Essays on social responsibility in the marketplace : an experimental economic analysis

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**NANYANG
TECHNOLOGICAL
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**ESSAYS ON SOCIAL RESPONSIBILITY IN THE
MARKETPLACE: AN EXPERIMENTAL ECONOMIC
ANALYSIS**

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SCHOOL OF SOCIAL SCIENCES
2018

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Executive Summary

The idea of market exchange dates back to the ancient world, as evidenced, for example, by ancient bazaars. Over the years, along with the development of the market economy, there have been many cases where sellers or buyers do not take responsibility for external costs generated by their activities, and these costs have instead been passed on to society. A voluntary market exchange would generally generate a social gain, on the condition that there are no negative externalities, whereas production or consumption of goods and services with negative externalities would potentially cause a social loss. Increasing attention has, therefore, been paid to correcting market failure from negative externalities.

There are a lot of interventions that are adopted by governments to address the issue of negative externalities, for example, imposing taxes and making laws or regulations. Apart from the driving forces of governments, the society can also take part in the stimulation of social responsibility. Promoting socially responsible behaviors has recently been recognized as a powerful approach that internalizes negative externalities. In particular, negative externalities caused by insufficient social responsibility have become an increasing concern, which further highlights the importance of stimulating social responsibility.

This thesis is concerned with socially responsible behaviors in the marketplace. We delve into this issue by investigating several potential interventions that stimulate socially responsible behaviors in a market setting. The thesis consists of three self-contained essays.

Chapter 1 investigates the role of non-binding social persuasion in motivating socially responsible behaviors in markets with negative externalities imposed on uninvolved third parties. In our study, we vary the costs of engaging in socially responsible behavior and investigate what

influences the increase in these costs have on the incentives for sellers and buyers to act in a socially responsible manner and the effectiveness of social persuasion. We show that social persuasion can indeed promote socially responsible behavior by influencing the attitudes of both sellers and buyers.

Chapter 2 reports the results of an experiment designed to explore the sanctioning behavior of third parties and its impact on socially responsible production and consumption when third parties are adversely affected by socially irresponsible transactions. Within our study we introduce a third party voluntary contribution mechanism with opportunities to punish socially irresponsible sellers. Meanwhile, we also vary the costs of conducting socially responsible behaviors. The responses of sellers and the behavioral change of buyers are subsequently examined. We find that sanctions exert a positive impact on socially responsible production but conversely, diminish the impulses towards socially responsible behavior in buyers.

Chapter 3 explores the causality between buyers' ex-ante product preferences and socially responsible production. We disclose consumer product preferences to firms before firms make production decisions. Our results demonstrate that a knowledge of buyers' preferences for socially responsible products would encourage sellers to exhibit social responsibility, on the condition that the preference is strong enough. However, the disclosure of the preference also causes a price reduction in socially irresponsible products. Attracted by the lower price, some buyers will switch to socially irresponsible products, a factor that, therefore, counteracts the positive influence of understanding buyers' preferences

Chapter 1 Persuading Buyers to Embrace Socially Responsible Acts: An Experimental Investigation

1.1 Introduction

In recent times, society has increasingly placed significant emphasis on the balance between personal profits and societal interests. This is also the reason why socially responsible behaviors in market environments have received a great deal of attention among scholars (Becchetti et al., 2014; Bénabou and Tirole, 2010; Vitell, 2015; Ha-Brookshire and Norum, 2011). This shift in the public attitude towards caring about socially responsible behaviors is also reflected in market participants' responses towards irresponsible business practices. They often avoid buying socially irresponsible products and prefer to buy socially responsible products even if they have to pay more. Greater the public awareness of social issues increases their willingness to pay for fair products. A good example of this is the case of Unilever, a giant in the market for consumer goods. Unilever found that its sustainable and socially responsible living-brands grow 30% faster than the rest of its traditional business, and in 2015 delivered nearly half the company's total growth (Chakravorti, 2017).

Despite this growing support from the public towards social responsibilities, many firms are still reluctant to do so for fearing that it will drag down their profits. The insufficient corporate social responsibility has seen its fair of social issues in the last two decades, such as poor working conditions, the exploitation of unskilled low-income workers, the use of child labor in the production process, and the adoption of environmentally unfriendly business practices (Landmann and Fröich, 2015; Sarkar and Sarkar, 2016; Castaldo et al., 2009). These plethora of social issues highlight an important trade-off between the pursuit of profits and the incentive to behave socially

responsible. This prompts policy makers to jump into the fray by implementing policies (imposing tax or making laws and regulations) that safeguard public interests against errant behaviors of socially irresponsible participants, and by spending resources to encourage the public to embrace socially responsible behaviors (Albareda et al., 2007, 2008; Steurer, 2010). However, relying on government regulatory efforts alone may be inadequate. There are also some drawbacks of government regulations. The costs of implementing them maybe too high relative to their benefits. Bureaucratic red tapes and inefficiencies also often hinder the effectiveness of these regulations. They may also make markets less competitive. While it is the duty of policy makers to ensure that public interests are served and market failures, caused by the resulting negative externalities imposed on the society, can be avoided, the general public should not take this for granted nor adopt a passive attitude. On the contrary, they should do their part by supporting various efforts like advocacy efforts and persuasive campaigns aimed at persuading companies to adopt socially responsible practices, beyond just pursuing profit maximization. Perhaps a fitting example of this public persuasion and advocacy is the recent case involving Samsung Corporation. In 2016, when reports began to surface that batteries in the new Samsung Galaxy Note 7 were exploding, the tech press jumped on the story, which snowballed quickly. A formal recall process was then initiated by Samsung in response to social pressure and opinions (Matthews and Heimer, 2016). The example of Samsung shows that business practices that are considered irresponsible and harmful to the public well-being can be shunned through pressure from non-profit organizations that champion social causes.

In the last decade, numerous theoretical and empirical studies have also been devoted to investigating issues concerning individual and corporate social responsibility. A number have concentrated on the causality between corporate social responsibility and financial performance

(Peloza, 2009; Flammer, 2015; Mallin et al., 2014; Cheng et al., 2014; Feicht, Grimm, and Seebauer, 2016). Others have focused on the consumers' side and have analyzed how consumers' preferences for ethical products influence market outcomes (De Pelsmacker et al., 2005; Korschun, Bhattacharya, and Swain, 2014; and Sundt and Rehdanz, 2015). Few studies, however, have looked at the various types of interventions that can promote individual and corporate social responsibility, despite some works on the causality between social pressure and ethical behaviors (Baron, 2009, 2010; DellaVigna, List, and Malmendier, 2012). Also, the majority of the previous studies have looked at only one side, either the seller side or the buyer side, but have overlooked market interactions between the two sides. Consideration such as this raises an important question of how market interactions between sellers and buyers would affect both parties' incentives to be socially responsible.

A recent paper (Bartling, Weber, and Yao, 2015) sheds new light on the research field of social responsibility in market interactions. They experimentally investigated the interesting and important question of whether or not market interactions erode social responsibility, concluding that market interactions do partially erode social responsibility. Their study concentrates on a comparison of social responsibility under the condition of market mechanism and non-market mechanism. In the meantime, some influencing factors like firm competition, buyer limited information, and high production cost are also investigated in their study. However, except for the high production cost, the other factors fail to show a statistically significant impact on social responsibility in the markets, which leaves the question how to promote socially responsible behaviors in markets still unsolved.

Our study closes these gaps and has a novel contribution to the literature on the promotion of socially responsible behaviors under the market mechanism. The primary purpose of this chapter

is to explore the potential role of non-binding persuasion by third parties, whose welfare is negatively affected by socially irresponsible behaviors of sellers and buyers, in encouraging sellers and buyers to behave in a more socially responsible manner. As far as we are aware, there is little direct evidence in economics that examines the role of social persuasion in promoting socially responsible behaviors by analyzing both seller and buyer behaviors in the market place. Among the jargon of economic analysis, such non-binding persuasion is cheap talk. It is interesting to examine whether cheap talk can exert significant influence on market transactions, although it carries an empty threat.

We base our experimental investigation on Bartling, Weber, and Yao (2015) novel experimental design and employ their market framework as our baseline treatment but focus on different research questions and experimental treatments. We analyze an experimental market where third parties, who are not involved in any market exchanges, are given opportunities to persuade buyers to purchase socially responsible products. We focus on cases when the surpluses accrued from the consumption are the same to buyers, and hence from a strictly selfish perspective, buyers would be indifferent between purchasing a socially responsible and an irresponsible product. Specifically, we evaluate whether or not persuasive messages sent by third parties to buyers might influence sellers' decisions to produce a costly socially responsible product that does not exert any negative externalities on third parties, and buyers' decisions about whether or not to purchase a socially responsible product. The resulting social gains from market transactions between sellers and buyers are also investigated. Our objective is also to find out whether the decision to produce a socially responsible product rather than a socially irresponsible product influences the relative prices between the two products and sellers' relative profits. Rather than examining only one side, either consumers or producers as in past studies, this study carried out an integrated evaluation of

both sides of the market and their interactions. To the best of our knowledge, our research is the first that analyzes the role of persuasion in promoting social responsibility using the experimental economic methodology.

Our results show that sellers and buyers do care about social responsibility, and it is reflected in their choice of action. In general, market participants consider being socially responsible as important and would not mind sacrificing their own benefits to improve the wellbeing of the third parties. Persuasion appears to have a significant positive effect in promoting socially responsible behaviors of both buyers and sellers. Its positive effect is much stronger when behaving in a socially responsible manner is not very costly. Meanwhile, the society also benefits from the market exchanges in the presence of persuasion. We also show that sellers of socially responsible products earn less profits than sellers of socially irresponsible products in the absence of persuasion. Interestingly, we find that persuasion helps to increase the relative profits of socially responsible sellers to socially irresponsible sellers. Buyers are also shown to care for social responsibility by purchasing a fair product instead of an unfair product, although this implies that buyers must shoulder higher expenditure.

The paper is structured as follows. Section 1.2 is devoted to a description of experimental design and procedures. The experimental predictions are presented in section 1.3. Section 1.4 discusses the results, and in section 1.5 we conclude.

1.2 Experimental Design and Procedures

1.2.1 The Baseline Treatment

The experimental design of our baseline treatment follows that of Bartling, Weber, and Yao (2015). The market trading institution resembles a posted-offer¹ product market. Each market consists of 13 subjects comprising of 5 sellers, 4 buyers, and 4 third parties. Each seller produces only one unit of product and each buyer purchases at most one product. Since there are more sellers than buyers, buyers have the bargaining power, and there will always be at least one unmatched seller.

Sellers and buyers exchange two types of products that differ only in their production costs and their impact on third parties' payoffs. One product is called the "fair product": it does not produce any negative externalities on third parties but incurs a positive production cost ($c^{fair} > 0$) for sellers to produce it. The other product is called the "unfair product": it creates a negative externality (e) on third parties, amounting to -60 points, but has zero cost² ($c^{unfair} = 0$) for sellers to produce it. The difference in production cost of the two products is thus Δc ($\Delta c = c^{fair} - c^{unfair} = c^{fair}$)³. If buyers make a purchase decision then, regardless of the product type, buyers will gain the same value (v), amounting to 50 points. Each seller produces only one type of product and sets a price for their product. The maximum price that a seller can charge is equal to the maximum value for buyers, which is 50 points. Accordingly, the maximum profit that can be

¹ In a posted offer market, sellers publicly announce prices on a take-it-or-leave-it basis and indicate the maximum number of units to be offered at that price. Buyers are randomly drawn, one at a time, and are given the opportunity to make purchases from any seller who has not sold his maximum specified sales quantity.

² We set the production cost of the unfair product as benchmark and normalize it to 0 for simplicity. From the perspective of selfish sellers, when a seller should make a choice between two types of products, only the relative difference in their production costs should matter rather than the absolute production cost of the chosen product. In addition to using a corner point such as zero, variations from this design could also be included in future work.

³ We employ two different values of Δc in each treatment. The exact value of Δc will be detailed later.

accrued from selling an unfair product and a fair product are, respectively, (v) and $(v - c^{fair})$. Each buyer purchases at most only one unit of product, and therefore, must choose whether to purchase either a fair product or an unfair product, or not to purchase any product at all. Each of the third parties is randomly paired with a buyer in each period. As a third party, he can neither sell nor buy and his payoff is determined by the product type bought by his corresponding buyer. There will be no loss incurred if either a fair product or no product is purchased by the corresponding buyer, and a loss (e) of 60 points if an unfair product is purchased by the corresponding buyer. Equations (1.1) to (1.3) summarize the payoffs of all parties per period. We set the endowment points for all players to 100 points in each period ($E^{seller} = E^{buyer} = E^{third\ party} = 100$).

The payoff of each seller can be expressed as;

$$\Pi^{seller} = \begin{cases} E^{seller} + p - c^{fair}, & \text{if the seller sells a fair product at price } p \\ E^{seller} + p, & \text{if the seller sells an unfair product at price } p \\ E^{seller}, & \text{if there is no sale} \end{cases} \quad (1.1)$$

The payoff of each buyer can be expressed as;

$$\Pi^{buyer} = \begin{cases} E^{buyer} + v - p, & \text{if the buyer purchases a product at price } p \\ E^{buyer}, & \text{if the buyer does not purchase any product} \end{cases} \quad (1.2)$$

The payoff of each third party can be expressed as;

$$\begin{aligned} \Pi^{third\ party} & \\ &= \begin{cases} E^{third\ party} - e, & \text{if the third party's corresponding buyer buys an unfair product} \\ E^{third\ party}, & \text{otherwise} \end{cases} \end{aligned} \quad (1.3)$$

Figure 1.1 describes the timeline of our baseline treatment. At the beginning of each period, sellers simultaneously set prices and product types. Once all sellers make their decisions, buyers

enter the market sequentially by a random order and are given the current menu of sellers' product offerings and the corresponding prices. Once a product is purchased by a buyer, it is no longer available to the other buyers. In order to eliminate the possibility of any cross-period reputation, product offerings are displayed in a random order in each period and the ID number of each seller is not revealed to buyers. After that buyers make their decisions either to purchase a product from one of the sellers or not to purchase a product at all.

Figure 1.1: Timeline of the Baseline Treatment

1.2.2 The Persuasion Treatment

The persuasion treatment is carried out by incorporating a stage where third parties are given an opportunity to send messages to persuade buyers to be socially responsible before buyers make purchase decisions.

The timeline for our persuasion treatment is as follows. At the beginning of the first period, each third party sends a short message to all buyers in the same market. In the meantime, each seller decides on which product type to produce and what price to charge. Sellers are informed of that buyers would receive messages from third parties before they make purchase decisions but without knowing the exact contents of messages. Buyers are then provided with all of the messages from third parties. Afterwards, buyers enter the market sequentially by a random order and make their purchase decisions. Once all transactions are completed, third parties give their feedback to

buyers, implying whether they are satisfied or unsatisfied with their corresponding buyer's product choice. Before the next period starts, the statistical summary of the third parties' feedback is revealed to all buyers within the same market. The messages are only sent during the first period in order not to annoy buyers by being continuously lobbied. But we do provide the feedback of third parties to buyers in every period. Non-binding persuasion is cheap talk, it does not directly affect the payoffs. The earnings of different roles are the same as the baseline treatment shown in equations (1.1) to (1.3).

Figure 1.2: Timeline of the Persuasion Treatment

1.2.3 The Two Cost Environments

We also employ two cost environments, in both baseline and persuasion treatments, by varying the extra production cost of the fair product (Δc). The two cost environments are the low-cost environment and high-cost environment. In the low-cost environment, it costs extra 10 points to produce fair products ($\Delta c = c^{fair} - c^{unfair} = c^{fair} = 10$), and the extra cost to produce the fair product increases to 40 points in the high-cost environment ($\Delta c = c^{fair} - c^{unfair} = c^{fair} = 40$). Thus, the production cost of the fair product relative to the unfair product is higher in the high-cost environment. In other words, either production or purchase of the fair product is more costly in the high-cost environment.

1.2.4 Experimental Procedures

The pairwise combinations of the 2 cost environments and 2 treatments discussed above yields 4 experimental treatments (see Table 1.1). Each treatment consists of 8 independent markets, and each market comprises of 13 participants (5 sellers, 4 buyers, 4 third parties). In total, we had 416 participants.

Table 1.1 Treatment Overview

Treatment	No. of Independent Markets	No. of Periods in Each Market	No. of Sellers	No. of Buyers	No. of Third Parties	Total No. of Subjects
Baseline	8	24	40	32	32	104
Persuasion	8	24	40	32	32	104
High Cost	8	24	40	32	32	104
High Cost & Persuasion	8	24	40	32	32	104
Total	32	96	160	128	128	416

The experiment was conducted at Nanyang Technological University. Participants were students from various academic majors including engineering, sciences, business and economics, social sciences, and humanities at Nanyang Technological University. The experiment was programmed using z-Tree software (Fischbacher, 2007). Each participant was given a unique anonymous ID number as their identification throughout the experiment. At the beginning of the experiment, written instructions were distributed and read aloud by the experimenter.

There were 3 stages in each experiment. Participants were randomly assigned to one of the three roles (buyer, seller or third party) at the beginning of the experiment and they remained within the same role for the entire duration of the experiment. Stage 1 was a competitive market game. The game was repeated for 24 periods. At the beginning of each period, each participant received an initial endowment of 100 points. At the end of stage one, one period was randomly selected to

determine their earnings. In Stage 2 we conducted the Holt-Laury risk preferences elicitation. In Stage 3, subjects were asked to answer a post-experiment questionnaire with the purpose to capture their demographic information and the reasons behind their decisions in the experiments. The details of the questionnaire are attached in the appendix. Participants earned around S\$19 to S\$20 on average, including a show-up fee of S\$2. The duration of the experiment was approximately 1.5 hours.

1.3 Experimental Predictions

We employ a simple inequality-aversion driven social-preferences model introduced by Fehr and Schmidt (1999) to work out the market equilibrium as well as to examine the impact of persuasion on the equilibrium. Assume people potentially care not only about their own benefits but also about the social impact of their actions (the benefit to others). The utility function of a seller (a buyer) can be expressed as.

$$U_i(x) = \Pi_i - \alpha_i \max\{\Pi_j - \Pi_i, 0\} - \beta_i \max\{\Pi_i - \Pi_j, 0\}, i \neq j, \beta_i \leq \alpha_i, 0 \leq \beta_i < 1 \quad (1.4)$$

Where, Π_i denotes the payoff of individual $i \in (\text{seller}, \text{buyer})$, which is equivalent to either a seller's profit or a buyer's consumer surplus, and Π_j denotes third party j 's payoff. The second term of the above utility function measures the disutility from disadvantageous inequality, and the third term measures the disutility from advantageous inequality. The third parties are not involved in any transactions, in addition to the initial endowment of 100 points, the maximum payoff that a third party can get from market transaction is 0, and the minimum payoff is -60. The latter prevails when an unfair product is purchased in the market. Buyers and sellers earn non-negative profits and thus would always face advantageous inequality vis-a-vis the third parties. By purchasing an unfair product, buyers can potentially obtain a larger payoff at the expense of the

third parties. Sellers of an unfair product would also obtain a larger payoff when a buyer purchases their product. Consequently, the second term of equation (1.4) is equal to 0, and only the third term matters for buyers and sellers.

We further extend the model by considering β_i as a function of other factors that could potentially influence buyers' and sellers' concerns for the payoff difference between them and the third parties. To examine the impact of persuasion on β_i , we introduce a treatment dummy D that takes the value of 1 for the persuasion treatment and 0 otherwise. Parameter φ denotes the magnitude of the treatment effect. For simplicity, we also assume that β_i follows a linear function, with $\beta_i = \beta_i' + \varphi_i * D$ ($0 \leq \beta_i < 1$ and $0 \leq \beta_i' < 1$)⁴, where β_i' denotes the overall impact of all the other influencing factors except for persuasion. The utility function is thus as follows:

$$U_i(x) = \Pi_i - (\beta_i' + \varphi_i * D)(\Pi_i - \Pi_j), i \neq j, 0 \leq \beta_i' < 1, 0 \leq (\beta_i' + \varphi_i) < 1 \quad (1.5)$$

Note that a seller (or a buyer) is considered to be self-interested if $(\beta_i' + \varphi_i * D) = 0$, as their utility function depends solely on their own payoffs. When $(\beta_i' + \varphi_i * D) > 0$ ($D = 0$ without persuasion and $D = 1$ with persuasion), it indicates sellers or buyers are socially responsible. Further, by assuming that $(\beta_i' + \varphi_i * D) < 1$, it implies that with-and without persuasion, sellers and buyers care more about their own payoffs than the payoff difference between them and their respective third party. In the presence of persuasion ($D = 1$), when $\varphi_i = 0$, persuasion has no impact on buyers' (sellers') incentive to buy (sell) a fair product. When $\varphi_i > 0$, persuasion carries a positive impact on social responsibility. It also implies that a larger weight is placed on the disparity between the buyer (the seller's) own payoff and their respective third party's payoff. Finally, when $\varphi_i < 0$, persuasion has a negative influence on social responsibility.

⁴ Without persuasion ($D = 0$), we have $\beta_i = \beta_i'$ and hence $0 \leq \beta_i' < 1$.

If both buyers and sellers are self-interested ($\beta'_i + \varphi_i * D = 0$, $U_i(x) = \Pi_i$), the utility function is maximized when their payoff reaches the maximum point. Thus the first buyer entering the market would choose the product with the lowest price in order to maximize her consumer surplus regardless of whether the product is fair or unfair. This is because in our setup both fair and unfair products generate the same amount of consumer surplus for buyers. Following the first buyer, the second buyer would select the second lowest price, and so on for the remaining two buyers. Thus, products with the first four lowest prices will be sold. From the seller's side, since the cost of production of the fair product is more expensive than that of the unfair product, offering the fair product requires them to charge a higher price for the fair product than the unfair product in order to maintain the same profit. Consequently, sellers of the unfair product can always undercut sellers of the fair product by an amount up to the production cost of the fair product. This implies that all five sellers would prefer to offer unfair products. Since there are more sellers than buyers, sellers face a competitive market. The price of the unfair product would be pushed down to its production cost. Hence, in equilibrium, we should expect that all products offered and purchased are unfair products and the market price should be equal to 0. However, the resulting outcome would be maximally inefficient for the society because only the unfair product is sold in the market and this product inflict negative externalities on third parties.

It is straightforward to see that the market equilibrium outcome is not going to be affected by persuasion by third parties as long as sellers' and buyers' utility solely depends on their own material payoff. We therefore have the following hypothesis.

Hypothesis 1: When buyers and sellers are self-interested, only the unfair product is produced by sellers and consumed by buyers. The equilibrium price of the unfair product is equal to its

production cost, which amounts to 0. The presence of persuasion by third parties has no influence on the market equilibrium outcome.

When buyers and sellers are assumed to have certain social responsibility, we should yield a market equilibrium that has a positive number of transactions of the fair product. If social responsibility is a persistent personal characteristic of market participants, we should expect a stable market share of the fair products over time.

To further explore the impact of persuasion, substituting payoff functions described in equations (1.1) and (1.2), we can obtain the utility function of sellers and buyers for different product choices.

Hence, seller i would produce fair products instead of unfair products if $U_{seller}^{fair\ product} \geq U_{seller}^{unfair\ product}$, that is:

$$\begin{aligned} & E_i^{seller} + p_i^{fair} - c^{fair} - (\beta_i' + \varphi_i * D)(E_i^{seller} + p_i^{fair} - c^{fair} - E_j^{third\ party}) \\ & \geq E_i^{seller} + p_i^{unfair} - (\beta_i' + \varphi_i * D)(E_i^{seller} + p_i^{unfair} - (E_j^{third\ party} - e)) \end{aligned} \quad (1.6)$$

Given $E_i^{seller} = E_j^{third\ party}$, $p_i^{fair} \geq c^{fair}$ and $p_i^{unfair} \geq c^{unfair} = 0$, this simplifies to:

$$p_i^{fair} - p_i^{unfair} \geq c^{fair} - \frac{(\beta_i' + \varphi_i * D)e}{1 - (\beta_i' + \varphi_i * D)} \quad (1.7)$$

The above equation shows that, from the perspective of a selfish seller (i.e. $(\beta_i' + \varphi_i * D) = 0$), the price difference between a fair product and an unfair product should at least cover his (her) per unit cost of producing a fair product. Otherwise, the seller would prefer to produce an unfair product. If the seller is socially responsible, the larger their degree of concern for others $(\beta_i' + \varphi_i * D)$,

D) is, the lower the price dispersion will be. Likewise, the larger the external cost (e) accrued when an unfair product is produced and purchased is, the lower the price dispersion will be.

