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My Peers are Watching me - Audience and Peer Effects in a Pay-What-You-Want Context

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Abstract

We experimentally investigate two relevant drivers of payments in voluntary settings: the effects of audience and peers. Our 2×2 between-subjects design varies the interpersonal closeness of buyers (*Strangers* vs. *Peers*) and the observability of their payments to other buyers (*Anonymous* vs. *Public*). This allows us to enrich the research on both drivers and identify whether payment observability (audience effect), the presence of known others (peer effect), or the combination of both affects voluntary payments. Payments are, on average, higher if they are made public and if buyers feel close to each other. While the effect of audience and peers on payments is additive in total, we do not find an interaction effect, if payments are observed by peers.

JEL classifications: C91, D03, L11

Keywords: social preferences; experiments; social image concerns; Pay-What-You-Want; interpersonal closeness

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1 Introduction

The "Metropolitan Museum of Art" in New York, the restaurant "Der Wiener Deewan" in Vienna, the "Nottingham Playhouse" in Nottingham and many more are doing it: they use the pricing mechanism Pay-What-You-Want (PWYW). The buyer in a PWYW scheme is allowed to choose any price he wants to pay for a product, including zero. Referring to Kim et al. (2009), PWYW can be defined as a participative pricing mechanism which "delegates the whole price determination to the buyer" (p. 45). In the last decade the Pay-What-You-Want pricing mechanism has not only been implemented by a variety of companies, but has likewise gained substantial attention from researchers in the fields of marketing and behavioral economics (see Gerpott, 2017; Greiff and Egbert, 2018, for recent reviews). PWYW is regarded as an innovative pricing strategy with the potential to attract more and especially new buyers, to reduce the uncertainty to test a product and to increase market penetration (Kim et al., 2009, 2014; Schmidt et al., 2015).

Although neoclassical economic theory would predict that in a PWYW scheme all buyers would behave selfish and pay nothing, there is substantial empirical evidence that people pay positive amounts (Kim et al., 2009; Regner and Barria, 2009; Gneezy et al., 2010). The success of a PWYW pricing mechanism heavily depends on the characteristics of the purchasing situation.

One potential instrument to increase payments is payment observability, i.e. making the payment decision publicly known to an audience (e.g., other buyers) instead of keeping it private knowledge. As an illustration, think about a theater visitor, who is surrounded by other visitors next to him at the counter and is observed during his payment decision. He might pay more to signal his generosity towards the surrounding others compared to a situation where he is not aware of other visitors at the ticket counter. The resulting higher payments due to the payment observability is also known as audience effect and can be explained by social image concerns (Bénabou and Tirole, 2006; Ellingsen and Johannesson, 2008; Andreoni and Bernheim, 2009).

When payments are observable it might be of importance who the audience is. This aspect emphasizes the social relationship between the visitor and the surrounding people during the payment decision. A behavioral change due to the presence of close others is known as peer effect. Psychological research indicates that being together and act in synchrony with peers results in entering a prosocial mindset (Wiltermuth and Heath, 2009; Reddish et al., 2013, 2016). In a PWYW setting this prosocial mindset might lead to higher payments, reflecting increased prosocial behavior towards the seller. This implies that the payment decision might vary conditionally on how close the visitor feels to the people surrounding him. It could be that other visitors, i.e. strangers, happen to be around at the ticket counter and this might be perceived as less close in contrast to a scenario where friends are around during the payment decision. If a visitor is together with known people it is furthermore unclear whether the mere presence

of close others already induces higher payments or whether it is necessary to make the payments public to influence the decision how much to pay.

Audience and peer effects are important phenomena – not the least in the context of PWYW – and they are conceptually different from each other. Existing studies investigating them in PWYW scenarios provide empirical evidence that other buyers increase payments (Hilbert and Suessmair, 2015; Schlüter and Vollan, 2015; Dorn and Suessmair, 2016, 2017), but their designs are not able to disentangle between the potential drivers of higher payments. Thus it remains unclear whether audience or peer effects, or the combination of both, are underlying motivators for increased payments.

Our study tests the effect of these factors by disentangling them in a controlled setting. Do payments differ between anonymous and public payment scenarios and how does the social relationship between the buyer and the surrounding people in these situations affect buyers' voluntary payments? More specifically, if the buyer consumes together with close others, does this closeness already lead to higher payments or does the closeness only have an effect if the payment decision is observed?

