Relationship Organization and Price Delegation: An Experimental Study

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Preliminary Draft – Please Do Not Circulate

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Abstract

Price delegation to the sales force is a practice widely adopted by firms. Yet, marketing models have shown that there is no strong theoretical basis for this practice. This paper examines the relationship between price delegation and managerial profits using a laboratory economics experiment. A novel feature of our experiment is that we study how varying the relationship organization of the sales manager and salesperson to allow for 1) requests by the salesperson for the manager to choose price delegation, and for 2) the manager to award the salesperson a small bonus after observing the latter's decisions, can affect outcomes. The experimental results show that contrary to the theoretical prediction, the manager chooses price delegation frequently and the salesperson responds reciprocally, leading to higher manager profits under price delegation. Moreover, this behavior increases when requests and bonuses are allowed. We show that a social preference model which incorporates positive reciprocity by the salesperson towards the manager can explain these results well.

Keywords: Sales Management, Experimental Economics, Behavioral Economics, Price Delegation

1. INTRODUCTION

In many industries, sales managers can let salespeople determine the prices of the products they sell to customers. This practice is known as price delegation.[1] In an early survey of the incidence of price delegation, Stephenson, Cron and Frasier (1979) find that 71% of medical supply firms adopt this practice. More recently, Hansen, Joseph and Krafft (2008) survey firms in the financial services, pharmaceutical, consumer goods and industrial goods industries and report that 72% of firms delegate pricing decisions to salespeople. In another study, Frenzen et al. (2010) find that 69% of firms in the industrial machinery and electrical engineering sectors practice price delegation. They also report that the practice of price delegation is associated with greater profitability.

Because price delegation is so widespread, marketing theorists have also examined whether this practice leads to greater profits for the firm (Weinberg 1975; Lal 1986; Joseph 2001; Bhardwaj 2001; Mishra and Prasad 2004; 2005). The conclusion from this literature is that price delegation does not. This result has been shown to be robust to alternative modeling assumptions such as information asymmetry between managers and salespeople and firm competition (Mishra and Prasad 2004; 2005).[2] Hence, the industry practice of delegating pricing decisions to the sales force does not appear to have a strong theoretical basis. The extant empirical research on price delegation is scant and limited to the aforementioned surveys. Given the challenges associated with drawing causal inferences from survey data, these studies are

[1] This practice includes both cases where the salespeople have complete autonomy to set prices, and where salespeople can decide on prices from a pre-approved price range. The alternative is for the manager to make the pricing decision.

[2] The following papers have shown that price delegation can be optimal in certain situations: Lal (1986) and Joseph (2001) show that price delegation can yield higher profits when the salesperson has better information about customer demand than the manager. Bhardwaj (2001) shows that price delegation can be optimal for firms that compete in markets with intense price competition. However, Mishra and Prasad (2004; 2005) show that firms can always do at least as well by setting prices themselves and adjusting the compensation contracts of the salespeople to manage the effects of information asymmetry and competition.

unable to offer conclusive insights about the relationship between price delegation and firm profits.

This paper contributes to the marketing literature in two ways. First, we employ an incentive-aligned laboratory experiment (Amaldoss et al. 2000; Ding et al. 2005) to design the first causal empirical test of whether firms should adopt price delegation. A novel feature of our experiment is that we investigate if the decision to adopt price delegation is robust to the relationship organization of the manager (representing the firm) and the salesperson—specifically, in addition to the benchmark price delegation model, we examine behavior when 1) the manager can award a small fixed bonus upon observing the salesperson's decisions, and when 2) the salesperson can submit a request to the manager to choose price delegation along with the decisions he intends to make if the manager approves the request. We incorporate these additional moves into the price delegation game in such a way so that the equilibrium prediction remains the same as in the benchmark model.

The experimental results are quite surprising. Even though the model in our experiment predicts that the manager should never choose price delegation, we find the incidence of delegation is high and varies systematically with the type of relationship organization between the manager and salesperson: Managers choose price delegation 21% of the time in our benchmark model treatment without bonus awards and salesperson requests; this incidence rises to 48% when managers can award the bonus and 52% when the salespeople can make requests, and all the way to 77% when both bonuses and requests are allowed. Moreover, when managers choose to delegate, salespeople respond by choosing a decision option that yields higher payoffs for both players relative to the Nash equilibrium outcome instead of the option that maximizes their own pecuniary payoff. We also find that the frequency of this type of response by salespeople is greater when managers can award the bonus and increases even more when salespeople can make requests. Consequently, our experiment shows that managers can earn higher profits when they choose price delegation.

The second contribution of our paper is to provide a formal explanation for the behavior observed in the experiment, which cannot be explained by the existing price delegation model. We develop a social preference model that captures positive reciprocity by the salesperson toward the manager—the salesperson cares about the manager's earnings if the manager makes a decision that yields the salesperson a payout greater than the Nash equilibrium payoff. We also allow the extent to which the salesperson cares about the manager's payoffs to vary depending on 1) whether the manager chooses price delegation and 2) whether the salesperson had requested for price delegation. It is also worth noting that our social preference model formalizes an idea that Mishra and Prasad (2005, p. 493) had alluded to when they stated that "price delegation may provide some intangible benefits, such as increased morale of the sales force." Our model also allows for "stochastic best-response" by the salesperson (McKelvey and Palfrey 1995; Lim and Ho 2007; Ho and Zhang 2008), so that while all decision options are selected with positive probability, those options that carry higher utility are selected more often (in other words, the salesperson "better-responds" instead of "best-responds"). The manager incorporates this knowledge about the salesperson's social preferences and choice rule into her decision calculus when deciding whether to choose price delegation.

We use the experimental data to estimate the social preference parameters in our model and confirm that the salesperson cares about the manager's payoffs. The results also show that the salesperson's social preferences are stronger 1) when the manager chooses price delegation and 2) when the salesperson submits a request for price delegation and the manager accedes to the request. In addition, the estimates provide further insights to how social preferences of the salesperson vary with the relationship organization between managers and salespeople: When managers can award bonuses, salespeople exhibit greater reciprocity. The degree of reciprocity is even stronger when managers allow salespeople to request for price delegation. We also show that our social preference model tracks the major empirical regularities of the experiment well.

Relation to Existing Literature. Besides the literature on sales force price delegation, our paper is also related to two separate streams of research in marketing. First, Srivastava and Chakravarti (2009) study the effect of relationship organization on buyer-seller negotiations in a multi-stage bargaining game with information asymmetry. They examine how allowing the players to communicate and how the nature of the messages players can send affect bargaining outcomes. Second, our paper adds to an emerging stream of work which shows that social preferences can explain firm pricing strategies and consumer behavior in luxury goods markets (Amaldoss and Jain 2005; 2010), the prevalent use of linear wholesale price contracts in channels (Cui, Zhang and Raju 2007) and why firms design sales contests with more winners than losers (Lim 2010; Chen, Ham and Lim 2011). Our paper unifies these disparate streams of research by studying how social preferences may vary with the way relationships between strategic actors are organized.

This paper is also related to seminal work in behavioral economics by Fehr, Gachter and Kirchsteiger (1997) and Fehr, Klein and Schmidt (2007), which shows experimentally that when manager-worker relationships are organized such that managers can request workers to exert a certain effort level and when they can award bonuses after observing the workers' effort, both managers and workers payoffs are higher compared to when the manager invests in costly technology to monitor worker's behavior. The authors explain this finding using social preferences. There are two main differences between our paper and these papers. First, in our experiments, it is the salesperson (worker), and not the manager, who can choose to make requests. We do this because we are interested in studying how the salesperson's social preferences may be influenced by his decision to make a request. Second, we test the validity of our proposed social preference model by estimating the social preference parameters implied by the experimental data. Our econometric specification also allows us to examine how the salesperson's social preferences vary with the manager's price delegation decision and the type of relationship organization.

The paper is organized as follows. We describe the price delegation model and the design of experimental test in Section 2. We report the experimental results in Section 3. In Section 4, we present the model of social preferences and show that it can explain the experimental data well. Section 5 concludes with a discussion of the managerial implications and directions for future research.

2. EXPERIMENTAL TEST

We begin by using a simple model of price delegation to illustrate the theoretical result that price delegation does not generate higher profits for the firm. In order to avoid showing the theory twice, we present only the parameterized version of the model (which is also the one used in our experiment).

The firm (represented by the manager which we denote as "she") produces a product at a unit cost of c=16 and sells the product to customers through a salesperson (which we denote as "he"). To simplify the model, we assume that there are three price levels that can be charged to customers (*Low*, *Medium* and *High*) and that the salesperson can choose to expend either *Low* or

High effort. The customer demand for the product is given by $Q(p, e) = 42 - p_{i=L,M,H} + e_{j=L,H}$, where p_L=27, p_M=29, p_H=34, e_L=2 and e_H=8. Note that customer demand increases with a lower price and higher salesperson effort. The salesperson receives a commission of 27% of the revenues generated on the product and his cost of effort is given by $c(e) = e^2_{j=L,H}$. The salesperson's payoffs are given by $\pi_S = 0.27 \times p_{i=L,M,H} \times Q - e^2_{j=L,H}$ while the manager profits are given by $\pi_M = (p_{i=L,M,H} - 16)Q - 0.27 \times p_{i=L,M,H} \times Q$. The moves of the game are as follows:

1. The manager decides whether to choose *Delegation* {*D*} or *No Delegation* {*ND*}. If she chooses {*ND*}, she determines the price: *Low Price* – {*LP*}, *Medium Price* – {*MP*} or *High Price* – {*HP*}, simultaneously.
2. The salesperson's decision depends on the manager's choice of {*D*} or {*ND*}:
   a. If the manager chooses {*ND*}, he chooses either *Low Effort* – {*LE*} or *High Effort* – {*HE*}.
   b. If the manager chooses {*D*}, he chooses both the price level and the effort level to expend.
3. Payoffs for both players are realized.

[Insert Figure 1 Here]

The decision tree and the payoffs for the price delegation game described above are shown in Figure 1. The payoffs were presented as cent-earnings in the experiment.

The subgame perfect Nash equilibrium (NE) of the game is that the manager will choose *No Delegation* with the *High Price*, with the salesperson responding with *Low Effort* (that is, {*ND*, *HP*, *LE*}). The intuition is as follows: First, if the manager chooses {*D*}, the salesperson will maximize his payoffs by choosing {*LP*, *LE*}. This yields the manager 63.1 cents, which is the lowest payoff among all the possible outcomes. Alternatively, if the manager chooses {*ND*}, she knows that no matter which price level she selects, the salesperson will always respond with *Low Effort* to maximize his payout. Given this, the price level that yields the manager the highest profits is the {*HP*}. In this case, she earns 88.2 cents, which is 25.1 cents more than her payoff when she chooses {*D*}.

2.1 Treatments

Our experiment consists of four treatments: the Standard (ST), Bonus (B), Request (R) and Bonus-Request (BR) treatments. These treatments vary in how the relationships between the manager and salesperson are organized. We proceed to detail the distinct features of each treatment.

Standard (ST) Treatment. In this treatment, subjects acting as managers and salespeople play the price delegation game described above and shown in Figure 1. We note that the price delegation game is different from the "trust game" (e.g., Berg, Dickhaut and McCabe 1995) in that choosing *Delegation* (which may be perceived to be an act of trust) does not necessarily expand the economic pie—in our model, the set of possible outcomes remains unchanged whether the manager chooses {*D*} or {*ND*}. As mentioned before, the NE prediction is that managers will choose *No Delegation* with the *High Price* and salespeople will respond with the *Low Effort* (that is, {*ND*, *HP*, *LE*}).