And, in the absence of persuasion ($D = 0$), we have:

$$p_i^{fair} - p_i^{unfair} \geq c^{fair} - \frac{\beta_i' e}{1 - \beta_i'} \quad (1.8)$$

With persuasion exists ($D = 1$), we have:

$$p_i^{fair} - p_i^{unfair} \geq c^{fair} - \frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} \quad (1.9)$$

If persuasion has positive impacts on seller i 's social responsibility ($D = 1$ and $\varphi_i > 0$),

$$c^{fair} - \frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} < c^{fair} - \frac{\beta_i' e}{1 - \beta_i'} \quad (1.10)$$

This implies that with an effective persuasion, a lower minimum price dispersion is needed to make the seller indifferent between offering a fair product and an unfair product. We can also verify that the more effective the persuasion is, the lower the required minimum price dispersion will be, and consequently sellers would be more likely to offer a fair product.

$$\frac{\partial(c^{fair} - \frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)})}{\partial(\varphi_i)} = -\frac{e}{(1 - (\beta_i' + \varphi_i))^2} < 0 \quad (1.11)$$

If however, persuasion has negative impacts on seller i 's social responsibility ($D = 1$ and $\varphi_i < 0$),

$$c^{fair} - \frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} > c^{fair} - \frac{\beta_i' e}{1 - \beta_i'} \quad (1.12)$$

This implies that a higher minimum price dispersion is required to make the seller indifferent between offering a fair product and an unfair product. In addition,

On the other hand, from the buyer's side, buyer i would purchase a fair product if

$U_{buyer}^{fair\ product} \geq U_{buyer}^{unfair\ product}$, that is:

$$\begin{aligned} & E_i^{buyer} + v - p_i^{fair} - (\beta_i' + \varphi_i * D)(E_i^{buyer} + v - p_i^{fair} - E_j^{third\ party}) \\ & \geq E_i^{buyer} + v - p_i^{unfair} - (\beta_i' + \varphi_i * D)(E_i^{buyer} + v - p_i^{unfair} - (E_j^{third\ party} - e)) \end{aligned} \quad (1.13)$$

Given $E_i^{buyer} = E_j^{third\ party}$ and $p_i^{fair}, p_i^{unfair} \leq v$, we can obtain that:

$$p_i^{fair} - p_i^{unfair} \leq \frac{(\beta_i' + \varphi_i * D)e}{1 - (\beta_i' + \varphi_i * D)} \quad (1.14)$$

The equation shows that, from the perspective of selfish buyers ($\beta_i' + \varphi_i * D = 0$), this buyer is willing to purchase a fair product only if the price of the fair product is the same as, or lower than, the price of the unfair product. If instead the buyer is socially responsible, the more she (he) is concerned with her (his) respective third party's wellbeing (i.e. a larger value of $(\beta_i' + \varphi_i * D)$), or the greater is the external cost inflicted on her (his) respective third party (i.e. a larger value of e), the higher is the price dispersion that the buyer is willing to pay.

Without persuasion ($D = 0$), we have:

$$p_i^{fair} - p_i^{unfair} \leq \frac{\beta_i' e}{1 - \beta_i'} \quad (1.15)$$

With persuasion ($D = 1$), we instead have:

$$p_i^{fair} - p_i^{unfair} \leq \frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} \quad (1.16)$$

If persuasion has a positive impact on buyer i 's social responsibility ($D = 1$ and $\varphi_i > 0$),

$$\frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} > \frac{\beta_i' e}{1 - \beta_i'} \quad (1.17)$$

This implies that the buyer is willing to pay a higher price for a fair product relative to an unfair product. However, if persuasion has a negative impact on buyer i 's degree of social responsibility (i.e. when $D = 1$ and $\varphi_i < 0$), the left hand side of the above expression is smaller than the right hand side of the above expression,

If persuasion has a negative impact on buyer i 's social responsibility ($D = 1$ and $\varphi_i < 0$),

$$\frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} < \frac{\beta_i' e}{1 - \beta_i'} \quad (1.18)$$

It implies that the buyer is only willing to pay a lower maximum price dispersion for the fair product. We can also verify that the sign of the following first derivative is positive.

$$\frac{\partial \left(\frac{(\beta_i' + \varphi_i)e}{1 - (\beta_i' + \varphi_i)} \right)}{\partial (\varphi_i)} = \frac{e}{(1 - (\beta_i' + \varphi_i))^2} > 0 \quad (1.19)$$

This implies that if the effect of persuasion becomes stronger, the maximum price dispersion that the buyer is willing to pay for the fair product increases. This would induce the buyer to be more likely to purchase the fair product. We therefore have the following hypothesis.

Hypothesis 2: Hypothesis 2: With socially responsible sellers and buyers, a positive market share for the fair product should be expected. Further, if persuasion has a positive (a negative) impact on the buyer's or seller's degree of social responsibility, then a lower (a higher) minimum price dispersion is required by a seller to be willing to offer a fair product, and a higher (a lower) maximum price dispersion is required by a buyer to be willing to purchase a fair product. Consequently, a larger (a smaller) market share is expected for the fair product.

1.4 Results and Discussions

In this section, data obtained from the experiments are analyzed and evaluated. Research questions proposed in section 1.1 are reiterated and addressed. In subsection 1.4.1, we investigate the aggregate results at the market level including market share of the fair product and average market price of fair and unfair products. The price premium between the two products is also examined. Subsection 1.4.2 delves into the issue by investigating buyers' product choices. Estimation of buyer utility function and regression results on buyer purchase price are also presented. We also explore the role of feedback in affecting buyers' product choices in treatments with persuasion. Subsection 1.4.3 studies sellers' product choices. Results on the profits of sellers of each product are presented as well. Subsection 1.4.4 looks at total social gains. A detailed description of third parties' messages is attached in the appendix.

1.4.1 The Market Level Analysis

1.4.1.1 The Market Share of Fair Products

Figure 1.3 depicts the average market share⁵ of the fair products across 8 independent markets in each treatment and the 95% confidence interval. Figure 1.4 additionally shows the average market share of the fair product for each treatment over periods. Referring to Figure 1.3, on average, approximately 44% in Baseline treatment, 60% in Persuasion treatment, 20% in High Cost treatment, and 19% in High Cost & Persuasion treatment of all accepted products are the fair products. This positive market share reveals a significant and stable concern of both sellers and buyers for the welfare of third parties. However, it is also important to note that the market share of the fair product significantly decreases in the high-cost environment (from 44% to 20% without

⁵ Market share of the fair product is the proportion of fair products of all successful transactions. The graph shows the average in each treatment.

persuasion and from 60% to 19% with persuasion). Consumption of fair products drops. High cost of producing a fair product significantly deters sellers from offering- and buyers from purchasing the fair product. This also means that a production subsidy extended to sellers who produce a fair product can substantially boost the market share of the fair product.

Also, when the extra cost to produce the fair product is low as shown in the left panel of Figure 1.3, persuasion increases the consumption of the fair products significantly⁶. The observed effects demonstrate a positive effect of persuasion in stimulating socially responsible consumption. However, when the extra cost to produce the fair product is higher, shown in the right panel of Figure 1.3 and Figure 1.4, we observe a significant difference for the first few periods but overall no discernible effect is observed⁷.

⁶ Two sided Wilcoxon rank sum test between Baseline and Persuasion, p-value is 0.0000, using the average market share of fair product across 8 markets in a period as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

⁷ Two sided Wilcoxon rank sum test between High Cost and High Cost & Persuasion, p-value is 0.1290, using the average market share of fair product across 8 markets in a period as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

Figure 1.3: Market Share of the Fair Product

Figure 1.4: Average Market Share of the Fair Product over time

Result 1.1: The fair product obtains a statistically significant positive market share in all treatments. The market share of the fair product is significantly higher in the low-cost environment

than in the high-cost environment. Persuasion significantly increases the market share of the fair product only in the low-cost environment, but not in the high cost environment.

1.4.1.2 The Market Price and Price Dispersion between Two Products

Figure 1.5 shows the time trend of price premium i.e. the difference between the price of the fair product and the price of the unfair product, averaged across all markets. The average price premium is around 5.128 in Baseline treatment, 9.253 in Persuasion treatment, 25.479 in High Cost treatment and 28.607 in High Cost & Persuasion treatment.

Recall that the maximum price premium that buyers are willing to pay without persuasion is $\frac{\beta_i' e}{1-\beta_i'}$ (Equation 1.15) and it is $\frac{(\beta_i' + \varphi_i) e}{1-(\beta_i' + \varphi_i)}$ with persuasion (Equation 1.16). Using the average price dispersion buyer paid as an approximation, we may get an estimation of value β_i' and φ_i of buyers.

In a low-cost environment without- and with persuasion, we have respectively,

$$\frac{\beta_i' e}{1-\beta_i'} = \frac{\beta_i'}{1-\beta_i'} * 60 = 5.128 \quad (1.20)$$

$$\frac{(\beta_i' + \varphi_i) e}{1-(\beta_i' + \varphi_i)} = \frac{(\beta_i' + \varphi_i)}{1-(\beta_i' + \varphi_i)} * 60 = 9.253 \quad (1.21)$$

Solving for β_i' and φ_i , we have $\beta_i' = 0.0787$ and $\varphi_i = 0.0549$.

In a low-cost environment without- and with persuasion, we have respectively,

$$\frac{\beta_i' e}{1-\beta_i'} = \frac{\beta_i'}{1-\beta_i'} * 60 = 25.479 \quad (1.22)$$

$$\frac{(\beta_i' + \varphi_i) e}{1-(\beta_i' + \varphi_i)} = \frac{(\beta_i' + \varphi_i)}{1-(\beta_i' + \varphi_i)} * 60 = 28.607 \quad (1.23)$$

Solving for β_i' and φ_i , we have $\beta_i' = 0.2980$ and $\varphi_i = 0.0248$

The sign of φ_i in both cost environments is positive. But the magnitude of φ_i in the low-cost environment is more than double of φ_i in the high-cost environment. It reveals more positive impact of persuasion on buyers in the low-cost environment. The results are consistent with result 1.1 and it also verifies Hypothesis 2.

In addition, referring to the Figure 1.5, the price dispersion is shown to be different from their cost different (except in Persuasion treatment). The Wilcoxon signed rank test using average price premium of a market as observation (8 observations) gives a p-value = 0.0117 in Baseline treatment, p-value = 0.3105 in Persuasion treatment, p-value = 0.0180 in High Cost and p-value = 0.0117 in High Cost & Persuasion treatment. The gap between price difference and the cost difference implies different profitability of the two types of products of sellers, which will be discussed in details later. Besides, the price premium in Baseline treatment is significantly different from that in Persuasion treatment. Applying two sided Wilcoxon rank sum test using average price premium of a market as observation, the equality of price premium between Baseline and Persuasion treatment is rejected at p-value = 0.0206. In the high-cost environment, the equality of price dispersion between High Cost and High Cost & Persuasion treatment is not rejected at p-value = 0.6434.

Figure 1.5 Price Dispersion over 24 Periods

In what follows, we run random-effects linear regressions to further analyze the treatment effect of persuasion on average market prices of different types of products (as shown in Table 1.2). The average market price of fair (unfair) products in a period is used as one observation. In Models (1) and (2), we focus on the market price of fair products. Models (3) and (4) look at the market price of unfair products. The reference category in Model (1) and Model (3) is Baseline treatment. In Models (2) and (4), the reference category is High Cost treatment. Persuasion and High Cost & Persuasion are treatment dummies.

Referring to Models (1) and (2), in both the low-cost and the high-cost environments, the average market price of fair products increases in the presence of persuasion. On the other hand, with persuasion, the market price of the unfair products is lower but not statistically significant (see Model (3) and Model (4)). The higher price of the fair products with persuasion could be attributed to two factors. The first one is that from the sellers' side, they expect that buyers are more likely to switch to fair the product. This may boost the confidence of the sellers of the fair product in raising the price for their product without fearing of losing customers. This may also

induce sellers of the unfair product to switch from offering the unfair product to offering the fair product. The second one is that from the buyers' side, the presence of persuasion may increase their buyers' willingness to pay for the fair product.

Result 1.2: Estimated value of φ_i for buyers is positive in both the low-cost and the high-cost environment, implying that there is a positive impact of persuasion on buyers' incentive to purchase the fair product.. The prices of the fair products are higher than the prices of the unfair products. Persuasion raises the average market price of fair products. Average market price of unfair price is lower with persuasion but not statistically significant.

Table 1.2: Random-Effects Linear Regressions of Market Prices by Product Type

	(1) Control for fair products	(2) Control for fair products	(3) Control for unfair products	(4) Control for unfair products
Dependent Variable	Average Market Price			
period	-0.101 (0.096)	-0.008 (0.044)	-0.231** (0.110)	-0.322** (0.139)
Persuasion	2.665** (1.177)		-2.404 (3.794)	
High Cost & Persuasion		1.768** (0.791)		-1.387 (3.470)
Constant	-16.155* (9.516)	37.212*** (4.904)	-53.390 (86.272)	126.837** (58.447)
Control Variables	Yes	Yes	Yes	Yes
Treatment considered	Baseline and Persuasion	High Cost and (High Cost & Persuasion)	Baseline and Persuasion	High Cost and (High Cost & Persuasion)
Observations	336	202	304	381
Number of Markets	16	15	15	16

Notes: the dependent variable in all models is the average market price of fair (unfair) product (Average Market Price). The average market price of fair (unfair) products in a period is used as one observation. In Models (1) and (2), we focus on the market price of fair products. Models (3) and (4) look at the market price of unfair products. The reference category in Model (1) and Model (3) is Baseline treatment. In Models (2) and (4), the reference category is High Cost treatment. Persuasion and High Cost & Persuasion are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. Variable period takes integer values between 1 and 24. Control variables take the average of all participants within the market, including gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. The models allow for market level random effects. Robust standard errors clustered at the market level in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

1.4.2 Buyer Side

1.4.2.1 Buyers' Product Choice

We further complement the investigation from buyers' side. Table 1.3 shows the random-effects probit regression results on buyer product choice. We aim to examine the treatment effect of persuasion on the likelihood of fair product purchase. The dependent variable is buyer i's product choice. It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is

purchased. Models (1) and (2) show the regression results using only the first period data. Models (3) and (4) present the estimation results using the entire data. The reference category is the Baseline treatment. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period to allow for different time trends across treatments.

We can see that in all regression models shown in Table 1.3, the fair product is more likely to be purchased in the presence of persuasion (Baseline and Persuasion). This follows from the positive and significant coefficient of treatment dummy Persuasion. Moreover, even in the high-cost environment, persuasion is shown to have a positive impact on the likelihood of fair product purchase as well. Test of equality between treatment dummies High Cost and High Cost & Persuasion is rejected in all models; the p-value is 0.0393 in Model (2) and 0.0610 in Model (4). However, the overall effect of persuasion in the high-cost environment is weaker than that in the low-cost environment. The marginal effect of persuasion is around 0.4 in the low-cost environment, and it is only around 0.158 in the high-cost environment. The magnitude is more than double in the low-cost environment, which is also consistent with our estimation of φ_i . We also find evidence that buyers behave in a less socially responsible manner when the cost of doing so increases (in both cases with and without persuasion). The coefficient of treatment dummy High Cost is shown to be negative and significant. Test of equality between Persuasion and High Cost & Persuasion is also rejected at p-value = 0.0001 in Model (2) and p-value = 0.0000 in Model (4).

Result 1.3: Persuasion increases the likelihood of the purchase of the fair products, suggesting the positive impact of persuasion on stimulating social responsibility. However, the positive influence of persuasion is weaker when the extra cost to produce the fair product is higher.

Table 1.3: Random-Effects Probit Regressions of Consumer Fair Product Choice

	(1)	(2)	(3)	(4)
Dependent Variable	Fair Product			
Period			-0.010*** (0.004)	-0.010*** (0.004)
Persuasion	0.348*** (0.114)	0.378*** (0.117)	0.407** (0.189)	0.413** (0.191)
High Cost	-0.336*** (0.129)	-0.330** (0.134)	-0.451*** (0.109)	-0.435*** (0.113)
High Cost & Persuasion	0.095 (0.144)	0.106 (0.155)	-0.263** (0.133)	-0.277** (0.134)
Persuasion X Period			-0.010 (0.009)	-0.010 (0.009)
High Cost X Period			0.015*** (0.005)	0.015*** (0.005)
(High Cost & Persuasion) X Period			-0.008 (0.006)	-0.008 (0.006)
Number of product offers buyer saw	-0.158 (0.286)	-0.175 (0.259)	-0.155** (0.071)	-0.162** (0.074)
Buyer order to enter the market	-0.195 (0.287)	-0.214 (0.264)	-0.140** (0.068)	-0.148** (0.072)
Control Variables	No	Yes	No	Yes
Period Considered	1	1	All periods	All periods
Observations	117	116	2,890	2,866
Number of Subjects			128	127

Notes: The dependent variable is buyer's product choice (Fair Product). It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Variable period takes integer values between 1 and 24. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a buyer's product choice in a period as an observation. Models (3) and (4) are panel specifications that include buyer random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.4.2.2 The Structural Estimation of Buyers' Utility Function

In this subsection, we further present the structural estimation results of buyers' utility function.

We assume that each individual potentially cares about their own benefits as well as the welfare

of others, and that they are willing to sacrifice some of their own money to avoid producing negative externalities on others. Such preferences could generally be represented by the following linear utility function ⁸(1.24) below.

$$U = \theta \Pi_i + \gamma \Pi_j \quad (1.24)$$

Π_i denotes buyer i 's payoff, Π_j denotes the corresponding third party j 's payoff, $\theta > 0$ captures the weight that buyer i assigns on her own payoffs, and γ captures buyer i 's concern for the third party. The ratio $\rho = \gamma/\theta$ measures buyer i 's concerns for the third party's payoffs relative to her own payoff. Larger ratio implies stronger buyer i 's concern for the third party's payoff. Thus, this ratio captures buyer i 's degree of social responsibility. We further specify buyer i 's utility obtained from consuming product q as follows and apply McFadden's (1974) conditional logit choice model to estimate the parameters.

$$U_{itq} = \theta(\Pi_i)_{tq} + \gamma(\Pi_j)_{tq} + \sum_{k=1}^K \alpha_{qk} z_{itk} + \varepsilon_{itq} \quad (1.25)$$

The above expression describes buyer i 's utility at period t from the consumption of product q . $q \in \{0, 1, 2 \dots Q^{it}\}$. Q^{it} denotes the number of product alternatives available. $q = 0$ corresponds to the case where buyers do not make any purchase. In our design, $2 \leq Q^{it} \leq 5$. z_{itk} are case-specific variables that vary across individuals but not across product alternatives. 5 case-specific variables are included in our estimation ($K=5$). They are period, gender, (natural logarithm of) age, nationality (Singaporean) and religion. Additionally, we assume identical coefficients of z_{itk} for alternatives, that is $\alpha_{qk} = \alpha_{q'k}$ for all $q, q' \neq 0$, as product choice options are displayed in

⁸ Utility function in equation (1.24) is a more general form of that in equation (1.4) as discussed in subsection 1.3.2. Rearrange equation (1.4), we may obtain $U_i = (1 - \beta_i)x_i + \beta_i x_j$. Where x_i is the same as x_i in equation (1.24) and x_j is the same as y in equation (1.24). As $(1 - \beta_i) + \beta_i$ equals to 1, equation (1.4) implicitly imposes a constraint that the coefficients of x_i and x_j add up to 1. Utility function in equation (1.24) further relaxes this assumptions and considers a more general case.

random order and alternatives are not identifiable. Error terms ε_{itq} have standard Type I extreme value distribution with density function of $f(\varepsilon) = \exp\{-\varepsilon - \exp(-\varepsilon)\}$.

The probability that individual i will choose product q is given by equation (1.26).

$$p_{iq} = \frac{\exp(\eta_{iq})}{\sum_{M \in Q} \exp(\eta_{iM})} \quad (1.26)$$

Where $\eta_{iq} = \theta(\Pi_i)_{tq} + \gamma(\Pi_j)_{tq} + \sum_{k=1}^K \alpha_{qk} z_{itk}$

The likelihood function is

$$L(\theta, \varphi, \alpha_{qk}) = \prod_{i=1}^N \prod_{q=0}^{Q^{it}} p_{iq}^{d_{iq}} \quad (1.27)$$

$d_{iq} = 1$ if individual i selects option q and $d_{iq} = 0$ otherwise.

The log-likelihood function is

$$l(\theta, \varphi, \alpha_{qk}) = \sum_{i=1}^N \sum_{q=0}^{Q^{it}} d_{iq} \log(p_{iq}) \quad (1.28)$$

Table 1.4 below shows the estimation results by maximizing the above likelihood function. The dependent variable is buyer product choice among seller product offerings. Models (1) to (4) provide the estimation results of buyer utility function in Baseline, Persuasion, High Cost and High Cost & Persuasion treatment respectively. Models (5) and (6) intend to justify the treatment effect of persuasion in the two cost environments respectively. To that end, interaction terms of ‘treatment dummy and third party payoffs, and ‘treatment dummy and buyer payoffs’ are introduced. Model (5) uses the data from both the Baseline and Persuasion treatments, while Model (6) uses the data from both the High Cost and High Cost & Persuasion treatments.

Referring to Models (1) to (4), it is as expected that buyers care about their own payoffs, as shown by the positive and significant coefficient of Buyer Payoff. In addition, the positive and significant coefficients of third parties' payoffs in all treatments (with one exception in High Cost & Persuasion) indicate buyers' fairly stable concern for the third parties' payoffs as well, albeit to a lesser degree. According to Models (5) and (6), persuasion appears to reduce the relative care of buyers for their own payoffs, though the concern for the welfare of third parties remains absolutely the same⁹. This follows from the negative and significant coefficient of Buyer Payoff X Persuasion and Buyer Payoff X (High Cost & Persuasion). It may suggest that the impact of persuasion on buyer's to become more socially responsible is through the channel of self-reflection.

Result 1.4: Buyers generally care about their own payoffs, and also about the third parties' payoff albeit to a lesser degree. Persuasion makes buyers' care less about their own payoff relative to the third parties' payoff.

⁹ Buyers' concerns for their own and for the third parties' payoffs could be independent because in our setting it is not necessary for buyers to suffer a reduction in their payoffs when they want to increase the third parties' payoff. For example, when a buyer purchases a fair product, and at the same time the seller of the fair product reduces her price, then both the buyer's payoff and her paired third party's payoff would increase at the same time.

Table 1.4: Estimation of Utility Function of Buyers

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Buyer Choice					
Buyer Payoff	0.372*** (0.031)	0.258*** (0.062)	0.107*** (0.027)	0.047** (0.023)	0.368*** (0.045)	0.107*** (0.027)
Third Party Payoff	0.046*** (0.009)	0.029*** (0.005)	0.044** (0.017)	0.008 (0.013)	0.046*** (0.009)	0.041*** (0.016)
Buyer Payoff X Persuasion					-0.106** (0.052)	
Third Party Payoff X Persuasion					-0.016 (0.011)	
Buyer Payoff X (High Cost & Persuasion)						-0.063* (0.036)
Third Party Payoff X (High Cost & Persuasion)						-0.032 (0.020)
Treatment considered	Baseline	Persuasion	High Cost	High Cost & Persuasion	(Baseline) and (Persuasion)	(High Cost) and (High Cost & Persuasion)
Observations	3,164	3,381	3,524	3,526	6,545	7,050

Notes: Models (1) to (4) provide the estimation of buyer utility function as specified in equation (1.25) of Baseline, Persuasion, High Cost and High Cost & Persuasion treatment respectively. Models (5) and (6) introduce interaction terms of ‘treatment dummy and third party payoff, and ‘treatment dummy and buyer payoff’. Model (5) includes observations in Baseline and Persuasion treatment and Model (6) use observations of High Cost and High Cost & Persuasion treatment. Robust standard errors clustered at the market level in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

1.4.2.3 Buyer's Purchase Price

Table 1.5 reports regression results on the buyer purchase price in each treatment. The dependent variable is the price that buyer i pays for the product she purchases. Each buyer's purchase price in a period is used as an observation. Models (1) to (4) report the estimated price difference paid by buyers between the two types of products in Baseline, Persuasion, High Cost and High Cost & Persuasion treatment respectively. As indicated by the positive and significant coefficient of Fair Product, the price of the fair product paid by buyers is significantly greater than the unfair product in all treatments. The price difference is about 5 points in Baseline treatment, 8 points in Persuasion treatment, 30 points in High Cost treatment, and 22 points in treatment High Cost & Persuasion treatment. It is about 50%, 80%, 75%, and 55% of their cost differences in Baseline, Persuasion, High Cost, and High Cost & Persuasion treatment respectively. Considering Baseline and Persuasion, in Baseline treatment, the extra cost to produce the fair product is borne equally by sellers and buyers. But in Persuasion, buyers pay for 80% of the cost and sellers only bear the remaining 20%. This suggests that in Persuasion treatment, buyers not only purchase more fair products (see result 1.1), but also sacrifice more of their own benefits by paying a higher price when they purchase the fair product. It further highlights the significant positive role of persuasion in promoting buyer socially responsible behaviors.

On the other hand, as shown in Table 1.5, the price difference seems to drop with persuasion in the high-cost environment, but the decrease is not statistically significant (see results of two sided Wilcoxon rank sum test as mentioned in the discussion of price dispersion above).

