The Thrill of the Deal: Quantifying the Price of Perceived Discounts and Mark-ups

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Abstract

I investigate the role of transaction utility on consumers' purchasing behavior. I designed two laboratory paradigms to mirror shopping experiences using discounts and mark-ups (Study 1) and coupons (Study 2). In my experiments, participants purchase virtual goods, allowing me to isolate transactional utility from inferences of product quality. Results reveal that consumers experience transactional utility even over these virtual goods, and will sacrifice monetary pay-offs for transaction utility. Participants gain utility from perceived discounts, disutility from perceived mark-ups, and utility from using more of a coupon. My estimates suggest consumers are willing to pay 37-57 cents to use an extra dollar of a coupon and 37-78 cents to avoid a dollar of perceived mark-up. These estimates suggests a large relevance for transaction utility across a wide array of consumer decisions and purchasing behavior.

Keywords: behavioral economics; experimental economics; transaction utility; sales; discounts; coupons; mark-ups

1 Introduction

Why do we buy the 50% off jacket only to never wear it, or reject the 2x surge price ride-share service only to walk two miles in an apocalyptic snowstorm? Although a traditional rational economic model assumes all consumers care about is the value of the good and its selling price, robust evidence suggests consumers make consumption decisions that deviate from this model. In economics, reference-dependence and loss aversion have been used to explain such deviations (Tversky and Kahneman, 1991). In marketing, the effect of comparative price advertising, such as providing an original price, has been shown to distort consumers' purchasing behavior (Compeau and Grewal, 1998; Krishna et al., 2002). These distortions raise two important questions: do consumers place value on the terms of the transaction itself separate from the value of the good, and if so, can distortions in purchasing behavior lead to material losses?

To explain seemingly "irrational" decisions linked to perceived discounts and mark-ups, Thaler (1985, 1999, 2008) proposed that consumers get two kinds of utility from a purchase: consumption utility[1] — the value of the good obtained relative to its price, and transaction utility — the perceived value of the "deal." A notable example, suggesting the importance of transaction utility, is JCPenney's short-lived switch from coupons to an "everyday low-pricing" structure in 2012 (Tuttle, 2012). Intuitively, consumers could now buy at discounted prices without having to search for coupons. However, the first quarter after their new pricing structure was implemented, the company reported a $163 million net loss. Moreover, a large set of false-advertisement class action lawsuits suggests firms have used "fictitious" original prices to create perceptions of discounts and trick consumers to buy.[2] Thus, understanding if transaction utility can distort consumer purchasing behavior has important economic implications for forecasting demand and firm pricing strategy, and regulators and policy makers will also benefit from understanding how transaction utility can be manipulated to exploit consumers.

But to what extent are distortions due to transaction utility? Anecdotal evidence and

[1] Thaler (1985, 1999, 2008) refers to consumption utility as "acquisition utility". For the purpose of clearer exposition, I rename this term "consumption utility" but I retain the same definition and mathematical structure.

[2] See Berkoff v. Homegoods Inc., United States District Court Central District of California Eastern Division, No. 5:15-cv-01480, July 23, 2015; Berkoff v. Marshalls of CA, LLC, United States District Court Central District of California Eastern Division, No. 5:15-cv-01475, July 23, 2015; Gennock v. Ann Inc., United States District Court Southern District of New York, No. 1:16-cv-03340-JPO, May 5, 2016; Munning v. The Gap, Inc., United States District Court Northern District of California, No. 3:16-cv-03804-TEH, July 7, 2016; Anderson v. Kate Spade and Company, United States District Court Southern District of New York, No. 1:16-cv-07300, September 19, 2016; Holter (2011); Kang (2015).

existing marketing studies suffer from a potential confound; consumers may use a reference price to update their quality-valuation of a good (Rao and Monroe, 1989).[3] Therefore, it is hard to disentangle the effect of transaction utility from inferences about product-quality drawn from original prices to study their impact on consumer purchasing behavior. In addition, prior work shows that perceived discounts increase purchase intentions but it does not provide concrete evidence that reference prices can lead to lower consumption utility.

The purpose of this paper is to disentangle transaction utility effect from product quality inference, and quantify the value of a dollar of transaction utility in dollar terms. This paper uses two incentivized experiments, which mirror the shopping experience using discounts and coupons, to test and show that consumers respond to irrelevant original prices, and this can lead to money lost consistent with predictions of a theory of "transaction utility." In both experiments, to exactly control consumer valuation, participants make purchasing decisions over a "virtual" product. Since there are no actual products, I am able to exogenously assign participant's valuation of the item (in dollars), thus keeping the value of the virtual product constant and shutting down the quality inference channel. Furthermore, I use these two experiments to quantify participants' are willingness to pay per dollar of transaction utility.

First, I designed a *Discount and Mark-up Game*, which mirrors the shopping experience of receiving a discount or mark-up by providing a selling price and an original price. I use this game to establish that consumers respond to irrelevant original prices, which can lead to money lost. In this game, participants were endowed with preferences, a selling price, and the original price for a "virtual" product, and they had to decide if they wanted to purchase the "virtual" product at the selling price or not. If participants chose to purchase the (hypothetical) good, they received the difference between their assigned value and the selling price as earnings, and \$0.00 otherwise. Therefore, the original price is irrelevant from an earnings standpoint; that is, participants cannot infer quality from the irrelevant original price. Nevertheless, comparisons between the irrelevant original price and the selling price may create perceptions of discounts or mark-ups. Rationally, participants in my game should choose to purchase all goods regardless of the original price. However, I find that participants respond to irrelevant original prices. Importantly, even when earnings would be identical, participants were more likely to purchase the good if the original price was above the selling price and significantly less likely to purchase the good if the original price was below the selling price (compared to a setting where no original price was provided). I

[3] Also see Plassmann et al. (2008); Lewis and Zalan (2014).

stress-tested these results in a setting where participants' potential earnings were displayed prior to making their decisions, and show that participants still respond to irrelevant original prices. This suggests that consumers receive utility from the terms of the deal itself.

The next questions is can transaction utility not only lead consumers to buy more or less but also buy the "wrong" products. I designed a second experiment, the *Coupon Game*, which mimics a shopping experience with a coupon, to test this. In this game, consumers were endowed with preferences for two "virtual" goods, shown the original prices for each good, and given a "$5.00 discount coupon valid for one item." They had to decide which good they wanted to purchase using their coupon. They received the difference between their assigned value and the selling price (that is, the original price after applying the coupon) of the chosen good as earnings. Rationally, in this game the coupon should only matter as a way to increase participants' earnings by reducing the selling price. However, I find that participants systematically forwent higher earnings and chose to purchase the good that uses up the entire value of the coupon almost 30% of the time. This suggests coupons may "trap" consumers into purchasing a more expensive good to exhaust the value of the coupon, thus achieving a higher discount, at the expense of earnings or savings maximization.

Finally, I can price transaction utility using the randomly assigned variation between earnings and perceived discounts (or markups) in the *Discount and Mark-up Game* and the *Coupon Game*. Estimates from the *Discount and Mark-Up Game* suggest that participants are willing to sacrifice 37-78 cents to *avoid a dollar* of perceived mark-up.[4] Estimates from the *Coupon Game* suggest participants are willing to pay 37-57 cents to *use an extra dollar of a coupon* (that is, gain a dollar of perceived discount).

These findings have important implications for firm strategy and consumer policy. Results suggest fictitious original prices can meaningfully distort consumer purchasing behavior. Importantly, distortions in purchasing behavior can lead to material losses for consumers. These findings suggest that transaction utility is an important component of demand and therefore should influence firm pricing strategy. Moreover, given the large set of class-action lawsuits on false advertisements due to fictitious prices, evidence of material loss is of interest to regulators, policy makers, and litigators.

This paper makes two key contributions to the existing literature. First, it provides evidence that consumers care about the terms of the transaction, separate from the value of the good itself. This builds on a large literature about reference-dependence and its

[4]By design, I'm not able to directly calculate the trade-off between consumption and transaction utility in the *Discount and Mark-Up Game* when participants are provided with a perceived discount because discounts increase transaction utility and earnings at the same time.

effects on demand (Tversky and Kahneman, 1991; Thaler, 1999).[5] It also adds to a large set of marketing studies exploring the effect of advertised reference prices on the perceived value of an offer and purchase intention (Berkowitz and Walton, 1980; Urbany et al., 1988; Lichtenstein et al., 1989; Moore and Olshavsky, 1989; Dodds et al., 1991; Grewal et al., 1998; Bitta et al., 1981; Mobley et al., 1988; Scot et al., 1993; Biswas and Burton, 1994; Sinha and Smith, 2000; Muehlbacher et al., 2011).[6] However, it is hard to disentangle the effects of transaction utility from the effects of inferences about product-quality in previous studies (Rao and Monroe, 1989).[7] By showing that consumers respond to irrelevant original prices, I provide the first incentive-compatible evidence of transaction utility without confounding from product quality.

In addition, I demonstrate that attention to irrelevant original prices can lead to worse outcomes for consumers. While prior work shows that perceived discounts increases purchase intentions, it does not provide concrete evidence that reference prices may cause material losses for consumers.

The rest of the paper proceeds as follows: Section 2 provides a review of Thaler's theory of transaction utility. Section 3 presents two studies using the *Discount and Mark-up Game* to demonstrate that an irrelevant original price can distort purchasing behavior due to transaction utility. Section 4 presents two studies using the *Coupon Game* and show that coupons can trap consumers into purchasing the "wrong" product. Section 5 provides a discussion on the potential welfare implications associated with "fictitious" sales, future areas of research, and practical applications of the findings in this paper.

[5]While, reference-dependence and loss aversion have been used to explain such deviations in economics (Tversky and Kahneman, 1991), Tversky and Kahneman (1991) and Thaler (1999) rejected the idea that costs incurred by buyers in markets are viewed as losses. Since then, a number of other models incorporating a reference structure have been introduced. These models posit consumers are loss-averse over quantities they were expecting to consume (Kőszegi and Rabin, 2006; Heidhues and Kőszegi, 2014), a consumer's attention is drawn towards salient attributes of goods (Bordalo et al., 2013), or a consumer's "disenchantment" towards the firm affect purchasing behavior (Sibly, 2004). These models predict deviations from the traditional rational model, but the theories may be intractable because they rely on endogenous references prices, which are hard to determine. Furthermore, these models may not always explain pricing patterns observed in the market such as "perpetual" sales from an essentially fictitious "regular price" seen in furniture and rug stores (Heidhues and Kőszegi, 2014).

[6]Other studies have also looked into the believability of a price offer (Scot et al., 1993; Suter and Burton, 1996), promotion frequency (Krishna et al., 1991; Kalwani and Yim, 1992), and search intentions (Bitta et al., 1981; Urbany et al., 1988; Biswas and Burton, 1994). Also see, Monroe (1973); Peterson et al. (1985); Rao and Monroe (1989); Biswas et al. (1993); Lichtenstein and Bearden (1988); Biswas and Blair (1991); Biswas and Burton (1993); Kaicker et al. (1995); Grewal et al. (1996); Darke and Dahl (2003); Darke and Chung (2005); Ngwe (2017). Other consumer decision and reference point studies have explored the effects of specific product comparison sets (Jahedi, 2010), anchoring (Dodonova and Khoroshilov, 2004), quantity limits (Inman et al., 1997), or time-inconsistencies (Nakamura and Steinsson, 2011) to show that these reference prices affect willingness to pay.

[7]Also see Plassmann et al. (2008); Lewis and Zalan (2014).

2 A Review of Transaction Utility

To explain why consumers might purchase a good at a price above their valuation for that good, or forgo purchasing a good that might seemingly make them better off, Thaler (1985, 1999, 2008) proposed that consumers derive two kinds of utility from a purchase: (1) consumption utility and (2) transaction utility. Adding transaction utility into consumers' purchase evaluation leads to two effects: (1) some goods may be purchased just because they were a good deal, and (2) some purchases, that would seemingly make the consumer better off, may be avoided because the deal was very bad.

Thaler defined transaction utility as the perceived value of the "deal," and it is some function of the selling price relative to a reference price. Examples of external reference prices include a seller's cost, the manufacturer's suggested retail price, the posted-price, and the original price of a good. Furthermore, Thaler posited the most important factor in determining the reference price is fairness, and fairness depends in large part on the cost to the seller.

A model of the consumer's decision problem incorporating transaction utility leads to two testable hypotheses. First, all else equal, as the reference price increases, consumers are more likely to purchase the item because it increases the difference between the reference price and the selling price, thus increasing the perceived discount. Second, under certain circumstances, if transaction utility is sufficiently high, consumers will purchase the good even if its consumption utility is negative because the positive gains from getting a good deal will offset any negative consumption utility.[8] Note, that these hypotheses deviate from the neoclassical rational model where consumers make purchasing decisions to maximize consumption utility alone. To show that transaction utility exists, I test these hypotheses using an irrelevant original price, that is, it contains no useful information relevant to consumption utility, but it can alter transaction utility.

3 Discount and Mark-up Game

I designed the *Discount and Mark-Up Game*, to test how participants respond to perceived discounts and mark-ups produced by an irrelevant randomly-assigned original price. This game was designed to mimic discounts and mark-ups observed in practice, where con-

[8] I note that this effect may be different depending on the concavity of the transaction utility function. In practice, a number of factors could also moderate this behavior including the credibility of the reference price or the salience of transaction utility.

sumers are shown and make comparisons between a selling price and an original price to obtain a perceived discount or mark-up.

The *Discount and Mark-Up Game* was used in two studies: study 1A and study 1B. In study 1A, I test if participants respond to irrelevant original prices consistent with predictions from a transaction utility model. In study 1B, I test the robustness of transaction utility effects after participants are given information to highlight their consumption utility. Below, I first describe the general design, then I describe the difference between study 1A and study 1B, followed by the results.

3.1 Design

The *Discount and Mark-Up Game* was designed to investigate the role of irrelevant original prices on consumer purchasing behavior in a "shopping" game. A total of 358 participants — 178 participants in study 1A and 180 participants in study 1B — played this game.[9] All participants received a $10 show-up fee for completing the 25-minute study.[10]

In this game, all participants were assigned the role of buyers and decided whether to buy a "virtual" product at a randomly-assigned selling price (P). Since this was a "virtual" product — that is, no actual product was used — buyers were assigned their value of the "virtual" product and the seller's cost. All buyers valued each "virtual" product at $9.00 and the seller had a cost of $6.00. To create consumption utility, participants were rewarded in earnings based on their purchasing decision: if the buyer decided to buy the item then the buyer's earnings were the value of the item less the selling price ($\$9.00 - P$), and the seller's earnings were the selling price less their cost ($P - \$6.00$), otherwise both received $0.00. To create transaction utility, buyers were also shown an original price (O) which provided irrelevant information in terms of the buyer's earnings or consumption utility ($\$9.00 - P$) but it could alter the perceived level of discount or mark-up, that is transaction utility ($O - P$), obtained.[11]

The *Discount and Mark-Up Game* relies on a 4×8 within-subject design where participants' selling price and original price where randomly assigned to create variation in two

[9] Participants are students from the University of Pennsylvania across a wide range of disciplines. They participated in 1 of 24 sessions at the Wharton Behavioral Lab in January and February 2018 (12 sessions each month) with 178 participants randomly assigned to study 1A and 180 participants randomly assigned to study 1B.

[10] Individuals participated in a *Coffee Drink Experiment*, the *Discount and Mark-up Game*, and the *Coupon Game* in the 25-minute study. Results from the *Coffee Drink Experiment* are presented in a companion paper (Huang, 2018).

[11] (See Figure 1 for examples of the buyer's decision screen.

dimensions: the earnings and perceived discount or mark-up from purchasing (see Figure 1 for example).[12]

In total, participants saw four different selling prices $\{\$6.72, \$7.51, \$8.03, \$8.42\}$, which corresponded to four different earnings: $\{\$2.28, \$1.49, \$0.97, \$0.58\}$.[13] For each possible level of earnings, participants made eight different purchasing decision. Conditional on each payoff, I manipulated the original price shown to create seven levels of perceived discount (or mark-up) compared to a control set where *no original price (control)* was shown. To facilitate comparisons, original prices were structured such that the selling price as a percentage of the original price was: $\frac{P}{O} \in \{60\%, 80\%, 90\%, 100\%, 110\%, 120\%, 140\%\}$, creating three discount treatments, one no discount/mark-up treatment, and three mark-up treatments.[14]

All participants saw each selling price and original price combination, for a total of 32 purchasing decisions, in a random order. At the end of the laboratory session, participants answered a series of demographic questions, and one round and two participants were randomly selected for payment: one buyer and one seller.[15]

To ensure the quality of participants' responses, all participants had to answer and pass two comprehension questions before proceeding to the game. The comprehension questions consisted of two multiple choice questions, each with 10 choices (see Figure C2 in the appendix for an example).[16] This ensured that all participants understood the game, and 97% of participants passed both comprehension questions on the first try.[17]

The key feature of this design is that participants were paid their earnings — calculated as the difference between the assigned value of the product and the selling price if they chose

[12]If participants chose to not purchase the item, their earnings were \$0.00. I assume that participants' perceived discount or mark-up obtained is zero when they chose to not purchase the item.

[13]The selling prices were selected to avoid numbers that would be easily remembered. I also allowed for variation in the buyer-seller split of the pie to account for inequity aversion (Fehr and Schmidt, 1999).

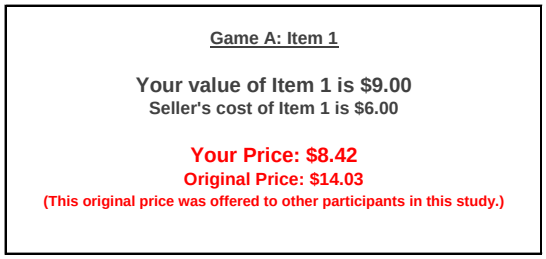
[14]Note, the original prices were selected such that the selling price contained a perceived discount or mark-up of 0%, 10%, 20%, or 40%. If an original price was presented, participants were also told "the original price was offered to other participants in this study." To make this a deception-free study, all original prices were offered to a small sample of participants who were excluded from the results below.

[15]Participants were also told: "You should make all your decisions assuming you are the buyer. Each round is independent of the others. Note that the price may be different from item to item. Please make each of your choices carefully. Remember, you may be selected as the buyer, in which case one of your rounds will be selected for payment. Since only one round is randomly chosen for payment you should treat each round as if it is the one and only round chosen for payment." See section C.1 in the appendix for experimental protocol.

