Selling to Loss Averse Consumers: A Survey

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Abstract

A small applied theory literature examining the effect of consumer loss aversion on equilibrium pricing has developed. I briefly survey this work, covering work on focal pricing, randomized pricing, insurance, flat-rate bias, price discrimination, nonlinear pricing, and expectations management. I finish by discussing evidence, challenges for the literature, and open questions.

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1 Introduction

A small applied theory literature examining the effect of consumer loss aversion on equilibrium pricing has developed. I briefly survey this work, covering work on focal pricing, randomized pricing, insurance, flat-rate bias, price discrimination, nonlinear pricing, and expectations management. (I omit work on loss averse bidders in auctions, which is surveyed by K˝ oszegi (2014).) I finish by discussing evidence, challenges for the literature, and open questions.

A wealth of evidence shows that individuals are loss averse: relative to a reference point, individuals feel a loss more acutely than an equal sized gain (Camerer 2004). Kahneman and Tversky’s (1979) well known prospect theory includes the first prominent formalization of loss aversion. However, K˝ oszegi and Rabin’s (2006, 2007) model of loss aversion is the first to be readily applicable to industrial organization questions.

A simplification of K˝ oszegi and Rabin’s (2006) model is as follows. Consumers have intrinsic utility \( v - p \) for buying an item worth \( v \) at price \( p \). Consumers also experience gain-loss utility \( \mu(v - r v) \) when consumption value differs from the reference point \( r v \) and gain loss utility \( \mu(p - r p) \) when expenditure differs from reference point \( r p \). The gain-loss function \( \mu \) is piecewise linear, weighting losses more than gains by a factor \( \lambda > 1 \), so that \( \mu(x) = x \) for gains \( (x \geq 0) \) but \( \mu(x) = \lambda x \) for losses \( (x \leq 0) \). Overall utility sums intrinsic and gain-loss utilities, and as reference points \( r v \) and \( r p \) are allowed to be stochastic, overall utility is evaluated by taking expectations over the distribution of reference points:

\[
U = E [v - p + \mu(v - r v) + \mu(p - r p)].
\]

Finally, a major contribution of K˝ oszegi and Rabin’s (2006) is that their model of loss aversion incorporates a model of reference points. The distribution of reference points is assumed to match the distribution of outcomes, consistent with rational expectations. Nevertheless, there remains substantial flexibility in implementing the rational expectations assumption. Since its introduction, K˝ oszegi and Rabin’s (2006) has been applied to analyze equilibrium pricing using a variety of assumptions about when and how reference point distributions are formed relative to firm pricing decisions. Importantly these variations in assumptions lead to dramatically different predictions about equilibrium firm pricing. In particular, some results show that loss aversion reduces price variation while other results show the reverse.

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1 Readers may also refer to Spiegler (2011) for a text book treatment or to Huck and Zhou (2011) and K˝ oszegi (2014) for complementary surveys.

2 Experimental evidence supports this assumption (Ericson and Fuster, 2011).
2 Focal Pricing

Heidhues and Köszegi (2008) apply Köszegi and Rabin’s (2006) model to analyze equilibrium pricing in a differentiated products oligopoly. Importantly, they assume that consumers form reference points before firms realize their asymmetric production costs and choose prices. Assuming reference points are fixed before prices are chosen implies that an off-equilibrium price deviation would not affect consumer reference points. In this case, Heidhues and Köszegi (2008) show that, given a single reference price, any firm’s residual demand curve has an outward kink at the reference price. In particular, raising price above the reference price, which is coded as a loss, curtails demand more than lowering price below the reference price, which is coded as a gain, expands demand. (Such outward kinks in demand have been documented empirically around lagged prices and attributed to loss aversion, for instance in consumer demand for eggs by Putler (1992).)

