Two Essays on the Effect of Social Norms on Marketing Actions

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Abstract

Research has demonstrated that social norms can impact behavior and consumption in a meaningful way. A better understanding of social norms can result in a better understanding of consumers and of market dynamics and indicate a way for firm to improve their profitability.

In *Essay 1: The Effect of Social Pressure on Corporate Social Responsibility*, I investigate consumers' reactions to products that include donations (a form of Corporate Social Responsibility, CSR). I identify "warm glow" and "social pressure" as the two principal drivers. On one hand, products offered by CSR-engaged firms are more appealing because of the warm glow consumers derive from choosing a product associated with a donation to their favored causes; such products directly enhance customer utility. On the other hand, once donations reach a threshold amount, consumers might feel social pressure to reciprocate the firm's donation. While such pressure can move some consumers to buy the product, it reduces utility and can lead some consumers to opt out of the market. Plainly, warm glow is favorable to selling CSR products, but does social pressure aversion imply that rational firms will never employ such appeals? Large numbers of firms do rely on social pressure based appeals (e.g., the Pink Ribbon campaign for breast cancer). When and why is this a wise choice?

In two separate experiments, I find evidence for warm glow and social pressure effects. I formalize and quantify these effects with a novel utility function that embodies these opposing effects and find them to be of the same order of magnitude; hence, both are managerially relevant. To develop this idea further, I build a model of a profit-maximizing firm that recognizes these warm glow and social pressure aversion preferences of its customers. Under a duopolistic market structures, I find that if warm glow is large enough, a firm will also engage in social pressure appeals despite its customers' aversion to social pressure. Put differently, despite its negative effect on consumers' preferences, employing social pressure in a CSR context can be profitable. Why? Intuitively, social pressure diminishes price sensitivity.

In *Essay 2: Fairness Ideals in Distribution Channels*, I examine the norm of fairness. Existing research suggests that concerns for fairness may significantly affect the

interactions between firms in a distribution channel. I analytically and experimentally evaluate how firms make decisions in a two-stage dyadic channel, in which firms decide on investments in the first stage and then on prices in the second stage. I find that firms' behavior differs significantly from the predictions of the standard economic model and is consistent with the existence of fairness concerns.

Using a Quantal Response Equilibrium (QRE) model, in which both the manufacturer and retailer make noisy best responses, I show fairness significantly impacts channel pricing decisions. Additionally, I compare four principles of distributive fairness: strict egalitarianism, liberal egalitarianism, and libertarianism, previously considered in the fairness literature, and a new principle of distributive fairness the sequence-aligned ideal that is studied first time in literature. Surprisingly, the new ideal, according to which the sequence of moving determines the formation of equitable payoff for players, significantly outperforms other fairness ideals.

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Chapter 1

Social Pressure and Warm Glow Effects of Corporate Social Responsibility

Companies today engage in a wide variety of initiatives aimed at improving the environment, as well as the world at large. Such initiatives, which range from donating part of a company's profits to charities to allowing employees to devote part of their working time to volunteering, have been grouped under the umbrella term Corporate Social Responsibility (CSR). According to Luo and Bhattacharya (2006), as many as 90% of Fortune 500 companies engage in CSR, and Brown (2007) claims companies' donations to charities, adjusted for inflation, rose by 166% between 1967-1971 and 2001-2006. Even during the recent economic crisis, corporate donations rose by 21.6% in real terms between 2008 and 2010 (Giving USA 2011).

Given the importance of CSR, it is not surprising that many researchers have studied the causes and consequences of CSR. However, there is little consistency regarding the basic effects of such corporate efforts. For instance, while it is intuitively plausible that a company might engage in CSR to increase profitability (Aupperle, Carrol, and Hatfield 1985; McGuire, Sundgren, and Schneeweis 1988) and market value (Arora and Gangopdhyay 1995; Segerson and Miceli 1998), there is no consistent evidence linking CSR to financial performance. A meta-analysis of 162 CSR studies by Margolis et al.

(2007) found, for instance, that 58% of studies indicate no significant effect of CSR on company performance, 27% find a positive effect, and 2% report a negative effect.[1] Given the prevalence of CSR and the lack of research showing that it holds benefits for companies, practitioners and researchers alike are curious to find definitive evidence.

To move toward an answer, I study one common form of CSR: products with "embedded donations." Each purchase of such a product commits the firm to giving a certain amount of money to a cause or charity: "Buy this," the companies say, "And we will give $2 to support clean water efforts," for instance. Several scholars suggest that these CSR actions are a response to consumers' desires and increase consumers' preferences for a product (e.g., Elfenbein, Fisman, and McManus 2010; Luo and Battacharya 2006; Navarro 1988). However, the bundling of the donation and purchase creates an interesting confluence of effects. While the donation itself may be desired by consumers, , Dell Vigna et al. (2012) contend that consumers have an aversion to be pressured— "...dislike to be seen as not giving..." . They demonstrate that consumers exhibit this dislike when asked to donate to charities directly by sorting themselves out of the interaction. I extend this proposition to donation embedded products. Thus, shoppers might buy a product with an embedded donation not just because CSR increased their preference, but because they feel *o*bligated to behave generously and reciprocate a conscientious action by the firm. In this case, exploiting social pressure to change consumers' choices might come at the cost of reduced utility for consumers.

Indeed, in a series of experiments, I find here that targeting donations at a preferred charity through embedded premiums has a positive effect on consumers' utility through "warm glow", while increasing social pressure has a negative effect on consumers' utility.

I formalize these insights with a novel utility function for products associated with CSR. While the utility increasing aspect of CSR has been examined by using warm glow preference representation (Baron 2007; Besley and Ghatak 2007; Graff-Zivin and Small 2005; and Krishna and Rajan 2009), to the best of my knowledge, aversion to social pressure in the context of CSR and has never been formally represented. In my work, I adapt the representation of aversion to social pressure used by Della Vigna et al. (2012) in the public good context to the embedded donation context.

[1] The remaining 13% percent of studies contained no information on sample size, so researchers could not compute significance.

As a second step, I use this utility function to quantify consumers' sensitivity to warm glow and aversion to social pressure. Using experimental (conjoint) data and a maximum likelihood approach, I estimate the parameters for aversion to social pressure and sensitivity to warm glow. When associated with a $0.89 Yoplait yogurt, a $1 donation to a charity chosen by the consumer yields a disutility from public social pressure of up to a $0.70 increase in price and a utility from warm glow equivalent to little less than a $0.90 discount.

Finally, I model rational firms that face consumers who display preferences of the kind described above. These firms can choose a price and a level of donation. By endogenizing the donation embedding decision, I can determine whether embedding donations is simply a characteristic of certain "responsible" firms, or whether it is a strategic response of profit-maximizing firms to consumers' social preferences. The richness of the consumers' utility function permits the possibility to represent different and conflicting donation embedded product appeals and their consequences for firms' decisions. Reflecting my experimental data, warm glow has a positive effect, while social pressure has a negative effect on consumers' utility, so that the net effect of embedding donations is ambiguous. Interestingly, I find that CSR can be profit enhancing for firms, and that although social pressure has a negative effect on consumers' utility, it can have a positive effect of firms' profits.

My research makes several contributions to the understanding of CSR. First, I show that embedding donations is a profitable business practice that can help maximize profits, but I do not assume that embedded donations *a*lways have a positive effect on consumers' preferences. In fact, I highlight the fact that embedded donations can have both positive and negative effects and that firms should be careful in designing their CSR actions. Second, I unpack the effect of social pressure and warm glow on consumers' preferences for donation embedded products. I show that donations impact social pressure and warm glow in opposite ways. Social pressure negatively impacts consumers' utility, but it can still, under some conditions, increase firms' profits. This finding is of great practical relevance for managers who seek to design donation embedded products and hope to effectively exploit aversion to social pressure. Third, I quantify aversion to social pressure and sensitivity to warm glow in monetary terms. This allows me to evaluate the relative importance and managerial relevance of warm glow and social pressure effects on consumers' CSR choices. Finally, my model offers a utility function that formalizes social pressure in the relationship between a firm and its customers. Such a model can be adapted to study a wide array of transactions.

My study is organized as follows. First, I provide a background on donation embedded products by reviewing the current literature on CSR and its appeals to consumers. Then I present a series of experiments investigating consumers' reactions to CSR appeals. Based on the results, I formalize consumers' preferences and quantify the parameters of the utility function. Next, I analyze a model that describes how pro-social consumer preferences affect firms' decisions and profitability, as well as donation levels and welfare. I conclude with proposed directions for future research.

1.1 Corporate Social Responsibility

CSR is believed to have a number of positive effects on consumers. Among them, CSR increases consumers' willingness to pay (Arora and Henderson 2007; Elfenbein and Mc Manus 2010; and Henderson and Arora 2010) and increases satisfaction and trust (Du et al. 2011; Luo and Bhattacharya 2006). It would be natural to think that such positive effects would also translate into better performance for firms engaging in CSR. However, several studies find that the effects of CSR on firm performance are not so clear-cut (Margolis et al. 2007).

A number of reasons are believed to be at the root of these contrasting results. The first is that different performance measures react differently to CSR initiatives. For example, measures of a firm's intangible value (e.g., Tobin's q) may be better at picking up the effect of CSR than accounting-based measures (e.g., return on investment; Luo and Battacharya 2006). Another reason could be that the effects of CSR are tied to a series of contingency conditions (Sen et al. 2006). For example, it is not enough for a firm to engage in CSR to reap its benefits-consumers must also be *aware* of the firm's efforts (Sen et al. 2006). Finally, a number of moderating factors can influence CSR's effect on consumers. For example, Winterich and Barone (2011) find that CSR increases consumers' preferences for a product only if customers identify with the cause supported by the firm. Luchs et al. (2010) find that the fit between CSR and product characteristics can impact the effect of CSR.

These multiple effects of CSR initiatives make it hard to track the effect of CSR on firm performance. Hence, I focus my investigation on consumers' reactions to CSR as an antecedent of firm performance.

1.1.1 Warm Glow

CSR can impact consumers' utility by changing the appeal-in fact, by heightening the appeal-of the product. Several mechanisms by which CSR can have this impact have been proposed.

First, CSR could simply be an "embedded premium" that works like a price promotion (Arora and Henderson 2007; Henderson and Arora 2010). That is, the "social good" is seen as a free add-on. Alternatively, CSR can be seen as a signal. Navarro (1988) proposes that CSR, like advertising, can act as a costly signal of quality for a firm, increasing consumers' perception of a firm's quality. This effect is found to be stronger for firms that are new to the market and/or those with a low reputation (Elfenbein and McManus 2010). CSR can also act as a signal to the consumer about relevant social comparisons. For example, buying a CSR product can be used to signal the consumer's own status (Griskevicius et al. 2010).

Of course, the effect of CSR can be moderated, and in some extreme cases reversed, by the fit between the CSR action and the firm's products (Luchs et al. 2010) or customers (Winterich and Barone 2011), as well as by the credibility of the CSR action (Becker-Olsen et al. 2006).

No matter which of these mechanisms is at work, they all have the effect of modifying consumers' utility for the product. The change can be likened to the warm glow an agent feels when she is contributing to a public good (Andreoni 1989; Baron 2007; Besley and Ghatak 2007; Graff-Zivin and Small 2005; and Krishna and Rajan 2009). Hence, this change in embedded donation product valuation can be compactly described by warm glow-like preferences.

In general, if consumers experience a warm glow (i.e., consumers care about donations to a public good), it is rational for a profit-maximizing firm to engage in CSR. For example, Besley and Ghatak (2007) and Krishna and Rajan (2009) show that in markets where warm-glow consumers exist, it can be profitable to engage in CSR, while Baron (2009) shows that in a market where a profit-maximizing firm and a competing social firm face warm-glow consumers, the former firm can be *forced* to engage in CSR by consumers' activism.

CSR can change (and often improve) consumers' perceptions about products and the companies that sell them.

1.1.2 Social Pressure

A number of firms' CSR actions seem to be aimed at making their pro-social behavior as public as possible. Consider the Susan B. Komen Society's breast cancer awareness "Pink Ribbon" campaign. During the month of October, now designated as a month of awareness, a number of firms sell products ranging from chocolate to bags, from Post-It notes to kitchen appliances, all to raise funds for research on breast cancer. The products associated with the campaign are very clearly identified by the color pink (see Figure 1.1), immediately recognizable by shoppers as associated with raising money for cancer research and treatment. At the same time that this type of initiative brings attention to the CSR initiative, it also creates social pressure for consumers to buying the donation embedded product. This social pressure is distinct from warm glow and is not necessarily utility enhancing for consumers. In fact, social pressure might lead people to choose a less preferred action to avoid being "seen as not giving..." (Della Vigna et al. 2012). That is, they may still buy the product, but out of guilt, not because it's the best choice for their needs.

This is similar to the context of public goods. When a solicitor explicitly asks for a donation, an individual might choose to donate just to avoid the guilt associated with saying "no" (e.g., Andreoni et al. 2012; Della Vigna et al. 2012). In this case, the behavior does not reflect an unconstrained preference, but only a context-specific decision to donate. Without an in-person ask, the same individual might have well declined to contribute. In fact, Andreoni et al. (2012) and Della Vigna et al. (2012) find that when subjects are given a chance to avoid direct solicitation, some do so. They suggest this finding is evidence that social pressure has a negative effect on consumers' utility, and it can only be avoided by sorting out of the market or by complying with the solicitor's request.

While a number of studies have modeled the impact of warm glow on consumers' and firms' CSR choices (Bagnoli and Watts 2003; Baron 2009; Besley and Ghatak

Figure 1.1: A sample of products from the “pink ribbon campaign”

2007; and Krishna and Rajan 2009), to the best of my knowledge, not much attention has been dedicated to the effect of social pressure on consumers’ utility and firm CSR choices. Even in the more general context of public goods, with the exception of Della Vigna et al. (2012), scholars tend to focus on only one of the two drivers of consumers’ contributions to public goods while ignoring the other. Therefore, I study the effect of social pressure on consumers’ attitudes toward products associated with CSR, including both the warm glow effect and negative social pressure.

My objective is to highlight the importance of separating warm glow and social pressure arising from firms’ CSR actions. Moreover, I seek to investigate the impact of social pressure on firm profits to understand why firms engage in initiatives such as the Pink Ribbon campaign, even though the campaigns exacerbate social pressure. Finally, I seek to quantify the effect of social pressure and warm glow to understand their empirical relevance.

1.2 Donation Embedded Products

In this section, I show evidence that CSR can activate both warm glow and social pressure. As mentioned above, I focus on a specific class of CSR actions: donation embedded products. When a donation embedded product is purchased, the firm commits to donate a sum of money to a charity or cause. Such products are a common form of CSR in the marketplace, embracing efforts such as research on breast cancer (e.g., the aforementioned "Pink Ribbon" campaign) to fighting AIDS (e.g., Gap's (RED) campaign) and including products from fast-moving consumer goods like candies to durable products like electronic and sport equipment to services like credit cards (f see 1.2).

There is a methodological advantage to focusing on embedded donations. Here, it is clear that the action unambiguously raises costs for the firm. This rules out a number of alternative explanations wherein the CSR action is undertaken because it actually reduces the firm's costs. For instance, appeals to consumers to switch to e-mail bills over paper (with a commitment to send donations to charities) are often viewed skeptically since the switch also reduces the firm's mailing costs.

Figure 1.2: A sample of donation embedded products

1.2.1 Social Pressure and Sorting Out

If embedding donations into products has a positive effect on consumers' preferences through warm glow, then raising the amount of donation (and holding everything else constant constant) should cause consumers to keep or increase their preferences for the donation embedded product. Warm glow can have decreasing marginal returns to donation amounts (e.g. Arora and Henderson 2007; and Henderson and Arora 2010), but nothing in the warm glow literature would explain a decrease in product preferences when donated amount increases.

Data showing a decrease in preferences would suggest that warm glow cannot entirely explain reactions to donation embedded products.How do we demonstrate a lowered preference? One approach is to estimate a utility function that embeds such effects. However, I begin with offering direct behavioral evidence. Following Della Vigna et al. 2012, who demonstrate that consumers exit or "sort out" when asked to donate to a charity because of their aversion to social pressure, I develop an experiment with a donation embedded product where subjects have an opportunity to exit.

Restaurant Study Subjects in a 2 X 3 (Matching X Setting) between subjects design were asked to imagine a situation in which they were meeting a friend for dinner at a restaurant. The first factor, (*matching*), varied three levels of donation to a charity. Subjects were informed the restaurant was participating in a campaign to raise funds to fight HIV/AIDS. This scenario resembles the popular "Dining Out for Life" campaign, a real annual event.[2]

Subjects were told that their bill would be increased by 10% and this money would be donated to the charity. Additionally, the restaurant would add matching donations. The restaurant's matching amounts were varied, so that the restaurant contributed 5%, 10%, or 20% of the bill to the cause. In the first case, with the restaurant giving 5% matching, the subject would be more generous than the restaurant; in the second case, 10%, subject and restaurant would be equally generous; and in the last case, 20%, the subject would be less generous than the restaurant.

Notice that as the restaurant's donation increased, the total donation always increased, but the subject's relative generosity (compared to the restaurant) decreased. If

[2] For more information on the campaign, visit diningoutforlife.com.

warm glow alone mattered, the increased total donation should lead more consumers to choose to stay the higher the restaurant's donation rose. If subjects instead dislike being seen as "not generous," the restaurant's increased donation should lead fewer subjects to stay.

The second factor, (*setting*), varied the degree to which the interaction was public. I supposed that social pressure would be magnified in a situation where someone could judge subjects' generosity. In the less public (door) condition, subjects learned about the campaign from a flier posted at the restaurant door. In the more public (table) condition, they were informed about it by the waitperson after being seated at their table. In the latter case, the increased public aspect-the pressure exerted by a direct interaction with a person and by having already taken a table in the restaurant, where other diners can see the subjects-should increase the negative effect of appearing less generous as the restaurant's donations increase.

The dependent variable measures subjects' response to being asked whether they would stay at the participating restaurant or leave and walk to a comparable, non-participating restaurant in the neighborhood. To control for heterogeneous price expectations, subjects were told the target restaurant offered a *prix fixe* meal for $19.99.

Stimuli were presented on-line to subjects recruited via mTurk, and 705 subjects completed the study.

Results. Table 1.1 reports the result of the experiment. Across conditions, the large majority of subjects chose to stay at the restaurant (81.99%), indicating that the promotion was largely appreciated. Moreover and perhaps unsurprisingly, when I disregard the matching level, a larger number of subjects decided to stay at the restaurant when they learned about the promotion at the table rather than at the door. It seems it *is* harder to leave the restaurant when you are already at the table than when you are still outside.

Comparing matching conditions, we find that the condition in which the restaurant matches the 10% donation from the customer with an equal 10% garners the highest number of "stayers". This contradicts warm glow. In fact, given that I have kept cost to subjects constant across matching condition, higher total donations (the highest restaurant contribution level) should be at least weakly preferred by subjects and translate into at least the same share of stayers as the 10% matching condition. So why do the subjects prefer the evenly matched donation?