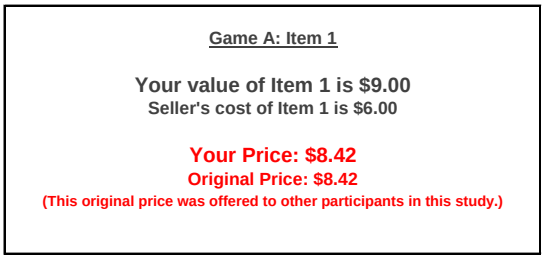
[16]Participants were shown a hypothetical scenario with the same decision screen as the game and were asked: (1) What are your earnings (in dollars) if you choose to purchase the item? (2) What are your earnings (in dollars) if you choose to NOT purchase the item? Participants were told to select their answers from two drop down list. Each drop down list consisted of 10 choices ranging from \$0.00 to \$9.00 in one dollar increments. There is a 1% chance of correctly guessing both comprehension questions.

[17]In study 1A, 98% of participants passed both comprehension questions on the first try and in study 1B, 96% of participants passed both comprehension questions on the first try.

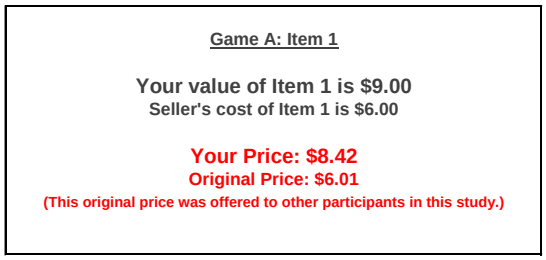
(A) Perceived Discount: $\frac{P}{O} = 60\%$



(B) No Discount/Mark-up: $\frac{P}{O} = 100\%$



(C) Perceived Mark-up: $\frac{P}{O} = 140\%$



(D) No Original Price (Control)

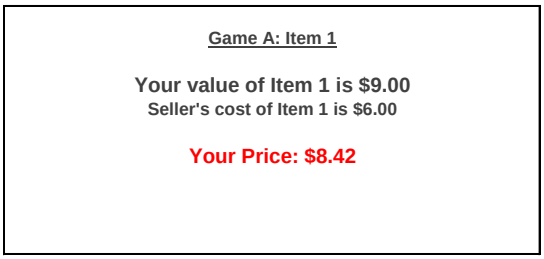


Figure 1: Examples of Participant's Decision Screen
Study 1A: Discount and Mark-up Game (Baseline)

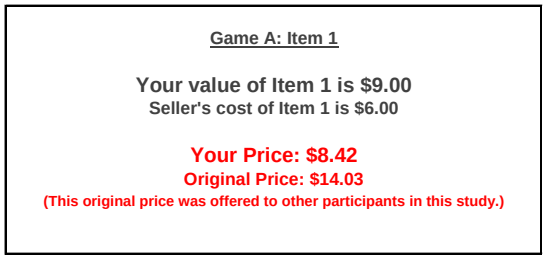
Note: In each round of the *Discount and Mark-up Game*, participants were shown their assigned value of the "virtual" product and the seller's cost, which is always fixed at $9.00 and $6.00. They are also shown the selling price and the original price which is randomly assigned. The four panels in this figure hold the selling price constant ($\pi_{buyer} = \$0.58$) but vary the original price such that the selling price appears discounted, equal to, or marked-up compared to the original price. Panel A shows an example where the selling price appears 40% discounted; panel B shows an example where the selling price is equal to the original price so there is no discount or mark-up; panel C shows an example where the selling price appears 40% marked-up; and panel D shows an example when participants were not provided with an original price (control) group.

to purchase the "virtual" product. Thus, in terms of payoff, the original price provided irrelevant information. Furthermore, if participants only cared about consumption utility, they should always purchase the "virtual" product, leading to higher earnings.

3.1.1 Difference between Study 1A and Study 1B

Participants were randomly assigned to one of two studies: *Study 1A: Baseline* or *Study 1B: With Earnings Displayed*. In both studies, participants played the *Discount and Mark-up Game* with the same incentives and the same 32 purchasing choices in a random order. The *only* difference between the two studies was that participant's earnings were displayed before making their decisions in *Study 1B: With Earnings Displayed*.

(A) Study 1A: Baseline



(B) Study 1B: With Earnings Displayed

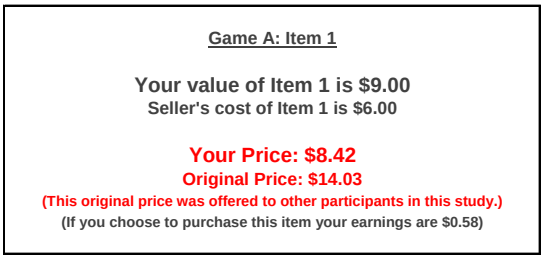


Figure 2: Examples of Participant's Decision Screen With and Without Earnings Displayed

Study 1A & 1B: Discount and Mark-up Game

Note: In each round of the *Discount and Mark-up Game*, participants were shown their assigned value of the item, the seller's cost, and the selling-price. Panel A shows an example when participants decision screen in *Study 1A: Baseline*, and Panel B shows an example when participants' potential earnings were displayed in *Study 1B: With Earnings Displayed*.

In the study 1B, participants saw the same decision screen as study 1A but participants' potential earnings were displayed with the following message: "(If you choose to purchase the item, your earnings are $___)." Figure 2 provide examples of participants' decision screens in study 1A and 1B. Study 1B is used to stress-test the robustness of transaction utility. By displaying potential earnings, I encourage participants to consider their consumption utility, as such, we should expect transaction utility effects to be considerably reduced.

In the next subsection, I present the results from the *Discount and Mark-up Game*. First, I present the main results from *Study 1A: Baseline*, then I discuss results from *Study 1B: With Earnings Displayed*.

3.2 Results

All analyses will focus on the average rate of purchasing the "virtual" product. I identify the effect of providing an irrelevant original price by comparing the presence of an original price that is above, below, or equal to the selling price to game rounds where the original price is absent (i.e., the no original price (control) rounds). I do so conditional on the participants' randomly-assigned expected earnings in case of purchase. I also explore the trade-off between earnings and perceived mark-up on a participant's probability of purchasing the good available.

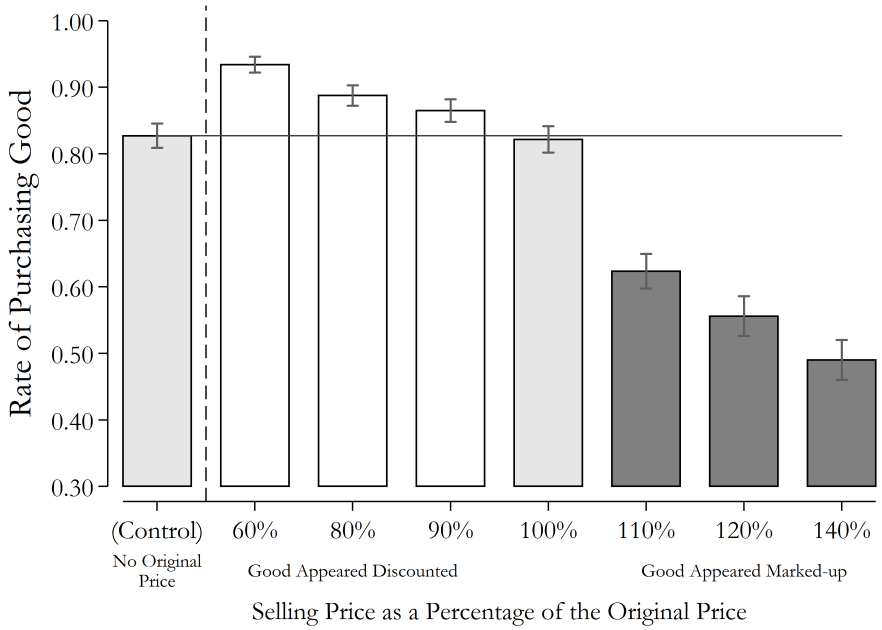
Figure 3 Panel A shows the average purchase rate when no original price was shown (control), and when the selling price appeared discounted, equaled, or appeared marked-up compared to the original price. Purchase rates are nearly identical in the control group and when the selling price equaled the original price (82.7% in control and 82.1% when the selling price equaled the original price; this difference is not statistically significant in a regression, $p = 0.696$). This suggests that in the absence of an original price, buyers behave as if the selling price is equal to the original price.

Furthermore, while participants' earnings increase if they choose to purchase the item (compared to not purchasing, leading to earnings of \$0), it is not unexpected to see a purchasing rate lower than 100% even when an original price is not shown, perhaps due to inequality aversion. Different selling prices led to different buyer-seller split of the pie. Figure A1 in the appendix shows the average purchase rate across conditions by selling price, and shows that as the buyer-seller split moved against the buyer, participants were less likely to purchase the item — this is consistent with the theory that individuals are inequity averse (Fehr and Schmidt, 1999).

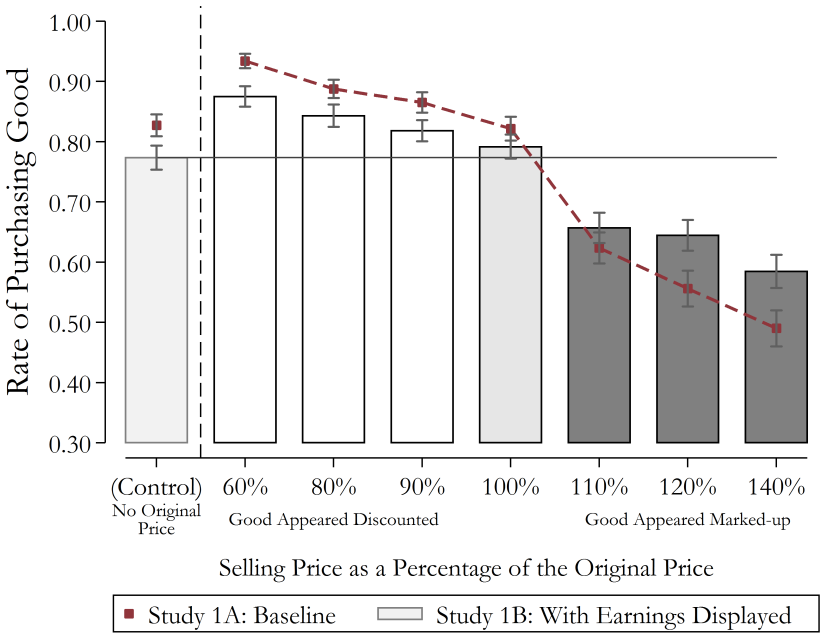
Moreover, Figure 3 Panel A shows that providing an irrelevant original price can distort purchasing behavior. Participants were more likely to purchase the item when the selling price appeared discounted. Providing an original price above the selling prices led to a 6.8 percentage point increase in the purchasing rate (in a regression controlling for game period and using robust standard errors clustered at the individual level, $p < 0.01$). Moreover, the larger the perceived discount, the higher the purchasing rate. A perceived discount of 10% led to a 3.8 percentage point increase while a perceived discount of 40% led to a 10.7 percentage point increase in the purchasing rate (see Table A1 regression (1) in the appendix, $p < 0.01$). Similarly, buyers were less likely to purchase the item when the selling price appeared marked-up, and the larger the mark-up the bigger the distortion. Providing an original price below the selling prices led to a 27.1 percentage point decrease in the

FIGURE 3: PARTICIPANTS RESPOND TO AN IRRELEVANT ORIGINAL PRICE
Study 1A & 1B: Discount and Mark-up Game

(A) STUDY 1A: BASELINE



(B) STUDY 1B: WITH EARNINGS DISPLAYED



Notes: Participants' average purchasing rate of the item by selling price as a percentage of the original price. Panel A show results for study 1A (baseline) and Panel B shows results for study 1B (with earnings displayed). Robust standard error bars clustered at the individual level are shown around each mean.

purchasing rate (in a regression controlling for game period and using robust standard errors clustered at the individual level, $p < 0.01$), a 10% perceived mark-up led to a 20.4 percentage point decrease and a 40% perceived mark-up led to a 33.7 percentage point decrease in the purchasing rate (see Table A1 regression (1) in the appendix, $p < 0.01$).[18] These results are robust and significant with or without controlling for selling price and game period.[19]

Figure A1 and Table A2 in the appendix show that the effect size of each percentage discount or mark-up level is also dependent on the perceived fairness between the buyer-seller split of the pie. When the buyer received the majority of the pie (i.e., when the buyer's selling price was \$6.72 leading to earnings of \$2.28 or 76% of the buyer-seller earnings split going to the buyer), participants were already choosing to purchase 97% of the time in the control rounds. As such, observing a perceived discount of 40% did not appear to increase the purchase rate. However, when buyers received the minority of the pie (i.e., when the buyer's selling price was \$8.42 leading to earnings of \$0.58 or 19% of the buyer-seller earnings split going to the buyer), participants were only choosing to purchase 66% of the time in the control rounds. As such, observing a perceived discount of 40% increased the purchase rate by 19.7 percentage points.

Furthermore, perceived mark-ups have a particularly strong effect on distorting behavior. Figure 3 Panel A shows that introducing a mark-up of 10% led to a steeper drop in the purchase rate than introducing a discount of 10%. We see this when we compare a 20.4 percentage point decrease in purchases due to a 10% perceived mark-up to a 3.8 percentage point increase due to a 10% perceived discount.[20] This is consistent with loss aversion, where consumers perceive negative transaction utility as more meaningful than equivalent positive transaction utility (Tversky and Kahneman, 1991; Thaler, 1985).

Compellingly, this variation arose within subject. Thus the same participants who were willing to purchase an item when the original price was absent or equal to the selling price were "over-purchasing" when presented with a perceived discount and "under-purchasing" when presented with a perceived mark-up, conditional on their earnings. These decision

[18] Table A1 in the appendix presents the results of the *Discount and Mark-up Game* in a regression framework, testing the effect of an original price by percentage below, above, or equal to the selling price on participants' purchasing decision.

[19] Table A4 in the appendix tests the marginal effect of a perceived percentage change between the selling price and the original price on the purchasing rate. Results are consistent and significant. I find that a perceived 10% change in discount increases the probability of purchasing the item by 2.70 percentage points while a perceived 10% change in mark-up decreases the probability of purchasing the item by 7.00 percentage points. This differential effects between discounts and mark-ups is consistent with prior findings that losses loom larger than gains with a 3:1 ratio (Fehr and Schmidt, 1999).

[20] The asymmetric response to discounts and mark-ups is present even when buyers are earning the minority of the buyer-seller pie (see Figure A1 and Table A2 in the appendix).

distortions are produced by providing information (i.e., the original price) that should be irrelevant in the participant's earnings calculations.

I explore the trade-off between participants' earnings and perceived level of discount or mark-up in dollars on participants' probability to purchase. This analysis parallels Thaler's transaction utility model with some simplifying assumptions. I assume that consumption utility (i.e., earnings) and transaction utility (i.e., the perceived discount or mark-up) are linear functions.

While there is no trade-off when the participants observes a perceived discount, we can look at participants' purchase rate when they observe a perceived mark-up.[21] In rounds with a perceived mark-up, participants are trading-off higher earning from choosing to purchase the item to reduce transaction disutility from getting a "bad" deal. For the purposes of this regression, I ignore inequity aversion. The regression specification estimated is:

$$Purchase_i = \alpha + \beta_1 \times Earnings_i + \beta_2 \times PerceivedMark\text{-}up_i + \epsilon_i$$

where $Purchase_i$ is whether participants i decided to purchase the item or not in the *Discount and Mark-up Game*; $Earnings_i$ is the difference in earnings (in dollars) between purchasing the item or not (representing "consumption utility"), and $PerceivedMark\text{-}up_i$ is the difference in perceived mark-up (in dollars) between purchasing the item or not (representing "transaction (dis)utility"). I control for the game period and cluster the random error, ϵ_i at the individual level.

Table 1 Panel A presents the trade-off between earnings (consumption utility) and perceived mark-up (transaction disutility) in study 1A. Focusing on regression (1), increasing earnings by a dollar increases the purchase rate by 18.4 percentage points. On the other hand, increasing the perceived mark-up by a dollar decreases the purchasing rate by 14.4 percentage points. Regressions (2) provides a robustness check using a Probit model and show marginal effects (holding all other independent variables at their mean).

Table 2 provides a robustness check of this effect. Regression (1) provides the baseline result for comparison. Regressions (2) and (3) subset the data to instances where the buyer-seller split is going against the buyer. By looking at rounds were the selling price is greater than \$7.50 I can focus on instances where the buyer's earnings was less than 50% of the buyer-seller earnings split, to account for inequity aversion.[22] Regression (2), shows the trade-off

[21] Furthermore, as previously mentioned, there appears to be top coding in the rounds where participants received a perceive discount.

[22] Sub-setting the data provides an "upper" bound for the effect on earnings because decreasing the selling price increases earnings and reduces buyer-seller inequality.

Table 1: Trade-off Between Earnings and Perceived Mark-up
Study 1A & 1B: Discount and Mark-up Game

Panel A: Study 1A Baseline		
	Dependent Variable: Purchase Good	
	OLS	Probit
	(1)	(2)
Earnings (in $)	0.184***	0.183***
	(0.017)	(0.016)
Perceived Mark-Up (in $)	-0.144***	-0.139***
	(0.011)	(0.010)
Constant	0.538***	
	(0.039)	
Ind. Clusters	178	178
Order Control	Yes	Yes
Observations	2848	2848
R-Squared	0.129	
Panel B: Study 1B With Earnings Displayed		
	Dependent Variable: Purchase Good	
	OLS	Probit
	(1)	(2)
Earnings (in $)	0.239***	0.242***
	(0.017)	(0.016)
Perceived Mark-Up (in $)	-0.088***	-0.085***
	(0.010)	(0.010)
Constant	0.428***	
	(0.041)	
Ind. Clusters	180	178
Order Control	Yes	Yes
Observations	2880	2880
R-Squared	0.138	

Notes: Trade-off between earnings and perceived mark-up. Panel A show results for study 1A (baseline) and Panel B shows results for study 1B (with earnings displayed). I control of game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

between earnings and perceived mark-up when the selling price is \$7.51, \$8.03, and \$8.42 only and shows that increasing earnings by a dollar increases the purchase rate by 20.0 percentage points. However this estimate incorporates the fact that increasing earnings also reduces inequality. On the other hand, increasing the perceived mark-up decreases the purchasing rate by 14.5 percentage points. Regression (3) shows the trade-off between earnings and perceived mark-up when the selling price is \$8.03 or \$8.42 only. This comparison reduces the effect of decreasing inequality when selling price is reduced because the inequity difference is smaller, that is, buyer's share of the pie only changes from 19% to 32%. Results show that increasing earnings by a dollar increases the purchase rate by 11.4 percentage points and increasing the perceived mark-up decreases the purchasing rate by 13.0 percentage points. It is important to note the coefficients estimated for a perceived mark-up are stable across regression specifications. As such, inequity aversion is not affecting transaction utility.

