

Naming Your Own Price Mechanisms: Revenue Gain or Drain?

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Very preliminary, please do not quote without the authors' permission.

October 19th, 2007

Abstract

The surge in online pricing mechanisms such as Priceline.com's "name your own price" (NYOP) leaves open an empirical question of why firms would deviate from the standard practices of posting a take-it-or-leave-it offer. Presumably firms find this sales method more profitable, despite some theoretical arguments that claim that a posted-price is always at least as good at generating revenue as any other mechanism. We use laboratory experiments to compare the NYOP mechanism with the standard posted-price mechanism. We find that using an NYOP mechanism can increase profit and consumer surplus when consumers are certain about the good they will receive, but when consumers are uncertain about the good there is no significant change in profit and a decrease in consumer surplus.

William Shatner (Priceline Negotiator): A guy is worried about naming his own price? I'm on it.

Negotiator: Naming your own price, huh?

Purchaser: Yeah, they want \$200 for a 4-star on the Vegas strip ... I'm going \$190.

Negotiator: Oh, you're a wuss.

Purchaser: What?

Negotiator: Go lower.

Purchaser: \$160.

Negotiator: Namby-pamby.

Purchaser: \$140?

Negotiator: Cupcake.

Purchaser: I want to get a room.

Negotiator: It's a guaranteed 4-star room, mama's boy.

Purchaser: \$99?

Negotiator: Now you're negotiating.¹

¹The commercial for Priceline.com is named "Tough Love" and is available at http://tickets.priceline.com/promo/shatner_pcln_negotiator.asp as of 10/16/07.

1 Introduction

A Name-Your-Own-Price (NYOP) mechanism² is one in which a buyer of a good submits a bid (price) to an agency to procure a good. If that bid is greater than some unknown threshold provided to the agency by the firms it represents then the consumer receives the good and pays the submitted price and if not the consumer does not receive the good. The commercial underscores the basic costs and benefits of using an NYOP mechanism, although it does gloss over one important factor. The obvious benefit is a reduction in payment amount for the consumer, and the obvious cost is that the consumer may bid too low and not receive the room, forcing the consumer to pay the posted-price. The one factor glossed over is that there is uncertainty in that the consumer is not bidding for a particular item (say a suite at the Bellagio) but for a good within a class of items that have certain characteristics (a room in a 4-star hotel on the Vegas strip).³

An open empirical question is whether NYOP provides larger profits than a simple posted-price (PP) or if coupling NYOP and posted-price mechanisms yield higher profit than either individually. In the theoretical literature, Proposition 5 of Riley and Zeckhauser (1983) states:

If the only information available to the seller is whether a buyer will accept or reject his asking price, the "take-it-or-leave-it" pricing strategy dominates any probabilistically declining asking price strategy.

Riley and Zeckhauser do admit that if buyers are risk averse then an auction may be optimal. They refer the reader to Maskin and Riley (1984) for a thorough discussion of a comparison of pricing mechanisms when buyers are risk averse. Maskin and Riley (1984) show that when buyers are risk averse "high bid" (i.e. 1st-price sealed bid) auctions are optimal. Under a different set of assumptions, primarily that auction sellers have a storage and auctioning cost and that posted-price sellers have a display cost, Wang (1993) finds that auctions are optimal particularly if value distributions are dispersed.

Theory specifically focused on NYOP mechanisms is relatively sparse, particularly in the case where the actual object purchased is obscured. Fay (2004) examines whether or not repeat bidding in NYOP auctions reduces profit and finds that either encouraging or discouraging repeat bidders may be profitable, depending on the percentage of the population that participates in repeat bidding. Ding, Eliashberg, Huber, and Saini (2005) (DEHS) construct a model that incorporates frustration and excitement in NYOP mechanisms and propose that frustration and excitement levels of consumers will vary over time based on past experiences, and that this variation in frustration and excitement will lead to fluctuations in bids over time. Terwiesch, Hann, and Savin (2003) suggest that additional haggling time will keep those customers who are not price sensitive from cannibalizing profits. They also show, in Proposition 3, that under certain conditions haggling profits will be higher than posted-price profits.

²This mechanism is also referred to in the literature as *reverse pricing*.

³Note that even the term "4-star hotel" is vague, as some online sources state that the Bellagio is a 4-star hotel while others state that it is a 5-star hotel.

