(0.183)	0.110	(0.320)	-0.510	(0.269)
Potential Competition												
ln(Loggers in County)	-0.016	(0.042)	-0.047	(0.038)	0.021	(0.019)	0.057	(0.037)	-0.047	(0.049)	-0.003	(0.040)
ln(Sawmills in County)	0.009	(0.058)	0.105	(0.050)	-0.064	(0.025)	-0.151	(0.046)	0.019	(0.066)	-0.032	(0.052)
ln(Active Loggers)	0.182	(0.023)	-0.021	(0.029)	0.068	(0.010)	0.056	(0.017)	0.075	(0.036)	0.003	(0.025)
ln(Active Mills)	-0.015	(0.016)	0.068	(0.016)	-0.038	(0.008)	-0.041	(0.012)	0.056	(0.024)	0.026	(0.018)
Entering Bidders												
Number of Logger Entrants											0.132	(0.010)
Number of Mill Entrants											0.193	(0.014)
Additional Controls (Dummy Variables)												
F-statistics (p-value in parenthesis)												
Years	4.76	(0.000)	4.20	(0.000)	3.61	(0.001)	3.91	(0.000)	8.34	(0.000)	5.89	(0.000)
Quarters	9.56	(0.000)	6.60	(0.000)	1.14	(0.331)	1.44	(0.230)	5.68	(0.001)	0.21	(0.888)
Species	3.77	(0.000)	5.84	(0.000)	3.15	(0.002)	2.70	(0.006)	4.98	(0.000)	2.60	(0.008)
Location	1.59	(0.098)	2.90	(0.001)	3.35	(0.000)	2.97	(0.001)	2.91	(0.001)	3.45	(0.000)
	N=707		N=707		N=707		N=707		N=707		N=707	
	F(56, 65(	12.92	F(56, 65(	36.26	F(56, 65(	38.59	F(56, 65(	27.69	F(56, 65(	42.76	F(58, 64(	60.42
	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000	P-value	0.000
	R^2	0.46	R^2	0.42	R^2	0.21	R^2	0.38	R^2	0.52	R^2	0.42

Notes: Table reports the complete coefficient estimates from the OLS specification reported in Table III of the paper. Each column contains coefficients from an OLS regressions of the dependent variable on listed covariates. The sample consists of California sales with propensity scores between 0.075 and 0.925. Robust standard errors in parentheses