Note that in Table 2 regressions (1) to (3), estimates of coefficients may contain loss aversion over *transaction utility*. Regressions (4) to (6) examine the trade-off between earnings and perceived mark-up "removing" loss aversion by estimating the trade-off using perceived mark-ups of 10%, 20%, and 40%. Regression (4) shows that increasing earnings by a dollar increases the purchase rate by 19.7 percentage points and increasing the perceived mark-up by a dollar decreases the purchase rate by 8.5 percentage points. An out of sample prediction using these estimates shows that when the selling price is equal to the original price, participants are willing to buy 67.5% of the time. This is statistically significantly different compared to the actual purchase rate (p-value=0.000 from a t-test comparing the actual purchase rate of 82.2% to the predicted purchase rate of 67.5%). This suggest that introducing loss aversion (over transaction utility) decreases the purchase rate by 14.7%.[23] Regressions (5) and (6) repeat this test limiting the data to control for inequity aversion (paralleling regressions (2) and (3)) and show consistent results.

Another way to separate loss aversion and transaction utility effects is by using a kinked linear regression with the following regression specification:

$$Purchase_i = \alpha + \beta_1 \times Earnings_i + \beta_2 \times 1\{Mark\text{-}up_i\} + \beta_3 \times PerceivedMark\text{-}up_i + \epsilon_i$$

This allows for a mark-up to have a binary effect. Estimates from regression (7) show that under this specification, the coefficients for earnings and perceived mark-up are consistent to those in regression (4) and the effect of getting a mark-up reduces the purchase rate by 14.5

[23] Comparing the loss aversion effect and the coefficient of a perceived mark-up suggests that loss aversion accounts for over 60% of the change in purchase rate (holding earnings constant).

percentage points in study 1A. Regressions (8) and (9) repeat this test limiting the data to control for inequity aversion and show consistent results.

TABLE 2: ROBUSTNESS CHECK: TRADE-OFF BETWEEN EARNINGS AND PERCEIVED MARK-UP

Study 1A: Discount and Mark-up Game

	Dependent Variable: Purchase Good								
	Mark-up 0-40%			Mark-up 10-40% Only			Loss Aversion Adjusted		
Selling Price:	All	≥ $7.51	≥ $8.03	All	≥ $7.51	≥ $8.03	All	≥ $7.51	≥ $8.03
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Earnings (in $)	0.184***	0.200***	0.114***	0.197***	0.183***	0.064	0.192***	0.209***	0.124***
	(0.017)	(0.026)	(0.038)	(0.018)	(0.028)	(0.045)	(0.017)	(0.026)	(0.038)
Perceived Mark-Up (in $)	-0.144***	-0.145***	-0.130***	-0.085***	-0.075***	-0.059***	-0.086***	-0.073***	-0.058***
	(0.011)	(0.012)	(0.012)	(0.011)	(0.012)	(0.013)	(0.011)	(0.012)	(0.013)
Mark-Up							-0.145***	-0.185***	-0.189***
							(0.022)	(0.026)	(0.029)
Constant	0.538***	0.530***	0.568***	0.425***	0.435***	0.499***	0.576***	0.581***	0.624***
	(0.039)	(0.045)	(0.050)	(0.046)	(0.051)	(0.059)	(0.038)	(0.045)	(0.050)
Ind. Clusters	178	178	178	178	178	178	178	178	178
Order Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2848	2136	1424	2136	1602	1068	2848	2136	1424
R-Squared	0.129	0.0874	0.0527	0.0856	0.0314	0.00809	0.136	0.0989	0.0645

Notes: Robustness check for trade-off between earnings and perceived mark-up for study 1A (baseline). I control of game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

3.3 How robust are transaction utility effects?

To stress-test transaction utility, I show that my results are robust to displaying potential earnings before participants make their purchasing decisions.[24] *Study 1B: With Earnings Displayed* uses the same *Discount and Mark-up Game* as before, but I encourage participants to consider their earnings, making consumption utility more salient. *Study 1B: With Earnings Displayed* is a setting difficult to replicate in the field: but could be viewed as mapping onto situations where consumers have a rational actor (perhaps a friend) telling them to consider the true "value" they are receiving from a good and to ignore the fact that the product is "on sale." This is a setting where we should not expect distortions due to an irrelevant original price, yet finding consistent results in this treatment would show how robust transaction utility is and provide a lower bound for my estimates.

Figure 3 Panel B shows the average purchasing rate by selling price as a percentage of the original price (mirroring Figure 3 Panel A) for *Study 1B: With Earnings Displayed*. Results are consistent with a setting where participants were not explicitly shown their earnings. This finding, that providing an irrelevant original price distorts purchasing behavior even

[24]Note that displaying earnings does not provide new information to the participant, as they can easily calculate the earnings themselves.

after participants' earnings are displayed — encouraging them to consider their consumption utility and seemingly pulling back the curtain and exposing crafty marketing techniques to manipulate sales, suggests that transaction utility is a strong and persistent effect.[25]

Table 1 Panel B presents the trade-off between earnings and perceived mark-up in *Study 1B: With Earnings Displayed* (mirroring Table 1 Panel A). Focusing on regression (1), increasing earnings by a dollar increases the purchase rate by 23.9 percentage points (compared to 18.4 percentage points in the previous study where *earnings are not displayed*). On the other hand, increasing the perceived mark-up decreases the purchase rate by only 8.8 percentage points (compared to 14.4 percentage points in the previous study where *earnings are not displayed*). Regression (2) provides a robustness check using a Probit model and show marginal effects (holding all other independent variables at their mean). Table A6 in the appendix provides a robustness check on this effect (mirroring Table 2). Results follow the same pattern as in study 1A and coefficient estimates are consistent.

Displaying earnings encourages participants to consider their earnings, which should make consumption utility more salient. As such, the persistence of transaction utility effects under this stress-test show how important the "value of the deal" is, and provides a lower bound for transaction utility.

3.4 Discussion

Results from study 1A and 1B using the *Discount and Mark-up Game* show that participants respond to irrelevant original prices and this can lead to money lost, consistent with predictions from a transaction utility model. This effect is robust to a setting where we should not expect to see transaction utility: when consumption utility is made salient by showing study participants their potential earnings prior to making a decision. This suggests that consumers care about the terms of the deal *separate* from the value of the good (that is, their consumption utility).

All participants had to answer two comprehension questions which consisted of calculating their earnings if they chose to purchase the item or not, and 97% of participants passed

[25]Table A5 in the appendix pools data from study 1A and 1B to interact the perceived percentage change with *earnings displayed* and show its effect on participants' purchasing decisions. Regression (5) shows, conditional on selling price, a perceived 10% change in mark-up when earnings are displayed increases the purchasing rate by 4.6 percentage points but this is more than offset by the coefficient of observing a perceived 10% change in mark-up (decreasing purchasing rate by 8.1 percentage points). Similarly, a perceived 10% change in discount when earnings are displayed marginally decreases the purchasing distortion by 1.2 percentage points but this is more than offset by the coefficient of observing a perceived 10% change in discount (increasing purchasing rate by 3.0 percentage points).

both comprehension questions on the first try. This suggest that individuals are capable of doing the correct earnings calculations, and this is a relatively simple calculation. Moreover, results are consistent when I restrict my sample to only the 97% of participants who passed the comprehension questions on the first try. Importantly, participants' purchasing rate is responding to both the selling price *and* the irrelevant original price as predicted by the transaction utility model. Moreover, participants continue to respond to irrelevant original prices even when their potential earnings are displayed.[26]

In addition, since the lab games varied consumption and transaction utility in dollar values, I can estimate participants' willingness to pay for a $1 gain or loss of transaction utility. I use Table 1 Panel A and compare the coefficients between earnings and perceived mark-up to estimate willingness to pay. I find that participants are willing to pay 78 cents to avoid a dollar of perceived mark-up.[27] I use Table 1 Panel B, which provides the effect of earnings and perceived mark-up in *Study 2B: With Earnings Displayed* to estimate a lower bound for willingness to pay. Displaying earnings to participants prior to making their decision reduces this exchange rate to 37 cents per dollar.

Next, I use the *Coupon Game*, which mimics the shopping experience using a coupon, to show that transaction utility is robust to a variety of settings and it can lead consumers to buy the "wrong" product.

4 Coupon Game

Imagine walking to a store with a $5.00 coupon in hand. You've read the fine print and know that you can use the coupon to purchase one of two products at the store. The first product is a low-quality good and it is priced at $1.00. The second product is a high-quality good and it is priced at $8.00. Which item would you choose to buy using your $5.00 coupon? Did you choose the high quality $8.00 item? Did it seem silly to use a $5.00 coupon on an item that was priced at $1.00? What if the consumer had been better off buying the low-quality good?

The usage of coupons presents a different, but common, way in which consumers can acquire transaction utility.[28] The value of the coupon, itself, may provide a distinct reference

[26] See appendix A for additional results on monotonicity, mediation, and heterogeneity, as well as a discussion on alternative explanations.

[27] Ngwe (2017) compares the change in purchasing probability between a dollar increase in fake sale or a dollar decrease in the real price and finds a similar estimate.

[28] In 2016, the total number of coupons distributed in the United States was worth $307 billion. (See https://www.statista.com/statistics/630086/total-number-of-coupons-distributed-in-the-us/)

point. Acting as a goal or target, the value of the coupon may increase the salience of transaction utility, trapping consumers into purchasing more expensive goods to exhaust the entire value of a coupon (so they can obtain a higher perceived discount).

The *Coupon Game* mimics a shopping experience with a coupon, mirroring the scenario above. I test and show that distortions due to transaction utility are present in a very different context and consumer may be manipulated into not only spending more but also buying the "wrong" products. This game was used in two studies: study 2A and study 2B. In study 2A, I test if participants respond to coupons by buying more expensive products in order to exhaust the value of the coupon consistent with predictions from a transaction utility model. In study 2B, I test the robustness of transaction utility effects in this setting by providing participants with their potential earnings information to highlight their consumption utility. Below, I first describe the general design, then I describe the difference between study 2A and study 2B, followed by the results.

4.1 Design

The *Coupon Game* was designed to test transaction utility effects in a different setting: consumers purchasing behavior using coupons. A total of 204 participants — 101 participants in study 2A and 103 participants in study 2B — played this game.[29] In addition to earning a $10 show-up fee, one round and one participant were randomly selected for payment in each session.[30]

In this game, all participants were assigned the role of buyers and decided between one of two "virtual" products to buy using a "$5.00 off the original price discount coupon valid for one item." Again, since both items were "virtual" products — that is, no actual products was used — buyers were assigned their values of both "virtual" products: item Y and item Z. All buyers always valued item Y at $6.00 and item Z at $8.00. Participants were also provided with the (randomly assigned) original prices (O_Y and O_Z) of both "virtual" products. To create consumption utility, participants were rewarded in earnings based on their purchasing decision: buyer's earnings were the value of the item less the price they pay (that is, the original price less the coupon value) for the chosen item.[31] Notice, participants obtain transaction utility measured by the amount of coupon value realized or the perceived

[29]Individuals participated in 1 of 12 sessions at the Wharton Behavioral Lab in January 2018 with 101 participants randomly assigned to study 2A and 103 participants randomly assigned to study 2B.

[30]See section C.2 in the appendix for experimental protocol.

[31]If a buyer choose to purchase Item Y, their earnings were $6.00 value - [$O_Y$ + "$5.00 coupon"] and if a buyer choose to purchase Item Z, their earnings were $8.00 value - [$O_Z$ + "$5.00 coupon"].

discount in dollars obtained. Crucially, all participants knew they were allowed to purchase only one of the two items. All participants were also told that if the value of the coupon exceeded the original price of the chosen item, they would not receive credit back (that is, they forfeit the remainder of the coupon value).

Figure 4 Panel A shows an example of the participants' decision screen for the *Coupon Game*. Following the scenario introduced above, item Y is a low-quality and low-price good; which you value at \$6.00 and the original price is \$1.00. Item Z is a high-quality and high price good; which you value at \$8.00 and the original price is \$8.00. Choosing to purchase item Y leads to \$6.00 in earnings but notice you are only using \$1.00 worth of the coupon value.[32] On the other hand, choosing to purchase item Z leads to \$5.00 in earnings, but you use the entire value of the coupon (leading to \$5.00 in perceived discount).[33]

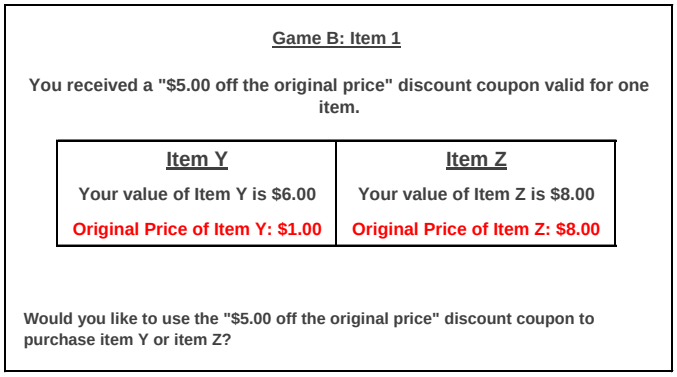
The *Coupon Game* relies on a 2×3 within-subject design where participant's original price of item Y and item Z were randomly assigned to create variation in two dimensions: (1) the difference in earnings and (2) the value of the coupon realized (i.e., perceived discount) between the two items. Participants observed 6 original prices combinations in a random order: $(O_Y, O_Z) \in \{(\$6, \$1), (\$6, \$3), (\$6, \$4.50), (\$1, \$8), (\$3, \$8), (\$4.50, \$8)\}$. Notice, for all six purchasing decisions the original price of one item is always greater than \$5.00 and one is always less than \$5.00. This was constructed such that one item always used the entire value of the coupon leading to a higher perceived discount (but lower earnings) and one item always sacrificed some portion of the coupon, leading to a lower perceived discount (but higher earnings). Which item led to a higher perceived discount, by using the full value of the coupon to offset the original price, was randomly assigned. For the purpose of a clear exposition, I define the following terms:

- The ***coupon-trap* good** is the item that used the entire value of the coupon. Participants achieved a higher perceived discount when they chose to purchase the *coupon-trap* good because it used all of the coupon. Thus, the perceived discount from purchasing the *coupon-trap* good is \$5.00. However, by design, this led to lower earnings. I posit the coupon value acted as a target, "trapping" consumers into purchasing the more expensive item in order to use the entire value of the coupon and gain a higher perceived discount.

- The ***alternative* good** is the other available good, which only used part of the coupon (and thus part of the coupon was sacrificed). Participants achieved a lower perceived

[32] Earnings from item Y: \$6.00 value - [\$1.00 + "\$5.00 coupon" = \$0.00] = \$6.00.
[33] Earnings from item Z: \$8.00 value - [\$8.00 + "\$5.00 coupon" = \$3.00] = \$5.00.

(A) Study 2A



(B) Study 2B

Figure 4: Participant's Decision Screen Across Experimental Conditions in the *Coupon Game*

Note: In each round of the *Coupon Game* participants were reminded they received a "$5.00 off the original price" discount coupon valid for one item and shown their assigned value and original price of each item. Panel A shows an example of the consumer decision problem in *Study 2A: Baseline*, and Panel B shows an example for *Study 2B: With Earnings Displayed*.

discount when they chose to purchase the *alternative* good because they do not receive credit back if the original price of the *alternative* good is lower than the coupon value. Thus, the perceived discount from purchasing the *alternative* good was always less than \$5.00, but it led to higher earnings.

To achieve the two key sources of variation in my experiment, I selected the values and manipulated the randomly assigned original prices for each good such that purchasing the *coupon-trap* good led to either \$1.00 or \$3.00 less in earnings compared to purchasing the *alternative* good. I also independently vary the extra coupon value gained from purchasing the *coupon-trap* good (compared to the *alternative* good), such that purchasing the *coupon-trap* good led to \$0.50, \$2.00, or \$4.00 in extra coupon value realized.

All participants saw each original prices combination, for a total of 6 purchasing decisions, in a random order. At the end of the laboratory sessions, participants answered a series of demographic questions, and one round and one participant was randomly selected for payment in each session.

To ensure the quality of participants' responses, all participants had to answer and *pass* two comprehension questions before proceeding to the game. The comprehension questions consisted of two multiple choice questions, each with 11 choices (see Figure C4 in the appendix for an example).[34] There is less than 1% chance of correctly guessing both comprehension questions. If participants failed any comprehension question, they had to try again until they passed both questions.[35] This ensured that all participants understood how to calculate their earnings by the time they played the game.

Calculating earnings for the *Coupon Game* required additional (and more complicated) math than calculating earnings in the *Discount and Mark-up Game*. In this case, participants first had to calculate the selling price they would be paying after applying the coupon. The selling price was the maximum of the difference between the original price less the coupon value and zero.[36] Then participants subtract the selling price from their assigned value to get to their earnings. Indeed, I find that participants found this math more difficult: only 50% of participants passed both comprehension questions on the first try. However, the remaining 50% who did not pass on their first attempt had the opportunity to re-answer the

[34]Participants were shown a hypothetical scenario with the same decision screen as the game and were asked: (1) What are your earnings if you choose to purchase the item Y? (2) What are your earnings if you choose to purchase the item Z? Participants were told to select their answer from two drop down list. Each drop down list consisted of 11 choices ranging from \$0.00 to \$10.00 in one dollar increments.

[35]Participants were not told which of the two questions they answered correctly and were asked to select the correct answer for both questions until they passed.

[36]In math, $selling\ price = max\{original\ price - coupon\ value, 0\}$.

comprehension questions until they passed.