Table 1.1: Restaurant Study—Descriptives

Matching		Setting		
		Table	Door	*Total*
5%	N	129	116	245
	Stay	84.50%	75.00%	80.00%
10%	N	110	103	213
	Stay	91.82%	75.73%	84.04%
20%	N	128	87	247
	Stay	82.81%	81.51%	82.19%
Total	N	367	338	705
	Stay	86.10%	77.51%	81.99%

To answer this question, I ran two logit regression models to predict the likelihood of staying at the restaurant. In the first model, I included only the effect of matching and location (Column 1 Table 1.2). Being at the door (versus sitting at the table) made a subject less likely to stay, and I found directional evidence that, compared to subjects in the 10% matching condition, subjects in the 20% matching condition were less likely to stay. This was true also of the subjects in the 5% matching condition. Whether at the door or the table, subjects may think the 20% matching is unbelievable and decide to leave the restaurant because they think the donation is a scam (there should be no interaction between matching and location). In contrast, if the drop in likelihood of staying between the 20% and the 10% matching condition was due to social pressure, we would expect to observe a higher drop in the table than in the door condition.

To determine which explanation better explains the data, I ran a second model in which I added the interaction of matching and location (Column 2 Table 1.2). The results of this second model indicate that social pressure is the preferred explanation.

First, when controlling for the interaction, the difference between the 10% matching condition and the other two conditions is significant, suggesting that raising the match from 10% to 20% significantly decreases the likelihood of staying at the focal restaurant.

Additionally, the interaction of match 20% and location at the door has a significant

Table 1.2: Restaurant Study—Logit Models

Dep. Var. Stay=1	Model (1) Coeff. (Std. Err.)	Model (2) Coeff. (Std. Err.)
Ind. Var.		
Door	-0.589	-1.280
	(.200)***	(.417)***
Match20	-0.135	-0.845
	(.252)	(.419)**
Match5	-0.284	-0.722
	(.248)	(.424)*
Door*Match20		1.191
		(.533)**
Door*Match5		0.683
		(.528)
Constant	1.976	2.418
	(.221)***	(.348)***
Observations	705	705
Log Likelihood	-327.4	-324.8

* significant at 10%; ** significant at 5%; *** significant at 1%

and positive effect on the likelihood of staying. In this condition, people at the door are more likely to stay at the restaurant than people at the table. This contrasts with the 10% condition, in which people at the door were more likely to leave than people at the table, and in the 5% condition, where there was no significant difference in likelihood of leaving between the two conditions. Finally, by contrasting the marginal effects we can see that subjects in the table condition were less likely to stay when there was a 20% matching than when there was 10% ($p < .05$), while in the door condition, such contrast is not significant ($p = .30$).

We can speculate that this pattern of results is due to the *interaction* of warm glow and social pressure. First note that warm glow and social pressure have two opposing effects: warm glow will lead subjects to sort *into* the market, while social pressure will lead subjects to sort *out* of the market. As the restaurant match increases, warm glow will increase because total donations are increasing. At the same time, social pressure will increase as the subject's generosity (relative to the restaurant) decreases. The aversion is magnified when the waitress witnesses the lack of generosity of a patron. According to my theory, I expect warm glow to increase at the same rate between the table and the door condition, while I expect social pressure to grow at a higher rate between the door and the table condition.

In fact, at the door, when there is no wait staff present, the net effect of warm glow and social pressure is such that there is no significant difference between the 10% and the 20% matching condition. However, in the table condition, where a restaurant staffer is present, in the 20% (vs. 10%) matching condition, social pressure is heightened to a level where it outweighs warm glow and causes consumers' to sort out of the market.

These results provide a strong first indication that both social pressure and warm glow apply to the context of product embedded donations, but that they have opposing and significant effects on consumers' behavior. One caution: social pressure and warm glow rise simultaneously with donations, and are thus not manipulated independently. I cannot separately identify and quantify the effect of warm glow and social pressure. Using additional experiments, I manipulate each effect separately, allowing for better characterization of their impacts on consumer behavior.

1.2.2 Separating Warm Glow and Social Pressure

I undertook three experiments intended to use subjects' product choices to isolate the effect of social pressure on consumers' utility from the effect of warm glow. I also aimed to characterize consumers' reactions to warm glow.

In the three experiments, I found that: 1) consumers' utility decreases when social pressure increases; 2) consumers' utility increases (less than proportionally) with the donation amount; and 3) consumers' utility increases if consumers like the beneficiary more.

Kindle Experiment

Experimental Design In this study, I asked subjects to choose between products associated with the well-known "Pink Ribbon" campaign. I ran my study in October 2011 (National Breast Cancer Awareness month), when this campaign is highly salient and social pressure to contribute to breast cancer research is particularly high. Even NFL players participate in the annual awareness campaign by wearing pink shoes and other gear during football games and media appearances.

In my experiment, 47 subjects recruited on mTurk were shown Kindle triplets (two associated with a donation, one not associated with a donation) and a no-buy option. They repeated this choice task 8 times with different Kindle triplets (for an example of a choice set, see Figure 1.3). The Kindle e-readers varied on 3 factors: 1) price: \$79 or \$89; 2) donation: \$0, \$5, or \$10 donated to the Susan G. Komen Foundation; and 3) visibility: a special (pink) vs. a classic (grey) edition Kindle.

Figure 1.3: Sample choice set

To capture the effect of warm glow, I manipulated the level of donation. Since warm glow is meant to capture the effect of donations on utility, by varying donation levels I could capture whether embedding donations elicited positive feelings, and, if so, how such warm glow varies with different levels of donations.

I manipulate social pressure, by the visibility of consumers' choice to other people. Recall that I define social pressure as the " dislike to be seen as not giving" (Della Vigna et al. 2012), increasing visibility of consumers' choices of donation embedded product increases social pressure. In this experiment, I changed the visibility of consumers' choices of donation embedded product independent of donation by varying the style of the product. The special edition Kindle was identified by its pink color. Subjects were told that choosing the pink product would tell everyone they supported breast cancer research. The classic edition (grey) Kindle was indistinguishable from the regular Kindle, so subjects' support for the cause would remain anonymous. Hence, the special edition Kindle (high visibility) corresponded to the condition of high social pressure, while the classic edition Kindle (low visibility) corresponded to low social pressure.[3]

Finally, I manipulate price at two levels to capture the net utility for the product itself compared to the no-buy option which is normalized to zero utility.

Results. I analyzed the data with a conditional logit discrete choice model. The results are reported in Table 1.3. As evidenced by AIC and BIC, the random coefficient models do a better job of describing consumers' choices than the regular models. In the interest of space, I concentrate the discussion on these results. [4]

Social pressure decreases consumers' utility. Model 3 in Table 1.3 indicates that an increase in social pressure decreases subjects' utility (Special Edition: -1.11, $p < 0.05$).

I find that warm glow increases consumers' utility. All of the coefficients associated with positive donations in Table 1.3 are positive and significant. In addition, while the $15 donation is three times larger than the $5 donation, the coefficient associated with the $15 donation ($15 Donation: 3.92, $p < 0.01$) is less than twice than the coefficient for $5 ($5 Donation: 7.05, $p < 0.01$). This finding shows a decreasing effect of donation on willingness to pay and confirms results from previous studies (Arora and Henderson 2007; Henderson and Arora 2010).

I examined the possibility that women are more sensitive to breast cancer research by interacting gender with donation. I find that both interaction coefficients between gender and donations are positive; however, only one coefficient is significant (Table 1.3 Model (4) - $15 Donation X Female: 2.63, $p < 0.01$).

[3] Note: Not all regular edition Kindles were embedded with donations, however, all special edition Kindles profiles included a donation.

[4] Appendix A describes the research sample in greater detail.

Table 1.3: Logit Model Estimates – Kindle

	Fixed Coefficients		Random Coefficients			
	(1)	(2)	(3)		(4)	
Dep. Var.	Coeff.	Coeff.	Mean of	SD of	Mean of	SD of
Choice=1			Coeff.	Coeff.	Coeff.	Coeff.
	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)
Ind. Var.						
Kindle	12.449	12.814	37.359	5.933	41.276	0.602
	(1.441)***	(2.170)***	(3.914)***	(1.234)***	(6.289)***	(.683)
Price	-0.159	-0.166	-0.360	0.075	-0.492	0.116
	(.018)***	(.027)***	(.047)***	(.018)***	(.075)***	(.031)***
$5 Donation	1.673	1.541	3.922	1.249	4.329	0.574
	(.245)***	(.341)***	(.679)***	(.600)**	(.824)***	(.635)
$15 Donation	2.933	2.450	7.049	3.165	6.053	3.674
	(.235)***	(.315)***	(1.164)***	(.737)***	(1.206)***	(.731)***
Special Edition	-0.400	-1.057	-1.107	6.254	-4.809	6.662
	(.173)**	(.285)***	(.505)**	(1.212)***	(1.872)**	(1.130)***
Kindle_female		1.125			1.265	3.009
		(3.047)			(6.875)	(1.024)***
Price_female		-0.004			0.133	0.070
		(.038)			(.077)	(.026)***
$5 Donation_female		0.529			-0.112	0.411
		(.525)			(.954)	(.618)
$15 Donation_ female		1.254			2.633	1.696
		(.505)**			(1.194)**	(.848)**
Special Edition_female		1.102			4.733	0.121
		(.366)***			(2.059)**	(.467)
N	1,504	1,504	1,504		1,504	
LL	-362.19	-333.23	-223.43		-209.36	
AIC	734.39	686.47	466.86		458.71	
BIC	760.97	739.63	520.01		565.03	

* significant at 10%; ** significant at 5%; *** significant at 1%

Discussion. In this experiment, I find that subjects display an increase in utility for a higher level of donations to breast cancer, but at a diminishing rate. Notice, however, since I focused on a single cause, the sensitivity of donations to that cause is indistinguishable from the overall warm glow itself.

I find that social pressure decreased preference for the donation embedded product. However, since social pressure is manipulated as the pink special edition product, I am concerned with threats to validity. Consider the effect of gender (Model 4 in Table 1.3). Pink is a color associated with femininity, so males might be averse to the special edition Kindle. The interaction coefficient of gender X social pressure is significant; the special edition Kindle has significantly lower utility than the regular edition for males (Special Edition: -4.81, $p < 0.01$), but not for females (Special Edition: -4.81+4.73=0.08, n.s.). Pink, then, could have a negative effect on males, exacerbating the effect of social pressure. Meanwhile, it could have a positive effect on women, reducing the negative effect of social pressure. I deal with this confound in the experiment below.

Yoplait Experiments

Experimental Design. The next two experiments were designed to close the gaps in the discussion of the first study. Specifically, I sought to separate styling/color from social pressure. I also sought to separate sensitivity to warm glow from the donation amount. I used a different product (consumable, not durable) to extend the validity of the results.

Yoplait Experiment 1. In this experiment, 51 subjects recruited from mTurk were asked to choose from Yoplait yogurt triplets (two different yogurts and a no-buy option). They repeated this task for ten triplets. For an example of one choice set, see Figure 1.4). The yogurts differed on four factors: 1) price: \$0.89 or \$1.29; 2) donation level: \$0.10 or \$0.30; 3) social pressure: public or private redemption; and 4) sensitivity to warm glow: pick your charity or Project HOPE as the beneficiary of the donation.

As before, the price and donation amount manipulations are straightforward. Social pressure was varied using the donation redemption process. Subjects were told that the firm would make the promised donation when they entered a code printed under the lid of the yogurt on a website. In the "public/visible" (high social pressure) condition, buyers had to go to a social media enabled site for the product, then enter their name and product code. Subjects were told that other purchasers could go to the site and see/search/compare donations. In the "private/anonymous" (low social pressure) condition, they had to go to a company website for the product and enter the product code anonymously. No search or comparison tools were provided on the site.

To study warm glow sensitivity, I also manipulated the beneficiary of the donation. In the high sensitivity condition I allowed subjects to choose the charity they preferred from a list of 200 popular charities[5] , while in the low sensitivity condition, the beneficiary of the donation was picked *a priori* by the researcher[6] . Since preferences for charities are distributed across the subject population, I reasoned that picking a charity allowed subjects to align the donation beneficiary better with their own preferences. This higher sensitivity should lead subjects to experience greater warm glow for any given level of donation.

I analyzed the choice data with a conditional logit discrete choice model. The results are reported in Table 1.4. As evidenced by AIC and BIC, the random coefficient model does a better job of describing consumers' choices than the regular models. As before, I concentrate the discussion on the random coefficient model that help us characterize warm glow and social pressure. For a description of the sample, see Appendix A.

Yoplait Experiment 1 confirms and extends the results of the Kindle Experiment. Consumers experience positive utility from a firm's donation (Table 1.4 Model (2) \$0.30 Donation: 1.51, $p < 0.01$). Moreover, their utility increases less than proportionally to increases in donations[7] . This finding confirms results from the previous experiment and suggests that people experience decreasing marginal returns from donations.

I find consumers are averse to social pressure (Table 1.4 Model (2) Public: -1.10, $p < 0.05$). I also find that consumers exhibit higher sensitivity to warm glow when they like the beneficiary of the donation more (Table 1.4 Model (2) Pick Your Own: 0.90, $p < 0.05$) as distinct from the donation amount.

Despite the corroborative evidence from the Kindle and Yoplait experiments, there

[5] The list was taken from the2010 *Forbes* list of the 200 largest U.S. charities.

[6] The beneficiary of the donation in the low warm glow condition was Project HOPE, a charity that delivers health education, medicines, supplies and volunteers where needed.

[7] By scaling the donation coefficient by the price coefficient, I find that a \$ 0.20 additional donation is only worth about \$ 0.13 to subjects

Table 1.4: Logit Model Estimates–Yoplait Experiment 1

	Fixed Coefficients	Random Coefficients	
	(1)	(2)	
Dep. Var.	Coeff.	Mean of	SD of
Choice=1		Coeff.	Coeff.
	(Std. Err.)	(Std. Err.)	(Std. Err.)
Ind. Var.			
Yoplait	5.336	17.638	6.462
	(.483)***	(2.040)***	(1.204)***
Price	-4.605	-11.463	6.064
	(.423)***	(1.295)***	(1.059)***
$0.30 Donation	0.539	1.513	0.521
	(.163)***	(.292)***	(.475)
Public	-0.672	-1.094	2.766
	(.153)***	(.430)**	(.440)***
Pick Your Own	0.447	0.898	2.331
	(.149)***	(.394)**	(.474)***
N	1,530	1,530	
LL	-455.18	-304.98	
AIC	920.36	629.96	
BIC	926.29	641.81	

* significant at 10%; ** significant at 5%; *** significant at 1%

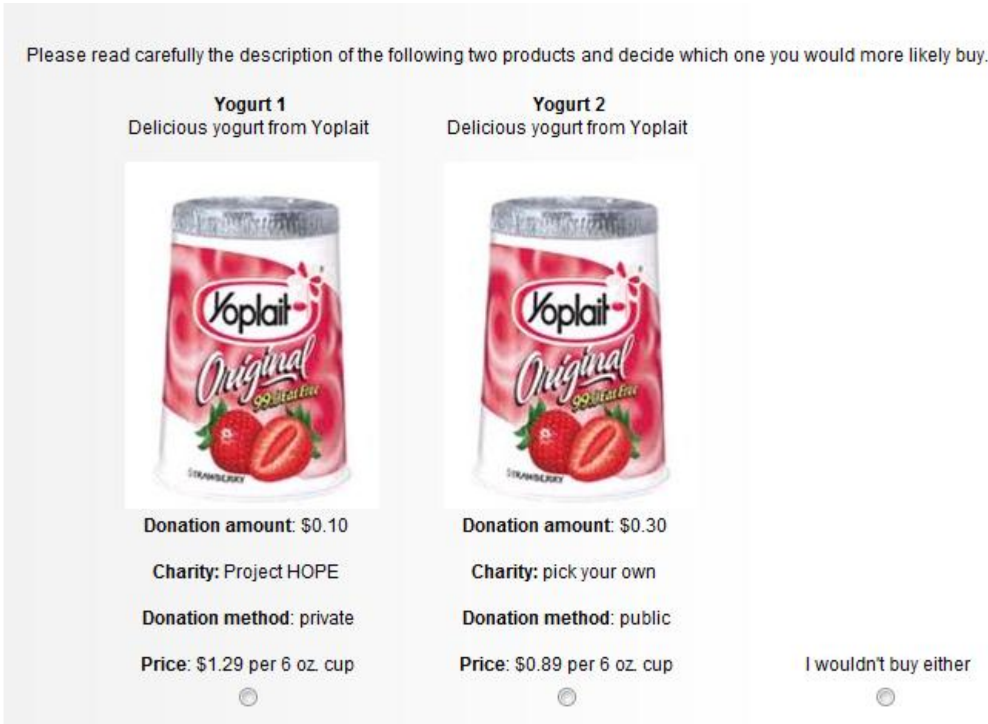

Figure 1.4: Screen shot of Yoplait choice set

are some unaddressed issues. Both studies employed the mTurk online setup. Subjects recruited from this pool are paid a relatively small sum ($0.50 for the studies above) to complete tasks online. The low stakes raise some question about the selection of the sample as well as about the attention subjects dedicate to the study. The online setting also limits control over subjects while completing the study. To overcome these issues, I repeated the Yoplait study in a controlled laboratory setting using students recruited at a large public university, making some additional design changes.

Yoplait Experiment 2. In this study, 61 students chose from a triplet of yogurt products and a no-buy option. They were paid $9.00 for their participation. They recorded their choices for 16 choice sets. For an example of a product choice set, see Figure 1.5. In each choice set, two of the three yogurts included a donation. The no-donation instance is different from that in the previous study. I manipulated 4 factors: 1) price: $0.89 or $1.29; 2) donation level: $0.00, $0.10 or $0.30; 3) sensitivity to warm glow: pick your charity or Project HOPE as the beneficiary of the donation; and 4) social pressure: public vs. private redemption.

Figure 1.5: Screen shot of Yoplait choice set

As in the previous experiment, I analyzed the choice data using a conditional logit discrete choice model. The results are reported in Table 1.5. As evidenced by AIC and BIC, the random coefficient model does a better job of describing consumers' choices than the regular models. [8]

This experiment further confirms and extends my results. First, the in-lab, university setting and sample are very different from an online context. Second, the inclusion of the yogurt option with no donation allows me to estimate the coefficient for Pick Your Own (vs. Project Hope) as in the previous Yoplait experiment, but also the coefficient for donation to Project Hope (vs. no donation), thereby shedding more light on the role of charity choice in warm glow.

As for the previous experiments, I find that consumers experience positive utility

[8] For a description of the sample, see Appendix A.

