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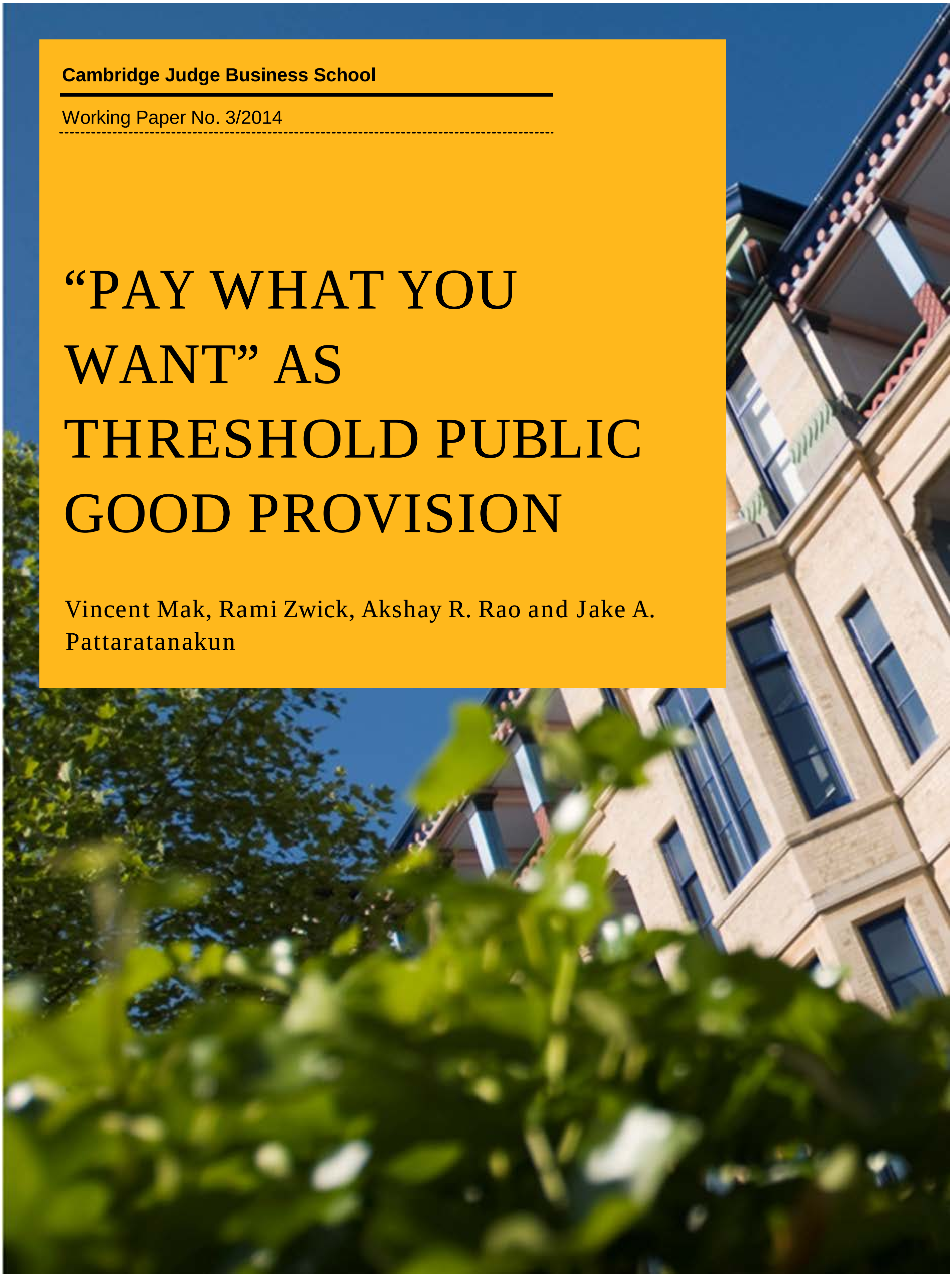

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"Pay What You Want" as Threshold Public Good Provision

Abstract

Prevailing wisdom on "pay what you want" (PWYW) pricing focuses on the influence of altruism or fairness on consumers' payments. In this paper, we offer a different perspective by demonstrating that, if the seller and consumers interact repeatedly, and future provision of PWYW depends on whether current revenue under PWYW is sufficient for the seller to achieve financial goals, then paying under PWYW can be likened to paying for a threshold public good. Our model implies that continuous provision of PWYW can be profitable even when all consumers are self-interested. We find in two experiments that if there is pre-payment online chat-room-style communication among consumers, then efficient tacit coordination at the payment stage can be accomplished to achieve continuous PWYW provision. We also show experimentally that pre-payment communication can sustain PWYW provision even when consumers have limited feedback about each other's payments, or limited information about the market.

Keywords: pay what you want; pay as you wish; threshold public goods; social dilemma; communication; feedback; market information

"Pay What You Want" as Threshold Public Good Provision

In a recent post on the Wikimedia Foundation website, Jimmy Wales, co-founder of Wikipedia, pleaded with users to donate to the website so that Wikipedia would not have to raise revenues through advertising. He wrote: "Commerce is fine. Advertising is not evil. But it doesn't belong here. Not in Wikipedia."[1] Wales has repeatedly made similar pleas to users for years, so as to assure that the website is financially sustained by users' donations. In effect, Wikipedia has survived by means of a "pay what you want" (PWYW) pricing policy, under which every user donates any amount they want (including nothing) for Wikipedia's products. Wales' message underscores the argument that user donations help "keep Wikipedia free". Sufficient donations would sustain Wikipedia's PWYW model in the future, but if donations did not reach sufficiency, Wikipedia might have to charge users a subscription fee that would potentially be higher than the donation solicited; or Wikipedia might then have to entertain advertisements, an action that could reduce users' future benefits because Wikipedia's pursuit of advertising revenue might adversely impact their real or perceived objectivity. This argument, apparently, has persuaded many users to pay Wikipedia, despite the fact that they could have paid nothing while consuming the website's content. In fact, the website has essentially become a public good with associated free riding issues, as the PWYW policy makes the website's content available to all users with no fees, and excludes no user.

The Wikipedia example highlights the core thesis of our paper. The prevailing wisdom in the literature focuses on how consumers' sense of altruism or of fairness towards the seller might influence their payments (e.g., Gneezy, Gneezy, Nelson, & Brown, 2010). We offer a different perspective by demonstrating that PWYW can transform a private good (e.g., the content of

Wikipedia) into a public good by effectively making it non-excludable and non-rivalrous. If (1) there are repeated interactions between the seller (e.g., the Wikimedia Foundation) and its customers (users of Wikipedia), and (2) future provision of PWYW depends on whether current revenue under PWYW is sufficiently large for the seller to achieve financial goals, then consumers paying under PWYW can be likened to paying for the future provision of a threshold or step-level public good (see e.g., van der Kragt, Orbell, & Dawes, 1983; Croson & Marks, 2000). By means of a simple model, we show that, theoretically, continuous provision of PWYW could be profitable to the seller even when all consumers are purely self-interested, independent of any social preferences towards the seller. As such, our perspective augments the extant literature on PWYW.

Like most other threshold public good models, our model allows for two types of equilibrium outcomes: a socially inferior outcome in which no consumer pays, and a set of socially efficient outcomes in which consumers coordinate tacitly to attain a high level of PWYW (the "public good") provision. As such, it has the characteristics of a social dilemma in a general sense (Van Lange, Joireman, Parks, & Van Dijk, 2013). A major objective of our study is to identify behavioral conditions that can sustain tacit coordination in the social dilemma manifested in our model. We found one such condition in our Experiment 1: if there is online chat-room-style communication among consumers prior to paying, then tacit coordination at the payment stage can be accomplished to achieve continuous provision of PWYW. Such long-term provision of PWYW is generally an efficient outcome for the seller and for consumers. In addition, our experimental results suggest that communication facilitates coordination by fostering social influence among players, so that they could collectively agree on and socially "contract" themselves to commit to actions that would improve efficiency (van der Kragt et al.

1983; Kerr & Kaufman-Gilliland, 1994). The mechanism can be understood as one by which norms of “appropriate” behavior that enhance efficiency became established among players via communication (see Weber, Kopelman, & Messick, 2004).

We conducted Experiment 2 to understand whether communication remains effective in sustaining PWYW when consumers have limited feedback about each other’s payments, or limited information about the market. The experiment was motivated by the fact that, in many real-life PWYW examples, consumers are not informed about each other’s specific payments to the seller; oftentimes, the most information that they can obtain is information about total payment. Similarly, consumers often have little information about the distribution of valuations among other consumers in the market. Therefore, we experimentally examined the extent to which communication might or might not be able to facilitate coordination when: (a) consumers receive feedback only about total payment under PWYW but no feedback about each other’s specific payments; and (b) consumers lack “market information” pertaining to the distribution of valuations among other consumers. Our findings are positive. Even when players received only partial feedback or no market information, communication could sustain continued provision of PWYW.

Our study is relevant to numerous real-life settings. For instance, several online platforms for independent artists (e.g., Bandcamp, NoiseTrade, Jamendo, Magnatune, and Kroogi) allow their artists to determine their pricing format (fixed price versus PWYW). These platforms bridge the gap between free (and often illegal) and fixed price models by letting fans determine the value of the content and pay an appropriate price. The fact that these PWYW sellers thrive on online consumer communication – such as chat forums – is consistent with one of our major experimental findings, namely that communication is key to socially efficient coordination that sustains long-term PWYW. Further, it has been suggested in the popular press that artists should switch from an initial PWYW model to fixed pricing if the PWYW pricing does not yield desired financial results (Geere, 2010).[2] This prescription is consistent with a feature of our model, according to which, if PWYW does not generate sufficient revenues to satisfy the seller’s financial goals, then the seller would resort to fixed pricing.

In more general terms, our research is germane to organizations or individuals who offer products or services to buyers and would prefer to not employ conventional fixed prices for their products and services. We develop, through a simple, stylized model and an experiment based on the model, insights into how such sellers might profitably survive while offering consumers PWYW. We also contribute to research in social dilemmas by revealing a possible link between donation-based business models and social dilemmas. Lastly, through our experiments, we highlight how communication could lead to high efficiency in social dilemmas even when players have limited feedback about each other’s payments, or limited information about the distribution of valuations among themselves. As such, we also contribute to research on “cheap talk” communication that pertains to previous studies in social psychology and economics, to be discussed below in our review of relevant literature.

Literature Review

Pay What You Want

While the pricing literature is voluminous, the literature that speaks to PWYW pricing is relatively sparse, and the possibility that PWYW may transform a private good into a public good has not been systematically investigated. A dominant stream of studies in the PWYW literature examines the social psychological determinants of payments in one-off PWYW settings; a major finding is that consumers’ payments under PWYW depend largely on their social preferences, in particular altruism, concerns for fairness, reciprocity, self-signaling, and social welfare concerns (e.g., Gneezy et al., 2010; Gneezy, Gneezy, Riener, & Nelson, 2012; Jang & Chu ,2012; Kim, Natter, & Spann, 2009; León, Noguera, & Tena-Sánchez, 2012; Regner & Barria, 2009; Riener & Traxler, 2012; Schmidt, Spann, & Zeithammer, 2014). Another stream of studies examines the profitability of PWYW. One approach views PWYW as a “loss leader” strategy. According to this approach, allowing PWYW for one product can generate profitable cross-sales, as consumers buy other high-margin products from the same seller (Steiner, 1997; Kim, Natter, & Spann, 2010; El Harbi, Grolleau, & Bekir, 2014). Alternatively, PWYW might enable a seller to do away with supply chain intermediaries and thus extract additional profits (Elberse & Bergsman, 2008a, b). In contrast with these perspectives, we argue that there are additional ways in which PWYW can be profitable in the long run.

Threshold Public Good Provision as Social Dilemmas

The literature on threshold public goods is more germane to our inquiry. While different variants of the threshold public good game have been studied experimentally (e.g., Cadsby & Maynes, 1998; Chen, Au, & Komorita, 1996; Croson & Marks, 2000; Mak & Zwick, 2010; McCarter, Budescu, & Sheffran, 2011; Rapoport 1988; van der Kragt et al., 1983), many studies examine the one-off provision setting. In contrast, Walker, Gardner, and Ostrom (1990) initiated a line of research (e.g., Walker & Gardner, 1992; Herr, Gardner, & Walker, 1997; Bru, Carera, Capra, & Gomez, 2003) that focuses on dynamic experimental versions of common pool resource problems, which are closely related to threshold public goods. These experiments involve common pool resources that may be available for exploitation by the same players over multiple periods, with the characteristic that resource levels in future periods are contingent on the degree of exploitation of current resources by the players. Results in this line of research have been inconclusive. Bru et al. (2003) observed over-cooperation in this setting, while other studies have observed over-exploitation, relative to equilibrium predictions.