We address these questions by means of a laboratory experiment which adapts the Pay-What-You-Want game, first used by Schmidt et al. (2015). In a 2×2 between-subjects design we vary the observability of buyers' payments (*Anonymous* vs. *Public*) and the interpersonal closeness of buyers (*Strangers* vs. *Peers*). Thus, our design allows us to disentangle possible underlying mechanisms: audience effects (payment observation), peer effects (presence of known people), and their interaction as potential payment drivers. This approach is an advantage compared to existing studies, which were not able to identify the driving mechanisms.

We find that payments are, on average, higher if they are made public and if the buyers feel close to each other. While our results establish independent main effects of an audience and peers, they do not provide evidence for an interaction effect: although payments are highest when peers observe the payment decision, the audience and peer effects do not interact significantly. Our results document that being together with known people during the buying situation already increases the payments and that the observability of the payments has only an additive effect on payments on top of this peer effect.

Economic models of social image concerns consider the effect of an audience and also the interplay with the peer dimension (Bénabou and Tirole, 2006; Ellingsen and Johannesson, 2008; Andreoni and Bernheim, 2009). Our results suggest that the presence of others needs to be taken into account on its own as an explanatory factor of pro-social behavior.

The remainder of this paper is organized as follows: section 2 reviews the related literature. In Section 3 we outline the experimental design. Section 4 presents and discusses the results. Section 5 concludes.

2 Literature Review

Our paper contributes to three streams of literature: PWYW, audience effects, and peer effects. In the following we provide some background on audience and peer effects from the fields of economics, psychology and sociology, and review to what extent audience and peer effects have been studied in the setting of PWYW.

The focus of recent research in the field of PWYW has been on the motives of the voluntary payments and on success factors for a PWYW scheme. Several studies propose that the differences in payments can be explained by individual characteristics which cannot be influenced by the company, so-called personal-related factors (see, e.g., Greiff and Egbert, 2018; Kunter, 2015; Natter and Kaufmann, 2015). Especially internal reference prices, social norms and social preferences like fairness and reciprocity are assumed to influence the payment decision (see, e.g., Riener and Traxler, 2012; Kim et al., 2009; Regner, 2015). Another strand of research is investigating situational variables, which might play a role for the payment decision and the success of PWYW. Factors like external reference prices, time of payment and market structure have been identified as particularly powerful (Johnson and Cui, 2013; Feldhaus et al., 2018; Armstrong Soule and Madrigal, 2015; Regner, 2015; Schmidt et al., 2015; Krämer et al., 2017). Two aspects empirically explored already, but not disentangled conceptually so far in the context of PWYW, are audience and peer effects.

Audience effects are well investigated in psychology and have gained attention in economics as well. They are defined as a change in behavior due to the fact that other persons – the audience – are present and predominantly also observing the behavior (Wolf et al., 2015; Zajonc, 1965; Triplett, 1898).

Lab and field evidence from public good games and studies in the context of charitable giving confirm a positive effect on prosocial behavior if there is an audience. Generally, average contributions/transfers decrease with higher levels of anonymity provided (Hoffman et al., 1996; Andreoni and Petrie, 2004; List et al., 2004; Soetevent, 2005; Alpizar et al., 2008). However, the empirical evidence of audience effects in PWYW contexts is inconclusive. Previous studies focused on different types of audiences, either on payment observability by the seller or on payment observability by the seller and other buyers.

Gneezy et al. (2012) as well as Regner and Riener (2017) investigated the seller only as an audience and do not find a positive audience effect in PWYW contexts. Gneezy et al. (2012) conducted a field experiment, where guests in a restaurant could pay either anonymously via an envelope or face-to-face to the waiter. They did not find significantly higher payment if the payments were made in public. Likewise, in Regner and Riener (2017) voluntary payments, where only the buyer knows how much he paid, were not significantly different in comparison to payments in a situation where also the seller of the good (in the field experiment, the artist) knew how much has been paid. Reduction of anonymity

was operationalized by lifting the identity (customer's name, e-mail and payment) to the seller/artist.

By contrast, studies focusing on the seller and other buyers as audience, find a positive audience effect in PWYW settings (Dorn and Suessmair, 2016, 2017; Hilbert and Suessmair, 2015; Schlüter and Vollan, 2015). Hilbert and Suessmair (2015) conducted a laboratory experiment in which participants could buy a travel mug via PWYW from the experimenter and manipulated social interaction on three levels: making the payment decision alone and anonymous, making it public in front of the experimenter or making it public in front of the experimenter and another subject. Their results demonstrate that payments were significantly higher in the public treatments compared to the anonymous treatment, supporting the assumption that being observed by other buyers increases payments.