The key feature of this design is that participants were paid their earnings — calculated as the difference between the assigned value and the price they pay (that is, the original price after applying the coupon) for their chosen item. Thus, the coupon should only matter as a way to increase participants' earnings by reducing the selling price. By construction, if participants only cared about consumption utility, they should always purchase the *alternative* good, leading to higher earnings.

4.1.1 Difference between Study 2A and Study 2B

Similar to the *Discount and Mark-up Game*, participants were randomly assigned to one of two studies: *Study 2A: Baseline* or *Study 2B: With Earnings Displayed*. In both studies, participants played the *Coupon Game* with the same incentives and the same 6 purchasing choices in a random order. The *only* difference between the two studies was that participant's earnings were displayed before making their decisions in *Study 2B: With Earnings Displayed*.

In study 2B, participants saw the same decision screen as study 2A but participants' potential earnings were displayed with the following message: "(Note: If you choose to purchase the item Y, your earnings are $___. If you choose to purchase item Z, your earnings are $___.)" Figure 4 provide examples of participants' decision screens in study 1A (in Panel A) and study 2B (in Panel B). Again, the study 2B is used as a stress-test of the robustness of the effect of transaction utility. By displaying potential earnings, I encourage participants to consider their consumption utility, as such, we should expect transaction utility effects to be considerably reduced.

In the following subsection, I present results from the *Coupon Game*. First, I present the main results from *Study 2A: Coupon Game*, then I discuss results from *Study 2B: Coupon Game with Earnings Displayed*.

4.2 Results

All analyses will focus on the average rate of purchasing the *coupon-trap* good. I look at the effect of (randomly assigned) extra earnings or extra coupon value realized if consumers were to purchase the *coupon-trap* good compared to the *alternative* good on participants' purchasing decisions.[37] I also explore the trade-off between earnings and perceived discount

[37]This analysis parallels the analysis done in the *Discount and Mark-up Game* where I examined the effect of perceived discount and mark-up achieved from choosing to purchase (compared to not purchase).

between the *coupon-trap* and *alternative* goods on a participant's probability of purchasing the *coupon-trap* good.[38]

Figure 5 Panel A shows participants' average purchase rate of the *coupon-trap* good by the (randomly assigned) extra coupon value that would be realized if the consumer purchased the *coupon-trap* good. First, participants are willing to give up a dollar in earnings to use an additional 50 cents worth of coupon 28.5 percent of the time. Conditional on (randomly assigned) potential earnings, when the *coupon-trap* good led to using an extra $2.00 worth of coupon, buyers were 2.5 percentage points more likely to purchase the *coupon-trap* (not significant). However, when the *coupon-trap* good led to using an extra $4.00 worth of coupon, buyers were more likely to purchase the *coupon-trap* good by 6.9 percentage points, and this is significant (see Table B1 regression (1) in the appendix, $p < 0.05$). Moreover, as the trade-off between earnings lost from purchasing the *coupon-trap* good increased from $1.00 to $3.00, the purchase rate of the *coupon-trap* good decreased by 6.6 percentage points (see Table B1 regression (1) in the appendix, $p < 0.01$).

Table 3 Panel A presents the results of a regression that exploits the variation in extra earnings and extra coupon value realized (i.e., additional perceived discount) if a consumer purchases the *coupon-trap* compared to the *alternative* good in study 2A. The regression specification estimated is as follows:

$$Purchase_i = \alpha + \beta_1 \times Extra\ Earnings_i + \beta_2 \times Extra\ Coupon\ Value\ Realized_i + \beta_3 \times X_i + \epsilon_i$$

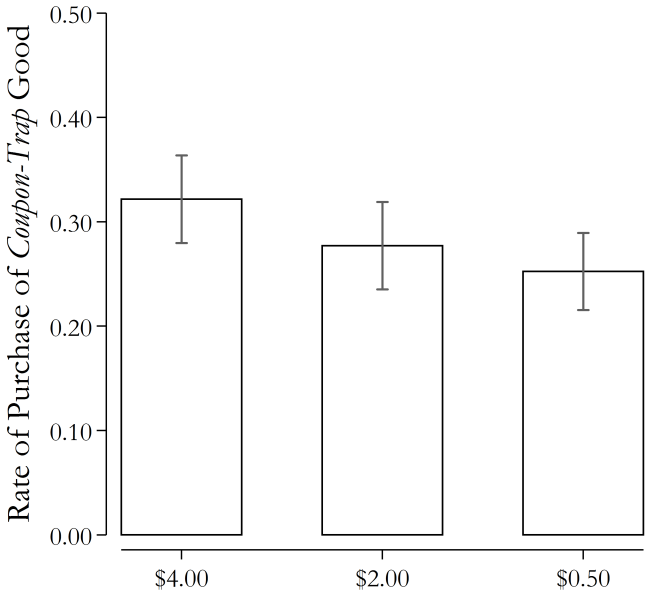
where $Purchase_i$ is whether participant i decided to purchase the *coupon-trap* good in the *Coupon Game*; $Extra\ Earnings_i$ is the extra earnings (in dollars) achieved if the consumer purchases the *coupon-trap* (compared to the *alternative* good); and $Extra\ Coupon\ Value\ Realized_i$ is the extra coupon value realized (in dollars) if the consumer purchases the *coupon-trap* good. I control for the game period and cluster the random error, ϵ_i at the individual level.

Regression (1) show the results for all participants in the *Coupon Game* when earnings are not displayed. The coefficient on extra earnings shows that participants were 3.3 percentage points less likely to purchase the *coupon-trap* good when earnings from the *coupon-trap* decreased by a dollar, and participants were 1.9 percentage points more likely to purchase the *coupon-trap* good when the extra coupon value realized increased by a dollar. For robustness, regression (2) estimates the coefficients in a Probit model and presents the marginal

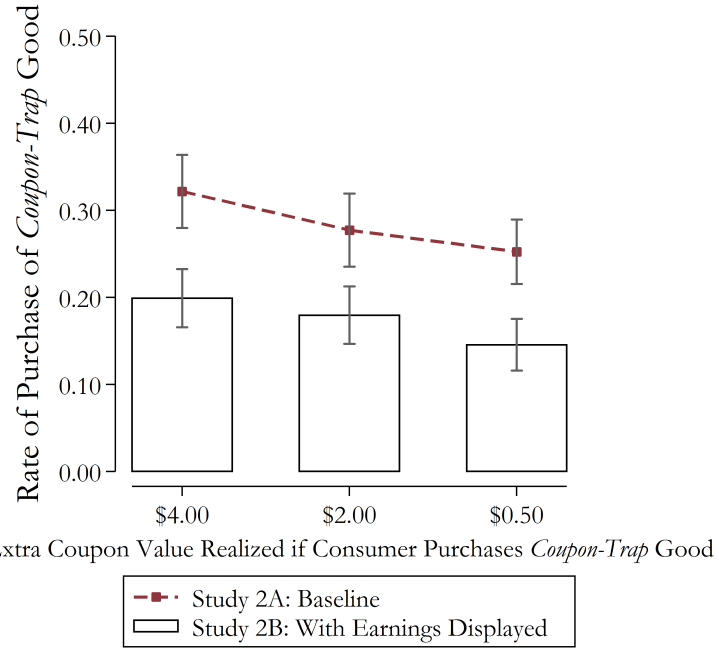
[38]This analysis parallels the analysis done in the *Discount and Mark-up Game* where I examined the trade-off between earnings and perceived mark-up on a participants' probability of purchasing the good available.

FIGURE 5: RATE OF PURCHASING THE *Coupon-Trap* GOOD
Study 2A & 2B: Coupon Game

(A) STUDY 2A: BASELINE



(B) STUDY 2B: WITH EARNINGS DISPLAYED



Note: Purchase rate of the *coupon-trap* good by experimental condition. The *coupon-trap* good is the item that uses up the entire value of the coupon which, by design, leads to a lower monetary payoff. Panel A show results for study 2A (baseline) and Panel B shows results for study 2B (with earnings displayed). Robust standard error bars clustered at the individual level are shown around each mean.

TABLE 3: TRADE-OFF BETWEEN EXTRA EARNINGS AND EXTRA COUPON VALUE REALIZED BY PURCHASING THE *Coupon-Trap* GOOD
Study 2A & 2B: Coupon Game

Panel A: Study 2A Baseline		
	Dependent Variable: Purchase of *Coupon-Trap* Good	
	OLS	Probit
	(1)	(2)
Extra Earnings (in $)	-0.033***	-0.033***
	(0.011)	(0.011)
Extra Coupon Value Realized (in $)	0.019**	0.019**
	(0.009)	(0.009)
Constant	0.336***	
	(0.052)	
Ind. Clusters	101	101
Order Control		
Observations	606	606
R-Squared	0.0103	
Panel B: Study 2B With Earnings Displayed		
	Dependent Variable: Purchase of *Coupon-Trap* Good	
	OLS	Probit
	(1)	(2)
Extra Earnings (in $)	-0.022**	-0.021**
	(0.010)	(0.010)
Extra Coupon Value Realized (in $)	0.015	0.015
	(0.010)	(0.010)
Constant	0.229***	
	(0.054)	
Ind. Clusters	103	103
Order Control		
Observations	618	618
R-Squared	0.00981	

Notes: Trade-off between extra earnings and extra coupon value realized if a consumer purchases the *coupon-trap* good on participants' purchasing choice. The *coupon-trap* good is the item that uses up the entire value of the coupon, which by design, leads to a lower monetary payoff. Panel A show results for study 2A (baseline) and Panel B shows results for study 2B (with earnings displayed). I control of the game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

effects (holding all other independent variables at their means). Results are consistent.[39]

This suggest that, conditional on earnings, individuals are responding to changes in discount gains and transaction utility can distort behavior in different settings. Notably, this was a within-subjects design. Thus the same participants who bought the *alternative* good, revealing that they did value the payoff, "switched" their purchase decision when the extra amount of coupon realized from the *coupon-trap* good was sufficiently high. They were willing to give up actual money for non-material gains in the form of transaction utility.

4.3 How robust are transaction utility effects?

Using *Study 2B: With Earnings Displayed*, I will show that my results are directionally consistent when displaying potential earnings before participants make their purchasing decisions. Recall, displaying earnings does not give the participants new information, as they can calculate their earnings with the value and original price provided. However, we should expect smaller transaction utility effects in this setting since showing earnings may encourage participants to think about their earnings, making consumption utility more salient.

Figure 5 Panel B shows the average purchase rate of the *coupon-trap* good by the (randomly assigned) extra coupon value realized if a consumer purchases the *coupon-trap* good compared to the *alternative* good (mirroring Figure 5 Panel A) for *Study 2B: With Earnings Displayed*. Results are directionally consistent with a setting where participants were not explicitly shown their earnings but differences between conditions are no longer significant in a regression (see Table B1 regressions (5) and (6) in the appendix). However, notice that participants are *still* choosing to purchase the *coupon-trap* good 15-20% of the time. Limiting the data to the "smarter" cohort of participants — participants who passed the comprehension questions on their first attempt — shows results are marginally significant (see Table B1 regressions (7) and (8) in the appendix).[40]

Table 3 Panel B presents the trade-off between extra earnings and extra coupon value realized if a consumer purchases the *coupon-trap* good (mirroring Table 3 Panel A) for participants in *Study 2B: With Earnings Displayed*. Estimates show directionally consistent results with those in the earnings not displayed treatment. Increasing the earnings lost from purchasing the *coupon-trap* good decreases its purchase rate by 2.2 percentage points. On the other hand, increasing the extra coupon value realized by a dollar increases the probability of purchasing the *coupon-trap* good by 1.5 percentage points but this is not

[39] See Table B2 regressions (1) and (2) in the appendix for estimates using only participants who passed the comprehension questions on the first try.

[40] Also see Figure B1 Panel B in the appendix.

significant. Regression (2) uses a Probit model, and reports the marginal effects holding all other independent variables at their mean, and shows a consistent story.[41]

In sum, the *Coupon Game's* transaction utility trap is easier to debias than the *Discount and Mark-up Game's* transaction utility trap. However, some directional evidence of bias remains even when earnings trade-offs are made explicit in the *Coupon Game*.

4.4 Discussion

Using the *Coupon Game*, which mirrors buying products with coupons, I showed that conditional on randomly assigned earnings from making a purchase of a *coupon-trap* good, participants respond to perceived discounts consistent with a theory of transaction utility. Results are consistent with prior work showing that coupons may increase spending by consumers (Milkman and Beshears, 2009), however, I show that not only does it increase spending but consumers are spending more on something that is "worse" for them, that is, it leads to lower consumption utility.

All participants had to answer two comprehension questions which consisted of calculating their earnings if they chose to buy item Y or item Z and they had to correctly answer both questions before proceeding to the game. While it appears that this earnings calculation is difficult, with only 50% of participants passing both comprehension question on the first try, participants had to pass the comprehension questions to proceed. As such, they are capable of doing the correct earnings calculations. One could imagine that participants who passed the comprehension questions on their first attempt are a "smarter" cohort. As a robustness check, I present results for only participants who passed the comprehension questions on the first try in the appendix (see Figure B1 and Table B1). Results are robust to this subset of "smarter" participants.[42] Importantly, participants' rate of purchase of the *coupon-trap* good is responsive to both the extra earnings and extra coupon value realized if a consumer purchases the *coupon-trap* good as predicted by the transaction utility model.[43]

Using Table 3 Panel A, I estimate participants are willing to pay 57 cents to gain a dollar of transaction utility. Coefficients in Table 3 Panel B are noisy but I can use coefficients from the "smarter" participants in Table B2 to find a lower bound: estimates suggest participants are willing to pay a minimum of 37 cents to gain a dollar of transaction

[41] See Table B2 regressions (1) and (2) in the appendix for estimates using only participants who passed the comprehension questions on the first try.

[42] While there is a level change across all six purchasing choice rounds, effects due to changes in earnings and amount of coupon value realized if a consumer purchases the *coupon-trap* good persist.

[43] See appendix B for additional results on monotonicity and heterogeneity, as well as a discussion on alternative explanations.

utility. Notice, this willingness to pay is similar to the 37-78 cents estimated in the *Discount and Mark-up Game*. While we might expect individuals to be willing to pay less for a perceived discount compared to a perceived mark-up, in accordance with loss aversion, it is possible that coupons are making transaction utility more salient, thus increasing willingness to pay.

5 General Discussion

Do consumers place value on the perceived quality of a "deal" (or, transaction utility), and if so, can it lead to material loss? This paper provides evidence that the answer is yes. Two incentive-compatible laboratory experiments, mirroring the shopping experience with discounts and coupons, demonstrate that irrelevant original prices can shift demand and lead to perverse changes in consumption decisions. I propose individuals gain utility from perceived discounts and disutility from perceived mark-ups, following past research on "transaction utility" (Thaler, 1985, 1999, 2008). Thus, individuals may choose to purchase a discounted, inferior good, or refused to purchased a marked-up, superior good, to gain transaction utility or avoid transaction disutility. Indeed, estimates with experimental data suggest participants are willing to pay 57 cents to gain a dollar of perceived discount and 78 cents to avoid a dollar of perceived mark-up.

Importantly, results from both experiments were not driven by product quality inference or study participants' inability to calculate earnings accurately. If consumers are inferring quality from an original price, then updating of beliefs may play a role in explaining distortions. However this is not possible for my study participants because they are not shown actual goods. Participants base their decisions on abstract items and randomly assigned values for these items. Moreover, participants had to successfully answer two comprehension questions to proceed to each game, thus they had the ability to do the math. Finally, effects persisted to varying degrees even after displaying potential earnings before participants made their decision. This suggest results were driven by transaction utility.

Future research should further explore the effects of attention and prior beliefs on transaction utility. Attention to irrelevant original prices may depend on the transaction context and consumers' prior experience.[44] Well-informed consumers may respond less to irrele-

[44]Prior models have theorized the effect of references prices on consumers' demand for a product using signaling (Bagwell and Riordan, 1991; Armstrong and Chen, 2013), attention (Gabaix et al., 2006; Koszegi and Szeidl, 2013), and bargain-hunting (Armstrong and Chen, 2013). These models suggest attention to prior prices and experience could mediate transaction utility effects.

vant original prices, or consumers may respond more to irrelevant original prices for rarely purchased goods (Bagwell and Riordan, 1991; Armstrong and Chen, 2013). For example, consumers rarely buy mattresses or rugs. Thus perceived sales from irrelevant original prices may be more believable, but consumers are less likely to be fooled by irrelevant original prices of everyday-products. Even within everyday-products, some consumers may be less likely to remember prior prices (Dickson and Sawyer, 1990). When faced with irrelevant original prices, consumers may find some perceived discounts and mark-ups more believable than others, based on prior experience and recall. Attention to irrelevant original prices may produce stronger responses from less-informed and inexperienced consumers than more-informed and experienced ones.

Moreover, distortions of purchasing behavior due to irrelevant original prices may only last as long as the irrelevant original prices are believable. Extremely high discounts and consistent sales may lead consumers to believe that the transaction utility gained is fake. Further research is needed to estimate consumers' sensitivity to consistent sales as well as the credibility of "fictitious" original prices. Additional research is also needed to compare different sale tactics and explore how they perform relative to one another.

Finally, future research should also focus on understanding the "half-life" of transaction utility. How long lasting is the experience of getting a good deal? What is the depreciation rate of transaction utility? Understanding how permanent transaction utility is could have important implications for consumer's welfare and long-term consumer policy and firm pricing regulations.

In general, understanding how transaction utility can affect demand is of great importance for firm pricing strategy, since virtually every retail firm engages in some form of discount or sales tactic. For example, years after JCPenney's pricing debacle, the company's sales have yet to fully recover, suggesting transaction utility could play an important role in short and long-term firm pricing strategy (Mourdoukoutas, 2017).

