Personalized Pricing and Price Fairness

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Abstract

Mobile web technology enables discriminatory, or personalized, pricing for many more consumer good categories than has traditionally been the case. Setting prices according to individual valuations, however, generates adverse consumer reaction unless consumers are invited to participate in the price-formation process. Consumer perceptions of price fairness are key to the sustainability of any discriminatory pricing regime. Perceptions of price fairness, in turn, are hypothesized to be shaped by "self-interested inequity aversion" in which prices tend to be regarded as unfair, and purchase probabilities fall, if others are perceived to pay a lower price, while prices tend to be regarded as more fair, and consumers more likely to purchase, if inequity is in the buyers favor. Our experimental data also shows that the implications of inequity aversion for sellers can be at least partially reversed if consumers are allowed to participate in the price-formation process by negotiating the price they pay. The primary implication of our findings is that, in order to be viable, any system of discriminatory pricing for consumer goods should invite consumers to have a stake in the price they pay. Such participatory pricing may provide one way out of the current trap of Hi-Lo, or promotional, pricing that neither retailers nor manufacturers regard as sustainable.

keywords: experimental economics, fairness, inequity aversion, price discrimination, retail pricing

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1 Introduction

Facilitated by highly granular price management algorithms and mobile-everywhere shopping apps, and motivated by substantial opportunities for profit (Sahay 2012), personalized, or discriminatory, pricing for consumer products has become increasingly prevalent (Weisstein, Monroe, and Kukar-Kinney 2013). Defined generally, discriminatory pricing involves varying prices for the same product across different consumers according to their willingness-to-pay, and communicating prices in a directed, personalized way (Garbarino and Lee 2003).[1] While simple in concept, in an environment with complete price-transparency, such price differences may induce perceptions of unfairness, loss of trust, credibility, fears of price-gouging, and reduced purchase intentions (Kannan and Kopalle 2001; Garbarino and Lee 2003; Haws and Bearden 2006; Rotemberg 2011). If consumers do not perceive the price they are asked to pay as "fair," they will not trust the vendor, nor the way in which prices are formed, and demand falls. Ultimately, retailers respond by reverting to more traditional pricing systems – witness the abandonment of discriminatory pricing by Amazon in 2000 (Reinartz 2002). From a broader perspective, given the inefficiencies inherent in traditional systems of promotional pricing (Lal and Rao 1997), finding solutions to some of the problems in implementing discriminatory pricing across a wider range of categories may be welfare-improving for the retail economy as a whole. In this research, we investigate how interpersonal price differences affect perceptions of inequity, how they can be mitigated, and how these perceptions affect the viability of a system of discriminatory pricing for retail products.

Perhaps due to its fundamental importance to the viability of any pricing system, price fairness has assumed a prominent place in both economics (Rotemberg 2011) and marketing research (Xia, Monroe, and Cox 2004). This literature reveals a number of factors that determine how price-fairness perceptions are formed: Consumers' perceptions of seller's cost (Kahneman, Knetsch, and Thaler 1986a, Vaidyanathan and Aggarwal 2003; Darke and Dahl

[1] The term "dynamic pricing" is often used in industry to describe discriminatory pricing, but we will use the latter to avoid confusion with intertemporal pricing strategies that take advantage of state-dependencies in demand.

2003; Bolton, Warlop and Alba 2003; Bolton and Alba 2006), buyers' previous experience with the product or seller (Darke and Dahl 2003; Bolton, Warlop and Alba 2003; Shehryar and Hunt 2005; Rondan-Cataluna and Martin-Ruiz 2011), cultural differences among buyers (Bolton et al. 2010), competitor prices (Bolton, Warlop and Alba 2003), loyalty to the retailer (Martin, Ponder, and Lueg 2009), the procedures used to set prices (Maxwell 2002; Xia, Monroe, and Cox 2004; Shehryar and Hunt 2005; Kukar-Kinney, Xia, and Monroe 2007; Tsai and Lee 2007), the motives inferred for setting prices (Campbell 2007), any perceived violation of social norms in price setting (Garbarino and Maxwell 2010; Maxwell and Garbarino 2010), and interpersonal differences in prices (Ordóñez, Connolly, and Coughlan 2000; Darke and Dahl 2003; Haws and Bearden 2006; Anderson and Simester 2008; Ashworth and McShane 2012). Although each of these factors is clearly important in forming impressions of price fairness, we focus on interpersonal comparisons as price transparency is one of the key defining features of discriminatory pricing in modern, multi-channel, social, and mobile platforms.[2]

Economists have long-formalized notions of inequity in contexts ranging from contributions to public goods to exploitation of common property resources. In particular, Fehr and Schmidt (1999), present a formal model of utility that maintains agents have an inherent distaste for inequity. That is, utility is reduced when they experience personal benefits that are either greater than others (advantageous inequity) or less than others (disadvantageous inequity). This notion of "self-centered inequity aversion," applied to market transactions for consumer products, implies that a regime of discriminatory pricing used by a consumer-products retailer is likely to fail, or be rejected as unfair by participants, if the agent has evidence that either others paid more or less than himself.[3] Because this is the raison d'etre for discriminatory pricing, any pricing platform based on this logic would seemed to be

[2]Sometimes ensuring lack of price transparency, i.e. price obfuscation, or preventing customers from finding out how much others paid, is another strategic option (Ellison and Ellison 2012). However, in the context of our research, consumer product retailing, obfuscation is difficult and unlikely to occur.

[3]The notion that consumers compare prices with those paid by others, and are more concerned with disadvantageous inequity than advantageous inequity is also consistent with the conclusions derived by Xia, Monroe, and Cox (2004) in their exhaustive review of the price fairness literature.

doomed to failure. If, however, the pattern of inequity aversion is more "self-interested inequity aversion" (Liaukonyte et al. 2015) then the discriminatory pricing regime is more likely to succeed. Self-interested inequity aversion holds that utility is reduced only when the agent has evidence that others have done better through a market transaction – paid a lower price – but is quite happy to learn that he or she has uniquely received a good deal. In this model, fairness is relative, but relative in a one-sided way, with no sense of symmetry as in the original Fehr and Schmidt (1999) model.[4]

Perceptions of inequity are likely to be one-sided. That is, prices are technically inequitable if either the buyer pays more or less than others, but Prospect Theory (Kahneman and Tversky 1979) maintains that individuals care more when they are disadvantaged relative to when they are advantaged by inequity. Although the concept of asymmetric inequity is ubiquitous in the price fairness literature (Ordonez, Connolly, and Coughlan 2000; Gelbrich 2011), there are no formal models that reveal how perceptions of advantageous relative to disadvantageous inequity are manifest in product choice. While basing empirical analysis in a formal model of utility maximizing is clearly not a pre-condition to drawing valid conclusions, there are benefits to doing so. Most importantly, by parameterizing consumer preferences for fairness, we are able to construct a simulation model in which we evaluate the stability of a discriminatory pricing regime by comparing purchase behaviors with the extent of inequity offered by sellers. Not all efficient markets are sustainable, but calculating choice probabilities allows us to quantify the incentives faced by both parties in sustaining the discriminatory pricing platform. In this study, we frame our empirical model of price fairness in a utility-theoretic model of inequity aversion (IA).

If buyers have some "skin in the game," their perceptions of inequity may be mitigated (Haws and Bearden 2006). That is, if buyers are allowed to participate in the price-formation process, then they are less likely to place the blame for an outcome that is perceived as inequitable on the seller (Elmaghraby and Keskinocak 2003; Kim, Natter, and Spann 2009;

[4]Charness and Rabin (2002) also document departures from self-centered inequity aversion, but our retail pricing environment does not allow for the type of reciprocal or altruistic behavior that they consider.

Sahay 2012). Therefore, we design an experiment that examines whether perceptions of fairness, and purchase behaviors, are affected by whether the buyer is in a purely price-posted (PP, or seller-determined), or a price-discovery (PD, seller-buyer negotiated) pricing environment.

Our primary hypothesis is that the buyer's utility falls the greater the divergence of the price that is paid, or at least offered from the retailer, and the price that others paid. Beyond a certain point, in fact, if the gap between the price that is offered and others' prices is sufficiently high, then the perception of inequity outweighs any perceived benefits of receiving a lower price, shoppers will not participate in the market, and it will fail. When we allow buyers to negotiate the final price, however, we expect to find fairness perceptions improve to the point where much larger differences in realized prices are acceptable, and discriminatory pricing equilibria are generally stable.

We find that both our hypotheses are supported by our experimental data. Namely, we find that consumers are sensitive to price-inequity, particularly when disadvantaged, or when others are observed to pay lower prices. However, we also find that the effect of adverse fairness perceptions can be at least partially overcome by allowing consumers to participate in the price setting process, or by negotiating prices in a price-discovery pricing regime. The primary implication of this finding is that systems of discriminatory pricing can indeed arrive at stable equilibria if consumers have some stake in the outcome, or responsibility for the price that they ultimately pay.

Our study makes a number of contributions to the literatures on discriminatory pricing, and price fairness more generally. First, by varying the magnitude of the difference in price offered to potential buyers, and allowing them to make a choice of whether to buy or not to buy, we are able to parameterize the extent of interpersonal price difference that is regarded as salient by buyers. In this respect, we synthesize the conceptual and empirical literatures on reference prices, the latitude or price acceptance, and price fairness.[5] This has great practical

[5] In the Fehr and Schmidt (1999) setting, loss is only relevant in consumer markets as a relative concept – relative to gains or losses experienced by other consumers. In this regard, the notion of inequity aversion is

importance for the design of discriminatory pricing platforms as sellers will have a better sense of "how much" prices may vary among buyers before the system is likely to collapse. Second, we investigate the importance of buyer participation in the transaction as a means of mitigating the effects of any perceived unfairness. While previous research has argued that such involvement is likely to be important, ours is the first to rigorously test the effect of price-discovery on price fairness, and product choice. Third, we synthesize the economics and marketing literatures on inequity by framing our conceptual model in terms of the "self-centered inequity" model of Fehr and Schmidt (1999). While similar in intuition to the equity theory of Adams (1965), it provides formal grounding of an econometric test for how disadvantageous inequity (DI) and advantageous inequity (AI) are likely to have differential effects on the incentives to participate in a market that uses discriminatory pricing. Fourth, we use our experimental findings to simulate the functioning of a market organized around a discriminatory pricing platform in order to assess how interpersonal differences in prices paid, and in pricing mechanisms, is likely to effect the probability that a market will be viable.

How discriminatory pricing affects welfare is an important, and non-trivial problem. Schmalensee (1981) shows that an increase in output is a necessary condition for third-degree price discrimination to be welfare-enhancing, but only in a model with linear demands and constant marginal costs. Varian (1985) derives a more general result in that he shows that price discrimination that leads to higher output can be welfare improving in a much more general class of demand and cost functions, a result further generalized by Ireland (1992). More recently, Cowan (2012) shows that price discrimination can increase consumer

more general than that of simple loss aversion (Kahneman and Tversky 1979), and encompasses loss aversion as a special case. We envision a purchase-scenario in which the object of the transaction – a t-shirt – is purely discretionary, so the consumer is neither forced to buy it, nor would suffer without it. In the reference-price literature – the object of the transaction is more usually a staple good, or at least a frequently-purchased grocery item that when faced with a higher price than expected, the consumer / subject truly does feel a sense of loss in an absolute sense, and not just relative to another consumer who happened to get a better deal (Lattin and Bucklin 1989; Hardie, Johnson, and Fader 1993; Kalyanaram and Winer 1995; Bell and Lattin 2000; Erdem, Mayhew, and Sun 2001; Mazumdar, Raj, and Sinha 2005; Pauwels, Srinivasan, and Franses 2007).

surplus, not total surplus, if the "ratio of the pass-through coefficient to the price elasticity at the uniform price is higher in the market with the higher price elasticity..." (p. 333). In our structural model of inequity aversion, how welfare changes with under discriminatory pricing depends more on the strength of the aversion effect. Using a series of counterfactual simulations, we show that inequity aversion reduces the likelihood that discriminatory pricing increases welfare, but does not rule it out, particularly if consumers are allowed to negotiate equilibrium prices.