Dorn and Suessmair (2016, 2017) also report that payments increase if they are observed by other buyers. They investigated three different levels of payment observability for the hypothetical purchase of a Big Mac in an online survey. Subjects were told to imagine either to pay anonymously and online, to pay face-to-face to the seller or to pay face-to-face to the seller and being observed by a couple of friends. Both studies find significantly higher payments in the face-to-face situations compared to the online scenario. Moreover, payments are significantly higher if friends observe.

However the interpretation of the results is limited as these studies cannot disentangle the underlying mechanisms of the higher payments. In all three studies two factors were varied at the same time: payment observability and different types of other buyers (strangers, friends) as audience. Thus the significant effect in the public scenarios might be driven either by the fact that the payments are observed by other buyers (audience effect) or by the closeness the subjects feel to each other (peer effect), but not necessarily by the interaction of both.

Economic approaches to model audience effects include Bénabou and Tirole (2006), Ellingsen and Johannesson (2008) and Andreoni and Bernheim (2009). They have in common that they employ a signaling model to explain audience effects. The behavior of an individual can be understood as a signal towards the audience, for instance, tipping as a signal to be a generous person. Signaling thus is a strategy to build and maintain a specific social image. This approach assumes that individuals care about what others think of them (the desire for "social esteem") and henceforth try to maintain a positive social image towards an audience which matters to them. This implies that not all audiences have the same relevance to an individual, but that rather some audiences are more important to an individual whereas others are less important. The model of Ellingsen and Johannesson (2008) includes this social dimension or relevance of the audience.

Comparing existing studies on audience effects in PWYW scenarios, the social dimension of the audience might serve as explanation for the different findings. All studies have in common that they manipulated the presence of an audience, but the type of the audience differs. Gneezy et al. (2012) and Regner and Riener (2017) do not find an increase of payments when they lift the payment anonymity

towards the seller in a real life situation, while Hilbert and Suessmair (2015) and Dorn and Suessmair (2016, 2017) report positive effects of making the payment known to the experimenter or the seller of a hypothetical product. Moreover, a second unknown buyer observing the payment does not increase payments (Hilbert and Suessmair, 2015), but friends observing it does (Dorn and Suessmair, 2016, 2017). Summing up, higher payments seem to be driven by other known buyers observing the payment – other unknown buyers may not be enough.

Peer effects argue along similar lines, namely that the interpersonal closeness between people influences their decision-making. The fact that the social dimension between a subject and the surrounding people matters is a well-established concept in psychology and sociology (Cooley, 1909; Aron et al., 1992, 1997). It is assumed that social relationships differ with regard to their subjectively assessed level of interpersonal closeness to each other (Gächter et al., 2015). Interpersonal closeness means the subjective evaluation of the social relationship between two or more people, also called "interconnectedness of self and other" (Aron et al., 1997). Whereas strangers are assumed to have no or only a low, peers are assumed to have a medium or high level of interpersonal closeness. Interpersonal closeness usually develops via seeing each other, sharing information with each other, spending time together or acting in synchrony (see, e.g., Jehn and Shah, 1997; Wiltermuth and Heath, 2009). Synchrony (e.g. dancing together, walking in step or simply acting together), for instance, is assumed to result in higher levels of perceived closeness and similarity (Tunçgenç and Cohen, 2016; Rabinowitch and Knafo-Noam, 2015) which in turn leads to more prosocial behavior (Kramer and Brewer, 1984; Brewer and Kramer, 1986; Valdesolo and Desteno, 2011). Rennung and Göritz (2016) point out that the increased prosocial behavior usually only applies to other subjects within the synchronous group. Recent studies (Reddish et al., 2013, 2016) test this limitation and show experimentally that higher levels of perceived interpersonal closeness induced through synchrony result in more prosocial behavior also towards people who are not part of the synchronous group. A study by van Baaren et al. (2004) provides empirical evidence along similar lines: people who are being mimicked are more prosocial in general, also towards people beyond the mimicry setting. These results can be interpreted as a generalized prosociality or as entering a prosocial mindset as soon as people feel close to each other. They indicate that peer effects can already be present even if the behavior of the peer is not observed. Not only the studies about interpersonal closeness and higher levels of prosociality, but also recent research in the field of neurobiology underpins peer influence without observed behavior. That the mere presence of peers activates the so-called social brain network, which is assumed to contain processes like thinking about others and the own relation to them, has been summarized by van Hoorn et al. (2016). In economics the level of closeness is secondary and not always mentioned when it comes to peer effects (see, e.g., Falk and Ichino, 2006; Bursztyn et al., 2014; Mas and Moretti, 2009; Thöni and Gächter, 2015). Observability of behavior is usually assumed

and peer effects are defined as externalities on others, without mentioning the social relationship between the two agents (see, e.g., Falk and Ichino, 2006).