Regulators and policy makers will also be interested in how transaction utility can be manipulated to exploit consumers. For example, research has shown an increase in the use of inflated "fictitious" original prices by retailers. Some of the most egregious pricing practices had items offered "on sale" more than 75 percent of the time.[45]

Finally, from a litigation perspective, evidence of consumers being deceived and suffer-

[45]Beginning March 2017, Consumer's Checkbook tracked the prices offered by 19 national chains for 20 big-ticket items at each store for 44 weeks. They found the use of inflated original prices and discounts more widespread compared to similar research performed in 2014 and 2015. See Brasler (2018). Consumer's Checkbook is an independent, non-profit consumer organization founded in 1974 to provide survey information to consumers about vendors and service providers (see http://www.checkbook.org).

ing economic harm due to fictitious original prices is a necessary condition in court rulings. However, typical rulings favor the advertisers and sellers because assessing material damages associated with fictitious pricing is difficult (Friedman, 2016). Showing evidence that "fictitious" original prices distort consumer behavior and it can lead to material losses is pertinent to such lawsuits. Moreover, quantifying participant's willingness to pay to gain a dollar of perceived discount or avoid a dollar of perceived mark-up provides a benchmark for economic harm.

Overall, these finding suggest that actual monetary losses due to transaction utility are non-trivial. If firms are using fake prices to trick consumers into purchasing then transaction utility achieved is not only a non-pecuniary, intangible gain but could also be though as "fake transaction utility." From the numerous class action lawsuits, we can infer that consumer come to realize this suggesting a need for stricter regulation.

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A Discount and Mark-up Game Appendix

A.1 Robustness Checks

Table A1 tests the effect of an original price by percentage below, above, or equal to the selling price on buyer's purchasing decision. The basic regression specification is:

$$Purchase_i = \alpha + \sum_{n=1}^{7} \beta_n \times Selling\ Price\ as\ \%\ of\ Original\ Price\ Dummies_{n,i} + \sum_{j=1}^{4} \beta_{n+j} \times Selling\ Price\ Dummy_{j,i} + \epsilon_i$$

where $Purchase_i$ is whether participants i decided to purchase the item or not in the *Discount and Mark-up Game*; $Selling\ Price\ as\ \%\ of\ Original\ Price\ Dummies_{n,i}$ is a dummy for being in each discount or mark-up percentage bin; and $Selling\ Price\ Dummy_{j,i}$ is a dummy for each of the selling prices. I cluster the random error, ϵ_i, at the individual level.

Table A1: Rate of Purchasing Good by Selling Price as a Percentage of the Original Price

Study 1A & 1B: Discount and Mark-up Game

	Dependent Variable: Purchase Good							
	Study 1A Baseline				**Study 1B With Earnings Displayed**			
	All Participants		Pass Comprehension		All Participants		Pass Comprehension	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
60% Of Original Price	0.107***	0.107***	0.105***	0.105***	0.102***	0.102***	0.103***	0.103***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
80% Of Original Price	0.060***	0.060***	0.057***	0.058***	0.070***	0.070***	0.071***	0.071***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
90% Of Original Price	0.038***	0.038***	0.036***	0.036***	0.044***	0.044***	0.045***	0.045***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)
100% Of Original Price	-0.006	-0.006	-0.006	-0.006	0.018	0.018	0.016	0.016
	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.016)	(0.016)
110% Of Original Price	-0.204***	-0.204***	-0.194***	-0.194***	-0.116***	-0.116***	-0.122***	-0.122***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)
120% Of Original Price	-0.271***	-0.271***	-0.264***	-0.264***	-0.130***	-0.130***	-0.141***	-0.141***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.020)	(0.020)	(0.020)	(0.020)
140% Of Original Price	-0.337***	-0.337***	-0.330***	-0.330***	-0.189***	-0.189***	-0.198***	-0.198***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.022)	(0.022)	(0.022)	(0.022)
Constant	0.829***	0.976***	0.828***	0.974***	0.765***	0.944***	0.777***	0.944***
	(0.020)	(0.016)	(0.020)	(0.017)	(0.022)	(0.016)	(0.022)	(0.017)
Selling Price: \$7.51		-0.086***		-0.084***		-0.083***		-0.074***
		(0.012)		(0.012)		(0.014)		(0.013)
Selling Price: \$8.03		-0.221***		-0.222***		-0.276***		-0.259***
		(0.021)		(0.021)		(0.024)		(0.023)
Selling Price: \$8.42		-0.273***		-0.274***		-0.365***		-0.345***
		(0.023)		(0.024)		(0.026)		(0.026)
Ind. Clusters	178	178	174	174	180	180	173	173
Price Dummies		Yes		Yes		Yes		Yes
Order Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5696	5696	5568	5568	5760	5760	5536	5536
R-Squared	0.132	0.195	0.126	0.190	0.0521	0.165	0.0585	0.163

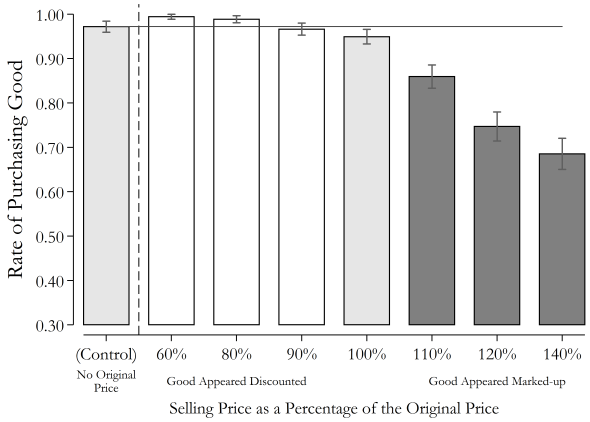
Notes: Participants' average purchase rate of the item conditional on the selling price. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Figure A1 and Figure A2 presents the average purchasing rate by selling price as a percentage of the original price for each of the four potential earnings shown to the participants in the *Discount and Mark-Up Game*. Figure A1 shows the results for the *earnings not displayed treatment* and Figure A2 shows the results for the *earnings displayed treatment*.

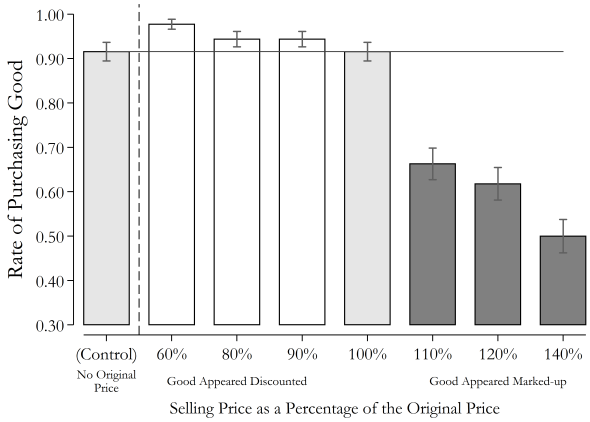
Figure A1: Buyer's Purchase Rate by Earnings

Study 1A: Discount and Mark-up Game (Baseline)

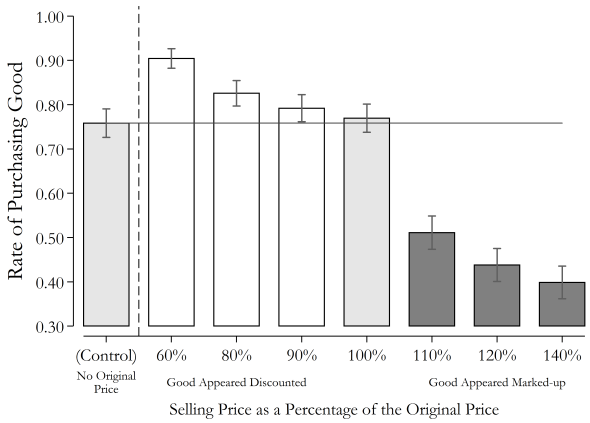
(a) Buyer's Earnings: $2.28



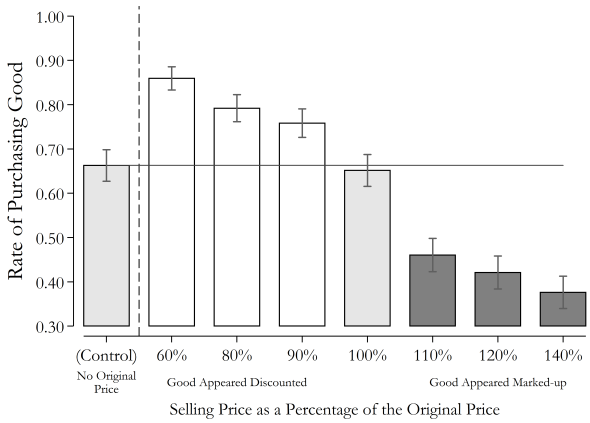
(b) Buyer's Earnings: $1.49



(c) Buyer's Earnings: $0.97



(d) Buyer's Earnings: $0.58

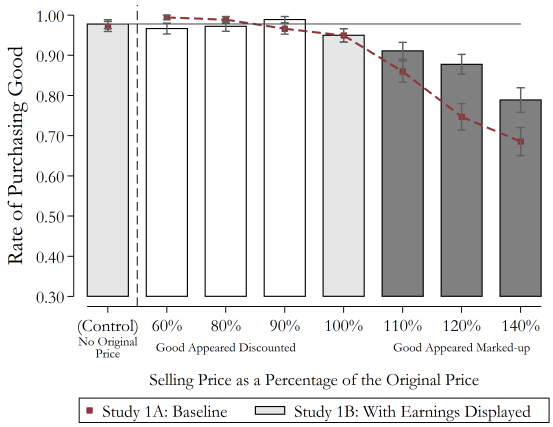


Note: Participants' average purchase rate of the item conditional on the earnings.

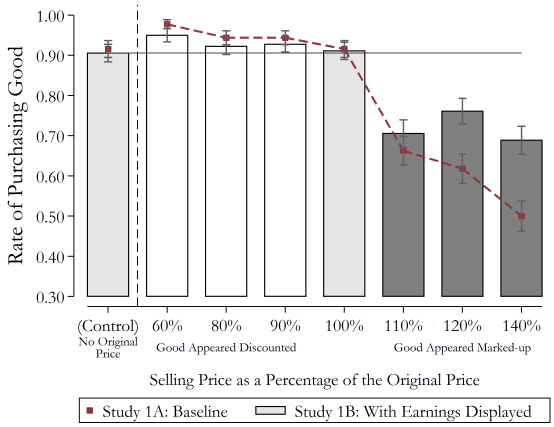
Figure A2: Buyer's Purchase Rate by Earnings

Study 1B: Discount and Mark-up Game with Earnings Displayed

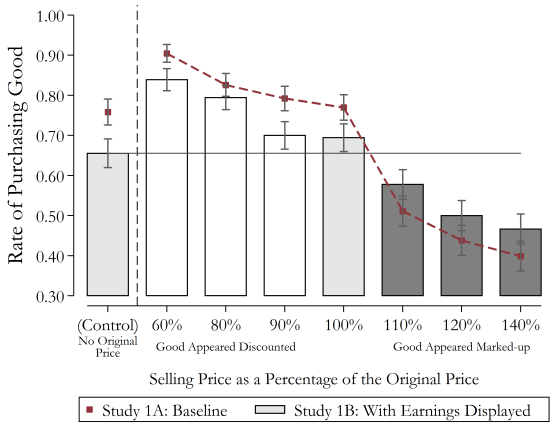
(a) Buyer's Earnings: $2.28



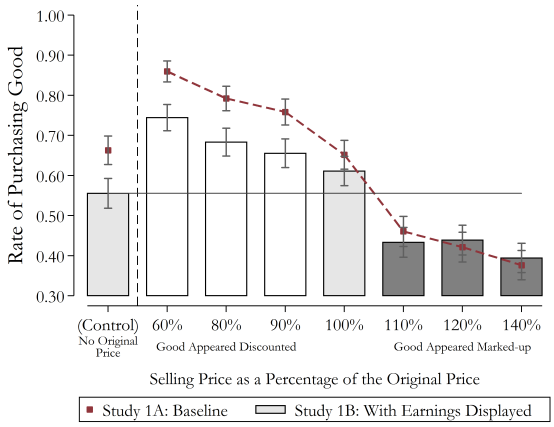
(b) Buyer's Earnings: $1.49



(c) Buyer's Earnings: $0.97



(d) Buyer's Earnings: $0.58



Note: Participants' average purchase rate of the item conditional on earnings.

Tables A2 and A3 tests the effect of an original price by percentage below, above, or equal to the selling price on buyer's purchasing decision subsetting the data or each selling price for the *earnings not displayed treatment* and *earnings displayed treatment*, respectively.

TABLE A2: PARTICIPANTS' RATE OF PURCHASING GOOD BY POTENTIAL EARNINGS
Study 1A: Discount and Mark-up Game (Baseline)

	Dependent Variable: Purchase Good							
Buyer's Selling Price:	\$6.72		\$7.51		\$8.03		\$8.42	
Buyer's Earnings:	\$2.28		\$1.49		\$0.97		\$0.58	
Buyer's Share:	76%		50%		32%		19%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
60% Of Original Price	0.022	0.023*	0.062***	0.060***	0.146***	0.147***	0.197***	0.196***
	(0.014)	(0.014)	(0.023)	(0.023)	(0.029)	(0.029)	(0.037)	(0.037)
80% Of Original Price	0.017	0.017	0.028	0.028	0.067**	0.068**	0.129***	0.130***
	(0.015)	(0.015)	(0.022)	(0.022)	(0.034)	(0.034)	(0.035)	(0.035)
90% Of Original Price	-0.006	-0.006	0.028	0.027	0.034	0.034	0.096***	0.094***
	(0.017)	(0.017)	(0.022)	(0.022)	(0.028)	(0.028)	(0.033)	(0.033)
100% Of Original Price	-0.022	-0.022	-0.000	-0.001	0.011	0.011	-0.011	-0.012
	(0.018)	(0.018)	(0.024)	(0.024)	(0.031)	(0.031)	(0.031)	(0.031)
110% Of Original Price	-0.112***	-0.112***	-0.253***	-0.253***	-0.247***	-0.247***	-0.202***	-0.203***
	(0.028)	(0.028)	(0.036)	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)
120% Of Original Price	-0.225***	-0.225***	-0.298***	-0.299***	-0.320***	-0.320***	-0.242***	-0.242***
	(0.033)	(0.033)	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)
140% Of Original Price	-0.287***	-0.287***	-0.416***	-0.416***	-0.360***	-0.360***	-0.287***	-0.286***
	(0.036)	(0.036)	(0.038)	(0.038)	(0.036)	(0.036)	(0.035)	(0.035)
Constant	0.972***	0.966***	0.916***	0.925***	0.758***	0.763***	0.663***	0.675***
	(0.012)	(0.018)	(0.021)	(0.025)	(0.032)	(0.037)	(0.036)	(0.042)
Ind. Clusters	178	178	178	178	178	178	178	178
Price Dummies		Yes		Yes		Yes		Yes
Order Control		Yes		Yes		Yes		Yes
Observations	1424	1424	1424	1424	1424	1424	1424	1424
R-Squared	0.133	0.133	0.195	0.196	0.151	0.151	0.124	0.124

Notes: Participants' average purchase rate of the item conditional on the earnings. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table A4 presents the results of the *Discount and Mark-Up Game* in a regression framework, testing the marginal effect of a perceived percentage change between the selling price and the original price on the purchasing rate. The basic regression specification is:

$$Purchase_i = \alpha + \beta_1 \times Perceived\ \%\ Change_i + \beta_2 \times Perceived\ \%\ Change \times Mark\text{-}up_i + \beta_3 \times Mark\text{-}up_i + \beta_4 \times Selling\ Price_i + \epsilon_i$$

where $Purchase_i$ is whether participant i decided to purchase the item or not in the *Discount and Mark-up Game*; $Perceived\ \%\ Change_i$ is the perceived discount (in percentage); and $Perceived\ \%\ Change \times Mark\text{-}up_i$ is the perceived mark-up (in percentage). I control for the game period and use dummies to control for the selling price. I cluster the random error, ϵ_i at the individual level.

Table A5 interacts the perceived percentage change with *earnings displayed treatment* and shows its effect on participants' purchasing decisions. The basic regression specification is:

Table A3: Buyer's Purchase Rate by Earnings

Study 1B: Discount and Mark-up Game with Earnings Displayed

	Dependent Variable: Purchase Good							
Buyer's Selling Price:	\$6.72		\$7.51		\$8.03		\$8.42	
Buyer's Earnings:	\$2.28		\$1.49		\$0.97		\$0.58	
Buyer's Share:	76%		50%		32%		19%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
60% Of Original Price	-0.011	-0.011	0.044**	0.045**	0.183***	0.189***	0.189***	0.188***
	(0.014)	(0.014)	(0.019)	(0.019)	(0.035)	(0.035)	(0.036)	(0.036)
80% Of Original Price	-0.006	-0.005	0.017	0.018	0.139***	0.139***	0.128***	0.127***
	(0.015)	(0.015)	(0.023)	(0.023)	(0.032)	(0.032)	(0.032)	(0.032)
90% Of Original Price	0.011	0.011	0.022	0.023	0.044	0.048	0.100***	0.101***
	(0.014)	(0.014)	(0.022)	(0.022)	(0.032)	(0.032)	(0.032)	(0.032)
100% Of Original Price	-0.028*	-0.028*	0.006	0.006	0.039	0.043	0.056	0.056
	(0.017)	(0.017)	(0.024)	(0.024)	(0.032)	(0.032)	(0.034)	(0.034)
110% Of Original Price	-0.067***	-0.066***	-0.200***	-0.200***	-0.078**	-0.075**	-0.122***	-0.122***
	(0.022)	(0.022)	(0.033)	(0.033)	(0.031)	(0.031)	(0.031)	(0.031)
120% Of Original Price	-0.100***	-0.100***	-0.144***	-0.145***	-0.156***	-0.156***	-0.117***	-0.115***
	(0.027)	(0.028)	(0.035)	(0.034)	(0.033)	(0.033)	(0.034)	(0.034)
140% Of Original Price	-0.189***	-0.189***	-0.217***	-0.218***	-0.189***	-0.187***	-0.161***	-0.162***
	(0.032)	(0.032)	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
Constant	0.978***	0.973***	0.906***	0.880***	0.656***	0.618***	0.556***	0.575***
	(0.011)	(0.016)	(0.022)	(0.030)	(0.036)	(0.043)	(0.037)	(0.041)
Ind. Clusters	180	180	180	180	180	180	180	180
Price Dummies		Yes		Yes		Yes		Yes
Order Control		Yes		Yes		Yes		Yes
Observations	1440	1440	1440	1440	1440	1440	1440	1440
R-Squared	0.0613	0.0614	0.0796	0.0811	0.0675	0.0692	0.0605	0.0609