Table 1.5: Logit Model Estimates–Yoplait 2

	Fixed Coefficients	Random Coefficients	
	(1)	(2)	
Dep. Var.	Coeff.	Mean of	SD of
Choice=1		Coeff.	Coeff.
	(Std. Err.)	(Std. Err.)	(Std. Err.)
Ind. Var.			
Yoplait	6.592	17.48	6.564
	(.335)***	(1.122)***	(.578)***
Price	-7.204	-12.58	4.165
	(.352)***	(.794)***	(.486)***
Donation	3.409	5.272	4.502
	(.606)***	(.986)***	(.749)***
Social Media	-0.479	-0.506	2.436
	(.108)***	(.224)**	(.311)***
Fixed Charity	1.446	2.293	1.815
	(.171)***	(.261)***	(.329)***
Pick Your Own	1.549	2.602	0.915
	(.167)***	(.314)***	(.265)***
N	3,904	3,904	
LL	-923.3	-570.6	
AIC	1,858.6	1,165.2	
BIC	1,896.2	1,171.0	

* significant at 10%; ** significant at 5%; *** significant at 1%

from the firm's donation (Table 1.5 Model (2) Donation: 5.272, $p < 0.01$). I also find that consumers exhibit greater warm glow sensitivity when they like the beneficiary of the donation more; picking the beneficiary of the donation increased their utility (Table 1.5 Model (2) Pick Your Own: 2.602, $p < 0.01$ vs. Project Hope: 2.293, $p < 0.01$). Finally, aversion to social pressure decreases utility in the high social pressure condition (Table 1.5 Model (2) Social Media: -0.506, $p < 0.05$).

Discussion. These experiments show that social pressure has a negative effect on consumers' utility, after controlling for warm glow. Regarding warm glow, I am able to separate buyers' increase in utility from a higher level of donations from their greater sensitivity to donations going to a cause that is more aligned with their preferences.

These results suggest that there are two contrasting effects on consumers' utility when donations embedded into a product are increased. In the next section, I propose a consumer utility function embodying these effects so that I might quantify warm glow sensitivity and social pressure aversion from these data.

1.2.3 Quantifying Warm Glow and Social Pressure

Utility function. Based on the experiments outlined above, a reasonable utility for a donation embedded product should include: 1) the consumption utility for the product; 2) warm glow utility; and 3) social pressure disutility. I propose the following:

$$U_i = \begin{cases} v - p + \beta\sqrt{d} & \text{if } 0 \leq d \leq \kappa p \\ v - p + \beta\sqrt{d} - \alpha(d - \kappa p) & \text{if } d > \kappa p \end{cases} \tag{1.1}$$

where

v is the consumer's gross valuation for the product;

p is the price of the product;

d is the firms' donation to the charity;

$\beta > 0$ is the consumer's sensitivity to warm glow;

$0 < \alpha < 1$ is the consumer's aversion to social pressure;

and $0 < \kappa < 1$ scales the donation made by the firm.

Consumption utility, v, is the same for a given product with or without a donation. The total warm glow, $\beta\sqrt{d}$, from buying a product that includes a donation is the product of consumer sensitivity to warm glow, β, attached to the target of the donation and the amount of the donation, d. The square root term captures marginal decreasing utility from donations as witnessed in my experiments.

Similar to Della Vigna et al. (2012), I find that social pressure arises as disutility for deviating from the firm's donation, d, the reference point against which agents compare their response. As d increases and surpasses a threshold, κp, the consumers' aversion to social pressure multiplies this deviation level to create social pressure, $\alpha(d - \kappa p)$. Although consumers pay p, only part of p goes to offset the firm's donation, so I use κ to scale the price. Crucially, κ is not always such that $d = \kappa p$. This allows some flexibility in capturing what the consumer feels is the "right" amount to give.

The social pressure term matters only when the consumer contribution, κp, is smaller than the firm's, d, capturing the notion that agents feel social pressure only when they perceive that they are not reciprocating sufficiently. Conversely, when the consumer perceives that he or she has reciprocated sufficiently ($d \leq \kappa p$), that consumer does not experience any social pressure. Note that this also means that consumers do not face *any* social pressure when the firm does not embed a donation ($d = 0$).

Estimation procedure. Using the data from my experiments and the utility function in Equation (1.1), I can estimate α, β and κ, as well as the coefficients for the price and valuation of the product once I re-express utility of each alternative j observed by subject i in each experiment with a linear function.

Valuation of the product v can be expressed as $\theta_v V_{ij}$, where V_{ij} is a dummy equal to 1 when the alternative j for subject i is a Kindle (Yoplait yogurt) and 0 otherwise (i.e., the no-buy alternative) and θ_v is the coefficient that captures the valuation of the product. Similarly, price sensitivity can be expressed as $\theta_p Price_{ij}$, where $Price_{ij}$ is the price for alternative j for subject i, and θ_p captures price sensitivity.

With regard to warm glow, recall that sensitivity is manipulated by letting subjects pick their own charity versus assigning the charity. As such, β_{PYO} captures sensitivity to warm glow when the charity is picked by the subject, while β_A captures sensitivity to warm glow when the charity is assigned by the experimenter. The square root of donation $\sqrt{d_{ij}}$ is multiplied by an indicator dummy, I_{PYOij}, equal to 1 if the charity for alternative j was chosen by subject i and 0 otherwise. Similarly, the square root of the donation $\sqrt{d_{ij}}$ is multiplied by an indicator dummy, I_{Aij}, equal to 1 if the charity for alternative j, subject i, was assigned by the researcher and 0 otherwise. In the no-buy option, all of the dummies are switched off, so that $I_{Aij} \neq (1 - I_{PYOij})$. I expect that $\beta_{PYO} > \beta_A > 0$.

Turning to social pressure, recall that aversion to social pressure, α, is manipulated by the public versus private setting. α_{pub} captures aversion to social pressure in the public setting, while α_{priv} captures aversion to social pressure in the private setting. The quantity α_{pub}, $(d_{ij} - \kappa Price_{ij})^+$ is multiplied by an indicator dummy, I_{pubij}, equal to 1 when the subject i's response is public for alternative j and 0 otherwise. Similarly, α_{priv}, $(d_{ij} - \kappa Price_{ij})^+$ is multiplied by an indicator dummy, I_{privij}, equal to 1 when the subject i's response is private for alternative j and 0 otherwise. As above, for the no buy option, all the dummies are switched off, so that $I_{pubij} \neq (1 - I_{privij})$. I expect that that $\alpha_{pub} < \alpha_{priv} < 0$.

Collecting terms, the estimation equation for alternative j for subject i can be written as:

$$\begin{aligned} u_{ij} = \theta_v V_{ij} + \theta_p Price_{ij} + \beta_{PYO} I_{PYOij}\sqrt{d_{ij}} + \beta_A I_{Aij}\sqrt{d_{ij}} \\ +\alpha_{pub} I_{pubij}(d_{ij} - \kappa Price_{ij})^+ + \alpha_{priv} I_{privij}(d_{ij} - \kappa Price_{ij})^+ + \epsilon_{ij} \end{aligned} \tag{1.2}$$

Let $\overline{\kappa}$ be such that $(d_{ij} - \kappa Price_{ij})^+$ is always positive. Under the assumption that $\kappa < \overline{\kappa}$, equation (1.2) can be rearranged as:

$$\begin{aligned} u_{ij} = \theta_v V_{ij} + \theta_p Price_{ij} - \alpha_{pub}\kappa I_{pubij} Price_{ij} - \alpha_{priv}\kappa I_{privij} Price_{ij} \\ +\beta_{PYO} I_{PYOij}\sqrt{d_j} + \beta_A I_{Aij}\sqrt{d_{ij}} + \alpha_{pub} I_{pubij} d_{ij} + \alpha_{priv} I_{privj} d_{ij} + \epsilon_{ij} \end{aligned} \tag{1.3}$$

The re-expressed function, Equation (1.3), is linear in its parameters, which allows me to write down the log-likelihood in a straightforward way. Assuming that error follows a type-1 extreme value, the log-likelihood can be written as:

$$LL = \frac{\sum_i \sum_j e^{u_{ij}}}{\sum_{\kappa}^{N} e^{u_{ij}}} \tag{1.4}$$

where N is the number of product alternatives seen by each subject in each trial. Below, I turn to this estimation for each of the experiments.

Kindle Experiment. I manipulated public versus private setting across subjects, but I did not manipulate the beneficiary in the Kindle experiment. This eliminates β_{PYO}, and equation 3 for alternative j observed by subject i simplifies to:

$$u_{ij} = \theta_v V_{ij} + \theta_p Price_{ij} - \alpha_{pub}\kappa I_{pubij} Price_{ij} + \beta_A I_{Aij}\sqrt{d} + \alpha_{pub} I_{pubij} d_{ij} + \alpha_{priv} I_{privij} d_{ij} + \epsilon_{ij} \quad (1.5)$$

with $0 < \kappa < 0.06 = \overline{\kappa}$[9]

Table 1.6: Parameter Estimates - Kindle Experiment

	Fixed Coefficients		Random Coefficients			
	(1)	(2)	(3)		(4)	
Dep. Var. Choice=1	Coeff.	Coeff.	Mean of Coeff.	SD of Coeff.	Mean of Coeff.	SD of Coeff.
	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)	(Std. Err.)
Ind. Var.						
θ_V	4.514	12.458	4.648	2.575	12.559	2.470
	(1.065)***	(1.457)***	(1.074)***	(.909)***	(1.464)***	(.922)***
θ_p	-0.042	-0.159	-0.041	0.033	-0.158	0.031
	(.013)***	(.018)***	(.013)***	(.013)**	(.018)***	(.013)**
β_A		0.628			0.645	0.486
		(.176)***			(.162)***	(.241)**
κ		0.035			0.031	-
		(.612)			(.896)	
α_{priv}		0.046			0.050	0.068
		(.036)			(.038)	(.105)
α_{pub}		0.008			0.005	0.120
		(.047)			(.043)	(.092)
N	1,504	1,504	1,504		1,504	
LL	-489.0	-362.7	-483.6		-353.7	
AIC	982.0	737.4	975.2		729.4	
BIC	992.6	769.3	996.5		787.9	

* significant at 10%; ** significant at 5%; *** significant at 1%

I find that the random coefficients specifications (Models 3 and 4, Table 1.6) explain

[9] The highest value κ can take such that $d - \kappa p > 0$ for all the data in the sample is $\overline{\kappa} = \frac{5}{89} = 0.06$

the data better. The baseline Model 3 incorporates neither social pressure nor warm glow from donations. Here, I find that the average subject has a positive utility for Kindle ($\theta_v = 4.648$, $p < 0.01$) and that the mean price coefficient is negative ($\theta_p = -0.041$, $p < 0.01$), indicating that subjects' utility is decreasing in price. The model with the behavioral parameters (Model 4 in Table 1.6) performs better than the model without (Model 3 in Table 1.6). Sensitivity to warm glow is positive and significant ($\beta = 0.645$, $p < 0.01$). Aversion to social pressure is insignificant in both the private ($\alpha_{priv} = 0.050$, $p > 0.1$) and the public condition ($\alpha_{pub} = 0.005$, $p > 0.01$).

The relevance of these results can be seen more clearly by using the price coefficient from Equation 1.5, (θ_p) to rescale sensitivity to warm glow and aversion to social pressure. I can compute that a \$5 donation to the Susan G. Komen Foundation generates warm glow of \$9.13; donating an additional dollar generates about \$0.87 additional willingness to pay. For this sample, the cost of social pressure is insignificant, suggesting that subjects are not willing to pay more or less due to social pressure. These conclusions should be viewed with caution since we know that the social pressure manipulation used in this experiment (the pink color) was viewed differently by men and women, in effect confounding social pressure and liking.

Yoplait Experiment 1. I manipulated public versus private setting, as well as "choose your charity" versus an assigned charity across subjects in the Yoplait experiments. In the first study, in each choice triplet, subjects chose between two donation embedded yogurts and a no-buy option. There were no yogurt product choices were without a donation. As such, I_{privj}, I_{pubj}, I_{PYO} and I_A are linearly dependent with V, so I set I_{privj} as the baseline and α_{priv} drops out, simplifying the estimating equation to:

$$\begin{aligned} u_{ij} &= \theta_v V_{ij} + \theta_p Price_{ij} - \alpha_{pub} \kappa I_{pubij} Price_{ij} \\ &+ \beta_{PYO} I_{PYOij} \sqrt{d_j} + \beta_A I_{Aij} \sqrt{d} + \alpha_{pub} I_{pubij} d_{ij} + \epsilon_{ij} \end{aligned} \tag{1.6}$$

with $0 < \kappa < 0.08 = \overline{\kappa}$[10]

The estimated random coefficient models fit the data better, so I focus my discussion on Models 3 and 4. The benchmark Model 3 in Table 1.7 incorporates neither social

[10] The highest value κ can take such that $d - \kappa p > 0$ for all the data in the sample is $\overline{\kappa} = \frac{0.10}{1.29} = 0.08$

Table 1.7: Parameter Estimates - Yoplait Experiment 1

	Fixed Coefficient		Random Coefficients			
	(1)	(2)	(3)		(4)	
Dep. Var. Choice=1	Coeff. (Std. Err.)	Coeff. (Std. Err.)	Mean of Coeff. (Std. Err.)	SD of Coeff. (Std. Err.)	Mean of Coeff. (Std. Err.)	SD of Coeff. (Std. Err.)
Ind. Var.						
θ_V	4.791	4.196	4.799	0.644	4.196	0.000
	(.416)***	(.463)***	(.417)***	(.572)	(.463)***	(.598)
θ_p	-4.033	-4.788	-4.072	0.640	-4.788	0.549
	(.385)***	(.440)***	(.388)***	(.690)	(.440)***	(.693)
β_{PYO}		4.281			4.281	0.000
		(.753)***			(.753)***	(1.569)
β_A		3.448			3.448	0.000
		(.824)***			(.824)***	(1.371)
κ		0.000			0.000	-
		(.000)			(.000)	
α_{pub}		-2.270			-2.270	0.000
		(.635)***			(.635)***	(2.563)
N	1,530	1,530	1,530		1,530	
LL	-481.0	-461.0	-480.0		-460.1	
AIB	966.0	934.0	968.0		942.2	
BIC	976.7	966.0	989.3		1000.9	

* significant at 10%; ** significant at 5%; *** significant at 1%

pressure nor warm glow from donations. I find that the average subject has positive utility for Yoplait yogurt ($\theta_V = 4.799$, $p < 0.01$) and that the mean price coefficient is negative ($\theta_p = -4.072$, $p < 0.01$). Model 4, which incorporates aversion to social pressure and sensitivity to warm glow, fits the data better (see AIC and BIC Table 1.7). The average subject displays an aversion to social pressure ($\alpha_{pub} = -2.270 < 0$, $p < 0.01$ - see Model 4 in Table 1.7). Regarding sensitivity to warm glow, I find that subjects obtain utility from donations, and that such utility increases when subjects are able to pick the target charity.($\beta_{PYO} = 4.281 > \beta_A = 3.448$, both $p < 0.01$ - see Model (4) in Table 1.7).

Rescaling the parameters by price, I find that a \$0.10 donation to Project HOPE is worth \$0.22 in warm glow, which increases to \$0.38 for a \$0.30 donation to the same charity. In comparison, a \$0.30 donation to a charity chosen by the subject increases willingness to pay by an additional \$0.10. Turning to social pressure, a \$1 donation induces a cost of \$0.42.

Yoplait Experiment 2. As in the first Yoplait study, I manipulated public versus private and choose your charity versus an assigned charity across subjects in this study with university students in a lab setting rather than the online setting presented above. In another difference, the choice sets were redesigned. Specifically, the choice triplets consisting of two yogurt products and the no-buy option also included yogurt products without a donation in some sets. As such, the estimating equation for alternative j observed by subject i given by:

$$\begin{aligned} u_{ij} = {} & \theta_v V_{ij} + \theta_p Price_{ij} - \alpha_{pub}\kappa I_{pubij} Price_{ij} - \alpha_{priv}\kappa I_{privij} Price_{ij} \\ & + \beta_A I_{Aij}\sqrt{d} + \beta_{PYO} I_{PYOij}\sqrt{d_j} + \alpha_{priv} I_{privij} d_{ij} + \alpha_{pub} I_{pubij} d_{ij} + \epsilon_{ij} \end{aligned} \tag{1.7}$$

with $0 < \kappa < 0.08 = \overline{\kappa}$[11]

The estimated random coefficient models fit the data better, so I focus my discussion on Models 3 and 4. Model 3 in Table 1.8 is a benchmark model where subjects feel no social pressure or warm glow from donations. I find that the average subject has positive utility for Yoplait yogurt ($\theta_V = 4.991$, $p < 0.01$) and that the mean price coefficient is negative ($\theta_p = -4.153$, $p < 0.01$). Model 4 adds aversion to social pressure and

[11] The highest value κ can take such that $d - \kappa p > 0$ for all the data in the sample is $\overline{\kappa} = \frac{0.10}{1.29} = 0.08$

Table 1.8: Parameter Estimates - Yoplait Experiment 2

	Fixed Coefficients		Random Coefficients			
	(1)	(2)	(3)		(4)	
Dep. Var. Choice=1	Coeff. (Std. Err.)	Coeff. (Std. Err.)	Mean of Coeff. (Std. Err.)	SD of Coeff. (Std. Err.)	Mean of Coeff. (Std. Err.)	SD of Coeff. (Std. Err.)
Ind. Var.						
θ_V	4.887	6.586	4.991	2.221	6.741	2.436
	(.291)***	(.334)***	(.296)***	(.528)***	(.340)***	(.554)***
θ_p	-4.171	-7.197	-4.153	1.361	-7.248	1.361
	(.293)***	(.350)***	(.294)***	(.527)***	(.354)***	(.537)***
β_A		6.265			6.322	0.489
		(.753)***			(.757)***	(1.151)
β_{PYO}		6.423			6.451	1.817
		(.749)***			(.755)***	(1.274)
κ		0.000			0.000	-
		(.000)			(.000)	
α_{priv}		-3.039			-2.921	1.263
		(1.373)**			(1.401)**	(2.414)
α_{pub}		-4.942			-5.041	3.593
		(1.368)***			(1.357)***	(2.361)
N	3,904	3,904	3,904		3,904	
LL	-1166	-925.5	-1148.4		-904.36	
AIB	2,336.0	1,865.0	2304.8		1,834.7	
BIC	2,348.5	1,908.9	2329.9		1,916.2	

* significant at 10%; ** significant at 5%; *** significant at 1%

sensitivity to warm glow. This model fits the data better (see AIC and BIC Table 1.8). The average aversion to social pressure is higher when subjects' behavior is more publicly visible ($\alpha_{pub} = -5.041 < \alpha_{priv} = -2.921 < 0$, both $p < 0.01$; significant difference with $p < 0.05$ - see Model 4 in Table 1.8). Additionally, for sensitivity to warm glow, I find that subjects obtain utility from donations, and that such utility increases when subjects are able to pick the target charity ($\beta_{PYO} = 6.322 < \beta_A = 6.451$, both $p < 0.01$ - see Model (4) in Table 1.8).

Rescaling the parameters by price, I find that a \$0.10 donation to Project HOPE creates warm glow of \$0.28; a \$0.30 donation to the same charity creates \$0.48 of warm glow. In comparison, a \$0.30 donation to a charity picked by the subject increases warm glow by an additional \$0.01. Turning to social pressure, a \$1 donation on a social media redemption site induces \$0.70 in social pressure cost, while the same donation on a private redemption site induces only \$0.40 in social pressure cost.