Table 1.5: Random-Effects Linear Regressions of Buyer Purchase Price in Each Treatment

Dependent Variable	(1)	(2)	(3)	(4)
	Buyer Purchase Price			
period	-0.164** (0.064)	-0.120 (0.182)	-0.269* (0.150)	-0.197 (0.185)
Fair Product	5.234*** (1.102)	8.202*** (1.503)	30.305*** (2.174)	21.647*** (3.795)
Constant	19.490*** (4.032)	23.332*** (4.591)	23.982*** (3.324)	35.499*** (6.691)
Control Variables	Yes	Yes	Yes	Yes
Treatment considered	Baseline	Persuasion	High Cost	High Cost & Persuasion
Observations	747	716	700	685
Number of Subjects	32	31	32	32

Notes: The dependent variable is buyer purchase price Each buyer's purchase price in a period is used as an observation. Variable period takes integer values between 1 and 24. Variable Fair Product takes on value 1 if a fair product is purchased and 0 if an unfair product is purchased. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. Models (1) to (4) report the estimated price difference paid by buyers between the two types of products in Baseline, Persuasion, High Cost and High Cost & Persuasion treatment respectively. The models allow for buyer random effects. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.4.2.4 The Third Parties' Approval Rating and Buyers' Product Choice

Recall that in both the Persuasion treatment and the High Cost & Persuasion treatment, third parties send the message at the beginning in period 1. In subsequent periods, third parties provide their approval rating to buyers at the end of every period after buyers making their purchase decision. In this part, we investigate the relation between the approval feedback received by buyers from the third parties and buyers' product choice. Table 1.6 summarizes the random-effects probit regression results using a buyer's purchase decision in every period as the unit of observation. The dependent variable is buyer product choice. It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Models (1) and (2) study observations in Persuasion treatment. Models (3) and (4) examines observations in High Cost & Persuasion treatment. The

proportion of positive feedback is the proportion of third parties indicating they are satisfied with their associated buyer's product choice in the previous period.

As suggested by the positive and significant coefficient of ‘Proportion of positive feedback,’ the more positive feedback is received from third parties in the previous period, the more buyers are encouraged to purchase fair products. In the high-cost environment, the marginal effect of positive feedback decreases (impact is only significant at 10% level). The motivating effect of positive feedback becomes weaker. It is as expected because buying a fair product is much costlier for buyers in the high-cost environment and merely positive feedback is not incentive enough.

Result 1.5: Buyers' decision to purchase a fair product is positively related to the proportion of positive feedback received by buyers from the third parties. However, this effect weakens in a high-cost environment.

Table 1.6: Random-Effects Probit Regressions of Feedback from Third Parties and Buyer Product Choice

	(1)	(2)	(3)	(4)
Dependent Variable	Fair Product			
Period	-0.006 (0.007)	-0.006 (0.008)	-0.003 (0.002)	-0.003** (0.001)
Purchase fair product in the previous period		0.099 (0.102)		-0.008 (0.027)
Proportion of positive feedback	0.006*** (0.002)	0.005*** (0.002)	0.001* (0.001)	0.001* (0.001)
Control Variables	No	Yes	No	Yes
Treatment Considered	Persuasion	Persuasion	High Cost & Persuasion	High Cost & Persuasion
Observations	691	668	611	611
Number of Subjects	32	31	32	32

Notes: The dependent variable is buyer's product choice (Fair Product). It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Variable period takes integer values between 1 and 24. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a buyer's product choice in a period as an observation. Models (1) and (2) include observations in Persuasion treatment. Models (3) and (4) examines observations in High

Cost & Persuasion treatment. The models allow for buyer random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.4.3 Seller Side

1.4.3.1 Sellers' Product Offering

Figure 1.6 provides an overview of the total number of fair products offered by sellers across 8 markets in each treatment. It is noted that the production of the fair products significantly decreases in the high-cost environment (High Cost treatment and High Cost & Persuasion treatment). This is as expected due to the increased production cost of the fair product. In the presence of persuasion, there are more of the fair products being offered when the extra cost to produce the fair product is low. On average, the number of fair products offered in the market of Persuasion treatment is 20 more than that in Baseline treatment. However, this increase is not evident in the high-cost environment. The average number of fair product offered in High Cost treatment is 25.375, and the number is 26.625 in High Cost & Persuasion treatment.

Figure 1.6: Number of the Fair Products Offered by Sellers

Figure 1.7 and Figure 1.8 further show the histogram of the frequency at which each seller offers the fair product and its kernel density curve in each treatment. From Figure 1.7, it is obvious that different distribution patterns are shown in Baseline treatment and Persuasion treatment. The Kolmogorov – Smirnov equality-of-distributions test gives a p-value of 0.064. The mean in Baseline is 0.424 with standard error 0.058. This implies that, in Baseline treatment, each seller on average offers fair product 42.4 times out of 100, or in other words, 42.4% of the sellers offer the fair product in Baseline treatment. In Persuasion treatment, the mean increases to 0.596 with standard error 0.052, implying that 59.6% of sellers offer the fair product. The median is about 0.313 in Baseline treatment and 0.646 in Persuasion treatment. The statistics show that there are more of fair products offered by sellers when persuasion is in effect in the low-cost environment.

However, the above result no longer holds when the extra cost to produce the fair product is high (high-cost environment). From Figure 1.8, the distributions in High Cost and High Cost & Persuasion are quite similar. Applying the Kolmogorov – Smirnov equality-of-distributions test, the p-value is 0.873. The mean is 0.211 with standard error 0.036 in High Cost treatment, and the median is 0.125. The mean in High Cost & Persuasion is 0.222 with standard error 0.044, and the median is 0.125.

Figure 1.7: Histogram of the Frequency of Sellers' Fair Product Production in Baseline and Persuasion Treatment

Figure 1.7 notes: the frequency of each seller to offer the fair product is considered as one observation. This graph shows the histogram (distribution) of seller frequency of offering the fair product. We have 40 sellers (40 observations) in each treatment.

Figure 1.8: Histogram of the Frequency of Sellers' Fair Product Production in High Cost and High Cost & Persuasion Treatment

Figure 1.8 notes: the frequency of each seller to offer the fair product is considered as one observation. This graph shows the histogram (distribution) of seller frequency of offering the fair product. We have 40 sellers (40 observations) in each treatment.

Table 1.7 summarizes the random effect probit regression results on the seller product choice. The dependent variable is seller's product choice. It takes on value 1 if a fair product is offered by the buyer and 0 if an unfair product is offered. Model (1) examines seller's product choice in period 1 only. Models (2) and (3) focus on the first and second half of 24 periods respectively. Model (4) look at all periods. The reference category is the Baseline treatment. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period to allow for different time trends across treatments.

Referring to Model (1), at the first period, persuasion is shown to increase the likelihood of fair product offering by sellers in both low-cost and high-cost environments. Test of equality between High Cost and High Cost & Persuasion is rejected at $p\text{-value} = 0.0000$ in Model (1). It is noteworthy that though we sent persuasive messages only to the buyers, persuasion also affects sellers' product choice indirectly. This could be due to the change in the sellers' expectations. Sellers know that buyers will receive messages from third parties. They expect that more buyers are likely to purchase the fair product after persuasion, and hence, offer more of the fair products.

However, as shown in Model (4), the overall impact of persuasion on sellers' product choices is weaker. The coefficient of Persuasion is still positive but significant at 10% level in the low-cost environment, and the overall effect of persuasion vanishes in the high-cost environment. Test of equality between High Cost and High Cost & Persuasion is not rejected at $p\text{-value} = 0.5157$ in Model (4). The reason could be that sellers are indirectly influenced by persuasion so that the impact is expected to be weaker than the direct impact on buyers. In the high-cost environment, sellers should incur much higher costs if they are offering the fair product. In addition, they also expect that it is less likely that buyers could be persuaded to purchase the fair product and pay a higher price. This accounts for the even weaker impact of persuasion in the high-cost environment. Results in Model (2) and Model (3) complement the investigation by showing that the impact of persuasion appears to be stronger in the first half than the second half of total 24 periods. One of the reasons could be that we only allow the persuasive messages to be sent to buyers in the first period, and so the impact of persuasion may decrease over time.

Table 1.7: Random-Effects Probit Regressions of Seller Fair Product Offering

	(1)	(2)	(3)	(4)
Dependent Variable	Fair Product			
Period		-0.003 (0.012)	-0.016** (0.007)	-0.004 (0.004)
Persuasion	0.307*** (0.095)	0.384** (0.167)	-0.206 (0.134)	0.229* (0.127)
High Cost	-0.345*** (0.091)	-0.244** (0.122)	-0.055 (0.216)	-0.099 (0.110)
High Cost & Persuasion	0.146 (0.117)	-0.207* (0.117)	-0.187 (0.155)	-0.159 (0.100)
Persuasion X Period		-0.030 (0.018)	0.020* (0.010)	-0.006 (0.006)
High Cost X Period		0.020 (0.018)	0.003 (0.011)	0.002 (0.005)
(High Cost & Persuasion) X Period		0.011 (0.016)	0.012 (0.011)	0.007 (0.006)
Offering fair product in the previous period		0.327*** (0.061)	0.306*** (0.077)	0.325*** (0.053)
Expected profit premium (Fair product-Unfair product)		0.008*** (0.002)	0.014*** (0.002)	0.011*** (0.002)
Control Variables	Yes	Yes	Yes	Yes
Period Considered	1	1-12	13-24	All periods
Observations	160	1,265	1,370	2,635
Number of Subjects		155	150	160

Notes: The dependent variable is seller's product choice (Fair Product). It takes on value 1 if a fair product is offered by the seller and 0 if an unfair product is offered. Variable period takes integer values between 1 and 24. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period. Expected profit premium is the average profit difference between fair and unfair products in the previous period. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a seller's product choice in a period as an observation. Models (2) to (4) are panel specifications that include seller random effects. Model (2) considers period 1 to 12 only, Model (3) considers period 13 to 24. Model (4) includes all periods. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 1.6: Sellers are more likely to offer a fair product with persuasion. The impact of persuasion appears to decrease over time. In the high-cost environment, persuasion works only at the very beginning, and the overall impact is not evident.

1.4.3.2 Profits of Sellers

This subsection serves as an extension of subsection 1.4.1.2. From the discussion of the prices of the different product types above, we may infer the profitability of sellers offering different products, given that the production costs are constant. Figure 1.9 and Figure 1.10 display the average profit margins (price - marginal cost) of different product types in each treatment over time. As suggested by Figure 1.9 and 1.10, both sellers of the fair and unfair products realize positive profits. Using average profit margin of a market for fair (unfair) product sellers as an observation (8 observations in each treatment for each product type), it is rejected that profits of fair (unfair) product sellers are equal to 0. Applying two sided Wilcoxon signed rank test, p-value < 0.05 for both fair and unfair product sellers in all treatments. It is also noted that, within the same treatment, sellers of unfair products generate more profits than fair product sellers in absolute value in Baseline, High Cost and High Cost & Persuasion Treatments. The two sided Wilcoxon rank sum test on the price equality between fair and unfair products gives p-value < 0.05 . It suggests that sellers of the fair product sacrifice their own money to avoid producing negative externalities, reflecting the social responsibility of sellers. There is one exception, in Persuasion treatment, the difference in profits of fair and unfair product sellers is not statistically significant. Thus, in the low-cost environment, even from the perspective of selfish sellers, there should be no incentive to produce the unfair product, which could motivate more of fair product production.

Figure 1.9 Profit Margin by Product Type in Baseline and Persuasion Treatment

Figure 1.10 Profit Margin by Product Type in High Cost and High Cost & Persuasion Treatment

Result 1.7: Both sellers of fair and unfair products realize a significant positive profit. However, unfair product sellers generate more profits than fair product sellers in absolute value in Baseline, High Cost, and High Cost & Persuasion treatments. In Persuasion treatment, fair and unfair product sellers earn similar profits.

1.4.4 Social Gains from Market Exchanges

Each transaction between sellers and buyers would result in either a gain or loss to society. There are 3 possible situations according to our design if we take the monetary sum of all participants for each transaction. A purchase of the fair product generates a net surplus of $50 - c^{fair}$ points ($c^{fair} = 10$ in the low-cost environment; $c^{fair} = 40$ in the high-cost environment). On the contrary, 10 points are deducted from the total surplus for each transaction of unfair product. A buyer's decision to not purchase any product exerts no impact on social welfare. Figure 1.11 depicts the social gains (net surplus of all transactions within a market) in each treatment averaged across 8 markets. The initial endowment of all subjects is normalized to 0 to reflect the pure monetary consequences from the market exchanges. The dashed and dotted line denotes the maximal social gains when all 4 buyers in a market purchase the fair product. The dashed line displays the maximal social losses when all products purchased by the 4 buyers in a market are unfair products. The solid line in between shows the social gains when there is no market exchange¹⁰ at all.

A voluntary market exchange would generally benefit both trading parties as well as the society. When negative externality exists, whether allowing or banning certain market exchanges still

¹⁰ The notion of no market exchange here is different from the “no market” situation discussed by Bartling, Weber, and Yao (2015). No market exchange refers to that there are no transactions in the market. It is related to banning market exchanges of certain product, if the exchanged goods could impose huge external costs on the society. It is still within the market framework. While, in Bartling, Weber, and Yao (2015), they mean not using market mechanism at all in the no market situation but instead using a self-interested central planner.

depends on different situations, if in the absence of tax and other government interventions. According to Figure 1.11, allowing market exchanges is still beneficial when the extra costs to produce the fair products are not high (as shown in the left panel of Figure 1.11). The social gains are positive in both Baseline and Persuasion treatment. The gains from fair product purchase totally offset the losses from unfair product purchase. Though it is not the ideal scenario (the dashed and dotted line where maximum social gains are 160), it is better than would be the case without market exchanges at all (the solid line where social gains are 0). The positive social gains imply that a considerable amount of fair products are purchased by our buyers, reflecting a certain level of social responsibility. Moreover, in the presence of persuasion, we observe an improvement in total social gains¹¹.

However, when the extra cost of producing the fair product increases (high-cost environment), as shown in the right panel of Figure 1.11, the society suffers a loss from market exchanges. It implies that much fewer fair products are purchased. Total gains are negative, and it makes the no market exchange option a better choice (the solid line where social gains are 0). Nevertheless, the total losses are still less than the worst situation (the dashed line where maximum social losses are 40). It suggests that a small fraction of the fair products are still purchased by buyers, though at an even higher expense. It further supports the hypothesis that markets do not fully erode social responsibility. In the presence of persuasion, from the graph only, the improvement is not obvious¹².

¹¹ Applying the two sided Wilcoxon rank sum test between Baseline and Persuasion treatment, the p-value is 0.0000, using period average across 8 markets as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

¹² Applying the two sided Wilcoxon rank sum test between High Cost and High Cost & Persuasion, the p-value is 0.4159, using period average across 8 markets as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

Figure 1.11 Average Social Gains across Markets

Table 1.8 further presents the regression results on the social gains. The dependent variable is the social gains of a market. Models (1) and (2) consider period 1 only and Models (3) and (4) employ a panel specification using social gains of each market in a period as an observation and include all 24 periods. The reference category is the Baseline treatment. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period to allow for different time trends across treatments.

Referring to Table 1.8, social gains is much less in the high-cost environment than in the low-cost environment, which is consistent with Figure 1.11. In addition, in the presence of persuasion, total social gains increase by around 47 points in the low-cost environment, as shown by the coefficient of treatment dummy Persuasion. In the high-cost environment, social gains on average

are still larger with persuasion than without persuasion. However, the magnitude is much smaller than that in the low-cost environment. Test of equality between High Cost and High Cost & Persuasion is rejected at $p\text{-value} = 0.061$ in Model (2) and $p\text{-value} = 0.093$ in Model (4).

As suggested by the regression results, persuasion helps to increase the total social gains, and the benefits of the society are much larger when the extra cost to produce a fair product is low (low-cost environment). Under this consideration, either a government subsidy to fair products or a tax imposed on unfair products should be helpful. By reducing the production cost of the fair product relative to the unfair product (moving from the high-cost environment as shown in the right panel to low-cost environment shown in the left panel of Figure 1.11), there are two benefits obtained. First, the society generates a net surplus as a result of more consumption of fair products in the low-cost environment (moving from High Cost treatment to Baseline treatment). Secondly, by implementing persuasion, the society could enjoy larger benefits in the low-cost environment than in the high-cost environment (moving from Baseline treatment to Persuasion treatment).

Result 1.8: The society benefits from market exchanges (compared to no market exchange in the low-cost environment, whereas, in the high-cost environment, the society suffers a loss (compared to no market exchange). In addition, persuasion helps to increase the total gains, and the amount increased in the low-cost environment is much larger than that in the high-cost environment.

Table 1.8: Random-Effects Linear Regressions of Social Gains

	(1)	(2)	(3)	(4)
Dependent Variable	Social Gains			
Period			-0.783*	-0.783*
			(0.426)	(0.427)
Persuasion	66.250**	59.453**	47.351**	47.979***
	(24.762)	(26.418)	(21.624)	(18.514)
High Cost	-78.750***	-78.079***	-81.676***	-81.294***
	(22.376)	(22.550)	(18.028)	(14.529)
High Cost & Persuasion	-50.000**	-50.354*	-72.645***	-61.103***
	(23.029)	(28.459)	(17.944)	(15.955)
Persuasion X Period			-1.513	-1.513
			(1.065)	(1.068)
High Cost X Period			0.992**	0.992**
			(0.452)	(0.454)
High Cost & Persuasion X Period			0.203	0.203
			(0.441)	(0.442)
Constant	57.500**	37.738	57.595***	61.027
	(21.856)	(49.773)	(17.669)	(50.133)
Control Variables	No	Yes	No	Yes
Period Considered	1	1	All periods	All periods
Observations	32	32	768	768
R-squared	0.715	0.727		
Number of Markets			32	32

Notes: The dependent variable is social gains at the level of each market (Social Gains). Variable period takes integer values between 1 and 24. Persuasion, High Cost, and High Cost & Persuasion are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment. Persuasion X Period, High Cost X Period, and (High Cost & Persuasion) X Period are interaction terms between treatment dummies and period. Control variables include the female ratio, Singaporean ratio, ratio of subjects knowing game theory, ratio of subjects having religion and ratio of subjects having major in economic in the market. All models use total social gains of a market in a period as an observation. Models (3) and (4) are panel specifications that include market random effects. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.5 Conclusion

We present experimental evidence on the impact of persuasion on socially responsible behaviors in the market place. Inspired by Bartling, Weber, and Yao's (2015) work on whether the market erodes moral behaviors, we realize that it is essential to discover effective interventions that can promote socially responsible behaviors. In particular, in recent years, many social issues,

caused by insufficient individual and corporate social responsibility, are emerging with the spread of marketization and globalization. Social responsibility stimulation as an alternative response to market failure is gradually becoming prominent.

Our experiment adopts a basic market framework with two types of products. One of them is socially irresponsible, and it produces negative externalities on the uninvolved third parties. The other product is socially responsible and does not produce any external costs. Our primary interest is to analyze the product choices of sellers and buyers under the intervention of non-binding persuasion. To that end, we introduce a treatment that incorporates persuasion into the market setting. Specifically, third parties are given opportunities to persuade buyers to purchase socially responsible products before buyers make their purchase decisions. With the aim of providing a comprehensive analysis of the role of persuasion, we also employ two cost environments by varying the amount of the extra cost of producing a socially responsible product.

Our results reveal a fairly stable concern for others from both sellers and buyers, and this is reflected in their choice of action taken. Persuasion appears to play a significant positive role in stimulating socially responsible behaviors of both buyers and sellers. The society also benefits more from market exchanges in the presence of persuasion. We also show that sellers of socially responsible products earn less profits than sellers of socially irresponsible products in general without persuasion. When persuasion is in effect, the relative profits of sellers of socially responsible products to sellers of socially irresponsible products increase. Buyers are also shown to care for the wellbeing of others by purchasing the socially responsible product instead of the socially irresponsible product, although this implies that buyers must shoulder higher expense.

This paper contributes to the research area of social responsibility stimulation. We propose, with experimental evidence provided, that there is a positive role for persuasion in stimulating

socially responsible behaviors. We also show that a government subsidy to enable sellers to reduce their production costs is beneficial to encourage socially responsible behaviors. In addition, we provide an integrated study of interactions between market participants and identify essential motives behind their socially responsible behaviors. This study provides valuable references to policy-makers for future policy implementation.

1.6 Appendix

1.6.1 Messages Sent by Third Parties

Messages sent to buyers by third parties are open-ended in our experimental design. We adopt the open-ended format instead of a binary selection as it is the normal way when someone wants to persuade others in real life. There are generally three types of messages sent by third parties according to our data. Table 1.9 summarizes the proportion of each type of messages in Persuasion and High Cost & Persuasion treatment.

Type I: third parties explicitly express their expectations on the product type purchased or not purchased by buyers. For instance, *“Please help to think of a win win situation by purchasing type I product. Thanks!!!”*; *“Hello please be kind and don't buy Product II :'(;.”* The proportion of this type of messages is around 31.25% of the total in Persuasion treatment and 28.125% in High Cost & Persuasion treatment.

Type II: without explicitly mentioning which type they want buyers to buy or not to buy, instead, third parties implicitly ask for buyers' consideration and kindness. For example, *“Please Please Please consider TP.”* *“We need you to help us – Buyers”*; *“Please be considerate to the third party :).”* The proportion of this type of messages is around 46.875% of the total in Persuasion treatment and 53.125% in High Cost & Persuasion treatment.

The total proportion of Type I and Type II messages is 78.125% in Persuasion treatment and 81.25% in High Cost & Persuasion treatment.

Type III: others. These messages express some suggestions for buyers from third parties, and they account for a small proportion of all messages. For example, *“buy type two product if the*

price is below 5". The proportion of this type messages is around 21.875% in Persuasion treatment and 18.75% in High Cost & Persuasion treatment.

Table 1.9: Summary of Messages

Type of Messages	Persuasion Treatment	High Cost & Persuasion Treatment
I: Explicit Persuasion	31.25%	28.13%
II: Implicit Persuasion	46.88%	53.13%
Total	78.13%	81.25%
III: Others	21.88%	18.75%
Total	100%	100%

1.6.2 Experimental Instruction for Persuasion Treatment in the Low-Cost Environment

Welcome to all of you! You are now taking part in an interactive study on decision making. **Please pay attention to the information provided here and make your decisions carefully. If at any time you have questions to ask, please raise your hand and we will attend to you in private.**

Please note that **unauthorized communication is prohibited**. Failure to adhere to this rule would force us to stop this study and you may be held liable for the cost incurred in this experiment.

Your participation in this study is voluntary. You will receive **SGD 2** show-up fee for participating in this study. You may decide to leave the study at any time. Unfortunately, if you withdraw before you complete the study, we can only pay you for the decisions that you have made up to the time of withdrawal, which could be substantially less than you will earn if you complete the entire study.

The amount of your earnings from this study depends on the decisions you and others make. At the end of this session, your earnings will be paid to you privately and in cash. They will be contained in an envelope (indicated with your unique user ID). You will need to sign a claim card given to you and exchange your claim card with your payment.

General Information

Each of you will be given a unique user ID and it will be clearly stated on your computer screen. At the end of the study, you will be asked to fill in your user ID and other information pertaining to your earnings from this study in the claim card. **Please fill in the correct user ID to make sure that you will get the correct amount of payment.**

Rest assured that your **anonymity will be preserved** throughout the study. You will never be aware of the personal identities of other participants during or after the study. Similarly, other participants will also never be aware of your personal identities during or after the study. You will only be identified by your user ID in our data collection. All information collected will **strictly be kept confidential** for the sole purpose of this study.

Specific Information

The total duration of this study is more or less 1.5 hours.

Your total earnings = earnings from Stage I + earnings from Stage II + show up fee (S\$ 2)

All incentives will be denominated in **experimental dollars** (expressed as **ECU**). The exact conversion rate will be detailed later.

Stage I

Stage I provides a scenario simulation of market. You will form a small market group and be randomly assigned a role in this market. Your role remains the same for the entire experiment.

You will interact with other participants anonymously through the computer interface for a number of periods. In each period, you will be given **100 ECUs** to make decisions.

There are three available roles:

- **Seller.**
- **Buyer.**
- **The Third Party:** As a third party, you cannot buy or sell. Your income is affected by the transaction between a seller and a buyer. **Each of you is paired randomly with one of the buyers.**

There are two types of products available for sellers to sell and buyers to buy.

- **Type I:** A product with no effect on the third party.
- **Type II:** A product with a loss for the third party.

To produce Type I product, the seller needs to incur costs of **10 ECUs**. To produce Type II product, there will be **no costs** for sellers.

When **Type II** product is purchased by a buyer, it will impose a loss of **60 ECUs** on the third party associated with this buyer; When **Type I** product is purchased or no product is purchased by a buyer, there will be **no loss** on the third party associated with this buyer.

The value of products regardless of the product type for buyers is always **50 ECUs**.

The sellers can set a price for a product range from **0** up to **50 ECUs**.