In the next section, we provide a brief summary of the literature on price fairness, and inequity aversion. We describe our experimental approach in Section 3, and how the experiment is designed to elicit both perceptions of price fairness, and how these perceptions affect purchase behavior. An empirical model of price fairness, inequity aversion, and purchase behavior is described in the fourth section, including how we identify the importance of fairness perceptions given that they are endogenous to the purchase decision. We summarize our experimental data, and estimates from several versions of the empirical model in Section 5, and follow with conclusions and implications in the final section – implications for both management practice in designing new pricing systems for consumer goods and for the efficiency of discriminatory pricing systems more generally.

2 Conceptual Background

Retail prices can evoke feelings of unfairness among consumers for a number of reasons. Kahneman, Knetch, and Thaler (KKT, 1986a,b) argue that consumers are motivated by a sense of dual entitlement (DE). DE theory maintains that consumers' perceptions of price fairness are governed by the notion that firms are expected to earn a reference level of profit, and consumers expect to pay a reference price. If consumers believe that a price increase is driven by higher demand – a snowstorm raising the demand for shovels in KKT – then the price is more likely to be viewed as unfair than if it were driven by higher costs of selling shovels. While interpersonal notions of equity are implicit in the reference price in

KKT, equity theory (ET, Adams 1965; Bagozzi 1975; Oliver and Swan 1989) makes such comparisons explicit as a basis for evaluating the fairness of a price. According to ET, the perception of a deal is guided by the reasoning that "...exchanges tend to be perceived as fair when the ratio of costs and benefits is the same for all participants..." (Darke and Dahl 2003; Xia, Kukar-Kinney, and Monroe 2010). While this interpretation of ET relies on outcomes, or distributive justice, prices that are set according to rules that are deemed to be *per se* unfair are regarded as violations of procedural justice (Thibault and Walker 1975; Martin, Ponder, and Lueg 2009). Maxwell (2002), for example, finds that consumers will regard prices as more fair, and will be more willing to purchase from one retailer relative to another, if they are aware of the rules used to set prices. Procedural justice, however, is often judged specific to an industry or market as perceptions of justice are made relative to social norms that have evolved differently from one context to the next (Xia, Monroe, and Cox 2004; Maxwell and Garbarino 2010).

Social norm (SN) theory explains why airline passengers do not appear to mind paying different prices from others in nearly identical seats, while Amazon was forced to abandon their attempt to price DVDs the same way in 2000 (Garbarino and Maxwell 2010). Regardless of social norms, buyers are more likely to be satisfied with the price they paid if they feel they received a "good deal" (Darke and Dahl 2003). Transaction utility theory (Thaler 1985) maintains that buyers obtain some benefit simply from the perception that they paid less than their reference price – and references prices can be established through interpersonal comparisons. In the context of discriminatory pricing, each of these theories would predict that price transparency – knowledge of what others paid – can lead to perceptions of inequity through any one of a number of mechanisms. In this research, we examine the implications of perceived inequity for market outcomes, and consider one way to mitigate the collapse of a system of discriminatory pricing.

Central to any model of price fairness is the notion that buyers, either explicitly or implicitly, have some sort of reference price they use to assess whether or not a price is fair.

Quite simply, fairness is not an absolute context. Consumers form benchmarks, or reference prices, in a number of ways: By recalling previous transactions, observing competitor prices, from an understanding of seller costs, or by observing the prices paid by other shoppers (Briesch et al. 1997). Indeed, for products that are purchased infrequently, are sufficiently unique that there are no real competitors, and if the costs of production cannot plausibly be known, prices paid by others is a logical benchmark for evaluating how fair a retail price is (Vaidanathan and Aggarwal 2003; Haws and Bearden 2006; Anderson and Simester 2008). In the reference price literature, however, benchmarks are likely to be uncertain as consumers do not have perfect knowledge regarding what others paid, or even what they paid in the past (Terui and Dehana 2006; Koszegi and Rabin 2006). Therefore, in this research we simulate both the notion of a reference price, and the uncertainty consumers have over what their reference price should be, by first asking subjects what they think the price of the item in question should be, and then presenting them not with a point estimate of what someone else paid (Wesstein, Monroe, and Kukar-Kinney 2013, for example), but with a distribution of what others paid. By varying the shape of this distribution, we are able to test for the effect of uncertainty on reference price formation, on the perception of fairness, and how these factors interact to influence purchase behaviors.

Discriminatory pricing through internet-based retail platforms invites buyers to compare the price they paid with others. Interpersonal differences in price are likely to be among the more salient drivers of fairness perceptions online as discriminatory pricing relies on interpersonal differences in willingness-to-pay in order to extract the most surplus from the market (Gelbrich 2011). Providing context for interpersonal comparisons is critical in establishing expectations that a system of pricing will yield outcomes that are, while not always similar among buyers, at least acceptable (Ordóñez, Connolly, and Coughlan 2000; Darke and Dahl 2003; Anderson and Simester 2008; Ashworth and McShane 2012). Perceptions of unfairness, however, do not necessarily mean that a system of discriminatory pricing is inherently untenable. Weisstein, Monroe, and Kukar-Kinney (2013), for example,

show that framing prices in terms of "dollars off" or "% off" can reduce the perception that price gap between one consumer and another is unfair, and can improve the level of trust in the vendor. In practical terms, however, it is not clear that framing prices this way is a long-term solution. Rather, to operate as a fundamentally different way of pricing consumer goods, a discriminatory pricing platform must have the perception of fairness as part of its design. In this study, our platform uses participation as a means of inducing fairness perceptions.

Allowing buyers to participate in price formation is one possible solution. Haws and Bearden (2006) provide empirical evidence that the highest level of dissatisfaction derives from a large inter-personal difference in prices, but that this dissonance was reduced when agents had the ability to control the price, at least partially, through an auction process. Dissatisfaction with posted prices declines when such retailer-controlled prices with large inter-personal differences represent a "good deal" for the buyer. However, if a shopper believes that someone else paid a lower price, even if the difference in price is justified by a lower cost, the price will be perceived as unfair and will create distrust. It is the ability of individuals to control negotiated prices that governs the difference in perceived fairness. With control over prices that are paid, shoppers are willing to take responsibility for any differences that emerge, and strive to "do better next time." Participatory pricing (Elmaghraby and Keskinocak 2003; Kim, Natter, and Spann 2009; Sahay 2012) may provide a means of both extracting surplus from the exchange, and improving consumers' willingness to buy, and their consequent satisfaction with the transaction. Although Haws and Bearden (2006) consider the identity of the price setter – either the buyer or the seller – in influencing perceptions of fairness and how satisfied buyers are with their purchase, both responses are self-reported and hypothetical, and not revealed behavior based on a utility-theoretic model of consumer decision making. In this study, we investigate the role of buyer participation in the price formation process as a means of mitigating the perception of unfairness using an incentive-compatible choice experiment, and we frame our investigation within a structural

model of buyer utility based on the self-centered inequity model of Fehr and Schmidt (1999).

Few studies link perceptions of price fairness to choice or market demand. Connecting fairness perceptions and demand is critical to understand whether a discriminatory pricing regime will succeed or fail. Among those who do consider this question, Anderson and Simester (2008) use a large-scale, choice-based, field experiment to study the question of why retailers do not offer premium prices for larger-size clothing, even when they typically pay wholesale premiums for plus sizes. They find that buyers of sizes that marginally qualify as "large" perceive premiums as unfair, and are less likely to buy as a result. Anderson and Simester (2010) find that customers react by making fewer subsequent purchases if they buy a product and later observe the same retailer selling it for less, attributing this effect to consumer antagonism. Losing some customers, however, does not necessarily mean that discriminatory pricing is suboptimal as Courty and Pagliero (2010) find that price variation in response to temporal changes in demand at an internet cafe may antagonize customers, but in fact increases net demand as the elasticity of demand is inversely related to its level. If perceptions of price fairness affect demand, then rational retailers should respond accordingly. Rotemberg (2011), for example, argues that optimal pricing is constrained by considerations of fairness. Whereas Rotemberg (2011) incorporates fairness-considerations through an analytical model, we take a different approach. We develop a simulation model in which consumers purchase according to rules based on constrained-optimal behavior, and parameterize their behavior through our empirical model, thus we are able to test not only whether a system of discriminatory pricing is optimal, but whether it is indeed stable.[6] Our conclusions find a threshold of price variation beyond which consumers regard interpersonal price differentials as unacceptable, and the system collapses. By allowing for participation in the price formation process, however, we find that the equilibrium is nearly always stable, and indeed may be welfare-increasing.

[6]Instability is defined as a pricing environment in which the purchase probability falls to zero, on average.

3 Experiment Design

We test our theory of self-interested inequity aversion, and the potential mitigating effect of market participation using an incentive-compatible, within- and between-subjects design. Subjects engage in a series of market transactions in which they pay to receive a relatively well-understood consumer good (Bolton, Warlop, and Alba 2003): A university-logo t-shirt (in their choice of size, retail value $19.95). All subjects are endowed with $30 at the start of the experiment and they get an additional $5, on average, from the risk elicitation lottery described below. Thus, on average, participants get $35 in cash that is theirs to either use to purchase goods, and/or to take home. We recruited 278 student-subjects from a large Eastern US university, and conducted the experiment using Qualtrics online survey software in a lab setting. Qualtrics allows us to record anonymous offers to buy t-shirts electronically, vary the offer price of the t-shirt randomly across subjects, and ask subjects to make a buy / no buy decision.

Each experimental session consisted of 4 parts: (1) a risk elicitation lottery; (2) practice rounds for the treatment-specific pricing experiment; (3) a treatment-specific pricing experiment, and (4) a demographic and socioeconomic survey. Subjects were randomly assigned to either group 1, the price-posted (PP) treatment, or group 2, the price-discovery (PD) treatment. The instruction script for the experiment is shown in Appendix A.

First, we elicited each subject's risk preferences as risk aversion may be a confounding factor in estimating inequity aversion. There is an emerging body of evidence that risk preferences can confound the elicitation of true asset valuations (Andersen, et al. 2008; Andreoni and Sprenger 2012; Yonezawa and Richards 2014). Moreover, risk seeking people tend to react less positively and at times negatively to the same fair procedures that appeal to risk averse people (Desai et al. 2011; Van Koten et al. 2013). One possible mechanism that is suggested in the literature is that being treated fairly reduces people's perception of uncertainty in the environment and while risk averse people find low uncertainty desirable and react positively to it, risk seeking people do not. Thus, to control for risk aversion in

our experiment, we first elicited risk preferences using the lottery-choice method developed by Holt and Laury (2002) and applied to store choices by Yonezawa and Richards (2014), and included each individual's risk-preference parameter as a control in the empirical model.