1.2.4 General Discussion

Together, my empirical analyses suggest that the warm glow and social pressure evoked by corporate donations embedded into products significantly impact consumers' utility and product choices. I find that a model incorporating these effects performs better than a benchmark model without these effects. My estimates of the focal parameters (viz. sensitivity to warm glow and aversion to social pressure) demonstrate statistical and managerial relevance.

Across the experiments, I establish that donations beyond a threshold induce costs. The threshold itself (relative to the price charged) is quite small, given that my estimates of κ are close to 0 in all of the experiments. Thus, I conclude that many real world donation campaigns create such costs. Furthermore, the cost induced by a specific donation level is contingent on features of the donation campaign. For instance, identifying the product with the donation visibly magnifies these costs. In my data, a visible or public \$1 donation creates a social pressure cost equivalent to a price increase of up to \$0.70-almost twice as much as a donation made in a private or less visible fashion. Pressuring buyers carries a cost in many circumstances, even when the cause is worthwhile.

Turning to warm glow, I find that in the Kindle experiment, the value of donating the first dollar to the Susan G. Komen Foundation is approximately \$4.08; in the first Yoplait experiment it is \$0.69 for donating the first dollar to Project HOPE and \$0.89 for donating the first dollar to a charity picked by the subject; and in the second Yoplait experiment it is \$0.87 for donating the first dollar to Project HOPE and \$0.89 for a charity picked by the subject. Warm glow has widely different valuations between products. The difference might be due to the different consumption utility of the products. For a package of yogurt, a \$1 donation is huge compared to the price, but it is a relatively small donation for a the purchase of a durable, relatively more expensive Kindle reader. It is possible that the \$1 donation for yogurt would be in the decreasing return area of the curve, while the \$1 donation for the Kindle is still in the portion of the curve where returns are more than proportional.

If we contrast more comparable donations, increasing the donation to the Susan G. Komen Foundation on a Kindle from \$5 to \$6 is worth approximately \$0.90 in warm glow, while the value of increasing the donation to Project HOPE from \$0.10 to \$0.30 on a Yoplait yogurt is \$0.16 in Experiment 2a and \$0.20 in Experiment 2b. Moving the \$0.30 donation from Project HOPE to a charity picked by the subject is worth about \$0.10 for subjects in Experiment 2a and \$0.01 for subjects in Experiment 2b. From these results, it is clear that while warm glow increases with donations, a firm should carefully calibrate its donations to avoid donating more than the warm glow it creates. Targeting donations at customers' preferred causes helps increase buyer's perceived "bang for the buck."

Pulling these results together, we get a clearer picture of consumers' reactions to donation embedded products. The managerial implications of warm glow are relatively straightforward. Principally, the decision-maker must fold into his calculus the diminishing response from each additional donation amount and calibrate donations carefully. However, the concomitant social pressure effect arising from donations makes the donation decision more complex. It is incorrect to infer that social pressure costs should *always* deter a firm from undertaking campaigns that exert social pressure on its customers. The net effect of warm glow and social pressure may be positive. Indeed, casual empiricism discloses that many firms resort to social pressure. For instance, the "Pink Ribbon" examples in Figure 1.1 are all instances in which the decision to use the highly iconic color plainly induces social pressure costs. We need to pinpoint more precisely the circumstances under which a rational firm will choose actions that yield social pressure.

1.3 Firms' Optimal Donation Embedding Strategy

Using the insights about warm glow and social pressure developed above, I develop an analytical model of consumers' response to corporate donations embedded into products and examine firms' reactions. In spite of its negative effect on consumers' utility, aversion to social pressure can be profit enhancing. The intuition is that social pressure decreases sensitivity to price so that under some conditions, it allows firms to reap higher profits.

1.3.1 Model

Consider a duopoly model with no collusion between the firms. Consumers are uniformly distributed along a Hotelling line on their preferences for the firm product, and firms are located at the two endpoints (Firm 1 at $x = 0$ and Firm 2 at $x = 1$). For a consumer located at x, utility for Firm 1's product is given by:

$$U_1 = v - tx - p_1 + \beta\sqrt{d_1} - \alpha(d_1 - \kappa p_1)^+ \tag{1.8}$$

while utility for Firm 2's product is given by:

$$U_2 = v - t(1 - x) - p_2 + \beta\sqrt{d_2} - \alpha(d_2 - \kappa p_2)^+ \tag{1.9}$$

where

v is valuation of the product;

t is the transportation cost;

x is the distance between the consumer and the firm;

p_i is the price set by firm i;

β is the sensitivity to warm glow;

d_i is the donation by firm i; and

α is the aversion to social pressure.

Hence, consumers differ on their preferences for the product, but not on their preferences for the charity. I focus on this source of consumer heterogeneity because I am interested in understanding whether embedding donations can sway consumers' purchases away from competing products. I am also interested in whether firms can use donation embedded products to gain a competitive advantage.[12]

Without loss of generality, I normalize the marginal cost for the product to 0 so that firm i's profits are given by:

$$\pi_i = (p_i - d_i)q_i \tag{1.10}$$

Firms decide simultaneously on donations and then, based on donations, they decide on prices. Consumers then decide from which firm to buy. To find the subgame perfect Nash equilibrium, I solve the optimization problem backward, starting by solving for quantities purchased. Quantity, q_i, is computed by finding the location of the marginal consumer who is indifferent between buying for Firm 1 and Firm 2. For such consumers, $U_1 = U_2$. Solving for x when $U_1 = U_2$ yields:

$$q_1 = 1 - q_2 = \frac{\beta\left(\sqrt{d_1} - \sqrt{d_2}\right) - p_1 + p_2 - \alpha(d_1 - \kappa p_1)^+ + \alpha(d_2 - \kappa p_2)^+ + t}{2t} \tag{1.11}$$

Plugging 1.11 into 1.10, the profit function for firm i is given by:

$$\pi_i = (p_i - d_i)\frac{\beta\left(\sqrt{d_i} - \sqrt{d_j}\right) - p_i + p_j - \alpha(d_i - \kappa p_i)^+ + \alpha(d_j - \kappa p_j)^+ + t}{2t} \tag{1.12}$$

Once I account for quantities, profit depends not only on a firm's own actions, but also on its competitor's actions. Quantities sold by Firm i are increasing in its own donations and in the other firm's prices, while they are decreasing in its own prices and in the other firm's donations.

Firms first decide on donations. Depending on donation level, four cases arise: 1) no firm offers donation embedded products; 2) both firms offer donation embedded products; 3) Firm 1 offers donation embedded products and Firm 2 does not; and 4)

[12] I also solved a model in which consumers where heterogeneous on β. The main difference in results between the current model and the model with consumers that are heterogeneous on β is that, depending on circumstances, firms might decide to serve only part of the market. In a market in which there is a high warm glow and a low warm glow segment of consumers, firms will decide to cater to both segments or only to the high warm glow consumers depending on the size of each segment as well as on the difference between the β of the two segments.

Firm 2 offers donation embedded products and Firm 1 does not. To maximize profits, I consider the four cases separately and compare the optimal solution across cases to find the equilibrium strategies. Within each case, I solve backward and maximize firms' profits first for prices, p_i, then for donations, d_i. Finally, I compare the four cases to find the equilibrium.

I find that in a duopoly where consumers are distributed along the Hotelling line, equilibrium prices, warm glow, and profits are given by:

Lemma 1.1 *For* $\beta^2 > \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ *both firms offer donation embedded products, and donations, prices, quantities and profits are given by:*

$$d_1 = d_2 = \frac{\beta^2}{4(\alpha+1-\alpha\kappa)^2}; \quad p_1 = p_2 = \frac{\beta^2}{4(1+\alpha-\alpha\kappa)^2} + \frac{t}{1-\alpha\kappa} \tag{1.13}$$
$$q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2(1-\alpha\kappa)}$$

For $\frac{4\kappa}{(1-\kappa)} t \leq \beta^2 \leq \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ *two equilibria exist:*

$$d_1 = d_2 = \frac{\kappa t}{1-\kappa}; \quad p_1 = p_2 = \frac{t}{1-\kappa}; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{1.14}$$

or

$$d_1 = d_2 = 0; \quad p_1 = p_2 = t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{1.15}$$

Finally, for $0 < \beta^2 < \frac{4\kappa}{(1-\kappa)} t$ *and* $\beta^2 < \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$*, both firms offer donation embedded products, and donations, prices, quantities, and profits are given by:*

$$d_1 = d_2 = \frac{\beta^2}{4}; \quad p_1 = p_2 = \frac{\beta^2}{4} + t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{1.16}$$

In Region 1, where warm glow is moderate, both firms offer donation embedded products, and their profits are increasing in social pressure. In Region 2, there are multiple equilibria, in which either both firms offer donation embedded products or no firm offers donation embedded products. In this region, firms experience the same profits, whether they both offer donation embedded products or neither offers such products. Finally, in Region 3, where warm glow is low, both firms offer donation embedded products, and there is no social pressure.

Even in the duopoly case, it is convenient for profit maximizing firms to offer donation embedded products, so long as customers are sensitive to warm glow (i.e., $\beta > 0$). There are regions in which social pressure arises in equilibrium, but such regions can only exist if consumers appreciate the donation chosen by the firm (i.e., $\beta >> 0$). Intuitively, social pressure is only present in the high warm glow region because to have social pressure, the price of the product has to be relatively low with respect to the donation (i.e., $d_i > \kappa p_i$). However, as warm glow decreases, optimal donation decreases faster than price. As a result, for any given κ, if sensitivity to warm glow is sufficiently low, donations become smaller than κp and social pressure disappears. This crossover happens at lower levels of warm glow sensitivity as κ decreases, but never happens if κ is sufficiently small (i.e., $\kappa \to 0$). The less consumers feel they are helping the firm in its prosocial behavior, the more guilt they experience.

Proposition 1 *For* $\beta^2 > \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$*, firms' prices and donations are decreasing in terms of aversion to social pressure,* α*, while profits are increasing in terms of aversion to social pressure,* α*.*

Proof for this result is immediate and is not provided. Intuitively, as aversion to social pressure increases, consumers appreciate donations less, but they are also less sensitive to price. As a result, firms choose lower donations and lower prices. However, because of the reduced sensitivity to price, firms do not have to lower prices as quickly as donations. Hence, in this region, firms' profits increase in social pressure, α. Interestingly, in this region, profits from offering donation embedded products are strictly higher than when neither firm offers donation embedded products[13] . This is due to the fact that social pressure softens price competition, thereby allowing firms to reap higher profits.

Proposition 2 *Firms' prices and donations increase weakly in terms of sensitivity to warm glow,* β*, while profits are independent of sensitivity to warm glow,* β*.*

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[13] As shown in Appendix B, when both firms do not offer donation embedded products $\pi_1 = \pi_2 = \frac{t}{2}$

Proof for this result is immediate and is not provided. This result highlights another interesting feature of a duopoly. While donations and profits are increasing in terms of sensitivity to warm glow, β, profits operate independently from sensitivity to warm glow. This is due to the competitive forces between firms, which prevent one firm from unilaterally raising prices to appropriate the extra utility consumers experience from warm glow. As a result, as sensitivity to social pressure, β, increases, firms provide higher donations and raise their prices just enough to cover the cost of providing the higher donation. If they were to raise their prices by more than their costs, other firms could undercut them. Hence, when both firms offer donation embedded products and social pressure is absent, firms cannot earn any additional profit from embedding donations, and their profits are the same as when neither firm offers donation embedded products.

1.3.2 Discussion

Overall, profit maximizing firms will choose to offer donation embedded products as long as consumers care enough about warm glow. In addition, competition does not crowd out donations nor does it prevent firm from applying social pressure. The interplay between warm glow and social pressure is quite complex, and worth some reflection.

Basically, the strategy for competing firms is to offer donation embedded products, at least as long as consumers care about the cause chosen by the firm; indeed, both donations and prices increase for more well liked causes. The competitive pressure keeps prices from rising faster than donations, so that profits are fixed in terms of warm glow, but consumers' utility is increasing in terms of sensitivity to warm glow. Note that sensitivity to warm glow is the primary driver of donations: if consumers do not experience warm glow (i.e., sensitivity to warm glow is $\beta = 0$), the optimal action for the firm is to make no donations. When there are no donations, the firm does not create social pressure on consumers because $d = 0 \leq \kappa p$. Hence, a firm's actions do not generate social pressure absent warm glow.

Aversion to social pressure does not make firms shy away from exerting such pressure. When the charities are liked by consumers (i.e., sensitivity to warm glow β is high), profits increase with aversion to social pressure. I conclude that a firm targeting well-liked causes should increase social pressure. As mentioned above, the intuition for this result is that aversion to social pressure decreases sensitivity to price.

When firms are competing and consumers are sensitive to warm glow, $\beta >> 0$, the equilibrium is for both firms to offer donation embedded products and aversion to social pressure has a positive effect on firms' profits. Indeed, while firms make no higher profits by offering donation embedded products when there is no social pressure, firms gain higher profits by offering donation embedded products when social pressure is present.

My results shed some light on the "green-washing" charge often laid by activists who accuse firms of being disingenuous about CSR. They argue that firms are not altruistically inclined, they are simply acting to increase profits. I show that a rational (i.e. profit-maximizing) firm is far-sighted enough to recognize and accommodate the social preferences of its own customers. This effect survives competitive pressures despite the cost-increasing aspect of embedded donations. I argue this is a desirable consequence.

1.4 Conclusion and Future Research

In this paper, I provide a new framework to evaluate CSR, specifically donations embedded into products. In a series of experiments, I highlight how these donations appeal to consumers through warm glow and social pressure. While warm glow has a positive effect on consumers' utility, social pressure has a negative effect. To the best of my knowledge, this is the first attempt to show the effect of social pressure on consumer and firm behavior in the context of a specific form of CSR, product embedded donations.

By using these insights on the drivers of CSR, I develop a model of firms' and consumers' behavior and show that embedding products with donations can improve profits. Additionally, I show that social pressure can be beneficial to firms, despite the negative effect social pressure has on consumers. Aversion to social pressure appears to reduce sensitivity to prices because, when consumers feel guilty for not doing the "right thing," they are willing to pay to make things right. This does not imply that consumers *like* social pressure; instead, their buying behavior is increased because they dislike it.

Moreover, in my estimation I am able to quantify the magnitude of the parameters and compare them to dollar values. I find that the mean cost of social pressure is between a few cents and \$0.70 for a \$1 donation, while the benefit of the first dollar of donation varies between \$0.69 and \$4.08, depending on the value of the product embedded with the donation and the beneficiary of the donation. I find ample evidence of consumers' heterogeneity for aversion to social pressure.

I also highlight, both empirically and theoretically, how social pressure can impact consumers' utility and how this feature should inform firms' behavior. By highlighting the negative effects of social pressure after controlling for warm glow, I draw attention to the importance of understanding social pressure and its effect on consumers' behavior. While social pressure has been studied as a way to increase compliance with social desirable consumeption patterns (Griskevicius et al. 2010; Goldstein et al. 2008; Schultz et al. 2007), little attention has been given to the potential cost of pressuring consumers into respecting social norms (with the notable exceptions of Andreoni et al. 2012 and Della Vigna et al. 2012).

By formalizing a utility representation for products associated with a donation, including warm glow and social pressure, I extend the previous literature in multiple ways. First, I provide a model to represent social pressure in interactions between a firm and its customers. While peer-to-peer social pressure had been formalized before in the context of contribution to public goods (Della Vigna et al. 2012), to the best of my knowledge, I am the first to extend the concept to firms. Additionally, I extend the CSR literature by using a richer utility function that considers both the positive and negative effects of CSR.

From a managerial perspective, my model provides clear direction for practitioners shaping their marketing actions to maximize profits. Marketers should offer donation embedded products. In choosing the donation to embed, they should align the cause with their consumers' preferences to maximize the effect of warm glow. Finally, companies should only resort to social pressure when the cause they choose can yield high warm glow.

Some limitations remain. The empirical results of my study that quantify warm glow sensitivity and social pressure aversion are based on stated preferences.While, I demonstrate that social pressure induces exit from the choice setting, it is possible that consumers in a real-world environment would make different choices than during an experiment. It would be interesting to study the phenomenon using field experiments or firm data. I also impose a specific structure to the utility function. While this allows me to solve for and get precise predictions for firm behavior, those predictions are predicated on the functional form. Further work could relax some of the assumptions. For example, the social pressure term in the utility function could incorporate an industry rather than a firm-specific donation level as the reference point and could examine how changes in the reference point can impact consumers' and firms' behavior.

Chapter 2

Fairness Ideals in Distribution Channels

Research in behavioral and experimental economics suggests that concerns for fairness impact a wide range of agents' behaviors.[1] Subjects in various versions of the ultimatum and dictator games routinely offer higher than optimal shares of the initial endowment, and responders virtually always turn down low offers that are significantly higher than predicted by standard economic models (Camerer 2003).

Through consumer and company surveys meant to investigate what is considered "fair" in circumstances ranging from price increases to renting contracts, researchers have found that people largely agree on what is and is not fair. This suggests that fairness is a widely understood concept (Anderson and Simester 2004, 2008, 2010; Gth, Schmittberger, and Schwarze 1982; Kahneman, Knetsch, and Thaler 1986a, 1986b; Olmstead and Rhode 1985). Perhaps stemming from this shared understanding, empirical evidence indicates that fairness or equity plays an important role in certain business contexts (Heide and John 1992; Jap 2001; Jap and Anderson 2003; Kumar, Scheer, and Steenkamp 1995; Olmsted and Rhode 1985; Scheer, Kumar, and Steenkamp 2003, Zaheer, McEvily, and Perrone 1998, Zaheer and Venkatraman 1995, etc.). For instance, in a study that surveyed 417 American and 289 Dutch auto dealers, Scheer, Kumar,

[1] A short list of research on this topic includes: Anderson and Simester 2004, 2008, 2010; Camerer 2003; Charness and Rabin 2002; Fehr, Klein, and Schmidt 2007; Fehr and Schmidt 1999; Goldfard et al. 2012; Gth, Schmittberger, and Schwarze 1982; Hackett 1994; Ho and Su 2009; Kahneman, Knetsch, and Thaler 1986a, 1986b; Macneil 1980; Olmstead and Rhode 1985, and Rabin 1993.

and Steenkamp (2003) found concerns for distributive fairness among business partners. They also found that *i*nequity plays a very different role for auto dealers across cultures: American dealers react only to disadvantageous inequity, while Dutch dealers are sensitive to unfairness whether it is a disadvantage or a boon to their own business.

There is also strong experimental support for fairness concerns among contracting agents (Fehr, Klein, and Schmidt 2007; Hackett 1994; Loch and Wu 2008). Fehr, Klein, and Schmidt (2007) have shown that bonus contracts that offer a voluntary and unenforceable bonus for satisfactory performance provide powerful incentives. In fact, they are superior to *e*xplicit incentive contracts for fair-minded players.

Other fields confirm this preference more widely. There is ample evidence in neuroscience and psychology suggesting that all human decision makers have an intrinsic desire for fairness (Bechara and Damasio 2005; Koenigs et al. 2007; Sanfey et al. 2003; Stephen and Pham 2008). Stephen and Pham (2008), in particular, have documented how decision makers' feelings of fairness and emotions play an important role in ultimatum games and negotiations.