The detailed processes are as follows:

At the beginning of the **first** period, each third party is asked to enter a short message that they would like to send to all buyers.

At the same time, sellers must decide on the product type to produce and the price to charge.

Once all third parties have entered messages to be sent and all sellers have made their decisions, buyers will be given information of all third parties' messages. After receiving all messages from the third parties, buyers are given information about sellers' product offerings and the corresponding prices.

After that, buyers make their decisions sequentially to purchase or not to purchase any products, the sequence is determined randomly. Should they choose to purchase, they will indicate which seller they want to purchase the product from.

For the **remaining** periods, sellers firstly decide on the product type to produce and the price to charge.

Once all sellers have made their decisions, buyers will be given information of all sellers' product offerings and the corresponding prices.

Buyers make their decisions sequentially to purchase or not to purchase any products, the sequence is determined randomly. Should they choose to purchase, they will indicate which seller they want to purchase the product from.

At the end of each period, each third party can give a feedback on his/her associated buyer's purchase decision of this period by either choosing "**Thumbs Up**" (they are satisfied with his/her associated buyer's purchase decision) or "**Thumbs Down**" (they are unsatisfied with his/her associated buyer's purchase decision).

Then buyers are given a summary of third parties' feedback in the form of the percentage of third parties are satisfied/ unsatisfied with his/her associated buyer's purchase decision in this period.

There will be **5** Sellers, **4** Buyers and **4** Third Parties in a group, thus there will be at least **1** inactive seller in each period.

The payoffs in ECUs for different roles are as follows:

Seller:

If a buyer accepts his/her offer, the payoff will be:

$$100 - \text{cost of production} + \text{price received from buyer}$$

If no buyer accepts his/her offer, the payoff will be:

$$100$$

Buyer:

If a buyer accepts an offer, the payoff will be:

$$100 + 50 - \text{price paid to seller}$$

If a buyer does not accept any offer, the payoff will be:

$$100$$

The Third Party:

If his/her associated buyer chose Type II Product (the product with a loss for the third party), the payoff will be:

$$100 - 60 = 40$$

If his/her associated buyer chose either Type I Product (the product with no effect on the third party) or did not purchase any product, the payoff will be:

$$100$$

Earnings in Stage I

At the end of the experiment, your earnings from 1 randomly-chosen period will be converted to Singapore dollar equivalently. Since each period has the same chance to be chosen and you do not know which period will be paid when you make your choice, the best strategy is paying careful attention to each period. The conversion rate from experimental dollars (ECU) to Singaporean dollars is:

$$10 \text{ ECUs} = 1 \text{ SGD}$$

Stage II

In Stage II, you are shown ten lines on the screen. In each of these lines you have a choice between two options A and B. You need to consider which of the two options you prefer in each of these lines.

After you have made your decision, the computer will randomly select one of the ten lines to determine your payout. Thereafter, the computer draws the payout based on the decision that you have made for the selected line - either Option A or Option B. To determine your earnings in the case you choose option B, there will be a second random draw. The computer will randomly determine if your payoff is 0 SGD or 3 SGD, with the **chances stated in Option B**. Your earning from this stage will be added to your final earnings from this experiment when the experiment is complete.

Look at line 1 at the top of the screen. Option A is 1.0 SGD. Option B has a 0% chance to earn 3.0 SGD and a 100% chance to receive 0.0 SGD. The other lines are similar. As you go down the column of option B, the chance to receive 3.0 SGD rises.

	Option A	Option B
	Choose Option B for ALL lines	
1	\$1	\$3 with 0% chance, \$0 with 100% chance
	Choose Option A for line 1 and Option B for rows 2 to 10	
2	\$1	\$3 with 10% chance, \$0 with 90% chance
	Choose Option A for rows 1,2 and Option B for 3 to 10	
3	\$1	\$3 with 20% chance, \$0 with 80% chance
	Choose Option A for rows 1 to 3 and Option B for rows 4 to 10	
4	\$1	\$3 with 30% chance, \$0 with 70% chance
	Choose Option A for rows 1 to 4 and Option B for rows 5 to 10	
5	\$1	\$3 with 40% chance, \$0 with 60% chance
	Choose Option A for rows 1 to 5 and Option B on lines 6 to 10	
6	\$1	\$3 with 50% chance, \$0 with 50% chance
	Choose Option A for rows 1 to 6 and Option B for rows 7 to 10	
7	\$1	\$3 with 60% chance, \$0 with 40% chance
	Choose Option A for lines 1 to 7 and option B for rows 8 to 10	
8	\$1	\$3 with 70% chance, \$0 with 30% chance
	Choose Option A for rows 1 to 8 and Option B on lines 9 to 10	
9	\$1	\$3 with 80% chance, \$0 with 20% chance
	Choose Option A for rows 1 to 9 and Option B on line 10	
10	\$1	\$3 with 90% chance, \$0 with 10% chance
	Choose Option A for ALL lines	
OK		

You need to consider which of the two options you prefer in each line. Only one of these lines will be selected to determine your payoff, but you do not know in advance which line will be paid. Hence you should pay attention to the choice you make in every line. Each line has an equal chance of being drawn.

The following are the choices available:

- Choose option B for ALL lines.
- Choose Option A for line 1 and Option B for lines 2 - 10
- Choose Option A for lines 1 - 2 and Option B for lines 3 - 10
- Choose Option A for lines 1 - 3 and Option B for lines 4 - 10
- Choose Option A for lines 1 - 4 and Option B for lines 5 - 10
- Choose Option A for lines 1 - 5 and Option B for lines 6 - 10
- Choose Option A for lines 1 - 6 and Option B for lines 7 - 10
- Choose Option A for lines 1 - 7 and Option B for lines 8 - 10
- Choose Option A for lines 1 - 8 and Option B for lines 9 - 10
- Choose Option A for lines 1 - 9 and Option B for line 10
- Choose Option A for ALL lines.

Stage III

In this final stage of the experiment, we will ask you to answer some questions about yourself. Please answer truthfully. When you have finished, we will prepare your final earning, and ask you to sign a receipt in exchange for the payment you receive.

Thank you again for your participation! If you have any questions, please raise your hand and an experimenter will come to you.

1.6.3 The Screenshot of the Post-experiment Questionnaire

Questionnaire

Please answer the following questions

What is your gender?

☐ M
☐ F

What is your age?

What is your nationality?

Which year in school are you?

☐ Year 1
☐ Year 2
☐ Year 3
☐ Year 4
☐ Masters
☐ Ph.D
☐ Others

What is your major?

Have you studied game theory before?

☐ Yes
☐ No

Questionnaire

For the following campus/off campus activities/organizations, which describes you best: A. active member, B. inactive member, or C. not a member?

a) Sport activity/organization:

☐ A
☐ B
☐ C

b) Art, music and other recreation activity/organization:

☐ A
☐ B
☐ C

c) Humanitarian, charity, social work activity/organization:

☐ A
☐ B
☐ C

d) Religious activity/organization:

☐ A
☐ B
☐ C

e) Environment , nature, animal protection activity/organization:

☐ A
☐ B
☐ C

Questionnaire

Could you indicate your religion?

How important is your religion to you ? (of a scale from 1 to 7, indicate 0 if you do not have any religion.)

Little influence 0 1 2 3 4 5 6 7 Very important

If you lost your wallet on campus, how likely do you think you would have it returned?

0% chance 1 2 3 4 5 6 7 100% chance

Continue

Chapter 2 Social Sanction and Socially Responsible Behavior in the Marketplace

2.1 Introduction

Sanctions are considered to be the most straightforward tool to induce norm compliance, as opposed to cultural norms and values. In contrast to cultural norms and values that evolve and adapt over a long time, sanctions can produce results in a short time¹³. As a powerful force, sanctions shape the way people behave (Ruff, Ugazio, and Fehr, 2013) and hence are widely adopted by governments, and some institutions, to deal with socially irresponsible actions, such as littering, child labor and violations of industrial quota for toxic emissions. In particular, when private self-interest and social welfare are at odds, potential social gains could be obtained if we encourage socially responsible behaviors by penalizing actions that deviate from social optimality. As an alternative, social persuasion may be a superior choice to costly sanctions, as the society will benefit from a reduced administrative cost. Nonetheless, sanctions still serve as an indispensable part of promotion of social responsibility. Not only because sanctions create incentives, related to self-interest, to take responsible actions, but also because of its unique deterrent effects (Engel and Nagin, 2015). Kirchler, Huber, Stefan, and Sutter (2015)'s work show that the threat of monetary punishment promotes moral behavior. Baron (2010) also verifies that externally imposed enforcement funded by voluntary donations from citizens expands the scope of people's self-regulation.

¹³ Note that it also takes time for punishments to be bedded in. Impact of punishments increase over time. See, for instance, Chaudhuri and Paichayontvijit (2017).

In the vast majority of cases, sanctions are implemented by governments and some institutions. On the other hand, social sanctions such as boycotts, protests, and campaigns have increasingly attracted attention and are covered in the news on a daily basis. There are plenty of examples showing that social sanctions could lead to increased corporate social responsibility. Nike's experience between the 1970s and 1990s is a representative example of the impact of social sanctions on corporate social responsibility. At first, Nike turned a deaf ear when it was targeted by numerous protests concerning their labor practices, but by the late 1990s, following high-profile protests at over 40 universities that held contracts with the company, it began to change its approach. In 1999, Nike adopted a code of conduct to govern its suppliers, and over the next five years, it conducted more than 600 factory audits to ensure that its standards were being met (Soule, 2009). Other examples, such as, within the United States of America, the public outcry leading up to the Civil Rights Act of 1964, the environmental protests that preceded the ban on DDT (dichlorodiphenyltrichloroethane), and the creation of the Environmental Protection Agency (Dale, 2014) also suggest the positive role of sanctions in stimulating social responsibility.

Referring to examples mentioned above, it must be admitted that social sanctions can play a pronounced role in the promotion of social responsibility; however, experimental evidence that supports this proposition has been few and far between in the past. This chapter is thus motivated to examine the role of social sanctions in stimulating social responsibility. It continues the study to explore potential interventions that promote socially responsible behaviors. We conduct new experimental treatments by employing a basic market framework introduced by Bartling, Weber, and Yao (2015). We focus on a market with external costs imposed on uninvolved third parties. A voluntary contribution mechanism with opportunities to punish irresponsible behaviors is then introduced in the market. Specifically, the third parties can decide whether or not to engage in

activism to punish socially irresponsible sellers by making contributions to an active pressure group which champions socially responsible activities. Sellers who behave in a socially irresponsible manner would thus suffer monetary losses. We also employ two cost environments by varying the cost of being socially responsible. They are the low-cost environment and high-cost environment respectively. In the high-cost environment, it is costlier for sellers to behave in a socially responsible manner. An integrated study on interactions of market participants is carried out in this study. Firstly, we examine the impact of social sanctions on firms' and consumers' socially responsible behaviors in the two different cost environments. Secondly, a comparison between market outcomes with and without social sanctions is presented. Thirdly, we also investigate the social gains from market exchanges. To our knowledge, this is the first experimental study that examines the impact of social sanctions on social responsibility within a market setting. The exploration of the power of social sanctions in promoting socially responsible behaviors, as well as its benefits and drawbacks, could provide valuable references for both academics and policy makers.

Our results are qualitatively consistent with the notion that sanctions have a positive effect in stimulating socially responsible behaviors. We find that there are more socially responsible products being offered in the presence of sanctions, which reflects the deterrent effect of sanctions. However, this effect diminishes when the cost of acting in a socially responsible manner is higher. We also demonstrate that buyers exhibit a certain level of social responsibility. However, in the presence of sanctions that are imposed only on sellers, buyers shirk responsibility and shift the blame onto sellers. The impulses towards socially responsible behaviors of buyers are diminished. We also show that the price of socially irresponsible products is higher with sanctions as sellers transfer their risk to buyers by charging a higher price. Buyers of socially irresponsible products

are hence worse off with sanctions. Third parties contribute only occasionally and otherwise try to get a free-ride. Though third parties are more likely to make contributions if they suffered monetary losses previously, the motivating effect of monetary losses reduces when conducting business in a socially responsible manner is costlier for sellers. The study finds that the society profits from market exchanges in a low-cost environment and suffers losses in a high-cost environment. Unfortunately, sanctions do not help to make any improvements.

The remainder of the paper is organized as follows: section 2.2 describes experimental design and procedures; experimental results and discussions are presented in section 2.3, and section 2.4 provides a summary.

2.2 Experimental Design and Procedures

The experiments were conducted at the Nanyang Technological University in the economics laboratory. All the participants were students at the University, and a total of 364 subjects¹⁴ were recruited on the basis of voluntary registration. We conducted 4 different experimental treatments, each consisting of several independent markets, and each independent market had a group of 13 members (5 sellers, 4 buyers, and 4 third parties). At the beginning of the experiment, participants were randomly assigned to one of the three roles and remained within these roles throughout the experiment's entire duration. The experiment was programmed using the software z-Tree (Fischbacher, 2007). Each subject was assigned a unique anonymous ID number, which was kept private throughout each session. At the beginning of the experiments, written instructions were distributed and read aloud. There were three stages in each session. Stage 1 was a competitive market game in which each participant received an initial endowment of 100 points in each period.

¹⁴ The 104 subjects of Baseline treatment and 104 subjects of High Cost treatment are the same as those in chapter 1.

The game was repeated for 24 periods. At the end of stage 1, one period was randomly selected to determine their earnings. In stage 2, we conducted the Holt-Laury risk preferences elicitation. In stage 3, subjects were asked to answer a post-experiment questionnaire with the purpose to capture their demographic information and the reasons behind their decisions in the experiments. The details of the questionnaire are attached in the appendix. Participants earned around S\$19 to S\$20 on average, including a show-up fee of S\$2. The duration of the experiment was approximately 1.5 hours.

2.2.1 The Baseline Treatment

The baseline treatment is the same as that described in the first chapter. The following briefly describes the baseline treatment. A simple market setting introduced by Bartling, Weber, and Yao (2015), is adopted, as their market framework is simple and provide the flexibility to make changes. The market is set up as a buyer market, with each independent market consisting of 5 sellers, 4 buyers, and 4 third parties. It is a posted-offer market¹⁵, and sellers and buyers could trade with each other. The treatment is designed in a way that allow each seller the choice to produce one of two products only: a socially responsible product (“fair product”) at the cost of c ($c^{fair} > 0$)¹⁶, or a socially irresponsible product (“unfair product”) at the cost of 0 ($c^{unfair} = 0$)¹⁷. The cost difference of the two types of products is denoted as Δc ($\Delta c = c^{fair} - c^{unfair} = c^{fair}$). In other words, sellers should incur an extra cost (Δc) in order to offer fair products than to offer unfair products. The product value (v) of both products is the same to buyers ($v = 50$), and each buyer

¹⁵ In a posted offer market, sellers publicly announce prices on a take-it-or-leave-it basis and indicate the maximum number of units to be offered at that price. Buyers are randomly drawn, one at a time, and are given the opportunity to make purchases from any seller who has not sold his maximum specified sales quantity.

¹⁶ We employ two different values of c^{fair} in each treatment. The exact value of c^{fair} will be detailed later.

¹⁷ We set the production cost of the unfair product as benchmark and normalize it to 0 for simplicity. Under the assumption of selfish sellers, when a seller should make a choice between two types of products, only the relative difference in their production costs should matter rather than the absolute production cost of the chosen product. In addition to using a corner point such as zero, variations from this design could also be included in future work.

is allowed to purchase at most one product. Each third party is randomly paired with a buyer in each period. Third parties are not involved in any transactions but could be affected by products exchanged between sellers and buyers. If the third party's associated buyer purchases an unfair product, the third party would incur an external cost of e ($e = 60$). If the third party's associated buyer purchases a fair product or does not purchase any products, there would be no loss incurred by the third party ($e = 0$). Equations (2.1) to (2.3), below, describe the payoffs of different roles. E is the initial endowment, and is set to 100 points for all subjects in each period ($E^{seller} = E^{buyer} = E^{third\ party} = 100$). Price (p) is set by sellers, but cannot exceed the product value ($0 \leq p \leq v$). Therefore, sellers of unfair products are able to earn a maximum profit v , while sellers of fair products could only receive $v - c^{fair}$ at most.

The payoff of each seller can be expressed as;

$$\Pi^{seller} = \begin{cases} E^{seller} + p - c^{fair}, & \text{if the seller sells a fair product at price } p \\ E^{seller} + p, & \text{if the seller sells an unfair product at price } p \\ E^{seller}, & \text{if there is no sale} \end{cases} \quad (2.1)$$

The payoff of each buyer can be expressed as;

$$\Pi^{buyer} = \begin{cases} E^{buyer} + v - p, & \text{if the buyer purchases a product at price } p \\ E^{buyer}, & \text{if the buyer does not purchase any product} \end{cases} \quad (2.2)$$

The payoff of each third party can be expressed as;

$$\Pi^{third\ party} \quad (2.3)$$

$$= \begin{cases} E^{third\ party} - e, & \text{if the third party's corresponding buyer buys an unfair product} \\ E^{third\ party}, & \text{otherwise} \end{cases}$$

The timeline of our baseline treatment is shown in Figure 2.1. Sellers are the first to interact and decide on the type of product they want to produce and the price to charge at the beginning.

Once all sellers have made their choices, buyers enter the market sequentially (allocated in random order) and are given the current menu of sellers' product offerings and the corresponding prices. After that, buyers make a purchase decision to either purchase a product from one of the sellers, or not to purchase a product at all. Once a product is purchased by a buyer, it is removed from the product offering menu. Product offerings are displayed in a random order in each period, and the ID number of each seller is not revealed to buyers in order to avoid the emergence of a cross-period reputation.

Figure 2.1: Timeline of the Baseline Treatment

2.2.2 The Sanction Treatment

In this chapter, monetary sanctions are imposed only on sellers, but not buyers. A third party voluntary contribution mechanism, with opportunities to punish sellers for their socially irresponsible behaviors, is employed. In the sanction treatment, third parties could decide on whether or not to contribute to an active pressure group. Contributions (C) incur a fixed cost of 40 points and these are sunk costs. There are no costs for third parties, if they do not make contributions ($C = 0$). All the contributions from third parties are used by activists to launch activities such as boycotts, protests or campaigns. As a consequence, any seller who successfully sells an unfair product will suffer reputational damage, which is further translated to monetary losses. The monetary losses to the sellers depend on the effectiveness of the pressure (EOP) they

are subjected to. The effectiveness of the pressure increases if there are more third parties making a contribution. It is described in the equations (2.4) and (2.5) below. n denotes the number of the third parties who choose to contribute and N is the total number of the third parties. Thus, when all third parties contribute, the monetary losses to each seller of the unfair product are 100 points. Likewise, the lower the proportion of third parties who contribute, the less effective the pressure and the lower the monetary losses will be on sellers. Sellers of unfair products can infer the number of third parties who make a contribution from their monetary losses.

$$\text{Monetary Losses} = (EOP)^2 * 100 \quad (2.4)$$

$$EOP = n/N \quad (2.5)$$

Equations (2.6) to (2.8) show the payoffs of different roles in the sanction treatment.

The payoff of each seller can be expressed as;

$$\pi^{seller} \quad (2.6)$$

$$= \begin{cases} E^{seller} + p - c^{fair}, & \text{if the seller sells a fair product at price } p \\ E^{seller} + p - (EOP)^2 * 100, & \text{if the seller sells an unfair product at price } p \\ E^{seller}, & \text{if there is no sale} \end{cases}$$

The payoff of each buyer can be expressed as;

$$\pi^{buyer} = \begin{cases} E^{buyer} + v - p, & \text{if the buyer purchases a product at price } p \\ E^{buyer}, & \text{if the buyer does not purchase any product} \end{cases} \quad (2.7)$$

The payoff of each third party can be expressed as;

$$\Pi^{third\ party} \quad (2.8)$$

$$= \begin{cases} E^{third\ party} - e - C, & \text{if the third party's corresponding buyer buys an unfair product} \\ E^{third\ party} - C, & \text{otherwise} \end{cases}$$

Figure 2.2 displays the timeline of the sanction treatment (a sample instruction of the sanction treatment can be also found in the appendix). At the beginning of each period, sellers decide on the product type to produce and set the corresponding price. At the same time, each third party decides on whether or not to contribute to an active pressure group. Following this, buyers enter the market sequentially in a random order and are given the current menu of sellers' product offerings and the corresponding prices. Finally, buyers make their purchase decisions.

Figure 2.2: Timeline of the Sanction Treatment

2.2.3 Treatment Overview

To allow for further analysis, we conducted the baseline treatment and the sanction treatment in two different cost environments by varying the production cost of fair products (c^{fair}). In the low-cost environment, the cost of producing the fair product is 10 points ($c^{fair} = 10$). In the high-cost environment, the cost of producing the fair product is 40 points ($c^{fair} = 40$). Thus, in total, four treatments are implemented. Table 2.1 below provides a treatment overview. There are 8 independent markets in each of Baseline and High Cost treatment and 6 independent markets in each of Sanction and High Cost & Sanction treatment. Our experiment generates a panel of data from 364 individuals over 24 periods.

Table 2.1: Treatment Overview

Treatment	No. of Independent Markets	No. of Periods in Each Market	No. of Sellers	No. of Buyers	No. of Third Parties	Total No. of Subjects
Baseline	8	24	40	32	32	104
Sanction	6	24	30	24	24	78
High Cost	8	24	40	32	32	104
High Cost & Sanction	6	24	30	24	24	78
Total	28	96	140	112	112	364

2.3 Results and Discussions

This section presents the most prominent empirical patterns observed in our experimental results. In subsection 2.3.1, we show the monetary losses of the unfair product sellers. Subsection 2.3.2 and subsection 2.3.3 concentrate on the impact of sanctions on socially responsible production and consumption respectively, within which behavioral change of sellers and buyers are investigated. In subsection 2.3.4, we analyze the sanctioning decisions of the third parties. Findings related to social gains from market exchanges are documented in subsection 2.3.5. Lastly, subsection 2.3.6 presents market outcomes with respect to the price and profits of each product type.

2.3.1 Knowledge of Monetary Losses on Unfair Product Sellers in Sanction and High Cost & Sanction Treatment

The market is designed to be a buyer market, with all products having the same product value to buyers. Without considering the buyers' preference for social responsibility, price competition among sellers is expected. Thus, a profit-maximizing seller would charge a competitive price and at the same time offer the product that gives the greatest return. Recall that it costs c^{fair} ($c^{fair} > 0$) to produce the fair product and 0 ($c^{unfair} = 0$) to produce the unfair product. Sellers of fair

products would never set a price below c^{fair} , otherwise they earn negative profits. Making use of the cost advantage, sellers of unfair products could charge a slightly lower price than the price of fair products to remain competitive and at the same time obtain the more profits than fair product sellers.

In the absence of sanction, there would be no loss for sellers if they chose to offer unfair products. Recall that sellers of unfair products could always undercut sellers of fair products by charging a marginally lower price which still allows them to generate more profits. All sellers would anticipate that, thus, it is a straightforward prediction that all sellers would offer unfair products, if we ignore their preference for social responsibility. And in the equilibrium, the price of the unfair product equals to its marginal cost which is zero.

When sanctions are present, there is a trade-off between the cost of offering the fair product and the potential monetary losses caused by the production of the unfair product. From the perspective of selfish sellers, they will offer fair product if and only if

$$p^{fair} - c^{fair} > p^{unfair} - \text{Monetary Losses} \quad (2.9)$$

That is

$$p^{fair} - p^{unfair} > c^{fair} - \text{Monetary Losses} \quad (2.10)$$

If the monetary losses are larger than the cost of offering a fair product, the right-hand side of equation (2.10) is negative. Note that unfair products sellers would never set a price higher than fair product sellers. The left-hand side is non-negative. The inequality always holds. Offering fair products is preferred. In the equilibrium, the price of fair products is c^{fair} .

If the monetary losses are lower than the cost of offering a fair product, then it follows that an unfair product would be produced. Sellers of unfair products can always set a price ranging from $(p^{fair} - c^{fair} + \text{Monetary Losses}, p^{fair})$ to obtain more profits than fair product sellers. In the equilibrium, only unfair products are offered at $price = \text{Monetary Losses}$.

Equations (2.11) to (2.13) below summarize the product offering strategy of selfish sellers by substituting into the equation of monetary losses. n denotes the number of the third parties who choose to contribute and N ($N = 4$) is the total number of the third parties. c^{fair} is the production cost of the fair product ($c^{fair} = 10$ in the low-cost environment, and $c^{fair} = 40$ in the high-cost environment).

$$\text{Fair product is preferred, if } c^{fair} < (n/N)^2 * 100 \quad (2.11)$$

$$\text{Preferences for fair products and unfair products are equal, if } c^{fair} = (n/N)^2 * 100 \quad (2.12)$$

$$\text{Unfair product is preferred, if } c^{fair} > (n/N)^2 * 100 \quad (2.13)$$

Solving for n in equation (2.11), we should have at least 2 third parties ($n \geq 2$ in the low-cost environment, threshold is 2) and 3 third parties ($n \geq 3$ in the high-cost environment, threshold is 3) making contributions in order to force the offering of fair products by selfish sellers. It is noted that in the high-cost environment, more contributions from third parties are demanded to motivate the production of the fair product for selfish sellers, or in other words, a higher threshold is required. We further define sanctions are effective, if the threshold is met. In this situation, offering a fair product is more profitable. When sanctions are ineffective, production of the unfair product is preferred. Whereas, in a case where sanctions are ineffective but still positive (i.e. when the threshold of third parties is not reached but monetary losses are greater than 0), offering the unfair

product leads to lower profits being obtained than would be the case without sanction. In this case, relative profitability of unfair products declines.