As a result, Heidhues and Köszegi (2008) find that there can exist focal price equilibria in which all firms charge the same price irrespective of their individual cost realizations. Firms with high cost realizations cannot raise prices without causing consumers to feel a painful loss and losing substantial sales, while firms with low cost realizations see no reason to lower prices because sales would increase little. As Heidhues and Köszegi (2008) argue, this is the first and only complete explanation for why firms with different costs would coordinate on the same price for a differentiated product, something observed in many markets (e.g. Competition Commission of the United Kingdom (1994) and Beck (2004)).

3 Randomized Pricing

Heidhues and Köszegi (2014) and Rosato (2014) make nearly the opposite assumption to Heidhues and Köszegi (2008). Rather than assuming that firms pricing choices cannot affect reference points, they assume that a monopolist can commit to a price distribution that directly determines consumers’ reference points. This alternative assumption leads to a starkly different prediction. Rather than compressing equilibrium prices of different goods with different costs to the same focal price, now loss aversion encourages a single firm to randomize price for the same product. The logic is that charging a very low price (that is too good to refuse) with positive probability ensures that consumers expect to buy with positive probability. This, in turn, raises their willingness to

3 Spiegler (2012) replicates Heidhues and Köszegi’s (2008) results in a “cover version” of their model that is simpler in several respects. Most importantly, rather than assuming each consumer takes expectations over a distribution of reference points that coincides with outcomes, Spiegler (2012) assumes that each consumer draws a single reference point from the distribution of outcomes. This makes the model more tractable and promising for future applications.
pay for the product when the price is higher, because not buying would be coded as a painful loss of consumption with positive probability.

Heidhues and K˝oszegi (2014) show that the optimal price distribution consists of a single atomic “regular price” and a continuous distribution of lower “sales prices”. The low sales prices create attachment to the product through consumers’ reference points, while the high regular price exploits the increased willingness to pay. Similarly, Rosato (2014) shows that when Walmart plans its black Friday sales, for every TV model on sale in limited quantities it should have a substitute model in stock at a higher price. While offering a deterministic price on each model, Walmart nevertheless effectively charges a stochastic price because consumers will be uncertain whether they will get a discounted model before it stocks out. The possibility of buying at the (too good to refuse) discount price raises consumers willingness to pay for the substitute model when the discount model is sold out because not buying would feel like a painful loss of a new TV. Such patterns of regular prices and sales may be explained by standard models of price discrimination (Tirole 1988) and uncertain demand with costly capacity (Dana 1999), but loss aversion is an intriguing alternative explanation.

Zhou (2011) shows that loss aversion can generate price randomization by another mechanism. Like Heidhues and K˝oszegi (2008), Zhou (2011) assumes that firms choose prices rather than price distributions. However, like Heidhues and K˝oszegi (2014), Zhou (2011) assumes that firms’ choices directly affect consumer reference points. In particular, Zhou (2011) first assumes that one of two Hotelling duopolists is prominent. Second, Zhou (2011) deviates from K˝oszegi and Rabin’s (2006) rational expectations assumption by assuming that consumers’ reference point is equal to the prominent firm’s price. As a result, the prominent firm’s residual demand curve exhibits a kink at its competitor’s price. In contrast to Heidhues and K˝oszegi (2008), this is an inward rather than outward kink. Raising its price above the competitors price curtails the prominent firm’s sales little because it raises consumers’ reference point such that paying the prominent firm’s higher price is not coded as a loss. Lowering its price below the competitor’s price expands the prominent firm’s sales a lot, however, because it lowers consumers’ reference point such that paying the competitor’s higher price is coded as a loss. As a result, the prominent firm randomizes between low and high prices in equilibrium.

4 Insurance and Flat-Rate Bias

The preceding papers all assume that uncertainty is completely resolved once a consumer makes a purchase. This precludes any scope for firms selling insurance. Importantly, however, loss aversion
creates first-order risk aversion to anticipated risks (Kőszegi and Rabin, 2007). Thus loss-averse consumers will demand insurance against even small scale risks when uncertainty is not resolved at the point of purchase. This may explain consumer demand for overpriced insurance for small risks, such as extended product warranties (Chen, Kalra and Sun, n.d.) or telephone wiring insurance (Cicchetti and Dubin, 1994) that could not be explained by risk aversion (Rabin, 2000).