The Holt and Laury (2002) risk scale presented subjects with a multiple price list (MPL) exercise shown in table 1. Each row represents a binary choice task in which the subject is asked to choose between two lotteries: One with varying probabilities of receiving values that are relatively similar (Choice A), and another with the same probabilities of receiving values that differ by a wider margin (Choice B). As subjects proceed through the choice tasks, the expected value of both options increases, but the expected value of option B becomes greater than that of option A. In our lottery choice experiment (as in others), subjects typically begin by choosing option A and switch to option B, and continue to choose option B until the end. Risk neutral subjects are expected to choose option A in the first four choice tasks and option B in the last six choice tasks, because the expected payoff from option A exceeds that from option B in the first four choice tasks. Risk loving subjects are expected to start by choosing option B prior to the fourth choice task, and risk averse subjects are expected to continue to choose option A even after the fifth choice task, switching to option B somewhere between the sixth and tenth choice task. In the empirical model below, we argue that risk aversion is expected to influence both the mean utility associated with a risky proposition and the disutility associated with perceived pricing inequity.

In table 1, the switching point, or the point at which the subject changes from choosing option A to option B, indicates the point of indifference. That is, the expected utility of the choice in option A must be equal to the expected utility from choice B. We use this fact to imply a coefficient of risk aversion for each row, using utility function of the constant absolute risk aversion (CARA) form: $U(y) = -\exp(-\rho_i y)$, where y is the payment amount, and ρ_i is the coefficient of risk aversion specific to individual i. In this function, a ρ_i value below zero indicates risk-loving behavior, and a value greater than zero suggests risk aversion. Because the subject can only make one choice in each row, the MPL scale cannot be used to infer

an exact value for the coefficient of risk aversion, but rather a range bound by the value of ρ_i in the row prior to the switching point, and the row after. Consistent with the literature using the Holt and Laury (2002) procedure, we use the midpoint of the upper bound and lower bound of ρ_i and use this as the coefficient of risk aversion in the subsequent analysis (Anderson and Mellor 2008; Nguyen and Leung 2009; Dohmen and Falk 2011; Anderson, Freeborn, and Hulbert 2012). In table 1 below, we indicate the value of ρ_i implied by each choice, but do not reveal the value at the time of the experiment. We then include the subject-specific value for ρ_i in the econometric model of price-fairness in order to remove any confounding effect of varying risk preferences among individuals.

[table 1 in here]

The second section of the experiment entailed a treatment-specific practice session in which subjects were presented with a board game (Monopoly) and were asked to make a "practice-purchase" decision that mirrored the decision making within treatment-specific pricing structure (PP or PD) of the third part of the experiment, which is described below. This section was included to make sure that subjects understood the decision making process and its implications on their compensation. After the practice rounds, subjects had an opportunity to ask the moderator any remaining clarifying questions about the structure and potential outcomes of the experiment.

In the third section of the experiment, we elicited each subject's aversion to price inequity. Prior empirical studies identify conditions that are more or less conducive to perceptions of fairness, and design their experiments accordingly. These studies are able to reveal what comparison is most salient for consumers' assessment of the fairness of the price they paid by varying seller cost, previous purchase experiences, other seller prices, prices of substitute products, or prices paid by other buyers, and then asking respondents to assess the fairness of the transaction. However, we take it as given that each of these elements are important, control for them by design, and focus on the precise mechanism behind interpersonal perceptions of inequity and, most importantly, how these comparisons are manifest in actual

purchase decisions. Specifically, our design controls for all other factors that may influence perceptions of price inequity. First, all subjects were told that the t-shirt is sold only by this vendor, so we eliminated the possibility that competitive factors were a source of unfairness.[7] Second, we controlled for the effect of previous purchase experience or perceptions of excess profit by directly asking respondents for their assessment of the source of any perceived unfairness. By including this variable in our estimating model, we were able to isolate the effect of inter-personal inequity econometrically. As our ultimate objective is to evaluate how a discriminatory pricing system can function, we are concerned with "how far" consumers are willing to go in allowing inequity to not influence their decisions to participate in the market.

As mentioned above, half of the participants were subjected to PP, and half to PD pricing structures. Each treatment in the third stage of the experiment consisted of ten rounds: 5 confidential rounds and 5 non-confidential rounds. In each round, all subjects faced different, randomly-drawn prices from predefined distributions. In the confidential rounds, however, the prices shown to each subject were strictly confidential, whereas the distribution of prices was revealed to everyone in the non-confidential rounds, both graphically and numerically (see the instruction script in Appendix A and Figures 1 through 3 for the exact manner in which the information about distribution was revealed). Confidential rounds always preceded non-confidential rounds. We used 3 different price distributions throughout the entire experiment, but always only one distribution per experimental session. In each case, the form of the distribution was approximately normal, with 5 price points, with probabilities (10%, 20%, 40%, 20%, 10%) of each of the five price points being randomly drawn. Each price distribution was centered on the retail price of the t-shirt ($20), but ranged from relatively disperse ($10; $15; $20; $25; $30), to intermediate ($12.50; $16.25; $20; $23.75; $27.50), to relatively concentrated ($15; $17.50; $20; $22.50; $25). At a maximum,

[7]By telling subjects that there is only one seller, and including control rounds in which subjects do not see others' prices, we implicitly difference out the effect of any attribution of unfairness toward the seller. Our approach was necessary to isolate the effect of inter-personal, as opposed to inter-firm comparisons of unfairness. Ashworth and McShane (2012), on the other hand, focus on perceptions of unfairness directed at the firm.

therefore, the difference between the prices offered ranged from \$10 (50% of the retail cost) to \$20 (100% of the retail cost). In order to avoid any ordering effects, or expectation-formation regarding prices that are likely to arise in future rounds, we randomized the sequence of price draws across rounds and across subjects. Subjects in both treatments were shown the t-shirt that could be purchased: a picture of the t-shirt and the actual t-shirt on display in front of the lab, told it was made of 100% cotton, was available in any size they desired, and were then given the opportunity to use some of their endowment to purchase the t-shirt.

In total, we conducted 12 experiment sessions, each consisting of 20 to 24 subjects (6 PP sessions and 6 PD sessions; two sessions for one of the three distributions within PP or PD treatments). Table 2 lists all variations of treatments along with the number of subjects that participated in each variation of the treatment.

[table 2 in here]

Price-Posted (PP) Treatment. In the PP treatment, subjects were not given the opportunity to negotiate, but were shown the randomly drawn price that they either had to accept or reject. We varied the offered price among rounds within a session and price distributions among sessions in order to ensure that the responses were robust to the nature of the asymmetry of prices faced by each subject. That is, each subject was presented with a varying price, but drawn from the same distribution as others in her session, which used one of the three price supports. Because the experiment consisted of several purchase rounds, subjects were informed that at most they can purchase only one t-shirt throughout the entire experiment and thus only one purchase decision would be binding and that the binding purchase / no-purchase decision would be randomly chosen by the moderator. All subjects were told that they would receive their t-shirt (if they chose to purchase one), and the remainder of their incentive money in cash at the end of the experiment session. After making their purchase decision, each subject was asked to assess the fairness of the prices they faced on a five-point scale (1 = unfair; 2 = slightly unfair; 3 = neutral; 4 = generally fair; 5 = fair) and, if they felt the price was unfair, the reason why (other stores may sell the t-shirt for less,

others in the session may have paid less (this option was available only for non-confidential rounds), paying excessive profit to the seller, the buyer expected to receive a discount for some reason, or past experience suggested it should sell for less).

Price-Discovery (PD) Treatment. Subjects in the PD treatment were informed that they would be entering into a negotiation with the seller over the price of the t-shirt. Potential buyers were told that they were to open negotiations by submitting a bid that would either be accepted or rejected by the seller. The available price options mirrored one of the three price distributions described above and, just like in PP treatment, buyers were allowed to choose a "no purchase" option if they were simply not interested in purchasing the t-shirt at any price. All buyers were informed that the seller's decision would depend on whether their bid is greater than or equal to a counter-offer randomly drawn from one of the three price distributions (kept constant for any specific session). Similar to the PP treatment, the PD treatment also consisted of 5 confidential and 5 non-confidential rounds and one round out of 10 was randomly selected as the binding round, and the actual purchase decision determined by the choice made in this round. After subjects were informed whether the seller had accepted or rejected their bid, they were asked to evaluate the fairness of the price on the same scale as in the PP treatments. If the subject felt that the price was unfair, they were provided an opportunity to choose from the same reasons described in the PP treatment.

By asking whether any perceived unfairness derives from paying more than others, contributing to excessive profits for the vendor, paying more than the subject had previously paid for a similar t-shirt, or whether they expected to receive a discount for some other reason – in addition to advantageous and disadvantageous inequity revealed by our experimental treatments – we are able to control for the effect of interpersonal and intrapersonal price differences on the perception of fairness, and how this perception affects consumers' willingness to purchase.

4 Empirical Model of Inequity Aversion

In this section, we describe an empirical model of purchase behavior in which perceptions of inequity are allowed to affect purchase behavior, how behavior is influenced by perceptions of fairness, and how fairness perceptions are formed. We build on the conceptual model of fairness in Fehr and Schmidt (1999) to specify an empirical model in which the probability that subjects will be willing to purchase a consumer good is a function of not only the price level, but the difference in price between themselves and others. Intuitively, our model suggests that the greater the feelings of inequity in prices among subjects, the less likely a particular agent is to purchase. Based on the principle of inequity aversion, we test two hypotheses: (1) self-centered inequity aversion in which agents experience negative marginal utility whether others pay less than themselves, or they pay less than others, and (2) self-interested inequity aversion in which agents experience negative marginal utility only if others pay less than they do, but positive utility if they pay less than others. According to Fehr and Schmidt (1999), the degree of self-centered inequity is predicted to rise in the degree of disadvantageous inequity (the amount others pay less than the agent) at a greater rate than with respect to advantageous inequity (the amount the agent pays less than others). In our extension to their model, after controlling for price, the effects of disadvantageous and advantageous inequity are expected to differ in sign. Further, by embedding our model of fairness within a discrete-choice framework, we are able to test not only how interpersonal price differences contribute to the perception of fairness, but how fairness perceptions affect purchase intentions.

Formally, the indirect utility function that reflects this logic is given by:

$$U_h(p_h, p_{-h}) = V_h - \eta p_h - \gamma_h F_h T + \theta_1 \rho_h + \theta_2 PD + \varepsilon_h, \tag{1}$$

where V_h is the autonomous value subject h places on the product, η is the marginal effect of price, F_h is the individual's subjective measure of the unfairness, or inequity, associated with the offered price, p_h, T is a binary variable that assumes a value of 1 for non-confidential

rounds (where price distributions of prices paid by others are revealed) and 0 for confidential rounds (where subjects do not know what prices others in the same session are getting), γ_h is a household-specific measure of the "disutility of inequity", θ_1 is the marginal effect of risk aversion, ρ_h, and θ_2 is the Price Discovery (PD) treatment fixed effect. Following Fehr and Schmidt (1999), we disaggregate the inequity effect, into disadvantageous and advantageous components such that: $\gamma_h F_h = \alpha_h DI_h + \beta_h AI_h$, where $DI_h = \left(\frac{1}{n-1}\right) \sum_{h \neq -h} \max(p_h - p_{-h}, 0)$ is the measure of disadvantageous inequity, and $AI_h = \left(\frac{1}{n-1}\right) \sum_{h \neq -h} \max(p_{-h} - p, 0)$ measures advantageous inequity, p_h represents the price paid by the subject in question, p_{-h} is the price paid by other agents, α_h is a measure of the marginal disutility from disadvantageous inequity (others pay less than agent) and β_h is a measure of the marginal disutility from advantageous inequity (others pay more than agent h). We test hypotheses regarding the effect of each type of inequity on the willingness to purchase by adding a vector of observed demographic features to equation (1), and include a measure of unobserved heterogeneity among experiment subjects, ε_h.