A recent field experiment by Schlüter and Vollan (2015) is consistent with peer effects in a Pay-What-You-Want context. They analyzed the behavior of customers in a flower field where customers could go to the field, pick flowers and put their payment into an honour box. The social tie between the buyer and other individuals in the field at the same time has not been manipulated systematically but observed as an independent variable. Either the customers were alone in the field, together with unknown people or they were in the field together with people they know. The main result of their study is that there is a significant difference between the individual and known people setting. However, whether the payment itself is observed by other people in the field is not known. Although the authors state that in 19% of the cases the buyers were alone at the cashbox, no conclusions can be drawn whether the payments were observed in the remaining 81% of the observations. Therefore, the results obtained are interesting, nevertheless the study likewise cannot disentangle, whether the results are driven by peer effects (the presence of known people) or by audience effects (the payment observation) or both (it seems likely that payments are observed especially when people know each other).

Recapping the related literature, it seems that in the presence of an audience individuals have an incentive to use their behavior as a signal towards observers. This incentive is expected to depend on how relevant the audience is to the individual. Existing empirical evidence suggests that other known buyers qualify as an audience that triggers social image concerns, while the seller or other stranger buyers do not or only to a lower degree. Focusing on peer effects it seems that higher levels of interpersonal closeness lead to more prosocial behavior in general, supporting the assumption that being together with close others leads to being in a prosocial mindset. Studies in the field of psychology support the claim that this peer effect is at work independent of the observability of the peer behavior. Applied to PWYW this effect might result in higher payments, representing behavior due to a prosocial mindset towards the seller.

Existing studies (Schlüter and Vollan, 2015; Hilbert and Suessmair, 2015; Dorn and Suessmair, 2016, 2017) observe higher payments but are not able to disentangle between the potential drivers of these higher payments. As they manipulate the payment observability and the social dimension of the surrounding people at the same time, it cannot be identified whether the payments are increased by audience or peer effects.

Our study takes both research streams into account as it analyzes buyers' choices in a PWYW setting when payments are made public or not and when the level of interpersonal closeness within the group of buyers is low or high. This novel approach allows us to draw conclusions about audience and peer effects individually and in interaction.

3 Experimental design

Our experimental set-up closely follows the base treatment of Schmidt et al. (2015), an established design to investigate PWYW settings in the laboratory.¹ The design enables subjects to make buying and selling decisions about a fictitious product. It therefore mimics a Pay-What-You-Want situation in a very stylized way while capturing the essential aspects of PWYW. At the beginning of each session, one seller is randomly assigned to a group of three buyers. The seller offers her product using the PWYW mechanism, therefore each buyer can pay what ever she wants for the product, including zero. Each of the buyers is allowed to buy one unit of the seller's product per round, she also can decide to buy nothing. The seller's unit cost of the product c is randomly selected from one of five possible costs (0, 1, 2, 3 or 4 points). The buyer's valuation of the product v^b is chosen from one of three possible valuations (2, 6 or 10 points) and is the same for all buyers in each period. The seller's costs and buyer's valuations vary in a specific sequence, which has been randomly determined before the experiment started (see Table 1). This sequence is kept constant over all treatments.

Table 1: Distribution of buyer valuations v^b and seller costs c

period	1	2	3	4	5	6	7	8	9	10
v^b	6	2	6	10	6	2	10	2	6	10
c	1	0	3	0	3	2	4	1	4	2

After having read the instructions (see the Appendix for a translation), subjects get to know, to which role (buyer or seller) they are randomly assigned to. The roles are kept constant during the whole experiment, as well as the buyer groups are staying the same during the experiment. The experiment consists of 4 stages. In the first stage, the seller makes a market entry decision. If she decides not to enter the market, the period ends and a payoff of zero accrues to the seller and the three buyers. If she enters the market, all subjects proceed to the second stage, the investment stage. The seller decides whether to invest in the quality of the product or not.² If she invests in the quality of the product, she incurs a fixed cost of 2 points. An investment in the quality of the product leads to a doubling of the buyers' valuation (i.e. 4, 12, 20 points). At the third stage, the learning stage, the seller learns her unit cost of production. Each buyer learns her valuation, the seller's investment decision, investment costs, and the sellers' unit cost of production. Finally, at the fourth stage, the buying stage, buyers make their payment decision. If the buyer does not buy the product, her payoff is zero. In case she buys the product, she decides what price to pay for it. Buyers can pay any amount, ranging from 0 points up to their valuation. After indicating their payment, each buyer's beliefs about the payments of the other two