Figure A1. Propensity Score Distribution
Northern Sales

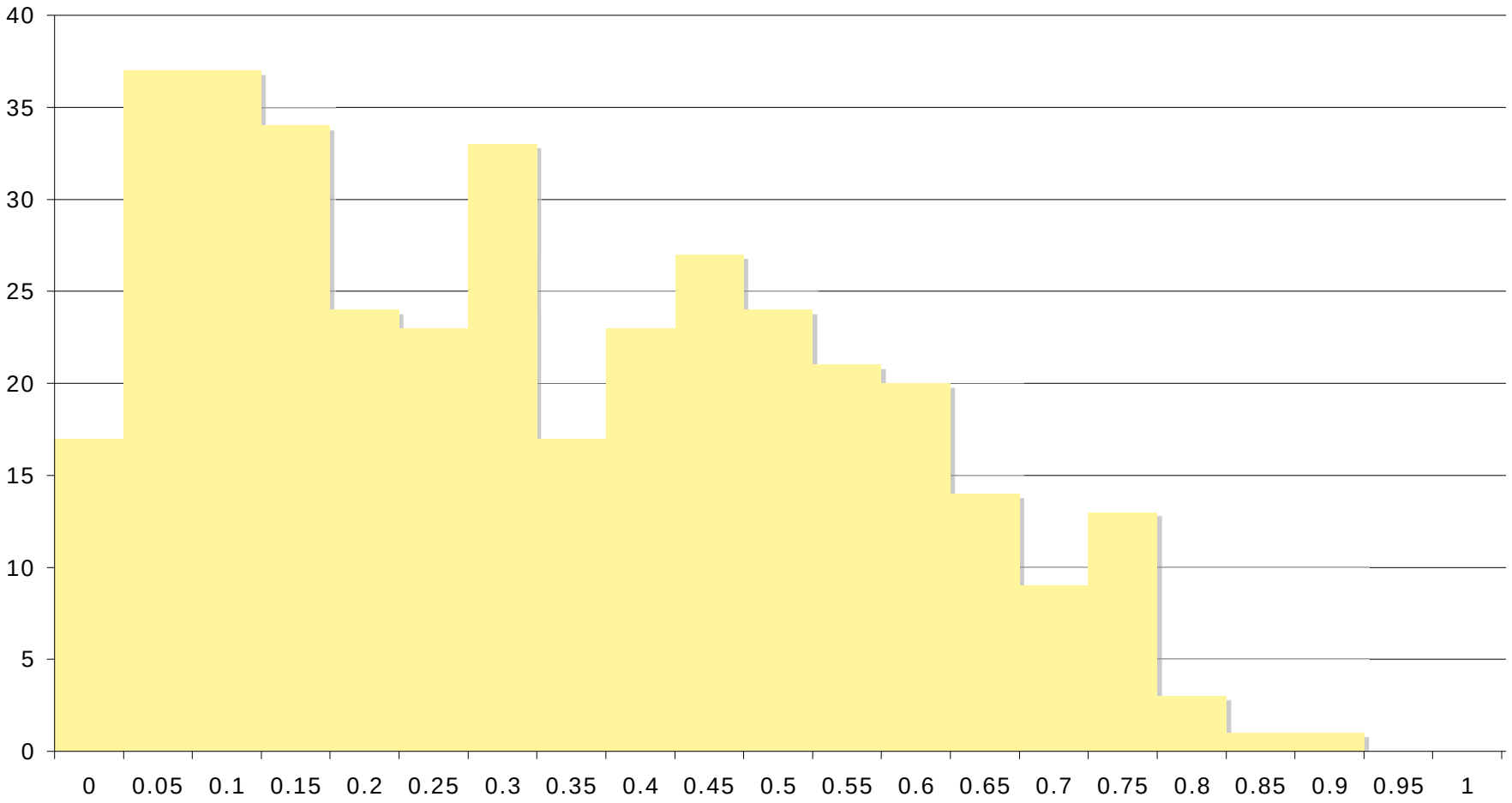


Figure A2. Propensity Score Distribution
California Sales

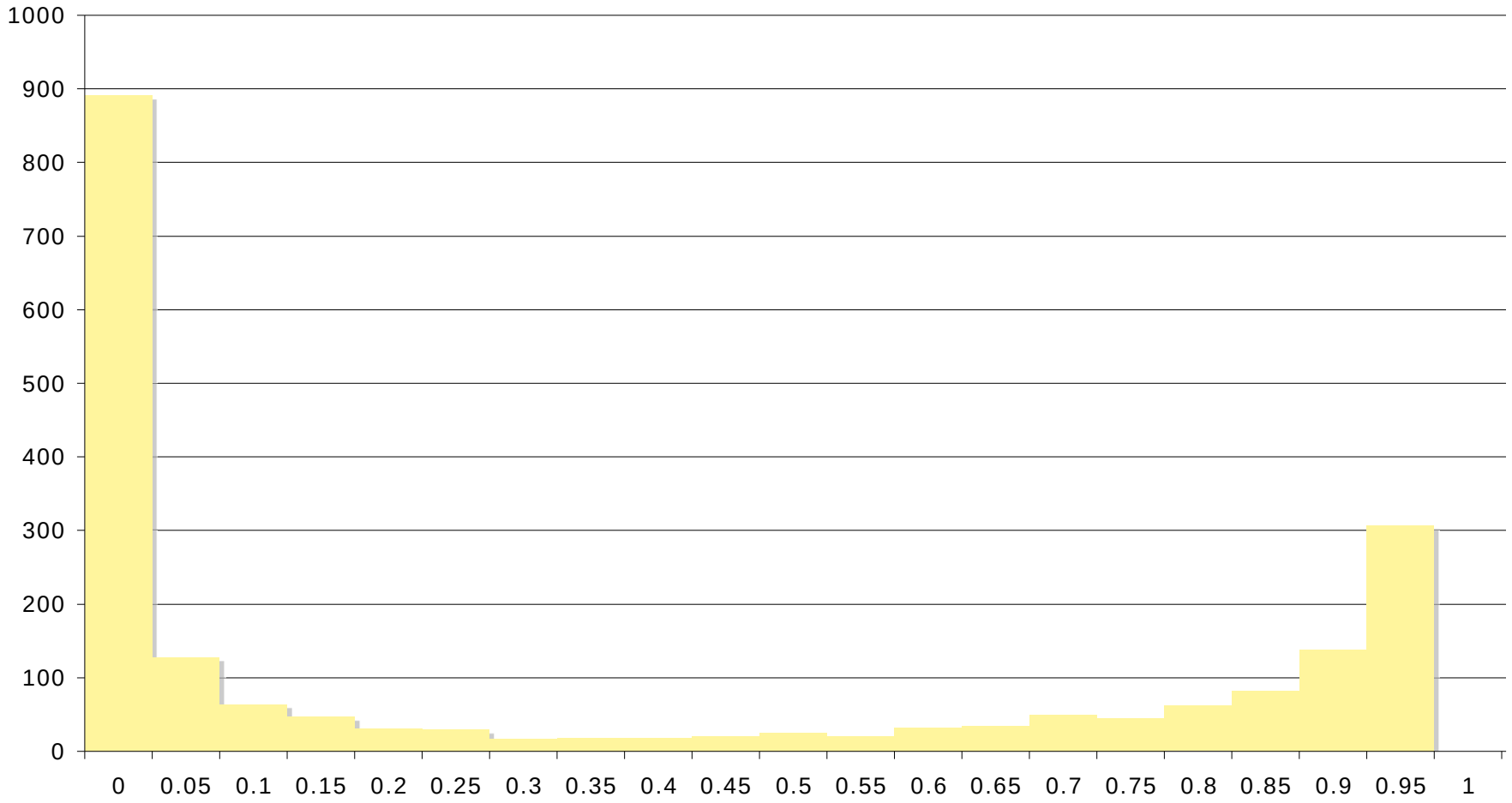
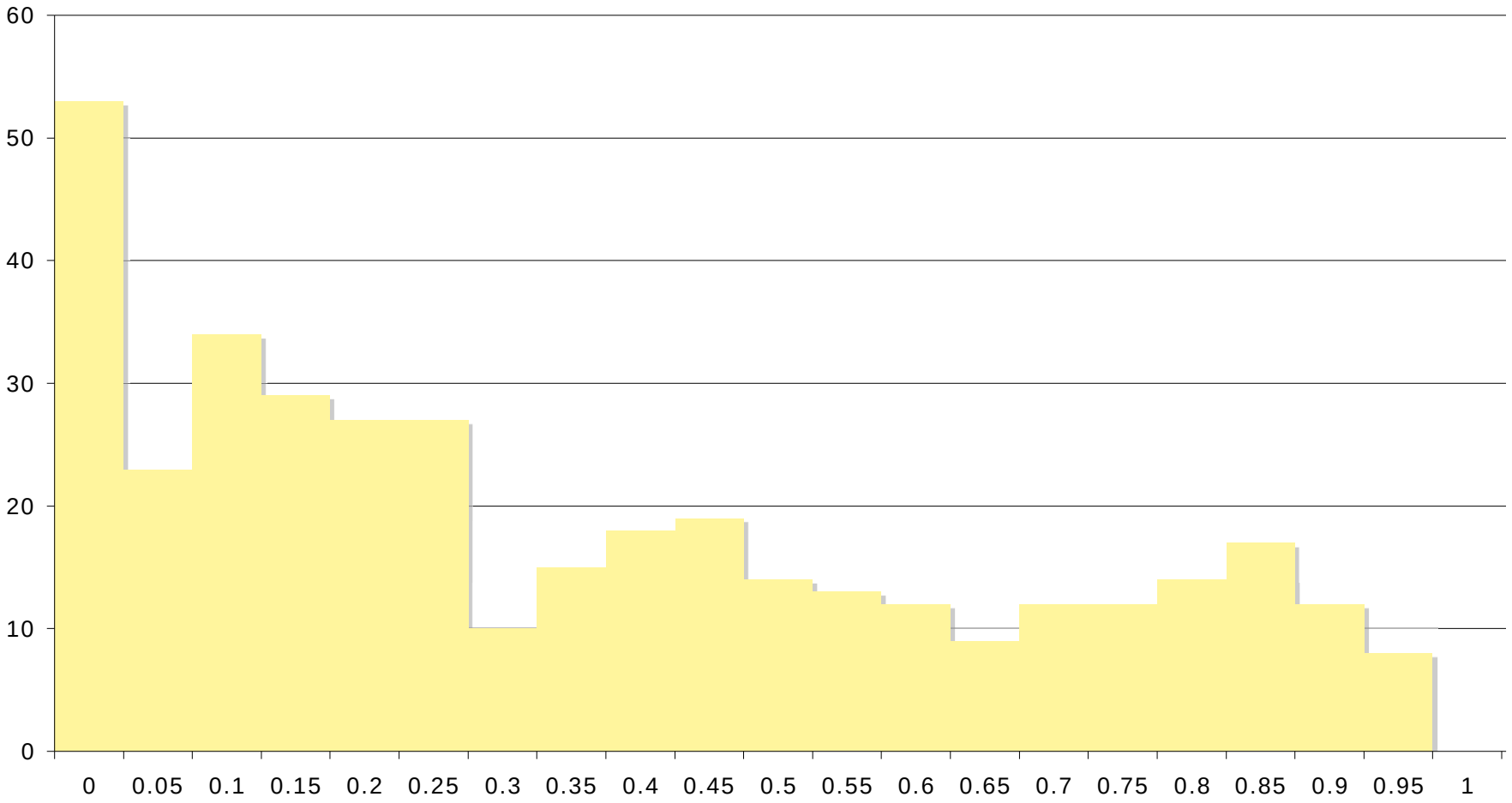


Figure A3. Propensity Score Distribution
Northern Sales, Schuster-Niccolucci Subsample



Notes for Figure A1

Notes: Figure shows the distribution of estimated propensity scores for the Northern Region. For each sale, the estimated propensity score is the estimated probability of the auction being sealed bid, obtained from the logit regression reported in Table II. Distribution is shown as a histogram with bins corresponding to estimated probability [0,00,0.05), [0.05,0.10), ... [0.95,1.00].

Notes for Figure A2

Notes: Figure shows the distribution of estimated propensity scores for the California Region. For each sale, the estimated propensity score is the estimated probability of the auction being sealed bid, obtained from the logit regression reported in Table II. Distribution is shown as a histogram with bins corresponding to estimated probability [0,00,0.05), [0.05,0.10), ... [0.95,1.00].

Notes for Figure A3

Notes: Figure shows the distribution of estimated propensity scores for the Northern Region, Schuster-Niccolucci subsample. For each sale, the estimated propensity score is the estimated probability of the auction being sealed bid, obtained from the logit regression reported in Table A6. Distribution is shown as a histogram with bins corresponding to estimated probability [0,00,0.05), [0.05,0.10), ... [0.95,1.00].