Given the widely documented importance of fairness, theorists and practitioners have called attention to the issue of understanding fairness as a top priority for developing and maintaining healthy business relationships in distribution channels. Cui, Raju, and Zhang (2007) model the effect of fairness concerns between manufacturers and retailers in a dyadic channel with linear demand. In their work, the manufacturer can use a single wholesale price to coordinate the channel-so long as the retailer has strong concerns for fairness. That is, the double marginalization problem can be avoided in a fair channel. Caliskan-Demirag, Chen, and Li (2010) extend Cui, Raju, and Zhang's work (2007) to consider non-linear demand functions. This team finds that a linear wholesale price can coordinate the channel at a wider range when the retailer is fair-minded. And, more recently, Pavlov and Katok (2011) affirmed that a linear pricing contract can still maximize the channel profit even when there is information asymmetry between channel members about fairness concerns. The importance of fairness to a healthy relationship among channel members is documented and analyzed time and time again.[2]

[2] The research includes: Anderson and Weitz 1992; Caliskan-Demirag, Chen, and Li 2010; Corsten and Kumar 2003, 2005; Frazier 1983; Hackett 1994; Katok and Wu 2009; Kaufmann and Stern 1988; Kumar 1996; Kumar, Scheer, and Steenkamp 1995; Loch and Wu 2008; Macneil 1980; McCharty 1985; Meyer et al. 2010; Olmstead and Rhode 1985; Scheer, Kumar, and Steenkamp 2003.

Although previous research has generated extensive useful insights on how fairness affects channel interactions, several important questions remain. How strong are fairness concerns in a channel? What principle guides the determination of the equitable payoff (i.e., what is considered a "fair deal")? And, if a firm's decision deviates from standard economic models' predictions, can we chalk it up to the decision maker's dedication to fairness or could it be bounded rationality restricting optimal choices?

In order to better understand these issues, I experimentally investigate theoretical predictions regarding prices in a dyadic channel in which the manufacturer acts as a Stackelberg leader in choosing prices and the retailer acts as a follower. From this, I build a Quantal Response Equilibrium (QRE) model (McKelvey and Palfrey 1995) that incorporates both the retailer's concerns for fairness and the bounded rationality affecting both firms to explain the discrepancy between the theoretical predictions and empirical regularities. The behavioral model nests the standard economic model as a special case. Through this enriched model, I am able to investigate how equitable payoffs are determined in a fair channel. I estimate the behavioral model from experimental data using maximum likelihood methods.

This research makes the following contributions to the extant literature: 1) I provide empirical evidence that fairness matters in distribution channels and I estimate its relevance. The estimation results suggest significant fairness concerns in channels. 2) I show that fairness concerns identify well entrenched preferences, and are not simply an artifact of bounded rationality. I use a two-sided QRE specification to study the bounded rationality of both the manufacturer and retailer and distinguish it from behavioral concerns for fairness. To the best of my knowledge, this is the first research that analyzes the bounded rationality of both players in a dyadic channel, and it allows me to quantify bounded rationality and fairness using experimental data from incentive aligned experimental studies. 3) I investigate how a fair split of profits is determined. This is the first study to use empirical evidence regarding what is considered a fair deal in the pricing game of a distribution channel. In particular, I examine what constitutes an equitable division of profit between the retailer and the manufacturer by comparing three fairness principles-strict egalitarianism, liberal egalitarianism, and libertarianism (Cappelen et al. 2007)-against a proposed new principle of fairness: the sequence-aligned ideal. This new principle reflects the power structure in the dyadic channel and proposes that the equitable payoff should be consistent with the ratio of players' profits in the standard Stackelberg game. Hence, this fairness principle can be seen as reflecting an important element in distribution channels: their power structure. 4) I show that the proposed sequence-aligned ideal performs best in experimental determinations of what is considered fair in a channel. This suggests that, in the context of channel relations, it is perceived as "fair" for the more powerful firm (in this model, the manufacturer acting as the Stackelberg leader) to obtain a higher payoff than the less powerful firm (the retailer acting as a follower). This finding reveals how power influences channel members' beliefs about deserved profits and how such beliefs affect decisions and eventually guide the realization of profits for the channel.

This chapter owes a great debt to Cappelen et al. (2007), who studied the three fairness ideals in a dictator distribution game in which the outputs of a production stage might determine the equitable payoff. It diverges, however, in three important ways: 1) This research presents a behavioral model that incorporates both bounded rationality and fairness concerns. The addition of bounded rationality allows me to better distinguish between deviations from rational decisions due to subjects' mistakes and deviations due to fairness concerns. 2) I propose an alternate fairness ideal, the sequence-aligned ideal, which generalizes the concept of strict egalitarianism. This ideal is particularly suited to the channel context because it can capture power differentials between channel members. Indeed, I show that the newly proposed fairness ideal outperforms other fairness ideals in experimental studies. 3) In this paper, players in a dyadic channel make pricing decisions in the second stage of the game, while in Cappelen et al. (2007), the dictator decides how much currency to give the passive receiver in the second stage. The active role of the retailer, who decides on a retail price in the second stage of the game and can punish the manufacturer for unfair behaviors, not only provides a more realistic setting but also forces manufacturers to carefully consider retailers' preferences and concerns about fairness. Additionally, the setting in this paper is more closely related to the dyadic channel structure widely studied in marketing and pricing literature.

My study further contributes to the literature on incorporating behavioral theories into quantitative marketing models to better understand how firms' decisions may be affected by certain behavioral factors. Past studies have concerned cognitive hierarchy

(Camerer, Ho, and Chong 2004; Goldfarb and Xiao 2011; Goldfarb and Yang 2009), fairness concerns (Chen and Cui 2012; Cui, Raju, and Shi 2012; Cui, Raju, and Zhang 2007; Feinberg, Krishna, and Zhang 2002), bounded rationality (Che, Sudhir, and Seetharaman 2007; Chen, Iyer, and Pazgal 2010), loss and/or risk aversion (Hardie, Johnson, and Fader 1993; Kalra and Shi 2010), regret or counterfactual considerations (Lim and Ho 2007; Syam, Krishnamurthy, and Hess 2008), reference dependency (Amaldoss and Jain 2010; Ho and Zhang 2008; Orhun 2009), emotions (Sanfey et al. 2003; Stephen and Pham 2008), and learning (Amaldoss and Jain 2005; Amaldoss, Bettman, and Payne 2008; Bradlow, Hu, and Ho 2004a,b; Chen, Su, and Zhao 2012; Ho and Weigelt 1996).

This chapter is organized as follows. In the next section, I outline the standard economic model and present theoretical predictions about prices and investments. In subsequent sections, I describe the experimental design and report results. Then, I outline a behavioral model that incorporates both bounded rationality and fairness concerns by channel members. The results of the estimated model are also described in the section. I conclude with main findings and directions for future research.

2.1 Standard Economic Model

The standard economic model provides the theoretical predictions of the investments and prices that channel members will choose when they are rational profit maximizers. Consider the standard dyadic channel, in which a single manufacturer sells its product through a single retailer. There are two stages of pricing. Each firm has an initial endowment of E at the beginning of the first stage. In stage one, both manufacturer and retailer simultaneously decide how much of their initial endowment E they would like to invest to increase the demand for the product. I denote $I_M \leq E$ as the manufacturer's investment and $I_R \leq E$ as the retailer's investment. Given their investments, the manufacturer moves first to charge a constant wholesale price w. Taking the wholesale price w as given, the retailer then sets the retail price p. Without loss of generality, I assume that production cost c is zero. Market demand is given by $D(p) = BD - b * p = a + I_M * R_M + I_R * R_R - b * p$, where $BD = a + I_M * R_M + I_R * R_R$refers to the base demand of the product, $R_M > 0$ ($R_R > 0$) represents the rate of return for the manufacturer's (retailer's) investment, and $b > 0$. I denote $\pi_M = w * D(p)$

as the manufacturer's profit from sales of products and $\pi_R = (p - w) * D(p)$ as the retailer's profit from sales of products. Thus, the manufacturer's total profit is given by $\Pi_M(I_M, w) = E - I_M + \pi_M = E - I_M + w * D(p)$ and the retailer's total profit is given by $\Pi_R(I_R\, p) = E - I_R + \pi_R = E - I_R + (p - w) * D(p)$.

I solve the model with backward induction. Detailed proofs are given in Appendix A. I first solve the sequential pricing game given any investments by the manufacturer and retailer. Firms' investments are then solved given firms' price decisions as a function of firms' investments. Given investments I_M and I_R, the optimal wholesale price is given by $w(I_M, I_R) = \frac{a+I_M R_M + I_R R_R}{2b}$, and the optimal retail price is given by $p(I_M, I_R) = \frac{3(a+I_M R_M + I_R R_R)}{4b}$. Given firms' best-response prices and the other firm's investment, a firm's profit is a convex function of its investment, and the optimal investments are given by

$$(I_M^*, I_R^*) = \begin{cases} (0,0) & if \quad 0 < R_M < R_{M1} \quad and \quad 0 < R_R < R_{R1} \\ (0,E) & if \quad 0 < R_M < R_{M2} \quad and \quad R_R \geq R_{R1} \\ (E,0) & if \quad R_M \geq R_{M1} \quad and \quad 0 < R_R < R_{R2} \\ (E,E) & if \quad R_M \geq R_{M3} \quad and \quad R_R \geq R_{R3} \end{cases} \tag{2.1}$$

The threshold values of return rates are defined as $R_{M1} = \frac{1}{E}(\sqrt{a^2 + 8bE} - a)$, $R_{R1} = \frac{1}{E}(\sqrt{a^2 + 16bE} - a)$, R_{M2} solved from $\Phi_M(R_{M2}, R_R) = 0$, R_{R2} solved from $\Phi_R(R_M, R_{R2}) = 0$ and R_{M3} and R_{R3} simultaneously solved from $\Phi_M(R_{M3}, R_{R3}) = 0$ and $\Phi_R(R_{M3}, R_{R3}) = 0$, where the functions Φ_M and Φ_R are given by

$$\begin{cases} \Phi_M(x, y) = E \cdot x^2 + 2(a + E \cdot y)x - 8b \\ \Phi_R(x, y) = E \cdot y^2 + 2(a + E \cdot x)y - 16b \end{cases} \tag{2.2}$$

2.2 The Experiment

Human subjects were recruited to act in the role of either the manufacturer or the retailer. Subjects were randomly assigned to one of four treatment conditions shown in Table 2.1. In each round, each player was matched with another player taking the opposite role. They played the first half of the rounds in the role of the manufacturer (retailer) and the second half in the role of the retailer (manufacturer). In the first stage of each round, the two players in the same channel simultaneously decided on the investments out of their initial endowment of $E = 10$ pesos. As I was interested in understanding how players determined an equitable payoff, the return rates were varied across conditions so that the return rate for the investments could be either .2 or 1.2. This variation allows me to differentiate between the effect of the contribution to the channel that is under the agents' control (i.e., the investments) and the effect of the contribution that is outside the agent's control (i.e., the effective return on investment as affected by the exogenously given return rates). The values of the return rates were selected so that the optimal investment decision for a profit maximizing agent would always be to invest the entire endowment when facing a high return rate of 1.2 and never to invest anything when facing a low return rate of .2, regardless of the other agent's decision and return rate.

In the second stage of the study, the player acting as the manufacturer decided on the wholesale price first. The player acting as the retailer was a follower, only setting the retail price after seeing the wholesale price. In the experiments, the available investment levels were 0, 5, and 10 pesos $a = b = 1$. Table 2.1 shows the theoretical predictions of investments and prices.

Table 2.1: Prediction of the Standard Economic Model

		Retailer	
		$R_R = 1.2$	$R_R = .2$
Manufacturer	$R_M = 1.2$	10.00, 10.00 12.50, 18.75	10.00, 0 7.50, 10.75
	$R_M = .2$	0, 10.00 7.50, 10.75	0, 0 .50, .75

Note: The first (second) number in each row in a cell refers to the decision by the manufacturer (retailer). The first row shows investments and the second row shows prices.

A total of 154 undergraduate students from a large, public, Midwestern university took part in the experiments. They received cash payments contingent on their performance in the experiments. Each session consisted of approximately 20 subjects and lasted for 75 minutes. Subjects played two trial rounds to familiarize themselves with the game. Roles were randomly assigned at the beginning of the experiment and switched after half the rounds were played (e.g., a subject assigned to retailer in round 1 would play as the retailer for the first half of the session and as manufacturer for the second half of the game). In each round, each subject was matched with a subject playing the opposite role. Subjects knew assignment was randomized and changed at every round, and they did not know with whom they would be paired. This setting let me control for both the reputation effect and players' long-term strategic considerations. I later show the robustness of the findings in repeated games in which each subject interacts repeatedly with a fixed partner.

The experimental procedure was as follows. At the beginning of a session, subjects were given a copy of the instructions and the researcher read the instructions aloud [3] . The researcher then answered any questions. At the beginning of each round, each participant was informed of her role for that round. Then, players simultaneously decided how much of the endowment to invest in the channel. As discussed above, players could choose to invest 0, 5, or 10 out of their total endowment of 10 pesos. After investments were decided, players were informed about the amount of the investments, I_M and I_R, and the amount of baseline demand, $1 + I_M * R_M + I_R * R_R$.

In the pricing stage, the manufacturer acted as a Stackelberg leader, moving first to decide on a wholesale price, w, based on investments and baseline demand. The retailer then moved to decide on retail price, p, based on investments, baseline demand, and wholesale price. The quantity sold was determined based on the demand function $D(p) = 1 + I_M * R_M + I_R * R_R - p$. For each unit sold, the manufacturer earned w pesos and the retailer earned $p - w$ pesos. After the quantity sold was determined, both firms' profits were calculated and communicated to both players. If any firm invested less than the initial endowment, the residual endowment was also added to that firm's final profit.

Subjects were paid a show up fee of $5 and a performance based sum computed by summing payoffs from each experimental round and then converting them to US dollars at a fixed rate. The total payment for each subject, including the show up fee, ranged between $15 and $25. The average payment to subjects was approximately $20. Subjects were paid in cash at the end of each session. The experiments were conducted

[3] See Appendix B for the instructions used in experiment 2 with $R_M = .2$ and $R_R = .2$. The instructions for other conditions are available from the authors upon request.

using z-Tree (Fischbacher 2007).

2.3 Experimental Results

Given this experimental setup, it is easy to compute equilibrium investments and equilibrium prices for profit maximizing agents. Figure 2.1 reports the optimal and the actual investment choice observed in the experiment for retailers, while Figure 2.2 reports the optimal and the actual investment choice observed for manufacturers. Subjects' decisions appear to systematically deviate from the equilibrium predictions. Depending on role and condition, about 40% to 60% of subjects do not choose the equilibrium investment level.

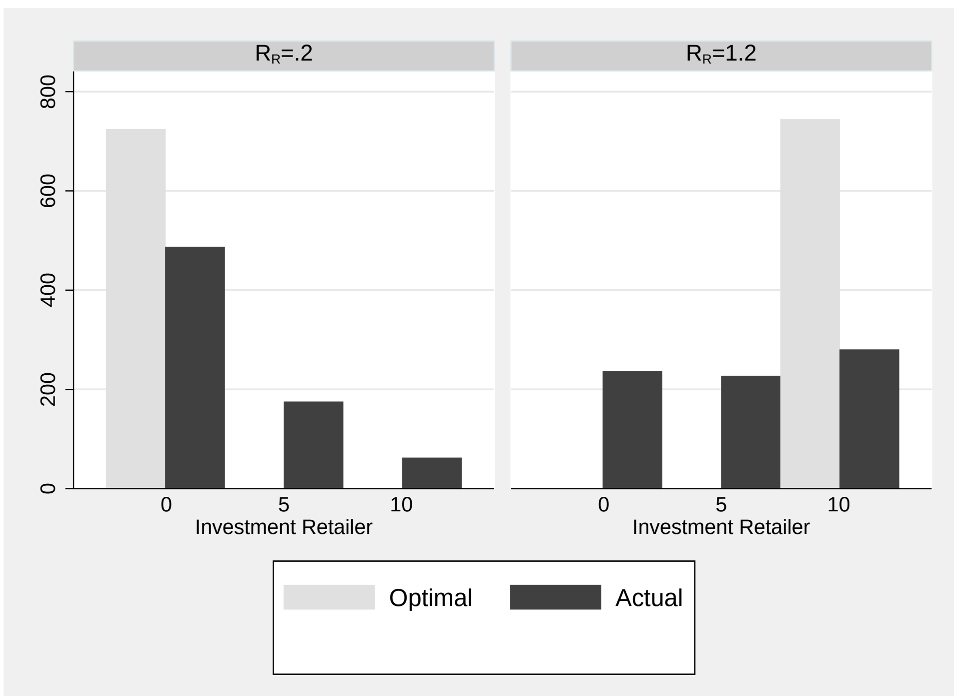

Figure 2.1: Optimal and Actual Investment Choices for Retailers

Similarly, Figure 2.3 shows the ratio between the actual prices chosen by subjects and the prices predicted by the standard economic model. The optimal prices were computed by taking into account the actual investments and, for the optimal retail price, the actual wholesale price. Looking at Figure 2.3, it is evident that subjects

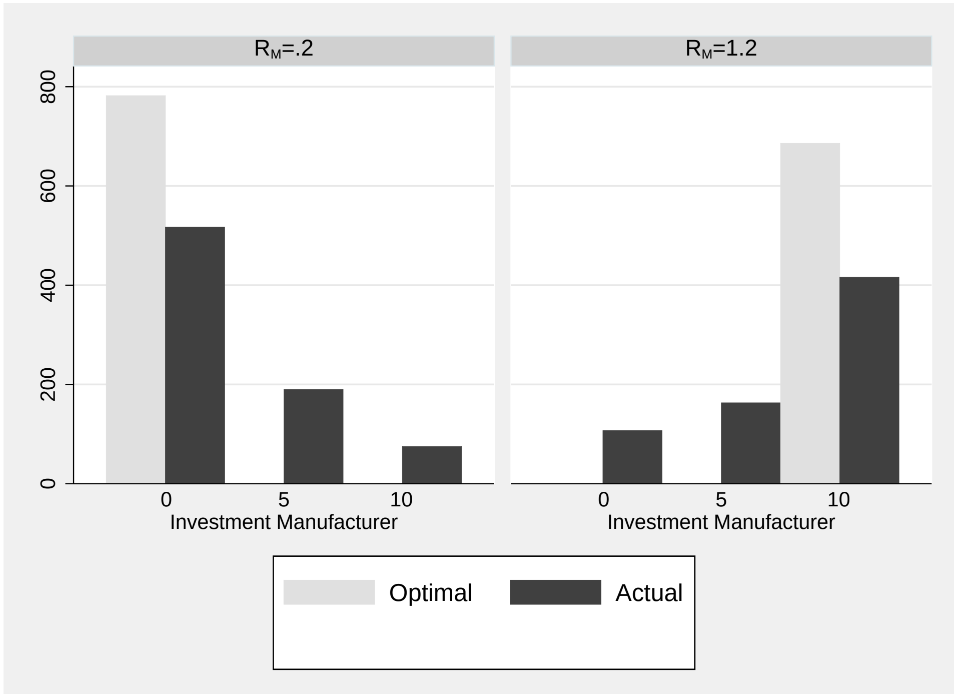

Figure 2.2: Optimal and Actual Investment Choices for Manufacturers

deviate from the optimal prices and that they have a tendency to overprice. In fact, the t-tests (Table 2.2) indicate a significant difference between the optimal prices and the actual prices. This confirms that the prices set by players are significantly higher than the optimal prices, even after accounting for actual investments and actual wholesale prices.