Figure 2.3 and Figure 2.4 detail the monetary losses on each unfair product seller in 24 periods of Sanction and High Cost & Sanction treatment. The dashed line indicates the threshold as discussed above. When monetary losses (y-axis) are 0, there is no third party contributing in the market in this period. If monetary losses are above the dashed line, monetary losses are greater than the production cost of fair products. Sanction is effective. Between 0 and the dashed line, sanction is ineffective but monetary losses are positive. Figure 2.5 further aggregates the information and shows the number of different situations in Sanction and High Cost & Sanction treatment. Referring to Figure 2.5, the contribution pattern is quite similar in the low and high cost environments, which reflects a stable number of contributors. However, across the 24 periods, the threshold is seldom met (as also shown in Figure 2.3 and Figure 2.4). In total, we observe that effective sanctions (i.e., cases where monetary losses for sellers of the unfair product were greater than the cost of producing the fair product) are present 13 times in Sanction treatment and twice in High Cost & Sanction treatment. There are 59 and 66 observations in Sanction and High Cost & Sanction treatment respectively with ineffective sanction but positive monetary losses.

Figure 2.3: Monetary Losses of Each Seller of the Unfair Product in Sanction Treatment

Figure 2.4: Monetary Losses of Each Seller of the Unfair Product in High Cost & Sanction Treatment

Figure 2.5: Overview of Monetary Losses on Unfair Product Seller

By the evidence collected in our study, overall, monetary losses do not appear to be severe enough to force the production of the fair product for selfish sellers. In particular, when it is more expensive to produce fair products, effective sanctions are rarely achieved due to the higher threshold for the number of third party contributors. The issue of third parties as ‘free riders’ could be one of the main contributing factors to this outcome. Third parties free ride on others’ contributions and want to benefit from what the other third party subjects will spend to sanction sellers. There could be other alternative ways of modelling sanctions to avoid this free rider problem (for future study), such as a one to one matching of third parties and sellers, where the third party’s spending on sanctions will directly affect the sellers’ payoffs. Additionally, it is noteworthy that most of the contributions are wasted, with many cases where we have contributions but not in the same period. It implies that the free-rider problem could be improved

by increasing the cooperation among third parties such as establishing a third party union. Another possible reason for the low contribution could be that contributions are very costly and it could only affect the choice of sellers in the following period, but not in the existing one. This design feature could also discourage third parties from making contributions.

However, these observations do not mean that we should jump to conclusions that introducing sanctions are useless. We instead took our investigation a step further, as shown in the following subsection 2.3.2.

Result 2.1: According to our data, from the perspective of selfish sellers, the monetary losses of unfair product sellers are not severe enough to force them to offer the fair product.

2.3.2 Impact of Sanction on Socially Responsible Production

Next, we turn our focus to the product choice of sellers in the presence of sanction. In order to identify the incentivizing effect of sanctions on socially responsible production, we make a comparison between treatments with sanction and treatments without sanction.

Figure 2.6 depicts the proportion of the fair product offered by sellers in each treatment. The positive proportions of the fair product in all treatments reveal the sellers' social concerns for third parties. In addition, from the left panel, it is evident that the proportion of fair products is higher in Sanction than Baseline treatment¹⁸. These observations imply that more of the fair products are offered by sellers when sanctions exist in the low-cost environment. This pattern, however, is not

¹⁸ Two sided Wilcoxon rank sum test between Baseline and Sanction, p-value is 0.0000, using the average market share of fair product across markets in a period as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

observed in the right panel when comparing High Cost and High Cost & Sanction treatment¹⁹ in the high-cost environment.

Figure 2.6: Proportion of Fair Products Offered by Sellers in Each Treatment

The visual impression obtained from Figure 2.6 is further corroborated by Figure 2.7 and Figure 2.8, which show the histogram of the frequency of each seller offering the fair product, and its kernel density curve, in each treatment. Different patterns are obtained in Baseline and Sanction treatment (the Kolmogorov – Smirnov equality-of-distributions test gives a p-value of 0.017); however, in the high-cost environments (High Cost and High Cost & Sanction), same distribution is not rejected (Kolmogorov – Smirnov equality-of-distributions test gives a p-value of 0.405). Table 2.2 summarizes the mean, standard error of the mean, and median of the frequency of each

¹⁹ Two sided Wilcoxon rank sum test between High Cost and High Cost & Sanction, p-value is 0.2384, using the average market share of fair product across markets in a period as an observation (24 observations for a treatment). In the regression analysis, we cluster the standard errors at the market level.

seller offering the fair product in each treatment. It is noted that the mean and median increase significantly in Sanction treatment if compared to Baseline treatment, while no significant changes are observed in treatment High Cost & Sanction compared to High Cost treatment. All these results suggest, in the low-cost environment, more sellers are offering the fair product at a higher frequency in the presence of sanctions, but this behavioral change is not obvious in the high-cost environment.

Figure 2.7: Histogram of the Frequency of Sellers' Fair Product Production in Baseline and Sanction Treatment

Figure 2.7 notes: the frequency of each seller to offer the fair product is considered as one observation. This graph shows the histogram (distribution) of seller frequency of offering the fair product. We have 40 sellers in Baseline treatment and 30 sellers in Sanction treatment.

Figure 2.8: Histogram of the Frequency of Sellers' Fair Product Production in High Cost and High Cost & Sanction Treatment

Figure 2.8 notes: the frequency of each seller to offer the fair product is considered as one observation. This graph shows the histogram (distribution) of seller frequency of offering the fair product. We have 40 sellers in High Cost treatment and 30 sellers in High Cost & Sanction treatment.

Table 2.2: Frequency of Sellers' Fair Product Production

Treatment	Mean	Standard Error of Mean	Median
Baseline	0.424	0.058	0.313
Sanction	0.569	0.050	0.521
High Cost	0.211	0.036	0.125
High Cost & Sanction	0.208	0.044	0.125

The investigation is taken a step further by showing the regression results on seller product choice in Table 2.3. The dependent variable is seller's product choice. It takes on value 1 if a fair product is offered by the buyer and 0 if an unfair product is offered. Models (1) and (2) examine seller's product choice at period 1 only. Models (3) and (4) look at all 24 periods. The reference category is the Baseline treatment. Sanction, High Cost, and High Cost & Sanction are treatment

dummies. Sanction X Period, High Cost X Period, and (High Cost & Sanction) X Period are interaction terms between treatment dummies and period to allow for different time trends across treatments.

Referring to all models, sanction appears to increase the likelihood of fair product offering by sellers in the low-cost environment. In the high-cost environment, although the difference is not obvious from the graphs above, the regression results show that the positive effect of sanction still remains but becomes weaker. Equality of High Cost and High Cost & Sanction is rejected at $p\text{-value} = 0.0000$ in Model (2) and $p\text{-value} = 0.0583$ in Model (4). The marginal effect is around 0.165 in the high-cost environment while it is about 0.32 in the low-cost environment as seen in Model (4). The results are surprising but understandable. Although sanctions are not severe enough to force sellers to offer the fair product, it appears that the existence of sanction mechanism itself has the deterrent effect. Although, from the past experience, monetary losses are not severe enough, it provides sellers the incentive to produce fair products as long as there is an uncertainty of being punished. In the high-cost environment, more contributions from third parties are required in order to lead to effective sanctions. Sellers would expect the drop in the success rate of the effective sanction. Uncertainty is reduced and the deterrent effect of sanction drops, which explains why the positive effect of sanctions is weaker in the high-cost environment.

We also show that sellers are more likely to offer fair products if they do so previously, indicating the stability of social responsibility. It is also noteworthy to mention that sellers are profit oriented, and more likely to produce fair products if a fair product has realized more profit in the previous period, as suggested by the positive and significant coefficient of expected profit premium. This provides insights into profit oriented socially responsible production.

Table 2.3: Random-Effects Probit Regressions of Seller Product Choice

Dependent Variable	(1)	(2)	(3)	(4)
		Fair Product		
Period			-0.005 (0.004)	-0.005 (0.004)
Sanction	0.243* (0.127)	0.221* (0.126)	0.312** (0.153)	0.321** (0.153)
High Cost	-0.272*** (0.092)	-0.303*** (0.098)	-0.167 (0.117)	-0.159 (0.122)
High Cost & Sanction	0.108 (0.104)	0.097 (0.114)	0.032 (0.126)	0.006 (0.127)
Sanction X Period			-0.005 (0.006)	-0.005 (0.006)
High Cost X Period			0.005 (0.005)	0.005 (0.005)
(High Cost & Sanction) X Period			-0.012* (0.006)	-0.012* (0.006)
Offering fair product in the previous period			0.185*** (0.050)	0.186*** (0.051)
Expected profit premium (Fair product-Unfair Product)			0.007*** (0.002)	0.007*** (0.002)
Control Variables	No	Yes	No	Yes
Period Considered	1	1	All periods	All periods
Observations	140	140	2,355	2,355
Number of Subjects			140	140

Notes: The dependent variable is seller's product choice (Fair Product). It takes on value 1 if a fair product is offered by the seller and 0 if an unfair product is offered. Variable period takes integer values between 1 and 24. Sanction, High Cost, and High Cost & Sanction are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment. Sanction X Period, High Cost X Period, and (High Cost & Sanction) X Period are interaction terms between treatment dummies and period. Expected profit premium is the average profit difference between fair and unfair products in the previous period. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a seller's product choice in a period as an observation. Models (3) and (4) are panel specifications that include seller random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 2.2: Sanction increases the likelihood of seller product offering in both low and high cost environments, with weaker impact in the high-cost environment. Sellers are more likely to offer fair products if they do so previously or if profits of fair products relative to unfair products increase.

2.3.3 Estimation of Buyer Utility Function

Subsection 2.3.3 considers the changes in the social preferences of buyers. As shown in Table 2.4, applying McFadden's (1974) conditional logit model, we estimate a specified utility function as indicated by equation (2.14).

$$U_{itq} = \theta(\Pi_i)_{tq} + \gamma(\Pi_j)_{tq} + \sum_{k=1}^K \alpha_{qk} z_{itk} + \varepsilon_{itq} \quad (2.14)$$

It describes buyer i 's concern for both their own benefits and others' welfare. U_{itq} is buyer i 's utility at period t , from product alternatives, $q \in \{0, 1, 2, \dots, Q^{it}\}$. Π_i denotes buyer i 's payoff and Π_j denotes the corresponding third party j 's payoff. Coefficient θ measures the weight that individuals place on their own benefits and γ captures their social concern for others' welfare. Hence, ratio $\rho = \gamma/\theta$ shows how many units of their own benefits an individual is willing to give up in exchange for a one-unit increase in others' welfare. In other words, a larger ρ implies a higher level of social responsibility. Product alternatives are denoted as $q \in \{0, 1, 2, \dots, Q^{it}\}$ where $q = 0$ corresponds to the option that buyers choose not make any purchases. The actual number of product offers observed by buyers is indicated by $2 \leq Q^{it} \leq 5$, as each buyer can select from between two and five offerings. z_{ik} are case-specific variables that vary across cases but not across alternatives. We include five case-specific variables ($K = 5$): period, gender, (natural logarithm of) age, nationality (Singaporean) and religion. An identical coefficient for alternatives is assumed, which is $\alpha_{qk} = \alpha_{q'k}$, for all $q, q' \neq 0$, as product choice options are displayed in a random order and hence alternatives are not identifiable (except for option not to purchase a product that is always available and identifiable). Error terms ε_{itq} have standard Type I extreme value distribution with density function of $f(\varepsilon) = \exp\{-\varepsilon - \exp(-\varepsilon)\}$.

The probability that individual i will choose product q is given by equation (2.15).

$$p_{iq} = \frac{\exp(\eta_{iq})}{\sum_{M \in Q} \exp(\eta_{iM})} \quad (2.15)$$

Where $\eta_{iq} = \theta(\Pi_i)_{tq} + \gamma(\Pi_j)_{tq} + \sum_{k=1}^K \alpha_{qk} z_{itk}$

The likelihood function is

$$L(\theta, \varphi, \alpha_{qk}) = \prod_{i=1}^N \prod_{q=0}^{Q^{it}} p_{iq}^{d_{iq}} \quad (2.16)$$

$d_{iq} = 1$ if individual i selects option q and $d_{iq} = 0$ otherwise.

The log-likelihood function is

$$l(\theta, \varphi, \alpha_{qk}) = \sum_{i=1}^N \sum_{q=0}^{Q^{it}} d_{iq} \log(p_{iq}) \quad (2.17)$$

Table 2.4 below shows the estimation results by maximizing the likelihood function above. The dependent variable is buyer product choice among available seller product offerings. Models (1) to (4) estimate buyers' utility function in Baseline, Sanction, High Cost and High Cost & Sanction treatment respectively. Models (5) and (6) delve into the impact of sanctions on buyers' utility in the two cost environments respectively. To that end, interaction terms of 'treatment dummy and third party payoffs, and 'treatment dummy and buyer payoffs' are introduced. Observations of both Baseline and Sanction treatment are examined in Model (5). Model (6) includes observations from both High Cost and High Cost & Sanction treatment.

Referring to Models (1) to (4), the positive and significant coefficient of the third party's payoff implies that buyers have a fairly stable concern for the welfare of third parties in all treatments. However, this concern for the welfare of third parties only accounts for a tiny fraction of the total when compared with the concern for their own payoff. The ratio ($\rho = \gamma/\theta$) is 0.12 in Baseline, 0.02 in Sanction, 0.41 in High Cost and 0.05 in High Cost & Sanction. It implies that for example

in Baseline treatment, buyers treat third parties' payoff as around 12% as importantly as their own payoffs.

Additionally, it is found that buyers care less about third parties' payoff when sanction is present. Both coefficients of Third Party Payoff X Sanction and Third Party Payoff X (High Cost & Sanction) are negative and significant. This is consistent with the drop in ratio ρ (from 0.12 in Baseline to 0.02 in Sanction; from 0.41 in High Cost to 0.05 in High Cost & Sanction). The possible explanation could be that monetary sanctions are imposed only upon sellers and not upon buyers; therefore, buyers feel that sellers should be the ones to take more responsibility. The impulses towards socially responsible behaviors from buyers are thus diminished.

Table 2.4: Estimation of Buyer Utility Function

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Buyer Choice					
Buyer Payoff	0.372*** (0.031)	0.362*** (0.100)	0.107*** (0.027)	0.277*** (0.092)	0.351*** (0.042)	0.128*** (0.028)
Third Party Payoff	0.046*** (0.009)	0.008** (0.003)	0.044** (0.017)	0.014*** (0.004)	0.045*** (0.008)	0.050*** (0.016)
Third Party Payoff X Sanction					-0.038*** (0.007)	
Third Party Payoff X (High Cost & Sanction)						-0.045*** (0.015)
Treatment Considered	Baseline	Sanction	High Cost	High Cost & Sanction	Baseline and Sanction	High Cost and High Cost & Sanction
Observations	3,164	2,605	3,524	2,391	5,769	5,915

Notes: Models (1) to (4) provide the estimation of buyer utility function as specified in equation (2.14) of Baseline, Sanction, High Cost and High Cost & Sanction treatment respectively. Models (5) and (6) introduce interaction term of 'treatment dummy and third party payoff'. Model (5) includes observations in Baseline and Sanction treatment and Model (6) use observations of High Cost and High Cost & Sanction treatment. Robust standard errors clustered at the market level in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Result 2.3: Buyers exhibit a certain level of social responsibility, reflected by their stable (albeit rather small) concern for the welfare of third parties. However, when sanctions are present and levied on sellers only, buyers' care for third parties decreases.

2.3.4 Sanctioning Decision of Third Parties

We categorize all third parties into three groups depending on the frequency by which they contribute over 24 periods. The percentage size of each group is presented in Figure 2.9. Category 1 is for third parties who never made a contribution. Category 2 consists of third parties who contributed to less than 12 periods. The remainder (category 3) includes third parties who contributed to 12 or more periods. It is important to note that in both Sanction and High Cost & Sanction, we had a very small proportion of third parties who contributed to more than 12 periods, which implies that sanctioning behavior from each third party is not sustained. The vast majority only contributed occasionally, while free-riding the rest of the time.

The results also show that the percentage of the third parties who never contributed significantly dropped in the high-cost environment. Applying two sided Wilcoxon rank sum test using total numbers of each category in a market as an observation, the equality between Sanction and High Cost & Sanction is rejected at $p\text{-value} = 0.0069$ for category 1, 0.0183 for category 2, and 0.5233 for category 3. More third parties would contribute as they recognize that more contributions are required in order to stimulate the production of the fair product in the high-cost environment. Referring to Figure 2.5, the final contribution pattern is quite similar in Sanction and High Cost & Sanction, this is because in Sanction treatment we have fewer contributors, but they contributed at a relative higher frequency on average. In High Cost & Sanction, although there are more contributors, on average each contributed less frequently.

Figure 2.9: Contribution Behaviors of Third Parties

We now turn to reactions of third parties to previous monetary losses and aim to explore whether earlier monetary losses would cause a change in the contribution behavior of third parties. Table 2.5 reports the regression results of third party contribution decisions on their monetary losses in the last few periods. The reference category is Sanction treatment. High Cost & Sanction is the treatment dummy. From the results, in Sanction treatment, past monetary losses increase the third parties' likelihood to contribute. However, the incentivizing effect of monetary losses only lasts for a short period (around 2 periods). In the High Cost & Sanction treatment, Suffer Losses in the last period + High Cost & Sanction X Suffer Losses in the last period = 0 if not rejected at p-value = 0.1555 in Model (1) and p-value = 0.2527 in Model (2), indicating an insignificant impact of past monetary losses on the willingness of third parties to contribute. Knowing that effective sanctions are less likely to be achieved in the high-cost environment, there is a corresponding decrease in incentives of third parties.

Table 2.5: Random-Effects Probit Regressions of Third Party Contribution Behavior

Dependent Variable	(1)	(2)
	Contribute	
Period	-0.002*	-0.002**
	(0.001)	(0.001)
High Cost & Sanction	0.052	0.047
	(0.045)	(0.045)
Suffer Losses in the last period	0.084***	0.087***
	(0.019)	(0.019)
High Cost & Sanction X Suffer Losses in the last period	-0.040**	-0.042*
	(0.020)	(0.025)
Suffer Losses in the second last period	0.068***	0.069***
	(0.018)	(0.022)
High Cost & Sanction X Suffer Losses in the second last period	-0.033**	-0.031**
	(0.014)	(0.014)
Suffer Losses in the third last period	0.005	0.004
	(0.010)	(0.010)
High Cost & Sanction X Suffer Losses in the third last period	-0.014	-0.003
	(0.019)	(0.023)
Control Variables	No	Yes
Observations	1,056	990
Number of Subjects	48	45

Notes: the dependent variable is Contribute. It takes on value 1 if a third party makes a contribution and 0 otherwise. Variable period takes integer values between 1 and 24. The reference category is Sanction treatment. High Cost & Sanction is the treatment dummy. Suffer Losses in the last period, Suffer Losses in the second last period, Suffer Losses in the third last period are binary variable. It takes on value 1 if it is true and 0 otherwise. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a third party's contribution decision in a period as an observation and allow for third party random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 2.4: Contributions from each third party are not sustained, most of them only contribute occasionally and are otherwise free-riding. It is found that third parties are more likely to contribute if they suffered monetary losses previously in the low-cost environment. Nevertheless, the motivating effect of monetary losses vanishes in the high-cost environment.

2.3.5 Impact of Sanctions on Aggregate Market Outcomes

In this subsection, price and profits of each type of product are presented. In addition, the influence of sanction is also investigated. We focus on observations of successful transactions.

2.3.5.1 Price and Price Premium

Figure 2.10 and Figure 2.11 show the average prices of the fair and unfair products over 24 periods in different cost environments. According to Figure 2.10, in the low-cost environment, significantly higher prices of the unfair products are discovered when sanctions are present (two sided Wilcoxon rank sum test using the average market price in a period as an observation and clustering at market level, the p-value is 0.092 for unfair products and 0.3571 for fair products). The effect is pronounced, and in the expected direction. Due to sanctions, sellers of unfair products are at risk of monetary losses; therefore, prices are raised in order to offset the potential monetary losses. The same results are obtained in the high-cost environment. Figure 2.11 shows that the price of unfair products increases substantially with sanction (two sided Wilcoxon rank sum test for clustered data between High Cost and High Cost & Sanction using the average market price in a period as an observation and clustering at market level, p-value is 0.001 for unfair products and 0.9005 for fair products). These observations imply that the risk of monetary losses to unfair product sellers is transferred to their buyers through a higher price being charged. Buyers of unfair products are worse off with sanction.

Figure 2.10: Average Prices by Product Type in Baseline and Sanction

Figure 2.11: Average Prices by Product Type in High Cost and High Cost & Sanction

Additionally, Figure 2.12 presents the average price premium (price premium = the price of the fair product – the price of the unfair product) over 24 periods. It shows that the price difference between the two types of products differs from (is less than) their cost difference. Taking two sided Wilcoxon signed-rank test based on independent markets, $p\text{-value} < 0.05$ for all treatments, and therefore, equality between price premium and the cost difference is rejected. It suggests that both sellers and buyers bear the production cost of the fair product. Additionally, in the presence of sanctions, the price premium drops significantly (two sided Wilcoxon rank sum test, the $p\text{-value}$

is 0.0707 in the low-cost environment and 0.0066 in the high-cost environment). This is due to the increase in the price of the unfair product when sanction exists.

Figure 2.12: Average Price Premium in Each Treatment

Table 2.6 summarizes the regression results of buyer purchase price in each treatment using each buyer's purchase price in a period as an observation. The dependent variable is the price buyer paid for the product. Fair product takes on value 1 if a fair product is purchased by a buyer and 0 otherwise. In general, there is a higher price of the fair product than the unfair product. The price difference is approximately 5 points in Baseline, 0.668 points units in Sanction, 30 points in High Cost, and 9.25 points in High Cost & Sanction. It is noteworthy that the price difference drops in the treatments with sanctions (consistent with graphs). In Sanction treatment, in particular, the price advantage of the fair product even disappears. The coefficient of Fair Product is statistically insignificant.

Table 2.6: Random-Effects Linear Regressions of Buyer Purchase Price in Each Treatment

	(1)	(2)	(3)	(4)
Dependent Variable	Buyer Purchase Price			
Period	-0.164** (0.064)	-0.397*** (0.130)	-0.269* (0.150)	-0.237** (0.121)
Fair Product	5.234*** (1.102)	0.668 (0.687)	30.305*** (2.174)	9.255*** (2.221)
Constant	19.490*** (4.032)	27.069*** (5.889)	23.982*** (3.324)	32.767*** (2.890)
Control Variables	Yes	Yes	Yes	Yes
Treatment considered	Baseline	Sanction	High Cost	High Cost & Sanction
Observations	747	568	700	466
Number of Subjects	32	24	32	22

Notes: The dependent variable is buyer purchase price, using a buyer's purchased product price in a period as an observation. Variable period takes integer values between 1 and 24. Variable Fair Product takes on value 1 if a fair product is purchased and 0 if an unfair product is purchased. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. Models (1) to (4) report the estimated price difference paid by buyers between the two types of products in Baseline, Sanction, High Cost and High Cost & Sanction treatment respectively. The models allow for buyer random effects. Robust standard errors clustered at the market level in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

To go one step further, we apply random-effects linear regression to see the treatment effect of sanction on the market price of each product type In Table 2.7. Models (1) and (2) focus on the price of fair products. Models (3) and (4) report the results on the price of unfair products. The reference category is Baseline treatment. Sanction, High Cost, and High Cost & Sanction are treatment dummies. The regression results further verify the role of sanctions in raising the prices of unfair products, especially in the high-cost environment. Equality between the coefficients of High Cost and High Cost & Sanction is rejected at $p\text{-value} = 0.000$ in Model (4). Results from the graph and the non-parametric tests are corroborated.