A more subtle point is that when a consumer signs a contract, for instance to open a bank account, establish cellular phone service, or lease a car, she remains uncertain about future usage and resulting charges for the product or service. Herweg and Mierendorff (2013) show that in this setting the optimal two-part tariff is a flat rate, with zero marginal price, if marginal costs are not too large and loss-aversion is strong. This follows because a flat rate tariff insures loss-averse consumers against variation in their bills, and hence they are willing to pay a premium. In other words, loss-averse consumers exhibit flat-rate bias, or the tendency to choose a flat rate tariff over a cheaper metered rate.

The evidence for flat-rate bias is mixed. Flat-rate bias was first documented in demand for traditional telephone service in the US (Hobson and Spady, 1988; Mitchell and Vogelsang, 1991) but in the same setting Miravete (2003) finds that consumers choose a flat rate too little rather than too much. Grubb (2009) and Grubb and Osborne (2015) find that cellular tariff choice mistakes are best explained by overconfidence rather than flat-rate bias. Lambrecht and Skiera (2006) document flat-rate bias in demand for internet service in Europe and survey results suggest an insurance motive contributes to the bias. DellaVigna and Malmendier (2006) document flat-rate bias in gym membership enrollment but convincingly argue that this is better explained by partially naive present bias than loss aversion.

5 Price Discrimination and Nonlinear Pricing

Carbajal and Ely (2013) characterize optimal nonlinear pricing in a Mussa and Rosen (1978) or Maskin and Riley (1984) model adapted for consumers who are loss averse in the product quality dimension. They find that loss aversion increases quality provision relative to the loss-neutral case. Thus the inefficient downward distortion of quality to low demand consumers is mitigated by loss aversion, but high demand consumers may have their quality allocation inefficiently distorted upwards. Hahn, Kim, Kim and Lee (2010) analyze the same question but allow loss aversion in both price and quality dimensions using Kőszegi and Rabin’s (2006) model. With two consumer types (low and high demand) they find that loss aversion can induce firms to offer only a single quality product when two would have been offered otherwise.
6 Managing Expectations

The effect of loss aversion depends critically on when consumers form reference points relative to learning about prices, product match values, or resolving other uncertainties. This is apparent in the contrasting results above, where whether loss aversion creates an incentive to moderate or exacerbate price dispersion depends on whether consumers form reference points or learn prices first. Importantly, the relative timing of reference point formation and resolution of uncertainty need not be exogenous. Rather, firms can influence the relative timing and the resulting effects of loss aversion by their advertising and disclosure policies.

Karle and Peitz (2014) address this issue directly, using a variation of Heidhues and Kőszegi’s (2008) model. Whereas Heidhues and Kőszegi (2008) assume that consumers all form reference points before learning firm prices or product match values (their locations on a Salop circle), Karle and Peitz (2014) assume that all consumers form reference points after observing firm prices, and fraction \( \beta \) form reference points after also learning product match values. While loss averse, the latter fraction of consumers behave no differently from loss-neutral consumers. Only consumers who form reference points before learning match values, when they remain uncertain which product they will buy and which firm’s price they will pay, are affected by their loss aversion. Karle and Peitz (2014) show that if duopolists have equal costs then equilibrium prices fall with the fraction \( \beta \) of consumers who learn about product attributes early, but the reverse is true if duopolists have very different costs.\textsuperscript{4}

In a related model, Karle (2013) allows a monopolist to choose how much product attribute information to advertise early to consumers. Karle (2013) finds that a monopolist maximizes profits by advertising partial product information and, as in Karle and Peitz’s (2014) model with symmetric costs, that consumer welfare would be higher with full disclosure.

Karle and Peitz (2014) and Karle’s (2013) results mean that even though all consumers are perfectly informed about prices and product characteristics at the point of purchase, advertising or disclosing product characteristics early will affect the distribution of surplus between firms and consumers by manipulating consumer expectations and reference points. They suggest that disclosure requirements could be a useful regulatory tool to stimulate competition or curtail monopoly markups even in markets that appear transparent in the sense that consumers are fully informed.