Why might NYOP generate more profit than PP? Primarily, if bidders only shade a little under their value then this is essentially a 1st-degree price discrimination mechanism. With posted prices the seller simply receives revenue of $N * p$ where N is the number of individuals with a value greater than the posted-price of p . The primary ways in which NYOP can increase profit are as follows. First, it is possible that a bidder submits a bid greater than the posted-price and the seller will clearly increase profit if this occurs. Second, the posted-price is typically greater than marginal or average cost for the seller. Thus, the seller could still increase profit by selling to individuals with values greater than marginal cost but below the posted-price, thus selling additional profitable units. The loss in revenue from NYOP stems from two sources. First, if a posted-price mechanism is not available as a fallback, individuals with values greater than the posted-price who fail to submit a bid greater than the threshold will not buy and reduce revenue. Second, when individuals with values greater than the posted-price submit a successful bid that is lower than the PP the seller loses revenue. The question is under what types of information conditions does this occur, and can a seller couple an NYOP mechanism with a posted-price mechanism to increase profit.

The experimental literature on NYOP mechanisms is just beginning to develop and primarily focuses on bidding behavior and comparisons to select-your-price (SYP) mechanisms. With an SYP mechanism a list of possible bids is provided by the seller, where the probability of that bid being accepted decreases as the bid decreases. Chernev (2003) conducts experiments using generation mechanisms (such as NYOP) and selection mechanisms (such as SYP) to determine how confident bidders feel in their likelihood of success. Throughout his multiple treatments, he finds that participants feel more confident in selection mechanisms than in generation mechanisms, although in Experiment 2 he finds that while participants are more confident with a selection mechanism that they prefer to use an augmented generation mechanism (i.e. an NYOP mechanism with a minimum and maximum for the allowable bid submission range). DEHS conduct experiments in which bidders participate in 20 consecutive rounds of NYOP with a constant value for an item and a known probability of winning for any bid level, with the probability of winning increasing as the bid increases. They find that participants increase bids when the previous bid was a loser and decrease bids when the previous bid was a winner. They ask the participants to self-report frustration and excitement levels with each bid submission and find that these emotions impact a bidder's strategy. Spann, Bernhardt, Haubl, and Skiera (2005) use field and lab experiments to determine whether NYOP or SYP mechanisms generate higher revenue. In particular, they use SYP mechanisms with a low range of values as well as with a high range of values. They find that the SYP mechanisms generate more revenue for the seller, particularly the SYP mechanism that has a high range of values.

We conduct experiments with 1 value in an attempt to establish a baseline for comparison with prior experimental results. We introduce a 2-value case for the consumer to mimic cases where an NYOP agency will provide the consumer with a good (such as an airline flight) but that the consumer may prefer one type of the good to another (such as an AM flight to a PM flight). In both the 1-value and 2-value treatments participants will progress through a series of NYOP and

posted-price mechanisms. The specifics of the experimental design are discussed in section 2. We present results on bidding behavior and a profit comparison between NYOP and posted-price mechanisms in section 3, and conclude with section 4.

2 Experimental Design.

Our experiment is designed to mimic potential information conditions an individual might face when using an NYOP mechanism. Two different purchasing mechanisms were used, a posted-price (PP) mechanism and an NYOP mechanism. When the posted-price mechanism was available participants were able to click a button to choose whether to accept or reject the list price. When the NYOP mechanism was available participants were told that they could submit a price and if their submitted price was higher than an unknown (to them) threshold price then they would win the item.

Each session consisted of 6 treatments with 12 rounds per treatment for a total of 72 rounds. Participants were told that they were bidding for fictitious airline tickets. The differences in the treatments were in the number of ticket values the participants received and in the information available to the participants. In half of the treatments participants received a value for a single ticket (1V) and in the other half of the treatments they received values for an AM ticket and a PM ticket (2V). For each ticket value condition there were 3 information conditions. In information condition 1 (IC1) participants simply saw their value(s) and the only mechanism available to purchase the ticket was an NYOP mechanism. For the two ticket value treatments participants were told that if their bid was successful the computer would randomly determine whether they received the AM or PM ticket.⁴ In information condition 2 (IC2) the only available mechanism was NYOP, but participants also saw a list price in addition to their value. However, they were unable to purchase the item at the list price. In the 2V rounds the list prices were the same for both the AM and PM tickets. The purpose of providing the list price was to provide some reference for participants when making their NYOP submissions, as bidders in actual NYOP auctions likely have some reference price on which they can base their decision. In information condition 3 (IC3) participants had all the information in IC2 but were now able to purchase the ticket at the list price if they chose to do so. Participants were informed that if they immediately chose the list price then the round would end but if they first used NYOP and their bid was unsuccessful they would then be able to purchase the ticket at the list price. In the 2V rounds participants could also choose which ticket they were buying if they chose to purchase using the posted price. Thus, each of the six treatments represents a combination of a number of ticket values and an information condition. Note that there was no treatment where only the posted-price mechanism was available as in the 1V treatments this would amount to 12 rounds of simply choosing to accept the list price when the list price was below the single ticket value and in the 2V treatments it would amount to choosing the highest ticket value if the highest ticket value was above the posted-price. Table

⁴This is true for all three information conditions.