Since I had specifically set out to study fairness, I also examined my experimental results for any instances of "punishment". I reasoned that, if players had concerns for fairness, they would react to an unfair decision by punishing the other channel member [4] . I defined a pricing decision as "punishment" if a player chose a price that brought the demand of the product to zero. Note that such punishment action effectively reduces the earnings of *both* players to zero. Not only is the action costly for the person being "punished", but also for the player doing the punishing. A rational profit maximizing

[4] This intuition was prompted by informal debriefing talks with subjects. When asked why they choose such high prices, subjects replied that it was their way of punishing the other player for charging a high wholesale price.

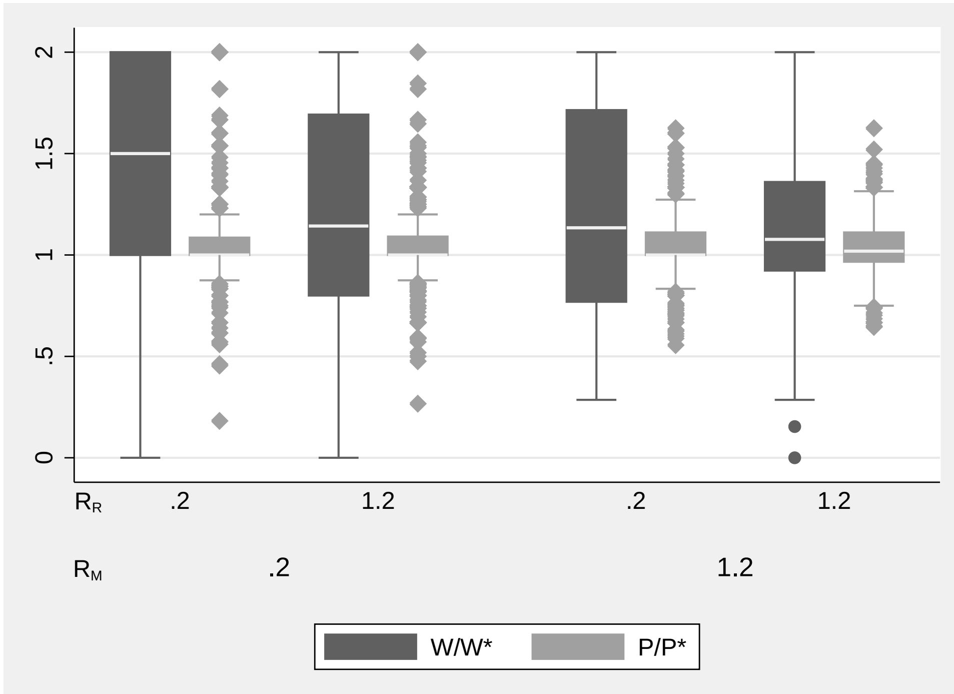

Figure 2.3: Ratio of Actual Prices to Optimal Prices

player should never choose to "punish", as it would only decrease her profit.

I run two logistic regressions to identify concerns of fairness by capturing the determinant of punishment.

$$\Pr(Punishment_M) = \frac{e^{\delta_{0M}+\delta_{2M}\frac{I_M}{I_M+I_R}+\delta_{3M}\frac{I_M R_M}{I_M R_M+I_R R_R}+C_i\delta_{CiM}}}{1+e^{\delta_{0M}+\delta_{2M}\frac{I_M}{I_M+I_R}\delta_{3M}\frac{I_M R_M}{I_M R_M+I_R R_R}+C_i\delta_{CiM}}} \tag{2.3}$$

In the first regression, the probability of manufacturer punishing the retailer is captured by Equation 2.3, where $Punishment_M$ is a dummy variable capturing punishment from the manufacturer (equal to one when manufacturer chooses a wholesale price equal to the baseline demand and zero otherwise). $\frac{I_M}{I_M+I_R}$ captures the ratio of manufacturer investment to total investment, $\frac{I_M R_M}{I_M R_M+I_R R_R}$ captures the ratio of manufacturer contribution to the demand to total contribution to the demand, and C_i is a vector of dummies capturing the experimental condition.[5]

[5] The baseline condition is $R_R = 0.2$ and $R_M = 0.2$, while for C_1 $R_R = 0.2$ and $R_M = 1.2$, for C_2 $R_R = 1.2$ and $R_M = 0.2$, and C_3 $R_R = 1.2$ and $R_M = 1.2$.

Table 2.2: Optimal and Actual Prices Given Actual Investments

		Retailer			
		$R_R = 1.2$		$R_R = .2$	
Manufacturer		w	p	w	p
$R_M = 1.2$	Optimal Price	8.65	13.52	4.91	7.57
	Standard Deviation	3.18	4.87	2.43	3.66
	Actual Price	9.73	13.92	5.32	7.89
	Standard Deviation	4.23	5.20	3.07	4.06
	t-test	-6.34***	-3.55***	-3.43***	-4.28***
$R_M = .2$	Optimal Price	3.66	5.75	.78	1.32
	Standard Deviation	2.53	4.01	.41	.72
	Actual Price	4.18	5.86	1.09	1.39
	Standard Deviation	3.39	4.15	.73	.76
	t-test	-5.10***	-2.28**	-11.19***	-5.09***

**significant at .05 confidence level ***significant at .01 confidence level.

$$\Pr(Punishment_R) = \frac{e^{\delta_{0R}+\delta_{1R}\frac{\hat{w}}{w^*}+\delta_{2R}\frac{I_M}{I_M+I_R}+\delta_{3R}\frac{I_M R_M}{I_M R_M+I_R R_R}+C_i\delta_{CiR}}}{1+e^{\delta_{0R}+\delta_{1R}\frac{\hat{w}}{w^*}+\delta_{2R}\frac{I_M}{I_M+I_R}+\delta_{3R}\frac{I_M R_M}{I_M R_M+I_R R_R}+C_i\delta_{CiR}}} \tag{2.4}$$

In the second retailer regression, the probability of the retailer punishing the manufacturer is captured in Equation 2.4, and only the instances in which there was no previous punishment from the manufacturer were considered. Similarly, $Punishment_R$ is a dummy variable that captures punishment from the retailer, which is equal to one when the retailer chooses a retail price equal to the baseline demand and zero otherwise. The regressors are the same as for the manufacturer regression. In addition, I included a term capturing the magnitude of the manufacturer's deviation from the optimal price, $\frac{\hat{w}}{w^*}$ (the ratio of the actual price chosen by the manufacturer to the optimal price given the baseline demand).

I find that manufacturers resort to punishment in 20% of their decisions, while retailers punish in about 22% of those decision instances in which they have not been punished. Moreover, I find (Table 2.3) that both δ_2 and δ_3 are not significant (i.e., neither investments nor contribution to demand have an impact on punishment decisions).

The decision to punish other players despite its costly consequences suggests that

Table 2.3: Predictors of Punishment

DV	$Punishment_M$	$Punishment_R$
	Coeff. (Std. Err.)	Coeff (Std. Err.)
δ_1	-	1.744
		(.194)***
δ_2	0.0192	-0.532
	(.618)	(.632)
δ_3	-0.579	0.720
	(.623)	(.670)
δ_{C1}	-0.854	-0.631
	(.192)***	(.240)***
δ_{C2}	-1.233	-0.682
	(.185)***	(.229)***
δ_{C3}	-2.414	-1.519
	(.272)***	(.235)***
δ_0	-0.161	-2.619
	(.155)	(.304)***
Observations	1,468	1,167
Log Likelihood	-676.4	-551.9
AIC	1364.72	1117.76
BIC	1396.47	1153.2

Note: Standard errors are shown in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

players are not purely self-interested. In addition, the significance of δ_1 implies that the retailer's punishment is a rather systematic consequence of manufacturer's action. The retailer becomes more likely to punish the more the manufacturer deviates upward from optimal wholesale price. This systematic behavior suggests that punishment is retaliation for a manufacturer's attempts to take advantage of the first-mover role and spurring the retailer to perceive the decision as unfair.

2.4 Capturing Empirical Regularities

The experimental data shows that both wholesale and retail prices are significantly different from the predictions of the standard economic model and that channel members are willing to punish each other even when such punishment is costly. I explain these results by generalizing the standard economic model to incorporate fairness concerns that can affect the interactions between channel members (Kumar 1996; Kumar, Scheer, and Steenkamp 1995; Loch and Wu 2008). Beyond fairness concerns, another possible reason for players to set prices that deviate from the standard economic model is bounded rationality. That is, these players are trying to maximize profits, but they are making mistakes in their decisions. In order to identify bounded rationality in price decision making, I employ the Quantal Response Equilibrium (QRE) model (McKelvey and Palfrey 1995).

I start with a discussion of the fairness ideals which determine the equitable payoff for a fair-minded firm. Next I analyze the QRE model that incorporates fairness concerns expressed by different fairness ideals. Finally, I estimate the QRE model with fairness concerns using the experimental data.

2.4.1 Fairness Ideals

I use the model of distributive fairness (Fehr and Schmidt 1999) to conceptualize fairness concerns between channel members (Kumar, Scheer, and Steenkamp 1995; Cui, Raju, and Zhang 2007). A firm with concerns for distributive fairness experiences disutility from inequity in the allocation of payoffs. The negative effect of inequity is stronger when the firm has a lower payoff compared with its equitable payoff (i.e., when a disadvantageous inequity occurs) than when the firm has a higher payoff (i.e., when an advantageous inequity occurs). The equitable payoff is the amount of monetary payoff a firm considers a fair deal.

I follow Cui, Raju, and Zhang (2007) by assuming that the retailer in the channel displays concerns for fairness, while the manufacturer is a profit maximizer. The manufacturer's and retailer's payoffs from sales of product are denoted, respectively, as π_M and π_R, the retailer's utility is given by

$$U_R = \Pi_R - \alpha \cdot \max\{\frac{\tau}{1-\tau}\pi_M - \pi_R, 0\} - \beta \cdot \max\{\pi_R - \frac{\tau}{1-\tau}\pi_M, 0\} \quad (2.5)$$

for $\alpha \geq \beta$ and $0 < \beta < 1$.[6] The terms in parentheses are used to distinguish between advantageous and disadvantageous inequity. To represent an agent that is more adverse to disadvantageous inequity than advantageous inequity, it is further assumed that $\alpha \geq \beta$.

In the utility function, different $\frac{\tau}{1-\tau}$ values represent different fairness ideals. The fairness ideal captures how a player's equitable payoff is determined. What is considered fair by players can vary as a result of social norms and power structure, as well as from the contributions of the players to the final payoff. Our experimental setup, in which the investments of different players affect both the base demand for the product and the firms' profits, is similar to an economy with investment-dependent market demands. In such a context, what is considered a fair profit allocation can depend on the concept I use to define fairness-the so-called fairness ideal. The three most prominent fairness ideals studied in earlier literature are strict libertarianism, strict egalitarianism, and liberal egalitarianism (Cappelen et al. 2007). The new construct is tested by this study.

Strict egalitarianism claims that agents should get the same share of the final outcome, regardless of their respective contributions. Strict libertarianism argues that agents' payoffs should be in agreement with their total contributions, including the factors under their control (i.e., investments) and factors outside of their control (i.e., return rates on investments). Liberal egalitarianism takes a middle ground, arguing that agents' final profits should be divided in proportion to the contributions that are under their control (in this case, investments).

The newly proposed fourth fairness ideal, the sequence-aligned ideal, posits that the players' payoff should be consonant with the share of channel profit it would obtain in the standard Stackelberg pricing model, in which the manufacturer and the retailer sequentially set prices to maximize respective profits. Therefore, when the manufacturer is the Stackelberg leader in a pricing game, the equitable payoff for the retailer would

[6] I assume the retailer compares profit from sales of product π_R with equitable payoff $\frac{\tau}{1-\tau}\pi_M$, which is also a function of the manufacturer's profit from sales of products. Firms' pricing decisions in the pricing stage will affect only their profits from sales of product, given their investment amounts. The residual of endowment, $E - I_j$ (with $j = M, R$), on the other hand, is independent of firms' pricing decisions.

be one-third of the total channel profit or one-half of the manufacturer's profit. The higher profit for the Stackelberg leader comes from its power advantage relative to the follower. The sequence-aligned ideal indicates that the equitable payoffs for the firms should be consistent with the channel's power structure in the channel. This is, to my knowledge, the first research empirically testing how power structure in channel affects the formation of equitable payoffs.

Note that the strict egalitarian ideal can be seen as a special case of the sequence-aligned ideal. When firms have equal power in the channel, they deserve an equal share of the total profit under the sequence-aligned ideal. This division of profits that coincides with the split under the strict egalitarian ideal. Hence, the use of a Stackelberg game is essential to separate the strict egalitarian and the sequence-aligned ideal.

Given the experimental design, each of all the fairness ideals can be represented by a unique value of τ.[7] A value of $\tau = \frac{1}{2}$ corresponds to the strict egalitarian ideal. This is because the retailer's equitable payoff is equal to the manufacturer's profit from sales of product (i.e., $\frac{\tau}{1-\tau}\pi_M = \pi_M$, when $\tau = \frac{1}{2}$). A value of $\tau = \frac{1}{3}$ will successfully represent the sequence-aligned ideal in a standard Stackelberg pricing game since $\frac{\tau}{1-\tau}\pi_M = \frac{\pi_M}{2}$ for $\tau = \frac{1}{3}$ (i.e., the retailer's equitable payoff is proportional to its payoff in a standard Stackelberg game). In a similar fashion, I can show that the value of τ with the liberal egalitarian ideal is given by

$$\tau = \begin{cases} \frac{1}{2} & if \quad I_M = I_R = 0 \\ \frac{I_R}{I_M + I_R} & otherwise \end{cases},$$

and the value of τ with the strict libertarian ideal is given by

$$\tau = \begin{cases} \frac{1}{2} & if \quad I_M = I_R = 0 \\ \frac{I_R \cdot R_R}{I_M \cdot R_M + I_R \cdot R_R} & otherwise \end{cases}.$$

In 2.4, I summarize these four fairness ideals for ease of reference. Note that both the strict egalitarian ideal and the sequence-aligned ideal generate equitable payoffs are independent of firms' investments, while the retailer's equitable payoffs under both the liberal egalitarian ideal and the strict egalitarian ideal depend on both firms' payoffs, which are affected by their investments.

[7] Since α and β measure the degree of fairness concerns for a decision maker but not his belief about what kind of deal is fair, they are independent of the fairness ideal. Therefore, I cannot use parameters α and β to test different fairness ideals.

Table 2.4: Fairness Ideals

Fairness Ideals	τ
Sequence-Aligned	$\frac{1}{3}$
Strict Egalitarian	$\frac{1}{2}$
Liberal Egalitarian	$\frac{1}{2}$, if $I_M = I_R = 0$; $\frac{I_R}{I_M+I_R}$, otherwise
Strict Libertarian	$\frac{1}{2}$, if $I_M = I_R = 0$; $\frac{I_R \cdot R_R}{I_M \cdot R_M + I_R \cdot R_R}$, otherwise

2.4.2 Quantal Response Equilibrium (QRE) Model with Fairness Ideals

It is worth pointing out the importance of bounded rationality in our behavioral model of fairness. Both bounded rationality and fairness concerns may spur players to deviate from optimal decisions. To discover whether fairness is simply an artifact of a deviation from perfect rationality or is an intrinsic preference by the players, I need to figure out whether fairness concerns survive after controlling for bounded rationality. In order to solve this issue, I use a QRE model to capture the deviations from perfect rationality by channel members (Chen, et al. 2012; McKelvey and Palfrey 1995; Ho and Zhang 2008; Lim and Ho 2007). Using a QRE model allows me to answer the following questions: 1) What is the driving force behind deviations in players' decisions? 2) Can I differentiate fairness concerns and bounded rationality and quantify each? 3) Are the manufacturer and retailer both equally affected by bounded rationality in the game?

The key idea of the QRE framework is that decision makers will not always make the optimal decision, but they will make *b*etter decisions more often. This idea can be operationalized using a logit model. If I assume that decision makers make suboptimal choices that are subject to random errors that are *i.i.d.* as an extreme value distribution, then the probability of choosing any given option can be computed using a logit specification. More specifically, the probability for the retailer to choose a retail price at level p_j is given by

$$prob(p = p_j) = \frac{e^{\lambda_R U_R(p_j)}}{\sum_k e^{\lambda_R U_R(p_k)}} \tag{2.6}$$

where the parameter λ_R refers to the retailer's degree of Nash rationality and increases as the retailer becomes more rational. It can be easily proven that when $\lambda_R = 0$, the probabilities of the retailer choosing each price level are the same; the retailer is randomly choosing a price level. Intuitively, this happens because the weight attached to the utility carried by each choice is zero. On the contrary, when $\lambda_R = \infty$, the retailer will choose the optimal price level with a probability of one. In fact, in contrast to the case where $\lambda_R = 0$, in this case the weight attached to the utility carried by each choice is infinity; the choice with the highest utility will always be selected.

Hence, the QRE specification nests both perfect rationality and random choice in a flexible specification. It also has the advantage of requiring only minimal assumptions on the behavioral data. In fact, while the QRE specification requires the econometrician to compute and compare the exact utility yielded by each alternative observed by a player, it only assumes that players choose a better alternative *m*ore often than a worse alternative.

2.4.3 Estimation and Results

I develop a series of models to estimate fairness and QRE parameters using the data from the pricing stage. I can group the models into two categories: 1) the base model in which both agents are boundedly rational and don't learn over time, and 2) the learning model in which both agents are boundedly rational and learn over time.

Since using a QRE specification requires discrete data and the prices in this model are continuous, I separate the data into three equally sized intervals and use the central value of each bin to compute profits and utility.[8] For example, since the feasible range for the retail price is between w and BD, the three available bins for the retail price are: 1) w to $\frac{BD-w}{3}$; 2) $\frac{BD-w}{3}$ to $\frac{2(BD-w)}{3}$; and 3) $\frac{2(BD-w)}{3}$ to BD. If the retailer chose a price in the first interval, I used$p = \frac{BD-w}{6}$; the second bin, $p = \frac{BD-w}{2}$; and the third bin, $p = \frac{5(BD-w)}{6}$. I divide the intervals into equally sized bins instead of using distributional characteristics (e.g., percentiles) because each observation has a different pricing space, making it difficult to determine valid cutoff points for the whole sample. I summarize the notation used for the parameters in Table 2.5.

[8] I also vary the number of intervals used to discretize the variables by using 3, 5, 7, and 9 intervals to discretize the retail price. This does not reveal any significant differences between the models.