Notes: Participants' average purchase rate of the item conditional on the earnings. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Perceived Percentage Change Effect on Purchasing Rate

Study 1A: Discount and Mark-up Game (Baseline)

	Dependent Variable: Purchase Good				
Buyer's Selling Price:	\$6.72	\$7.51	\$8.03	\$8.42	
Buyer's Earnings:	\$2.28	\$1.49	\$0.97	\$0.58	All
Buyer's Share:	76%	50%	32%	19%	
	(1)	(2)	(3)	(4)	(5)
Perceived % Change	0.1126***	0.1411***	0.3459***	0.4841***	0.2708***
	(0.0402)	(0.0523)	(0.0742)	(0.0875)	(0.0435)
Perceived % Change × Mark-Up	-0.6557***	-0.6892***	-0.6950***	-0.7540***	-0.6981***
	(0.1284)	(0.1128)	(0.1262)	(0.1186)	(0.0732)
Mark-Up	-0.0643**	-0.1986***	-0.2321***	-0.1981***	-0.1734***
	(0.0316)	(0.0353)	(0.0357)	(0.0322)	(0.0211)
Constant	0.9514***	0.9348***	0.7695***	0.6940***	0.9805***
	(0.0216)	(0.0234)	(0.0339)	(0.0378)	(0.0173)
Selling Price: \$7.51					-0.0900***
					(0.0125)
Selling Price: \$8.03					-0.2215***
					(0.0206)
Selling Price: \$8.42					-0.2674***
					(0.0232)
Ind. Clusters	178	178	178	178	178
Price Dummies					Yes
Order Control	Yes	Yes	Yes	Yes	Yes
Observations	1246	1246	1246	1246	4984
R-Squared	0.127	0.200	0.163	0.139	0.200

Notes: Effect of a one percent increase in perceived discount or mark-up on participants' purchase rate, conditional on earnings. I control of game period and selling price. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

$$
\begin{aligned}
Choice_i = \alpha &+ \beta_1 \times Perceived\ \%\ Change \times Mark\text{-}up \times Earnings\ Displayed_i \\
&+ \beta_2 \times Perceived\ \%\ Change \times Mark\text{-}up_i \\
&+ \beta_3 \times Perceived\ \%\ Change \times Earnings\ Displayed_i \\
&+ \beta_4 \times Earnings\ Displayed_i \\
&+ \beta_5 \times Perceived\ \%\ Change_i \\
&+ \beta_6 \times Mark\text{-}up_i \\
&+ \beta_7 \times Selling\ Price_i + \epsilon_i
\end{aligned}
$$

TABLE A5: DISPLAYING EARNINGS INCREASES CONSUMPTION UTILITY SALIENCE
Discount and Mark-up Game (Study 1A & 1B Pooled)

	Dependent Variable: Purchase Good				
Buyer's Selling Price:	$6.72	$7.51	$8.03	$8.42	
Buyer's Earnings:	$2.28	$1.49	$0.97	$0.58	All
Buyer's Share:	76%	50%	32%	19%	
	(1)	(2)	(3)	(4)	(5)
Perceived % Change × Mark-Up × Earnings Displayed	0.4046***	0.5970***	0.4098***	0.4093***	0.4570***
	(0.1221)	(0.1503)	(0.1494)	(0.1505)	(0.1186)
Perceived % Change × Mark-Up	-0.7462***	-0.7393***	-0.9191***	-0.8170***	-0.8065***
	(0.1071)	(0.1109)	(0.1153)	(0.1173)	(0.0801)
Perceived % Change × Earnings Displayed	-0.1475**	-0.0805	-0.0741	-0.1954*	-0.1249*
	(0.0645)	(0.0849)	(0.1092)	(0.1154)	(0.0666)
Earnings Displayed	0.0269	-0.0001	-0.0356	-0.0529	-0.0157
	(0.0191)	(0.0281)	(0.0424)	(0.0442)	(0.0267)
Perceived % Change	0.1384***	0.1562***	0.4048***	0.5018***	0.3010***
	(0.0420)	(0.0571)	(0.0731)	(0.0872)	(0.0456)
Mark-Up	-0.0373*	-0.1844***	-0.1625***	-0.1793***	-0.1409***
	(0.0204)	(0.0242)	(0.0243)	(0.0240)	(0.0143)
Constant	0.9420***	0.9154***	0.7301***	0.6860***	0.9796***
	(0.0181)	(0.0219)	(0.0318)	(0.0345)	(0.0181)
Selling Price: $7.51					-0.0870***
					(0.0096)
Selling Price: $8.03					-0.2454***
					(0.0157)
Selling Price: $8.42					-0.3120***
					(0.0177)
Ind. Clusters	358	358	358	358	358
Price Dummies					Yes
Order Control	Yes	Yes	Yes	Yes	Yes
Observations	2506	2506	2506	2506	10024
R-Squared	0.101	0.148	0.118	0.105	0.180

Notes: Effect of displaying earnings and a one percent increase in perceived discount or mark-up on participants' purchase rate, conditional on earnings. I control of game period and selling price. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

A.2 Regression Specification?

I note that estimates of willingness to pay may be different depending on the concavity of the transaction utility function. In practice, a number of factors could also moderate this behavior including the credibility of the reference price or the salience of transaction utility. Visual analysis of Figure 3 suggest that the effect or transaction utility is fairly linear in the experimental data, with the exception of a kink going from no discount or mark-up to a perceived mark-up. As such, my trade-off analysis uses a linear regression specification.

While a willingness to sacrifice 78 cents to avoid a dollar of perceived mark-up may seem high, note that this value may contain loss aversion over *transaction utility*. Using Table 2 regressions (4) and (7) I estimate participant's willingness to pay "removing" loss aversion. This exercise shows that participants are willing to sacrifice 43 cents in order to

TABLE A6: ROBUSTNESS CHECK: LOWER BOUND OF TRADE-OFF BETWEEN EARNINGS AND PERCEIVED MARK-UP

Study 1B: Discount and Mark-up Game with Earnings Displayed

	Dependent Variable: Purchase Good								
	Mark-up 0-40%			Mark-up 10-40% Only			Loss Aversion Adjusted		
Selling Price:	All	≥ $7.51	≥ $8.03	All	≥ $7.51	≥ $8.03	All	≥ $7.51	≥ $8.03
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Earnings (in $)	0.239***	0.318***	0.220***	0.256***	0.322***	0.228***	0.244***	0.325***	0.226***
	(0.017)	(0.030)	(0.047)	(0.019)	(0.032)	(0.051)	(0.018)	(0.030)	(0.047)
Perceived Mark-Up (in $)	-0.088***	-0.089***	-0.090***	-0.048***	-0.037***	-0.045***	-0.051***	-0.037***	-0.045***
	(0.010)	(0.010)	(0.011)	(0.010)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)
Mark-Up							-0.093***	-0.134***	-0.117***
							(0.021)	(0.025)	(0.029)
Constant	0.428***	0.355***	0.424***	0.345***	0.264***	0.335***	0.452***	0.390***	0.456***
	(0.041)	(0.048)	(0.055)	(0.046)	(0.052)	(0.061)	(0.041)	(0.049)	(0.056)
Ind. Clusters	180	180	180	180	180	180	180	180	180
Order Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2880	2160	1440	2160	1620	1080	2880	2160	1440
R-Squared	0.138	0.0865	0.0325	0.126	0.0635	0.0130	0.142	0.0927	0.0370

Notes: Trade-off between earnings and perceived mark-up. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

avoid a dollar of perceived mark-up in study 1A. Doing the same analysis using study 1B, when participants are shown their potential earnings, suggest a willingness to pay 19 cents (see Appendix Table A6, regressions (4) and (7)). [46]

A.3 Monotonic Preferences Over Transaction Utility

Given the same buyers made decisions over different levels of transaction utility, I can explore consumers preferences over perceived discounts and mark-ups. Pooling data from study 1A and 1B, I find that, conditional on earnings, 4.6% of participants never buy the "virtual" product. About 45.5% percent of participants exhibit fully rational behavior and always buy regardless of the perceived discount or mark-up. Conditional on earnings, 30.5% of participants have a single switching point from buying to not buying exhibit monotonic preferences over perceived discounts and mark-ups. The remaining 19.5% of participants have multiple switching points. Furthermore, focusing on participants who had a single switching point, I find that 30% of participants switched at the 0% to 10% mark-up range.

A.4 Heterogeneity of Transaction Utility Effect

While the sample of participants is fairly homogeneous, student from the University of Pennsylvania, I am able to explore if specific consumer traits attenuate or amplify transaction utility effects. In particular, I look at how gender and having taken a marketing 101 course have a differential effect. I also explore, participants' self-reported measures of caring about discounts and being averse to mark-ups. Finally, I look at participants' experience, both the number of lab experiment sessions they have done as well as experience in the *Discount and Mark-up Game*. To do this, I use a difference-in-difference regression that interacts the selling price as a percentage of the original price ($\frac{P}{O}$) and a binary (or categorical) measure of the 6 heterogeneity groups (see Table A7 and A8 in the appendix).

[46] Estimates show that getting a mark-up reduces the purchase rate by 14.5 percentage points in study 1A and 9.3 percentage points in study 1B. Compared to the coefficient for earnings, the effect of receiving a mark-up has is equivalent to reducing earnings by 75 cents in study 1A and 38 cents in study 1B. See Table 2 regression (7) and Table A6 regression (7) in the appendix.

First, conventional wisdom might say that women tend to enjoy shopping and buying things at discounts more. As such, we might expect women to be more susceptible to transaction utility effects compared to their male counterparts. Using data from study 1A, I find a perceived 10 percentage points increase in the selling price as a percent of the original price decreases the probability of purchasing the item by an additional 2.8 percentage points for female participants compared to male participants and this is statistically significant.[47] Results are weaker but consistent when participants were shown their potential earnings in study 1B.[48]

Second, we might expect students who have previously taken a marketing 101 course to know about discounts and promotion tactics that companies use to drive sales. As such, we might expect transaction utility effects to be attenuated for those who have taken a marketing course. Indeed, I find that participants who have taken a marketing 101 course exhibit a less steep slope. I find a perceived 10 percentage points increase in the selling price as a percent of the original price increases the probability of purchasing the item by 1.8 percentage points for participants who have taken a marketing 101 course compared those who have never taken a marketing 101 class and this is significant at the 5% level.[49]

Third, in a post-survey, participants were also ask to self-report how important discounts where to them and how averse they were to surge pricing on a 5-point likert scale.[50] Again, we find that results are correlated with self-reported measures of caring about discounts and being averse to mark-ups. In study 1A, participants who cared more about discounts or were more averse to surge pricing where more likely to not buy under mark-ups and more likely to buy under a discount compare to participants who cared less about getting discounts and were less averse to mark-ups, that is they exhibited steeper slopes. This is significant at the 1% level.[51]

Looking at participants' experience doing lab experiments, I divide my sample into participants who have below or above median number of lab sessions done.[52] I find no significant differences between those who have participated above the median number of lab sessions compare to those below in study 1A or study 1B.[53]

Finally, focusing on participants' experience in the *Discount and Mark-up Game*, I divide my data into the first 16 rounds of the game and the last 16 rounds of the game. Again, there is no significant differences between the first and second half of the game in study 1A or study 1B.[54]

[47] See Table A7 regression (1) in the appendix.

[48] See Table A8 regression (1) in the appendix.

[49] See Table A7 regression (2). Results are weaker but directionally consistent in study 1B. See Table A8 regression (2) in the appendix.

[50] Participants were asked: How important is it that your purchases contain a discounted price (that is, a mark-down on the original price)? (Examples of sales or discounts include: store discount codes, purchase rewards, or sales.) and self-reported this measure using a 5-point likert scale from "extremely important" to "not at all important". Participants were also asked: How averse are you to make a purchase knowing that the price is inflated (that is, a mark-up on the original price)? (Examples of inflated pricing include: ride share (Uber or Lyft) services at rush hour, hotels prices during peak season, airfare ticket prices during specific times, or sports events during high demand.) and self-reported this measure using a 5-point likert scale from "extremely averse" to "Not at all averse".

[51] See Table A7 regression (3) and (4) in the appendix. Results from study 1B show that coefficients are directionally consistent but not significant or marginally significant (see Table A8 regression (3) and (4) in the appendix.

[52] In study 1A, participants number of lab sessions attended ranges from 1 to 160 and in study 1B, participants' number of lab sessions attended ranges from 1 to 126. In both studies, the median number of lab sessions done is 13.

[53] See Table A7 and A8 regression (5) in the appendix.

[54] See Table A7 and A8 regression (6) in the appendix.

Table A7: Heterogeneity of Buyer's Purchase Rate
Study 1A: Discount and Mark-up Game (Baseline)

Group:	**Dependent Variable: Purchase Good**					
	Female Participant	**Taken Marketing**	**Care Discount**	**Averse Surge**	**Lab Experience**	**Last 16 Rounds**
	(1)	(2)	(3)	(4)	(5)	(6)
Group × $\frac{P}{O}$	-0.2811***	0.1898**	-0.1206***	-0.1279***	-0.0454	-0.0293
	(0.1030)	(0.0872)	(0.0410)	(0.0464)	(0.0888)	(0.0512)
Group	0.1546*	-0.0913	0.0765**	0.0779**	0.0172	0.0196
	(0.0820)	(0.0701)	(0.0341)	(0.0376)	(0.0710)	(0.0540)
$\frac{P}{O}$	-0.4170***	-0.7297***	-0.3433***	-0.3105**	-0.6128***	-0.6230***
	(0.0905)	(0.0620)	(0.1062)	(0.1254)	(0.0660)	(0.0493)
Constant	1.4059***	1.5728***	1.3426***	1.3303***	1.5190***	1.5112***
	(0.0738)	(0.0537)	(0.0885)	(0.1024)	(0.0548)	(0.0422)
Ind. Clusters	178	178	178	178	178	178
Price Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Order Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4984	4984	4984	4984	4984	4984
R-Squared	0.203	0.201	0.200	0.202	0.186	0.185

Notes: Participants' average purchase rate of the item conditional on the earnings. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table A8: Heterogeneity of Buyer's Purchase Rate
Study 1B: Discount and Mark-up Game with Earnings Displayed

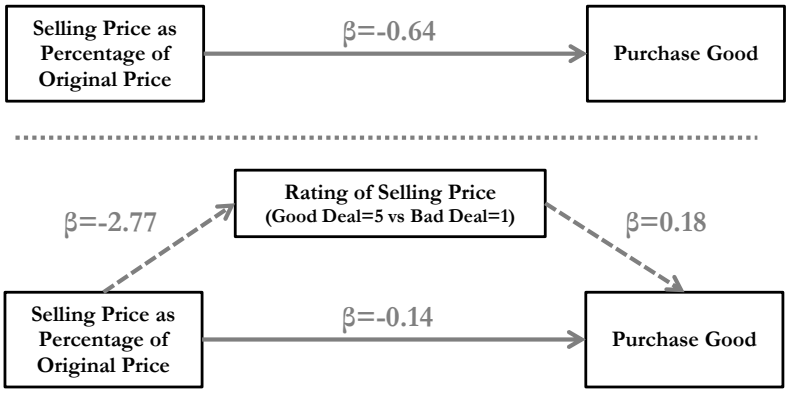
Group:	**Dependent Variable: Purchase Good**					
	Female Participant	**Taken Marketing**	**Care Discount**	**Averse Surge**	**Lab Experience**	**Last 16 Rounds**
	(1)	(2)	(3)	(4)	(5)	(6)
Group × $\frac{P}{O}$	-0.1792**	0.0598	-0.0623	-0.0772*	0.1262	-0.0100
	(0.0884)	(0.0858)	(0.0411)	(0.0410)	(0.0797)	(0.0453)
Group	0.1080	-0.0100	0.0324	0.0405	-0.0608	-0.0034
	(0.0800)	(0.0772)	(0.0351)	(0.0370)	(0.0725)	(0.0472)
$\frac{P}{O}$	-0.2796***	-0.4310***	-0.2603***	-0.2025*	-0.4801***	-0.4050***
	(0.0755)	(0.0472)	(0.0924)	(0.1061)	(0.0603)	(0.0430)
Constant	1.2436***	1.3256***	1.2440***	1.2137***	1.3564***	1.3132***
	(0.0690)	(0.0442)	(0.0786)	(0.0969)	(0.0569)	(0.0419)
Ind. Clusters	180	180	180	180	180	180
Price Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Order Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5040	5040	5040	5040	5040	5040
R-Squared	0.166	0.162	0.164	0.168	0.166	0.159

Notes: Participants' average purchase rate of the item conditional on the earnings. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

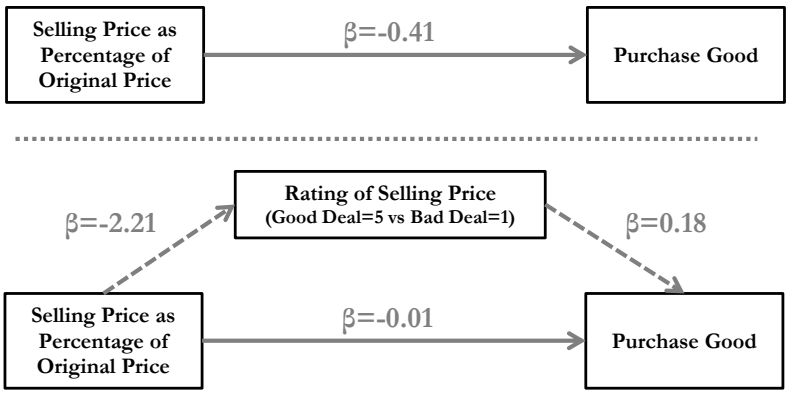
A.5 Mediation: Participants' Perception of the Deal

FIGURE A3: MEDIATION ANALYSIS
Study 1A & 1B: Discount and Mark-up Game

(A) STUDY 1A: BASELINE



(B) STUDY 1B: WITH EARNINGS DISPLAYED



Note: Mediation analysis: using participant's rating of the selling price shown.