Communication Among Players in Social Dilemmas

How may high efficiency be achieved in social dilemmas? This is an important practical question for our research, because our main thesis is that the type of PWYW mechanism we are examining implies a form of social dilemma. A theoretical approach to answering this question comes from the concept of “appropriateness” discussed in previous literature (Dawes & Messick, 2000; Weber et al., 2004; see also a summary in Van Lange et al., 2013, and related discussion of “self-control” in Elster, 1985). This concept pertains to the idea that people in social dilemmas make decision by asking themselves the following question: “What does a person like me do in a situation like this?” Thus high efficiency may be achieved if norms of “appropriate” behavior that enhance efficiency can be established among players.

Previous research suggests that social interactions among players, such as pre-play communication, can help establish such norms and improve efficiency through fostering social influence among people. Van der Kragt et al. (1983) offered some of the earliest evidence that face-to-face communication among subjects before a threshold public good game yielded a much higher success rate of provision, compared with when there was no communication. Their results have been further investigated and consolidated in studies such as Kerr and Kaufman-Gilliland (1994) (see also the discussion in Weber et al., 2004). It has been suggested that communication may help establish norms and improve efficiency because it enhances common understanding (Van Dijk, de Kwaadsteniet, & De Cremer, 2009), bolstering group identity (Brewer, 1979; Edney, 1980; Dawes & Messick, 2000), and perhaps even more importantly, because it enables players to collectively agree on and socially “contract” themselves to commit to actions that would improve efficiency (van der Kragt et al., 1983; Kerr & Kaufman-Gilliland, 1994).

Pre-play communication is typically non-binding to the players’ decisions. The research in experimental economics on “cheap talk” is germane to this issue. Experimental studies on cheap talk have covered a wide range of forms of communication, from very restrictive announcements of intended strategies to free-form face-to-face communication, in the context of laboratory games such as bargaining games, signaling games, coordination games, and others (see Crawford, 1998, supplemented by Battaglini & Makarov, 2014, Section 1.1). It is generally found that cheap talk, despite being formally non-binding, could lead to better coordination in achieving efficient outcomes in many situations. However, experimental economics studies that specifically focus on cheap talk in threshold public good provision are relatively rare, as is indicated in Croson and Marks (2000)’s meta-analysis of threshold public good games (see e.g., Table 1 in that article).

Much of previous social psychological or experimental economics research on communication in public good experiments has focused on face-to-face communication. The few exceptions include Bochet, Page, and Putterman (2006), who found that online chat-room-style communication achieved considerably lower efficiency than face-to-face communication in their classic (i.e., linear) public good experiment. In other words, what is true with face-to-face communication might not hold for other forms of communication. This distinction is important because, among the examples that our model captures stylistically, most involve online PWYW sellers receiving payments from consumers who seldom, if ever, interact face-to-face. Instead, consumers in those contexts often interact through social media that have a chat-room flavor, in the sense that users can freely communicate while preserving their anonymity. The efficacy of online chat-room-style communication on threshold public good provisions has rarely been examined. Yet it is a crucial and relevant issue as to whether such communication can achieve high efficiency in our PWYW context. As we shall see, our experiments provide much needed affirmative evidence.

Feedback on Payments and Information about the Market

Experimental studies on social dilemmas have seldom examined whether communication remains effective in facilitating efficiency when players have limited feedback about each other’s contributions, or limited information about the distribution of valuations among themselves. Exceptions include the classic public good experiments of Fehr and Gächter (2000) and Nikiforakis (2010), who showed (in settings without communication) that insufficient feedback about other players’ specific previous actions can have detrimental effects on efficiency. These results further highlight the importance of our Experiment 2 in determining if communication may overcome lack of information to achieve high efficiency in our decision context.

A Model of Continuous PWYW Provision

In this section, we present a simple model to generate our core insights. We shall then use a version of this model to set up our experiment. The model consists of the following features:

(1) There is a seller, S, and a population of N consumers. There are infinitely or indefinitely repeated interactions (selling opportunities) between the seller and consumers. Each interaction is denoted as a period. The seller sells its products with negligible marginal cost. For example, the products can be Wikipedia webpages, digital music tracks, and the like;

(2) Consumers time-discount future payoffs with a per-period discount factor δ ($0 < \delta < 1$). Each consumer i derives a payoff of u_i for consuming the seller’s products over one period, so

that the *net* payoff to consumer i in a period in which he/she has paid a price p_i is u_i- p_i. Consumers may be heterogeneous in that they may have different u_i s.[3]

(3) In the first period, the seller offers PWYW to all the consumers.

(4) The seller will continue to offer PWYW as long as total payment received reaches a positive threshold π in every period. But, if total consumer payment falls below the threshold, it is common knowledge among consumers that the seller will charge a pre-specified fixed price, p, in all future periods. We assume that the threshold π is so large that no consumer can single-handedly pay for the continuation of PWYW with a zero or positive net payoff (i.e. $\pi > max\{u_i\}$). In practice, a consumer might still attempt to sustain PWYW temporarily by paying so much as to incur a loss, in the hope that he/she will create momentum for other consumers to pitch in in the future. But this strategy is not sustainable, and therefore we focus on stationary outcomes in which all consumers obtain non-negative payoffs continuously.

Our model can be seen as a highly stylized version of the Wikipedia example. Wikipedia is offered under PWYW to users of its content, and Wikipedia incurs zero marginal cost when users browse its pages. Different users may derive different utility from browsing Wikipedia and may have different next best alternatives (such as other reference websites, reference books, and the like). As discussed before, once donations from users fall short of a sufficiency threshold, the Wikimedia Foundation might have to switch to a subscription fee model (analogous to a fixed price). The threshold could be, at a minimum, the fixed per-period operational cost of running the website, but can also be any broadly defined minimum revenue requirement for cash flow stability and other financial concerns that Wikipedia chooses.[4]

Equilibrium Outcomes

In deriving equilibrium outcomes of our model to be tested in our experiment, we focus on simple stationary equilibria in which, in any period in which the seller offers PWYW, any consumer *i* always pays the same price p_i*. This means that consumers do not change their PWYW payments according to the history of payments or other incidental factors.[5]

The no-contribution equilibrium. One obvious feasible equilibrium outcome is that no one pays when PWYW is available, so the seller switches to a fixed price from the second period onwards, after having offered PWYW in the first period. This is because, for any consumer *i*, if all other consumers pay nothing whenever PWYW is available, *i* would not be able to pay to sustain PWYW with a positive payoff, and hence would be best off paying nothing under PWYW as well. We call this the no-contribution equilibrium.

In the no-contribution equilibrium, *i* gains a net payoff of u_i in the first period (by paying nothing under PWYW); afterwards, under a fixed price, *i* subscribes to the seller if $u_i \geq p$, but refrains from subscribing otherwise. Therefore, if $u_i \geq p$, *i*'s time-discounted net payoff from this equilibriums is:

$$u_i + \delta(u_i - p) + \delta^2(u_i - p) + \delta^3(u_i - p) + ... = u_i + \frac{\delta(u_i - p)}{1-\delta} = \frac{u_i - \delta p}{1-\delta}.$$

If $u_i < p$, *i*'s time-discounted net payoff from this equilibriums is simply u_i, because the consumer refrains from purchase in all fixed pricing periods.

The PWYW equilibria. We now consider feasible PWYW equilibria in which some consumers pay positive amounts whenever PWYW is available. We first note that total consumer payment under PWYW in such equilibria must be exactly equal to the threshold π. If total payment under PWYW in equilibrium falls below the threshold, every consumer would be better off paying nothing, because only fixed prices will be available in all subsequent periods. On the other hand, if total consumer payment under PWYW exceeds the threshold in equilibrium, every consumer who pays a positive amount would be better off paying less given all others' payments, because PWYW would continue in the next period. Therefore, in equilibrium, we must have:

$$\sum_i p_i{*} = \pi.$$

In addition, every consumer *i* who pays a positive amount $p_i{*}$ under PWYW in equilibrium must find it preferable to pay that amount to sustain PWYW, compared with deviating by paying less, which would result in the seller switching to a fixed price in all subsequent periods. In the first (equilibrium) case, *i*'s time-discounted net payoff is:

$$(u_i - p_i{*}) + \delta(u_i - p_i{*}) + \delta^2(u_i - p_i{*}) + \delta^3(u_i - p_i{*}) + ... = \frac{u_i - p_i{*}}{1-\delta}.$$

In the second (deviation) case, the most *i* can earn is to deviate by paying nothing under PWYW, which would yield a time-discounted net payoff of:

$$u_i + \delta(u_i - p) + \delta^2(u_i - p) + \delta^3(u_i - p) + ... = \frac{u_i - \delta p}{1-\delta},$$

if $u_i \geq p$, and a time-discounted net payoff of u_i if $u_i < p$. Comparing the net payoffs, we find that *i* is incentivized to pay $p_i{*}$ to sustain PWYW if the following conditions are satisfied:

$$\begin{cases} p_i{*} \leq \delta p \text{ if } u_i \geq p, \\ p_i{*} \leq \delta u_i \text{ if } u_i < p, \end{cases}$$

or equivalently,

$$p_i{*} \leq \delta \min\{u_i, p\}.$$

Therefore, as long as a *payment scheme*, according to which every consumer *i* has a specified payment $p_i{*}$ under PWYW, satisfies the theoretical conditions that: (1) $\sum_i p_i{*} = \pi$, and (2)

$p_i^* \leq \delta \min\{u_i, p\}$ for every consumer *i*, then the payment scheme represents a feasible equilibrium outcome in which PWYW is sustained in every period and total payment from consumers is always the positive amount of π. Under such an equilibrium, PWYW is indeed profitable in the long run to the seller, because the threshold has been achieved. Further, as the above calculation implies, every consumer is either better off (this happens if the consumer's p_i^* is strictly less than $\delta \min\{u_i, p\}$) or not worse off in a PWYW equilibrium, than in the no-contribution equilibrium. That is, in general, PWYW equilibria are more efficient for consumers than the no-contribution equilibrium. Moreover, it can be expected in general that some consumers would not buy from the seller under fixed pricing as their u_i s are less than *p*. In that case, the total welfare of the seller and consumers would be less under the no-contribution equilibrium than under the PWYW equilibria. That is, the PWYW equilibria are also generally more efficient for the seller and the consumers as a whole, compared with the no-contribution equilibrium.

Discussion. Our analysis suggests that our model can be likened to a one-off threshold public good game (and thus a social dilemma in a general sense; see Van Lange et al., 2013), where the threshold is π and player *i* has endowment $\delta \min\{u_i, p\}$. As long as the players can tacitly coordinate their contributions to reach the threshold without any contribution exceeding their endowment, the public good will be provided. In our case, the availability of another period of PWYW is analogous to the provision of the threshold public good. In other words, PWYW equilibria exist if the threshold π is not too high, consumers are very forward looking and thus concerned with their future payoffs (δ is high), the fixed price is sufficiently high and serves as a deterrent to consumers (*p* is not too low), and a sufficient number of consumers derive high utility from the seller's products (a sufficient number of u_i s are not too low). However, the issue of free riding, endemic to many threshold public good games, is relevant to our setting. A second issue, that of tacit coordination, arises as well. This is because, as is often the case with threshold public good games (see Croson & Marks, 2000), the PWYW equilibrium is generally not unique. Instead, a great multitude of equilibria are generally feasible, each corresponding to a feasible payment scheme. Even if the focal seller S clearly announces the threshold profit π, consumers might still fail, in practice, to sustain PWYW, not because each consumer fails to react "correctly", but because either: (1) one or more consumers make "irrational", perhaps unintentional, errors (such as simple calculation mistakes), or (2) there is insufficient coordination, so that consumers' assumptions and actions are misaligned, as it is unclear to them which particular payment scheme they should converge upon.

Two other issues emerge from our model. First, can the seller earn higher profits under the PWYW equilibria than under a fixed price? Generally, if the seller will not be able to sustain its operations under a fixed price – that is, if even under an optimal fixed price it cannot earn up to the threshold π – then PWYW equilibria could be more profitable than fixed pricing. In addition, a scenario under which the seller simply cannot run its business under fixed pricing, and thus has to discontinue operations once PWYW fails to generate sufficient revenue, is captured in our model when there exists a prohibitively high p that drives all consumers away. As discussed above, this factor is conducive to PWYW equilibria. Second, note that some consumers may pay nothing under a PWYW equilibrium, and as long as some other consumers pay to ensure that total payment reaches the threshold, PWYW is sustainable. Behaviorally, we may expect that lower valuation consumers pay less than higher valuation consumers in PWYW equilibria that are likely to be realized. This is consistent with previous observations that PWYW can serve as a price discrimination device (see, e.g., Kim et al., 2009).