¹Our *Stranger Anonymous* condition aims to replicate Schmidt et al. (2015)'s baseline. Our design differs in only three aspects from the baseline treatment in Schmidt et al. (2015): subjects played 2 blocks with 5 rounds instead of 4 blocks with 5 rounds, not every round was paid out but only the average of 2 randomly selected rounds from each block. Finally, the conversion rates are different.

²The investment decision has been kept to allow a replication of Schmidt et al. (2015), although it is not the focus of this study.

buyers in the group are elicited. Each buyer estimates how much she believes the two other buyers paid for the product. The belief elicitation is incentivized: Participants earn 1 point if the guess is correct, 0.5 points if the guess deviates ± 1 from the real payment of the others and 0 otherwise. At the end of every period the subjects get to know their own payoff only, without getting feedback on others' payments and without getting feedback about the correctness of their guess.

The game is played repeatedly in 2 blocks with 5 periods each (10 periods overall). Within each block the same group of one seller and three buyers is connected. After the first block is completed, sellers are randomly rematched to three other buyers for the next block. Each subject maintains her individual role as seller or buyer throughout the experiment. All decisions were made on the computers.

The seller's payoff, if she entered the market, consists of the sum of prices paid by the buyers minus her production and investment costs. The buyer's payoff, if the seller entered the market, is defined as her valuation minus the price paid for the product. For the final payoffs, shown at the very end of the experiment, two periods (one in each block) are randomly chosen and the average payout of these two periods is used as payoff. The conversion rate is 1 point = €1.25.

Our 2×2 between-subjects design varies the peer effect, operationalized as interpersonal closeness between buyers, and the audience effect, operationalized by the anonymity of their payments. The closeness between the buyers has been manipulated as follows: buyers in the *Strangers* and the *Peers* condition did not know each other before the experiment started. However, at the beginning of the experiment, the three buyers per group in the *Peers* treatment were instructed as follows to make sure they feel closer and get acquainted with each other: *Please stand up now and keep standing until the two other participants in your group stood up as well. Please look into each other's eye and sit down again afterwards.*³ To facilitate procedures the buyers in the same group were seated next to each other in the lab. The experiment continued only after all buyers followed these instructions. This procedure distinguished the *Peers* from the *Strangers* treatment.⁴

Anonymity of payment was manipulated via revealing the payments after all decisions were made.⁵ Buyers were informed that all their payments were either revealed to the other buyers (at the very end of the experiment), i.e., *Public* treatment, or not revealed, i.e., *Anonymous* treatment. To ensure that buyers could identify and match other buyers with their specific payments, each buyer was shown the first names of the two other buyers in their group. This procedure applied both to the *Stranger* and *Peer* condition to keep them identical, except of the manipulation of interpersonal closeness. All buyers in the *Public* condition had to enter their first names at the beginning of the experiment. The correct entry was validated by an experimenter via controlling an ID card of the subject. In the *Peer Public* treatment

³This manipulation of interpersonal closeness has been pre-tested and led to significant differences in perceived interpersonal closeness.

⁴We originally aimed to investigate a third level of closeness, namely friends as buyers. Due to difficulties in recruiting friends for the experimental sessions we had to drop this plan and went on with the two treatments as mentioned above.

⁵We wanted the buyers to decide simultaneously and without learning effects during the experiment, thus we decided for this procedure.

the participants were additionally informed about the cubicle number of the other buyers in their group. Strictly speaking, the buyers in the *Stranger Public* treatment were therefore no complete strangers. They were informed about each others' first names, but did not get to know any further information about the other buyers. It seems fair to assume that just providing first names is not sufficient to identify another subject in the lab and that the subjects were still strangers to each other. We decided to accept this procedure which allowed us to compare both public treatments with each other. If only in the *Peer Public* treatment names had been shown, more than just the degree of closeness would have been changed and the treatments would not have been comparable anymore. Table 2 summarizes the treatments and number of observations per treatment.