In study 1A and study 1B, I also asked participants to rate their selling price on a scale from 1-5 where 1 is a "very bad deal" and 5 is a "very good deal".[55] While this measure was not incentivized, I use participants' reported perceptions of getting a good deal or a bad deal to do a mediation analysis. Table A1 regressions (2) and (5) in the appendix shows that in both study 1A and study 1B the perceived discount or mark-up is a significant predictor of the participants' perception of the deal: as the selling price as a percentage of the original price ($\frac{P}{O}$) increase, participant's rating of the price decreases and this is significant (regression coefficient in study 1A is -2.77 and coefficient in study 1B is -2.21). Moreover, including participant's rating of the deal reduces the effect of selling price as a percentage

[55]This questions was asked on the same decision screen the buyer where buyers made their purchasing decision. Figure C3 in Appendix C.1 shows an example.

of the original price ($\frac{P}{O}$). In study 1A the coefficient of $\frac{P}{O}$ is reduced to -13.9 percentage points (compared to 63.8 percentage points in a regression without the mediator). In study 1B the coefficient of $\frac{P}{O}$ is reduced to -0.8 percentage points and not significant (compared to 41.1 percentage points in a regression without the mediator). This suggest, that discounts and mark-ups alter participant's perceptions of the terms of the transactions, even when consumption utility is constant, and this in turn distorts their purchasing behavior.

TABLE A9: BUYER'S PURCHASE RATE BY MEDIATED BY PERCEIVED DEAL
Study 1A & 1B: Discount and Mark-up Game

	Study 1A Baseline			Study 1B Earnings Displayed		
Dependent Variable:	**Purchase Good**	**Rate Deal**	**Purchase Good**	**Purchase Good**	**Rate Deal**	**Purchase Good**
	(1)	(2)	(3)	(4)	(5)	(6)
Rate Deal			0.1803***			0.1815***
			(0.0147)			(0.0142)
$\frac{P}{O}$	-0.6380***	-2.7685***	-0.1388***	-0.4101***	-2.2136***	-0.0082
	(0.0442)	(0.1052)	(0.0380)	(0.0396)	(0.1149)	(0.0337)
Constant	1.5286***	6.3858***	0.3770***	1.3218***	6.0147***	0.2299***
	(0.0393)	(0.0953)	(0.0838)	(0.0379)	(0.1080)	(0.0792)
Ind. Clusters	178	178	178	180	180	180
Price Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Order Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4984	4984	4984	5040	5040	5040
R-Squared	0.185	0.468	0.290	0.159	0.389	0.288

Notes: Participants' average purchase rate of the item conditional on the earnings. I control for game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

A.6 Alternative Explanations?

Could there be alternative explanations for these experimental results? Below I address potential channels such as ability to calculate earnings, signaling, anchoring, and experimenter demand.

I find that results are not driven by participant's inability to calculate their earnings. All participants had to answer two comprehension questions which consisted of calculating their earnings if they chose to purchase the item or not, and 97% of participants passed both comprehension questions on the first try. This suggest that individuals are capable of doing the correct earnings calculations, and this is a relatively simple calculation. Moreover, results are consistent when I restrict my sample to only the 97% of participants who passed the comprehension questions on the first try. Importantly, participants' purchasing rate is responding to both the selling price *and* the irrelevant original price as predicted by the transaction utility model. Moreover, participants continue to respond to irrelevant original prices even when their potential earnings are displayed.

Perhaps participants are making their purchasing decisions based on prior experiences or perceived discounts or mark-ups seen in previous rounds? First, all participants are told to treat each round independently since only one round will be chosen for payment if the participant is selected to be the buyer. Furthermore, a regression controlling for the perceived discount or mark-up seen (up to three periods) shows that the effect of prior discounts and mark-ups is not significant.[56]

Maybe the original price is signaling something else about the social norms or standard of transactions? I find this is not the case. If there are any additional signals from the original

[56] Another way to test how robust results were to prior discounts and mark-ups would have been to only look at results from the first period. I chose not to do this analysis because reducing the sample to only the first period would lead to only 1-10 observations per treatment cell.

price, we might expect to see a differential effect in the first half compared to the second half of the study — that is, after participants have seen a large set of randomly assigned original prices, they would realize that any signal from the original price is just noise. As previously stated, I find that the effect between the first and second half of the study is nearly identical.[57]

Could this just be an anchoring effect? Prior research has shown that anchoring effects are stronger under judgment uncertainty. For example, when you are uncertain about the quality of wine you might anchor to the last two digits of your social security number or when you are uncertain about the number of countries in Africa you might anchor to the (random) previous number you saw (Kahneman, 1992). In my study, judgment uncertainty is removed or minimized by fixing the buyer's value and seller's cost, so anchoring effects should be minimal. However, if transaction utility exists then individuals need a "reference point" to derive positive or negative transaction utility. Since I'm providing "virtual" products with no prior "reference price," participants might "anchor" to the original price as the reference price to evaluate *transaction utility*. In any case, this could mean that the formation of reference points and its effects on consumer's decisions may not be fully understood and this research seeks further understand and unpack the importance of reference points in the presence of transaction utility.

You might think experimenter demand might be driving these results. Again, I find this is not the case. First, we could expect participants who have done several lab experiments to be less susceptible to experimenter demand — a sort of diminishing sensitivity due to constant exposure. As previously stated, I find that there is no difference in transaction utility effects between rookie and veteran lab experiment participants.[58] Moreover, in the spirit of de Quidt et al. (2018), where experimenter demand can be bounded by the effect of asking participants to behave in the two extremes of a prediction, study 1B provides such a test. In study 1B, participants are displayed their potential earnings prior to making their decision. This could be thought of as producing experimenter demand for participants to place more value on their earnings. As such, finding that transaction utility is robust to that setting provides a *lower bound* of transaction utility effects.[59]

[57] See Table A7 and A8 regression (6) in the appendix.

[58] See Table A7 and A8 regression (5) in the appendix.

[59] If asking participants to rate how good or bad of a deal their selling price hinted to participants that this was a study about the deal perception, a counter argument could be that by allowing participants to voice out if the deal was good or not and separately choose to buy or not, transaction utility effect could have actually been attenuated. Asking participants to rate the deal allowed them to tell the experimenter that they know a selling price was a bad deal and *still* choose to purchase the "virtual" product to get positive earnings without feeling foolish. In fact, I find that even participants who, conditional on earnings, always purchased the product, they would still rate the price as a bad deal when they perceived a mark-up.

B Coupon Game Appendix

B.1 Robustness Check

Table B1 presents the results of the *Coupon Game* in a regression framework, testing the effect of extra earnings and extra amount of coupon value used up from purchasing the *coupon-trap* good on participants' purchase decision. The basic regression specification is:

$$\begin{aligned} \textit{Purchase}_i =& \alpha + \beta_1 \times \textit{\$4.00 Extra Coupon Value Used Dummy}_i \\ &+ \beta_2 \times \textit{\$2.00 Extra Coupon Value Used Dummy}_i \\ &+ \beta_3 \times \textit{-\$3.00 Extra Earnings}_i + \epsilon_i \end{aligned}$$

where $Purchase_i$ is whether participant i decided to purchase the *coupon-trap* good by participant i; *\$4.00 Extra Coupon Value Used Dummy*$_i$ is a dummy for being in a round where purchasing the *coupon-trap* good leads to using an extra \$4.00 worth of coupon value; *\$2.00 Extra Coupon Value Used Dummy*$_i$ is a dummy for being in a round where purchasing the *coupon-trap* good leads to using an extra \$2.00 worth of coupon value; *-\$3.00 Extra Earnings*$_i$ is a dummy for being in a round where purchasing the *coupon-trap* good leads to -\$3.00 in extra earnings (compared to -\$1.00 in extra earnings). I cluster the random error, ϵ_i, at the individual level.

Table B1: Rate of Purchasing the *Coupon-Trap* Good

	Dependent Variable: Purchase *Coupon-Trap* Good							
	Study 2A Baseline				**Study 2B With Earnings Displayed**			
	All Participants		Pass Comprehension		All Participants		Pass Comprehension	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\$4.00 Extra Coupon Value Realized	0.069**	0.067**	0.066*	0.063*	0.053	0.054	0.094*	0.094*
	(0.031)	(0.031)	(0.033)	(0.033)	(0.035)	(0.035)	(0.049)	(0.049)
\$2.00 Extra Coupon Value Realized	0.025	0.023	0.009	0.005	0.034	0.032	0.021	0.021
	(0.025)	(0.025)	(0.029)	(0.028)	(0.028)	(0.028)	(0.033)	(0.033)
Constant	0.285***	0.315***	0.239***	0.287***	0.168***	0.211***	0.087**	0.085
	(0.038)	(0.048)	(0.051)	(0.063)	(0.031)	(0.048)	(0.035)	(0.052)
-\$3.00 Extra Earnings	-0.066***	-0.066***	-0.101***	-0.103***	-0.045**	-0.044**	-0.007	-0.007
	(0.022)	(0.022)	(0.028)	(0.029)	(0.020)	(0.020)	(0.021)	(0.021)
Ind. Clusters	101	101	53	53	103	103	48	48
Order Control		Yes		Yes		Yes		Yes
Observations	606	606	318	318	618	618	288	288
R-Squared	0.00940	0.0104	0.0201	0.0229	0.00694	0.00994	0.0152	0.0153

Notes: Rate of purchasing the *coupon-trap* good, the item that uses up the entire value of the coupon which, by design, leads to a lower earnings. I control of the game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

B.2 Robustness Check: "Smarter" Cohort Only

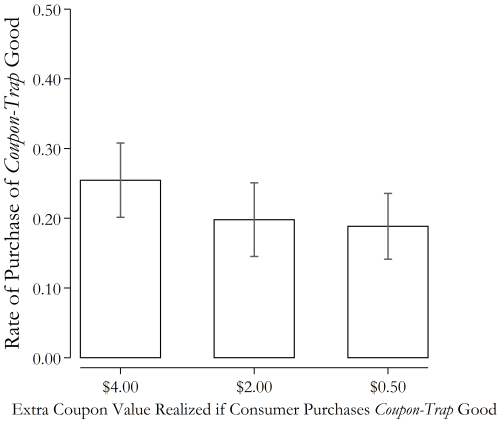
Figure B1 presents the average purchase rate of the *coupon-trap* good for individuals who passed the comprehension questions on the first attempt.

Table B2 presents trade-off between earnings loss and discount gain for individuals who passed the comprehension questions on the first attempt.

B.3 Monotonic Preferences Over Transaction Utility

Given the same buyers made decisions over different levels of transaction utility, I can explore consumers' preferences over different levels of coupon value realized. Pooling data from study 2A and 2B, I find that, conditional on earnings, 63% of participants exhibit fully rational behavior and never buy the *coupon-trap* good. Conditional on earnings, 15% of participants buy the *coupon-trap* good once, 11% of participants buy the *coupon-trap* good twice, and 10% of participants always buy the *coupon-trap* good. Moreover, of the 26% of participants

(A) Study 2A: Baseline



(B) Study 2B: Earnings Displayed

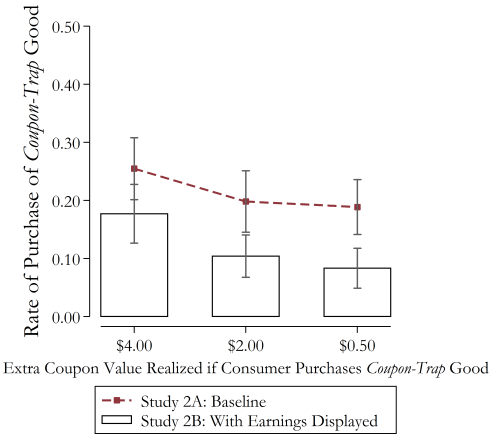


Figure B1: Rate of Purchasing the *Coupon-Trap* Good (Smarter Cohort: Pass Comprehension on First Try Only)

Note: Rate of purchasing the *coupon-trap* good, that is, the item that uses up the entire value of the coupon which, by design, leads to a lower monetary payoff. Results includes only participants who passed the comprehension question on the first try only. Results are consistent with using all data. Robust standard error bars clustered at the individual level are shown around each mean.

Table B2: Rate of Purchasing the *Coupon-Trap* Good (Smarter Cohort)

Dependent Variable: Purchase of *Coupon-Trap* Good				
	Study 2A Baseline		**Study 2B With Earnings Displayed**	
	OLS	Probit	OLS	Probit
	(1)	(2)	(3)	(4)
Extra Earnings (in $)	-0.051***	-0.051***	-0.003	-0.003
	(0.014)	(0.014)	(0.011)	(0.011)
Extra Coupon Value Realized (in $)	0.019*	0.018*	0.027*	0.027*
	(0.010)	(0.009)	(0.014)	(0.014)
Constant	0.320***		0.067	
	(0.073)		(0.059)	
Ind. Clusters	53	53	48	48
Order Control	Yes	Yes	Yes	Yes
Observations	318	318	288	288

Notes: Rate of purchasing the *coupon-trap* good, the item that uses up the entire value of the coupon which, by design, leads to a lower earnings. Results includes only participants who passed the comprehension question on the first try only. Results are consistent with using all data. I control of the game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

who choose to buy the *coupon-trap* good at least once, 81% of them exhibit monotonic preferences over coupon value realized. The remaining 19% of participants have multiple switching points.

B.4 Heterogeneity of Transaction Utility Effect

Similar to the *Discount and Mark-up Game*, I explore consumer heterogeneity in the *Coupon Game*. Looking at the same six groups as before: participant gender, having taken a marketing 101 course, participants' self-reported measures of caring about discounts and being averse to mark-ups, and participant's experience in lab sessions done as well as the *Coupon Game*. I find that coefficients are not statistically significant (see Table B3 in the appendix).

TABLE B3: HETEROGENEITY OF BUYER'S PURCHASE RATE OF *Coupon-Trap* GOOD
Study 2A & 2B: Coupon Game

Group:	**Dependent Variable: Purchase of *Coupon-Trap* Good**					
	Female Participant	**Taken Marketing**	**Care Discount**	**Averse Surge**	**Lab Experience**	**Last 3 Rounds**
	(1)	(2)	(3)	(4)	(5)	(6)
Group × Extra Coupon Value Realized	-0.0043	-0.0026	0.0000	0.0061	-0.0091	-0.0009
	(0.0151)	(0.0140)	(0.0085)	(0.0071)	(0.0138)	(0.0149)
Extra Coupon Value Used	0.0203	0.0179**	0.0170	0.0011	0.0210***	0.0176*
	(0.0130)	(0.0082)	(0.0232)	(0.0197)	(0.0076)	(0.0103)
Group	-0.0076	0.0689	0.0113	-0.0272	0.0446	0.0164
	(0.0637)	(0.0573)	(0.0294)	(0.0307)	(0.0524)	(0.0466)
-$3.00 Extra Earnings	-0.0546***	-0.0545***	-0.0545***	-0.0546***	-0.0545***	-0.0542***
	(0.0148)	(0.0148)	(0.0148)	(0.0147)	(0.0148)	(0.0149)
Display Earnings	-0.1092**	-0.0975**	-0.1081**	-0.1061**	-0.1098**	-0.1090**
	(0.0453)	(0.0446)	(0.0451)	(0.0451)	(0.0453)	(0.0452)
Constant	0.3159***	0.2807***	0.2814***	0.3793***	0.2911***	0.3146***
	(0.0684)	(0.0472)	(0.0900)	(0.0962)	(0.0473)	(0.0470)
Ind. Clusters	204	204	204	204	204	204
Order Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1224	1224	1224	1224	1224	1224
R-Squared	0.0268	0.0315	0.0271	0.0281	0.0276	0.0266

Notes: Rate of purchasing the *coupon-trap* good, the item that uses up the entire value of the coupon which, by design, leads to a lower earnings. I control of the game period. Robust standard errors in parentheses. Standard errors clustered at the individual level. Significance: *** p<0.01, ** p<0.05, * p<0.1.

B.5 Alternative Explanations?

Are participants anchoring to the $5 coupon value? As previously stated, in my study, judgment uncertainty is removed or minimized by fixing the buyer's value of the two products, so anchoring effects should be minimal. However, if transaction utility exists then individuals may anchor to $5.00 as the target amount of transaction utility to achieve. In a companion paper (Huang, 2018), I provide suggestive evidence that coupon values may act as targets increasing the weight placed on transaction utility.

You might think experimenter demand might be driving these results. Again, I find this is not the case. First, we could expect participants who have done several lab experiments to be less susceptible to experimenter demand — a sort of diminishing sensitivity due to constant exposure. As previously stated, I find that there is no difference in transaction utility effects between rookie and veteran lab experiment participants.[60] Moreover, in the spirit of de Quidt et al. (2018), study 2B provides such a test. In study 2B, participants are displayed their potential earnings prior to making their decision. This could be thought of

[60] See Table B3 regression (5) in the appendix.

as producing experimenter demand for participants to place more value on their earnings. In study 2B, while the slope effect is only directionally consistent, participants are still choosing to purchase the *coupon-trap* good 15-20% of the time (see Figure 5 Panel B). Furthermore, focusing on only the smarter cohort of participants who passed the comprehension check on the first try in Study 2B, I find that participants are 9.4 percentage points more likely to buy the *coupon-trap* good when the extra coupon value realized is \$4.00 compared to \$0.50 and this is a marginally significant (see Table B1 regression (7) and (8)).

C Experimental Protocols

General Instructions

This is part 2 of the Decision Making Study. In this part of the study you will be participating in two games (Game A and Game B) in which you play the role of a buyer. Below is a brief description of each game.

- Game A: As a buyer in Game A, you will encounter a store. You will review the price of 32 items in the store and decide if you would like to purchase the item or not. As such, you will be playing a total of 32 rounds in Game A.
- Game B: As a buyer in Game B, you will review the prices of two items and decide which item you would like to purchase. You will be playing a total of 6 rounds in Game B.

At the end of the session, the lab coordinator will randomly select one participant to be the buyer for each of the two games. If you are randomly selected to be the buyer, then one of your rounds in that game will be randomly selected for bonus payment.
Please click "Next" to read the instructions for Game A.