With this model, the self-centered inequity hypothesis is given by: $H_0 : \alpha_h = \beta_h = 0$ against the alternative hypothesis: $H_A : \alpha_h > \beta_h > 0$, or that there is indeed a significant disutility of perceived inequity in the offered prices, and that the marginal disutility of perceived inequity is greater for disadvantageous inequity than for advantageous inequity. Therefore, the greater the difference in prices among agents, the less likely is a subject to purchase the product, ceteris paribus, and the pricing system is more likely to fail.

Self-interested inequity aversion, however, is framed in terms of the joint hypothesis: $H_0 : \alpha_h = \beta_h = 0$ against a different alternative hypothesis: $H_A : \alpha_h > 0; \beta_h < 0$. In this case, the agent is less likely to purchase if others pay less than herself, but more likely if she pays less than others. The greater the difference in disadvantageous prices among agents, the less likely is a subject to purchase the product, but the greater the advantageous difference, the more likely to purchase.

Assuming ε_h is Type I Extreme Value distributed, and allowing for both measures of the

marginal disutility of inequity to differ among agents, we specify a random coefficient logit model of purchase behavior where the probability of buying is given by:

$$\Pr(y=1) = \frac{\exp(V_h - \eta p_h - \gamma_h F_h T + \theta_1 \rho_h + \theta_2 PD + \sum_i \delta_i x_{hi})}{1 + \exp(V_h - \eta p_h - \gamma_h F_h T + \theta_1 \rho_h + \theta_2 PD + \sum_i \delta_i x_{hi})}, \tag{2}$$

where y is a discrete choice variable that equals 1 when the subject chooses to purchase the offered item, and 0 when he or she does not, x_{hi} is a vector of demographic variables describing agent h, and δ_i are parameters to be estimated. In our empirical model, both α_h and β_h vary by subject and, in the most general form of the model, with whether the observation is associated with a PD or PP regime, and the degree of risk aversion. We allow these parameters to be normally distributed according to: $\alpha_h = \alpha_0 + \alpha_1 PD + \alpha_2 \rho_h + \alpha_3 v_h$, and $\beta_h = \beta_0 + \beta_1 PD + \beta_2 \rho_h + \beta_3 u_h$, where $v_h, u_h \tilde{} N(0,1)$ and α_3, β_3 are scale parameters. In this way, our model reflects any remaining unobserved heterogeneity that is not described by variation in demographic elements.

Thus, in our most general model, the PD fixed effect and risk aversion parameter, ρ_h, enter the specification twice: (i) as a first order, direct effect (utility shifter) and (ii) as a second order, indirect effect (as a moderator of inequity perception). The first order effects (θ_1 and θ_2) capture systematic differences in bidding behavior that are associated with the Price Discovery treatment and different levels of risk aversion; whereas the second order effects reveal how these variables shape both advantageous and disadvantageous inequity. When subjects are allowed to participate in the price-formation process (in the PD treatment), we expect the disutility associated with inequity of both types to be reduced, simply because subjects feel a greater sense of responsibility for the price they pay. Similarly, we expect risk aversion to moderate the effect of inequity on purchase outcomes. Because all prices are revealed in the non-confidential rounds ($T = 1$) in both the PD and PP treatments, we essentially remove the risk associated with interpersonal variation in prices for subjects in treatment rounds. Therefore, more risk averse individuals should manifest either AI or DI in higher purchase probabilities.

In our model, perceptions of price fairness are driven by inequity (AI and DI), and can determine differences in purchasing behavior. Therefore, fairness perceptions are likely to be endogenous to the purchase decision, so we analyze the data using an endogenous-switching framework. In the first-stage, the perception of fairness is estimated in an ordered probit framework as a function of exogenous instruments such as demographic attributes and previously formed opinions about price-formation. Then, in the second stage, the fitted values of fairness are used to estimate the model in (2) to correct for the endogeneity of fairness evaluations. More formally, we estimate the first stage ordered-probit model of fairness-perception such that:

$$\Pr(F_h = m) = \left\{ \begin{array}{ll} \Phi\left((\tau_1 - \sum_j \phi_{1j} z_{hj} - \boldsymbol{\varepsilon})/\boldsymbol{\sigma}\right), & if\ m = 1, \\ \Phi\left((\tau_m - \sum_j \phi_{2j} z_{hj} - \boldsymbol{\varepsilon})/\boldsymbol{\sigma}\right) - \Phi\left((\tau_{m-1} - \sum_j \phi_{3j} z_{hj} - \boldsymbol{\varepsilon})/\boldsymbol{\sigma}\right), & if\ 1 < m < 5, \\ 1 - \Phi\left((\tau_5 - \sum_j \phi_{5j} z_{hj} - \boldsymbol{\varepsilon})/\boldsymbol{\sigma}\right), & if\ m = 5, \end{array} \right\} \tag{3}$$

where τ_i is now the threshold level of utility that separates each fairness-evaluation level, and Φ is a normal CDF with standard deviation σ. The elements of z_{hj} are group averages of demographic and socioeconomic values, and attitudinal variables collected from Section 3 of the survey instrument (see next section for the discussion about the validity of instruments). Finally, the ε vector is an *iid* normal error term. After estimating the model in (3), we then use fitted values for F_h as instruments for the fairness effect in the discrete-choice model of t-shirt demand described in the first stage.

In this way, we are able to estimate not only the impact of inequity on purchase intentions, but fairness perception as well. Specifically, in this model the effect of inequity on purchase behavior is driven by consumers' perceptions of interpersonal price-fairness. Linking unfairness and inequity in an econometric model of consumer-products demand provides information that is managerially-useful as any proposed discriminatory pricing system of-

fered as an alternative to the existing price-posted regime has to be perceived as fair in order to be successful. If consumers are unwilling to purchase if they believe they are being exploited, then the system as a whole will be unsustainable. We evaluate this possibility through our empirical results presented next.

5 Results and Discussion

In this section, we first provide a summary of our experimental data before evaluating several different specifications of the discrete choice purchase model, adding first exogenous and then endogenous perceptions of unfairness to our random-coefficient logit specification. In this way, we test our core hypotheses without excluding a simpler, more concise treatment of fairness and inequity.

5.1 Descriptive Statistics

We summarize the experimental data in tables 3 and 4 below. On average, the experimental subjects were generally neutral in their assessment of the fairness of the offered prices (mean = 2.863; neutral ranking = 3), but many found the price they were offered to be unfair (standard deviation = 1.291). In fact, approximately 43% of the time subjects responded that the price of the t-shirt was either unfair or slightly unfair. Of more importance, however, is how feelings of fairness and inequity affect purchase decisions. Among those who regarded the price as unfair or slightly unfair, only 4.9% choose to buy the t-shirt, while over 73% of those who regarded the price as fair or generally fair choose to buy. Clearly, fairness perceptions appear to be related to subjects' decision to purchase. Further, at the low end, among the purchasing opportunities for which the AI index is positive, meaning that the price they face is lower than at least some of the other subjects', the purchase probability is 18.3%, while it falls to 11.9% among those who are asked to pay a higher price relative to at least some others in the same experimental session. This difference in purchasing probability increases with the increase in the magnitudes of the AI and DI._While this summary data

are not conclusive, they do suggest that inequity may have an important effect on purchase decisions.

In table 4, we investigate this question further by considering how fairness, AI, DI, and purchase probabilities vary by pricing regime. That is, if fairness and inequity affect purchase decisions, then it is natural to ask whether these constructs are influenced by the way prices are formed. Given that higher values of the fairness-Likert index indicate more favorable perceptions of fairness, a system of price discovery generates an index value 0.109 points higher ($p = 0.0008$) than a price-posted system. While the difference in fairness perceptions is not "large" in an economic sense, the difference in purchase probabilities between the two regimes is. Subjects in the price-posted treatment purchased the t-shirt only 13.1% of the time, while subjects purchased t-shirts 20.1% of the time in the price discovery treatment ($p = 0.0000$). This difference is both statistically and economically significant. Table 4 also shows that the mean AI and DI values are not significantly different between the two treatments ($p = 0.7099$ and 0.2373, respectively). However, we only show these values to make their construction clear: Each is calculated relative to the distributions drawn for others in the same treatment, by definition, so are mathematical constructs only and do not involve differences in perception between the two treatments. If the subject has a positive AI(DI) value, it simply means that he or she faces a price that is lower(higher) than the prices faced by at least some of the others in her or his treatment. Furthermore, by construction, the magnitude of AI(DI) reflects the degree to which own price is better(worse) than price faced by others and the proportion of subjects who received worse (better) prices. We examine this question with the econometric results presented next.

5.2 Econometric Results

[tables 3 and 4 in here]

The first econometric specification (model 1 in table 5) examines only the AI and DI hypotheses, controlling for prices, first order PD treatment and risk aversion effects (but

no second order effects), and unobserved heterogeneity, but no heterogeneity in purchase intentions that derive from demographic (observed) differences among subjects. The second model (model 2 in table 5) includes observed heterogeneity. In both specifications, the price-effect is negative, as expected, and slightly larger in the specification that does not account for observed heterogeneity among respondents. As we will see in comparing these results to more complete specifications, this difference is consistent with the direction of omitted variables bias throughout. The first order effect of risk aversion is not statistically significant in these two specifications. However, based on our hypotheses, we still maintain that risk aversion might have a significant moderating indirect effect through inequity measures (we estimate the moderating effect in the subsequent specifications).

The significant and positive PD treatment effect in each specification indicates that purchase probability is higher under a regime of price discovery relative to one in which prices are posted by the supplier. Although this finding was expected, based on the summary results presented in table 4, the results in table 5 show that the treatment effect remains significant even after controlling for variation in prices and both forms of inequity. Even without controlling for differences in perceived fairness between the pricing regimes, consumers are evidently more likely to purchase consumer goods when they have a role in negotiating an acceptable price.

Models 1 and 2 in table 5 use simpler constructs for inequity measures that for now exclude second order PD treatment and risk aversion effects: $\alpha_h = \alpha_0 + \alpha_3 v_h$, and $\beta_h = \beta_0 + \beta_3 u_h$,, where $v_h, u_h \tilde{} N(0,1)$. We find support for the self-interested inequity aversion hypothesis, relative to the self-centered inequity hypothesis of Fehr and Schmidt (1999). Recall that the latter implies an alternative hypothesis of: $H_A : \alpha_h > \beta_h > 0$, while the former implies $H_A : \alpha_h > 0, \beta_h < 0$, or, in words, that utility is reduced under any form of perceived price inequity under self-centered inequity aversion, while advantageous inequity (β_h) can actually raise expected utility under self-interested inequity aversion. In each case, the mean DI effect (α_h) is significantly greater than zero, while the mean AI effect (β_h) is

significantly lower than zero in both specifications. Therefore, we reject self-centered inequity aversion as an explanation for differences in purchase behavior in an environment of revealed interpersonal price differences in favor of our hypothesis of self-interested inequity aversion. Comparing model 1 to model 2 in terms of fit provides partially conflicting results. While a likelihood ratio test (LR) suggests that the simpler model (model 1) provides a better fit to the data ($LR = 49.014$ compared to a critical Chi-square value of 12.591 with 6 degrees of freedom), the AIC value indicates that model 2 provides a better fit. Because model 2 minimizes AIC (between these 2 models), and demographic variables are of some inherent interest, we choose model 2 from among these simple specifications. Among other results in this table, we find that unobserved heterogeneity, or variation in both the DI and AI effects, is significant in both specifications, so we retain a random-coefficients approach in each of the remaining models.