Treatment	# of Ticket Values	Information Condition
U1	1	IC1
K1	1	IC2
A1	1	IC3
U2	2	IC4
K2	2	IC5
A2	2	IC6

Table 1: Ticket values and information conditions of the 6 phases

1 provides a summary of the 6 treatments. The number represents the number of values present in the treatment. Treatments beginning with a *U* mean that all information except the bidder’s value was *unknown*, while a *K* means that the posted-price is *known* but not available. Treatments beginning with an *A* mean that the posted-price is both known AND *available*.

To control for potential order effects of the treatments, 4 different orders were used. In all orderings either all three 1V treatments were run first or all three 2V treatments were run first. The two orderings when the 1V treatments were run first were *U1, K1, A1, U2, K2, A2* and *A1, K1, U1, A2, K2, U2*. When the 2V treatments were run first the orderings were *U2, K2, A2, U1, K1, A1* and *A2, K2, U2, A1, K1, U1*. Note that in each of these orderings either one feature from the information conditions is added or one is subtracted. For example, in the *U1, K1, A1, U2, K2, A2* ordering participants initially see only their value with the NYOP mechanism (treatment *U1*), then the list price which cannot be used is added (treatment *K1*), and finally they see the list price and are able to purchase the ticket using the list price (treatment *A1*). Instructions for the first set of orderings (all 3 treatments) were read first and then the treatments were run. After the first 3 treatments were run the instructions for the second set of 3 treatments were read and then those treatments were run. A total of 64 participants participated in the experiment, with 16 participants participating in each ordering. For cash payments, two treatments were drawn at random at the end of the experiment and participants were paid their total earnings for those two treatments.⁵ Average earnings, including the \$5 show-up payment, were approximately \$12 for the 45 minute experiment.

2.1 Parameter Choices

Participants received no information on the distribution of values other than the information they saw on their screens (value and, in some treatments, list price). The reason participants were uninformed about the distributions because (1) it is unlikely that participants know actual value distributions when making actual purchasing decisions and (2) this lack of knowledge prevents participants from establishing where the range of threshold values lies in the distribution as the experiment progresses. Actual values were chosen randomly from a uniform distribution over

⁵About half of the subjects participated in sessions in which only 1 treatment was randomly drawn. Since this was the first experiment run at our university using payment for decision-making we increased the payment to 2 randomly drawn treatment to boost participant pay without altering incentives.

$[a_t, a_t + 400]$. However, this distribution was different in each of the 12 rounds of the treatment, where $a_t \sim U(0, 1600)$, making the lowest distribution $[0, 400]$ and the highest $[1600, 2000]$. Again, this was done to prevent the participants from establishing where the range of threshold values might lie. The overall range of values between 0 and 2000 was meant to provide a reasonable range for airline ticket prices. For the 2-value case, each value was drawn independently from the same distribution.

Monopolist's posted-prices were set at the midpoint of the value distribution. For the 1-value cases this is consistent with a monopolist's profit maximization choice. For the 2-value case the posted-price is also set at the midpoint, although this is not the monopolist's profit-maximizing choice when consumers have two random draws from a uniform distribution.⁶ We kept the posted-price at the midpoint of the value distribution in the 2-value case in an attempt to keep any beliefs that may have formed about the relationship of the posted-price and the private values consistent. Once the value distribution and posted-prices were established threshold prices were created. These values were drawn between the lower bound of the value distribution (a_t) and the posted-price (p_t).

In order to ease comparison across treatments, values were rotated among participants in the following manner. Values were initially generated for all 12 rounds and 16 participants in the $U1$ treatment. For the 12 rounds of the $K1$ treatment, participant 2 simply received participant 1's value in the $U1$ treatment, participant 3 received participant 2's value, etc., and participant 1 received participant 16's value. For the remaining treatments the same process was used to shift the values by one participant. Thus, in aggregate, all treatments use the same values but a specific participant will not see the same value in round 3 of all the treatments unless it happens by random chance that the same value was initially drawn for two consecutive participants.