Bonus (B) Treatment. This treatment is identical to the ST treatment with one exception: If the manager chooses to delegate, he has the option of awarding a 3-cent bonus to the salesperson upon observing the latter's price and effort decisions. Awarding the bonus reduces the manager's payoff by 3 cents. Unlike the experiments in Fehr, Gachter and Kirchsteiger (1997) and Fehr, Klein and Schmidt (2007), the amount of bonus the manager can award in our experiment is exogenously pre-determined and not a decision made by the manager. We selected this feature because 1) it simplifies the decision space of the manager and 2) our focus is not to examine how much managers would reward salespeople after observing their behavior. It is straightforward to see that the equilibrium prediction in the B treatment is identical to that of the ST treatment. This is because the decision to award the bonus is made in the last stage of the game. In this last stage (assuming that the manager chooses *Delegation*), the manager will not have any incentive to award the bonus. Note that even if the salesperson believes that the manager will do so, the small size of the bonus is not sufficient to induce the salesperson to deviate from choosing $\{LP, LE\}$ under $\{D\}$.

Request (R) Treatment. This treatment is identical to the ST treatment with one exception: At the start of the game, before the manager makes his delegation decision of $\{D\}$ or $\{ND\}$, we allow the salesperson to submit a request to the manager to select $\{D\}$. If the salesperson chooses to send this request, he also has to communicate the price and effort he intends to select if the manager accedes to his request. These stated intentions are non-binding (i.e., cheap talk) and as such, the equilibrium prediction remains $\{ND, HP, LE\}$. Note that while in Fehr, Gachter and Kirchsteiger (1997) and Fehr, Klein and Schmidt (2007) it is the principal (manager) who sends a message to the agent (salesperson) along with the contract she offers; in this paper, it is the salesperson who communicates to the manager before the she makes her decision.

Bonus-Request (BR) Treatment. The BR treatment combines the features of the B and R treatments: The salesperson can request the manager to choose *Delegation* (and also communicate his intended price and effort selection to the manager), and the manager can award a 3-cent bonus after observing the salesperson's decision, if she chooses $\{D\}$. As explained above, these two features do not alter the equilibrium prediction of $\{ND, HP, LE\}$.

2.2 Parameter Selection

In our experiment, we adopted a discrete version of the price delegation model to simplify the decision space faced by subjects in the experiment, so that decisions due to cognitive errors can be minimized. As stated earlier, the payoffs in Figure 1 were presented to the subjects in cents-earnings in every decision round. The parameter values of the model that generated these payoffs were carefully selected to ensure that deviations from the Nash prediction carry significant pecuniary ramifications in the experiment—we elaborate on this by discussing the following payoff features in the price delegation game:

High Price and Low Effort Outcome. This is also the Nash outcome (given that the manager chooses $\{ND\}$) and yields the manager and salesperson 88.2 and 87.8 cents respectively. We also designed this outcome to be the most equitable one to reduce the chance that the Nash outcome is not selected by subjects due to equity concerns.

Low Price and Low Effort Outcome. This is the predicted outcome if the manager chooses $\{D\}$ because it yields the highest payout for the salesperson (a 32.1 cent improvement over the Nash outcome). This is also the outcome that gives the lowest payout to the manager, with a decline of 25.1 cents compared to the Nash outcome. Note also that if the manager ever chooses $\{D\}$, the salesperson stands to lose at least 6.5 cents if he deviates from choosing $\{LP, LE\}$. This loss is greater than the 3-cent gain even if the manager awards the bonus. We designed these significant payoff differences so that the manager faces a strong incentive not to choose *Delegation*.

Medium Price and High Effort Outcome. This outcome is the only one that yields both the manager and the salesperson higher payoffs relative to the Nash outcome, with a payoff improvement of 20.4 cents 12.6 cents respectively. However, theory predicts that this outcome will not be reached because if the manager chooses {*ND*, *MP*}, the salesperson will choose {*LE*} over {*HE*} because he gains an additional 13 cents by doing so.

2.3 Experimental Procedure

A total of 146 undergraduate business students at a large public research university participated in the experiment. We conducted 2 or 3 experimental sessions for each of the four treatments, with each session having 12 to 18 participants. Each experimental session consists of 16 decision rounds. There were a total 36 subjects in each of the ST, R and BR treatments, and a total of 38 subjects in the B treatment. The subjects received course credit for showing up for the experimental session on time and earned cash based on the outcomes of the price delegation game. Subjects earned $15 on average with a range of $13 to $17. The experiment was implemented using Z-tree software (Fischbacher 2007). Upon entering the laboratory, subjects were seated at separate computer terminals and were handed the instructions. The instructions were then read aloud by the experimenter. Subjects were either assigned to be Player A (the manager) or Player B (the salesperson) and their role was fixed throughout the 16 decision rounds. Subjects were told that they would be randomly and anonymously matched with another subject that is assigned to a different role (that is, Player A will be matched with Player B) in every round. At the end of each round, the decisions and payoffs were shown to subjects. To familiarize them with the experimental procedure, we included three practice rounds that carried no monetary consequences. The full instructions for the BR treatment are given in Appendix 1.

2.4 Hypotheses

Based on the above discussion, the predictions of the price delegation model can be summarized into two testable hypotheses. Hypothesis 1 states that the manager will never choose price delegation and specifies the behavior of the manager and salesperson. Hypothesis 2 states that changing the way relationships are organized between the manager and the salesperson (through allowing for requests and bonuses) should not affect behavior. Formally, we have

Hypothesis 1 *(Nash Equilibrium Behavior)*: The manager will choose *No Delegation* and set a *High Price*, and the salesperson will respond by choosing *Low Effort*. Choosing *Delegation* will lead to lower profits for the manager.

Hypothesis 2 (*Effect of Relationship Organization*): Organizing the manager-salesperson relationship so that 1) the manager can award a bonus after observing the salesperson's decisions and/or so that 2) the salesperson can request the manager to choose *Delegation* will not affect behavior.

3. EXPERIMENTAL RESULTS

In the price delegation game shown in Figure 1, there are 12 possible decision outcomes (*Delegation* (Yes or No) × 3 *Price Levels* × *2 Effort Levels*). Table 1 shows the relative frequencies of the major decision outcomes (as a percentage of all possible outcomes) for the four treatments.[3] As can be seen in Table 1, subject's decisions appear quite stable across the two halves of the 16 decision rounds.[4] Hence, we pool the data across all the decision rounds in the following analysis of experimental results experiment.

[Insert Table 1 and Figure 2 Here]

[3] To economize on space, we report only the decision outcomes of theoretical interest and those that occurred most frequently. The entire set of results can be obtained from the authors upon request.

[4] We conducted several statistical tests to check for differences in behavior between Rounds 1-8 and Rounds 9-16 within each treatment and found no significant differences. The details are available from the authors.

Incidence of Delegation and Nash Equilibrium (NE) Outcome. Figure 2 displays the percentage frequencies in which managers chose {*D*} and the incidence of the NE outcome of {*ND*, *HP*, *LE*} across the ST, B, R and BR treatments. To begin, although the price delegation model predicts that managers would not choose {*D*} at all, the data shows that the incidences of *Delegation* across the four treatments were 20.8% (ST), 48.0% (B), 52.1% (R) and 77.4% (BR). Correspondingly, the incidences of NE outcome in the four treatments were 54.5% (ST), 28.3% (B), 30.6% (R) and 15.1% (BR). A formal comparison (using a logistic regression with treatment dummies) indicates that the incidence of the NE outcome is highest in the ST treatment, followed by the B and R treatments, and lowest in the BR treatment.[5] Next, we note that in the B, R and BR treatments, the modal outcome is {*D*, *MP*, *HE*}, with observed frequencies of 33.6%, 42.4% and 66.3%, respectively (see Table 1). Clearly, the experimental results show that Hypothesis 1, which states that {*ND*, *HP*, *LE*} will be observed, is not supported. Moreover, these results suggest that contrary to Hypothesis 2, the incidences of the NE outcome vary with the different way relationships between the manager and salesperson are organized across the treatments.

Salesperson Behavior under Delegation. The price delegation model predicts that if the manager chooses {*D*}, the salesperson will choose {*LP*, *LE*} since this option yields the highest monetary payoff. Although choosing {*MP*, *HE*} yields both the manager and the salesperson higher payoffs relative to the NE outcome, the salesperson should prefer {*LP*, *LE*} over {*MP*, *HE*} as he earns 19.5 cents more. In our experiment, however, we find that when managers chose {*D*}, salespeople chose {*MP*, *HE*} more often than {*LP*, *LE*} across all treatments: Conditional on managers choosing {*D*}, the relative frequencies were 60.0% versus 28.3% in ST (z=3.49,

[5] The incidence of the NE outcome was no different between the B and R treatments (z=0.49, p=0.621). The incidence of the NE outcome in the ST treatment is higher than in the B and R treatments (p-value=0.000 in both cases). The incidence of the NE outcome in the BR treatment is lower compared to the other three treatments (with p-values of less than 0.002 in all cases).

p=0.000); 69.9% versus 12.3% in B (*z*=9.99, *p*=0.000), 81.3% versus 11.3% in R (*z*=12.16, *p*=0.000) and 85.7% versus 8.5% in BR (*z*=16.32, *p*=0.000). These results are also plotted in Figure 3. Next, comparing across treatments, we find that salespeople chose {*LP*, *LE*} more frequently in the ST treatment than in the other treatments (*z*=3.58, *p*=0.000). Salespeople also chose {*MP*, *HE*} more frequently when they could request the manager to choose {*D*} (in the R and BR treatments) and when their requests were granted, compared to when they could not do so in the B and ST treatments (*z*=4.20, *p*=0.000). Note that even when salespeople could not make requests, they chose {*MP*, *HE*} at least 60% of the time conditional on {*D*}.

[Insert Figure 3 Here]

Managers' Decisions Leading to the {MP, HE} Outcome. In the price delegation game, the {*MP*, *HE*} outcome may be achieved whether the manager chooses {*D*} or {*ND*}. If the manager chooses *No Delegation*, the outcome can be reached if he chooses *Medium Price* and the salesperson responds with *High Effort*. Figure 4 reports the incidences of {*MP*, *HE*} under {*D*} and {*ND*} (as a percentage of all the 12 possible decision outcomes) across the four treatments. The data shows that that the {*MP*, *HE*} outcome was reached more often when managers chose {*D*} compared to when managers chose {*ND*} and selected the *Medium Price*. This result holds across all treatments: 12.5% versus 7.3% in ST (*z*=2.09, *p*=0.036); 33.6% versus 7.2% in B (*z*=8.05, *p*=0.000); 42.4% versus 5.2% in R (*z*=10.47, *p*=0.000); and 66.3% versus 1.3% in BR (*z*=16.47, *p*=0.000).