We now turn to an empirical examination of our model.

Experiment 1

As discussed in the previous section, our model exhibits a social dilemma with the character of threshold public good provision. A major objective of Experiment 1 is to identify behavioral conditions that can sustain tacit coordination in that social dilemma. Specifically, our experiment was designed to investigate whether and how PWYW equilibria can be attained in a laboratory environment that simulates our model.

A fundamental feature of our experimental setup was that we simulated the focal seller using a computer, and subjects knew this to be so. This approach minimized any altruistic, non-economic motivation towards the seller on the part of the subjects, as consumer subjects might be inclined to allow a human seller subject an opportunity to earn a “fair share”. If the proposed PWYW provision mechanism is shown to be sustainable with a computer serving as the seller in the lab, it might be even more successful in the field, where consumers’ fairness and reciprocity considerations towards the seller may provide additional motivation for them to pay (e.g., Kahneman, Knetsch, & Thaler, 1986).

Basic Setup and Theoretical Considerations

Our experiment was designed to mimic a model setting in which the consumer population consisted of $N = 8$ players with a per-period time discount factor $\delta = .9$. To operationalize an infinitely repeated game with time discounting in the laboratory, we adopted a common experimental procedure that makes use of the equivalence between such a game and a repeated game with indefinite termination (see, e.g., Zwick, Rapoport, & Howard, 1992). Specifically, each game in the experiment consisted of an indefinite number of rounds – which corresponded to the periods in the model – and, conditioned on the game being played now, there was always a 90% continuation probability that there would be a next round in which the game would be played again. This continuation probability is equivalent to the time discount factor $\delta = .9$ in an expected utility framework.

– Insert Table 1 about here –

There were two types of players who differed in their valuations of the products or options in the experimental game (see Table 1): Type Y players or "fans" of the seller *S* that offered PWYW, and Type Z players or "casuals". Type Y players derived a per-round payoff of $u_F = 201$ tokens (the experimental currency) from the products sold by *S*. Type Z players derived a per-round payoff of $u_C = 49$ tokens from *S*'s products. All players were made aware of the seller's condition that PWYW should yield a threshold level of revenue to the seller, failing which PWYW would be discontinued and a fixed price regime would be instituted.

In addition, we introduced an outside option that was an alternative to *S*'s products. The outside option was always priced at 48 tokens per round. It provided no benefit to the Type Y players (as "fans" of *S*, they would not compromise with purchasing anything else) but provided the same payoff as *S* to Type Z players (who, as "casuals", were indifferent between *S* and the outside option), i.e., 49 tokens per round. These parameters were common to all conditions, as was the fixed price that *S* would charge per round once PWYW was discontinued, which we set at $p = 200$ tokens (note that the per-round profit maximizing price for *S* under fixed pricing would also be 200 tokens, if Type Y players would buy from *S* only if they could earn at least one token's net payoff from its products). Because the outside option was irrelevant to Type Y players, the amount that a Type Y player would pay in a PWYW equilibrium could not be higher than $\delta \cdot p = 180$ tokens, applying results from the previous section.

On the other hand, Type Z players would choose the outside option when *S* imposed a fixed price of 200 tokens, since that price would be too high relative to their utility from *S*'s products, while the outside option at least offered them a net payoff of one token (= 49 – 48 tokens) per round. This means that the effective fixed price that a Type Z player would pay when *S* imposed fixed pricing would be 48 tokens. Thus the amount that a Type Z player would pay in a PWYW equilibrium could not be higher than $\delta \cdot 48 = 43.2$ tokens. Together with the upper limit of 180 tokens for a Type Y player's payment under a PWYW equilibrium, the threshold π could not be higher than:

$$180 \cdot 2 + 43.2 \cdot 6 = 619.2 \text{ tokens},$$

if there could be any feasible PWYW equilibria. This serves as the theoretically derived condition for the feasibility of continuous provision of PWYW in our experiment. As such, we set the threshold for continuation of PWYW at $\pi = 400$ tokens across all conditions, which ensured that PWYW equilibria would be theoretically feasible in our setup.[6]

– Insert Figure 1 about here –

Behavioral Considerations and Design

Our experimental manipulations were motivated by behavioral considerations. They included a number of realistic situational variables which would be relevant in facilitating the establishment of norms of "appropriate" behavior (Weber et al., 2004).

The first manipulated factor was the framing of the experimental task. In half of the conditions, the frame was "rich", featuring the purchase of songs of independent music bands, which mimicked some of the real-life PWYW examples discussed earlier. In the other half of the conditions, the frame was neutral. Subjects exposed to a “rich” frame may potentially be influenced by the cover story of independent music bands *per se*, rather than by the strategic nature of the situation (see e.g., Chou, McConnell, Nagel, & Plott, 2009). The influence might then result in different perceptions of what would be normative or “appropriate”, compared with perceptions under the neutral frame.

The second factor manipulated involved explicit mechanisms that might enhance coordination to sustain PWYW. These included:

(1) A “chat” manipulation that offered subjects the opportunity to carry out online chat-room-style communication. As discussed in the literature review, it has long been known that face-to-face communication is effective in enhancing efficiency in threshold public good provision. Nevertheless, it is much less clear whether online chat-room-style communication that preserves anonymity is similarly effective;

(2) A “suggestion” manipulation by which the experimenter provided suggested payments to subjects. Specifically, it was suggested that each Type Y player should pay 164 tokens and each Type Z players should pay 12 tokens to *S* under PWYW. If all subjects followed the suggestion, an “equi-earnings” equilibrium would result, according to which everyone would receive identical earnings in every round. Once subjects realized this feature, the payments constituted a fair and natural choice of equilibrium for them, and as such was behaviorally a “focal point” (Schelling, 1960). While we considered this idea to be of sufficient potential to be included in our experiment, we also note that the provision of reference points has been found not to be effective in increasing PWYW revenues (Johnson & Cui, 2013).

Overall, Experiment 1 employed a 2 (frame: rich versus neutral) x 3 (coordination mechanism: no mechanism versus chat versus suggestion) between-subjects factorial design.

Experimental Procedures

One hundred ninety-two student subjects from a major university in Hong Kong participated in the experiment. All the subjects were fluent in English and volunteered to participate in the study, which was billed as a decision-making experiment with payoff contingent on performance. Subjects were divided into groups of eight, so that every subject interacted with the same group of seven other subjects throughout the session. There were six groups of subjects in each condition with rich frame, and two groups in each condition with neutral frame. During the experiment, all decisions were made via networked computers using the z-Tree software (Fischbacher, 2007).

Each session consisted of a practice game followed by 20 games for payment, each with an indefinite number of rounds. In every condition, after all the games were concluded in a session, 5 games were chosen at random from the 20 games for payment, and each subject was paid his/her earnings from all the rounds in the chosen games after converting tokens to Hong Kong dollars at the rate of 1 token = HK$0.1 (US$1 ≈ HK$7.8). In addition, every subject was paid a show-up fee of HK$40. A typical session lasted approximately two hours. Average subject payment across all conditions, including the show-up fee, was HK$171.7, which was commensurate with typical hourly student wages at that university.

Framing. The instructions used in both frames are included in the Appendix. The instructions introduced subjects to the basic setup and decision tasks of the experiment, in descriptive terms that varied with frame but were formally equivalent across frames.

Rich frame. Subjects were told that two (fictitious) bands, “Playa” and “Quello”, had each uploaded a new song to their site during every round of the game, to allow people to listen to it online. During each round, a player could either listen to a Playa song or to a Quello song, or to neither. At the beginning of each game, each player was assigned to one of two types: “Fan of Playa” or “Casual Listener”. As such, the types differed in their valuations of the songs of the two bands as summarized in Table 1. Of the eight players in each group, two were Fans of Playa and six were Casual Listeners. Every player’s role stayed the same in all rounds of the same game, but was re-assigned randomly from game to game, with the constraint that each player had to be a Fan of Playa in 5 games and a Casual Listener in 15 games.

Neutral frame. The instructions were formally equivalent to those provided under the “rich” frame but no specific cover story was provided. For example, subjects were given options named “S”, “N”, and “R” to choose from, instead of “Playa”, “Neither”, and “Quello”. Their experimental task was described plainly as a choice between three options rather than a choice over listening (or not) to a song. At the beginning of each game, subjects were assigned to be of either “Type Y” or “Type Z”, instead of “Fan of Playa” or “Casual Listener”. The threshold was similarly described in neutral terms.

Common to both frames, at the beginning of every round, the simulated seller *S* announced its pricing policy for that round, indicating whether it offered PWYW or a fixed price of 48 tokens in that round. If PWYW was offered, each player then decided whether to buy from *S* at a non-negative price of her choice, to buy the outside option at a price of 48 tokens, or to not buy. If *S* offered a fixed price, each player then decided whether to buy from *S* at the fixed price, to buy the outside option, or to not buy.

Players made independent decisions simultaneously. After all players had made their decisions in a round, they were informed about the choices and prices paid by every player under anonymous labels. If PWYW was offered in that round, players were also informed about whether total payment reached the threshold and whether *S* would continue to offer PWYW or would implement a fixed price in the next round. Once *S* implemented fixed pricing in a round, players could expect that *S* would continue to implement it in all remaining rounds in the game. Figure 1 is a schematic representation of the sequence of decisions in each round.

A randomization process then took place, so that the game proceeded to the next round with 90% chance and ended immediately with 10% chance. As discussed earlier, this procedure operationalized a per-round time discount factor of $\delta = .9$ for the subjects' payoffs.

– Insert Figure 1 about here –

Coordination mechanisms. In the "chat" conditions, subjects were allowed to engage in online communication over a "chat forum" before every game for a limited duration.[7] In the "suggestion" conditions, the experimenter provided all subjects with a suggested payment scheme for sustaining PWYW. The suggested scheme appeared on every decision screen and was also mentioned in the instructions. For example, under the rich frame, subjects read the following in their instructions:

Suggested payments under the "pay as you wish" scheme

Although Playa allows players to pay as much as they wish for listening to their song in a round when the "pay as you wish" scheme is implemented, they nevertheless provide suggested payment amounts. In particular, they suggest that Fans of Playa pay 164 tokens and hence earn (201-164=) 37 tokens in such a round. Casual Listeners are suggested to pay 12 tokens and hence earn (49-12=) 37 tokens in such a round. If all players pay their suggested amount in such a round, the total payment to Playa will be (2x164+6x12=) 400, exactly the amount needed to keep the "pay as you wish" scheme going to the next round (if there is a next round).

The corresponding passage under the neutral frame was:

Suggested payments under the "pay as you wish" scheme

Although players are allowed to pay as much as they wish for S in a round when the "pay as you wish" scheme is implemented, suggested payment amounts are nevertheless provided. In particular, Type Y players are suggested to pay 164 tokens and hence earn (201-164=) 37 tokens in such a round. Type Z players are suggested to pay 12 tokens and hence earn (49-12=) 37 tokens in such a round. If all players pay their suggested amount in such a round, the total payment to S will be (2x164+6x12=) 400, exactly the amount needed to keep the “pay as you wish” scheme going to the next round (if there is a next round).

Analysis and Results

All analyses and results reported here exclude data from the practice games in which subject behavior was not incentivized. We focus on the following dependent variables of interest:

(a) At the group level, a sustainability measure that is equal to the total number of rounds with sustained PWYW throughout the session. A round with sustained PWYW is defined to be one in which PWYW was allowed and total payment to the focal seller reached the threshold. The unit of observation is group;

(b) At the individual level, the payment to the focal seller *S* under PWYW by Type Y and Type Z players (“Fans of Playa” and “Casual Listeners” under rich framing) respectively. The unit of observation is the payment to *S* in each PWYW round by each player of the relevant type. To account for possible correlations among decisions by the same player over rounds, as well as among players in the same group, we conduct our analysis on these payment variables using the generalized estimating equations (GEE) approach (see Hardin & Hilbe, 2003).

We first describe our statistical analyses and then provide further insights that emerge from a more detailed examination of the data and the chat log.