3 Results

In what follows we compare behavior in each of the six treatments with each other. In addition to comparing the different treatments with each other we will also compare them with the benchmark scenario which is when *only* the posted price is available. For reasons mentioned in Section 2, the experiment with only the posted price was not conducted and the data for this benchmark is computer generated in the following manner. The good is purchased using the posted-price if $v_t \geq p_t$ for the one value case and if $\max\{v_{1,t}, v_{2,t}\} \geq p_t$ for the two value case. The scenarios where only the posted-price is available is referred to as PP1 (for one value) and PP2 (for two values).

Since values for participants were generated using a uniform distribution on the interval $[a_t, a_t + 400]$ where values of a_t were varied between different rounds to decrease the possibility that participants would learn the precise threshold most of the analysis that follows focuses on data that is normalized with respect to a_t . In other words, if a participant's bid is b_t his normalized bid is $b_t - a_t$. Also, given that in each round $p_t = a_t + 200$ the normalized posted price is always 200.

⁶The monopoly price should be the first-order statistic from a uniform distribution when 2 values are drawn, which would be a normalized value of 267.

	$U1$	$K1$	$A1$	$U2$	$K2$	$A2$
Average	80.72	118.12	100.61	107.55	124.47	91.83
Median	106.00	145.50	126.00	107.50	136.00	107.00

Table 2: Average (normalized) bids across phases

3.1 Individual Behavior

We now turn to comparing the way participants bid in different treatments. The average and median normalized bids are presented in Table 2. Note that the median and average bids are taken only over the positive bids, so that for the $A1$ and $A2$ treatments they exclude instances in which the participants purchased the good without bidding. Participants bid less in U treatments than in K treatments regardless of the number of values. The interpretation of this is quite straightforward: U treatments as compared to K treatments provide less cues to participants about where the threshold might lie. In the $U1$ treatment participants observe only one number which is v_1 , whereas in the $K1$ treatment participants observe v_1 and p and both numbers are within 200 of each other. Thus in $K1$ participants are more likely to submit bids closer to v_1 and p than in $U1$. In other words, a person observing a value of 1800 and posted price of 1750 is less likely to submit a bid of 900 as compared to a person who observes only the value of 1800. For the same reason the average bid in $U2$ is less than in $K2$.

The difference between K and A treatments and its sign are also intuitive. In A treatments participants have the same information as in corresponding K treatments, however, since the posted price is available they are less likely to submit the bids above the posted price which decreases the average bid in $A1$ versus $K1$ and in $A2$ versus $K2$. In addition to that in $A2$ treatment goods purchased using the PP Agency and the NYOP Agency are different and, moreover, those purchased using the NYOP Agency are inferior. Consequently, it reduces even further participants willingness to bid in $A2$ and so the average bid in $A2$ ends up to be smaller than in $U2$ and $A1$.

Comparing the corresponding one and two-value treatments a somewhat surprising finding is that participants do not bid less in 2-value treatments except for $A2$ treatment. A more expected result would be that since NYOP goods in $U2$ and $K2$ are worse than NYOP goods in $U1$ and $K1$ participants would bid less in the former two treatments. The reason behind this is exactly the same as the one behind the difference in $K1$ and $U1$. participants in $U2$ actually receive more information by observing two values instead of one as in $U1$. Consequently, their bids are closer to the values they observe.

Result 1. *Participants bid less in U and A treatments as compared to K treatments. Uncertainty about the NYOP good does not significantly reduce the bidding in $U2$ and $K2$ treatments compared to the $U1$ and $K1$ treatments since this is outweighed by participants having more information. Having a posted price option available reduces bids and more so when participants have two value as in $A2$.*

Next we analyze participants' decisions and in particular how different pieces of information affected those decisions. In our analysis we separate the U and K treatments from the A treatments.

	U1		K1		U2		K2	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
$v_{1,t}$	0.922	0.000	0.680	0.000	0.497	0.000	0.402	0.000
p_t	-0.007	0.849	0.302	0.000	-0.008	0.739	0.237	0.000
$Profit_{t-1}$	-0.510	0.000	0.081	0.209	-0.034	0.282	-0.022	0.398
Won_{t-1}	20.115	0.097	-9.136	0.279	-7.139	0.118	-4.086	0.313
$v_{2,t}$	*	*	*	*	0.491	0.000	0.353	0.000
$ v_{1,t} - v_{2,t} $	*	*	*	*	-0.351	0.000	-0.247	0.000
<i>Constant</i>	-10.353	0.382	-57.009	0.000	-17.924	0.002	-34.314	0.000

Table 3: Fixed-effect Panel Data Regressions for the U and K Treatments

The reason is that in the former two the participants could only decide how much to bid. In the A treatments participants had an additional option of buying without bidding which some participants used.⁷ Table 3 shows the results of fixed-effect panel-data estimation of participants' bidding behavior in the U and K treatments. The variables $v_{1,t}$ and $v_{2,t}$ represent the AM and PM values respectively and p_t is the posted-price, which may or may not be observable. The variable $Profit_{t-1}$ is the profit earned in the previous period and Won_{t-1} is a dummy variable equal to 1 if the participant's bid was accepted the previous period and 0 if not.