[table 5 in here]

We next relax the implicit assumption in the models of table 5 that inequity alone determines differences in purchase behavior. Rather, the model in table 6 (model 3) examines the interaction between perceptions of price fairness, and each form of inequity. In this sense, model 3 provides a more direct test of our self-interested inequity aversion hypothesis in that equation (1) describes inequity aversion as the mechanism underlying the price-fairness effect that is commonly found in the literature, and not simply an empirical construct. We compare model 3 to model 2 using the same set of specification tests, and then test the inequity and treatment hypotheses from the preferred model. A LR test comparing models 2 and 3 provides a Chi-square statistic of 49.100, so we reject model 2 in favor of the fairness-inequity specification in model 3. This conclusion is also supported by the AIC criteria as 0.822 (model 3) is less than 0.833 (model 2). Based on the estimated mean values of α_h and β_h from model 3, we again reject the null hypothesis implied by the self-centered inequity hypothesis, but fail to reject the self-interested inequity hypothesis. That is, utility again rises in the level of advantageous perceived price inequity, but in this model inequity is

the manifestation of perceived price fairness. In other words, prices are only regarded as unfair, and affect purchase behavior as a consequence, when they lead to perceptions of interpersonal inequity. Controlling for perceptions of inequity, the PD treatment effect is again strongly positive. For a given level of inequity, subjects were much more likely to purchase under a price discovery regime than under a price posted regime. Because it is logically impossible to design a pricing system in which all consumers who face different prices are left in an advantageous position relative to other buyers, this finding suggests that giving them a stake in setting prices may be a viable solution. However, these estimates do not account for the fact that perceptions of price fairness are likely to be endogenous to the purchase decision. That is, perceptions of price fairness are likely highly correlated with the unexplained component of any purchase model, so the parameter estimates in our fairness model may be biased.

[table 6 in here]

To correct for the possibility of endogeneity bias, and to identify the fairness-inequity effect in the purchase model, we next estimate a two-stage instrumental variables (IV) regression in which we first create an instrument for price fairness that is likely to be orthogonal to the purchase-residuals, and then re-estimate the logit purchase model. Because the price fairness variable is ordinal, the first-stage IV regression we use for this purpose is the ordered probit model in (3). In order to be valid instruments, the variables in this model must be correlated with fairness perceptions, but mean independent of the errors in the purchase equation. In an experimental setting, demographic variables are exogenous to the perception of fairness, but are included in the demand model directly so cannot represent independent instruments. Therefore, we use group-averages for a set of demographic variables as instruments for fairness perceptions. Group averages are valid instruments as they are pre-determined to the choice process and, as such, are exogenous. More importantly, group averages are not arguments of the purchase model itself, so represent independent factors explaining a subject's perception of fairness (Durlauf 2002). Second, individual responses that

reflect attitudes brought to the experiment, reflecting previously-formed opinions on how prices are formed are also valid instruments: Whether fairness derives from interpersonal comparisons, comparisons across stores, over purchase experiences, or discount expectations are all good instruments. Third, variables that are modified by the experimenter and not the subject are also valid instruments. In our case, the price and price discovery treatments are determined by the experimenter so are exogenous to the decision maker. These three sets of instruments help identify the fairness effect in a model that corrects for the endogeneity of fairness evaluations.

The estimates shown in table 7 reveal that these first-stage variables, individually and collectively, are strongly associated with subjects' evaluation of price fairness. First, the Chi-square value $(4, 124.8)$ compares the estimated model to a null model that consists of constant terms only. In this regard, we easily reject the null model in favor of the estimated specification. Second, the McFadden pseudo-R^2 value (McFadden 1974) (0.4684) implies that the instruments, when taken together, are not weak in the sense of Staiger and Stock (1997).[8] Third, and perhaps more importantly, many of the parameter estimates are individually significant.[9] The marginal effects imply that, for example, a \$1.00 change in price is associated with a 0.38% lower probability the price is regarded as either generally fair or fair (sum of marginal effects of $F = 4$ and $F = 5$), all else constant. Wealthier, more highly educated, married subjects were more likely to regard the price as fair or generally fair, while those in the price discovery treatment were 0.28% more likely to consider the price fair, although this latter effect is only significant at a 10.6% level. Perhaps not surprisingly, the strongest explanatory variables, according to their relative marginal effects, are the rationales for unfairness. Subjects who thought someone else paid a lower price were 73%

[8] The McFadden pseudo-R^2 is calculated as $R^2 = 1 - LLF^e/LLF^o$, where LLF^e is the log-likelihood function value from the estimated model, and LLF^o is the log-likelihood of a model in which all but the constant term are restricted to 0. Therefore, exploiting the well-understood relationship between R^2 and the F-statistic, our estimates imply a first-stage F-statistic of 175.316, which is greater than the value of 10.0 suggested by Staiger and Stock (1997).

[9] The marginal effects for the significant parameter estimates are significant as well. Standard errors are available from the authors, but not shown in table 6 due to space limitations.

more likely to regard the price as unfair or generally unfair, while subjects who expected a discount were nearly 6% less likely to consider the price to be fair. Previous experience in buying the good was also strongly related to the assessment of fairness, but the perception that higher prices contributed to excess profit was less so. Taken together, however, these variables explain much of the variation in fairness perceptions among subjects. Because each of these instruments is independent of the error in the purchase-decision model, and are correlated with fairness perceptions, they are likely to be high-quality instruments.

[table 7 in here]

We then re-estimate the fairness-inequity purchase model with fitted values of the fairness assessment variable as an instrument for endogenous fairness perceptions. The results from the endogeneity-corrected model are reported in table 8. In this table, we present estimates from 3 models (models 4, 5, and 6), the first of which defines fairness as a function of the AI and DI variables calculated without second order PD treatment and risk aversion effects, like the above, while the other two models add the second order effects: The second (model 5) recognizes that PD treatment effects are likely present in the fairness-inequity variable, and the third (model 6) accounts for the likely effect of risk aversion on how AI and DI affect purchase probabilities. That is, if fairness-inequity is indeed an important determinant of purchase behavior, then we test the hypothesis that a price discovery regime may be able to ameliorate some of the feelings of unfairness, and raise purchase probabilities as a result. We also test whether more risk averse individuals are more likely to purchase under either regime, as hypothesized.

As a first step in comparing the specifications to this point, we compare model 3 to model 4 using a Hausman (1978) test in order to determine whether our IV estimator has indeed addressed our endogeneity concerns. In this application, model 3 is efficient under the null hypothesis of exogeneity, while model 4 is consistent under the alternative. The calculated Chi-square statistic is 109.214 (p-value = 0.000), so we reject the null of exogeneity, and conclude that specification 4 is preferred due to the relative absence of endogeneity bias. We

next compare the goodness of fit of models 4 and 5 in order to examine whether including the "deeper parameters" that may help improve fairness perceptions provides a better fit to the data. For this purpose, we use a LR test and find a Chi-square value of 175.216 (critical χ^2 = 5.991) so we reject model 4 in favor of model 5 and conclude that differentiating the price fairness effect between price posted and price discovery treatments significantly improves the explanatory ability of the model. Next, we compare models 5 and 6 using the same approach. At the same critical Chi-square value, the calculated statistic is 12.854, so we reject model 5 in favor of model 6. Consequently, we interpret the estimates from model 6, the most comprehensive model of fairness-equity and purchase behavior.

[table 8 in here]

In general, the findings from model 6 confirm the estimates from the previous models. That is, perceptions of price-fairness, when the subject is advantaged relative to others buying the same item, significantly increase purchase probability, and the opposite is true for subjects who are disadvantaged by perceptions of price-unfairness. However, in this model we find that the advantageous-inequity (AI) effect falls to roughly one-third of its previous amount (-0.026 versus -0.061) for those in the PD treatment. In other words, when subjects are allowed to participate in the price formation process, the fact that they may have obtained a better price than others does relatively little to improve the likelihood of purchase. The net DI effect for those in the PD treatment is also intuitive. Although the mean DI effect remains positive, as in previous models, when we include the PD treatment effect, the net DI effect is now negative (-0.734 versus 0.920 in model 4). This finding implies that subjects in the PD treatment who felt that the pricing relative to others was unfair were more likely to purchase relative to those in the PP treatment. Despite the fact that these subjects are disadvantaged relative to others in their experiment-session, the ability to negotiate the price of the t-shirt dramatically improved the likelihood they would purchase. Clearly, any system of discriminatory pricing in which prices are transparent and can be expected to differ among buyers will be more successful if buyers are able to

negotiate prices, rather than face prices on a take-it-or-leave-it basis. Finally, the estimates in table 8 show that risk aversion has no significant effect on purchase probabilities when inequity is advantageous, but risk averse subjects are significantly more likely to purchase when experiencing DI than risk-loving subjects. Again, recall that the fairness effect is only "switched on" for subjects in the non-confidential rounds, or rounds in which prices were revealed through either a PP or PD pricing mechanism. For these subjects, the mere fact that prices are transparent reduces the uncertainty that they face and risk of making a mistake and purchasing when others pay a lower price. Risk averse people find low uncertainty desirable and react positively to it, while risk seeking people do not (Desai et al. 2011). Therefore, in a price-transparent environment, more risk averse subjects are more likely to purchase, even when inequity is disadvantageous._

5.3 Simulation and Counterfactual Results

Our quantitative estimates of the relationship between AI, DI and purchase behavior permit a more careful study of market equilibrium, stability and welfare. That is, if a pricing regime causes the mean purchase probability to fall below a lower threshold level on a regular basis, then the equilibrium is determined to be unstable.[10] By simulating model 6 for a risk-neutral subject, we can parameterize the range of prices that will force the purchase probability below an arbitrary threshold under either a PP or PD regime. In the first simulation, we examine the effect of increasing the level of DI, or the range of prices below that faced by a typical subject, on purchase behavior in a PP regime, and in the second we examine the same effect on purchases in a PD regime. Table 9 presents the results of this numerical stability simulation. In the first row, we report the "base case" simulation conducted at the sample mean of both DI and AI, for both the PP and PD experiments. In this case, roughly 20% of sample subjects indicate intent to purchase under PD and 13% under PP. Next, we increase the extent to which subjects experience disadvantaged inequity by 10% (row 2), 20% (row

[10]Note that this threshold is not likely to be zero as some positive sales will be required to cover the fixed costs of shelving the item.

3), and 30% (row 4). By increasing the range of prices among subjects under a PP regime, we find that the purchase probability falls below 10% in row 2 to below 5% in row 4. In general, a 5% penetration rate would be regarded as a failure for most consumer products, so we interpret this outcome as a failure of the pricing system to generate a sustainable equilibrium. Next, we examine the same change in DI on purchase probabilities under a PD regime. From the initial 20%, we see that intent to purchase falls by only 2% to 18% with 10% greater DI, and to 16% with 30% greater DI. At least in this parameterization, PD is able to maintain a stable equilibrium even when the level of interpersonal price difference rises by 30%. Although this simulation is specific to our data, it is indicative of how our approach can be used to analyze the stability implications of a pricing regime.