[Insert Figure 4 Here]

Incidence of Bonus Award, Requests and Request Approvals. In the B treatment, if the manager chooses {*D*}, she may award a 3-cent bonus to the salesperson after observing his behavior. This occurs 72% of the time when the manager chooses to delegate. If the salesperson responds to the manager's choice of {*D*} by choosing {*MP*, *HE*}, the manager awards the bonus with near certainty—97% of the time. In the R treatment, salespeople requested the manager to choose *Delegation* 88% of the time and 58% of the submitted requests were approved. The overall proportion of requests that come with the stated intention of {*MP*, *HE*} is 70% (see Figure 4). Conditional on making a request, salespeople indicated that they intend to choose {*MP*, *HE*} 80% of the time and when managers observed this type of request, they chose {*D*} 70% of the time. This result suggests that when the salesperson communicates his intention to select {*MP*, *HE*}, the option that yields payoffs that are higher for *both players* compared to the NE outcome, the manager acts as if they believe that the salesperson will carry out his stated intention.[6] Finally, in the BR treatment, salespeople submitted requests for delegation 93% of the time and 82% of the submitted requests were approved. Conditional on making a request, salespeople indicated that they intend to select {*MP*, *HE*} 87% of the time (so that the overall proportion of requests that come with the stated intention of {*MP*, *HE*} is 81%, as shown in Figure 4). When the manager observed this type of request, they chose to delegate 91% of the time. Managers awarded bonuses 78% of the time under delegation – this incidence increases to 88% if the salesperson chose {*MP*, *HE*}.

[Insert Figure 5 and Table 2 Here]

Manager Profits. Figure 5 shows the profits the manager obtained depending on whether she chose {*D*} or {*ND*}. The price delegation model predicts that manager profits should be lower by

[6] Note that if the salesperson communicates an intention to choose {*MP*, *HE*}, the manager may reach the same outcome by choosing *No Delegation* followed by the *Medium Price*, and hope for the salesperson to respond by choosing *High Effort*. The data shows that the manager chooses to delegate instead (70% compared to 8%). This suggests that the manager's belief about the salesperson's commitment to carry out his stated intention is contingent only on the manager choosing *Delegation*.

25.1 cents (88.2-63.1) if she chooses to delegate. This prediction is not supported in the data. In the ST treatment, manager profits were no different under {*D*} and {*ND*} (t=1.42, p=0.174). More strikingly, in the B, R and BR treatments, manager profits were higher under {*D*} than when she chose {*ND*}, with respective p-values of 0.013, 0.000 and 0.000. Next, we compare manager profits obtained under *Delegation* across treatments via OLS regressions. The results are shown in Table 2 and indicate the following: 1) Manager profits in the ST treatment are lower than in the other three treatments; 2) Allowing salespeople to request the manager to delegate (in the R and BR treatments) leads to higher manager profits compared to simply allowing the manager to award a bonus *ex post* (in the B treatment). These results suggest that the relationship organization of the manager and salesperson can exert a significant impact on manager profits in the price delegation game.

Summary. The experimental results show that the predictions of the price delegation model does not explain behavior well: 1) Managers chose *Delegation* much more often than predicted (in fact, more often than *No Delegation* in the R and BR treatments) and accede to salespeople's requests for delegation most of the time; 2) When managers choose {*D*}, salespeople respond by overwhelmingly choosing {*MP*, *HE*} instead of {*LP*, *LE*}; 3) In the B and BR treatments, managers awarded bonuses almost all the time when salespeople chose {*MP*, *HE*}. As shown in Figures 2 to 4, the degree to which these behavioral "anomalies" occur also varies systematically with the way the relationship between the manager and salesperson is organized across treatments. In the next section, we develop a formal explanation for these behavioral patterns.

4. EXPLAINING THE BEHAVIORAL REGULARITIES

The price delegation model that generated Hypotheses 1 and 2 (which are strongly rejected by the experimental data) is based on the assumption that the utility of the manager and salesperson depends solely on their respective pecuniary payoffs. In this section, we show that generalizing the salesperson's utility function to incorporate social preferences—more specifically, positive reciprocity by the salesperson towards the manager, can provide a better explanation of the experimental results. Our proposed model is based on the social preference model of Charness and Rabin (2002) —our paper adapts and extends their modeling framework to the price delegation context. We begin by specifying the salesperson's preferences and show how they may vary when there are requests and bonuses, and then econometrically estimate the social preference parameters as implied by the experimental data.

4.1 A Model of Social Preferences: Utility Specification

Standard (ST) Treatment. The salesperson's generalized utility function is given by

$$(1) \qquad U_S^{ST} = (1 - I_D)\left[\pi_S + I_{\pi_S > \hat{\pi}_S}\theta_{ND}(\pi_M - \hat{\pi}_M)\right] + I_D\left[\pi_S + I_{\pi_S > \hat{\pi}_S}\theta_D(\pi_M - \hat{\pi}_M)\right],$$

where

- I_D is an indicator which equals 1 when the manager chooses $\{D\}$, 0 otherwise
- π_M and π_S are the payoffs of the manager and the salesperson, respectively
- $\hat{\pi}_M$ and $\hat{\pi}_S$ are the payoffs of the manager and the salesperson under the NE outcome
- $I_{\pi_S > \hat{\pi}_S}$ is an indicator which equals 1 if the salesperson earns a payoff that is greater than the NE payoff, 0 otherwise
- θ_{ND}>0 and θ_D>0 are the salesperson's social preference parameters under *No Delegation* and *Delegation*, respectively.

The first term in Equation (1) represents the utility of the salesperson when the manager chooses *No Delegation*. If the manager chooses {*MP*} or {*LP*} under {*ND*}, the salesperson's payoffs will be greater than what he would have earned under the NE outcome (recall that the manager would have to choose {*HP*} to reach the NE outcome). In this scenario (which also means that $I_{\pi_S>\hat{\pi}_S}$=1), we assume that the salesperson would care about how much the manager earns. The degree to which he does so is captured by the social preference parameter, θ_{ND}, which we assume to be positive. Hence, the salesperson suffers disutility if he makes a decision that leads to the manager earning less than the NE payout (that is, when $\pi_M - \hat{\pi}_M$ is negative). Conversely, the salesperson derives additional utility if the manager earns more than the NE payoff (that is, when $\pi_M - \hat{\pi}_M$ is positive). For example, if the manager chooses *No Delegation* and *Medium Price*, the salesperson's utility if he responds with *High Effort* is $U_S^{ST} = 100.4 + \theta_{ND}(108.6 - 88.2)$.

The second term in Equation (1) specifies the salesperson's utility if the manager chooses *Delegation*. Again, we assume that when the salesperson evaluates options that yield him a payoff that is greater than the NE payout (that is, when $I_{\pi_S>\hat{\pi}_S}$=1), he also cares about how much the manager earns relative to her NE payout. To allow for the possibility that the salesperson may care about the manager's payoffs to different extents depending on whether the manager chooses {*D*} or {*ND*}, we introduce another parameter, θ_D>0, to capture the salesperson's social preferences when the manager delegates.

Note that our model can be interpreted as one that captures positive reciprocity by the salesperson—if the manager does not take an action that can result in the salesperson earning more than the NE payoff (that is, when $I_{\pi_S>\hat{\pi}_S}$=0), the salesperson does not care about the manager's payoffs. Note also that if $\theta_{ND} = \theta_D = 0$, our model reduces to the price delegation model as assumed in Section 2. Given the specification in Equation 1, the actual utilities for the salesperson for each of the 12 decision outcomes in the price delegation game are shown in Table 3.

[Insert Table 3 Here]

Bonus (B) Treatment. The utility function of the salesperson in the B treatment is identical to that of the ST treatment with one exception: We assume that when the manager chooses *Delegation*, the salesperson believes that the manager will also award the 3-cent bonus if he selects *Medium Price* and *High Effort*. This assumption is supported by the experimental data, which shows that the manager awards the bonus 97% of the time conditional on the salesperson responding with {*MP*, *HE*} to the manager's choice of {*D*}.[7] To model this, we adjust the salesperson's utility for the {*D*, *MP*, *HE*} outcome to be $U_S^B = 100.4 + 3 + \theta_D(108.6 - 3 - 88.2)$. Notice that while the salesperson's payoff increases by 3 cents in this scenario, the manager's payoffs are reduced by the same amount due to the bonus award.

Request (R) Treatment. In the R treatment, we incorporate the salesperson's request behavior into his utility function. The utility specification of the salesperson is given by

$$(2)\ U_S^R = (1 - I_D)\left[\pi_S + I_{\pi_S > \hat{\pi}_S}\theta_{ND}(\pi_M - \hat{\pi}_M)\right] + I_D\left\{(1 - I_R)\left[\pi_S + I_{\pi_S > \hat{\pi}_S}\theta_D(\pi_M - \hat{\pi}_M)\right] + I_R\left[\pi_S + I_{\pi_S > \hat{\pi}_S}\theta_{DR}(\pi_M - \bar{\pi}_M)\right]\right\},$$

where

[7] An alternative approach would be to develop a model that captures the manager's decision of whether to award the bonus. We believe that while this approach would add substantial complexity to the behavioral model, it would not yield significant insights because in our experiment, the bonus award is very small relative to the payouts.

- I_D, $I_{\pi_S>\hat{\pi}_S}$ π_M, π_S, $\hat{\pi}_M$, $\hat{\pi}_S$, θ_{ND} and θ_D are as defined in Equation (1)

- I_R is an indicator function which equals 1 if the salesperson submits a request and states an intention to choose {*MP*, *HE*}, 0 otherwise

- $\bar{\pi}_M = 108.6$, the manager's payout under {*MP*, *HE*}

- θ_{DR}>0 is the salesperson's social preference parameter when the salesperson submits a request and states an intention to choose {*MP*, *HE*}, and the manager approves the request.

The first term in Equation (2) is the utility of the salesperson when the manager chooses *No Delegation* and is identical to that in the ST treatment (see first term of Equation 1). The second term in Equation (2) specifies the salesperson's utility if the manager chooses *Delegation* and can be further separated into two components: If the salesperson does not submit a request for the manager to choose {*D*}, or if he submits a requests and stated an intention other than {*MP*, *HE*}, the salesperson utility is given by $\left[\pi_S + I_{\pi_S>\hat{\pi}_S}\theta_D(\pi_M - \hat{\pi}_M)\right]$. This component is identical to the specification in the ST treatment (see second term of Equation 1). However, if the salesperson submits a requests and states an intention to choose {*MP*, *HE*} (in which case I_R = 1), the salesperson's utility under {*D*} is $[\pi_S + I_{\pi_S>\hat{\pi}_S}\theta_{DR}(\pi_M - \bar{\pi}_M)]$. In this second scenario, the salesperson cares about how much the manager earns relative to $\bar{\pi}_M = 108.6$, which is the amount the manager earns if the salesperson acts according to his stated intentions. In other words, the salesperson's reference payout with respect to how much he cares about the manager's payoffs is no longer the manager's NE payout, but rather the level of payout that corresponds to the salesperson's stated intentions.[8] We allow the salesperson's social preference parameter in this case to be captured by θ_{DR}>0. This specification allows us to examine to what extent requests may affect the salesperson's utility in the price delegation game. The actual

[8] Charness and Dufwenberg (2006) and Vanberg (2008) study the effect of pre-game communication of intentions and find that players are likely to honor their stated intentions.

utilities for the salesperson for each of the 12 decision outcomes in the price delegation game are shown in Table 3.

Bonus-Request (BR) Treatment. The salesperson's utility function in the BR treatment is identical to that in the R treatment (Equation 2) with one exception: We assume that the salesperson believes that if he selects *Medium Price* and *High Effort* when the manager chooses *Delegation*, the manager will award the 3-cent bonus. This feature is identical to the specification in the B treatment.