Statistical analysis. We first test the effect of framing. At the group level, we conduct an ANOVA employing a 2 (frame: rich versus neutral) x 3 (coordination mechanism: no mechanism versus chat versus suggestion) between-subjects design on the sustainability measure. We find no significant main effect of framing ($F(1,18) = 1.82$, $p > .1$), nor is there a significant interaction ($F(2,18) = 1.45$, $p > .2$). Then, at the individual level, we conduct GEE analysis on the effect of framing on Type Y and Type Z players’ payments respectively given each coordination mechanism manipulation. The resulting estimates are almost always not significantly different from zero ($p > .2$) indicating that payments were largely unaffected by framing. The only exception appears with Type Y players' payments with no coordination mechanism, where the mean payment *decreased* from 126.51 tokens under the neutral frame (s.d. = 72.32 tokens) to 62.96 tokens under the rich frame (s.d. = 84.96 tokens) at significance level $p < .01$. While this single anomalous finding may deserve more investigation, it only appears in "control" conditions without coordination mechanisms; otherwise the mean payments did not differ significantly across different frames. As such, we consider the framing manipulation to have had no effect on the major dependent variables in ways that affects our major analysis and conclusions. For the remaining analyses, therefore, the data from the two framing manipulations are combined.

– Insert Table 2 and Figure 2 about here –

Table 2 presents the main results of Experiment 1 aggregated over the framing manipulations. First of all, the table reveals that, sustainability (167.50 rounds on average) was much higher with chat than under any other coordination mechanism condition (no more than 36 rounds on average). This is confirmed by further statistical analysis on the sustainability measure. A 3-factor (coordination mechanism manipulation) ANOVA on this variable yields $F(2,21)= 91.09$, $p < .01$. Pairwise comparisons indicate that sustainability is significantly higher under chat than in the other two cases ($p< .05$ in both comparisons), while suggestion yielded only marginally higher sustainability than no coordination mechanism ($p = .089$).

Most importantly, with chat, the mean total number of rounds with PWYW was more than 86.78% of the mean total number of rounds played, indicating highly sustained PWYW. To offer a more comprehensive picture, Figure 2 presents the mean number of rounds with sustained

PWYW classified by the game’s length (in rounds). For purposes of reference, the line $y = x$, representing perfect sustainability, is also provided. With chat, the plot is much closer to the perfect sustainability line than the plots associated with the other conditions, all of which largely failed to sustain PWYW. The figure thus provides a visual illustration of our major findings from the experiment, namely the effectiveness of online chat-room-style communication in sustaining PWYW.

Table 2 also indicates that payments of Type Y players were higher with chat than otherwise, but the same cannot be said for Type Z players. GEE analysis shows that Type Y players paid significantly more with chat compared with both no mechanism and suggestion; Type Y players also paid significantly more with suggestion than with no mechanism ($p < .01$ in all relevant comparisons). Thus it seems that suggestion as a coordination mechanism did have some effect on Type Y players, but not strong enough to actually lead to highly sustainable PWYW. On the other hand, Type Z players’ payments were not significantly different between any of the two coordination mechanism manipulations ($p \geq .1$ in all relevant GEE comparisons).

These results highlight the fact that chat did not necessarily enhance efficiency by leading *every* player to pay more than otherwise under PWYW. While it could lead to some of the players (Type Y players who valued the target product highly) to pay more, it could not lead to significant changes in payments from the remaining players (Type Z players). Furthermore, the mean payments under chat (160.76 tokens with Type Y players; 12.28 tokens with Type Z players) were close to the equi-earnings equilibrium of Type Y players paying 164 tokens and Type Z players paying 12 tokens (see the Thick description below for more details on this point). What chat did was to enable players to cooperate and mutually commit to a payment scheme that sustained PWYW. Without chat, Type Z players might be paying in vain to sustain PWYW because Type Y players tended to not pay enough. In fact, directionally (although the effect is not statistically significant), Table 2 suggests that Type Z players could be "trying too hard" to sustain PWYW when there was no coordination mechanism, by paying more than they would have to with chat.

To sum up, our statistical analysis suggests that a PWYW policy with a pre-announced threshold induced highly sustainable PWYW among subjects, if: (1) the policy theoretically admits PWYW equilibria, and (2) subjects were allowed to communicate with each other through online chat-room-style communication preserving anonymity, before payments were made. But how did chat lead to such efficient outcomes? We now examine further the data and chat log to address this question.

Thick description. The following insights emerge from the data and the chat log:

(1) Under fixed pricing, subjects paid according to predictions (i.e. Type Y players chose S and Type Z players chose R) in at least 96% of the observations in any condition;

(2) In the chat conditions, even when early on in the session (at least before game 10 and even by game 5 or 6) the groups were often playing exactly according to or close to an equilibrium payment scheme that sustained PWYW with total payment equal to 400 tokens. Six groups played according to the equi-earnings equilibrium payment scheme of [Type Y: 164 tokens; Type Z: 12 tokens], while one group played according to an almost equi-earnings equilibrium with a payment scheme of [Type Y: 170 tokens; Type Z: 10 tokens]. The remaining group arrived at a payment scheme of [Type Y: 162 tokens; Type Z: 13 tokens], which make up a total payment of 402 tokens;

(3) It appears that many subjects intuited from early on that they should cooperate to sustain PWYW. This is most directly reflected in the chat log in the chat condition in which there

was hardly any challenge to the notion that subjects should cooperate. Subjects were instead occupied from early on with arriving at a commonly agreed upon payment scheme through chat. Here are some suggestive quotes:

(a) “ …[if] anyone cheat *(sic)* all of us get the least ... including the cheater,”

(b) “ If we know when [the game ends] we can simply pay zero [in the last round] ... but [since we do not, it is] not worth taking the risk,”

(c) “… please think of the benefit of the whole team,”

(d) “… if you break our relationship ... you will earn less,”

(e) “PLEASE DON'T TRY TO CHEAT!!!!!!!!!!!!!!!!!”

(f) “…don't worry, everyone [has] fair chance to be [Fan of Playa],”

(g) “…the more the number of round[s] the more we gain.”

(4) Further inspection of the chat log supports van der Kragt et al. (1983)’s similar findings that communication enhanced coordination in two major ways:

(a) Subjects could work out a PWYW-sustaining payment scheme that everyone agreed upon, which was essentially a “minimally contributing set” (in van der Kragt et al.’s terms) that added up to exactly the threshold. In the experiment, this was usually achieved by one player suggesting the payment scheme and then discussing with/explaining to other players why they should follow it;

(b) Subjects could then make commitments to each other that they would adhere to the payment scheme that was agreed upon (see also Kerr & Kaufman-Gilliland, 1994). In other words, chat allowed for the establishment of an obligation or a “social contract”, even though chat was essentially “cheap talk” and, if individual deviations in a game occurred, it would be very difficult to identify the renegade. It was typical that, following the suggestion and discussion over a payment scheme (say, the equi-earnings scheme), every player would send out a single-line message as a confirmation to others of his/her agreement with the scheme, before the current chat session was concluded. Also, since the suggestion condition did not lead to highly sustainable PWYW, a “social contract” was apparently essential for PWYW sustainability and was more important than prescribed payments given by the seller.

To summarize, chat enhanced coordination by helping players to establish among themselves a norm of “appropriate” payments, which players found justifiable and also found themselves obliged to follow because of prior commitment in the chat forum;

(5) In the control condition with no coordination mechanism, subjects appeared to have had serious coordination problems. Attempts to sustain PWYW by individual subjects were very often undermined by other subjects’ low or zero payments. Even in the suggestion condition, initial enthusiasm to sustain PWYW could have been dampened because certain subjects tried to take a little advantage by paying slightly less than what was suggested for their role, despite the very clear realization that everyone’s payment was critical to sustaining PWYW. Nevertheless, attempts to establish sustained PWYW could be observed throughout the session in both control and suggestion conditions;

To conclude, Experiment 1’s data suggests that chat led to effectively sustained PWYW, because subjects could then collectively agree on and socially “contract” themselves to commit to a payment scheme that constituted a PWYW equilibrium. In the process, individual subjects’ misaligned behavior with respect to that payment scheme could be eliminated through social influence.

Experiment 2

Experiment 1 established that online chat-room-style communication prior to paying could facilitate tacit coordination at the payment stage to sustain efficient provision of PWYW. It should be noted, however, that subjects in Experiment 1 were provided a breakdown of payments from all subjects after every round in the experiment. Previous payments could have been perceived by players as normative signals of "appropriate" behavior (see Weber & Murnighan, 2008). Such information could be a confound that undermines our claim that communication *per se* could establish norms of payments which enhanced efficiency. Moreover, as discussed earlier, in many real-life PWYW examples, consumers are not informed about each other's specific payments to the seller; oftentimes, the most information that they can obtain is information about total payment.

On the other hand, subjects in Experiment 1 were clearly informed about the distribution of player types in the market (two players who valued the target product highly, and six players whose valuation of the target product was not as high). But in many real-life PWYW examples, consumers often have little information about the distribution of valuations among other consumers in the market.

These considerations highlight the importance of experimentally testing the extent to which communication might or might not be able to facilitate coordination when: (a) consumers receive feedback only about total payment under PWYW but no feedback about each other's specific payments; and (b) consumers lack "market information" pertaining to the distribution of valuations among other consumers. Experiment 2 was designed to address these considerations.

The experiment employed a 2 (feedback: full versus partial) x 2 (market information: full versus no) between-subjects factorial design. The setup was similar to the chat condition with neutral frame in Experiment 1 except that, across conditions, we manipulated the amount of feedback to players regarding previous payments (full breakdown of previous payments versus only the total payment), and the information that players were given about the distribution of Type Y and Type Z players in the group (full versus no market information).

Experimental Procedures

One hundred sixty student subjects from a major university in Bangkok, Thailand, participated in the experiment. All the subjects were fluent in English and volunteered to participate in the study, which was billed as a decision-making experiment with payoff contingent on performance. Subjects were divided into groups of eight, so that every subject interacted with the same group of seven other subjects throughout the session. There were five groups of subjects in each condition. The conversion rate from token to Thai baht was 1 token = 0.13 baht (1 baht ≈ US$0.033). In addition, every subject was paid a show-up fee of 40 baht. A typical session lasted approximately two hours. Average subject payment across all conditions, including the show-up fee, was 210.4 baht, which was commensurate with typical hourly student wages at that university.

The experimental setup in all conditions followed the chat condition with neutral frame in Experiment 1 with the following distinguishing features:

Feedback. In the full feedback conditions, after all players had made their decisions in a round, they were informed about the choices and prices paid by every player under anonymous labels. If PWYW was offered in that round, players were also informed about whether total payment reached the threshold and whether *S* would continue to offer PWYW or would implement fixed pricing in the next round. In the partial feedback conditions, players were not given such detailed feedback. If PWYW was offered in a round, they were informed only about the total payment to *S* and whether *S* would continue to offer PWYW in the next round. The players received no feedback about other players’ decisions otherwise.

Market information. In the full market information conditions, players were informed that there were always two Type Y players and six Type Z players in each group, and that each player would be Type Y in 5 games and Type Z in 15 games. In the no market information conditions, players were not given any such information.

Because online communication was allowed in all conditions, it was in principle possible for players to disclose their previous payments and/or types to each other, even when such information was not provided by default. But chat messages might not be truthful, nor might they be perceived as credible. It was thus our objective to assess if communication might still be able to facilitate coordination to sustain PWYW in this case.

Analysis and Results

Our data analysis approach for Experiment 2 is similar to that for Experiment 1 where appropriate. All analyses and results reported exclude data from the practice games in which subject behavior was not incentivized. At the group level, we focus on a sustainability measure that is equal to the total number of rounds with sustained PWYW throughout the session. At the individual level, we focus on the payment to the focal seller *S* under PWYW by Type Y and Type Z players respectively. We conduct our analysis on these payment variables using the GEE approach to account for possible correlations among decisions by the same player or by players in the same group. We first describe our statistical analyses and then provide further insights that emerge from a more detailed examination of the data and the chat log.

– Insert Table 3 and Figure 3 about here –

Statistical analysis. Table 3 presents the main results. First, the table reveals that sustainability was reasonably high in all conditions. An ANOVA employing a 2 (feedback: full versus partial) x 2 (market information: full versus no) between-subjects design on the sustainability measure yielded neither significant main effects nor significant interactions ($p > .1$ in all cases). This finding further supports our observation that, even when subjects only had partial feedback or no market information, chat alone could facilitate coordination across our experimental conditions.

The mean total number of rounds with PWYW across conditions was at least 49.2% of the mean total number of rounds played. Except for the condition with the least amount of information (i.e. partial feedback/no market information), on average a group was able to sustain PWYW in at least 68% of the rounds played. To offer a more comprehensive picture, Figure 3 displays the mean number of rounds with sustained PWYW classified by the game's length (in rounds). The plots are approximately equally close to the perfect sustainability line, except the condition with the least amount of feedback and market information.