[table 9 in here]

Even if stable from a consumer perspective, a pricing regime may not be efficient in welfare sense, and therefore collapse in equilibrium. We investigate this question by conducting a set of counterfactual simulations using the parameters from table 6. In table 10, simulation 1 refers to a baseline case in which there is no discriminatory pricing and the seller behaves as a uniform-price monopolist; simulation 2 introduces discriminatory pricing, but without inequity aversion or the ability to negotiate prices (PP); simulation 3 adds inequity aversion to experiment 2; simulation 4 includes both the ability to negotiate and inequity aversion (PD); while consumers in simulation 5 retain the ability to negotiate, but have no inequity aversion. Our findings with respect to both consumer and total surplus are instructive, and interesting. Namely, we find that introducing discriminatory pricing causes surplus to rise as some consumers purchase where they wouldn't have under a uniform pricing regime. However, introducing inequity aversion to a PP world reduces surplus dramatically, while allowing consumers to negotiate restores much of the surplus lost when they realize others may be getting better prices. Of course, consumers are best off when they do not care what others pay, and are allowed to negotiate. Producers, on the other hand, earn considerably less under inequity aversion, primarily because the share of consumers purchasing falls.

Giving consumers the ability to negotiate, however, increases producer surplus as more consumers are willing to purchase, at higher price points. Ultimately, the most efficient system in our data, conditional on our finding that consumers are indeed inequity averse, is one in which consumers are allowed to negotiate personalized prices. Consumers are able to obtain the items they want, and pay a price they consider reasonable. Therefore, this structural simulation provides corroborating evidence for what table 9 suggests, namely that a discriminatory pricing regime without participation by consumers will likely fail in an equilibrium sense.

[table 10 in here]

The implications of our findings for online, or offline, discriminatory pricing for consumer products are clear. First, if retailers avoid discriminatory pricing out of fear of alienating consumers after the Amazon lesson, their concerns may be misplaced as the problem lies not with discriminatory pricing *per se*, but how it is implemented. In a price-transparent environment, consumers appreciate the opportunity to try to negotiate a better deal, not necessarily because they expect to be successful in doing so, but because they are able to have some skin in the game. In this sense, our findings are similar to the notion of "transaction utility" in which the consumer derives positive utility from finding a better deal (Thaler 1985) – not necessarily defined relative to some internal reference price, but compared to others who have purchased the same item. Second, if perceptions of unfairness truly derive from primitives of advantageous and disadvantageous inequity, then the negative consequences of adopting a pricing regime in which prices will differ among consumers, by definition, can be addressed by dealing with inequity directly. Free gifts, coupons, frequent-shopper bonuses, and other offers outside of the transaction have all been suggested as ways of dealing with the sense of being treated differently, in a negative way, from others (Weisstein, Monroe, and Kukar-Kinney 2013). Third, retailers should be conscious of the fact that perceptions of price fairness are multi-dimensional constructs. That is, consumers do not form impressions of how fair a price is only by comparing to the prices paid by other consumers. Other

stores, past experiences, expectations, or some notion of firm profitability also contribute to how prices are perceived. To the extent that perceived price fairness is critical in driving purchase decisions, each of these potential factors should be considered in a more general pricing policy.

6 Concluding Remarks and Implications

In this study we investigate the role of interpersonal price-comparisons and the perception of price fairness on the viability of discriminatory pricing platforms for consumer goods. We frame our analysis in terms of a conceptual model of inequity aversion, and examine how different pricing regimes – either a take-it-or-leave-it pricing model or a participatory price-discovery model – affect the perception of price fairness, and purchase probability. We test our theory of price fairness and inequity using an experiment in which subjects face a number of incentive-compatible purchase situations in an environment of uncertain, but transparent, retail prices. By comparing perceptions of price fairness, pricing inequity, and purchase behavior between experimental price-platform treatments, we are able to examine the importance of fairness in the purchase decision, and how perceptions can be overcome by allowing consumers to participate in the price-setting process.

We find that consumers are indeed less likely to purchase if they regard the price of a typical consumer good as unfair. Moreover, we show that perceptions of price fairness, and the subsequent effect on purchase behavior, are well-explained by a model of self-interested inequity aversion. That is, consumers are more willing to purchase if the perceived inequity in pricing is in their favor, and less likely to purchase if it is not. However, if consumers are allowed to participate in the price formation process by negotiating the purchase price with the seller, then they are much more likely to purchase.

Based on these experimental results, we then simulate potential market outcomes under a range of disadvantageous prices in order to determine whether discriminatory pricing would be viable under either a price-posed or price-discovery regime. By increasing the level of

disadvantageous inequity by up to 30%, we find that discriminatory pricing under price transparency would likely fail in a price-posted regime, but would perform quite well in a negotiated-pricing system. In our empirical model, we take into account many other popular explanations for consumers' perception of price fairness (prior experience, other sellers, expectations of discounts, or an unwillingness to pay excess profits to the seller), so our findings provide strong evidence that a system of discriminatory pricing – common in industries such as hotels and airlines – can be viable for consumer goods, despite highly prominent failures in the past. Giving buyers a stake in the outcome of the transaction is the key to making discriminatory pricing work when consumers are fully aware of the prices that others pay.

Our findings have potentially important implications for the future of consumer-product retailing. Hi-Lo pricing, in which bricks-and-mortar retailers offer relatively high everyday prices, and then discount frequently in order to steal customers from other stores, is the manifestation of discriminatory pricing in the offline world. Many commentators believe that this model is not sustainable (Engage3). Manufacturers do not like Hi-Lo pricing, because retailers use manufacturer promotional allowances to fund period discounts – discounts that often simply cause consumers to push inevitable purchases forward in time, or cherry-pick low prices without developing any intention of re-purchasing the product on sale. Retailers similarly face substantial administrative costs in offering frequent price promotions, and risk alienating their customers if prices are regarded as simply too volatile. As retailers and manufacturers alike search for a new pricing model, a system of participatory pricing, or discriminatory pricing, in which each consumer enters into a negotiation with the retailer, and ultimately pays near to his or her willingness to pay, holds much practical promise. Supported by many large retailers and manufacturers, perceptions of price unfairness on the part of consumers is likely to be the most important practical barrier to its implementation. We find that discriminatory pricing can indeed work for a range of retail products, provided the gap in price between those who are able to find and exploit lower prices and those who

do not, does not become "too large," and if consumers are able to negotiate prices.

Future research in this area would be well-advised to explore how the nature of the product or service affects the relationship between price-fairness, price-discovery, and purchase probability. The consumer products industry is, by definition, extremely diverse, so there may be some class of products, perhaps perishables or prepared foods, for which negotiation would be impractical. We also implicitly assume a monopoly retailer. If other sellers are able to enter into negotiations with the buyer, it would be of interest to determine how this affects fairness perceptions, and equilibrium prices between the retailers. Moreover, there are a number of environmental variables that we held constant in our experiment in order to focus on the nature of the pricing regime. However, others have shown that offering value in other ways – free gifts, coupons, frequent-shopper points, and the like – are effective in improving perceptions of fairness. It remains to determine whether these tools would be sufficient to restore the viability of a system of posted discriminatory pricing for consumer goods.

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Table 1. Risk Preference Choice Lotteries

Choice A				Choice B				Implied ρ
10%	\$10.00	90%	\$8.00	10%	\$19.00	90%	\$1.00	-0.19
20%	\$10.00	80%	\$8.00	20%	\$19.00	80%	\$1.00	-0.11
30%	\$10.00	70%	\$8.00	30%	\$19.00	70%	\$1.00	-0.06
40%	\$10.00	60%	\$8.00	40%	\$19.00	60%	\$1.00	-0.02
50%	\$10.00	50%	\$8.00	50%	\$19.00	50%	\$1.00	0.03
60%	\$10.00	40%	\$8.00	60%	\$19.00	40%	\$1.00	0.07
70%	\$10.00	30%	\$8.00	70%	\$19.00	30%	\$1.00	0.11
80%	\$10.00	20%	\$8.00	80%	\$19.00	20%	\$1.00	0.17
90%	\$10.00	10%	\$8.00	90%	\$19.00	10%	\$1.00	0.25
100%	\$10.00	0%	\$8.00	100%	\$19.00	0%	\$1.00	0.70

Note: Indifference value of ρ calculated with $U(y) = -\exp(-\rho y)$.

Table 2. N by Treatment and Price Distribution

Treatment	Price Distribution	N
Price Discovery (PD)	P=[\$10; \$15; \$20; \$25; \$30]	47
	P=[\$12.50; \$16.25; \$20; \$23.75; \$27.50]	47
	P=[\$15; \$17.50; \$20; \$22.50; \$25]	47
Posted Price (PP)	P=[\$10; \$15; \$20; \$25; \$30]	44
	P=[\$12.50; \$16.25; \$20; \$23.75; \$27.50]	47
	P=[\$15; \$17.50; \$20; \$22.50; \$25]	46

Table 3. Summary of Experimental Data

	Units	Mean	Std. Dev.	Min	Max	Obs.
Individual Characteristics:						
Age	Years	20.496	1.724	18.0	35.0	2780
Male	%	0.399	0.490	0.0	1.0	2780
Household Size	#	1.871	1.473	1.0	7.0	2780
Income	$,000	48.460	73.944	0.0	250.0	2780
Education	Years	13.550	1.423	10.0	20.0	2780
Marital Status	% Single	0.982	0.133	0.0	1.0	2780
Risk Aversion	Index	0.105	0.162	-0.27	0.86	2780
Fairness Evaluations:						
Average Fairness Eval.	5 = Fair	2.863	1.291	1.0	5.0	2780
Unfair	Response = 1	0.172	0.377	0.0	1.0	477
Slightly Unfair	Response = 2	0.262	0.440	0.0	1.0	729
Neutral	Response = 3	0.231	0.422	0.0	1.0	643
Generally Fair	Response = 4	0.201	0.401	0.0	1.0	559
Fair	Response = 5	0.134	0.341	0.0	1.0	372
Inequity:						
Advantageous Inequity	Index	2.344	2.480	0.0	10.5	1390
Disadvantageous Inequity	Index	2.352	2.352	0.0	10.5	1390
Purchase Probability:						
Avg. Purchase Probability	%	0.166	0.372	0.0	1.0	2780
If Unfair	%	0.049	0.162	0.0	1.0	2780
If Fair	%	0.732	0.467	0.0	1.0	2780
In Advantageous Inequity	%	0.183	0.386	0.0	1.0	1390
In Disadvantageous Inequity	%	0.119	0.325	0.0	1.0	1390

Table 4. Experiment Summary by Regime

	Posted		Discovery	
	Mean	Std. Dev.	Mean	Std. Dev.
Fairness	2.808	1.288	2.917	1.292
Pr(Buy)	0.131	0.337	0.201	0.401
AI	2.363	2.497	2.326	2.467
DI	2.332	2.442	2.380	2.507

Table 5. Logit Purchase Model by AI and DI

	Model 1		Model 2	
	Estimate	t-ratio	Estimate	t-ratio
Non-Random Parameters:				
Price	-0.0731*	-26.6788	-0.0689*	-7.1442
Age	N.A.	N.A.	-0.0428*	-3.6550
Gender	N.A.	N.A.	-0.3148*	-6.7277
HH Size	N.A.	N.A.	-0.0447*	-2.2084
Income	N.A.	N.A.	0.0032*	9.3529
Education	N.A.	N.A.	0.1021*	5.9212
Marital Status	N.A.	N.A.	-0.5632*	-2.9952
Risk Aversion	0.1053	0.6771	0.1285	0.7633
Price Discovery	1.9932*	33.4156	2.0282*	33.4469
Random Parameters:				
AI	-0.1328*	-4.6147	-0.2228*	-6.5662
DI	1.5702*	9.5469	2.2599*	9.7064
Standard Deviations of Random Parameters:				
σ(AI)	1.0788*	12.4216	1.0598*	11.8624
σ(DI)	5.0001*	10.8266	8.5215*	10.5151
Chi-square	464.9043		440.3972	
AIC	0.8450		0.8331	

Note: A single asterisk indicates significance at a 5% level.