Manager's Utility. The manager's utility across the four treatments is simply $U_M = \pi_M$. We assume that the manager knows the salesperson's utility function, and makes decisions that rationally anticipate the salesperson's behavior.

4.2 Estimating the Social Preference Parameters

Given the above utility specifications, we estimate the salesperson's social preferences parameters using both the decisions of the manager and the salesperson in the experiment. We assume that when the salesperson evaluates his decision options following the manager's choice, he follows a logit choice rule with a "rationality" parameter $\lambda^S \geq 0$ (if $\lambda^S = 0$, the salesperson chooses randomly; if λ^S approaches ∞, he always chooses the option with the highest utility). Because the salesperson faces a different number of decision options depending on whether the manager chooses {*D*} or {*ND*} (six versus two options respectively), we estimate separate λ^Ss for each scenario.

At the start of the price delegation game, the manager has to communicate one of the following four decisions to the salesperson: {*ND*, *HP*}, {*ND*, *MP*}, {*ND*, *LP*} and {*D*}. We assume that when the manager formulates the expected utilities for each of these options, she knows both the salesperson's utility functions and choice rule. Hence, our model has a Quantal-Response Equilibrium (QRE) feature in that the manager accounts for "stochastic best-response" by the salesperson.[9] As in the case of the salesperson, we assume that the manager selects her decision option following a logit choice rule, with a rationality parameter $\lambda^M \geq 0$. Appendix 2 shows the decision choice probabilities for the manager and the salesperson in the ST treatment.

Given the above setup and taking the unit of observation to be each manager-salesperson pair (which we denote by *k*) and denoting each treatment by *T*, the log-likelihood function is:

$$(3)\ LL(\theta_{ND}^T, \theta_D^T, \theta_{DR}^B, \theta_{DR}^{BR}, \lambda^M, \lambda_{ND}^S, \lambda_D^S) = \sum_T \sum_k log\,[Pr(Manager's\ Choice_k^T) \times Pr(Salesperson's\ Choice_k^T | Manager's\ Choice_k^T)].$$

Note from Equation (3) that the estimates of θ reflect both the salesperson's preferences and the manager's beliefs about the salesperson's preferences and choice probabilities (which we assume to be accurate).[10] We also allow the θs to be treatment-specific to assess whether the social preference parameters of the salesperson depend on how the relationship between the manager and the salesperson is organized. Next, because the set of delegation, price and effort decision options does not vary across treatments, the "rationality" parameters in the choice probabilities of the manager and salesperson (that is, the λs) are fixed to be common across treatments.

[9] The QRE model was first introduced by McKelvey and Palfrey (1995) and has the feature that players choose among strategies probabilistically, but those strategies that yield higher utilities are chosen more frequently. This concept was first applied to marketing by Lim and Ho (2007) and Ho and Zhang (2008).
[10] We also estimated a model where this assumption is relaxed and find that it does not track the empirical regularities of the experiment better.

Results. The Maximum Likelihood parameter estimates of the model described above (which we denote as the Full Model) is shown in Column 3 of Table 4. We also estimated a series of nested models that enable us to examine potential differences in the values of θs both within and across treatments. The results of these constrained models are also reported in Table 4.

[Insert Table 4 Here]

Column 3 of Table 4 shows that all the social preference parameters θ are positive and statistically significant at the 5% level, indicating that the salesperson indeed cares about the manager's payouts if the manager makes decisions that allow the salesperson to earn more than the NE payout. Note however that all the estimated θs are less than one, which implies that the salesperson cares about his own payoff more than the manager's payoff. The model without social preferences (Nested Model 1, where θ=0) is also strongly rejected by the data (*p*=0.000).

We proceed to examine if there are differences in θ within each treatment. Table 4 shows that the model which assumes a common θ within each treatment (Nested Model 2) does not explain the data well (*W*=192.3, *p*=0.000). Specifically, we find that $\theta_D > \theta_{ND}$ in the ST (*W*=71.0, *p*=0.000), B (*W*=70.4, *p*=0.000) and BR (*W*=4.8, *p*=0.029) treatments. In the R treatment, the estimates of θ_D^R and θ_{ND}^R are not statistically different (0.421 versus 0.378, *W*=1.6, *p*-value=0.200), but the former is directionally higher. These findings suggest that the salesperson cares more about the manager's payoffs when the manager chooses {*D*} instead of {*ND*}, even though any of the payoff outcomes in the price delegation game can be achieved whether {*D*} or {*ND*} is chosen. The manager factors this into her decision calculus and increases her incidence of choosing *Delegation*.

Next, we examine the role of requests and stated intentions on the salesperson's social preferences by comparing estimates of θ_{DR} with θ_{ND} and θ_{D} within each of the R and BR treatments. First, we find that $\theta_{DR} > \theta_{ND}$ in both the R (*W*=98.2, *p*=0.000) and BR (*W*=88.1, *p*=0.000) treatments, which again supports the finding that the salesperson cares more about the manager's payoffs if the manager chooses to delegate. More importantly, we find that $\theta_{DR} > \theta_{D}$ in both the R (*W*=31.0, *p*=0.000) and BR (*W*=31.7, *p*=0.000) treatments. We confirm these results by showing that the model which assumes $\theta_{DR} = \theta_{D}$ (Nested Model 3) does not fit the data as well as the Full Model (*W*=108.9, *p*=0.000). These findings show that the salesperson cares more about the manager's payoffs if he submits a request, and can explain why the manager chooses to delegate more often in these treatments.

To shed light on the effect of relationship organization on preferences and behavior, we now compare θ_{ND}, θ_{D} and θ_{DR} across treatments. To begin, we note that the estimates of θ_{ND}, the degree to which the salesperson cares about the manager's payoffs under {*ND*} when he earns more than the NE payout, is relatively stable across the four treatments, with a range of 0.346 to 0.391. Next, we focus on the salesperson's social preference parameters when the manager chooses to delegate. We observe the following: 1) We find that $\theta_{D}^{B} > \theta_{D}^{ST}$ (*W*=25.1, *p*=0.000), which indicates that allowing the manager to award a small bonus increases the likelihood of reciprocal behavior by the salesperson; 2) When the salesperson makes a request, he cares more about the manager's payoff than when he does not do so ($\theta_{DR}^{R} > \theta_{D}^{ST}$, *W*=52.5, *p*=0.000); 3) Perhaps most importantly, we find that the salesperson's social preferences are stronger when he is allowed to make requests and when he does so, compared to the case where the manager can award a small bonus. Specifically, we find that $\theta_{DR}^{R} > \theta_{D}^{B}$ (*W*=21.9, *p*-value=0.000). 4) Finally, the extent to which the salesperson cares about the manager's payoffs is strongest with the combination of requests and the expectation of a small bonus ($\theta_{DR}^{BR} > \theta_{DR}^{R}$ (W=20.4, p-value=0.000).

We further assess the validity of the Full Model by examining if it tracks the major empirical regularities of the experiment well. Table 5 shows that it not only does, but predicts the major outcomes in the experiment better than the nested models which do not account for how θ may vary with whether the manager chooses to delegate or with the relationship organization of the manager and salesperson.

[Insert Table 5 Here]

5. DISCUSSION & CONCLUSION

This paper conducts the first experimental test that examines the relationship between price delegation and manager profits. The results show that managers choose price delegation frequently and salespeople reciprocate with higher sales effort, leading to greater profitability for managers. We also find that the incidence of this behavior increases when managers can award a bonus to salespeople after observing their decisions and when salespeople can request managers to select price delegation. We show that a social preference model which incorporates positive reciprocity by the salesperson towards the manager can explain these results well. We also empirically examine how the degree to which the salesperson care about the manager's profits can vary depending on whether the manager chooses to delegate and whether the salesperson makes a request.

Our paper reconciles the current disconnect between marketing theory and industry practice by showing that price delegation can be optimal. More importantly, our paper suggests that the way relationships between the sales managers and their salespeople are organized is a critical factor in determining whether price delegation can be successful. Specifically, sales managers can create systems that allow salespeople to request for authority to negotiate prices directly with customers and link their performance to bonus awards. Even if there are no budgets for bonuses, having a system that allows request by salespeople can still enhance performance—in fact, our paper finds that social commitment devices such as requests with stated intentions can be a greater driver of salesperson effort than the expectation of receiving a bonus.[11]

We conclude with several limitations and directions for future research. First, we did not examine the effectiveness of limited price delegation—that is, allowing salespeople to set prices but limiting them only to a restricted price range or only under certain conditions in the selling process. It would be interesting to study how this type of control mechanism may affect salesperson behavior. Second, there are many other ways the manager-salesperson relationship can be organized. For example, the decision by the manager to choose price delegation could be accompanied by a request from the manager to the salesperson to choose a certain decision. Furthermore, the amount of bonus awarded by the manager might not be known to the salesperson before makes his effort decision. Finally, it will be useful to conduct field studies to assess how our findings may extend beyond the laboratory "marketplace."

[11] We must qualify this finding with the caveat that the bonus amount in our experiment is limited to a small fixed amount. Awarding a larger bonus may elicit higher sales effort, but will also lower firm profits.

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Figure 1: ST Treatment Price Delegation Game Tree

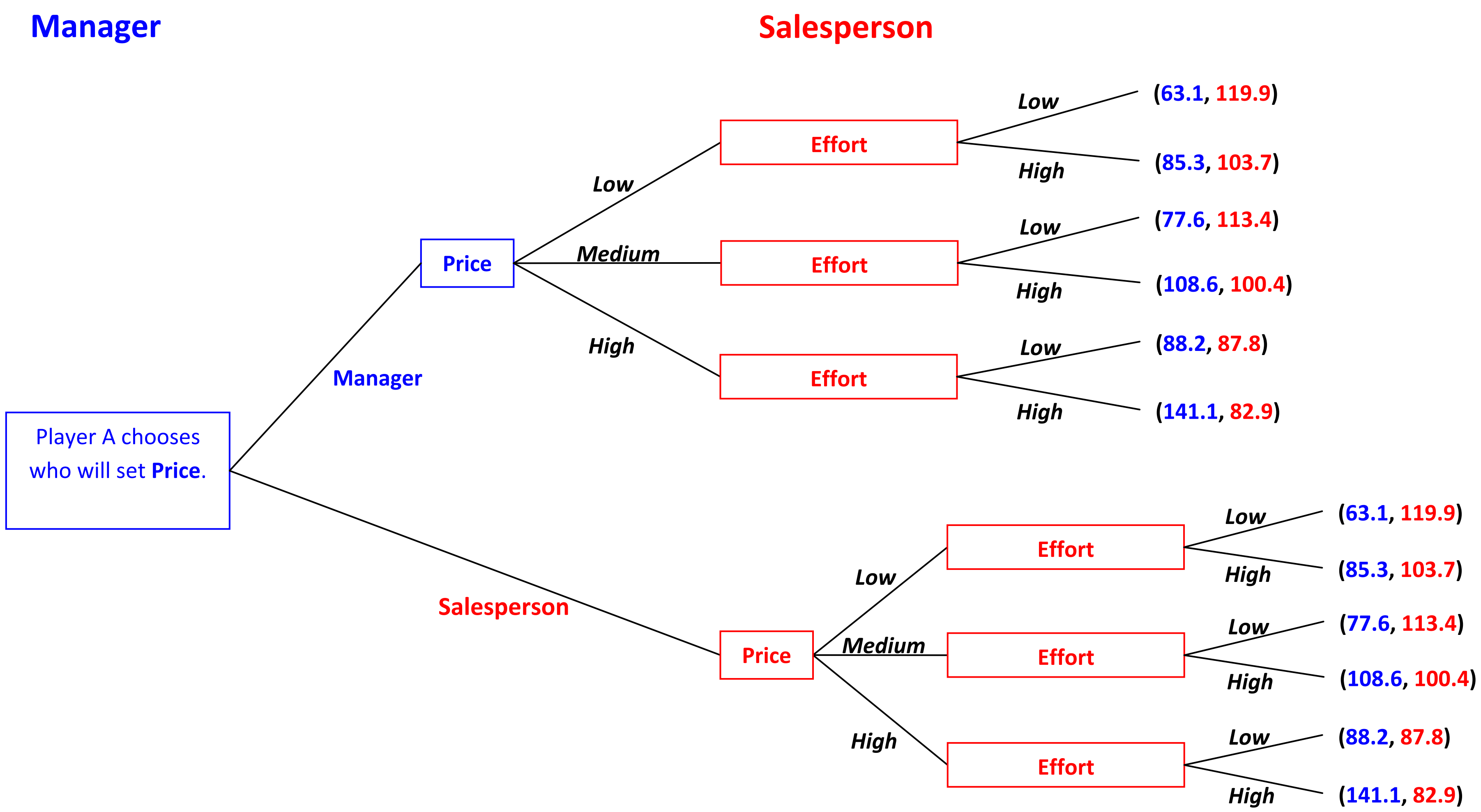


Table 1: Relative Frequencies of the Major Decision Outcomes[++]