The effect of variables on participants' bidding is very intuitive. The coefficients on $v_{1,t}$ and $v_{2,t}$ are positive and statistically significant, demonstrating that participants with higher valuations submit higher bids. The posted-price (p_t) also has a significant and positive effect when it was observable in the K treatments but is insignificant when it was unobservable in the U treatments. In the 2-value treatments participants with a larger difference in valuations submitted lower bids since the NYOP goods were less desirable for them. Variables as $Profit_{t-1}$ and Won_{t-1} had no significant affect on participants' bidding. This is in contrast to DEHS who find that previous period outcomes impact bidding behavior. The likely reason for the difference between our study and Ding, et. al. is that values were changing throughout our study.

The analysis of behavior in the A treatments has to be different since participants have an additional option of buying without bidding. This option was used 78 times out of 768 in A1 (10.1%) and 125 times out of 768 in A2 (16.3%). This is a high percentage when compared to that in DEHS, who have less than 4% of participants buying without bidding. A high number of buying without bidding outcomes is surprising in the A1 treatment given that participants do not lose anything if the bid gets rejected since the NYOP product is just as good as the posted price product and the posted price product is available even if the bid gets rejected. At the same time, by bidding in A1 participants gain by having a chance of getting the good at a price that is cheaper than the posted price. However, if it is the high value participants who are buying without bidding then this is consistent with the predictions of Terwiesch, Hann, and Savin (2003) in that they expect small haggling costs to keep high value bidders from using the NYOP mechanism.

⁷Consequently, we divide our analysis of the A treatment behavior into 2 steps. First, we analyze what factors determined a subject's decision to bid or not to bid. Then among those subjects who decided to bid we will look at what factors influenced their bids.

	A1		A2	
	Coef.	p-value	Coef.	p-value
$v_{1,t} - a_t$	0.017	0.000	0.007	0.000
p_t	-0.001	0.188	-0.001	0.014
$v_{2,t} - a_t$	*	*	0.004	0.001
$ v_{1,t} - v_{2,t} $	*	*	0.004	0.005

Table 4: Analysis of Buying without Bidding

In the *A2* treatment the situation is slightly different because participants do not know the exact valuation of the NYOP product they might obtain. It still might be possible to submit a very low bid that, if accepted, would make the NYOP good more profitable than the posted price good but that such a bid could be infeasible given the non-negativity constraint on bids and participants might expect that bids should be reasonably close to the posted price in order to be accepted and decide not to bid.

The results of a Logit regression on the decision to buy without bidding are presented in Table 4. Table 4 shows it is participants with higher valuations who are more likely to purchase the good immediately instead of submitting a bid. Summary statistics fortify this observation even further as the average normalized valuation of those who were buying without bidding in *A1* was 288 (cf with the population average of 197 and normalized p of 200). This suggests that even in a very simple environment such as *A1* there are some non-monetary costs associated with bidding such as mental cost of deciding how much to bid, possible disutility of having the bid rejected, and, finally, pressing more buttons. For participants with high valuations who can guarantee themselves a high profit from the purchase the extra gain from bidding might be less than these costs in which case they choose to buy without bidding.

In the *A2* treatment the situation is similar. Just as with *A1*, logit analysis shows that participants with higher valuations are more likely to buy without bidding. In addition, those participants who have a larger difference between their valuations are also more likely to ignore the bidding option. Finally, the actual value of the posted price has a negative impact on the likelihood of buying without bidding. This is consistent with the observation that when the posted price is higher it is possible for participants to submit a very low bid so that the NYOP good is profitable regardless of its realized value. Consequently, participants facing higher p_t are less likely to buy without bidding.