\textsuperscript{4}Heidhues and Kőszegi (2008) and Spiegler (2012) show that loss aversion in the money dimension is procompetitive. Like Zhou (2011), Karle and Peitz (2014) show that loss aversion in the money dimension is procompetitive but loss aversion in the product consumption dimension is anticompetitive. Karle and Peitz (2014) find that which effect dominates varies with the degree of asymmetry between firms. In a laboratory experiment, Karle, Kirchsteiger and Peitz (Forthcoming) show that price sensitivity in consumer choice is correlated with separately measured loss aversion.
when making purchases. In other words, loss aversion implies that consumer protection policy should consider expectations management.

7 Discussion

The papers I have described above are all essentially static. Reference points are formed once and not revised. Obviously consumer reference points must evolve over time in response to new information. This must matter for market outcomes when firms interact with consumers over time, whether through repeat purchases, long term contracts, or advertising prior to purchase. Filling this hole presents a challenge for the literature, however. Within the static literature there are many variations in assumptions about reference point formation that substantially affect predictions. This will likely present an even greater challenge for models with evolving reference points and suggests that empirical evidence about how reference points evolve would be very valuable.

Some evidence is available from studies about drip pricing. Drip pricing entails gradual revelation of the total price during the purchase process. For example, an online retailer that does not reveal shipping charges until a consumer goes through the check-out process would be engaged in drip pricing. Unlike a case of hidden add-on fees, where a consumer might buy a base product before learning the fee for an add-on such as a checked bag fee, in this example, the consumer learns the total price before making a decision to buy. Nevertheless, the firms choice to delay revealing the shipping charge until late in the purchase process may affect market outcomes. In a standard model, this might be interpreted as a way for firms to raise consumer search costs. Allowing for loss aversion, however, it may serve as a form of expectations management. If consumers expect to buy when they see an up front cost, loss aversion may create attachment to the product (a pseudo endowment effect) that dissuades them from changing their minds when they finally learn about high shipping charges.

A laboratory experiment conducted by the former UK Office of Fair Trade (OFT), provides evidence consistent with this story (OFT 2010). They find that consumers pay higher prices and search less when shops employ drip pricing, revealing shipping and handling charges only after additional mouse clicks. However, drip pricing’s effect diminishes over time as lab subjects learn to expect the pricing ploy, and they express irritation with it in survey responses.

Each day on eBay sellers are running similar experiments for their own purposes, selling identical items in different ways. A seller may choose transparent pricing, disclosing a "free shipping" logo in its listing in search results. Alternatively a seller may choose drip pricing, adding a shipping fee that is not revealed until a shopper clicks on a listing within search results. Einav, Kuchler,
Levin and Sundaresan (Forthcoming) analyze many such seller experiments on eBay. They find that offering free shipping results in a $2.50 higher total price on average than charging a $0.01 shipping fee. However, conditional on charging a shipping fee, raising shipping fees $1 increases the average total price (inclusive of shipping) by $0.20 to $0.30.\(^5\)

Both OFT (2010) and Einav et al. (Forthcoming) results are consistent with two ideas. First, drip pricing causes loss averse consumers to become attached to products when seeing a low base price, and to weight shipping fees less when they are revealed as a result. Second, at least some experienced consumers anticipate this upfront and avoid drip pricing in favor of firms offering transparent free shipping. Another direction for future work would be to consider dynamic models in which consumers must forecast how their reference points will change when making current decisions. How would behavior of sophisticated consumers who anticipate reference point changes differ from naive consumers who do not? Are eBay’s free-shipping listings targeted particularly at the sophisticated?

\(^5\)Earlier eBay studies also find that buyers do not fully offset shipping fees in their bids (Tyan, 2005; Hossain and Morgan, 2006; Brown, Hossain and Morgan, 2010)
References