		Price	Effort	Percentage Frequency (Rounds 1-8)	Percentage Frequency (Rounds 9-16)	Percentage Frequency (All Rounds)[#]	Percentage Frequency Conditional on Requests Made (All Rounds)[+]
ST Treatment	*No Delegation*	*High*	*Low*	59.7	49.3	54.5	
		Medium	*Low*	13.2	14.6	13.9	
		Medium	*High*	6.3	8.3	7.3	
	Delegation	*Medium*	*High*	12.5	12.5	12.5	
		Low	*Low*	4.9	6.9	5.9	
B Treatment	*No Delegation*	*High*	*Low*	31.6	25.0	28.3	
		Medium	*Low*	15.1	7.9	11.5	
		Medium	*High*	7.2	7.2	7.2	
	Delegation	*Medium*	*High*	27.6	39.5	33.6	
		Low	*Low*	5.3	6.6	6.3	
R Treatment (Requests Made with Medium Price and High Effort Intentions)	*No Delegation*	*High*	*Low*	11.1	19.4	15.3	21.8
		Medium	*Low*	3.5	4.9	4.2	5.9
		Medium	*High*	0.7	2.1	1.4	2.0
	Delegation	*Medium*	*High*	38.9	44.4	41.7	59.4
		Low	*Low*	6.3	4.2	5.2	7.4
R Treatment (No Requests and Requests Made without Medium Price and High Effort Intentions)	*No Delegation*	*High*	*Low*	17.4	13.2	16.0	51.2
		Medium	*Low*	6.3	3.5	4.9	16.3
		Medium	*High*	5.6	2.1	3.8	12.8
	Delegation	*Medium*	*High*	1.4	0.0	0.7	2.4
		Low	*Low*	0.7	0.7	0.7	2.4
BR Treatment (Requests Made with Medium Price and High Effort Intentions)	*No Delegation*	*High*	*Low*	6.3	4.9	5.6	6.9
		Medium	*Low*	0.7	0.7	0.7	0.9
		Medium	*High*	0.0	0.7	0.3	0.4
	Delegation	*Medium*	*High*	66.7	65.3	66.0	81.6
		Low	*Low*	4.2	7.6	5.9	7.3
BR Treatment (No Requests and Requests Made without Medium Price and High Effort Intentions)	*No Delegation*	*High*	*Low*	9.7	11.1	10.4	54.6
		Medium	*Low*	3.5	4.2	3.8	20.0
		Medium	*High*	2.1	0.0	1.0	5.5
	Delegation	*Medium*	*High*	0.7	0.0	0.3	1.8
		Low	*Low*	1.4	0.0	0.7	3.6

[#] Unconditional percentages within each treatment; [+] For the R and BR treatments, the percentage frequencies are conditional on requests made equal to $\{D, MP, HE\}$; [++] There are 288 observations each in the ST, R and BR treatments and 304 observations in the B treatment.

Figure 2: Comparing the Percentage of *Delegation* and NE Outcomes across the Treatments

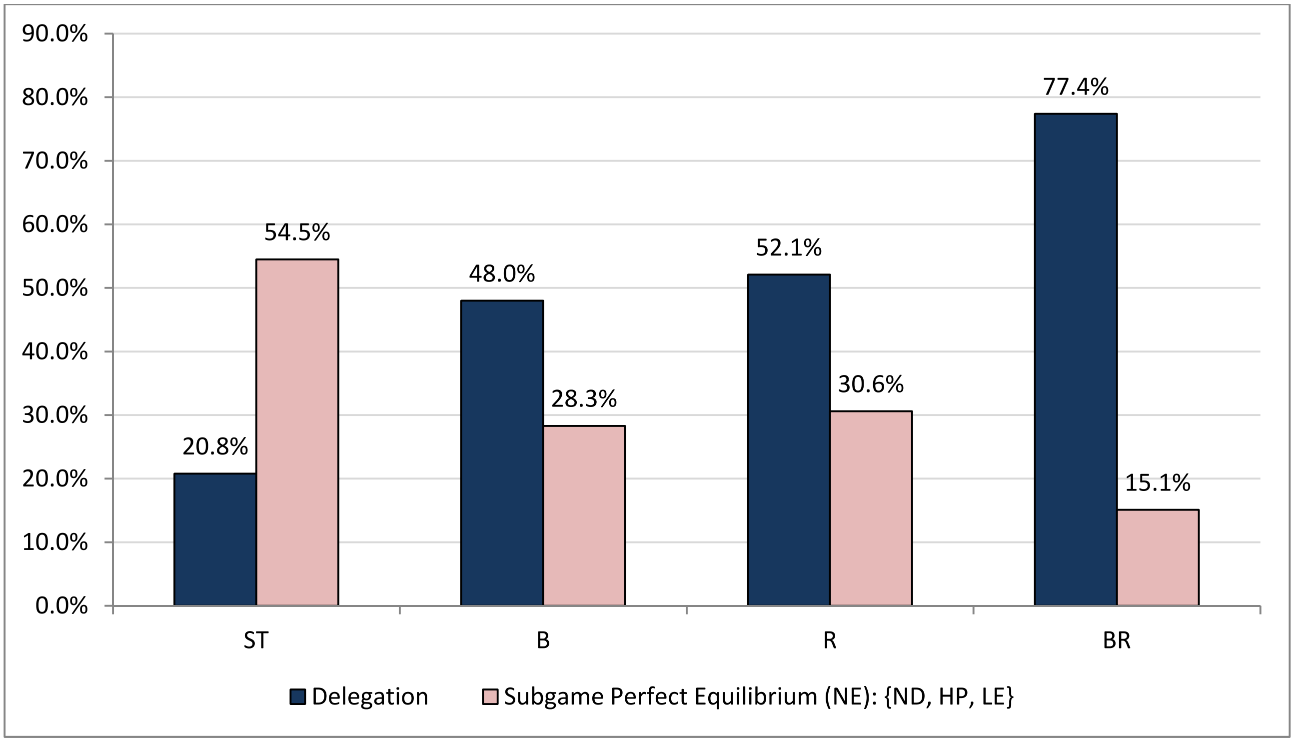


Figure 3: Comparing the Percentage of the {*Medium Price, High Effort*} Outcome to the {*Low Price, Low Effort*} Outcome Conditional on *Delegation*

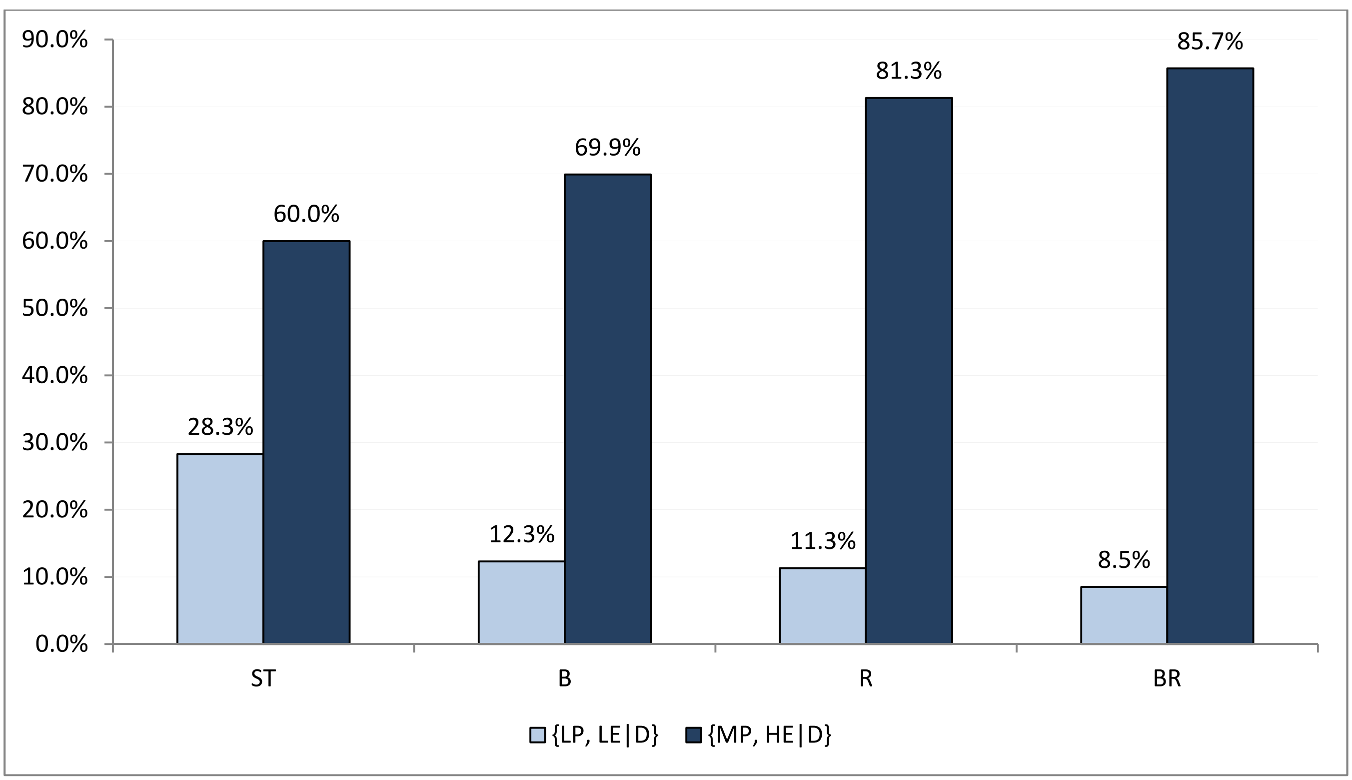


Figure 4: Comparing the Percentage of the {*Delegation, Medium Price, High Effort*} Outcome to the {*No Delegation, Medium Price, High Effort*} Outcome