Result 2: *In the A treatments there were many instances of participants buying without bidding. In the A1 treatment participants with higher valuation were more likely to ignore the bidding option. In the A2 treatments participants with higher valuations and larger difference in values were more likely to purchase the good without bidding.*

For those participants who did bid in *A1* and *A2* treatments Table shows the regression estimates of a fixed-effects panel regression similar to Table 3. The variable $Bought_{t-1}$ is a dummy variables equal to 1 if the item was purchased using the posted-price mechanism in the previous period after an NYOP bid was unsuccessful and 0 otherwise while $Nobid_{t-1}$ is a dummy variable equal to 1 if the

	A1		A2	
	Coef.	p-value	Coef.	p-value
$v_{1,t}$	0.574	0.000	0.359	0.000
p_t	0.403	0.000	0.326	0.000
$Profit_{t-1}$	0.003	0.942	0.018	0.604
Won_{t-1}	-10.190	0.176	-24.669	0.004
$Bought_{t-1}$	-13.244	0.134	-6.046	0.507
$Nobid_{t-1}$	16.743	0.245	2.738	0.814
$v_{2,t}$	*	*	0.291	0.000
$ v_{1,t} - v_{2,t} $	*	*	-0.321	0.000
$Constant$	-57.570	8.354	-29.668	0.005

Table 5: Regression Analysis of Bidding in A Treatments

item was purchased using the posted-price mechanism in the previous period without submission of an NYOP bid. Note that the bidding behavior in the A treatments has a similar pattern to the U and K treatments in that participants with higher values bid higher, participants with a larger difference in their values tend to bid lower, and bids are higher when the posted price is higher. In addition to that, in the A2 treatment those participants whose bid was accepted in period $t - 1$ tended to bid less in period t . Combining these results with our observations for the U and K treatments we receive the following result.

Result 3. *In all treatments participants' valuation(s). Posted price had significant and positive effect on participants' bids whenever it was observable that is in K and A treatments. Difference in values, $|v_{1,t} - v_{2,t}|$, has significantly negative effect on bids in all 2-value treatments.*

3.2 Profit Comparison

Table 6 shows the average profit earned by the seller in each of the treatments as well as the benchmark profit that the seller would earn using only the posted price. The table also shows the number of times the good is actually purchased using the NYOP agency and the posted price agency, respectively, as well as the total number of actual purchases and the total number of purchases that would have occurred with the specified posted prices.

The profit from the actual transactions in the experiment is slightly higher than the benchmark posted-price profit in the U1 and K1 treatments and is considerably higher in the A1 treatments. Using the t -test for mean comparison we have that the difference in profit is significant for K1 and A1 but not for U1. The fact that the A1 treatment leads to much higher profit than the posted price benchmark is very surprising at first. One would expect that given that NYOP goods and posted price goods are perfect substitutes and there is no substantial bidding cost in A1 (especially compared with actual NYOP institutions) the NYOP channel should cannibalize the profit from the posted price channel and lead to a reduction in profit.

There are two main reasons why this does not happen. First of all, since the NYOP agency offers the product at a cheaper price than p_t it increases the number of customers purchasing the

	U1	K1	A1	U2	K2	A2
Profit	103.216	106.255	120.327	96.361	100.934	147.677
Profit PP	100	100	100	153.125	153.125	153.125
NYOP	405 (53%)	477 (62%)	368 (48%)	415 (54%)	466 (61%)	329 (43%)
Posted Price	*	*	180 (23%)	*	*	328 (43%)
Total	405 (53%)	477 (62%)	548 (71%)	415 (54%)	466 (61%)	657 (86%)
Total PP	384 (50%)	384 (50%)	384 (50%)	588 (77%)	588 (77%)	588 (77%)

Table 6: Profit and Number of Transactions

product. Second, as discussed earlier, many agents with high valuations preferred to buy without bidding and so the seller received the same profit from these agents as he would receive in the benchmark. The only profit loss for the seller was coming from participants with $v_{1,t} > p$ whose bid got accepted. However, given that the number of sales in A1 increases to 71% from the 50% of the benchmark, this source of the profit loss was overcome by an increase in a number of sales.

Result 4: *When participants have only one value, introducing the NYOP channel increases seller profit. The main source of profit increase comes from a 40% increase in the number of customers. In addition to that many customers purchased the posted price good without bidding which also decreased a potentially cannibalizing effect of the NYOP channel.*

In the A2 treatment the situation is more complicated than in the A1. The A2 treatment captures an important feature of Priceline which is that customers have less information about the NYOP good. Consequently, the NYOP good is inferior to the good purchased at the posted price. This is good for the seller because the customers with $\max\{v_1, v_2\} > p$ are less likely to use the NYOP channel to begin with. Furthermore, those that will use it will submit lower bids than in A1, so their bids are more likely to be rejected and they will still have to pay the posted price. The drawback of concealing the information in the NYOP channel also stems from the fact that participants will bid less for the NYOP good. In particular, it would imply that the profit loss from customers with $\max\{v_1, v_2\} > p$ whose bid got accepted is larger, and there will be less new customers with $\max\{v_1, v_2\} < p$. As Table 6 shows the overall effect is that the profit in the A2 treatment is lower than the benchmark profit and the difference is significant (p -value of t -test is 0.0395). Our preliminary result is