Table 6. Purchase Model with Fairness Effect

	Model 3	
	Estimate	t-ratio
Non-Random Parameters:		
Price	-0.0682*	-7.2038
Age	-0.0464*	-3.9099
Gender	-0.3018*	-6.3171
HH Size	-0.0318	-1.5377
Income	0.0031*	8.4722
Education	0.1024*	5.8452
Marital Status	-0.5927*	-3.1555
Risk Aversion	0.0192	0.1119
Price Discovery	2.1068*	33.7412
Random Parameters:		
Fairness*AI	-0.0687*	-7.4281
Fairness*DI	0.5977*	9.4858
St. Deviations of Random Parameters:		
σ(AI)	0.2689*	11.4267
σ(DI)	3.4587*	11.3407
Chi-square	464.9471	
AIC	0.8220	

Note: A single asterisk indicates significance at a 5% level.

Table 7. Fairness Ordered Logit Model

			Marginal Effects				
	Estimate	t-ratio	F = 1	F = 2	F = 3	F = 4	F = 5
Constant	30.0123*	6.9881					
Price	-0.2480*	-20.0178	0.0003	0.0614	-0.0580	-0.0032	-0.0006
Age	-0.5925*	-3.7545	0.0008	0.1468	-0.1384	-0.0076	-0.0015
Gender	1.8975*	2.6519	-0.0025	-0.4700	0.4434	0.0243	0.0048
HH Size	-0.1702	-1.2562	0.0002	0.0422	-0.0398	-0.0022	-0.0004
Income	-0.0056	-1.2293	0.0007	0.0014	-0.0013	-0.0007	-0.0002
Education	-0.0975	-0.7616	0.0001	0.0242	-0.0228	-0.0013	-0.0003
Marital Status	-1.0980	-0.5234	0.0014	0.2720	-0.2566	-0.0141	-0.0028
Price Discovery	0.1755	1.5724	-0.0002	-0.0435	0.0410	0.0023	0.0005
Risk Aversion	0.1607	1.5688	-0.0002	-0.0398	0.0375	0.0021	0.0004
Someone Paid Less	-9.2647*	-54.5048	0.8494	-0.1138	-0.6981	-0.0313	-0.0063
Excessive Profit	-9.5676*	-48.0038	0.9160	-0.2566	-0.6331	-0.0220	-0.0044
Discount Expectations	-10.2501*	-71.6991	0.9031	-0.0846	-0.7591	-0.0493	-0.0101
Experience	-9.3227*	-63.0766	0.8014	0.0035	-0.7502	-0.0454	-0.0093
Threshold Parameters							
μ_1	6.5066*	32.5753					
μ_2	10.7756*	159.0494					
μ_3	12.5987*	179.2389					
Chi-square	4124.8310						
AIC	1.6960						
Pseudo-R^2	0.4684						
F	187.5416						

Note: Marginal effects are defined as the change in the probability of F assuming an ordered value for a unit change in an explanatory variable. A single asterisk indicates significance at a 5% level.

Table 8. Endogenous Fairness and Participatory Pricing

	Model 4		Model 5		Model 6	
	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
Non-Random Parameters:						
Price	-0.0585*	-7.0688	-0.0584*	-7.0666	-0.0586*	-7.0614
Age	-0.0498*	-4.4611	-0.0484*	-4.3202	-0.0473*	-4.1934
Gender	-0.2959*	-6.7258	-0.2901*	-6.5667	-0.3025*	-6.7969
HH Size	-0.0294	-1.5385	-0.0274	-1.4181	-0.0280	-1.4426
Income	0.0028*	7.9429	0.0029*	8.4000	0.0029*	8.2000
Education	0.1019*	6.1953	0.0986*	5.9066	0.0983*	5.8605
Marital Status	-0.7638*	-4.5260	-0.7462*	-4.4193	-0.7501*	-4.4187
Risk Aversion	-0.0161	-0.0833	-0.0384	-0.1997	-0.0384	-0.1960
Price Discovery	2.2395*	36.7672	2.2233*	35.3519	2.2209*	35.4102
Random Parameters:						
Fairness*AI	-0.0766*	-6.4270	-0.1938*	-8.6380	-0.2053*	-8.2574
Fairness*DI	1.1407*	8.8396	5.5136*	8.7217	6.2822*	8.3734
Standard Deviations of Random Parameters:						
s(AI)	0.3445*	10.6891	0.4743*	8.9041	0.5360*	8.6070
s(DI)	6.3747*	10.3599	6.3083*	9.3602	7.2275*	8.9170
Random Parameter Functions:						
F(AI(PD))			0.1744*	6.6192	0.1796*	6.4174
F(DI(PD))			-6.0950*	-8.5089	-7.0163*	-8.1538
F(AI(ρ))					0.1628	1.1229
F(DI(ρ))					-2.6661*	-5.0219
Chi-square	429.2430		516.8514		523.2788	
AIC	0.8350		0.8052		0.8041	

Note: A single asterisk indicates significance at a 5% level.

Table 9. Stability Experiment Results

Experiment 1			Experiment 2		
Scenario	% Purchasing	Std. Dev.	Scenario	% Purchasing	Std. Dev.
Price Posted	0.1311	0.0374	Price Discovery	0.2012	0.1191
DI +10%	0.0916**	0.0280	DI +10%	0.1831**	0.1255
DI +20%	0.0630**	0.0203	DI +20%	0.1706**	0.1302
DI +30%	0.0429**	0.0143	DI +30%	0.1621*	0.1336

Note: DI = disadvantageous inequity. A single asterisk indicates statistically different from the previous row at a 10% level, and a double asterisk is significant at 5%.

Table 10. Welfare Implications of Price Discovery

	Simulation				
	1	2	3	4	5
Consumer Surplus	5.4324	5.5387	4.7030	5.3947	5.7027
Std. Dev.	(0.0556)	(0.0469)	(0.6691)	(0.6992)	(0.1696)
Producer Surplus	8.2879	8.0472	5.3664	11.7674	12.6284
Std. Dev.	(2.1174)	(1.5543)	(1.3092)	(6.4060)	(4.8010)
Total	13.7204	13.5859	10.0694	17.1621	18.3312

Note: Simulation 1 is "no price discrimination," simulation 2 is "price discrimination, no inequity aversion, no negotiation," simulation 3 is "price discrimination, inequity aversion, no negotiation," simulation 4 is "price discrimination, inequity aversion, negotiation," and simulation 5 is "price discrimination, no inequity aversion, negotiation."

Appendix A: Experiment Script

In each session, subjects were shown, and read, the following instruction script (note that any identifying information has been removed to ensure the review remains double-blind).

Introduction

Thank you for choosing to participate in our study, which will take under an hour of your time. Please do not use the computer in front of you until we ask, and please do not use your cell phones during the experiment. Once the experiment starts, please refrain from talking to your neighbors.

Your participation in this study is voluntary, and you can stop the study at any time. If you complete the study, you will receive $35 or equivalent in compensation, on average, based on the choices you make throughout this study. We are examining consumer demand for XXX University branded items. During this experiment, you will go through a series of price negotiations for these items. If at any point anything is unclear, please let us know. Since we are paying you a significant amount of money, we expect that you will take the decisions that you make throughout this experiment seriously. The results of the study may be published in an academic journal but your name will not be revealed in any way. All responses are completely confidential.

If you have any questions concerning the research study, please contact the research team at: XXX (XXX@XXX). If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at XXX or access their website at XXX. You may also report your concerns or complaints anonymously through Ethicspoint or by calling toll free at XXX. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.

Risk attitudes

On the next screen, you will have 10 chances to select between two bets (lotteries). At the end of the experiment, one row will be chosen at random, and the lottery will be played

by the computer. You will earn the dollar amount implied by your choice in addition to the base participation compensation of $30. [See table 1 for the lottery choices that were displayed on the screen, without the implied risk coefficient].

Practice Round (PD treatment)

In the practice round, you will be given four opportunities to buy this monopoly game. You will enter a negotiation with the seller over the price at which you may purchase the Monopoly game. The seller will then either accept or reject your offer depending on a randomly drawn seller's price. If your offer is greater than or equal to this seller's price, you will purchase the monopoly game at your offered price. If your offered price is below the randomly drawn seller's price, then the seller will reject your offer and you will not purchase the monopoly game. This is just a practice round – you will not purchase the game during the experiment. After four negotiations, one negotiation will be randomly selected to be binding. Suppose the second negotiation of the Practice round is randomly picked to be binding. Then, the price you named in the second negotiation, and the seller's decision to accept or decline your offer affected the outcome. That outcome is now displayed on your screens.

Practice Round (PP treatment)

In the practice round, you will be given several of opportunities (drawn randomly) to buy a monopoly game. Since prices will be drawn randomly, it is likely that you will receive the same price more than once. For each of those opportunities you will be asked whether you would like to purchase the game or not. This is just a practice round – you will not purchase the game during the experiment. After four purchase opportunities, one will be randomly selected to be binding. Suppose the second randomly drawn price (opportunity to purchase the game) of the pactice round is randomly picked to be binding. Then, your decision to purchase or not to purchase the monopoly game at the second randomly drawn in price affected the outcome. That outcome is now displayed on your screens.

T-shirt Introduction (PD/PP treatment)

The item for negotiation/purchase is this long sleeve 100% cotton T-shirt. It is printed with XXX in arch letters in on the front, and is displayed in front of the room. Sizes S-XXL are available. Based on your experience as a t-shirt buyer, what do you think the retail price for this T-shirt is? Please enter the $ amount in the box below.

Experiment Structure, Round I (PD treatment)

There will be two rounds of five opportunities (randomly drawn) to buy the T-shirt. Each time, you will enter a negotiation with the seller over the price at which you may purchase the T-shirt. Just like in the practice round for the Monopoly game, the seller will either accept or reject your offer depending on a randomly drawn seller's price. If your offer is greater than or equal to this seller's price, you will purchase the T-shirt at your offered price. If your offered price is below the randomly drawn seller's price, then the seller will reject your offer and you will not purchase the T-shirt. Only one of these decisions that you make throughout the ENTIRE EXPERIMENT will be binding, and the choice of that decision will be made randomly. At most, you can purchase the T-shirt once in the entire experiment, no matter how many times you indicated that you agreed to purchase. Since prices will be drawn randomly, it is likely that you will receive the same draw more than once. For each of those negotiations you will be asked to evaluate pricing fairness.