Table 3 indicates that payments of both types of players varied across conditions. GEE analysis of the payments shows that: (1) Given full market information, the payment of either type of players did not differ significantly with full versus partial feedback (both at $p > .5$); (2) Given no market information, Type Y players paid significantly more with full relative to partial feedback while Type Z players paid significantly less (both at $p < .01$).[8] That is, payments under the two full market information conditions were largely the same, while payments under the two no market information conditions were sensitive to the level of feedback, a finding to be discussed further below. Nevertheless, as suggested by the sustainability analysis, such payment differences did not lead to significant differences in total payment, and it is the total payment that directly impacted PWYW sustainability. This outcome occurred apparently because individual payment differences (whenever statistically significant) were typically in opposite directions for different player types, which then mitigated each other at the aggregate level.

To sum up, our statistical analysis of Experiment 2's data suggests that communication was highly effective in sustaining PWYW even when players only had limited feedback about each other's payments, or limited information about the market. But how did communication lead to efficient outcomes even when the players did not have full feedback or market information? We now examine further the data and chat log to address this question.

Thick description. The following insights emerge from the data and the chat log:

(1) Under fixed pricing, subjects paid according to predictions (i.e. Type Y players chose S and Type Z players chose R) in at least 90% of the observations in any condition;

(2) Consistent with Table 3, Figure 3, and the statistical tests, we do not observe significant differences between the conditions in terms of the groups' performance in sustaining PWYW, although groups in the partial feedback/no market information condition tended to do slightly less well. Each condition had at least one group which, by the end of the session, had converged upon an equilibrium payment scheme that sustained PWYW. There were a variety of ways by which the group attempted to "solve" the problem of coordination by mutually committing to a payment scheme, with the equi-earnings scheme being a relatively frequent, but by no means dominant, outcome. In general, high efficiency and stable sustenance of PWYW were associated with the players arriving at the equi-earnings scheme. More specifically:

(a) In the full feedback/full market information condition, one group – which was exceptionally unstable in sustaining PWYW – hovered between the payment schemes [Type Y: 200 tokens; Type Z: 0 tokens] and [Type Y: 0 tokens; Type Z: five players 70 tokens, one player 50 tokens]. Another group in the same condition – which managed to sustain PWYW well – arrived at the payment scheme [Type Y: 140 tokens; Type Z: 20 tokens]. Yet another group in that condition sustained PWYW consistently by the equi-earnings scheme;

(b) In the full feedback/no market information condition, one group transitioned from [Type Y: 170 tokens; Type Z: 10 tokens] to [Type Y: 167 tokens; Type Z: 11 tokens] throughout the session, which brought it closer to the equi-earnings scheme. Two groups sustained PWYW consistently by the equi-earnings scheme. The remaining two groups also often managed to sustain PWYW by the equi-earnings scheme, but with occasional destabilizing fluctuations that would fail to ensure continuous PWYW provision;

(c) In the partial feedback/full market information condition, one group was already playing the equilibrium [Type Y: 158 tokens; Type Z: 14 tokens] in games 3 and 4, and then switched to the equi-earnings scheme in game 5. Another group sustained PWYW consistently by the equi-earnings scheme;

(d) In the partial feedback/no market information condition, no group sustained PWYW consistently from early on, although total PWYW payment still managed to be higher than the threshold in 66.1% of the PWYW rounds across all groups. Moreover, one group had been largely successful in sustaining PWYW from game 3 onwards, though often not with an equilibrium payment scheme except in the last five games, when the group played an equi-earnings equilibrium consistently.

Groups that did not exhibit stable sustenance of PWYW could still often sustain PWYW for at least 45% of the played rounds except for one group in the partial feedback/full market information condition (35%), and two groups in the partial feedback/no market information condition (more than 20%).

(3) An inspection of the chat log shows that subjects in all conditions had the same concerns, and made use of chat to cooperate in the same way, as described for Experiment 1 in point (4) and (5) of the Thick description of that experiment’s Analysis and Results section. That is, chat was used by the group to arrive at a PWYW-sustaining payment scheme, then expressing their commitment to the “social contract” that bound them to the scheme while admonishing each other to be “honest” and to not “cheat”. Partial feedback or no market information could present obstacles to coordination through chat, but the obstacles were not necessarily significant, nor were they insurmountable. Moreover, there is evidence that:

(a) Whether feedback was full or partial was not crucial to the functions of the chat in sustaining PWYW. First, chat facilitated coordination partly because the group could then mutually agree on a payment scheme, and such agreement could be reached independently of whether the players observed each other’s previous payments. Second, even when there was full feedback on specific payments, subjects remained anonymous in the online network environment of the experiment, so that “cheaters” violating the “social contract” could not be personally identifiable. On the other hand, even when feedback was partial, all that the group needed to know in order to maintain the “social contract” was whether there was any cheating (i.e., whether the total payment was less than expected), not any further details. Nevertheless, full feedback about the choices and payments of every player did seem to facilitate the group’s own “market research” effort when they had no market information, as explained below;

(b) In the no market information conditions, subjects might be able to figure out the distribution of the types of players in the following ways: (i) they could disclose their types to each other (even though their disclosures were not necessarily credible); (ii) they could first assign a normatively acceptable payment scheme to each other (such as some approximate form of equi-earnings scheme that guaranteed a “decent” payoff of similar magnitude to every type of player) and then deduce from the feedback what the distribution might be. Such an approach was especially feasible with full feedback;

(c) In fact, as can be seen in Table 3, Figure 3, our statistical analysis, as well as point (2)(c) in this section, full feedback/no market information groups could sustain PWYW slightly better than full feedback/full market information groups. The average payment by type in the former condition is also very close to the equi-earnings equilibrium (see Table 3). Our inspection of the chat log suggests that, when there was no market information, the group’s effort to understand the distribution of player types among themselves might have led to increased interactions that further improved group bonding and the strength of the “social contract”. Yet it appears that this could only happen when there was full feedback, so that it was relatively easy for the group to determine market information through the feedback.

To conclude, Experiment 2’s data suggests that chat could sustain PWYW provision even when subjects had limited feedback about each other’s payments, or limited information about the laboratory market. This occurred because: (a) chat helped to establish a “social contract” among subjects, and knowledge of whether the total payment reached threshold or not was sufficient for the monitoring of the “social contract”; and (b) subjects could quickly find out information about the market by disclosing their private information to each other, or through inferences based on the received feedback (especially when there was full feedback). We explore the managerial implications of these observations in the following section.

Discussion and Conclusions

In this paper, we offer a perspective on PWYW that augments the literature on this pricing policy. We demonstrate that, if the seller and consumers interact repeatedly, and future provision of PWYW depends on whether current revenue under PWYW is sufficiently large for the seller to achieve financial goals, then paying under PWYW can be likened to paying for a threshold public good. An implication, which we demonstrate through analyzing a simple model, is that continuous provision of the PWYW option can be profitable even when all consumers are purely self-interested, independent of any social preferences towards the seller.

In Experiment 1, we observe that if there was anonymous online chat prior to paying, then efficient tacit coordination at the payment stage could be accomplished to achieve continuous provision of PWYW. Such long-term provision of PWYW is generally an efficient outcome for the seller and for consumers. We find that communication was important since subjects could then collectively agree on and socially “contract” themselves to commit to a payment scheme that constitutes a PWYW equilibrium (see van der Kragt et al, 1983; Kerr & Kaufman-Gilliland, 1994). In the process, if individual subjects’ behavior was misaligned with respect to that payment scheme, social influence could help establish a norm of “appropriate” behavior (Weber et al., 2004) to eliminate the misalignment.

In Experiment 2, we find that chat could sustain PWYW provision even when subjects only had feedback about total payment under PWYW, but no feedback about each other’s specific payments, as well as when they lacked market information pertaining to the distribution of valuations among themselves. This occurred because: (a) chat established a “social contract” among subjects, and knowledge of whether the total payment reached threshold or not was sufficient for the monitoring of the “social contract”; and (b) subjects could quickly find out information about the market by disclosing their private information to each other, or through inferences based on the received feedback (especially when there was full feedback).

From the perspectives of social dilemma research and research on communication and “cheap talk” in experimental economics, our work adds to the few studies on non-face-to-face communication in threshold public good provision. As mentioned in the Literature Review section, much previous research on communication in threshold public good provision focused on face-to-face communication, starting with van der Kragt et al. (1983). However, among the examples that our model captures stylistically, most involve online PWYW sellers receiving payments from consumers who seldom, if ever, interact face-to-face. Instead, consumers in those contexts often interact through social media that have a chat-room flavor, in the sense that users can freely communicate while preserving anonymity. Bochet et al. (2006) suggest that online chat-room-style communication might not be as efficacious as face-to-face communication in classic public good games; our results therefore provide much needed affirmative evidence on whether online chat-room-style communication might facilitate efficient provision of threshold public goods. Our findings from Experiment 2 further confirm the power of online communication when information about other players’ payments or valuations was limited; in this respect, we contribute to the few previous studies on feedback in public good games, such as Fehr and Gächter (2000) and Nikiforakis (2010).

Managerial Implications

Our results suggest a way for PWYW to succeed, namely that the seller clearly announces its intention to switch from PWYW to a fixed price should a revenue threshold not be achieved, and this explicit “threat” is perceived to be credible by consumers. Our insight mirrors what Jimmy Wales has been trying to accomplish with his repeated pleas to users of Wikipedia content, as discussed at the beginning of this paper. Although Wales’ pleas did not necessarily specify a clear threshold, the Wikimedia Foundation typically announced a target that appeared at the top of every Wikipedia page in donation campaigns.

We also suggest that PWYW does not have to be a loss leader strategy that needs to be subsidized by derivative, secondary revenue. In markets in which there is a segment of “die-hard” consumers who can potentially influence casual consumers, PWYW could be a feasible pricing policy. PWYW can be successful as long as (1) there is repeated interaction between the seller and consumers, (2) the threshold set by the seller is not too high, (3) consumers are very forward looking, (4) the fixed price is sufficiently high to be a deterrent for consumers, (5) a sufficient number of consumers derive high utility from the seller’s products, and (6) normative payments can be established among consumers through online communication platforms such as chat forums.

Moreover, whether the seller publicizes a breakdown of payments is not crucial as long as there is effective communication among the major contributing consumers, since the mere feedback of total payment can be sufficient to bind them to their promises. Also, through communication, consumers could disclose their valuations of the target product to each other. At the same time, repeated interactions could help consumers figure out the composition of types of consumers in the market by comparing the payments agreed and committed to over the communication platform with the actual payments. This is especially true when the seller opts to publicize a more detailed breakdown of payment distributions.

For independent music bands, it is possible to meet the conditions for sustained PWYW that we have identified. A small group of lovers of non-mainstream music likely constitute the band’s core customers, who form a closely knit social network with frequent online communications. This segment probably has the ability to influence a “casual” segment, comprising friends and relatives, to patronize the band and pay sufficiently high prices to avoid the prospect of a high fixed price. Similarly, a restaurant serving a local community might meet the criteria as well. The restaurant could build a brand reputation for being sensitive to social welfare issues, and thus attract a “fan base” which then influences their networks to patronize the restaurant and pay sufficiently high prices to avoid the prospect of a higher fixed price.

Limitations and Future Research

Our experiments were carried out with each “market” consisting of only eight consumers. Laboratory conditions do not allow us to conduct experiments with group sizes that approximate naturally occurring markets. It would therefore be important to conduct field experiments in the future to see if the insights we gain from our experiment generalize to larger markets.[9] More crucially, our idea of increasing consumers’ incentive to pay (in fact, incentivizing even the most “selfish” consumers to pay) by communicating a credible threat has not been tested empirically in the field.

Consumers may also derive procedural utility from PWYW pricing and may wish to encourage the seller to continue using PWYW, and therefore may choose to pay sufficiently high prices to sustain a PWYW outcome. For example, 37% of the consumers (out of 12,643) who responded to a survey conducted by 2D Boy after paying what they wished while downloading the "World of Goo" game selected the option "I like the pay-what-you-want model and wanted to support it" in answer to the question "Why did you choose that amount?".[10] Future research might take these factors into account to add richness to the theoretical argument and practical applicability of PWYW pricing.

Finally, extensions could incorporate competition, according to which each of a number of competing sellers can decide between PWYW and fixed pricing for its product in every period (see Schmidt et al., 2014, for a related duopolistic experiment). The model might also consider a highly stochastic market environment in which consumer tastes and outside options change from period to period. In these scenarios, we still expect that equilibria with profitable PWYW could exist over some parameter ranges, as long as sufficient numbers of repeated interactions occur and the seller might switch to fixed pricing or even shut down if revenues from PWYW are not sufficient. However, coordination issues remain, and experiments on these extensions could yield insights on how PWYW could be sustained in complex business environments.