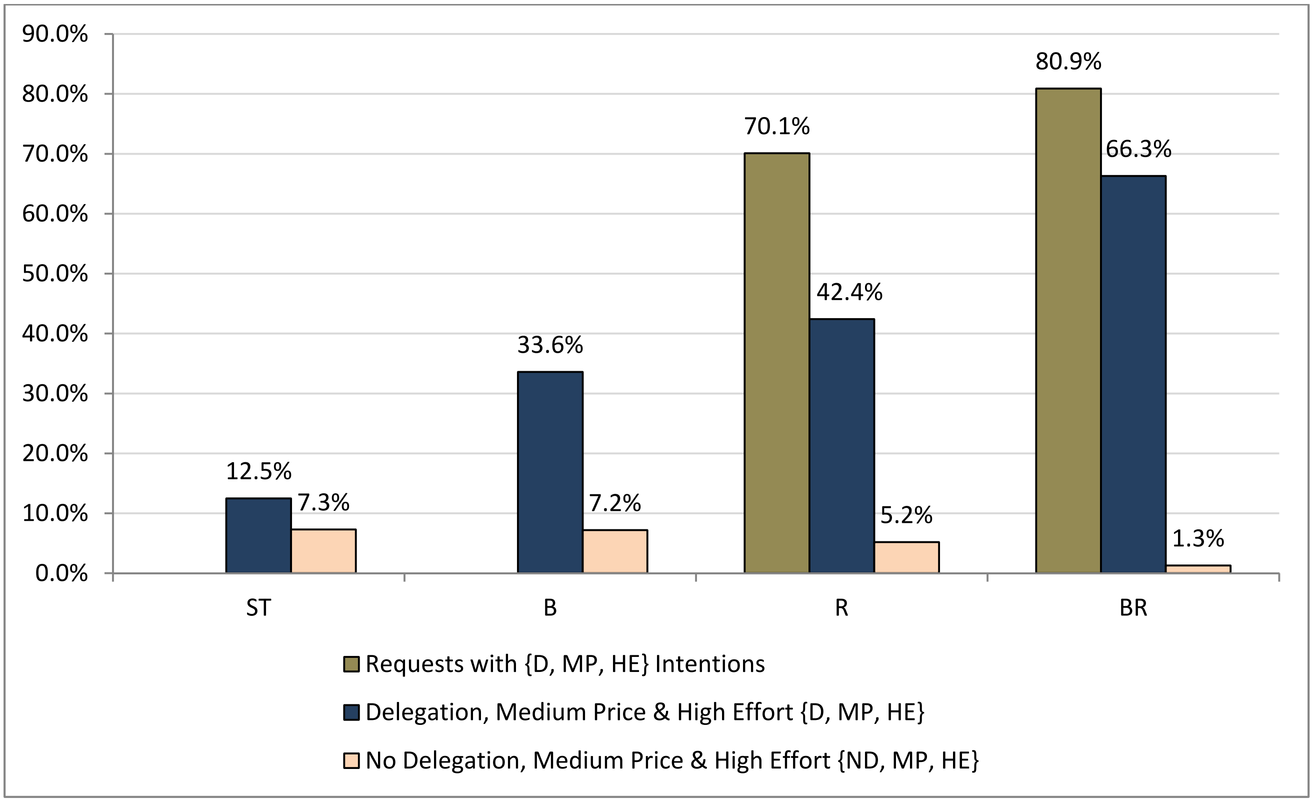


Figure 5: Comparing Manager Profits under *Delegation* versus *No Delegation*

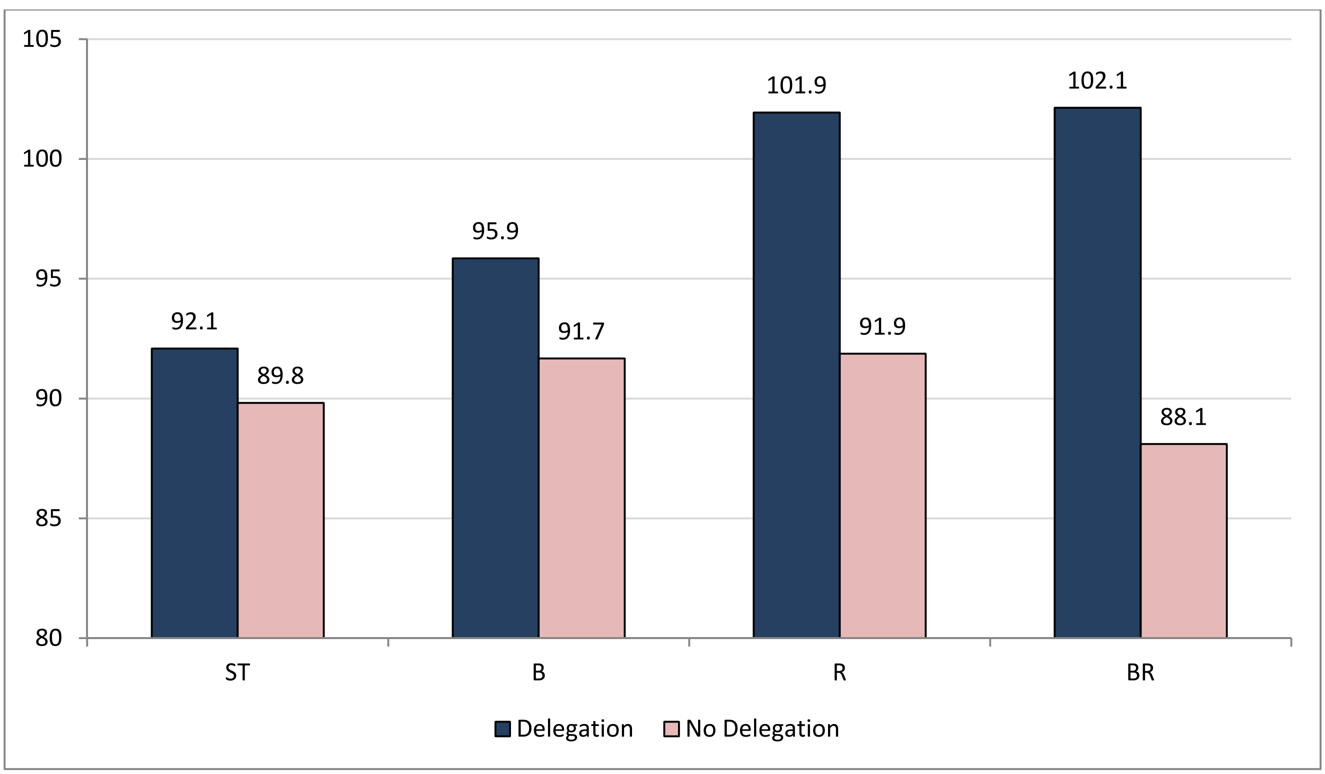


Table 2: OLS Regressions Comparing Manager Profits under *Delegation* across Treatments

		Estimates	Standard Errors	*t*-stat	*p*-value
ST Treatment as the Comparison Group (R^2=0.051; 68 Clusters)	**Constant**	92.09*	1.45	63.39	0.000
	B Treatment Dummy	3.76*	1.81	2.08	0.042
	R Treatment Dummy	9.85*	1.90	5.19	0.000
	BR Treatment Dummy	10.05*	1.57	6.41	0.000
B Treatment as the Comparison Group (R^2=0.051; 68 Clusters)	**Constant**	95.85*	1.08	88.61	0.000
	ST Treatment Dummy	-3.76*	1.81	-2.08	0.042
	R Treatment Dummy	6.09*	1.63	3.73	0.000
	BR Treatment Dummy	6.28*	1.23	5.10	0.000
R Treatment as the Comparison Group (R^2=0.051; 68 Clusters)	**Constant**	101.94*	1.22	83.35	0.000
	ST Treatment Dummy	-9.85*	1.90	-5.19	0.000
	B Treatment Dummy	-6.09*	1.63	-3.73	0.000
	BR Treatment Dummy	0.20	1.36	0.15	0.885
BR Treatment as the Comparison Group (R^2=0.051; 68 Clusters)	**Constant**	102.14*	0.59	173.76	0.000
	ST Treatment Dummy	-10.05*	1.57	-6.41	0.000
	B Treatment Dummy	-6.28*	1.23	-5.10	0.000
	R Treatment Dummy	-0.20	1.36	-0.15	0.885

*Significant at the 5% level

Table 3: Salesperson's Utility Specifications across Treatments

<table>
<tr><th colspan="2"><u>Game Outcomes</u></th><th><u>ST</u></th><th><u>B</u></th><th><u>R</u>+</th><th><u>BR</u>+</th></tr>
<tr><td rowspan="6">No Delegation</td><td>High Price & Low Effort</td><td colspan="4">87.8</td></tr>
<tr><td>High Price & High Effort</td><td colspan="4">82.9</td></tr>
<tr><td>Medium Price & Low Effort</td><td colspan="4">113.4+θ_{ND}(77.6-88.2)</td></tr>
<tr><td>Medium Price & High Effort</td><td colspan="4">100.4+θ_{ND}(108.6-88.2)</td></tr>
<tr><td>Low Price & Low Effort</td><td colspan="4">119.9+θ_{ND}(63.1-88.2)</td></tr>
<tr><td>Low Price & High Effort</td><td colspan="4">103.7+θ_{ND}(85.3-88.2)</td></tr>
<tr><td rowspan="6">Delegation</td><td>High Price & Low Effort</td><td colspan="4">87.8</td></tr>
<tr><td>High Price & High Effort</td><td colspan="4">82.9</td></tr>
<tr><td>Medium Price & Low Effort</td><td colspan="2">113.4+θ_D(77.6-88.2)</td><td>113.4+θ_{DR}(77.6-108.6)</td><td>113.4+θ_{DR}(77.6-105.6)</td></tr>
<tr><td>Medium Price & High Effort</td><td>100.4+θ_D(108.6-88.2)</td><td>103.4+θ_D(105.6-88.2)</td><td>100.4</td><td>103.4</td></tr>
<tr><td>Low Price & Low Effort</td><td colspan="2">119.9+θ_D(63.1-88.2)</td><td>119.9+θ_{DR}(63.1-108.6)</td><td>119.9+θ_{DR}(63.1-105.6)</td></tr>
<tr><td>Low Price & High Effort</td><td colspan="2">103.7+θ_D(85.3-88.2)</td><td>103.7+θ_{DR}(85.3-108.6)</td><td>103.7+θ_{DR}(85.3-105.6)</td></tr>
</table>

+This the request treatment when a request is made and is equal to the *Medium Price* and *High Effort* payout.