Experiment Structure, Round I (PP treatment)

There will be two rounds of five opportunities (drawn randomly) to buy the T-shirt (in your size). Since prices will be drawn randomly, it is likely that you will receive the same price more than once. For each of those opportunities you will be asked whether you would like to purchase the T-shirt or not. Only one of these decisions that you make throughout the ENTIRE EXPERIMENT will be binding, and the choice of that decision will be made randomly. At most, you can purchase the T-shirt once in the entire experiment, no matter how many times you indicated that you agreed to purchase. Since prices will be drawn randomly, it is likely that you will receive the same draw more than once. For each of those opportunities you will be asked to evaluate pricing fairness.

Round II (PD/PP treatment)

In the next round you will see information about the prices accepted by sellers and the prices that are offered to other participants for the same T-shirt during the same time in this experiment. REMINDER: At most, you can purchase the t-shirt once in the entire experiment, no matter how many times you indicated that you agreed to purchase.

Survey and Receipts

Please follow the instructions on your screen and answer all the questions in the survey. Note that you can only move forward in the survey. Wave us over if any of the survey questions are not clear. Once you successfully submit the survey, you will be directed to a page that determines your payout. You should now see whether you purchased the T-shirt or not, along with your total monetary compensation. Please fill out the receipt accordingly. The compensation is dispensed in front of the room

Price Distributions

Figures 1 to 3 show the price-distributions that were revealed to the subjects in order to graphically describe the extent of price-dispersion among subjects.

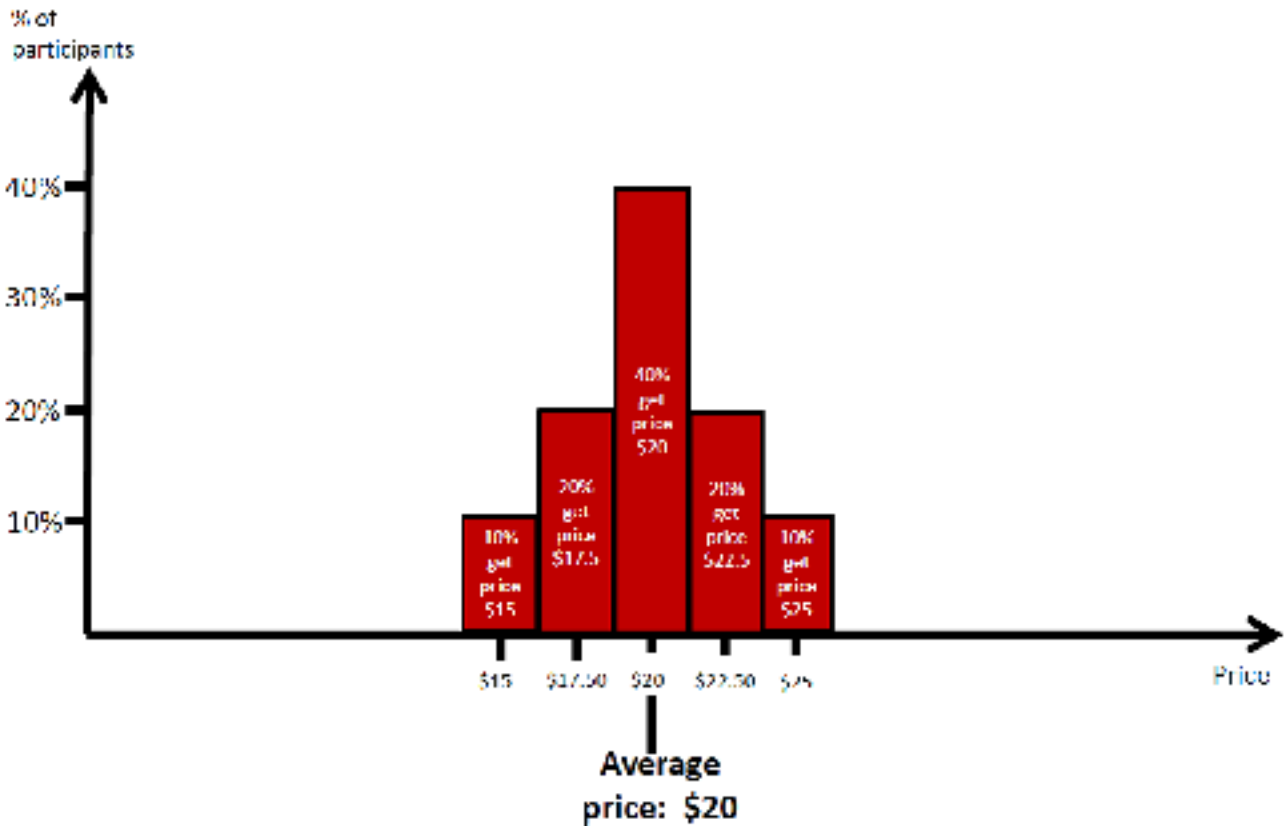

Figure 1: Price Distribution 1

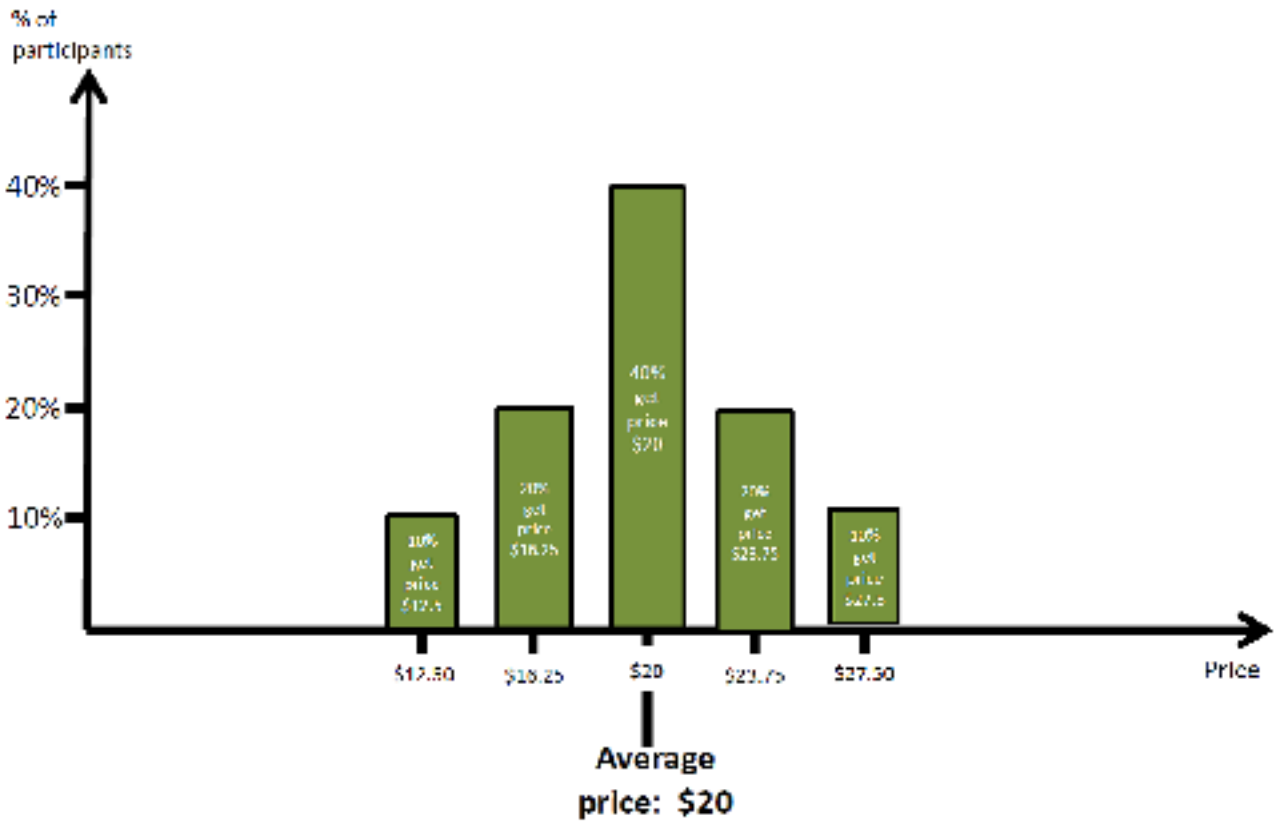

Figure 2: Price Distribution 2

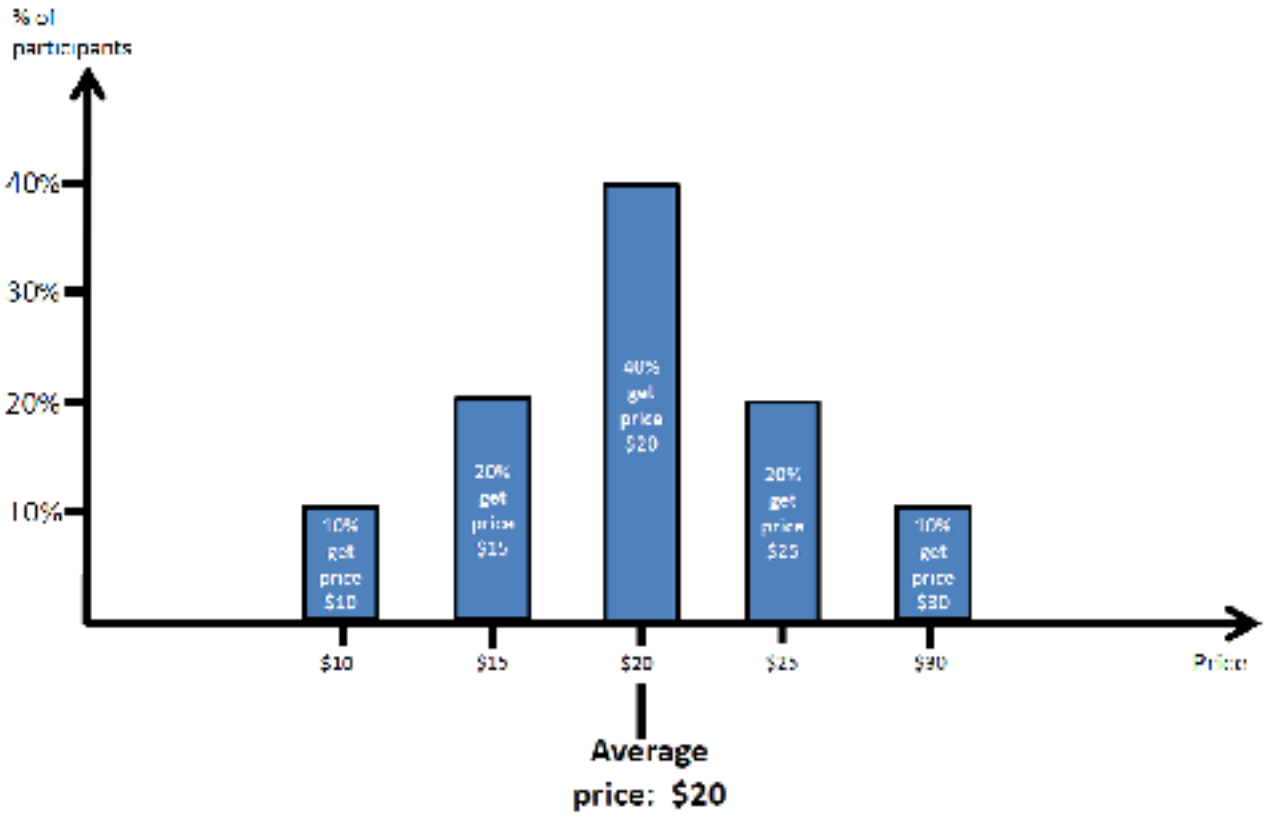

Figure 3: Price Distribution 3