Table 2.7: Random-Effects Linear Regressions of Prices by Product Type

	(1)	(2)	(3)	(4)
	Control for Fair Products		Control for Unfair Products	
Dependent Variable	Average Market Price			
Period	-0.154** (0.061)	-0.154** (0.062)	-0.320*** (0.071)	-0.320*** (0.071)
Sanction	0.051 (2.402)	0.324 (1.905)	4.808 (3.154)	4.733* (2.790)
High Cost	18.160*** (1.716)	18.875*** (1.906)	-4.725 (2.908)	-5.010 (3.321)
High Cost & Sanction	16.608*** (1.771)	17.477*** (1.869)	11.411*** (2.495)	9.681*** (3.101)
Constant	28.228*** (1.741)	17.623* (9.771)	24.871*** (2.297)	25.755 (30.778)
Control Variables	No	Yes	No	Yes
Observations	451	451	623	623
Number of Markets	27	27	28	28

Notes: the dependent variable in all models is the average market price of fair (unfair) product (Average Market Price). It employs a panel specification. The average market price of fair (unfair) products in a period is used as one observation. In Models (1) and (2), we focus on the market price of fair products. Models (3) and (4) look at the market price of unfair products. The reference category is Baseline treatment. Sanction, High Cost, and High Cost & Sanction are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. Variable period takes integer values between 1 and 24. Control variables take the average of all participants within the market, including gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. The models allow for market level random effects. Robust standard errors clustered at the market level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Result 2.5: Introducing sanction has the effect of increasing the price levels of unfair products.

2.3.5.2 Profits

So far, we have found that sanction raises the prices of the unfair products. However, the relative profitability of unfair product sellers is still unclear as the amount of monetary losses is not taken into consideration. Figure 2.13 and Figure 2.14 together present the profits of sellers of different product types in each treatment. Within each treatment, it suggests that it is more profitable to be a seller of unfair products than to be a seller of fair products, in absolute value (applying two sided Wilcoxon signed rank test and using average profits in a market as an observation, equality is

rejected at $p\text{-value} < 0.05$). Thus, to offer the fair product, part of the sellers' own benefits are given up, reflecting the social responsibility of fair product sellers.

In addition, from the right panel of Figure 2.13, sellers of unfair products are not more profitable with Sanction than without in the low-cost environment, though there is an increase in the price of the unfair products (two sided Wilcoxon rank sum test using market average profits as an observation, the $p\text{-value}$ is 0.6056). This suggests that the monetary sanctions fully offset the benefits of higher prices being charged for the unfair product in Sanction treatment. In the high-cost environment as shown in Figure 2.14. Sellers of the unfair product earn abnormal profits even in the presence of sanctions (two sided Wilcoxon rank sum test between High Cost and High Cost & Sanction using market average profits of the unfair product as an observation, the $p\text{-value}$ is 0.0098). This is because sellers of the unfair products charge a much higher price but only suffer a few monetary losses in the high-cost environment (third parties' contribution is not enough).

To complement this analysis, Table 2.8 reports the regression results of profits. It employs panel specification using the average market profits in a period as an observation. Model (1) and Model (2) examine the profits of fair products. Model (3) and Model (4) forces on profits of unfair products. Equality of High Cost and High Cost & Sanction is rejected at $p\text{-value} = 0.0023$. The obtained regression results are consistent with previous non-parametric tests.

Figure 2.13: Average Profits by Product Type in Baseline and Sanction

Figure 2.14: Average Profits by Product Type in High Cost and High Cost & Sanction

Table 2.8: Random-Effects Linear Regressions of Profits

	(1)	(2)	(3)	(4)
	Control for Fair Products		Control for Unfair Products	
Dependent Variable	Average Profits			
Period	-0.137*** (0.049)	-0.136*** (0.050)	-0.125* (0.064)	-0.127** (0.064)
Sanction	-0.196 (2.308)	0.384 (1.691)	1.715 (2.293)	2.409 (2.153)
High Cost	-10.714*** (1.530)	-9.786*** (1.656)	-1.912 (2.620)	-0.902 (3.140)
High Cost & Sanction	-12.495*** (1.537)	-12.002*** (1.586)	7.048*** (2.415)	7.750*** (2.464)
Constant	15.631*** (1.544)	1.066 (8.572)	16.016*** (1.986)	-5.792 (25.012)
Control Variables	No	Yes	No	Yes
Observations	495	495	642	642
Number of Markets	28	28	28	28

Notes: the dependent variable in all models is the average profits of fair (unfair) product. It employs a panel specification. The average profits of fair (unfair) products in a period of a market is used as one observation. In Models (1) and (2), we focus on the profits of fair products. Models (3) and (4) look at the profits of unfair products. The reference category is Baseline treatment. Sanction, High Cost, and High Cost & Sanction are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. Variable period takes integer values between 1 and 24. Control variables take the average of all participants within the market, including gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. The models allow for market level random effects. Robust standard errors clustered at the market level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Result 2.7: Sellers of unfair products realize more profits than sellers of fair products in absolute value. With sanction, the difference in profits of unfair product sellers and fair product sellers is not significant in the low-cost environment. In the high-cost environments, sanction increases the profits of unfair product sellers.

2.3.6 Social Gains from Market Exchanges

In the following subsection, we discuss the social gains from market exchanges. Our method is simply to take the sum of the monetary gains or losses of all participants in a market. If the sum is greater than 0, social gains are positive, and the society benefits from market exchanges. Otherwise, if the sum is less than 0, social gains are negative, and hence the society suffers losses. The initial endowment of each participant is normalized to 0 in order to reflect the social gains purely from market exchanges. By our assumptions, activists get 0, as all contributions from third parties are utilized to initiate the sanctions.

An exchange of the fair product would lead to positive social gains since it makes both trading parties better off, and the third parties are not negatively affected. On the other hand, an exchange of the unfair product would cause negative social gains or in other words, social losses. Though sellers and buyers profit from the exchange, third parties suffer losses. According to our design, the losses on third parties are larger than the total benefits that the exchange generates; therefore, social losses are expected when an unfair product is exchanged.

The influence of sanction on social gains depends on their impact on the consumption of the fair products. In treatments with sanction, contributions made to activists by third parties are considered as extra costs. If more of the fair products are exchanged under sanction, there is a decrease in both the total external costs and the total monetary losses suffered by sellers. If the benefits generated are larger than the contribution costs, there is an increase in total social gains. If less of the fair products are exchanged, then the situation may become even worse. In addition to the increased external costs, with sanction, third parties incur additional contribution costs and monetary losses imposed on sellers increase, which results in a rise in social losses.

Figure 2.15 shows the average total social gains across markets in each treatment and their 95% confidence intervals. In the low-cost environment, the society benefits from market exchanges (above the solid line where there are no market exchanges). The monetary sum of all participants is positive in Baseline treatment, which implies that most products purchased are fair products and corroborates the social responsibility of both sellers and buyers. However, in the high-cost environment, the monetary sum is negative in High Cost, which indicates that the number of unfair products purchased has increased significantly and sellers and buyers exhibit less concern for others.

In addition, as shown in the left panel of Figure 2.15, an increase in social gains is not evident with sanction. Two sided Wilcoxon rank sum test collapsed at the market level gives a p-value of 0.7963, which is surprising can it also be expected. Compared to Baseline, it shows the extra contribution costs paid by third parties is offset by the benefits from the increased consumption of the fair product in Sanction treatment. Whereas from the right panel of Figure 2.15, we observe negative social gains in the high-cost environment, and the total social losses increase significantly with sanction (two sided Wilcoxon rank sum test collapsed at the market level gives a p-value of 0.0029). This is because the increase in the consumption of fair products is not enough in the high-cost environment when sanction exists. Compounding this are the additional monetary losses of sellers of the unfair products and extra contribution costs of the third parties that make the situation even worse.

Figure 2.15: Average Social Gains across Markets

Further evidence is obtained in Table 2.9, as we employ a random-effects linear regression to analyze the impact of sanctions on total social gains. Models (1) and (2) study the impact of sanctions on the social gains in the low-cost environment, using observations from both Baseline and Sanction treatment. The reference category is Baseline treatment. Sanction is the treatment dummy. Models (3) and (4) concentrate on the high-cost environment, using observations from High Cost and High Cost & Sanction. The reference category is High Cost treatment. High Cost & Sanction is the treatment dummy. Referring to Models (1) and (2), the insignificant coefficient of Sanction is consistent with our non-parametric tests. It reveals that the total consumption of fair products increases with sanction. However, the benefits generated from more consumption of fair products counteract the contribution costs of third parties. In the high-cost environment, social

gains drop significantly with sanction. This is because the increase in the consumption of fair products is not enough to cover the contribution costs of third parties.

Table 2.9: Random-Effects Linear Regressions of Social Gains from Market Exchanges

Dependent Variable	(1)	(2)	(3)	(4)
			Social Gains	
Period	-1.472*** (0.491)	-1.472*** (0.496)	0.607* (0.354)	0.607* (0.358)
Sanction	-4.184 (25.008)	0.481 (14.785)		
High Cost & Sanction			-43.576*** (11.105)	-41.300*** (7.688)
Constant	66.216*** (19.689)	399.477*** (145.934)	-29.052*** (5.848)	-153.986 (153.415)
Control Variables	No	Yes	No	Yes
Treatment Considered	Baseline and Sanction	Baseline and Sanction	High Cost and High Cost & Sanction	High Cost and High Cost & Sanction
Observations	336	336	336	336
Number of Markets	14	14	14	14

Notes: The dependent variable is social gains at the level of each market (Social Gains). Variable period takes integer values between 1 and 24. Sanction and High Cost & Sanction are treatment dummies. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment in Models (1) and (2). The reference category is High Cost in Models (3) and (4). Control variables take the average of all participants within the market, including gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models employ a panel specification and use total social gains of a market in a period as an observation. The models allow for market level random effects. Robust standard errors clustered at the market level in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Result 2.5: The society profits from market exchanges in the low-cost environment and suffers losses in the high-cost environment. When sanctions exist, in the low-cost environment, no significant increase in social gains. In the high-cost environment, having sanction even reduces the social gains.

2.4 Conclusion

Sanctions are considered a powerful force that can shape the way people behave. As opposed to social norms, they can produce effects in a short time and are therefore widely employed in policy implementations. This chapter examines the impact of social sanctions on the promotion of socially responsible behaviors in a market setting. In the experimental design, sellers and buyers face a choice between two products. One is socially responsible and exerts no impact on third parties. The other is socially irresponsible and imposes external costs on third parties. We then implement a sanction mechanism with opportunities to punish socially irresponsible sellers, where the amount of monetary punishments depend on the voluntary contributions from third parties. The choices of actions taken by sellers and buyers in the presence of social sanctions are then examined.

Our results show that sanction has significant positive effects in promoting socially responsible production, reflecting its deterrent effect. The deterrent effect weakens when it is costlier for sellers to behave in a socially responsible manner. Buyers are shown to exhibit a certain level of social responsibility; however, they shirk responsibility and shift the blame onto sellers when sanction is levied on sellers only. Third parties free ride on others and want to benefit from others' contribution. They are more likely to take part in costly sanctions when they are negatively affected. The motivating effect of monetary losses decreases when they anticipate a drop in the deterrent effect of sanction. In addition, we also show that the total social gains are not increased by sanctions, with sanctions sometimes even being counterproductive, if it becomes costly to behave in a socially responsible manner. Lastly, aggregate results on the price and profits of different types of products are also presented in this study.

This chapter serves as an important component of our body of work that explores potential interventions to stimulate social responsibility. It provides experimental evidence that supports the positive role of social sanctions in promoting socially responsible behaviors. Meanwhile, it also reveals some issues we should pay attention to, such as free-riding, buyers shifting responsibility onto sellers, and so on. It provides a valuable policy reference for the implementation of social sanctions in real life. There are many possible expansions of our work, such as improving the sanction mechanism. To alleviate the free-riding problem, we may employ a one to one matching between third parties and sellers, in which the case the third party's contribution directly determine the corresponding seller's payoff. We could set up a third party union so that third parties within the union enjoy the benefits by making contributions. We could also increase the cooperation among third parties to avoid wasted contribution from third parties. At the same time, we could also impose sanctions on buyers to stimulate buyers' social responsibility.

2.5 Appendix

2.5.1 Experimental Instruction for Sanction Treatment in the Low-Cost Environment

Welcome to all of you! You are now taking part in an interactive study on decision making. **Please pay attention to the information provided here and make your decisions carefully. If at any time you have questions to ask, please raise your hand and we will attend to you in private.**

Please note that **unauthorized communication is prohibited**. Failure to adhere to this rule would force us to stop this study and you may be held liable for the cost incurred in this experiment.

Your participation in this study is voluntary. You will receive **SGD 2** show-up fee for participating in this study. You may decide to leave the study at any time. Unfortunately, if you withdraw before you complete the study, we can only pay you for the decisions that you have made up to the time of withdrawal, which could be substantially less than you will earn if you complete the entire study.

The amount of your earnings from this study depends on the decisions you and others make. At the end of this session, your earnings will be paid to you privately and in cash. They will be contained in an envelope (indicated with your unique user ID). You will need to sign a claim card given to you and exchange your claim card with your payment.

General Information

Each of you will be given a unique user ID and it will be clearly stated on your computer screen. At the end of the study, you will be asked to fill in your user ID and other information pertaining to your earnings from this study in the claim card. **Please fill in the correct user ID to make sure that you will get the correct amount of payment.**

Rest assured that your **anonymity will be preserved** throughout the study. You will never be aware of the personal identities of other participants during or after the study. Similarly, other participants will also never be aware of your personal identities during or after the study. You will only be identified by your user ID in our data collection. All information collected will **strictly be kept confidential** for the sole purpose of this study.

Specific Information

The total duration of this study is more or less 1.5 hours.

Your total earnings = earnings from Stage I + earnings from Stage II + show up fee (S\$ 2)

All incentives will be denominated in **experimental dollars** (expressed as **ECU**). The exact conversion rate will be detailed later.

Stage I

Stage I provides a scenario simulation of market. You will form a small market group and be randomly assigned a role in this market. Your role remains the same for the entire experiment.

You will interact with other participants anonymously through the computer interface for a number of periods. In each period, you will be given **100 ECUs** to make decisions.

There are three available roles:

- **Seller.**
- **Buyer.**
- **The Third Party:** As a third party, you cannot buy or sell. Your income is affected by the transaction between a seller and a buyer. **Each of you is paired randomly with one of the buyers.**

There are two types of products available for sellers to sell and buyers to buy.

- **Type I:** A product with no effect on the third party.
- **Type II:** A product with a loss for the third party.

To produce Type I product, the seller needs to incur costs of **10 ECUs**. To produce Type II product, there will be **no costs** for sellers.

When **Type II** product is purchased by a buyer, it will impose a loss of **60 ECUs** on the third party associated with this buyer; When **Type I** product is purchased or no product is purchased by a buyer, there will be **no loss** on the third party associated with this buyer.

The value of products regardless of the product type for buyers is always **50 ECUs**.

The sellers can set a price for a product range from **0** up to **50 ECUs**.

Each third party can decide whether or not to engage in activism for example by making contribution to an active pressure group which champions socially responsible activities. Contribution costs **40 ECUs** and it is a **sunk cost**. A higher proportion of the third party who chooses to contribute would increase the influence of the activist on the sellers. Only sellers who make a successful sale of **Type II** product would potentially be negatively affected. Pressure by activist could potentially inflict monetary losses to the sellers, the amount of losses depends on the effectiveness of the pressure.

$$\text{Monetary losses} = (\text{EOP}^2) * 100$$

The effectiveness of pressure (**EOP**) is denoted as (n/N) , where n denotes number of the third parties who choose to contribute and N denotes the total number of the third parties. Thus, when all third parties contribute, monetary losses on sellers is 100 ECUs. Likewise, the lower the proportion, the less effective the pressure will be and hence lower monetary losses on sellers will be.

The detailed processes are as follows:

At the beginning of each period, each third party makes a decision on whether to contribute or not. At the same time, sellers must decide on the product type to produce and the price to charge.

Once all third parties and sellers have made their decisions, buyers will be given information of all sellers' product offerings and the corresponding prices.

Buyers make their decisions sequentially to purchase or not to purchase any products, the sequence is determined randomly. Should they choose to purchase, they will indicate which seller they want to purchase the product from.

There will be **5** Sellers, **4** Buyers and **4** Third Parties in a group, thus there will be **at least 1** inactive seller in each period.

The payoffs in ECUs for different roles are as follows:

Seller:

If a buyer accepts his/her offer:

a. He/she produces Type I product (the product with no effect on the third party), the payoff will be:
 $100 - \text{cost of production} + \text{price received from buyer}$

b. He/she produces Type II product (the product with a loss for the third party), the payoff will be:

$$\mathbf{100 - \text{cost of production} + \text{price received from buyer} - (EOP^2) * 100}$$

If no buyer accepts his offer, the payoff will be:

$$\mathbf{100}$$

Buyer:

If a buyer accepts an offer, the payoff will be:

$$\mathbf{100 + 50 - \text{price paid to seller}}$$

If a buyer does not accept any offer, the payoff will be:

$$\mathbf{100}$$

The Third Party:

If his/her associated buyer chose Type II Product (the product with a loss for the third party), the payoff will be:

$$\mathbf{100 - 60 - \text{Contribution}}$$

If his/her associated buyer chose either Type I Product (the product with no effect on the third party) or did not purchase any product, the payoff will be:

$$\mathbf{100 - \text{Contribution}}$$

Earnings in Stage I

At the end of the experiment, your earnings from 1 randomly-chosen period will be converted to Singapore dollar equivalently. Since each period has the same chance to be chosen and you do not know which period will be paid when you make your choice, the best strategy is paying careful attention to each period. The conversion rate from experimental dollars (ECU) to Singaporean dollars is:

$$10 \text{ ECUs} = 1 \text{ SGD}$$

Stage II

In Stage II, you are shown ten lines on the screen. In each of these lines you have a choice between two options A and B. You need to consider which of the two options you prefer in each of these lines.

After you have made your decision, the computer will randomly select one of the ten lines to determine your payout. Thereafter, the computer draws the payout based on the decision that you have made for the selected line - either Option A or Option B. To determine your earnings in the case you choose option B, there will be a second random draw. The computer will randomly determine if your payoff is 0 SGD or 3 SGD, with the **chances stated in Option B**. Your earning from this stage will be added to your final earnings from this experiment when the experiment is complete.

Look at line 1 at the top of the screen. Option A is 1.0 SGD. Option B has a 0% chance to earn 3.0 SGD and a 100% chance to receive 0.0 SGD. The other lines are similar. As you go down the column of option B, the chance to receive 3.0 SGD rises.

	Option A		Option B
		Choose Option B for ALL lines	
1	\$1		\$3 with 0% chance, \$0 with 100% chance
		Choose Option A for line 1 and Option B for rows 2 to 10	
2	\$1		\$3 with 10% chance, \$0 with 90% chance
		Choose Option A for rows 1, 2 and Option B for 3 to 10	
3	\$1		\$3 with 20% chance, \$0 with 80% chance
		Choose Option A for rows 1 to 3 and Option B for rows 4 to 10	
4	\$1		\$3 with 30% chance, \$0 with 70% chance
		Choose Option A for rows 1 to 4 and Option B for rows 5 to 10	
5	\$1		\$3 with 40% chance, \$0 with 60% chance
		Choose Option A for rows 1 to 5 and Option B on lines 6 to 10	
6	\$1		\$3 with 50% chance, \$0 with 50% chance
		Choose Option A for rows 1 to 6 and Option B for rows 7 to 10	
7	\$1		\$3 with 60% chance, \$0 with 40% chance
		Choose Option A for lines 1 to 7 and option B for rows 8 to 10	
8	\$1		\$3 with 70% chance, \$0 with 30% chance
		Choose Option A for rows 1 to 8 and Option B on lines 9 to 10	
9	\$1		\$3 with 80% chance, \$0 with 20% chance
		Choose Option A for rows 1 to 9 and Option B on line 10	
10	\$1		\$3 with 90% chance, \$0 with 10% chance
		Choose Option A for ALL lines	
			OK

You need to consider which of the two options you prefer in each line. Only one of these lines will be selected to determine your payoff, but you do not know in advance which line will be paid. Hence you should pay attention to the choice you make in every line. Each line has an equal chance of being drawn.

The following are the choices available:

- Choose option B for ALL lines.
- Choose Option A for line 1 and Option B for lines 2 - 10
- Choose Option A for lines 1 - 2 and Option B for lines 3 - 10
- Choose Option A for lines 1 - 3 and Option B for lines 4 - 10
- Choose Option A for lines 1 - 4 and Option B for lines 5 - 10
- Choose Option A for lines 1 - 5 and Option B for lines 6 - 10
- Choose Option A for lines 1 - 6 and Option B for lines 7 - 10
- Choose Option A for lines 1 - 7 and Option B for lines 8 - 10
- Choose Option A for lines 1 - 8 and Option B for lines 9 - 10
- Choose Option A for lines 1 - 9 and Option B for line 10
- Choose Option A for ALL lines.

Stage III

In this final stage of the experiment, we will ask you to answer some questions about yourself. Please answer truthfully. When you have finished, we will prepare your final earning, and ask you to sign a receipt in exchange for the payment you receive.

Thank you again for your participation! If you have any questions, please raise your hand and an experimenter will come to you.

2.5.2 The Screenshot of the Post-experiment Questionnaire

Questionnaire

Please answer the following questions

What is your gender?

☐ M
☐ F

What is your age?

What is your nationality?

Which year in school are you?

☐ Year 1
☐ Year 2
☐ Year 3
☐ Year 4
☐ Masters
☐ Ph.D
☐ Others

What is your major?

Have you studied game theory before?

☐ Yes
☐ No

Questionnaire

For the following campus/off campus activities/organizations, which describes you best: A. active member, B. inactive member, or C. not a member?

a) Sport activity/organization:

☐ A
☐ B
☐ C

b) Art, music and other recreation activity/organization:

☐ A
☐ B
☐ C

c) Humanitarian, charity, social work activity/organization:

☐ A
☐ B
☐ C

d) Religious activity/organization:

☐ A
☐ B
☐ C

e) Environment , nature, animal protection activity/organization:

☐ A
☐ B
☐ C

Questionnaire

Could you indicate your religion?

How important is your religion to you ? (of a scale from 1 to 7, indicate 0 if you do not have any religion.)

Little influence 0 1 2 3 4 5 6 7 Very important

If you lost your wallet on campus, how likely do you think you would have it returned?

0% chance 1 2 3 4 5 6 7 100% chance

Continue

Chapter 3 Buyers' Ex-Ante Product Preferences and Sellers' Incentives to Behave in Socially Responsible Ways

3.1 Introduction

Corporate social responsibility has risen to significant prominence in recent years. A variety of motivations are behind a firm's socially responsible behaviors. There is no denying that some of the firms behave in a socially responsible way as it is the right thing to do, while others may only be motivated by financial rewards. For example, firms develop corporate social responsibility as a means of reputation building, and this enhanced reputation is then utilized by the firms to improve revenues, such as by charging a price premium and enjoying increased customer loyalty (Sen and Bhattacharya, 2001; Du, Bhattacharya, and Sen, 2010; Chernev and Blair, 2015; Lii and Lee, 2012; Chiu et al., 2016). It is also noteworthy that quite a few firms are engaging in socially responsible production as a response to consumers' demands for socially responsible products. The notion of exploring consumers' attitudes and reactions to corporate social responsibility, to develop guidance to improve corporate social responsibility, has been well recognized by firms (Becker-Olsen, Cudmore, and Hill, 2006; Mohr, Webb, and Harris, 2001; Tian, Wang, and Yang, 2011; Marín and Román, 2016).

There are many ways in which firms can get to know consumers' concerns about socially responsible production, such as by analyzing their boycott campaigns and socially responsible buying behaviors. The most straightforward way of analyzing consumers' views is to conduct a survey that infers consumers' purchase preferences. In reality, firms face a product choice between socially responsible products and socially irresponsible products. Therefore, before production begins, a market survey could be conducted with potential customers. Following this, the question

is whether or not a firm chooses to offer the socially responsible product to cater for the needs of consumers if all of the potential consumers declare a preference for the socially responsible product.

It is well known that for a company to succeed, its product choices should be aligned with consumer purchase preferences. If there is a demand only for socially responsible products, offering socially responsible products would be the obvious choice. However, it is usually at the expense of higher production costs. Yet, on the other hand, being credulous and blindly following consumers' product preferences would also cause firms to get into dangerous situations. Buyers could make a simple statement that their purchase preferences are at a very low cost or even zero cost. The suggestions are so "cheap" that it is unclear whether these mere words can be trusted. Moreover, options between being socially responsible and gaining greater benefits through buying a product are constantly evaluated by consumers. In addition to their moral and social responsibility, consumers are faced with multiple competing factors when making purchase decisions, such as price, quality, and convenience. Any factor could potentially lead to inconsistencies between their preferences and actual behaviors. This uncertainty further increases the seller's potential risk. Though past research suggests consumers are willing to reward firms for their support for socially responsible products and pay a significant premium for them (De Pelsmacker, Driesen, and Rayp, 2005; Van Loo et al., 2014; Loureiro and Lotade, 2005), it has been shown that a gap between consumers' attitudes and their actual purchase behaviors still exists (De Pelsmacker et al., 2005).