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Footnotes

[1] http://wikimediafoundation.org/wiki/Keep_Wikipedia_Free (retrieved June 16, 2014)

[2] Another example is Humble Bundles, a series of collections of video games, music albums, and eBooks, that are sold and distributed online. The bundles are typically offered on a semi-regular basis under PWYW during a two-week period; consumers can divide up their payments among the creators of the bundles, the Humble Bundle platform, and charity, in any proportion of their choosing. Several of the bundles have brought in over $1 million and the 20 completed bundles as of January 2013 have raised more than $32.7 million. Clearly, PWYW has been profitable for Humble Bundle. However, the vendor is aware of the fact that there is no guarantee that the policy will continue to be profitable. Specifically, the company states in their website: "*So far*, we've let people name their price …" and emphasizes that "We may, without prior notice, change the Service; stop providing the Service or features of the Service, to you or to users generally; or create usage limits for the Service". Consumers understand the fragility of the system and on various social media sites, these consumers encourage each other to pay Humble Bundle enough to "help keep it going" in addition to allocating payment to developers and charity (information retrieved from http://www.humblebundle.com/ on June 16, 2014).

[3] It is not essential for the distribution of u_i s in the population to be known to all consumers. As we shall show, to attain an efficient equilibrium, each consumer only needs to know how much he/she needs to pay under PWYW, and practically nothing else.

[4] Obviously, in the interest of parsimony, our model ignores several possible complexities, such as the charging of different fees for different pages, per use fees, consumer uncertainty about the veracity of the prospective fixed fee, and how permanent that fixed fee might be, unstable consumer preferences (different utilities at different time) and the like.

[5] Technically, this is the characteristic of Markov perfect equilibria (Maskin & Tirole, 1988).

[6] In additional sessions not reported here in detail, we experimented on the same setup as in Experiment 1 but with a threshold of 680 tokens, which was higher than the theoretical maximum of 619.2 tokens at which PWYW equilibria are still feasible. As expected, PWYW was not sustainable in those sessions even with chat and regardless of framing. At the other extreme, we also experimented on a setup with a threshold of zero token (i.e., the seller continued to offer PWYW unconditionally); we found that, in those sessions, subjects rarely paid the seller, even with chat and under rich framing. These latter results indicate that altruism-motivated paying behavior was not important in our laboratory setting. In the interest of brevity, we do not discuss these additional sessions in the paper. Our results are obtainable upon request.

[7] We ran a pilot session with unlimited chat allowed throughout the experiment. The results were similar to the chat condition reported here, but it took subjects almost three hours to finish the session. Therefore, for practical reasons, we chose a limited duration structure for our main experiment. The allowed duration for chat before each game was: (1) Practice Game to Game 6: 3 minutes; (2) Game 7 to Game 13: 2 minutes; (3) Game 14 to Game 20: 1 minute.

[8] Consistently, analysis on the effect of market information controlling for feedback shows that, given full feedback, Type Y players paid marginally less to *S* under PWYW when they had full, relative to no, market information ($p = .051$) while Type Z players paid significantly more ($p < .01$); on the other hand, given partial feedback, Type Y players paid significantly more with full compared with no market information, while Type Z players paid significantly less (both at $p < .01$). That is, the full market information conditions lay “mid-way” between the other two conditions in terms of individual payments.

[9] The fan base needs not be very large for profitable application of our proposed pricing policy. For example, musician Matthew Ebel said that he makes 26.3% of his net income from just 40 hard-core fans (http://www.musicthinktank.com/blog/in-defense-of-1000-true-fans-part-ii-matthew-ebel.html, retrieved June 16, 2014) which is consistent with Kevin Kelly's theory that to be a success as a content creator, you just need 1,000 "true fans". (http://www.kk.org/thetechnium/archives/2008/03/1000_true_fans.php, retrieved June 16, 2014).

[10] We thank Ron Carmel and Kyle Gabler, the 2D Boy team, for sharing the survey data with us.

Table 1

Players’ valuations in tokens in the experiments.

	Seller offering conditional PWYW (“Playa” in rich frame, “S” in neutral frame)	*Outside option* (“Quello” in rich frame, “R” in neutral frame)
“Fan of Playa” or “Type Y” (two players)	201	0
“Casual Listener” or “Type Z” (six players)	49	49

Note. Other parameters that were common in all conditions include: per-round discount factor = δ = .9; threshold for PWYW continuation = π = 400 tokens; fixed price of the outside option = 48 tokens; the fixed pricing regime of Playa/ S had p =200 tokens.

Table 2

Mean payments in PWYW rounds to focal seller S and the mean number of rounds with sustained PWYW in Experiment 1, by coordination mechanism manipulation.

	Mean payment to S in tokens in a PWYW round (SD)		*Mean no. of rounds in session (SD)*	
Coordination mechanism	*Type Y Player*	*Type Z Player*	*played*	*with sustained PWYW*
No mechanism (control)	82.82 (86.34)	20.79 (55.91)	191.50 (4.87)	10.50 (9.96)
Chat	160.76 (21.08)	12.28 (3.29)	193.00 (5.15)	167.50 (18.24)
Suggestion	136.85 (65.23)	11.67 (14.80)	191.88 (4.67)	35.88 (37.95)

Note. The standard deviations of the PWYW payment entries are calculated with the payment to *S* in each PWYW round by each player of the relevant type as the unit of observation. The standard deviations of the number of rounds played/with sustained PWYW are calculated with group as the unit of observation. Data across framing manipulations have been aggregated.

Table 3

Mean payments in PWYW rounds to focal seller S and the mean number of rounds with sustained PWYW in Experiment 2, by condition.

		Mean payment to S in tokens in a PWYW round (SD)		*Mean no. of rounds in session (SD)*	
Feedback	*Market information*	*Type Y Player*	*Type Z Player*	*played*	*with sustained PWYW*
Full	Full	157.26 (37.79)	15.29 (16.41)	189.80 (1.64)	139.00 (31.91)
	No	164.01 (13.98)	12.35 (5.32)	192.60 (8.32)	152.40 (29.31)
Partial	Full	159.52 (16.67)	14.62 (7.55)	194.00 (7.48)	133.20 (60.85)
	No	148.87 (34.43)	20.95 (23.01)	190.60 (4.16)	93.80 (50.69)

Note. The standard deviations of the PWYW payment entries are calculated with the payment to *S* in each PWYW round by each player of the relevant type as the unit of observation. The standard deviations of the number of rounds played/with sustained PWYW are calculated with group as the unit of observation.

Figure 1. Sequence of decisions in each round in the experiments.

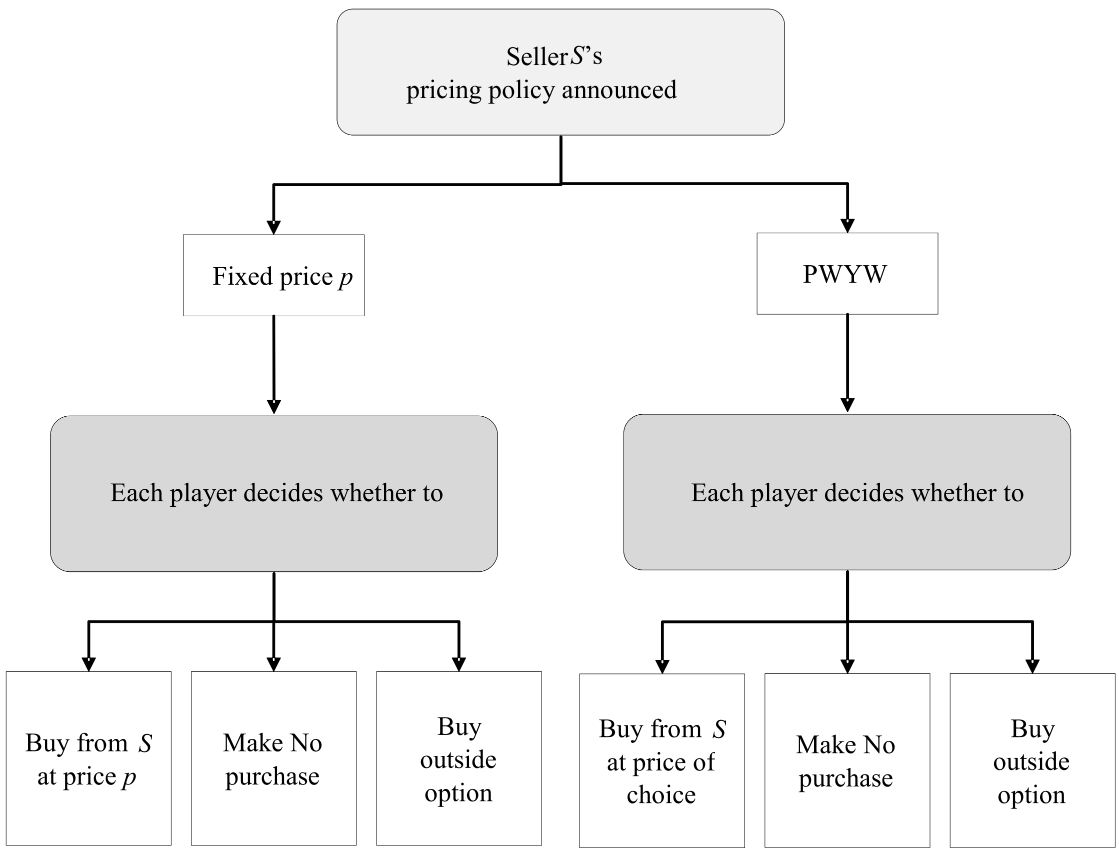
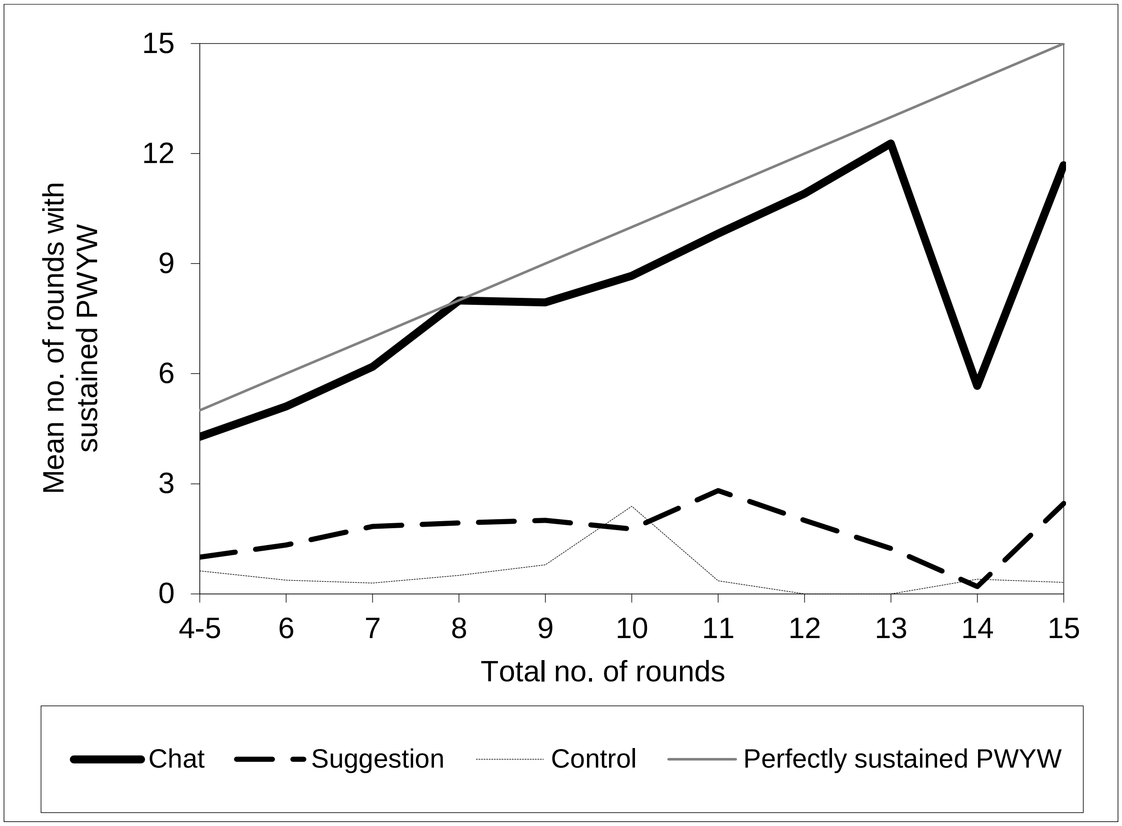
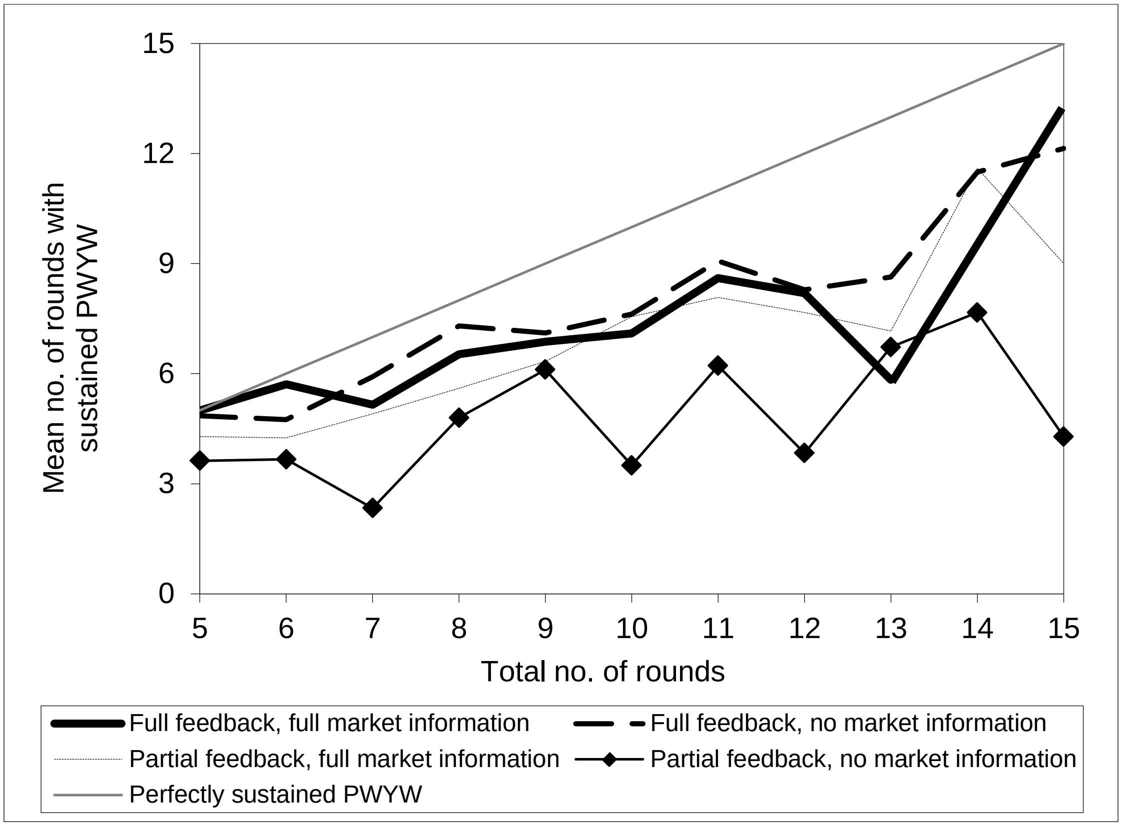