Result 5. *Concealing the NYOP product information from participants leads to a decrease in profit. The difference from the A1 treatment comes from the fact that a number of new customers is much smaller and that participants submit lower bids than in A1 which decreases the profit from the NYOP channel.*

An important variable that determines the profitability of the NYOP channel is the threshold level above which submitted bids are accepted. In order to be able to study the role of the threshold we used 12 possible (normalized) values. The lowest normalized value was 9 and the highest value was 192. The former means that almost any bid above the marginal cost would be accepted. The latter means that there is only a very narrow window between the threshold and the posted price, $p(= 200)$, in which bids would be accepted.

Threshold	Transactions			Profit		Transactions			Profit	
	A2	PP2	Acc-ed Bids	A2	PP2	A1	PP1	Acc-ed Bids	A1	PP1
192	51	52	3	159.63	162.50	46	40	4	146.27	125.00
189	52	52	5	169.27	162.50	38	28	2	122.83	87.50
159	50	48	11	155.59	150.00	33	28	12	99.89	87.50
123	52	52	19	152.80	162.50	38	32	29	106.34	100.00
99	55	48	29	151.50	150.00	45	32	33	118.98	100.00
85	56	48	37	152.77	150.00	44	32	40	112.19	100.00
81	52	44	34	136.84	137.50	41	24	33	107.41	75.00
60	57	52	21	158.11	162.50	53	36	45	127.88	112.50
32	55	48	35	134.91	150.00	43	28	27	108.13	87.50
25	56	44	49	124.73	137.50	60	36	52	143.97	112.50
24	59	44	42	134.66	137.50	50	32	40	116.28	100.00
9	62	56	44	141.33	175.00	57	36	51	133.77	112.50

Table 7: Profit by Threshold Values

The tradeoff for the firm when it determines the threshold is that a lower threshold means more accepted bids and consequently a larger increase in a number of customers.⁸ At the same time it means the loss of profit from the customers with valuations above the posted price whose bids get accepted. In Table 7 we show how seller profit varies for different threshold levels in the *A1* and *A2* treatments.

Notice as the threshold level decreases in both the *A1* and *A2* treatments that the total number of transactions together with the total number of accepted bids is, in general, increasing. As for profit, in *A1* it is always strictly above the benchmark profit. In *A2* the circumstances are slightly more complicated and are captured by Figure 1. In particular, Figure 1 shows that the difference in profit is the largest for the lowest threshold level, whereas for all other threshold levels the benchmark and actual profit are much closer to each other. For threshold levels of 85, 99, 159 and 189 treatment *A2* yields a slightly higher profit. For the remaining levels the benchmark leads to a higher profit.

Conducting *t*-tests for each threshold level we have that the only levels that lead to a significant difference in profits are 9, 25 and 32 with *p*-values being 0.0005, 0.0952 and 0.0317 correspondingly. The alternative hypothesis for the *t*-test was that the benchmark average profit is higher than the *A2* average profit. The result suggests that *A2* is significantly less profitable than the posted price benchmark only for low threshold levels. For higher threshold levels the difference in profit is statistically insignificant. The last observation is that if we conduct a *t*-test for the population excluding the observations with a threshold level of 9 then the difference in profits is also insignificant with the *p*-value of 0.1453.⁹ We conclude the analysis with the following result:

Result 6. *Unless the threshold level is set too low the introduction of the NYOP channel does not significantly decrease profit. When the threshold level is set too low there is an expected*

⁸We ignore here the possibility that customers can learn the threshold with time.

⁹That does not produce the sample selection problem since the threshold was exogenously determined.