Taking all factors into consideration, whether socially responsible production would emerge from consumers' preferences to socially responsible products is still unclear. This study primarily seeks to ascertain the role of consumers' product preferences in encouraging socially responsible production in a market setting. It also lends insights into the inconsistency between consumers'

product preferences and their actual purchase behaviors. An experimental approach is adopted in this chapter, with our control treatment following the work of Bartling, Weber, and Yao (2015). In the design, each seller can choose to offer one of two types of products, where one imposes external costs on the society, and the other does not. Buyers then make their purchase decisions from the available product offerings. In addition, before the firms make their product choices, we introduce a new treatment of information disclosure, providing these firms with consumer product preferences. After this information has been disclosed, the reaction of firms, as well as their product choices, are then examined. This chapter conducts an integrated study of both the consumer's side and the firm's side. Behaviors are investigated at the level of individual subjects with real monetary consequences. Additionally, experimental evidence of market outcomes, such as the price and profitability of each type of product, is also provided.

Our data shows that our buyers have a strong preference for fair products (72.74% of total observations) and two thirds of them stick to their preferences when making actual purchases. The disclosure of buyers' preferences provides a reference point for sellers' expectations on demand for socially responsible products. Socially responsible production increases when sellers are informed of the buyers' preference for socially responsible products. In addition, it is also observed that sellers of socially irresponsible products will lower product prices, and simply receive less profits when they are informed of buyers' strong preferences for socially responsible products. The decrease in the price of socially irresponsible products could potentially cause some buyers to switch to these products, leading to a greater gap between the preferences and the actual behaviors of buyers. When this decision is taken by firms, it arguably counteracts the positive effects of increased socially responsible production. The final socially responsible consumption depends on

which effect is stronger: the preference for socially responsible products, or the preference for lower prices.

Our study closes the gap on the relationship between consumers' product preferences and a firm's socially responsible production. It provides a couple of important innovations compared to previous works. Though there are a number of papers discussing consumers' social attitudes and their reactions to corporate social responsibility, few, if any, of these experimentally examine the causality between consumers' product preferences and a firm's product choice. In addition, our study contributes to the growing body of work that seeks to stimulate social responsibility in the market place. In this chapter, we demonstrate that the disclosure of consumer product preferences for socially responsible products could exert a positive impact on socially responsible production, but should also be accompanied by improving consumers' awareness of social responsibility. Our results suggest a potentially effective intervention that could be implemented in future for welfare improvement and the promotion of social responsibility.

The remainder of the article is organized as follows. In the next section, we provide a review of our experimental design and procedures. This is followed by a discussion of our results. Lastly, we present a conclusive summary of our major findings and their implications.

3.2 Experimental Design

The baseline treatment used in this chapter is adopted from our first two chapters, which is inspired by the work of Bartling, Weber, and Yao (2015). This chapter additionally introduces a new treatment (ex-ante preference treatment) that discloses buyer ex-ante product preferences to sellers before sellers offer the products. Both the baseline treatment and ex-ante preference

treatment employ a simple posted-offer market²⁰. Each market comprises of 13 subjects: 5 sellers, 4 buyers, and 4 third parties. There are 8 independent markets in baseline treatment and 6 in ex-ante preference treatment. Table 3.1 provides a treatment overview.

Table 3.1: Treatment Overview

Treatment	No. of Independent Markets	No. of Periods in Each Market	No. of Sellers	No. of Buyers	No. of Third Parties	Total No. of Subjects
Baseline	8	24	40	32	32	104
Ex-Ante Preference	6	24	30	24	24	78
Total	14	48	70	56	56	182

In the basic market setting, buyers and sellers can exchange two types of products that only differ in their impact on third parties and in their production costs. One of them, called "fair product," does not produce negative externalities. The other product, the "unfair product," imposes external costs (e) on the third parties, amounting to -60 points. To produce the fair product incurs an expense of cost c ($c^{fair} > 0$), while it costs nothing to produce the unfair product ($c^{unfair} = 0$)²¹. The cost difference of the two types of products is denoted as Δc ($\Delta c = c^{fair} - c^{unfair} = c^{fair}$). In other words, sellers should incur an extra cost (Δc) in order to offer fair products than to offer unfair products. Regardless of the product type, both products have the same product value v ($v = 50$) to buyers. We have 5 seller, 4 buyers and 4 third parties in a market. Each seller can produce only one product and set a price (p) up to the product value (v). Each buyer is able to

²⁰ In a posted offer market, sellers publicly announce prices on a take-it-or-leave-it basis and indicate the maximum number of units to be offered at that price. Buyers are randomly drawn, one at a time, and are given the opportunity to make purchases from any seller who has not sold his maximum specified sales quantity.

²¹ We set the production cost of the unfair product as benchmark and normalize it to 0 for simplicity. From the perspective of selfish sellers, when a seller should make a choice between two types of products, only the relative difference in their production costs should matter rather than the absolute production cost of the chosen product. In addition to using a corner point such as zero, variations from this design could also be included in future work.

purchase at most one product. Since there are more sellers than buyers, the market is a buyer market. Each third party is randomly paired with a particular buyer in each period. As a third party, they can neither sell nor buy, but may incur losses depending on the product bought by the corresponding buyer. That is, there is no loss if a fair product or no product is purchased by the corresponding buyer, and a loss of e ($e = 60$) if an unfair product is purchased. Each participant regardless of their roles is given the same initial endowments ($E^{seller} = E^{buyer} = E^{third\ party} = 100\ points$) at the beginning of each period. Equations (3.1) to (3.3) below are the payoff functions for different roles.

The payoff of each seller can be expressed as;

$$\Pi^{seller} = \begin{cases} E^{seller} + p - c^{fair}, & \text{if the seller sells a fair product at price } p \\ E^{seller} + p, & \text{if the seller sells an unfair product at price } p \\ E^{seller}, & \text{if there is no sale} \end{cases} \quad (3.1)$$

The payoff of each buyer can be expressed as;

$$\Pi^{buyer} = \begin{cases} E^{buyer} + v - p, & \text{if the buyer purchases a product at price } p \\ E^{buyer}, & \text{if the buyer does not purchase any product} \end{cases} \quad (3.2)$$

The payoff of each third party can be expressed as;

$$\Pi^{third\ party} \quad (3.3)$$

$$= \begin{cases} E^{third\ party} - e, & \text{if the third party's corresponding buyer buys an unfair product} \\ E^{third\ party}, & \text{otherwise} \end{cases}$$

The procedures of our Baseline treatment follow steps of normal transactions, as shown in Figure 3.1. At the first step, each seller simultaneously decides on the product type to produce and sets the price. Once this has been completed, buyers enter the market sequentially by a random

order and make their decisions to purchase from whichever seller they may choose, or choose not to purchase any products at all.

Figure 3.1: Timeline of the Baseline Treatment

In Ex-ante Preference treatment, at the very beginning buyers express their product preferences, including the preferred product type and the price they are willing to pay for it. After that, a summary of buyers' preferences is revealed to all sellers within the same market. There are 4 pieces of information provided to sellers: 1) the proportion of buyers preferring fair product; 2) the proportion of buyers preferring unfair product; 3) the average price that buyers are willing to pay for fair products, conditional on buyer preferring the fair product; 4) the average price that buyers are willing to pay for unfair products, conditional on buyers preferring the unfair product. Upon seeing the information, sellers decide on the product type to produce and the price to charge. After this, buyers enter the market sequentially by a random order and make their purchase decisions. The timeline of Ex-ante Preference treatment is summarized in Figure 3.2. A sample instruction is also attached in the appendix.

Figure 3.2: Timeline of the Ex-Ante Preference Treatment

The experiment was conducted at Nanyang Technological University and we had 156 subjects in total. All the participants were students at Nanyang Technological University. At the beginning of the study, participants were randomly assigned to one of the three roles (buyer, seller, and third party) and remained within these roles throughout the experiment's entire duration. The experiment was programmed using the software z-Tree (Fischbacher, 2007). Participants pre-registered in advance to participate. Each participant was identified with a unique anonymous ID number throughout the experiment. At the beginning of the experiment, written instructions were distributed and read aloud. There were 3 stages in each session, stage 1 was a competitive market game, which was repeated for 24 periods. At the beginning of each period, each participant received an initial endowment of 100 points. At the end of stage 1, one period was randomly selected to determine payments. In stage 2, we conducted the Holt-Laury risk preferences elicitation. In stage 3, subjects were asked to answer a post-experiment questionnaire with the purpose to capture their demographic information and the reasons behind their decisions in the experiments. The details of the questionnaire are attached in the appendix. Participants earned around S\$19 to S\$20 on average, including a showing up fee of S\$2, with an experiment lasting approximately 1.5 hours.

3.3 Results

The results are presented in three steps. Subsection 3.3.1 considers, in detail, buyers' preferences and their actual behaviors within Ex-ante Preference treatment. Subsection 3.3.2 studies the subsequent reactions of sellers to the disclosed buyer preference, especially on their product choices and prices offered. Evaluation within Ex-ante Preference treatment and a comparison between Baseline and Ex-ante Preference treatment are presented. The last subsection 3.3.3 shows the final market outcome on the market share of the fair product. An investigation on the final price and profit margin of each type of product is also included.

3.3.1 Knowledge of Buyer Product Preferences and Purchasing Behaviors in Ex-ante Preference Treatment

Table 3.2 provides a summary of buyers' product preferences and their actual purchasing behaviors²². There are 6 possible behaviors of buyers. In situation 1, a buyer states a preference for the fair product and finally buys the fair product. In situation 2, a buyer states a preference for the unfair product and finally buys the unfair product. In situation 3, a buyer states a preference for the fair product but changes their minds to buy the unfair product. In situation 4, a buyer states a preference for the unfair product but ultimately decides to purchase the fair product. It is important to note that, in situations 1 and 2, the preferences stated by buyers are in line with their actual purchase behaviors showing their high credibility. In both cases, the sellers who cater to buyers have a higher probability of beating their competitors and earn profits. However, blindly following consumers' product preferences when situation 3 and 4 occur, sellers are at risk of both losing customers and profits. The lower the credibility of buyers, the higher the risk that sellers

²² In the appendix, we provide more details about each buyer's preference and purchase behaviors, demonstrating the heterogeneous credibility of buyers.

have. In situation 5, a buyer states a preference of fair product and rejects all offers. In situation 6, a buyer states a preference of unfair products and rejects all offers. Situation 5 is observed 21 times out of 576 observations in total of 6 markets. In all cases, these buyers rejected all offers because only unfair products were available. Though the number of these cases is quite small, it demonstrates a real socially responsible consumption. Lastly, situation 6 occurred 5 times.

According to Table 3.2, it is noteworthy that around 72.74% of total observations that buyers state a product preference for fair products, which implies a relatively strong preference in our buyers toward socially responsible products. However, roughly a third of them change their ideas and switch to unfair products and final purchases of fair products significantly decrease among these buyers (from 72.74% to 46.18%). Besides, the default rate (situation 3) in the first period is the lowest among 24 periods, which is 4.25% on average. The rate increases during the first 4 periods and then remains relative stable. Among these observations that buyers change ideas, 36% of them only have unfair products available to choose. However, 64% of them is due to the lower credibility. Several reasons contribute to this result. It may be due to the unavailability of fair products. Or they may not take the higher price of fair products into consideration and be attracted by the lower price of unfair products. It is also possible that some buyers adopt a strategy to influence the market price of unfair products by indicating the preference for fair products. But in general, it is not evident from our data. The number of these subjects is very small. There are 3 of 24 buyers having their product choices different from their preferences in more than 12 of 24 periods. Conditional on that buyer have both products available to choose; only one buyer is doing so in 17 of 24 periods.

Table 3.2: Summary of Buyer Behaviors in Ex-ante Preference Treatment

		Product Purchased			
		Fair Product	Unfair Product	No Product	Total
Product	Fair Product	46.18% (266)	22.40% (129)	4.17% (24)	72.74% (419)
Preference	Unfair Product	6.77% (39)	20.14% (116)	0.35% (2)	27.26% (157)
Total		52.95% (305)	42.53% (245)	4.51% (26)	100.00% (576)

Notes: Table 3.2 shows the percent of each type of buyer behaviors. Each buyer's behavior in each period is used as one observation. We categorize all observations into the 6 situations as discussed above. We then calculate the percent of each situation and take the average of 6 markets. The figures in the table are rounded to 0.01%. (number in the bracket is total number of observations).

Table 3.3 contains the regression results of the buyer product choice in Ex-ante Preference treatment. We analyze the relation between buyer product choices and buyer ex-ante product preferences. The dependent variable is buyer's product choice. It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Models (1) and (2) study all observations of when buyers accept an offer. Models (3) to (5) include only observations when buyers can choose from both fair and unfair products. As suggested by all the models, buyers' likelihood to purchase the fair product is positively related to their preference for the fair product. This positive relation could be provide incentives for sellers to follow the product preference of buyers. In addition, buyers' product choices are also related to many factors. The negative and significant coefficient of 'credibility of buyers' reveals that the lower the credibility of a buyer, the less likely it is that the buyer will purchase the fair products. Meanwhile, it is also noted that buyers are more likely to purchase the fair products if there are more available product offerings, which is indicated by the positive and significant coefficient of 'No. of product offers'. It implies that buyers tend to behave in a socially responsible manner if there are more options for them to choose from. Buyers are also shown to have a tendency to repeat their prior product choices. If a buyer has purchased the fair product in the previous period, it is more likely that he will purchase

the fair product in the present period as well. It highlights the stability of social responsibility of buyers. Lastly, buyers' product choices are sensitive to product prices which is as expected. We find that price of unfair product is positively related to more of fair product consumption, and conversely, a higher priced fair product discourages fair product consumption (refer to the coefficients of 'lowest price of fair/unfair product'). The larger the price difference between fair and unfair products, the less likely that fair products will be purchased. The price sensitivity of buyers' product choices suggests their care for own benefits.

Table 3.3 Random-Effects Probit Regressions of Buyer Product Choice in Ex-ante Preference Treatment

Dependent Variable	(1)	(2)	(3)	(4)	(5)
	All observations		Observations conditional on buyers face both two types of products		
			Fair Product		
Period	-0.004 (0.006)	-0.003 (0.006)	-0.005 (0.006)	-0.004 (0.006)	-0.006 (0.007)
Preference for fair product	0.286*** (0.071)	0.293*** (0.067)	0.491*** (0.173)	0.504*** (0.164)	0.477*** (0.160)
Purchase fair product in the previous period	0.160*** (0.036)	0.165*** (0.035)	0.180*** (0.042)	0.184*** (0.055)	0.182*** (0.047)
No. of product offers	0.059*** (0.020)	0.061*** (0.019)	0.211*** (0.052)	0.214*** (0.052)	0.219*** (0.052)
Credibility of buyers	-0.641*** (0.183)	-0.742*** (0.250)	-1.211*** (0.302)	-1.180*** (0.351)	-1.222*** (0.364)
Lowest price of fair product			-0.031*** (0.004)	-0.030*** (0.003)	
Lowest price of unfair product			0.036*** (0.006)	0.037*** (0.006)	
Price difference between fair and unfair product					-0.034*** (0.004)
Control Variables	No	Yes	No	Yes	Yes
Observations	508	508	342	342	342
Number of subjects	24	24	24	24	24

Notes: the dependent variable in all models is variable Fair Product. It takes on value 1 if a fair product is purchased and 0 if an unfair product is purchased. Observations that buyer makes no product choice are excluded. Variable 'period' takes integer values between 1 and 24. Variable 'Preference for fair product' identifies the product preference stated by a buyer. It takes on value 1 if a buyer prefers the fair product and 0 if a buyer prefers the unfair product. Variable 'credibility of buyers' reflects buyer credibility. It is the difference between the frequency that a buyer states a preference for the fair product and his actual frequency of purchasing the fair product. Variable 'No. of product offers' is the number of products available to buyers. 'Purchase fair product in the previous period' takes on value 1 if a buyer has purchased the fair product in the previous period and 0 otherwise. 'Lowest price of unfair product' is the minimum price of unfair products in a buyer's choice set. 'Lowest price of fair product' is the minimum price of fair products in a buyer's choice set. 'Price difference between fair and unfair product' is the price difference between the lowest price of fair products and the lowest price of unfair products in a buyer's choice set. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models are panel specifications using a buyer's product choice in a period as an observation and allowing buyer random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 3.1: Our data suggest that our buyers have a strong preference for the fair product, and most of our buyers stick to their preferences. However, there are still quite a number of these buyers who change their minds. There are several potential determinants for a buyer's final product choice. Firstly, we show a positive relation between buyer preference for fair products and their purchase of fair products. Secondly, a negative relation between the credibility of buyers and their likelihood to purchase fair products is discovered. Thirdly, buyers are more likely to purchase the fair product if they have more product options available to choose. The product choices of buyers are also price sensitive. Price of unfair (fair) products is positively (negatively) related to fair product consumption. Lastly, buyers tend to repeat their prior choices of fair products; therefore, a persistent socially responsible consumption has been observed within Ex-ante Preference treatment.

Next, we turn to the prices that buyers are willing to pay, as stated by buyers before actual transactions. Figure 3.2 presents the average price that buyers are willing to pay for each product type and the 95% confidence interval. As shown in Figure 3.2, though the product value is the same to buyers, buyers state that they are willing to pay a higher price to reward fair product production. Price equality of the two types of products is rejected. Two sided Wilcoxon rank sum test for clustered data²³ gives a p-value of 0.0000, and this is further verified in Table 3.4. On average, in reference to Model (1) to (3), buyers who prefer fair products are willing to pay about 3.6 points more than those buyers preferring unfair products, which follows from the positive and significant coefficient of variable 'preference of fair product'. However, it is also noted that the additional price that buyers are willing to pay is less than half of the extra costs (5 points) for

²³ We use Wilcoxon rank sum test for clustered data. The average price that buyers are willing to pay for fair/unfair products in each period is considered as one observation. Number of observations of price of fair product is 114. Number of observations of price of unfair product is 114. Number of clusters is 6 at the market level.

sellers to produce the fair products. It reveals that buyers are willing to share the responsibility with sellers, but only willing to pay a small proportion of total costs.

Figure 3.3: Prices Willing to Pay by Product Type

Table 3.4: Random-Effects Linear Regressions of Buyer's Willingness to Pay

Dependent Variable	(1)	(2)	(3)
	price willing to pay		
Period	-0.106 (0.122)	-0.107 (0.121)	-0.107 (0.122)
Preference for fair product	3.782** (1.785)	3.709** (1.795)	3.583** (1.779)
Preference for fair product in the previous period	0.507 (0.966)	0.442 (0.983)	0.343 (0.950)
Credibility of buyers		9.372 (9.093)	1.891 (7.387)
Constant	17.051*** (1.764)	15.653*** (1.997)	41.619*** (10.119)
Control Variables	No	No	Yes
Observations	552	552	552
Number of subjects	24	24	24

Notes: the dependent variable in all models is variable 'price willing to pay'. It is the price stated by a buyer that they are willing to pay for their preferred product. Variable period takes integer values between 1 and 24. Variable 'preference for fair product' identifies the product preference stated by a buyer. It takes on value 1 if a buyer prefers the fair product and 0 if a buyer prefers the unfair product. 'Preference for fair product in the previous period' takes on value 1 if a buyer stated the preference for fair product in the previous period and 0 otherwise. Variable 'credibility of buyers' reflects buyer credibility. It is the difference between the frequency that a buyer states a preference for the fair product and his actual frequency of purchasing the fair product. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models are panel specifications using a buyer's price willing to pay in a period as an observation and allowing buyer random effects. Robust standard errors clustered at the market level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Result 3.2: Buyers state that they are willing to pay a higher price for fair products. However, the additional price that they are willing to pay is less than 50% of the extra costs to produce the fair products for sellers.

3.3.2 Reaction of Sellers

3.3.2.1 The Product Choices of Sellers in Ex-ante Preference Treatment

Table 3.5 shows the regression results on sellers' product choices once they know buyers' product preferences in Ex-ante Preference treatment. The dependent variable is seller's product choice. It takes on value 1 if a fair product is offered by the buyer and 0 if an unfair product is offered. As indicated by the positive and significant coefficient of proportion of buyers preferring fair products, sellers' likelihood to offer a fair product is positively related to buyers' preference for fair products. This provides supporting evidence for the hypothesis that demand for socially responsible products would potentially encourage socially responsible production. However, the likelihood drops if there are large inconsistencies between buyers' stated preferences and their actual behaviors. In addition, seller's likelihood to offer fair products is also positively related to the realized profits of fair products relative to unfair products. It reveals a profit-oriented seller behavior. Lastly, if a seller offered the fair product in the previous period, there is a greater probability that they will also offer the fair product in the present period (as shown by the positive and significant coefficient of offer fair product in the last period). Social responsibility as a persistent characteristic of sellers is confirmed. In addition, surprisingly the price that buyers stated they were willing to pay played a limited role in the sellers' product decisions. Coefficients of price willing to pay for fair (unfair) product are statistically insignificant. This may suggest that sellers only believe in buyers' preferences of product types, but not in the prices they are willing to pay. It is important to note that all results discussed above only shows a relation but not a causal effect. We will have a comparison between Baseline treatment and Ex-ante treatment in the next subsection to figure out if there is any causal effect of buyer preference disclosure.

Table 3.5: Random-Effects Probit Regressions of Seller Product Choice in Ex-ante Preference Treatment

Dependent Variable	(1)	(2)	(3)
		Fair Product	
Period	0.002 (0.003)	0.007** (0.003)	0.007** (0.003)
Proportion of buyers preferring fair product	0.006*** (0.002)	0.007*** (0.002)	0.007*** (0.001)
Market average buyer credibility in the previous period	-0.544*** (0.060)	-0.535*** (0.087)	-0.556*** (0.098)
Profit difference between fair and unfair product in the previous period		0.012*** (0.003)	0.012*** (0.003)
Offer fair product in the previous period		0.214*** (0.060)	0.212*** (0.063)
Price willing to pay for fair product	0.006*** (0.002)	0.004 (0.003)	0.006* (0.004)
Price willing to pay for unfair product	-0.002* (0.001)	0.000 (0.001)	-0.000 (0.001)
Control Variables	No	No	Yes
Observations	690	590	590
Number of subjects	30	30	30

Notes: the dependent variable in all models is variable Fair Product. It takes on value 1 if a seller offers the fair product and 0 if a seller offers the unfair product 0. Period takes integer values between 1 and 24. Proportion of buyers preferring fair product is the proportion of buyers that prefer fair products in a market. Market average buyer credibility in the previous period is measured by the difference between the proportion of buyers that prefer fair products and the actual proportion of buyers that purchase fair products in a market in the previous period. Variable ‘Offer fair product in the previous period’ takes on value 1 if a seller has offered the fair product in the previous period and 0 otherwise. Profit difference between fair and unfair product in the previous period is the average profit difference between offering a fair product and offering an unfair product in the previous period. Price willing to pay for fair product is the average price stated by buyers that they are willing to pay for fair products in a market. Price willing to pay for unfair products is the average price stated by buyers that they are willing to pay for unfair products in a market. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models are panel specifications using a seller’s product choice in a period as an observation and allowing seller random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 3.3: It has been shown a positive relation between seller’s likelihood to offer fair products and buyer preference for fair products. However, the likelihood that sellers will offer fair

products drops significantly if there is a greater inconsistency between buyers' stated preferences and their actual behaviors. In addition, we discovered that sellers are more likely to produce fair products if they have done so previously. The expected profit is another essential factor that determines a seller's product decision.

3.3.2.2 The Product Choices of Sellers: Comparison between Baseline and Ex-ante Preference Treatment

It has been shown that in the Ex-ante Preference treatment, buyers' preferences for fair products is positively related to fair product production. In this section, we further compare the fair product production between our Baseline treatment and the Ex-ante Preference treatment to figure out whether there is a positive causal effect of buyer preference disclosure. Figure 3.4 displays the histogram of the frequency of sellers' fair product production and the kernel density curve in the two treatments. It is evident that the left panel has a different distribution pattern from the right panel. The Kolmogorov–Smirnov equality-of-distributions test gives a p-value of 0.011. In Baseline treatment, mean is 0.42 with standard error 0.0582. In Ex-ante Preference treatment, mean is 0.52 with standard error 0.0397. Median in Baseline treatment is 0.31, and it is 0.52 in Ex-ante Preference treatment. The results reveal that the disclosure of buyers' product preferences before actual transactions is beneficial in stimulating socially responsible production.

From the left panel of Figure 3.4, it is also noteworthy that we have two peaks, representing two extreme cases of sellers either offering fair products at a low frequency or a high frequency. Whereas, in Ex-ante Preference treatment, under the guidance of buyers' product preferences, the two peaks converge into one (see in the right panel of Figure 3.4). This suggests that the disclosed buyers' preferences provide a reference point to sellers and in turn affects their product offering actions. Sellers adjust their expectations on demand for fair products to the revealed buyers'

preferences accordingly. If the reference point is above their original expectations, sellers would offer fair products more frequently and vice versa. Based upon this consideration, the location of the reference point plays a significant role. If the reference point is very low, it could discourage sellers who are highly socially responsible. When they realize that buyer preference for fair products is below their original expectations, fair product production decreases. Thus, a strong enough preference for fair products among buyers is essential to stimulate socially responsible production. Over time, sellers also learn from the previous periods, in particular when buyers' preferences are unmatched with their actual purchase behaviors. Recall that we have 72.74% of buyers state a preference for fair products but only 52.95% of buyers purchase the fair products in the end. The learning behaviors of sellers explain why the fair product offering frequency on average is 52% instead of 72.4%.