Table 2.5: Notation of Estimation Results

λ_R	QRE parameter of the retailer
λ_M	QRE parameter of the manufacturer
α	Parameter of disadvantageous inequity
β	Parameter of advantageous inequity
τ	Parameter of fairness ideal

Base model To understand whether and how fairness impacts subjects' pricing decisions, I first estimated a base model using data from the pricing stage and assuming the manufacturer and retailer are both boundedly rational. Note that when the manufacturer decides on the wholesale price w, she does not know for sure what retail price, p, will be chosen by the boundedly rational retailer. As a result, the manufacturer must make a decision based on her expected profit from each possible wholesale price level. On the contrary, when the retailer chooses the retail price, the wholesale price is already known. Hence, the manufacturer faces a more complicated decision. Under this framework, the log-likelihood for the estimation can be represented as follows,

$$LL = LLM + LLR \tag{2.7}$$

where

$$\begin{aligned} LLM &= \sum_n \sum_i y^{w=w_i} \log(prob(w = w_i)) = \sum_n \sum_i y^{w=w_i} \log(\frac{e^{\lambda_M E\pi_M(w_i|p_j)}}{\sum_k e^{\lambda_M E\pi_M(w_k|p_j)}}) \\ &= \sum_n \sum_i y^{w=w_i} \log(\frac{e^{\lambda_M \sum_j prob(p=p_j)\cdot\pi_M(w_i|p_j)}}{\sum_k e^{\lambda_M \sum_j prob(p=p_j)\cdot\pi_M(w_k|p_j)}}) \end{aligned} \tag{2.8}$$

and

$$LLR = \sum_n \sum_j y^{p=p_j} \log(prob(p = p_j)) = \sum_n \sum_j y^{p=p_j} \log(\frac{e^{\lambda_R U_R(p_j)}}{\sum_k e^{\lambda_R U_R(p_k)}}) \tag{2.9}$$

Here U_R is the utility given by Equation 2.5, $\pi_M = D(p) * w$, and λ_M and λ_R are, respectively, the QRE parameters for the manufacturer and the retailer.[9] Note that

[9] I estimated the maximum likelihood using the fmincon routine in Matlab. Parameters were restricted to respect the assumptions of the theory ($\alpha \geq \beta \geq 0$, $\lambda_R \geq 0$, and $\lambda_M \geq 0$)

the probabilities of different retail prices affect the probabilities of the manufacturer choosing different wholesale prices. This requires simultaneously estimating the log-likelihoods for both manufacturer and retailer (i.e., LLM and LLR).

In my analysis, I estimated different variants of this base model. First, I ran a model with no concerns for fairness and used it as a baseline to check whether considering fairness concerns improved the explanatory power of the model. Next, I ran the four models corresponding to the four different fairness ideals.

The estimation results are presented in Table 2.6. As you can see, all of the models that account for fairness have a significantly better fit than the baseline model. The AIC and BIC values suggest that the fairness ideal best capturing subjects' behaviors is the sequence-aligned ideal. This suggests that there are significant concerns for distributive fairness in a channel where both players are boundedly rational.

Table 2.6: Estimation Results of the Base Model

	$\alpha=\beta=0$	Sequence-Aligned	Strict Egalitarian	Liberal Egalitarian	Strictly Libertarian
λ_R	.10	.08	.08	.08	.08
	(.01)***	(.01)***	(.01)***	(.01)***	(.01)***
λ_M	.02	.02	.02	.02	.02
	(.00)***	(.00)***	(.00)***	(.00)***	(.00)***
α		.39	.14	.07	.01
		(.10)***	(.04)***	(.03)**	(.01)
β		.10	-.38	-.67	-.71
		(.15)	(.23)*	(.26)***	(.26)***
Observations	4404	4404	4404	4404	4404
LL	-3131.8	-3117.23	-3119.93	-3124.45	-3125.7
vs. $\alpha=\beta=0$	-	29.14***	23.74***	14.7***	12.2**
AIC	6267.60	6242.46	6247.86	6256.90	6259.40
BIC	6280.38	6268.02	6273.42	6282.46	6284.96

Note: Standard errors are shown in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

The parameter of disadvantageous inequity α is equal to .39 and is significantly different from zero in the sequence-aligned model ($p < .01$). The parameter of advantageous inequity β is given by .10, directional but insignificant ($p = .50$). Note that the manufacturers' beliefs on retailers' preference play a role in the estimated parameters, hence the insignificant result might be due to manufacturers believing that retailers do not care about advantageous inequality (i.e., manufacturers assume that retailers will not be concerned by unfairness if it results in higher retailer profits).

Since both α and β are positive, the data suggests that an increase in inequity decreases retailer's utility (see Equation 2.5) and players *do* care about disadvantageous and advantageous inequity. That is, concerns exist regarding distributive fairness in the channel. Still, since $\alpha > \beta$, the estimation does confirm that players are *more* dissatisfied with experiencing disadvantageous than advantageous inequity.

Finally, note that both players are boundedly rational. In particular, the QRE parameter for the retailer in the full model is given by $\lambda_R = .08$, while the QRE parameter for the manufacturer is $\lambda_M = .02$. Since a lower QRE parameter implies a higher rate of mistakes, the estimated results indicate that the manufacturer is more prone to mistakes when choosing prices than the retailer. Intuitively, the difference in the QRE parameters can be attributed to the manufacturer's more complicated decisions. This is consistent with the experimental setup in which the manufacturer had to anticipate the retailer's boundedly rational responses when deciding on the wholesale price, while the retailer simply set a retail price p after observing the wholesale price w.

Learning model In addition to the base model, I estimated a model in which subjects were allowed to learn over time (Camerer and Ho 1999; Camerer, Ho, and Chong 2002, 2003; Chen, et al. 2012). To represent learning, I let the QRE parameter change over time according to the following:

$$\lambda_i(t) = \lambda_i + (\theta_i - \lambda_i)e^{-\delta(t-1)} \tag{2.10}$$

where i indicates whether the subject is a retailer or a manufacturer and the bounded rationality parameter $\lambda(t)$ decays exponentially over time.

Note that $\lambda_i(1) = \theta_i$ and $\lambda_i(\infty) = \lambda_i$. Therefore, θ_i can be interpreted as the initial rationality parameter, λ_i as the eventual rationality parameter, and δ captures the rate of learning. Given that the manufacturer and the retailer face different decision situations, I assume the initial and the final rationality parameters will be different for different types of players, and I assume that all players are learning at the same rate.

As for the base model, I run a series of models that allow me to compare the standard model without fairness to the models that incorporate different fairness ideals. Once again, models allowing for fairness dominate the standard model and the fairness ideal that best represents data is the sequence-aligned ideal (see Table 2.7).

Table 2.7: Estimation Results Of The Model With Learning

	$\alpha = \beta = 0$	Sequence-Aligned	Strict Egalitarian	Liberal Egalitarian	Strictly Libertarian
θ_R	.06	.05	.05	.05	.06
	(.02)***	(.01)***	(.01)***	(.01)***	(.02)***
λ_R	.16	.27	.19	.16	.16
	(.05)***	(.71)	(.17)	(.08)**	(.06)***
θ_M	.01	.02	.02	.02	.02
	(.01)***	(.00)***	(.01)***	(.01)***	(.01)***
λ_M	.03	.05	.04	.03	.03
	(.01)***	(.10)	(.02)	(.01)***	(.01)***
δ	.18	.04	.10	.15	.18
	(.19)	(.16)	(.18)	(.18)	(.19)
α	-	.42	.15	.07	.01
		(.10)***	(.04)***	(.03)**	(.01)
β	-	.00	.00	.00	.00
		(.17)	(.17)	(.15)	(.14)
Observations	4404	4404	4404	4404	4404
LL	-3124.99	-3109.48	-3110.28	-3121.69	-3124.34
vs. α=β=0	-	31.02***	29.42***	6.6**	1.3
AIC	6259.98	6232.96	6234.56	6257.38	6262.68
BIC	6291.93	6277.69	6279.29	6302.11	6307.41

Note: Standard errors are shown in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

In the interest of space, I limit my discussion to the best fitting model, the newly-proposed sequence-aligned model. Once again, I find that the parameter for disadvantageous inequity is significant; the retailer experiences disutility when its profit is less than half of the manufacturer's profit. Additionally, the initial rationality parameter indicates that subjects are boundedly rational. The learning parameter is not significant, suggesting that there is no significant learning over time. This inability to learn might be due to the experimental protocol, which randomly matched subjects at each round-this makes the game a one-shot opportunity with no ability to display learning (regardless of whether it might have taken place).

In general, the results of the model that considers learning are comparable those of the base model. Comparing across models, the fairness parameters are similar, with both disadvantageous inequity parameters significant and not significantly different and both advantageous inequity parameters not significantly different from zero. The bounded rationality parameters are also consistent, suggesting that subjects are boundedly rational and retailers tend to make fewer mistakes than manufacturers. As for the base model, I speculate that the difference between the rationality parameters in the learning model is due to the higher complexity of the choice faced by the manufacturer as the first-move player.

2.5 Discussion and Conclusion

In this paper, I experimentally investigate the theoretical predictions on prices in a dyadic channel, where the manufacturer acts as a Stackelberg leader in setting prices, and the retailer acts as a follower. A behavioral model that incorporates both retailers' concerns for fairness and bounded rationality by both firms is proposed to explain the discrepancy between theoretical predictions and empirical regularities. Through this enriched model, I investigate how equitable payoffs are determined in the fair channel and propose a new principle of fairness, the sequence-aligned fairness ideal. This work makes several contributions to the literature.

First, to the best of my knowledge, this research is the first to empirically study fairness ideals in distribution channel. I provide an estimation of fairness parameters in a channel context, and the results suggest that there are significant fairness concerns in dyadic channels. In particular, I find that players are adverse to both advantageous and disadvantageous inequities, and they display a greater aversion for disadvantageous inequity than for advantageous inequity. This research finding provides evidence that fairness can significantly affect firms' decisions in channel and offers support to the notion that fairness can modify channel relations.

Second, this research contributes to the understanding of the determinants of equitable payoffs between fair-minded agents in business relations. I compare three commonly proposed fairness principles (Cappelen et al. 2007)-strict egalitarian, liberal egalitarian, and strict libertarian-with a newly proposed principle of fairness. The new sequence-aligned ideal reflects the power structure of the channel. Comparing and modeling the four principles suggests that the sequence-aligned ideal significantly outperforms other ideals in describing subjects' behaviors in our experiments. The newly established ideal is particularly interesting and important because it reflects the concept that the equitable payoff for the retailer is consonant with the ratio of players' profits in the standard Stackelberg game and suggests that power structure affects what is perceived as "fair". This finding indicates that it is fair for the more powerful firm (in our model, the manufacturer as a Stackelberg leader in our model) to obtain a higher payoff. This finding contributes to the literature on distribution channels by showing how power influences channel members' notions of deserved profits and how such beliefs affect decisions and eventually guide the realization of profits for all the members in a channel.

Last, but not least, this study includes both inclinations for social preferences and bounded rationality. I differentiate and quantify both effects through incentive-aligned experimental studies. On one hand, I find that both manufacturers and retailers make errors in their decisions, although to different extents. Since the manufacturer is the first mover in a Stackelberg game, setting its wholesale price before the retailer decides on the retail price, the manufacturer faces a more complex task. This is confirmed by my estimation: the QRE parameter for the manufacturer is significantly smaller than that for the retailer and the manufacturer is less rational than the retailer. Moreover, when subjects interact repeatedly, they learn more than when they interact with different opponents. On the other hand, I find that even after accounting for bounded rationality, fairness concerns still significantly affect firms' decisions. This implies that deviations in players' pricing decisions from predictions of the standard economic model are not entirely due to errors in decision making-emotion, in the form of concern for fairness, clearly influences the interactions between firms in dyadic distribution channels.

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Appendix A

Sample

Kindle Experiment. The sample collected was fairly heterogeneous and a relatively good representation of the US market. Of the 47 subjects that participated in my experiment, 55.3% were female. Respondents varied in age between 18 and 65, with the average respondent being 39.6 years old. The majority of the subjects had a high school (46.8%) or a college degree (38.3%), with the rest having a master's (8.5%) or a graduate degree (6.4%). Even in terms of household income, the sample was fairly heterogeneous, with the majority of the subjects (36.2%) declaring a household income between $25,000 and $49,999, 23.4% declaring an income below $25,000, 17.0% declaring an income between $50,000 and $74,999 and the remaining 23.4% declaring a household income above $75,000.

Yoplait Experiment 1. The sample collected was fairly heterogeneous and a relatively good representation of the US market. Of the 51 subjects that participated in my experiment, 39.2% were female. Respondents varied in age between 18 and 65, with the average respondent being 39.8 years old. The majority of the subjects had a college degree (51.0%), another 37.4% of the subjects had a high school diploma, while the rest had a master's (5.9%) or a graduate degree (5.9%). Even in terms of household income, the sample was fairly heterogeneous, with the majority of the subjects (43.1%) declaring a household income between $25,000 and $49,999, 37.3% declaring an income below $25,000, 17.7% declaring an income between $50,000 and $74,999 and the remaining 17.7% declaring a household income above $75,000.

Yoplait Experiment 2. The sample consisted of full time students (undergraduate and graduate) at a large public university. Of the 61 subjects that participated in my experiment, 39.2% were female. Respondents ranged in age between 19 and 60, with 75% of subjects being 24 or younger), and the average respondent being 24.4 years old. The majority of the subjects reported to have a high school diploma (37.7%), another 31.2% of the subjects had a college degree, while the rest had a master's (13.1%) or a graduate degree (18%). The majority of the subjects (54.1%) reported a household income below $25,000, 11.5% declared an income between $25,000 snd $49,999, 16.4% declaring an income between $50,000 and $74,999 and the remaining 18% declared a household income above $75,000.

Appendix B

Model Analysis

Proof of Lemma 1.1. First, compute q by finding the location of the marginal consumer who is indifferent between buying for Firm 1 or Firm 2. For such consumers $U_1 = U_2$.

Solving for x when $U_1 = U_2$ yields:

$$q_1 = 1 - q_2 = \frac{\beta\left(\sqrt{d_1} - \sqrt{d_2}\right) - p_1 + p_2 - \alpha(d_1 - \kappa p_1)^+ + \alpha(d_2 - \kappa p_2)^+ + t}{2t} \tag{B1}$$

Hence the duopolist problem is given by:

$$\max_{p_i, d_i} \quad (p_i - d_i)q_i \tag{B2}$$

And plugging B1 into B2, the profit function for firm i is given by:

$$\pi_i = (p_i - d_i)\frac{\beta\left(\sqrt{d_i} - \sqrt{d_j}\right) - p_i + p_j - \alpha(d_i - \kappa p_i)^+ + \alpha(d_j - \kappa p_j)^+ + t}{2t} \tag{B3}$$

Firms decide first whether to offer donation embedded products, then they decide on an optimal level of donation and prices. Hence, to solve for the subgame perfect Nash equilibrium I first maximize profits with respect to prices and then maximize donations given the decision to (not) offer donation embedded products for each firm. Finally I compare the profits for the 4 possible scenarios: 1) both firms offer donation embedded products; 2) no firm offers donation embedded products; 3) Firm 1 offers donation embedded products and Firm 2 does not; and 4) Firm 2 offers donation embedded products and Firm 1 does not.

The maximization process withing the subgames is as follows. Given any level of donation d_i the firm can choose 2 levels of prices: 1) $\kappa p \leq d$; and 2)$\kappa p > d$. Within each condition, I maximized profits first by profits and then by donations. Finally, I compared profits across cases and picked the strategy that maximized profits while satisfying all conditions. I report only the results of the subgames in the interest of space.

If both firms decide not to offer donation embedded products, then the optimal prices, quantities and profits are given by:

$$d_1 = d_2 = 0; \quad p_1 = p_2 = t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B4}$$

If both firms decide to offer donation embedded products, then the optimal donation, prices, quantities and profits are given by:

For $\beta^2 > \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\alpha\kappa)(1-\kappa)}$

$$d_1 = d_2 = \frac{\beta^2}{4(\alpha+1-\alpha\kappa)^2}; \quad p_1 = p_2 = \frac{\beta^2}{4(1+\alpha-\alpha\kappa)^2} + \frac{t}{1-\alpha\kappa}; \tag{B5}$$
$$q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2(1-\alpha\kappa)}$$

For $\frac{4\kappa}{(1-\kappa)}t \leq \beta^2 \leq \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\alpha\kappa)(1-\kappa)}$

$$d_1 = d_2 = \frac{\kappa t}{1-\kappa}; \quad p_1 = p_2 = \frac{t}{1-\kappa}; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B6}$$

For $0 < \beta^2 < \frac{4\kappa}{(1-\kappa)}t$

$$d_1 = d_2 = \frac{\beta^2}{4}; \quad p_1 = p_2 = \frac{\beta^2}{4} + t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B7}$$

If Firm 1 decides to offer donation embedded products and Firm 2 decides not to offer donation embedded products, the optimal donation, prices, quantities and profits are given by:

For $\beta^2 > \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{[3-4\kappa(1+\alpha-\alpha\kappa)]}$ and $\beta^2 < 12(1+\alpha-\alpha\kappa)t$

$$d_1 = \frac{\beta^2}{4(\alpha+1-\alpha\kappa)^2}; \quad d_2 = 0 \tag{B8}$$
$$p_1 = \frac{t}{1-\alpha\kappa} + \frac{(4+\alpha-4\alpha\kappa)\beta^2}{12(1+\alpha-\alpha\kappa)(1-\alpha\kappa)}; \quad p_2 = t - \frac{\beta^2}{12(1+\alpha-\alpha\kappa)}$$

$$q_1 = \frac{(12(1+\alpha-\alpha\kappa)t+\beta^2)}{24(1+\alpha-\alpha\kappa)t}; \qquad q_2 = \frac{(12(1+\alpha-\alpha\kappa)t-\beta^2)}{24(1+\alpha-\alpha\kappa)t}$$
$$\pi_1 = \frac{(12(1+\alpha-\alpha\kappa)t+\beta^2)^2}{288(1+\alpha-\alpha\kappa)^2(1-\alpha\kappa)t}; \qquad \pi_2 = \frac{(12(1+\alpha-\alpha\kappa)t-\beta^2)^2}{288(1+\alpha-\alpha\kappa)^2 t}$$

For $\beta^2 > \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{[3-4\kappa(1+\alpha-\alpha\kappa)]}$ and $\beta^2 > 12(1+\alpha-\alpha\kappa)t$

$$d_1 = \frac{\beta^2}{4(\alpha+1-\alpha\kappa)^2}; \qquad d_2 = 0 \tag{B9}$$
$$p_1 = \frac{t}{1-\alpha\kappa} + \frac{(4+\alpha-4\alpha\kappa)\beta^2}{12(1+\alpha-\alpha\kappa)(1-\alpha\kappa)}; \qquad p_2 = 0$$
$$q_1 = 1; \qquad q_2 = 0$$
$$\pi_1 = \frac{(12(1+\alpha-\alpha\kappa)t+\beta^2)}{12(1+\alpha-\alpha\kappa)(1-\alpha\kappa)t}; \qquad \pi_2 = 0$$

