



## 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.

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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 et al., 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).<sup>1</sup> 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 (Garbarino and Lee, 2003; Haws and Bearden, 2006; Kannan and Kopalle, 2001; 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 et al., 2004). This literature reveals a number of factors that determine how price-fairness perceptions are formed: Consumers' perceptions of seller's cost (Bolton and Alba, 2006; Bolton et al., 2003; Darke and Dahl, 2003; Kahneman et al., 1986a; Vaidyanathan and Aggarwal, 2003), buyers' previous experience with the product or seller (Bolton et al., 2003; Darke and Dahl, 2003; Rondan-Cataluña and Martin-Ruiz, 2011; Shehryar and Hunt, 2005), cultural differences among buyers (Bolton et al., 2010), competitor prices (Bolton et al., 2003), loyalty to the retailer (Martin et al., 2009), the procedures used to set prices (Kukar-Kinney et al., 2007; Maxwell, 2002; Shehryar and Hunt, 2005; Tsai and Lee, 2007; Xia et al., 2004), 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 (Anderson and Simester, 2008; Ashworth and McShane, 2012; Darke and Dahl, 2003; Haws and

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<sup>1</sup> 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.

Bearden, 2006; Ordóñez et al., 2000). 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.<sup>2</sup>

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.<sup>3</sup> Because this is the *raison d'être* for discriminatory pricing, any pricing platform based on this logic would seem to be doomed to failure. If, however, the pattern of inequity aversion is more “self-interested inequity aversion” (Liukonyte 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.<sup>4</sup>

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 (Gelbrich, 2011; Ordóñez et al., 2000), 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 et al., 2009; 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.<sup>5</sup> This has great practical 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 affect 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

<sup>2</sup> 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, 2009). However, in the context of our research, consumer product retailing, obfuscation is difficult and unlikely to occur.

<sup>3</sup> 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 et al. (2004) in their exhaustive review of the price fairness literature.

<sup>4</sup> 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.

<sup>5</sup> 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 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 / 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 (Bell and Lattin, 2000; Erdem, Mayhew, and Sun, 2001; Hardie, Johnson, and Fader, 1993; Kalyanaram and Winer, 1995; Lattin and Bucklin, 1989; Mazumdar, Raj, and Sinha, 2005; Pauwels, Srinivasan, and Franses, 2007).

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