Figure 2. Mean number of rounds with sustained PWYW by length of game (i.e., total number of rounds in the game) and coordination mechanism manipulation: Experiment 1.



Note. Data across framing manipulations have been aggregated.

Figure 3. Mean number of rounds with sustained PWYW by length of game (i.e., total number of rounds in the game) and condition: Experiment 2.



Appendix

Experimental Instructions for Experiment 1, Chat Conditions

<table>
<tr><th>Neutral Frame</th><th>Rich Frame</th></tr>
<tr><td>INSTRUCTIONS</td><td>THE ONLINE MUSIC GAME

INSTRUCTIONS</td></tr>
<tr><td colspan="2">In this study you will make many decisions. Your payment at the end of the study will depend on your own decisions as well as the decisions of others you play with.

During this study you will play the same game 20 times, and each game will consist of a number of rounds.</td></tr>
<tr><td colspan="2">Description of the Game</td></tr>
<tr><td>The game is played by 8 players.

In each round, a player can choose one of three options: option S or option R or option N.</td><td>The game is played by 8 players. Two bands, the Playa band and the Quello band, upload a new song to their site every round of the game and allow people to listen to it online.

In each round, a player can either listen to a Playa song or to a Quello song or to none.</td></tr>
<tr><td colspan="2">Types of Players</td></tr>
<tr><td>There are two types of players, who differ in how much they value each option.

1. Type Y players – To these players, option S is equivalent to gaining 201 tokens (the experimental currency used in this study that will be later converted to real money); but options R and N are equivalent to gaining nothing i.e. 0 token.

2. Type Z players – To these players, options S and R are equivalent to gaining 49 tokens, but option N is equivalent to gaining nothing i.e. 0 token.</td><td>There are two types of players, who differ in how much they like each band.

1. Fans of Playa – these people love Playa's music but not Quello's. To them, listening to a Playa song is equivalent to gaining 201 tokens (the experimental currency used in this study that will be later converted to real money); but listening to a Quello song is worth nothing to them, and is in fact equivalent to gaining 0 token.

2. Casual Listeners – these people like listening to music in general but do not prefer one band over the other. Listening</td></tr>
</table>

To sum up:

Type of player	Gain from selecting one option		
	S	***R***	***N***
Y	201 tokens	0 token	0 token
Z	49 tokens	49 tokens	0 token

Of the 8 players in the game, <u>two</u> are of Type Y and <u>six</u> are of Type Z

to any song – be it Playa or Quello – means the same to them, and is always equivalent to gaining 49 tokens.

To sum up:

Type of player	Gain from listening to a song of	
	Playa	***Quello***
Fan of Playa	201 tokens	0 token
Casual Listener	49 tokens	49 tokens

Of the 8 players in the game, <u>two</u> are Fans of Playa and <u>six</u> are Casual Listeners.

We will assign these roles to you and the other players before each game begins. Every player's role will be fixed in all the rounds of the same game, but will be re-assigned from game to game.

Each player will be of Type Y in 5 games and Type Z in 15 games.

Each player will be a Fan of Playa in 5 games and a Casual Listener in 15 games.

Payment

To choose an option, you may need to pay. Different options have different payment schemes:

- <u>The payment scheme for option S</u>. In the first round of every game, anyone who chooses S can pay as he/she wishes. In other words, if you choose S you may pay nothing (0 token), or you may pay any number of tokens you wish; it is entirely up to you how much you pay for S.
  However, this scheme of "pay as you wish" for S will continue to the next round only if the total payment for S from all those who have chosen S in this round is at least <u>400</u> tokens; otherwise, S will cost <u>200</u> tokens in all future rounds of the game.
  In general, **as long as the total payment**

To listen to a song, you may need to pay. The two bands have different payment schemes:

- <u>Playa payment scheme</u>. In the first round of every game, Playa allows every listener to pay as he/she wishes. In other words, if you listen to a Playa song you may pay nothing (0 token), or you may pay any number of tokens you wish; it is entirely up to you how much you pay Playa for its song.
  However, Playa will continue to carry out this "pay as you wish" scheme only if it receives at least <u>400</u> tokens from all those who have listened to the Playa song in this round; otherwise, it will charge a fixed fee of <u>200</u> tokens per song in all future rounds of the game.
  In general, Playa's management decides

for S is at least 400 tokens in a round, the payment for selecting S will continue to be "pay as you wish"; but once the total payment for S in a round is less than 400 tokens, the payment scheme for S will change and S will cost 200 tokens per round in all future rounds of the game. • The payment scheme for option R. You pay 48 tokens to choose R in a round, and this is the same in all rounds. • The payment scheme for option N. You pay nothing i.e. 0 token to choose N in a round, and this is the same in all rounds.	that, **as long as the total payment that Playa receives from its listener(s) is at least 400 tokens in a round, Playa will continue to allow every listener to pay as he/she wishes; but once Playa receives less than 400 tokens in a round, it will change its payment scheme and will charge every listener a fixed fee of 200 tokens per round in all future rounds of the game.** • Quello payment scheme. Quello always charges a fixed fee of 48 tokens per song per round.
How much does a player earn from choosing an option in a round?	***How much does a player earn from listening to a song in a round?***
Your (and every other player's) earnings from choosing an option in a round are calculated as follows: **Earnings from choosing an option** **= Gain from choosing the option – payment** Choosing R If a Type Z player chooses R in a round, he/she gains 49 tokens, but has to pay 48 tokens. Thus his/her earnings in that round are equal to: Earnings = 49 tokens – 48 tokens = 1 token. So a Type Z player earns 1 token for choosing R in a round. If a Type Y player chooses R in a round, he/she gains 0 token, but has to pay 48 tokens. Thus his/her earnings in that round are equal to:	Your (and every other player's) earnings from listening to a song in a round are calculated as follows: **Earnings from listening to a song** **= Gain from listening to the song – payment** Listening to a Quello song If a Casual Listener listens to a Quello song in a round, he/she gains 49 tokens from listening to the song, but has to pay 48 tokens for the song. Thus his/her earnings in that round are equal to: Earnings = 49 tokens – 48 tokens = 1 token. So a Casual Listener earns 1 token for listening to a Quello song in a round. If a Fan of Playa listens to a Quello song in a round, he/she gains 0 token from listening to the song, but has to pay 48 tokens for the song. Thus his/her earnings in that round are

Earnings = 0 token – 48 tokens = -48 tokens.

So a Type Y player *loses* 48 tokens for choosing R in a round.

To sum up:

Type of player	***Earnings from choosing R***
Y	-48 tokens
Z	1 token

Choosing S

If a player chooses S in a round, and if S has a fixed cost of 200 tokens in that round, the calculation of earnings is similar to that for choosing R, but with a cost of 200 tokens instead of 48 tokens. But if the payment scheme for S is "pay as you wish" in that round, the payment and thus earnings of a player may vary from player to player depending on how much (if at all) each player pays. To sum up:

Type of player	***Earnings from choosing S in a round under "pay as you wish" (supposing player pays* m *tokens)***	***Earnings from choosing S in a round under fixed cost (of 200 tokens per round)***
Y	(201 – m) tokens	(201-200) = 1 token
Z	(49 – m) tokens	(49-200) = -151 tokens

If a player chooses option N in a round, equal to:

Earnings = 0 token – 48 tokens = -48 tokens.

So a Fan of Playa *loses* 48 tokens for listening to a Quello song in a round.

To sum up:

	Earnings from listening to a Quello song
Fan of Playa	-48 tokens
Casual Listener	1 token

Listening to a Playa song

If a player listens to a Playa song in a round, and if Playa charges a fixed fee of 200 tokens in that round, the calculation of earnings is similar to that for listening to a Quello song, but with a payment of 200 tokens instead of 48 tokens. But if Playa allows every listener to pay as he/she wishes in that round, the payment and thus earnings of a player may vary from player to player depending on how much (if at all) each player pays. To sum up:

	Earnings from listening to a Playa song in a round under "pay as you wish" (supposing player pays* m *tokens)	***Earnings from listening to a Playa song in a round under fixed fee (of 200 tokens per round)***
Fan of Playa	(201 – m) tokens	(201-200) = 1 token
Casual Listener	(49 – m) tokens	(49-200) = -151 tokens

If a player does not listen to any song in a round, his/her earnings in that round is 0 token.

<table>
<tr><td>his/her earnings in that round is 0 token.</td><td></td></tr>
<tr><td colspan="2">How does the game continue after a round is finished?</td></tr>
<tr><td colspan="2">A round is finished when all players have made their decisions for that round. After that, the computer will randomly select whether the game will end or whether it will proceed to the next round. After each round, there is a 90% chance that the game will continue to the next round and a 10% chance that the game will end immediately.</td></tr>
<tr><td colspan="2">The chat forum</td></tr>
<tr><td colspan="2">Before each game, there is a chat forum with limited duration through which players in the same group can send messages to each other. You are allowed to:
1. chat 3 minutes before each game in Games 1 to 6,
2. chat 2 minutes before each game in Games 7 to 13, and
3. chat 1 minute before each game in Games 14 to 20.
1.</td></tr>
<tr><td colspan="2">Procedures</td></tr>
<tr><td>You will enter all your decisions via the computer terminal in front of you.

As each game begins, you will see on the computer screen whether you have been randomly assigned to be a Type Y or a Type Z player. Remember that: (1) there are two Type Y players and six Type Z players in every game; (2) every player's role (Type Y/Type Z) will be fixed in all the rounds of the same game, but will be re-assigned from game to game; and (3) each player will be of Type Y in 5 games and Type Z in 15 games.

At the beginning of each round, you will see a Decision Screen such as Decision Screens (1) to (4) (Please refer to the handout on your desk labeled "Decision Screens".)

A Decision Screen lists the following from top to bottom:
• Whether you are a Type Y or a Type Z player.
• The number of the current game and</td><td>You will enter all your decisions via the computer terminal in front of you.

As each game begins, you will see on the computer screen whether you have been randomly assigned to be a Fan of Playa or a Casual Listener. Remember that: (1) there are two Fans of Playa and six Casual Listeners in every game; (2) every player's role (Fan of Playa/Casual Listener) will be fixed in all the rounds of the same game, but will be re-assigned from game to game; and (3) each player will be a Fan of Playa in 5 games and a Casual Listener in 15 games.