For $\frac{6\kappa}{(3-2\kappa)}t \leq \beta^2 \leq \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{[3-4\kappa(1+\alpha-\alpha\kappa)]}$ and $\beta^2 > \frac{(1-\kappa)^2}{2\kappa(1+\kappa)}t$

$$d_1 = \frac{\beta^2+2t-\beta\sqrt{\beta^2+4t}}{2\kappa^2}; \qquad d_2 = 0 \tag{B10}$$
$$p_1 = \frac{\beta^2+2t-\beta\sqrt{\beta^2+4t}}{2\kappa}; \qquad p_2 = 0$$
$$q_1 = \frac{-\beta^2+2(-1+\kappa)t+\beta\left(\sqrt{\beta^2+4t}+\sqrt{2}\kappa\sqrt{\beta^2+2t-b\sqrt{\beta^2+4t}}\right)}{4\kappa t};$$
$$q_2 = \frac{\beta^2+2(1+\kappa)t-\beta\left(\sqrt{\beta^2+4t}+\sqrt{2}\kappa\sqrt{\beta^2+2t-\beta\sqrt{\beta^2+4t}}\right)}{4\kappa t}$$
$$\pi_1 = (1-\kappa)\left(\beta^2+2t-\beta\sqrt{\beta^2+4t}\right)$$
$$\frac{\left(-\beta^2+2(-1+\kappa)t+\beta\left(\sqrt{\beta^2+4t}+\sqrt{2}\kappa\sqrt{\beta^2+2t-\beta\sqrt{\beta^2+4t}}\right)\right)}{8\kappa^2 t}; \qquad \pi_2 = 0$$

For $\frac{6\kappa}{(3-2\kappa)}t \leq \beta^2 \leq \frac{12\kappa(1+\alpha-\alpha\kappa)^2 t}{[3-4\kappa(1+\alpha-\alpha\kappa)]}$ and $\beta^2 \leq \frac{(1-\kappa)^2}{2\kappa(1+\kappa)}t$

$$d_1 = \frac{\beta^2+2t-\beta\sqrt{\beta^2+4t}}{2\kappa^2}; \qquad d_2 = 0 \tag{B11}$$
$$p_1 = \frac{\beta^2+2t-\beta\sqrt{\beta^2+4t}}{2\kappa}; \qquad p_2 = 0$$
$$q_1 = 0; \qquad q_2 = 1$$
$$\pi_1 = 0; \qquad \pi_2 = 0$$

For $0 < \beta^2 < \frac{6\kappa}{(3-2\kappa)}t$

$$d_1 = \frac{\beta^2}{4}; \quad d_2 = 0 \tag{B12}$$
$$p_1 = t + \frac{\beta^2}{6}; \quad p_2 = t - \frac{\beta^2}{12}$$
$$q_1 = \frac{(12t + \beta^2)}{24t}; \quad q_2 = \frac{(12t - \beta^2)}{24t}$$
$$\pi_1 = \frac{(12t + \beta^2)^2}{288t}; \quad \pi_2 = \frac{(12t - \beta^2)^2}{288t}$$

The subgame in which Firm 2 offers donation embedded products and Firm 1 does not offer donation embedded products is symmetric and won't be discussed in the interest of space.

Comparing the subgames, I find that both firms offer donation embedded products if $\beta^2 > \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ or if $0 < \beta^2 < \frac{4\kappa}{(1-\kappa)}t$ and $\beta^2 < \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$. For the remaining region, I have multiple equilibria with either both firms offering donation embedded products, or no firms offering donation embedded products.

For $\beta^2 > \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ both firms offer donation embedded products, and donations, prices, quantities and profits are given by:

$$d_1 = d_2 = \frac{\beta^2}{4(\alpha + 1 - \alpha\kappa)^2}; \quad p_1 = p_2 = \frac{\beta^2}{4(1 + \alpha - \alpha\kappa)^2} + \frac{t}{1 - \alpha\kappa} \tag{B13}$$
$$q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2(1 - \alpha\kappa)}$$

For $\frac{4\kappa}{(1-\kappa)}t \leq \beta^2 \leq \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ two equilibria exist:

$$d_1 = d_2 = \frac{\kappa t}{1 - \kappa}; \quad p_1 = p_2 = \frac{t}{1 - \kappa}; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B14}$$

or

$$d_1 = d_2 = 0; \quad p_1 = p_2 = t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B15}$$

Finally, for $0 < \beta^2 < \frac{4\kappa}{(1-\kappa)}t$ and $\beta^2 < \frac{4\kappa(1+\alpha-\alpha\kappa)^2 t}{(1-\kappa)(1-\alpha\kappa)}$ both firms offer donation embedded products, and donations, prices, quantities and profits are given by:

$$d_1 = d_2 = \frac{\beta^2}{4}; \quad p_1 = p_2 = \frac{\beta^2}{4} + t; \quad q_1 = q_2 = \frac{1}{2}; \quad \pi_1 = \pi_2 = \frac{t}{2} \tag{B16}$$

Q.E.D.

Appendix C

Model Analysis

Solving Optimal Prices and Investment of the Standard Economic Model. Assume base line demand, BD, is given by $BD = a + I_M \cdot R_M + I_R \cdot R_R$, and market demand, $D(p)$ is given by $D\,(p) = BD - b \cdot p$ with $b > 0$. Further assume that manufacturer's and retailer's profits are given by the sum of the residual endowment and the profit from product sale so that $\Pi_M = E - I_M + w \cdot D(p)$ and $\Pi_R = E - I_R + (p - w) \cdot D(p)$.

First the retailer maximizes its profit with respect to p, $\max_p \Pi_R = E - I_R + (p - w) \cdot D(p)$. From first order condition we get $p^*(w, I_M, I_R) = \frac{a + I_M \cdot R_M + I_R \cdot R_R + w}{2b}$. Given p^*, The manufacturer maximizes its profits with respect to w, $\max_w \Pi_M = E - I_M + w \cdot D(p^*)$. From first order condition, we then have $w^*(I_M, I_R) = \frac{a + I_M \cdot R_M + I_R \cdot R_R}{2b}$ and $p^*(I_M, I_R) = \frac{3(a + I_M \cdot R_M + I_R \cdot R_R)}{4b}$.

Substituting optimal prices into profits, the manufacturers' total profit is given by $\Pi_M(I_M, I_R) = E - I_M + \frac{(a + I_M \cdot R_M + I_R \cdot R_R)^2}{8b}$ and the retailers' total profit is given by $\Pi_R(I_M, I_R) = E - I_R + \frac{(a + I_M \cdot R_M + I_R \cdot R_R)^2}{16b}$.

Because the profit function is convex in investments, $D^2 \begin{pmatrix} \Pi_M(I_M, I_R) \\ \Pi_R(I_M, I_R) \end{pmatrix} = \begin{bmatrix} R_M^2 & R_M \cdot R_R \\ R_M \cdot R_R & R_R^2 \end{bmatrix}$ is positive semidefinite, we will always have corner solutions to the maximization problem. Hence for $i = M, R$, either

$I_i = 0$ or $I_i = E$ so that

$$(I_M^*, I_R^*) = \begin{cases} (0,0) & if \quad 0 < R_M < R_{M1} \quad and \quad 0 < R_R < R_{R1} \\ (0,E) & if \quad 0 < R_M < R_{M2} \quad and \quad R_R \geq R_{R1} \\ (E,0) & if \quad R_M \geq R_{M1} \quad and \quad 0 < R_R < R_{R2} \\ (E,E) & if \quad R_M \geq R_{M3} \quad and \quad R_R \geq R_{R3} \end{cases}.$$

We can compute the threshold values by comparing profits for different investment strategies. In order for (0, 0) to be an equilibrium, we must have $\Pi_M(0,0) > \Pi_M(E,0)$ and $\Pi_R(0,0) > \Pi_R(0,E)$. This leads to $\frac{a^2}{8b} + E > \frac{(a+E\cdot R_M)^2}{8b}$ and $\frac{a^2}{16b} + E > \frac{(a+E\cdot R_R)^2}{16b}$. Defining $R_{M1} = \frac{1}{E}(\sqrt{a^2+8bE} - a)$ and $R_{R1} = \frac{1}{E}(\sqrt{a^2+16bE} - a)$, it is easy to show that the conditions are equivalent to $0 < R_M < R_{M1}$ and $0 < R_R < R_{R1}$.

Similarly, for (E,E) to be an equilibrium, we have $\Pi_M(E,E) \geq \Pi_M(0,E)$ and $\Pi_R(E,E) \geq \Pi_R(E,0)$, which leads to

$$\frac{(a + E\cdot R_M + E\cdot R_R)^2}{8b} \geq \frac{(a+E\cdot R_R)^2}{8b} + E \tag{C1}$$

and

$$\frac{(a + E\cdot R_M + E\cdot R_R)^2}{16b} \geq \frac{(a+E\cdot R_M)^2}{16b} - E \tag{C2}$$

Denote R_M by x and R_R by y, so equation A1 becomes $\Phi_M(x,y) = Ex^2 + 2x(a + Ey) - 8b \geq 0$ and equation A2 becomes $\Phi_R(x,y) = Ey^2 + 2y(a+Ex) - 16b \geq 0$.

For $(0,E)$ to be an equilibrium, the conditions are $\Pi_M(0,E) > \Pi_M(E,E)$ and $\Pi_R(0,E) \geq \Pi_R(0,0)$, which implies that $\Phi_M < 0$ and $R_R \geq R_{R1}$. Similarly, the conditions for $(E,0)$ to be an equilibrium are given by $\Phi_R < 0$ and $R_M \geq R_{M1}$.

Hence, to solve for R_{M2}, R_{R2}, R_{M3}, and R_{R3}, it is sufficient to solve $\Phi_M(R_{M2}, R_R)$ =0 for R_{M2}, $\Phi_R(R_M, R_{R2})$ =0 for R_{R2}, and to simultaneously solve $\Phi_M(R_{M3}, R_{R3})$ =0 and $\Phi_R(R_{M3}, R_{R3})$ =0 for R_{M3} and R_{R3}.

Solving Optimal Prices of the Behavioral Model. Given the baseline demand $BD = a + I_M R_M + I_R R_R$, the manufacturer's profit is given by $\pi_M = w(BD - bp)$ and the retailers' utility is given by $U_R = \pi_R - \alpha \cdot \max\{\frac{\tau}{1-\tau}\pi_M - \pi_R, 0\} - \beta \cdot \max\{\pi_R - \frac{\tau}{1-\tau}\pi_M, 0\}$.

Because the utility function is not continuously differentiable, we need to distinguish between the cases in which the retailer experiences disadvantageous and advantageous inequity. The retailer experiences disadvantageous inequity when $\pi_R - \frac{\tau}{1-\tau}\pi_M \leq 0$ or equivalently $p \leq (1 + \frac{\tau}{1-\tau})w$. Hence, the retailer faces the following maximization problem

$$\max_p (p-w)(BD-bp) - \alpha\,[\frac{\tau}{1-\tau}w - (p-w)](BD-bp)$$
$$s.t.\ p \leq (1+\frac{\tau}{1-\tau})w.$$

Similarly, the retailer experiences advantageous inequity when $\pi_R - \frac{\tau}{1-\tau}\pi_M \geq 0$ or equivalently $p \geq (1 + \frac{\tau}{1-\tau})w$. Hence, the retailer faces the following maximization problem

$$\max_p (p-w)(BD-bp) - \beta\,\left[(p-w) - \frac{\tau}{1-\tau}w\right](BD-bp)$$
$$s.t.\ p \leq (1+\frac{\tau}{1-\tau})w.$$

Following Cui, Raju and Zhang (2007), the optimal retail prices are given by

$$p^*(w, I_M, I_R) = \begin{cases} \frac{BD+w}{2b} - \frac{\beta w \frac{\tau}{1-\tau}}{2(1-\beta)} & if\ w \leq w_2 \\ w + \frac{\tau}{1-\tau}w & if\ w_2 < w \leq w_1 \\ \frac{BD+w}{2b} - \frac{\alpha w \frac{\tau}{1-\tau}}{2(1+\alpha)} & if\ w > w_1 \end{cases}$$

where $w_1 = \frac{a(1-\alpha)}{1+\alpha+(2+\alpha)\frac{\tau}{1-\tau}}$ and $w_2 = \frac{a(1-\beta)}{1-\beta-(2+\beta)\frac{\tau}{1-\tau}}$.

If the manufacturer chooses a price in the range $w \leq w_2$, then the manufacturer's maximization problem is given by $\max_w w(BD-bp)$, $s.t.\ p = \frac{BD+w}{2} - \frac{\beta w \frac{\tau}{1-\tau}}{2(1-\beta)}$ and $w \leq w_2$.

If the manufacturer chooses a price from the range $w_2 < w \leq w_1$, then the manufacturer's maximization problem is given by $\max_w w(BD-bp)$, s.t. $p = w + \gamma \cdot w$, $w > w_2$, and $w \leq w_1$.

If the manufacturer chooses a price in the range $w > w_1$, then the manufacturer's maximization problem is given by $\max_w w(BD-bp)$, $s.t.\ p = \frac{BD+w}{2b} - \frac{\alpha\gamma\cdot w}{2(1+\alpha)}$ and $w > w_1$.

The optimal wholesale prices can be solved accordingly and are given by

$$w^*(I_M, I_R) = \begin{cases} \overline{w}_I & if \quad 0 < \beta \leq 1-3\tau & and \quad \alpha \geq \beta \\ \overline{w}_{III} & if \quad 1-3\tau < \beta \leq 1-\tau & and \quad \beta \leq \alpha < \overline{\alpha} \\ w_2 & if \quad 1-3\tau < \beta \leq 1-\tau & and \quad \alpha \geq max\,\{\overline{\alpha},\ \beta\} \\ \overline{w}_{III} & if \quad \beta = 1-\tau & and \quad \beta \leq \alpha < 2\tau - 1 \\ w_2 & if \quad \beta = 1-\tau & and \quad \alpha \geq max\{2\tau-1, \beta\} \\ \overline{w}_{III} & if \quad 1-\tau < \beta < 1 & and \quad \beta \leq \alpha < 2\tau - 1 \\ \overline{w}_{II} & if \quad 1-\tau < \beta < 1 & and \quad \alpha \geq max\{2\tau-1, \beta\} \end{cases}$$

where $\overline{w}_I = \frac{BD(1-\beta)}{2b(1-\beta-\beta\frac{\tau}{1-\tau})}$, $\overline{w}_{II} = \frac{BD}{2b(1+\frac{\tau}{1-\tau})}$, $\overline{w}_{III} = \frac{BD(1+\alpha)}{2b(1+\alpha+\alpha\gamma)}$, and $\overline{\alpha} = \frac{(1-\beta-3\tau)^2-8\beta\tau^2}{8\tau^2-(1-\beta-3\tau)^2}$.

Appendix D

Instructions

You are about to participate in a decision-making experiment. By following these instructions you can earn a considerable amount of money which will be paid to you in cash before you leave today. Your earnings depend on your decisions as well as on the decisions of other participants. It is important that you do not look at the decisions of others, and that you do not talk, laugh, or make noises during the experiment. You will be warned if you violate this rule the first time. If you violate this rule twice, you will be asked to leave the room immediately and your cash earnings will be $0. The experiment is designed in a way that the anonymity of all the participants is protected.

In this experiment, there will be a total of 20 decision rounds. In each round, you will earn point earnings measured in pesos. The more pesos points you earn, the more cash earnings you make. The decision steps and how you earn pesos points in every round are described as follows:

In each round, you will be randomly matched with another person in the room. You will be acting as either a retailer or a manufacturer. The other person who is matched with you will be acting as a manufacturer if you are acting as a retailer, or will be acting as a retailer if you are acting as a manufacturer. You will act as a manufacturer in 10 out of the 20 rounds and will act as a retailer in the other 10 rounds. In each round, both you and the person you are matched with will make decisions in two phases – an investment phase and a pricing phase. In the investment phase, both the manufacturer and the retailer will each be assigned with 10 pesos and they decide how much to invest to increase the base demand of the product that the retailer is buying from the manufacturer and selling to consumers. In the pricing phase, the manufacturer will decide on the wholesale price and the retailer will decide on the retail price of the product. Consumer demands, the manufacturer's profit, and the retailer's profit will be determined as described below. A manufacturer will not meet with the same retailer for more than once, and a retailer will not meet with the same manufacturer for more than once.

Experimental Procedure The following procedural steps will be repeated in each of the 20 decision rounds:

Step 1: Determining your role

Your computer screen will show whether you are a manufacturer or a retailer in each round. Every subject will be a retailer for 10 rounds and a manufacturer for the other 10 rounds.

Step 2: Determining each member's investment amount

At the beginning of each round both the manufacturer and the retailer will each start with 10 pesos. You will decide how much of the 10 pesos to invest. You can choose to invest 0 pesos, 5 pesos or 10 pesos. After both the manufacturer and retailer decide on their investments, their investment amounts will be shown to each other. Each investment is going to affect the total demand for the product in the way below.

Step 3: Determination of total demand

After both the manufacturer and retailer make investments (denoted as IM for manufacturer and IR for retailer in pesos), the total demand D in unit is determined as follows.

$D = 1 + 0.2 * IM + 0.2 * IR - P$

That is, whenever you make an investment, the investment is going to increase the base demand of the product by 0.2 times of your investments if you are acting as the manufacturer or by 0.2 times of your investments if you are acting as the retailer. Here P refers to the retail price that will be chosen by the retailer later.

Step 4: Manufacturer decides on wholesale price W

After investment amounts IM and IR are chosen, the manufacturer decides on wholesale price W at which the manufacturer sells the product to the retailer.

Step 5: Retailer decides on retail price P

After the wholesale price W is set by the manufacturer, the retailer decides on retail price P.

Step 6: Profits to the manufacturer and retailer

After the manufacturer chooses wholesale price W and the retailer decides on the retail price P, the manufacturer's total profit PiM is given by:

$PiM = 10 - IM + W * D$

The retailer's total profit PiR is given by:

$PiR = 10 - IR + (P - W) * D$

Here D is the demand, 10 is the amount of pesos you start with, and IM or IR is the investment amount you made before.

You will play a test game of 2 rounds before the formal game starts.

Example

Suppose the manufacturer invests 5 pesos and the retailer invests 5 pesos. The manufacturer charges a wholesale price of 1.5 pesos and the retailer charges a retail price of 2.25 pesos. Then total demand D is going to be given by

$D = 1 + 0.2 * 5 + 0.2 * 5 - 2.25 = 0.75$

$PiM = 10 - IM + W * D = 10 - 5 + 1.5 * 0.75 = 6.125$

$PiR = 10 - IR + (P - W) * D = 10 - 5 + (2.25 - 1.5) * 0.75 = 5.5625$

Your Payoffs

Your dollar earnings for the experiment are determined as follows. First, we will sum up your pesos earnings for each of the 20 rounds in which you participated. The profit is going to be converted at a fix rate of dollars per pesos. On top of these earnings you will get a $5 participation fee. We will pay you this amount when you leave the experiment. Note the more pesos you earn, the more money you will receive.