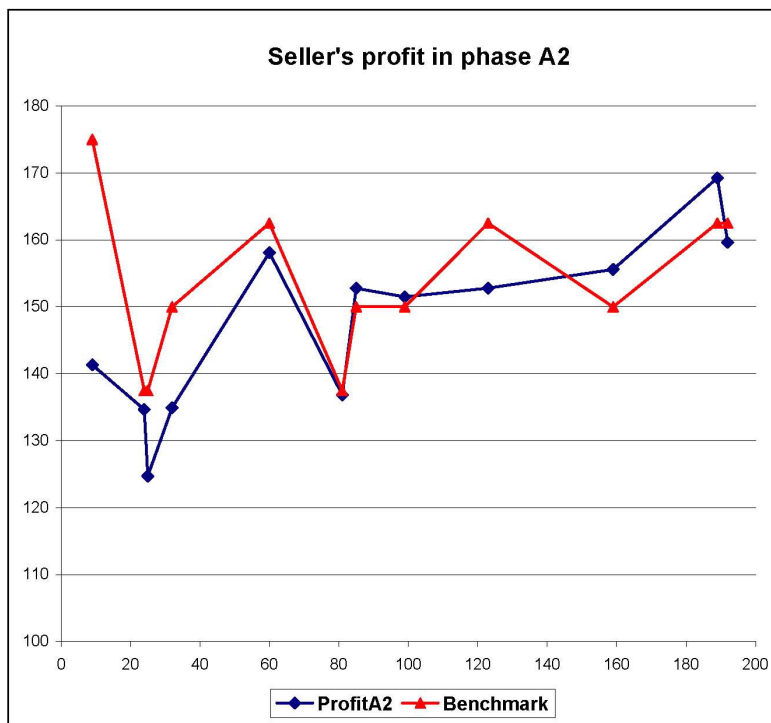


Figure 1: Seller's actual profit in treatment A2 vs. the benchmark by threshold.

	U1	K1	A1	U2	K2	A2
Surplus	35.440	<i>48.621</i>	53.378	35.194	39.965	68.979
SurplusPP	46.88	<i>46.88</i>	46.88	80.16	80.16	80.16
Profit	<i>103.216</i>	106.255	120.327	96.361	100.934	147.677
ProfitPP	<i>100</i>	100	100	153.125	153.125	153.125
Welfare	138.656	154.876	173.704	131.555	140.898	216.656
WelfarePP	146.880	146.880	146.880	233.287	233.287	233.287

Table 8: Average Consumer Surplus, Seller Profit and Social Welfare

significant decrease in seller's profit.

3.3 Consumer Surplus and Social Welfare

We now compare the surplus received by consumers and the total social welfare with those of the posted price benchmark. As Table shows, in the 1-value treatments consumer surplus is lower than the benchmark in *U1* but higher than the benchmark in *A1*. This occurs because in *U1* the only piece of information available for consumers is the valuation. Consequently, many consumers were bidding too low and as a result they would not purchase the good and receive zero surplus. In *A1* the main gain in surplus comes from the fact that more customers were served than in the benchmark and many of them were able to purchase the good at a (cheaper) NYOP price.

In 2-value treatments, the consumer surplus is lower than the benchmark in all three treatments. The main source of the decrease is the mismatch that occurs when the consumer with a higher valuation for an AM flight receives a PM flight and vice versa. In contrast, in the posted price environment the consumer would always purchase the good that he values most. Consistently with that the surplus gap is the smallest in *A2* where many participants purchased the posted price good thereby decreasing the number of mismatches.

The difference in social welfare between the benchmark and the experiment is similar. In all treatments but *K1* and *A1* the social welfare is significantly decreased. The increase in *K1* and *A1* treatments comes from the fact that more participants were served than in the benchmark (see Table 6). The decrease in social welfare in the 2-value treatments comes from the aforementioned mismatch and also from participants' lower willingness to pay for the NYOP product. When the posted price option is available in *A2* the decrease in welfare is the smallest among the 2-value treatments though still significant.

Result 7: *Introducing the NYOP channel without hiding any information is beneficial both for consumers and producers. Introducing the NYOP channel and concealing the product information is detrimental for consumers because of the mismatch. The producers on the other hand do not experience significant difference unless the threshold level is set too low (see Result 6).*

4 Conclusion

The results of our experiments show that coupling NYOP mechanisms and posted-price mechanisms provides a benefit to both consumers AND producers when the value of the object the consumer will receive is known to the consumer with certainty. However, when an individual is uncertain about the good he will receive then adding an NYOP mechanism to the standard practice of posted-price appears to lead to little to no change in seller profit but a sizable reduction in consumer surplus. The bulk of the reduction in consumer surplus stems from the mismatch that occurs when consumers receive their low-valued item.

There are, however, reasons to think that this mismatch may be overstated by the experiment. This would be primarily due to the fact that the values in the 2-value case were drawn independently from the value distribution. It may be that actual values for the good, such as an AM or PM flight, are positively correlated. This would lead to less loss of consumer surplus by two methods. First, many participants in the experiment bid below their lowest value it may lead to the item being purchased more often through the NYOP mechanism. Second, it could lead to less consumer surplus loss simply because the values would not be as dispersed and winning the inferior item with a bid above that item's value would not be too costly.

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