At the beginning of each round, you will see a Decision Screen such as Decision Screens (1) to (4) (Please refer to the handout on your desk labeled "Decision Screens".)

A Decision Screen lists the following from top to bottom:
• Whether you are a Fan of Playa or a Casual Listener.
• The number of the current game and</td></tr>
</table>

current round. • The payment scheme of S, R and N in the current round. • Three buttons that correspond to the decisions you can make in that round, i.e. (from left to right) (1) choose S; (2) choose N; (3) choose R. • Under each button, you will see a column of numbers that include: (i) Your gain in tokens if you choose the option labeled on the button; (ii) The cost you would have to pay for your decision, except if your decision is to choose S under "pay as you wish" (see (iv)); (iii) Your earnings as a result of your decision, except if your decision is to choose S under "pay as you wish" (see (iv)); (iv) If the payment scheme for S is of "pay as you wish" in the current round, then, in the space under the "S" button where the cost would be stated for other decisions, there is a blank. You may enter in the blank any potential payment that you are considering. After that, you may click the "Calculate" button to calculate your earnings from choosing S with that payment. You may repeat this process for as many potential payments as you like.	current round. • The payment scheme of Playa and Quello in the current round. • Three buttons that correspond to the decisions you can make in that round, i.e. (from left to right) (1) listen to a Playa song; (2) listen to no song; (3) listen to a Quello song. • Under each button, you will see a column of numbers that include: (v) Your gain in tokens if your decision is as labeled on the button; (vi) The fee that you would have to pay for your decision, except if your decision is to listen to a Playa song under "pay as you wish" (see (iv)); (vii) Your earnings as a result of your decision, except if your decision is to listen to a Playa song under "pay as you wish" (see (iv)); (viii) If Playa allows every listener to pay as he/she wishes in the current round, then, in the space under the "Playa" button where the fee would be stated for other decisions, there is a blank. You may enter in the blank any potential payment that you are considering. After that, you may click the "Calculate" button to calculate your earnings from listening to a Playa song with that payment. You may repeat this process for as many potential payments as you like.
To make a decision, click the button labeled with your choice – except that if the payment scheme for S is "pay as you wish" in the current round, and you decide to choose S, you will need to: (1) enter your payment in the blank space under the "S" button, (2) click the "Calculate" button to see what your earnings will be, and (3) click the "S" button.	To make a decision, click the button labeled with your choice – except that, if Playa allows every listener to pay as he/she wishes in the current round, and you decide to listen to a Playa song, you will need to: (1) enter your payment in the blank space under the "Playa" button, (2) click the "Calculate" button to see what your earnings will be, and (3) click the "Playa" button.
Players choose options simultaneously. After	Players make listening decisions

all players have made decisions in a round, a feedback screen will appear that shows: (1) every player's decision (S/R/N), payment, and earnings in that round; (2) the total payment for each option in that round. If the payment scheme for S is "pay as you wish" in the current round, the feedback screen will also show: (a) whether the total payment for S reaches 400 tokens; and (b) whether the "pay as you wish" payment scheme for S will continue in the next round of the game, or will change to a fixed cost in all future rounds of the game.	simultaneously and without communication with each other. After all players have made decisions in a round, a feedback screen will appear that shows: (1) every player's decision (Playa/Quello/Neither), payment, and earnings in that round; (2) the total payment received by each band in that round. If Playa allows every listener to pay as he/she wishes in the current round, the feedback screen will also show: (a) whether the total payment received by Playa reaches 400 tokens; and (b) whether Playa will continue to allow every listener to pay as he/she wishes in the next round of the game, or will charge a fixed fee in all future rounds of the game.

Afterwards, the computer will select whether the game will proceed to the next round or will end. Remember that there is a 90% chance that the game will proceed to the next round, and a 10% chance that it will end.

Once a game is ended, the next game will begin – unless you have already come to the last (20^{th}) game, after which the study will be finished.

You will play 20 games with the same group of 8 players (including yourself).

Payment

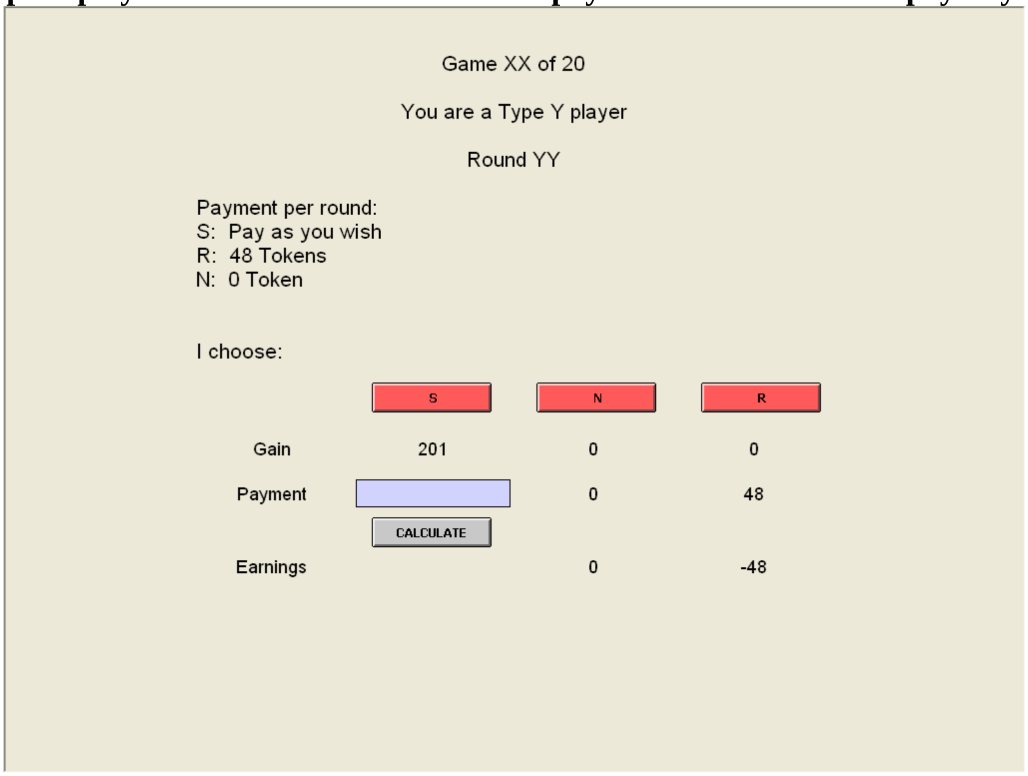
After all 20 games are finished, we will choose 5 games at random and pay you your total earnings from all the rounds in those games at a rate of HK$1 = 10 tokens. If you have any questions, please raise your hand and the study coordinator will come to speak to you.

If you wish to participate in this study, please sign the consent form. Afterwards, when you are ready to start, please click the "START" button on the screen. You will then begin to play 1 practice game to familiarize yourself with the study; the practice game will not be chosen for calculation of your final payment. After the practice game is finished, you will play the 20 games of the study.

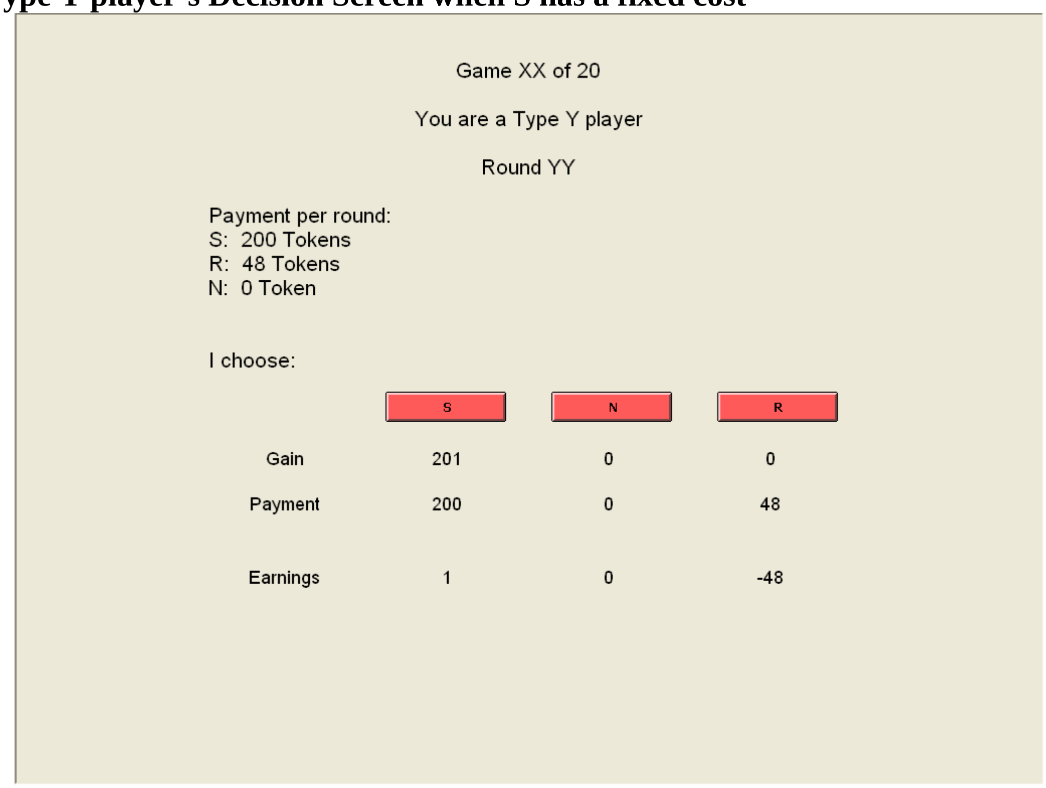
Please wait patiently until all other players are ready to start.

Decision Screens (supplementary handout to the experimental instructions)

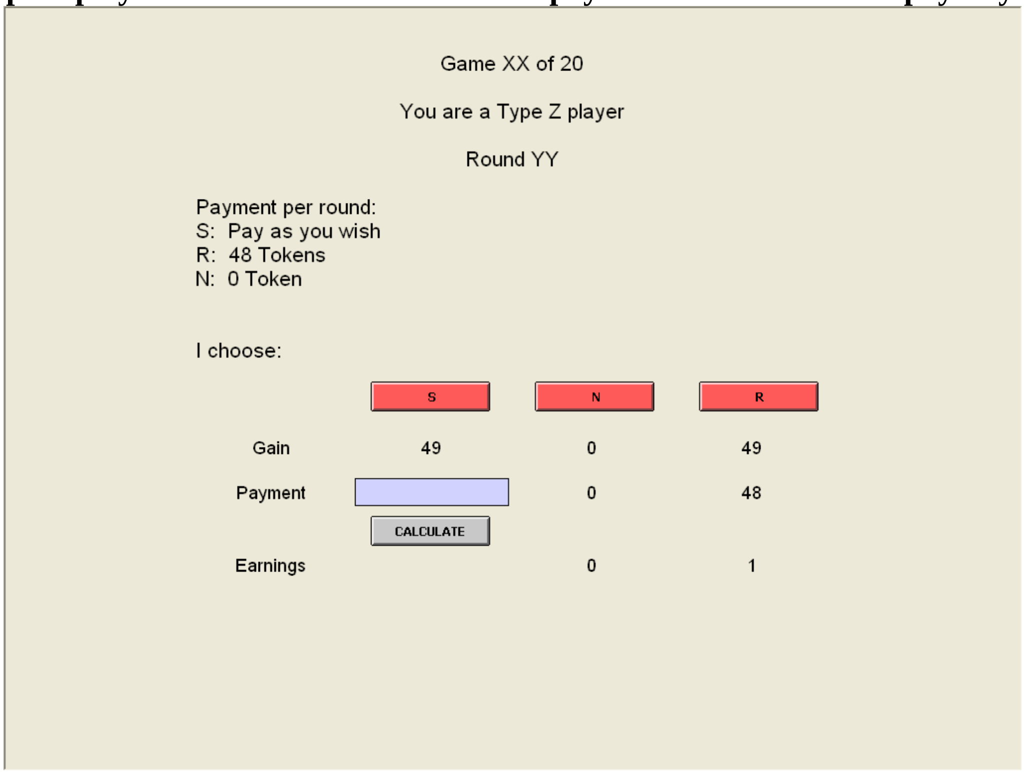
(1) A Type Y player's Decision Screen when the payment scheme for S is "pay as you wish"



(2) A Type Y player's Decision Screen when S has a fixed cost



(3) A Type Z player's Decision Screen when the payment scheme for S is "pay as you wish"



(4) A Type Z player's Decision Screen when S has a fixed cost