Table 4: Social Preference Model Estimation Results

Treatment	Parameter	Full Model	Nested Model 1: No Social Preferences	Nested Model 2: Common $\boldsymbol{\theta}$ within each Treatment	Nested Model 3: $\boldsymbol{\theta_D = \theta_{DR}}$ in the R and BR Treatments	Nested Model 4: Common $\boldsymbol{\theta_N, \theta_D}$ & $\boldsymbol{\theta_{DR}}$ across Treatments
ST	θ_{ND}^{ST}	0.369* (0.015)+		0.480* (0.003)	0.364* (0.010)	0.374* (0.005)
	θ_{D}^{ST}	0.491* (0.008)			0.491* (0.016)	0.487* (0.008)
B	θ_{ND}^{B}	0.391* (0.008)		0.482* (0.005)	0.389* (0.010)	
	θ_{D}^{B}	0.618* (0.028)			0.633* (0.026)	
R	θ_{ND}^{R}	0.378* (0.009)		0.513* (0.004)	0.379* (0.011)	
	θ_{D}^{R}	0.421* (0.035)			0.664* (0.024)	
	θ_{DR}^{R}	0.727* (0.035)				0.664* (0.018)
BR	θ_{ND}^{BR}	0.346* (0.017)		0.517* (0.008)	0.340* (0.021)	
	θ_{D}^{BR}	0.436* (0.042)			0.824* (0.043)	
	θ_{DR}^{BR}	0.904* (0.057)				
	λ^M	0.181* (0.011)	0.039* (0.004)	0.285* (0.010)	0.151* (0.010)	0.178* (0.010)
	λ_{ND}^{S}	0.496* (0.029)	0.200* (0.010)	0.264* (0.007)	0.452* (0.024)	0.495* (0.027)
	λ_{D}^{S}	0.184* (0.016)	0.000 (0.005)	0.626* (0.013)	0.190* (0.013)	0.275* (0.013)
	LL	-1713.1	-2699.5	-2040.6	-1824.4	-1764.8
	Wald Test (W)		6189.67*	192.27*	108.90*	41.85*

Nested Model 1 Constraints: $\theta_{ND}^{ST} = \theta_{ND}^{B} = \theta_{ND}^{R} = \theta_{ND}^{BR} = \theta_{D}^{ST} = \theta_{D}^{B} = \theta_{D}^{R} = \theta_{D}^{BR} = \theta_{DR}^{R} = \theta_{DR}^{BR} = 0$
Nested Model 2 Constraints: $\theta_{ND}^{ST} = \theta_{D}^{ST}$; $\theta_{ND}^{B} = \theta_{D}^{B}$; $\theta_{ND}^{R} = \theta_{D}^{R} = \theta_{DR}^{R}$; $\theta_{ND}^{BR} = \theta_{D}^{BR} = \theta_{DR}^{BR}$
Nested Model 3 Constraints: $\theta_{D}^{R} = \theta_{DR}^{R}$; $\theta_{D}^{BR} = \theta_{DR}^{BR}$
Nested Model 4 Constraints: $\theta_{ND}^{ST} = \theta_{ND}^{B} = \theta_{ND}^{R} = \theta_{ND}^{BR}$; $\theta_{D}^{ST} = \theta_{D}^{B} = \theta_{D}^{R} = \theta_{D}^{BR}$; $\theta_{DR}^{R} = \theta_{DR}^{BR}$

* Significant at the 5% level
+ The standard errors are shown in parentheses

Table 5: Social Preferences Model Predictions in Percentage Deviations from the Data[+]

		Price	Effort	Data	Full Model	Nested Model 2: Common θ within each Treatment	Nested Model 3: $\theta_D = \theta_{DR}$ in the R and BR Treatments	Nested Model 4: Common θ_N, θ_D & θ_{DR} across Treatments
ST Treatment	*No Delegation*	*High*	*Low*	54.5	-3.6	-5.2	**-10.5**	-8.6
		Medium	*Low*	13.9	1.1	1.2	-4.1	0.9
		Medium	*High*	7.3	-0.4	-0.3	8.9	0.1
	Delegation	*Medium*	*High*	12.5	-3.5	-3.3	-0.9	0.3
		Low	*Low*	5.9	-0.6	-0.5	-3.2	0.3
B Treatment	*No Delegation*	*High*	*Low*	28.3	0.8	1.2	2.0	**12.4**
		Medium	*Low*	11.5	0.2	0.1	-4.6	1.7
		Medium	*High*	7.2	0.3	0.4	4.3	-0.6
	Delegation	*Medium*	*High*	33.6	-1.9	-1.2	2.3	**-13.3**
		Low	*Low*	6.3	-1.0	-1.8	-3.3	0.1
R Treatment (Requests Made with *Medium Price* and *High Effort* Intentions)	*No Delegation*	*High*	*Low*	21.8	-5.5	3.9	1.2	-9.9
		Medium	*Low*	5.9	-0.4	3.2	1.5	-2.0
		Medium	*High*	2.0	0.9	3.2	**13.9**	-0.1
	Delegation	*Medium*	*High*	59.4	-4.2	**-20.6**	**-21.6**	7.7
		Low	*Low*	7.4	-2.9	-2.3	-4.0	-3.9
R Treatment (No Requests and Requests Made without *Medium Price* and *High Effort* Intentions)	*No Delegation*	*High*	*Low*	51.2	4.7	**-25.6**	**-28.2**	-5.3
		Medium	*Low*	16.3	2.4	-7.2	-8.9	-1.5
		Medium	*High*	12.8	-2.9	-7.6	3.1	-5.4
	Delegation	*Medium*	*High*	2.4	0.9	**36.2**	**35.4**	**10.4**
		Low	*Low*	2.4	1.1	2.6	1.0	3.8
BR Treatment (Requests Made with *Medium Price* and *High Effort* Intentions)	*No Delegation*	*High*	*Low*	6.9	5.1	**11.9**	**11.4**	7.6
		Medium	*Low*	0.9	1.7	3.7	5.2	3.8
		Medium	*High*	0.4	0.5	1.1	**13.1**	1.9
	Delegation	*Medium*	*High*	81.6	-6.7	**-18.6**	**-29.4**	**-15.0**
		Low	*Low*	7.3	-6.0	-5.4	-5.6	-4.7
BR Treatment (No Requests and Requests Made without *Medium Price* and *High Effort* Intentions)	*No Delegation*	*High*	*Low*	54.6	4.7	**-35.9**	**-36.3**	**-13.9**
		Medium	*Low*	20.0	-7.0	**-15.4**	**-13.9**	-6.8
		Medium	*High*	5.5	-1.3	-4.0	8.0	1.1
	Delegation	*Medium*	*High*	1.8	5.1	**60.9**	**50.4**	**18.5**
		Low	*Low*	3.6	1.2	-1.7	-1.9	2.8

[+]Deviations greater than 10% are indicated in BOLD.

<u>**APPENDIX 1: BR TREATMENT INSTRUCTIONS**</u>

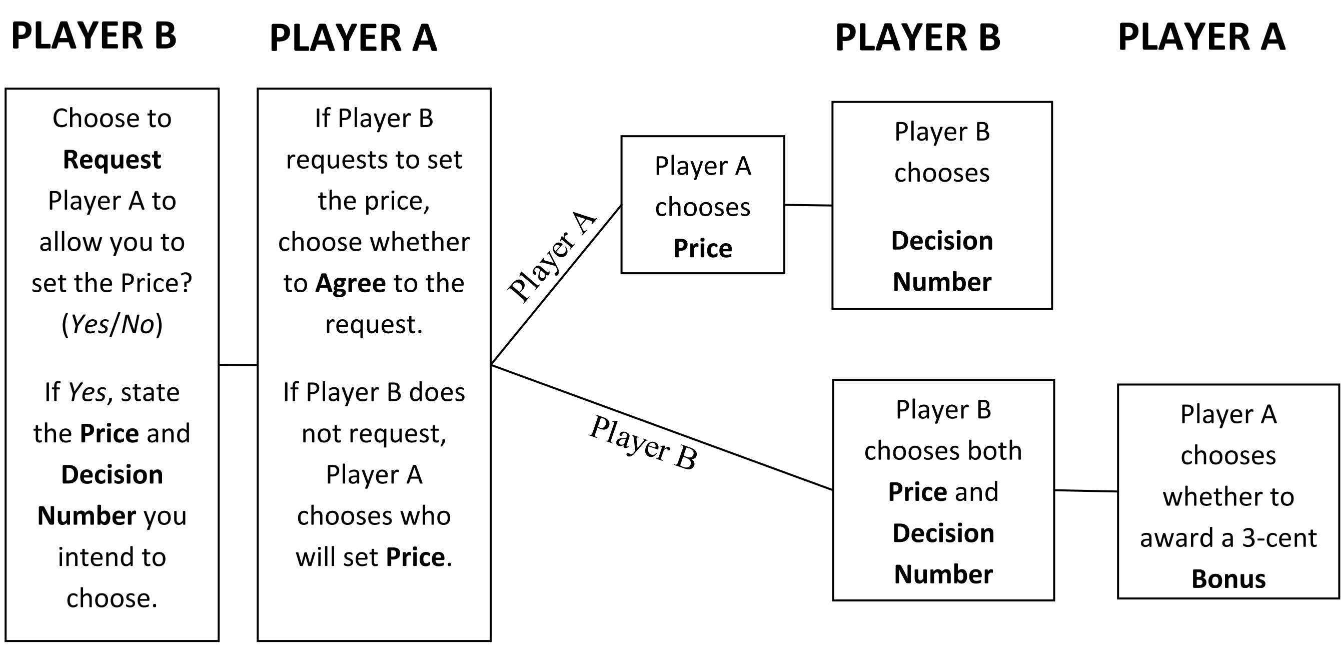
1. Introduction

This is an experiment in decision making. The instructions are simple - if you follow them carefully and make good decisions, you could earn a considerable amount of money which will be paid to you immediately following this experiment. What you earn partly depends on your decisions and partly on the decisions of others. Do not look at the decisions of others. Do not talk during the experiment. You will be warned if you violate this rule. If you violate this rule twice, we will cancel the experiment immediately and your earnings will be $0.

The participants in this experiment will participate in a total of 16 decision rounds. At the start of the experiment, you will be assigned to be either Player A or Player B. This assignment will be your player role for all of the decision rounds. The computer will also <u>randomly and anonymously</u> match the participants into pairs such that there is one Player A and one Player B in each pair. This matching procedure will be repeated every round. That is, you will be rematched with another player each round until all 16 rounds are complete. As will be described in detail below, Player A's decisions affect the earnings of Player B and vice versa. The experiment begins with Player B's move which is followed by Player A's move and then by Player B's move. The experiment ends with either Player B or Player A's move. We will use a computer program to coordinate the experiment. The specific moves and decisions for each player are described below.

2. Moves and Decisions

<u>**Move Sequence**</u>



Step 1: Player B's Move:

- *Decide whether to request Player A to allow you to set the Price (Yes or No)*
    - If Player B requests (*Yes*), you must also
        - *State to Player A the Price (Low, Medium or High) that you intend to select.*
        - *State to Player A the Decision Number (Low or High) that you intend to select.*

    - If Player B does not request (*No*):
        - Wait for Player A's Move

Step 2: Player A's Move

- If Player B requests to set the Price:
    - *Decide whether to Agree or Do Not Agree*
        - If you agree to allow Player B to set the Price:
            - Your move ends
        - If you do not agree to allow Player B to set the price:
            - *Set the Price (Low, Medium or High)*

- If Player B does not request to set the Price:
    - *Choose whether you want to set the Price yourself or allow Player B to set the Price (Yourself or Player B)*
        - If Player A decides to set the Price himself:
            - *Set the Price (Low, Medium or High)*
              Player B will be shown the Price you select.

        - If Player A allows Player B to set the Price:
            - Wait till next move

Step 3: Player B's Move

- If Player B requests to set the Price and Player A agrees:
    - *Choose the Price (Low, Medium or High) and*
    - *Choose the Decision Number (Low or High)*

- If Player B requests to set the Price and Player A does not agree:
    - *Choose the Decision Number (Low or High) only*

- If Player B does not request to set the Price but Player A allows Player B to set the price:
    - *Choose the Price (Low, Medium or High) and*
    - *Choose the Decision Number (Low or High)*

- If Player B does not request to set the Price and Player A decides to set the Price:
    - *Choose the Decision Number (Low or High) only*

Step 4: Player A's Move

- If you allowed Player B to set the Price
  - *Choose to award a 3 cent Bonus (Bonus or No Bonus)*
    The Bonus reduces your payout by 3 cents and increases Player B's payout by 3 cents.