Figure 3.4: Histogram of the Frequency of Sellers' Fair Product Production

Figure 3.4 notes: the frequency of each seller to offer the fair product is considered as one observation. This graph shows the histogram (distribution) of seller frequency of offering the fair product. We have 40 sellers (40 observations) in Baseline treatment and 30 sellers (30 observations) in Ex-ante Preference treatment.

Result 3.4: Disclosure of buyers' preferences for fair products encourage sellers to offer fair products more frequently.

3.3.2.3 The Prices Offered by Sellers: Comparison between Baseline and Ex-ante Preference Treatment

Figure 3.5 shows the time path of the market price for the fair and unfair products offered by sellers, averaged across markets. In Figure 3.5, the price of unfair products is significantly lower in Ex-ante Preference than Baseline treatment. The two sided Wilcoxon rank sum test between Baseline and Ex-ante Preference treatment using the average market price as an observation, gives a p-value of 0.0933. On the other hand, we may expect there to be an increase in the price offered for fair products in Ex-ante Preference treatment due to the high demand; however, this is not observed. The two sided Wilcoxon rank sum test gives a p-value of 0.1967. This may be due to the increased competition among sellers of fair products, caused by buyers' strong preferences for fair products. Raising the price of fair products would potentially lead to the loss of consumers.

Figure 3.5 Average Offer Price by Sellers

Table 3.6 further presents the regression results on prices offered by sellers in the two treatments. The dependent variable is the product price offered by sellers, using the product price of each seller offer as an observation. Ex-ante Preference is the treatment dummy. The reference category is Baseline treatment. Models (1) and (2) look at observations where sellers offer fair products. Models (3) and (4) study observations where sellers offer unfair products. The results are in line with our non-parametric tests. The negative and significant coefficient of Ex-ante Preference in Model (3) and Model (4) verifies that the price of unfair products is about 6 points lower in Ex-ante Preference than Baseline treatment. It reveals that unfair product sellers reduce their profits to retain buyers when they are informed of buyers' strong preferences for fair products. On the other hand, it also suggests that buyers could benefit from stating a preference for fair products but ending up purchasing the unfair one. This also explains why some of the buyers change their minds to purchase unfair products instead.

Table 3.6: Random-Effects Linear Regressions of Seller Offer Price by Product Type

Dependent Variable	(1)	(2)	(3)	(4)
	Fair Product	Fair Product	Unfair Product	Unfair Product
	Seller Offer Price			
Period	-0.114*	-0.114*	-0.252***	-0.250***
	(0.060)	(0.061)	(0.081)	(0.081)
Ex-ante Preference	-1.241	-1.255	-5.713**	-5.879**
	(2.293)	(1.985)	(2.865)	(2.566)
Control Variables	No	Yes	No	Yes
Constant	27.877***	36.530***	26.407***	29.887***
	(1.870)	(2.889)	(1.753)	(3.816)
Observations	778	778	902	902
Number of Subject	64	64	65	65

Notes: the dependent variable is product price offered by sellers. Variable period takes integer values between 1 and 24. Ex-ante Preference is a treatment dummy. It takes on value 1 if observations are from Ex-ante Preference treatment and 0 otherwise. The reference category is Baseline treatment. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. The models allow for seller random effects. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Result 3.5: Sellers of unfair products lower the price when they are informed of buyers' strong preferences for fair products. Price change of fair products is not evident with preference disclosure.

3.3.3 The Product Choice of Buyers: Comparison between Baseline and Ex-ante Preference Treatment

Table 3.7 presents the results of the investigation on buyer product choice by comparing between Baseline and Ex-ante Preference treatment. We aim to justify whether or not disclosure of preference has treatment effect on the product choice of buyers. The dependent variable is buyer's product choice. It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Models (1) and (2) show the regression results of the first period. Models (3) and (4) look at all 24 periods. The reference category is the Baseline treatment. Ex-ante Preference is the treatment dummy. Ex-ante Preference X Period is the interaction term between treatment dummy and period to allow for different time trends across treatments.

Referring to Models (1) and (2), at the first period, the disclosure of preference increases the likelihood of purchasing fair products by buyers. However, over time, the treatment effect is not evident (see Models (3) and (4)). This is because most of the buyers follow their preference for fair products at the first period. The default rate is the lowest in the first period as mentioned above in subsection 3.3.1. We only have 4.25% of buyers who state a preference for fair products but purchase unfair products. The period average default rate is around 22.25%.

Table 3.7 Random-Effects Probit Regressions of Consumer Fair Product Choice

Dependent Variable	(1)	(2)	(3)	(4)
	Fair Product			
Period			-0.010** (0.004)	-0.010** (0.004)
Ex-ante Preference	0.333** (0.156)	0.415** (0.165)	0.173 (0.181)	0.217 (0.221)
Ex-ante Preference X Period			-0.000 (0.006)	-0.000 (0.006)
Number of product offers buyer saw	-0.374 (0.411)	-0.478 (0.447)	-0.166 (0.127)	-0.167 (0.128)
Buyer order to enter the market	-0.394 (0.418)	-0.492 (0.456)	-0.199 (0.137)	-0.200 (0.138)
Control Variables	No	Yes	No	Yes
Period Considered	1	1	All periods	All periods
Observations	51	51	1,297	1,297
Number of Subjects			56	56

Notes: The dependent variable is buyer's product choice (Fair Product). It takes on value 1 if a fair product is purchased by the buyer and 0 if an unfair product is purchased. Variable period takes integer values between 1 and 24. Ex-ante Preference is the treatment dummy. It takes on value 1 if observations are from the respective treatment and 0 otherwise. The reference category is Baseline treatment. Ex-ante Preference X Period is the interaction terms between treatment dummy and period. Control variables include gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. All models use a buyer's product choice in a period as an observation. Models (3) and (4) are panel specifications that include buyer random effects. The coefficients report marginal effects instead of raw probit coefficients. Robust standard errors clustered at the market level in parentheses *** p<0.01, ** p<0.05, * p<0.1

3.3.4 Aggregate Market Outcomes

In this subsection, the overall market share of the fair products is evaluated, followed by the discussion of the results. An investigation of the price, as well as the profit margin for each type of products, is also presented. We have 747 observations in Baseline and 550 observations in Ex-ante Preference of buyers making a purchase. Analysis in this subsection considers all these successful transactions where the offers are accepted by buyers.

3.3.3.1 Market Share of the Fair Product

Figure 3.6 shows the time path of the final market share of fair products, averaged across markets. A higher market share of fair products is not evident in Ex-ante Preference treatment. Two sided Wilcoxon rank sum test for clustered data²⁴ is not rejected at $p\text{-value} = 0.3339$. Although surprising, this is consistent with that our findings that fair production significantly increase and fair product consumption does not increase significantly. The main reason is that actual behaviors of buyers are not consistent with their stated preferences if we keep in mind that around one third of the buyers ultimately changed their minds to purchase unfair products, even they stated the preferences for fair products. There are many factors that contribute to the inconsistency of buyers' preferences and actual behaviors. We note that the price offered by sellers is one of the important reasons. According to subsection 3.3.2.3, sellers of unfair products lower their prices to retain buyers when they are informed of buyers' strong preferences for fair products. As a result, it is inevitable that some buyers would be attracted to these offers and purchase unfair products instead; thus, when this occurs, the purchase of fair products drops. Meanwhile, it is also noteworthy that the inconsistency could potentially reduce the size of treatment effect on fair product production (see discussion in 3.3.2.1).

²⁴ We use Wilcoxon rank sum test for clustered data. The average price that buyers are willing to pay for fair/unfair products in each period is used as one observation and is clustered at market level. Number of clusters is 8 in Baseline treatment and 6 in Ex-ante Preference treatment.

Figure 3.6 Market Share of the Fair Products

Result 3.6: A higher market share of fair products in Ex-ante Preference than Baseline treatment is not evident.

3.3.3.2 Transaction Price and Profit Margin

Figure 3.7 illustrates the average transaction prices of the fair and unfair products in each treatment and the 95% confidence interval. The price of unfair products is significantly lower than that of fair products. This is expected since sellers of unfair products offer a lower price due to them having zero cost. It is also shown that the transaction price of unfair products is significantly lower in Ex-ante Preference than Baseline treatment. It is consistent with our result 3.5 because the transaction price is, to a great extent, determined by the price offered by sellers. Equal price of unfair products in Baseline and Ex-ante Preference is rejected at $p\text{-value} = 0.0933$ (two sided

Wilcoxon rank sum test using the market average price as an observation), and it is not rejected for fair products at $p\text{-value} = 0.1967$.

Figure 3.7 Transaction Price by Product Type over time

Table 3.8 further shows the regression results on profits of different types of products. The dependent variable is average market seller profit using the average market seller profits of fair (unfair) products in a period as one observation. Ex-ante Preference is the treatment dummy. Controlling for unfair products in Models (1) and (2), profits of the unfair products are lower in Ex-ante Preference than Baseline treatment, which is consistent with the results of the transaction price. There is no significant difference between the profits of the fair products in Baseline and Ex-ante Preference treatment (Models (3) and (4)).

Table 3.8 Random-Effects Linear Regressions of Profit by Product Type

	(1)	(2)	(3)	(4)
	Control for unfair products		Control for fair products	
Dependent Variable	Average Market Seller Profits			
Period	-0.169*** (0.054)	-0.168*** (0.054)	-0.064 (0.047)	-0.064 (0.047)
Ex-ante Preference	-4.788 (3.173)	-4.691*** (1.794)	-2.110 (2.322)	-2.425 (1.480)
Control Variables	No	Yes	No	Yes
Constant	23.156*** (2.372)	60.036*** (10.953)	17.126*** (1.679)	46.050*** (8.116)
Observations	288	288	295	295
Number of Markets	14	14	14	14

Notes: the dependent variable is the average market seller profits of fair (unfair) product (Average Market Seller Price). The average market seller profit of fair (unfair) products in a period is used as one observation. In Models (1) and (2), we focus on the profits of unfair products. Models (3) and (4) look at profits of fair products. The reference category is Baseline treatment. Ex-ante Preference is the treatment dummy. It takes on value 1 if observations are from the respective treatment and 0 otherwise. Variable period takes integer values between 1 and 24. Control variables take the average of all participants within the market, including gender, Singaporean, knowledge of game theory, religion, trust, major in economic and risk preference. The models allow for market level random effects. Robust standard errors clustered at the market level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Result 3.7: Sellers of fair products receive significantly less profits than sellers of unfair products. Price of the unfair products drops significantly in Ex-ante Preference compared to Baseline treatment. Consequently, seller profits of unfair products are lower in Ex-ante Preference treatment. Price and profit difference of the fair products in the two treatments are not evident.

3.4 Conclusion

There are many incentives for firms to behave in a socially responsible manner. Consumers' attitude to corporate social responsibility is one of the essential determinants when firms make business decisions. In other words, to some extent, the preferences of consumers play a leading role in the development of corporate social responsibility. However, their influence may be limited due to the inconsistency between buyers' preferences and actual purchase behaviors. Consumers

are constantly trying to balance their desire for socially responsible consumption and with their other needs such as a low price. Even with consumers' strong preferences towards social responsible products, it is not always reflected in their purchase behaviors.

This chapter experimentally seeks to ascertain the role of consumers' preferences for socially responsible products in stimulating socially responsible production. We adopt a simple market setting with two types of products. One is socially responsible, and the other imposes external costs on others. Before sellers make production decisions, buyers' preferences for socially responsible products are revealed to sellers. An investigation of sellers' reactions to the revealed buyers' preferences is then presented.

Our results show a positive impact of buyers' preferences for socially responsible products on socially responsible production. However, on the other hand, we find that the prices offered for socially irresponsible products drop significantly if buyers have strong preferences for socially responsible products. This lower price potentially attract buyers to switch to socially irresponsible products. The final socially responsible consumption will depend on which demand is larger, the demand for socially responsible products or the demand for a low price. We also identified certain factors related to either sellers' or buyers' product choices, such as expected profit, price, and credibility of buyers and so on.

This study makes two incremental contributions to the literature. Firstly, it provides direct experimental evidence that supports the positive impact of consumers' preferences in stimulating socially responsible production. Secondly, it contributes to the growing body of work that seeks to promote social responsibility. We propose that the disclosure of buyers' preferences for socially responsible products to sellers may work as a potential intervention that will stimulate socially

responsible production. Meanwhile, this study provides interesting directions for future studies, for example, to explore the impact of buyers' credibility on socially responsible production.

3.5 Appendix

3.5.1 Ex-ante Preference and Actual Frequency of Purchasing the Fair Product

Table 3.9: Buyers' Ex-Ante Preference and Actual Frequencies of Purchasing the Fair Product

	Frequency	Buyer 1	Buyer 2	Buyer 3	Buyer 4	Market Average
Market 1	Stated	0.54	1.00	1.00	1.00	0.89
	Purchased	0.33	1.00	0.77	1.00	0.78
	Purchased (C)	0.13	1.00	0.70	1.00	0.71
	Stated - Purchased	0.21	0.00	0.23	0.00	0.11
	Stated - Purchased (C)	0.41	0.00	0.30	0.00	0.18
Market 2	Stated	0.63	1.00	0.04	0.79	0.61
	Purchased	0.33	0.95	0.17	0.33	0.45
	Purchased (C)	0.31	1.00	0.07	0.33	0.43
	Stated - Purchased	0.29	0.05	-0.13	0.46	0.17
	Stated - Purchased (C)	0.31	0.00	-0.03	0.46	0.19
Market 3	Stated	1.00	1.00	1.00	0.71	0.93
	Purchased	0.26	0.25	0.91	0.88	0.57
	Purchased (C)	0.19	0.17	1.00	1.00	0.59
	Stated - Purchased	0.74	0.75	0.09	-0.17	0.35
	Stated - Purchased (C)	0.81	0.83	0.00	-0.29	0.34
Market 4	Stated	0.92	0.67	0.92	0.04	0.64
	Purchased	0.63	0.58	0.95	0.25	0.60
	Purchased (C)	0.63	0.63	0.92	0.07	0.56
	Stated - Purchased	0.29	0.08	-0.03	-0.21	0.03
	Stated - Purchased (C)	0.29	0.04	-0.01	-0.03	0.08
Market 5	Stated	1.00	0.58	0.96	0.04	0.65
	Purchased	0.46	0.50	0.42	0.08	0.36
	Purchased (C)	0.50	0.60	0.64	0.07	0.45
	Stated - Purchased	0.54	0.08	0.54	-0.04	0.28
	Stated - Purchased (C)	0.50	-0.02	0.32	-0.03	0.19
Market 6	Stated	0.67	1.00	1.00	0.67	0.83
	Purchased	0.29	0.76	1.00	0.50	0.64
	Purchased (C)	0.29	0.75	1.00	0.46	0.62
	Stated - Purchased	0.38	0.24	0.00	0.17	0.19
	Stated - Purchased (C)	0.38	0.25	0.00	0.21	0.21

Notes: stated is the frequency that a buyer stated a preference for the fair product. Purchased is the frequency that a buyer actually purchased the fair product. Purchased (C) is the frequency that a buyer actually purchased the fair product, conditionally on observations that a buyer faced both types of products. (Stated – Purchased) is the difference between stated and purchased. (Stated - Purchased (C)) is the difference between stated and purchased (C).

3.5.2 Experimental Instruction of Ex-Ante Preference Treatment

Welcome to all of you! You are now taking part in an interactive study on decision making. **Please pay attention to the information provided here and make your decisions carefully. If at any time you have questions to ask, please raise your hand and we will attend to you in private.**

Please note that **unauthorized communication is prohibited**. Failure to adhere to this rule would force us to stop this study and you may be held liable for the cost incurred in this experiment.

Your participation in this study is voluntary. You will receive **SGD 2** show-up fee for participating in this study. You may decide to leave the study at any time. Unfortunately, if you withdraw before you complete the study, we can only pay you for the decisions that you have made up to the time of withdrawal, which could be substantially less than you will earn if you complete the entire study.

The amount of your earnings from this study depends on the decisions you and others make. At the end of this session, your earnings will be paid to you privately and in cash. They will be contained in an envelope (indicated with your unique user ID). You will need to sign a claim card given to you and exchange your claim card with your payment.

General Information

Each of you will be given a unique user ID and it will be clearly stated on your computer screen. At the end of the study, you will be asked to fill in your user ID and other information pertaining to your earnings from this study in the claim card. **Please fill in the correct user ID to make sure that you will get the correct amount of payment.**

Rest assured that your **anonymity will be preserved** throughout the study. You will never be aware of the personal identities of other participants during or after the study. Similarly, other participants will also never be aware of your personal identities during or after the study. You will only be identified by your user ID in our data collection. All information collected will **strictly be kept confidential** for the sole purpose of this study.

Specific Information

The total duration of this study is more or less 1.5 hours.

Your total earnings = earnings from Stage I + earnings from Stage II + show up fee (S\$ 2)

All incentives will be denominated in **experimental dollars** (expressed as **ECU**). The exact conversion rate will be detailed later.

Stage I

Stage I provides a scenario simulation of market. You will form a small market group and be randomly assigned a role in this market. Your role remains the same for the entire experiment.

You will interact with other participants anonymously through the computer interface for a number of periods. In each period, you will be given **100 ECUs** to make decisions.

There are three available roles:

- **Seller.**
- **Buyer.**
- **The Third Party:** As a third party, you cannot buy or sell. Your income is affected by the transaction between a seller and a buyer. **Each of you is paired randomly with one of the buyers.**

There are two types of products available for sellers to sell and buyers to buy.

- **Type I:** A product with no effect on the third party.
- **Type II:** A product with a loss for the third party.

To produce Type I product, the seller needs to incur costs of **10 ECUs**. To produce Type II product, there will be **no costs** for sellers.

When **Type II** product is purchased by a buyer, it will impose a loss of **60 ECUs** on the third party associated with this buyer; When **Type I** product is purchased or no product is purchased by a buyer, there will be **no loss** on the third party associated with this buyer.

The value of products regardless of the product type for buyers is always **50 ECUs**.

The sellers can set a price for a product range from **0** up to **50 ECUs**.

The detailed processes are as follows:

At the beginning of each period, Buyers can express their purchase preferences that include the preferred product type and the price they are willing to pay.

Once all buyers have expressed their purchase preferences, each seller will receive the information about the proportion of each product type that buyers preferred and the average price of each product type that buyers are willing to pay.

Upon seeing the information, sellers must decide on the product type to produce and the price to charge.

Once all sellers have made their decisions, buyers will be given information of all sellers' product offerings and the corresponding prices.

Buyers make their decisions sequentially to purchase or not to purchase any products, the sequence is determined randomly. Should they choose to purchase, they will indicate which seller they want to purchase the product from.

There will be **5** Sellers, **4** Buyers and **4** Third Parties in a group, thus there will be **at least 1** inactive seller in each period.

The payoffs in ECUs for different roles are as follows:

Seller:

If a buyer accepts his/her offer, the payoff will be:

$$100 - \text{costs of production} + \text{price received from buyer}$$

If no buyer accepts his/her offer, the payoff will be:

$$100$$

Buyer:

If a buyer accepts an offer, the payoff will be:

$$100 + 50 - \text{price paid to seller}$$

If a buyer does not accept any offer, the payoff will be:

$$100$$

The Third Party:

If his/her associated buyer chose Type II Product (the product with a loss for the third party), the payoff will be:

$$100 - 60 = 40$$

If his/her associated buyer chose either Type I Product (the product with no effect on the third party) or did not purchase any product, the payoff will be:

$$100$$

Earnings in Stage I

At the end of the experiment, your earnings from 1 randomly-chosen period will be converted to Singapore dollar equivalently. Since each period has the same chance to be chosen and you do not know which period will be paid when you make your choice, the best strategy is paying careful attention to each period. The conversion rate from experimental dollars (ECU) to Singaporean dollars is:

$$10 \text{ ECUs} = 1 \text{ SGD}$$

Stage II

In Stage II, you are shown ten lines on the screen. In each of these lines you have a choice between two options A and B. You need to consider which of the two options you prefer in each of these lines.

After you have made your decision, the computer will randomly select one of the ten lines to determine your payout. Thereafter, the computer draws the payout based on the decision that you have made for the selected line - either Option A or Option B. To determine your earnings in the case you choose option B, there will be a second random draw. The computer will randomly determine if your payoff is 0 SGD or 3 SGD, with the **chances stated in Option B**. Your earning from this stage will be added to your final earnings from this experiment when the experiment is complete.

Look at line 1 at the top of the screen. Option A is 1.0 SGD. Option B has a 0% chance to earn 3.0 SGD and a 100% chance to receive 0.0 SGD. The other lines are similar. As you go down the column of option B, the chance to receive 3.0 SGD rises.

	Option A		Option B
		Choose Option B for ALL lines	
1	\$1		\$3 with 0% chance, \$0 with 100% chance
		Choose Option A for line 1 and Option B for rows 2 to 10	
2	\$1		\$3 with 10% chance, \$0 with 90% chance
		Choose Option A for rows 1,2 and Option B for 3 to 10	
3	\$1		\$3 with 20% chance, \$0 with 80% chance
		Choose Option A for rows 1 to 3 and Option B for rows 4 to 10	
4	\$1		\$3 with 30% chance, \$0 with 70% chance
		Choose Option A for rows 1 to 4 and Option B for rows 5 to 10	
5	\$1		\$3 with 40% chance, \$0 with 60% chance
		Choose Option A for rows 1 to 5 and Option B on lines 6 to 10	
6	\$1		\$3 with 50% chance, \$0 with 50% chance
		Choose Option A for rows 1 to 6 and Option B for rows 7 to 10	
7	\$1		\$3 with 60% chance, \$0 with 40% chance
		Choose Option A for lines 1 to 7 and option B for rows 8 to 10	
8	\$1		\$3 with 70% chance, \$0 with 30% chance
		Choose Option A for rows 1 to 8 and Option B on lines 9 to 10	
9	\$1		\$3 with 80% chance, \$0 with 20% chance
		Choose Option A for rows 1 to 9 and Option B on line 10	
10	\$1		\$3 with 90% chance, \$0 with 10% chance
		Choose Option A for ALL lines	
			OK

You need to consider which of the two options you prefer in each line. Only one of these lines will be selected to determine your payoff, but you do not know in advance which line will be paid. Hence you should pay attention to the choice you make in every line. Each line has an equal chance of being drawn.

The following are the choices available:

- Choose option B for ALL lines.
- Choose Option A for line 1 and Option B for lines 2 - 10
- Choose Option A for lines 1 - 2 and Option B for lines 3 - 10
- Choose Option A for lines 1 - 3 and Option B for lines 4 - 10
- Choose Option A for lines 1 - 4 and Option B for lines 5 - 10
- Choose Option A for lines 1 - 5 and Option B for lines 6 - 10
- Choose Option A for lines 1 - 6 and Option B for lines 7 - 10
- Choose Option A for lines 1 - 7 and Option B for lines 8 - 10
- Choose Option A for lines 1 - 8 and Option B for lines 9 - 10
- Choose Option A for lines 1 - 9 and Option B for line 10
- Choose Option A for ALL lines.

Stage III

In this final stage of the experiment, we will ask you to answer some questions about yourself. Please answer truthfully. When you have finished, we will prepare your final earning, and ask you to sign a receipt in exchange for the payment you receive.

Thank you again for your participation! If you have any questions, please raise your hand and an experimenter will come to you.

3.5.3 The Screenshot of the Post-experiment Questionnaire

Questionnaire

Please answer the following questions

What is your gender?

☐ M
☐ F

What is your age?

What is your nationality?

Which year in school are you?

☐ Year 1
☐ Year 2
☐ Year 3
☐ Year 4
☐ Masters
☐ Ph.D
☐ Others

What is your major?

Have you studied game theory before?

☐ Yes
☐ No

Questionnaire

For the following campus/off campus activities/organizations, which describes you best: A. active member, B. inactive member, or C. not a member?

a) Sport activity/organization:

☐ A
☐ B
☐ C

b) Art, music and other recreation activity/organization:

☐ A
☐ B
☐ C

c) Humanitarian, charity, social work activity/organization:

☐ A
☐ B
☐ C

d) Religious activity/organization:

☐ A
☐ B
☐ C

e) Environment, nature, animal protection activity/organization:

☐ A
☐ B
☐ C

Questionnaire

Could you indicate your religion?

How important is your religion to you ? (of a scale from 1 to 7, indicate 0 if you do not have any religion.)

Little influence 0 1 2 3 4 5 6 7 Very important

If you lost your wallet on campus, how likely do you think you would have it returned?

0% chance 1 2 3 4 5 6 7 100% chance

Continue

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