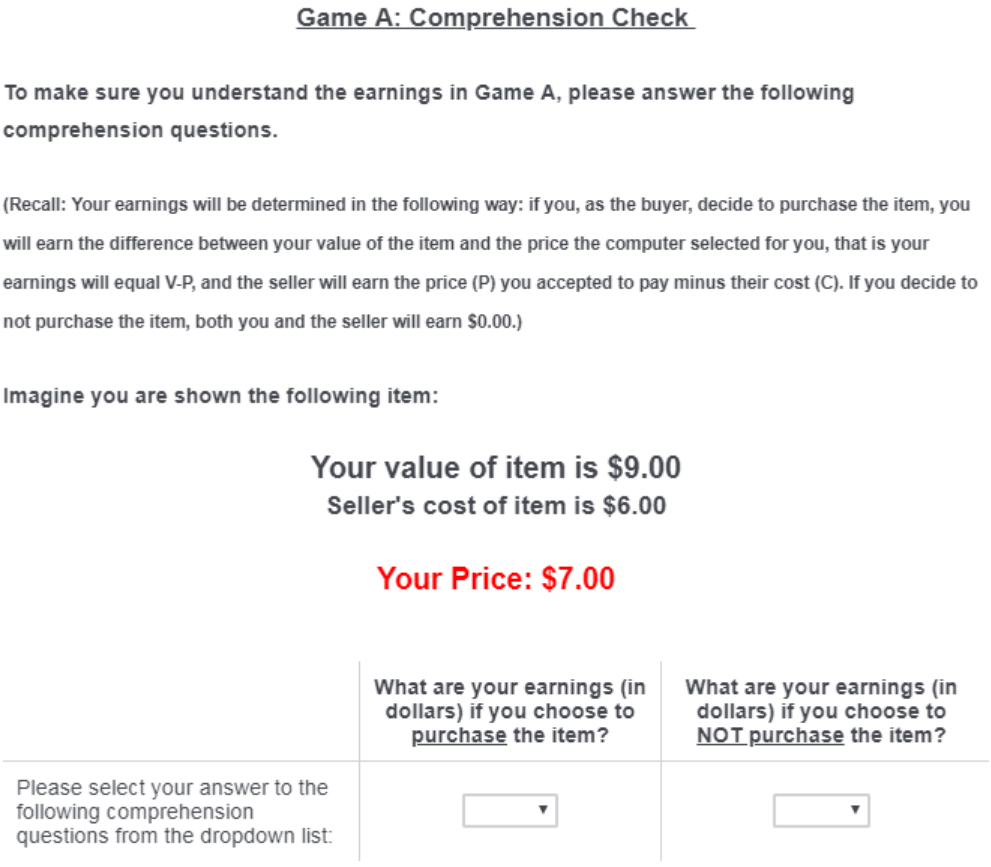
C.1 Discount and Mark-up Game

Game A: Instructions

In this game you play the role of a buyer. As a buyer, you will encounter a store. You will review the price of 32 items in the store and decide if you would like to purchase the item or not. As such, you will be playing a total of 32 rounds in Game A.
In this game, you will value each item at the store at \$9.00 while the seller has a cost of \$6.00.
For each item, you will be told how much you value (V) the item. Then the computer will determine the price (P) of the item for you. The computer will give you either a price with a discount (that is, a mark-down on the original price), a price with an inflated price (that is, a mark-up on the original price), or the original price (that is, neither a discounted nor marked-up price). The computer may also show you the original price other participants in this study have been offered for each of the items. You will decide whether or not you want to purchase the each item at the price the computer selected for you.

Game A: Earnings and Bonus Payment

Your earnings will be determined in the following way: if you, as the buyer, decide to purchase the item, you will earn the difference between your value of the item and the price the computer selected for you, that is your earnings will equal V-P, and the seller will earn the price (P) you accepted to pay minus their cost (C). If you decide to not purchase the item, both you and the seller will earn \$0.00.
At the end of the session, the lab coordinator will randomly select one participant to be the buyer in Game A. If you are randomly selected to be the buyer, then one of your rounds in Game A will be randomly selected for bonus payment. You will receive your earnings from that round. The lab coordinator will also randomly select a different participant to be the seller. If you are randomly selected to be the seller, your earnings will not depend on your decisions.
Note: you should make all your decisions assuming you are the buyer.
Each round is independent of the others. Note that the price may be different from item to item. Please make each of your choices carefully. Remember, you may be selected as the buyer, in which case one of your rounds will be selected for payment. Since only one round is randomly chosen for payment you should treat each round as if it is the one and only round chosen for payment.
Please click "Next".



Game A: Comprehension Check

To make sure you understand the earnings in Game A, please answer the following comprehension questions.

(Recall: Your earnings will be determined in the following way: if you, as the buyer, decide to purchase the item, you will earn the difference between your value of the item and the price the computer selected for you, that is your earnings will equal V-P, and the seller will earn the price (P) you accepted to pay minus their cost (C). If you decide to not purchase the item, both you and the seller will earn $0.00.)

Imagine you are shown the following item:

Your value of item is $9.00
Seller's cost of item is $6.00

Your Price: $7.00

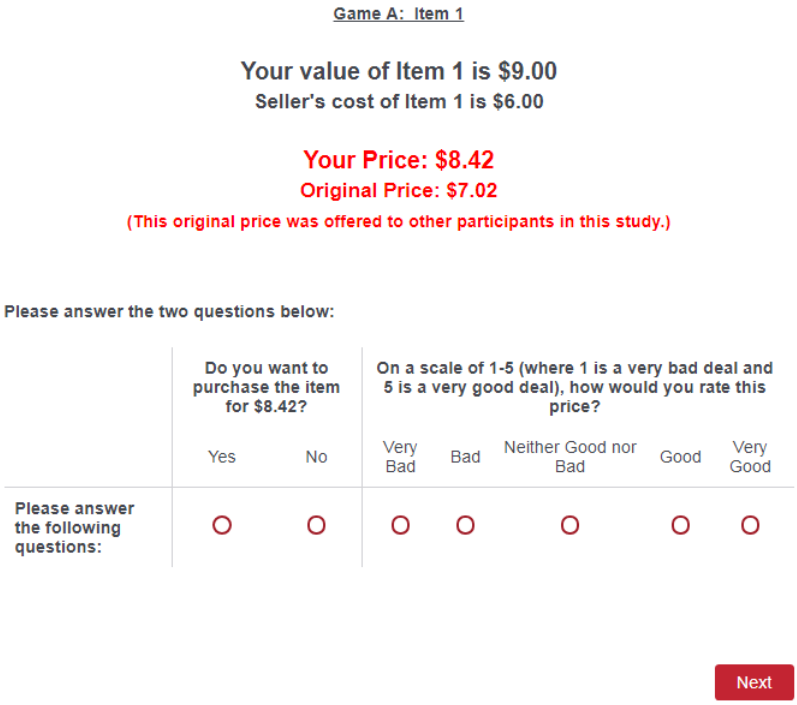
	What are your earnings (in dollars) if you choose to purchase the item?	What are your earnings (in dollars) if you choose to NOT purchase the item?
Please select your answer to the following comprehension questions from the dropdown list:		

FIGURE C2: COMPREHENSION QUESTIONS
Discount and Mark-up Game

Game A

You have entered Game A. In this game, the computer may show you the original price that other participants in this study have been offered for each of the items, your value (V) of the item (that is, how much you value the item), and the price (P) the computer selected for you. The computer will give you either a price with a discount (that is, a mark-down on the original price), a price with an inflated price (that is, a mark-up on the original price), or the original price (that is, neither a discounted nor marked-up price). You will decide whether or not you want to purchase the each item at the price the computer selected for you.
You will be asked whether you want to buy each of the 32 different items.

(A) Earnings Not Displayed



(B) Earnings Displayed

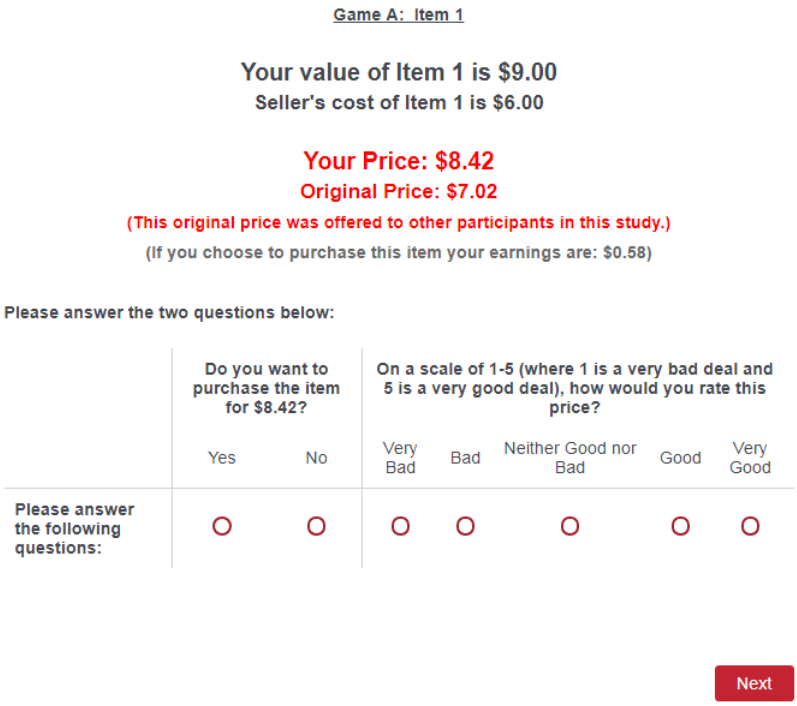


Figure C3: Participants' Decision Problem
Discount and Mark-up Game Game

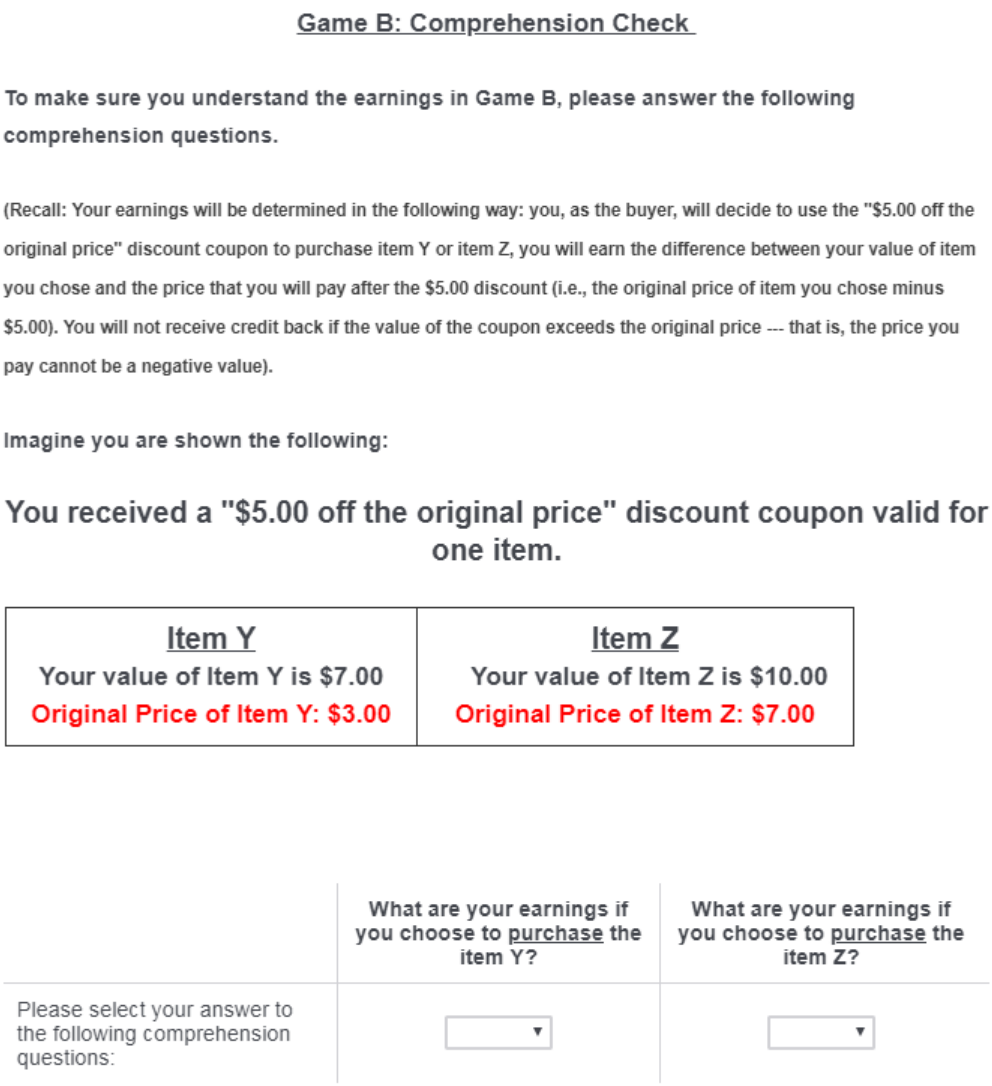
C.2 Coupon Game

Game B: Instructions

In this game you play the role of a buyer. As a buyer, you will review the original prices of two items and decide which item you would like to purchase. You can only buy one item in each round. You will be playing a total of 6 rounds in Game B.
In this game, you will value item Y at $6.00 and item Z at $8.00. You have received a "$5.00 off the original price" discount coupon valid for one item.
For both, item Y and item Z, the computer will show you how much you value each item. You will also be shown the original price of item Y and the original price of item Z. Since you have received a "$5.00 off the original price" discount coupon valid for one item, the price that you pay will be the original price of the item minus $5.00. You will decide whether you want to use the "$5.00 off the original price" discount coupon to purchase item Y or item Z.

Game B: Earnings and Bonus Payment

Your earnings will be determined in the following way: if you, as the buyer, decide to use the "$5.00 off the original price" discount coupon to purchase item Y, you will earn the difference between your value of item Y and the price that you will pay after the $5.00 discount (i.e., the original price of item Y minus $5.00). You will not receive credit back if the value of the coupon exceeds the original price (that is, the price you pay cannot be a negative value). Similarly, if you decide to use the "$5.00 off the original price" discount coupon to purchase item Z, you will earn the difference between your value of item Z and the price that you will pay after the $5.00 discount (i.e., the original price of item Z minus $5.00). You will not receive credit back if the value of the coupon exceeds the original price (that is, the price you pay cannot be a negative value).
At the end of the session, the lab coordinator will randomly select one participant to be the buyer in Game B. If you are randomly selected to be the buyer, then one of your rounds in Game B will be randomly selected for bonus payment. You will receive your earnings from that round.
Each round is independent of the others. Note that the price may be different from item to item. Please make each of your choices carefully. Remember, you may be selected as the buyer, in which case one of your rounds will be selected for payment. Since only one round is randomly chosen for payment you should treat each round as if it is the one and only round chosen for payment.
Please click "Next" to Begin.



Game B: Comprehension Check

To make sure you understand the earnings in Game B, please answer the following comprehension questions.

(Recall: Your earnings will be determined in the following way: you, as the buyer, will decide to use the "$5.00 off the original price" discount coupon to purchase item Y or item Z, you will earn the difference between your value of item you chose and the price that you will pay after the $5.00 discount (i.e., the original price of item you chose minus $5.00). You will not receive credit back if the value of the coupon exceeds the original price --- that is, the price you pay cannot be a negative value).

Imagine you are shown the following:

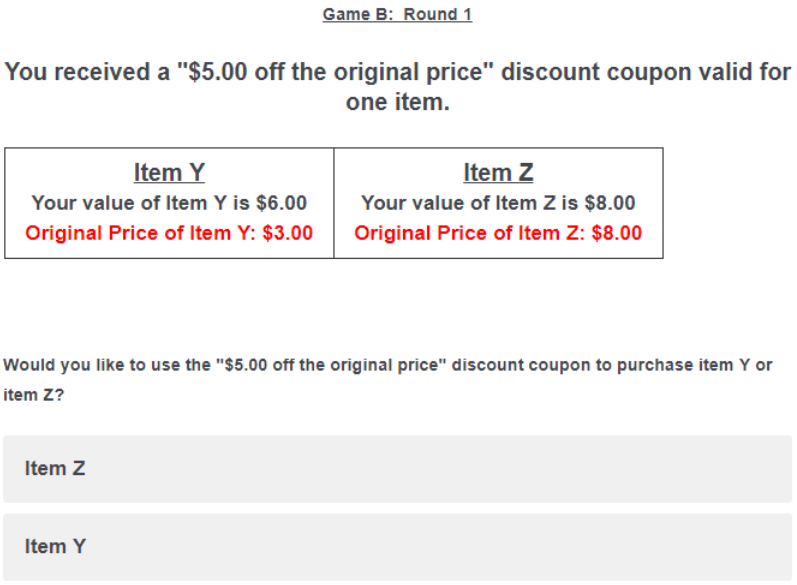
You received a "$5.00 off the original price" discount coupon valid for one item.

Item Y	Item Z
Your value of Item Y is $7.00	Your value of Item Z is $10.00
Original Price of Item Y: $3.00	Original Price of Item Z: $7.00

	What are your earnings if you choose to purchase the item Y?	What are your earnings if you choose to purchase the item Z?
Please select your answer to the following comprehension questions:	▾	▾

FIGURE C4: COMPREHENSION QUESTIONS
Coupn Game

(A) Earnings Not Displayed



(B) Earnings Displayed

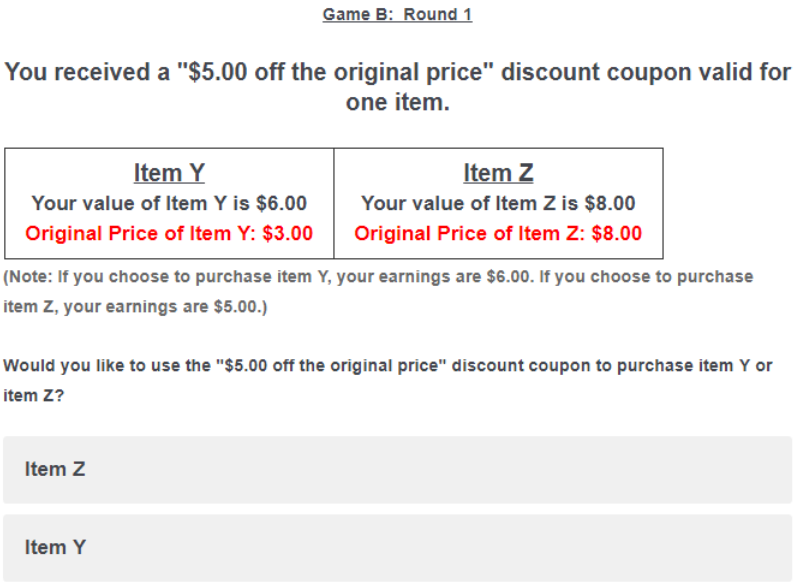


Figure C5: Participants' Decision Problem
Coupon Game