- If you chose to set the Price yourself
  - Your move ends

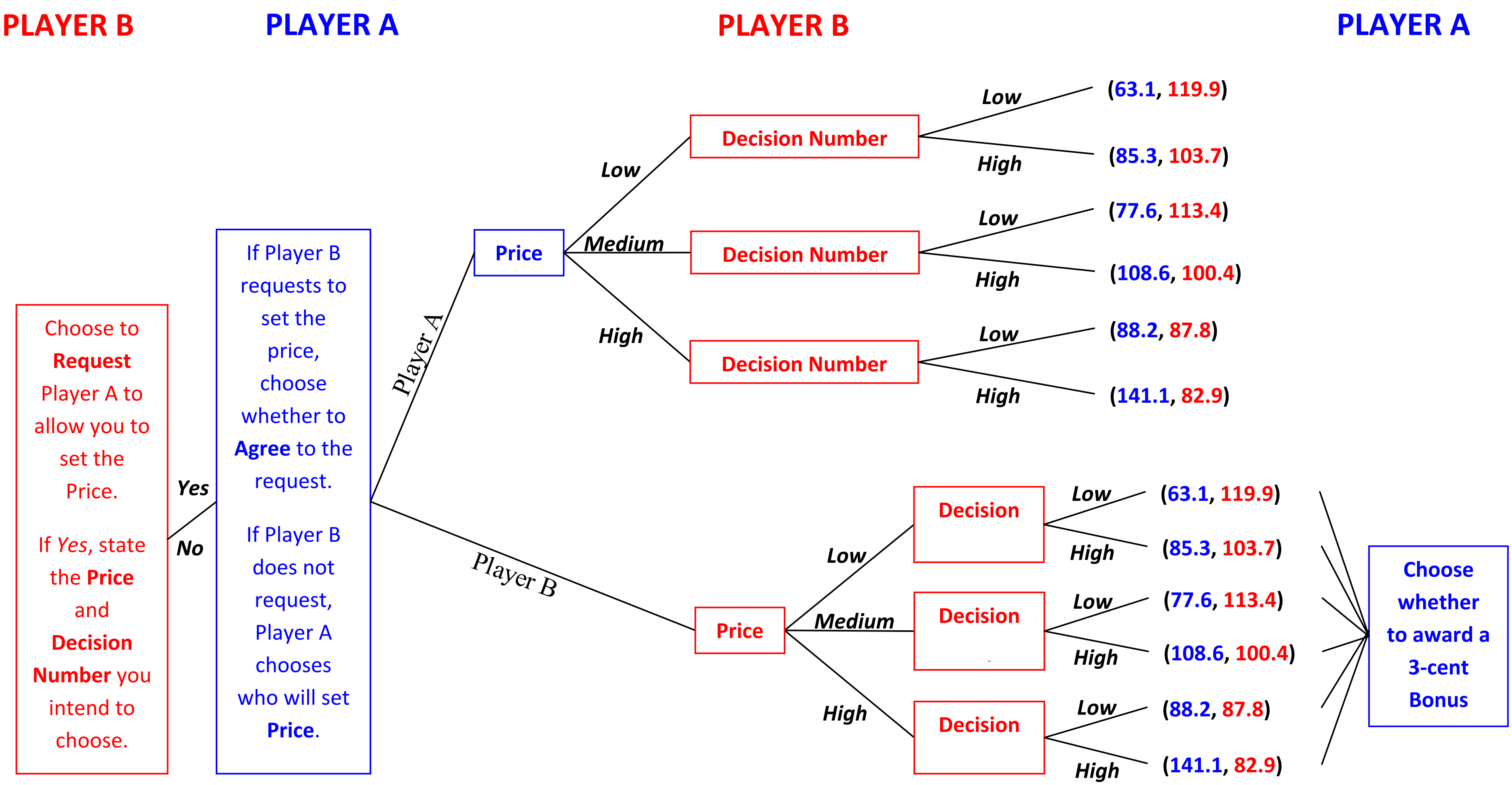
Payout for each Round (in cents)

Price (A or B's Decision)	Decision Number (B's Decision)	A's Payout	B's Payout	Total Payout (A+B)
Low	**Low**	**63.1**	**119.9**	**183**
Low	**High**	**85.3**	**103.7**	**189**
Medium	**Low**	**77.6**	**113.4**	**191**
Medium	**High**	**108.6**	**100.4**	**209**
High	**Low**	**88.2**	**87.8**	**176**
High	**High**	**141.1**	**82.9**	**224**

3. Cash Earnings

Your final earnings will be the sum of your cash earnings for the 16 decision rounds.

Are there any questions?


PLAYER B
PLAYER A
PLAYER B
PLAYER A
Choose to **Request** Player A to allow you to set the Price.
If *Yes*, state the **Price** and **Decision Number** you intend to choose.
Yes
No
If Player B requests to set the price, choose whether to **Agree** to the request.
If Player B does not request, Player A chooses who will set **Price**.
Player A
Player B
Price
Low
Medium
High
Decision Number
Decision Number
Decision Number
Low
High
(63.1, 119.9)
(85.3, 103.7)
(77.6, 113.4)
(108.6, 100.4)
(88.2, 87.8)
(141.1, 82.9)
Price
Decision
Decision
Decision
(63.1, 119.9)
(85.3, 103.7)
(77.6, 113.4)
(108.6, 100.4)
(88.2, 87.8)
(141.1, 82.9)
Choose whether to award a 3-cent Bonus

APPENDIX 2: CHOICE PROBABILITY FORMULATIONS (ST Treatment)

We explain the choice probability formulations for the ST treatment here. We use the NE outcome of {*ND, HP, LE*} as an example. The salesperson's probability of responding with *Low Effort* to the manager's choice of {*ND, HP*}, which we denote by Pr (*LE*|*ND*&*HP*), is shown in Row 1 of Table A1. Notice that there are only two choices that the salesperson could select: *Low Effort* or *High Effort*.

The manager rationally anticipates the salesperson's (probabilistic) response to *No Delegation* and *High Price* and forms her expected utility for the decision option {*ND, HP*}. This expected utility, which is denoted as *U*(*ND*&*HP*), is given in Row 10 of Table A1. The probability of choosing {*ND, HP*}, which we denote by Pr(*ND*&*HP*), is shown in 14 of Table A1. The remaining probabilities for the ST treatment are also shown in Table A1. The choice probability formulations for the B, R and BR treatments are constructed in the same manner, with the only difference being the specifications of the salesperson's utility in the other treatments.

Table A1: Choice Probability Formulations for the ST Treatment

		Formulations		
Salesperson's Choice Probabilities	$\boldsymbol{Pr(LE\|ND\&HP)}$	$\frac{e^{\lambda^S_{ND}(87.8)}}{e^{\lambda^S_{ND}(87.8)}+e^{\lambda^S_{ND}(82.9)}}$	$\boldsymbol{Pr(HE\|ND\&HP)}$	$1-Prob(LE\|ND\&HP)$
	$\boldsymbol{Pr(LE\|ND\&MP)}$	$\frac{e^{\lambda^S_{ND}[113.4+\theta_{ND}(77.6-88.2)]}}{e^{\lambda^S_{ND}[113.4+\theta_{ND}(77.6-88.2)]}+e^{\lambda^S_{ND}[100.4+\theta_{ND}(108.6-88.2)]}}$	$\boldsymbol{Pr(HE\|ND\&MP)}$	$1-Prob(LE\|ND\&MP)$
	$\boldsymbol{Pr(LE\|ND\&LP)}$	$\frac{e^{\lambda^S_{ND}[119.9+\theta_{ND}(63.1-88.2)]}}{e^{\lambda^S_{ND}[119.9+\theta_{ND}(63.1-88.2)]}+e^{\lambda^S_{ND}[103.7+\theta_{ND}(85.3-88.2)]}}$	$\boldsymbol{Pr(HE\|ND\&LP)}$	$1-Prob(LE\|ND\&LP)$
	$\boldsymbol{Pr(HP\&LE\|D)}$	$\frac{e^{\lambda^S_D(87.8)}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
	$\boldsymbol{Pr(HP\&HE\|D)}$	$\frac{e^{\lambda^S_D(82.9)}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
	$\boldsymbol{Pr(MP\&LE\|D)}$	$\frac{e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
	$\boldsymbol{Pr(MP\&HE\|D)}$	$\frac{e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
	$\boldsymbol{Pr(LP\&LE\|D)}$	$\frac{e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
	$\boldsymbol{Pr(LP\&HE\|D)}$	$\frac{e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}{e^{\lambda^S_D(87.8)}+e^{\lambda^S_D(82.9)}+e^{\lambda^S_D[113.4+\theta_D(77.6-88.2)]}+e^{\lambda^S_D[100.4+\theta_D(108.6-88.2)]}+e^{\lambda^S_D[119.9+\theta_D(63.1-88.2)]}+e^{\lambda^S_D[103.7+\theta_D(85.3-88.2)]}}$		
Manager's Expected Utilities	$\boldsymbol{U(ND\&HP)}$	$88.2\times Pr(LE\|ND\&HP)+141.1\times Pr(HE\|ND\&HP)$		
	$\boldsymbol{U(ND\&MP)}$	$77.6\times Pr(LE\|ND\&MP)+108.6\times Pr(HE\|ND\&MP)$		
	$\boldsymbol{U(ND\&LP)}$	$63.1\times Pr(LE\|ND\&LP)+85.3\times Pr(HE\|ND\&LP)$		
	$\boldsymbol{U(D)}$	$88.2\times Pr(HP\&LE\|D)+141.1\times Pr(HP\&HE\|D)+77.6\times Pr(MP\&LE\|D)+108.6\times Pr(MP\&HE\|D)+63.1\times Pr(LP\&LE\|D)+85.3\times Pr(LP\&HE\|D)$		
Manager's Choice Probabilities	$\boldsymbol{Pr(ND\&HP)}$	$\frac{e^{\lambda^M\times U(ND\&HP)}}{e^{\lambda^M\times U(ND\&HP)}+e^{\lambda^M\times U(ND\&MP)}+e^{\lambda^M\times U(ND\&LP)}+e^{\lambda^M\times U(D)}}$		
	$\boldsymbol{Pr(ND\&MP)}$	$\frac{e^{\lambda^M\times U(ND\&MP)}}{e^{\lambda^M\times U(ND\&HP)}+e^{\lambda^M\times U(ND\&MP)}+e^{\lambda^M\times U(ND\&LP)}+e^{\lambda^M\times U(D)}}$		
	$\boldsymbol{Pr(ND\&LP)}$	$\frac{e^{\lambda^M\times U(ND\&LP)}}{e^{\lambda^M\times U(ND\&HP)}+e^{\lambda^M\times U(ND\&MP)}+e^{\lambda^M\times U(ND\&LP)}+e^{\lambda^M\times U(D)}}$		
	$\boldsymbol{Pr(D)}$	$\frac{e^{\lambda^M\times U(D)}}{e^{\lambda^M\times U(ND\&HP)}+e^{\lambda^M\times U(ND\&MP)}+e^{\lambda^M\times U(ND\&LP)}+e^{\lambda^M\times U(D)}}$		