Table 2: Treatments and Observations			
	Anonymous	Public	<i>Total</i>
Stranger	44	44	88
Peer	44	44	88
<i>Total</i>	88	88	176

After completion of the experiment, subjects' social preferences were elicited using the social value orientation (SVO) slider measure (Murphy et al., 2011). We also measured the strength of the social tie as interpersonal closeness using the Inclusion of the Other in the Self (IOS) Scale (Aron et al., 1992; Gächter et al., 2015). According to the IOS Scale a social relationship with a low social tie is represented by a low feeling of closeness (low values on the 7 point scale), whereas a social relationship with a high social tie is represented by a high feeling of closeness (high values on the 7 point scale). Subjects also provided demographic information, such as age, gender and field of studies.

3.1 Behavioral predictions

Previous studies that manipulated audience effects in a Pay-What-You-Want setting found positive effects on payments when other known buyers were the audience (Hilbert and Suessmair, 2015; Dorn and Suessmair, 2016, 2017). No positive effects were found, if the audience consisted of the seller or another unknown buyer (Gneezy et al., 2012; Hilbert and Suessmair, 2015; Regner and Riener, 2017). What could explain the different results of public exposure in the context of PWYW? Different types of audiences might lead to different directions and strengths of the audience effect. The social image model of Ellingsen and Johannesson (2008) includes different dimensions of audiences and predicts that the closer the values of the agent and the audience are, the more does the agent care about the evaluation of the audience.

Adapted to our PWYW context, buyers can use the payment as a signal to the audience in order to achieve a reputation of a generous person. A positive effect of being observed on prosocial behavior has

been found even if minimal cues of observation are used.⁶ Therefore, we expect a basic audience effect already among strangers. We also expect an independent peer effect on buyers' behavior, as it is known that higher levels of interpersonal closeness may induce a prosocial mindset and lead to more prosocial behavior, without observing the behavior of peers or knowing that other peers observe own behavior (Reddish et al., 2013, 2016). Finally, with an increasing level of closeness we assume that it becomes more important what others think about a person. Hence, we expect higher payments, the closer the relationship between buyers gets.

In our experimental setting, the *Stranger-Anonymous* treatment serves as our baseline in which we expect the lowest payments. Buyers know their payments are not made public and thus they do not have an incentive to pay more to be regarded as generous. While they know that they are in a group with two other buyers, they do not know anything about the other two. In *Stranger-Public* our design activates the social image channel as payments are made public. Thus, we expect that audience effects lead to higher payments. Ceteris paribus, that is, controlling for buyer valuation and whether the seller invests in a quality increase, we propose the following hypothesis.

Hypothesis 1 *Payments are, on average, higher in the Public condition than in the baseline.*

In *Peer-Anonymous*, the interpersonal closeness channel is activated due to the interaction between buyers, which leads to entering a prosocial mindset. We assume that being in a prosocial mindset in a PWYW setting leads to higher payments, as it reflects an increased prosocial behavior towards the seller. Hence, we expect higher payments than in *Stranger-Anonymous* as buyers in the *Peer* group feel closer to each other.

Hypothesis 2 *Payments are, on average, higher in the Peer condition than in the baseline.*

The *Peer-Public* treatment activates the audience as well as the interpersonal closeness channel. We expect the highest payments due to a positive interaction effect between the two factors. Payments are made public to a peer audience, supposedly a more relevant one than strangers.

Hypothesis 3 *Payments are, on average, highest in Peer-Public.*

The following alternative motivations may also influence buyers' choices in our experimental setting: distributional preferences (e.g., Fehr and Schmidt, 1999) or self-signaling (e.g., Bénabou and Tirole, 2011). We assume that their effects are equally distributed across treatments.

3.2 Participants and procedures

We conducted a power analysis prior to the experiment using the software GPower in order to estimate the required sample size. The a priori analysis showed that a sample of 172 people can give a power of

⁶Haley and Fessler (2005) report increased dictator game giving and Krupka and Croson (2016) increased charitable giving, if subjects are exposed to a stylized pair of eyes.

95% for the medium effect size found previously (Regner and Riener, 2017). One hundred and seventy-six students participated in the study, which took place in the experimental lab at the University of Jena, Germany. They were recruited from various academic disciplines using the ORSEE recruitment system (Greiner, 2004). The percentage of male subjects was 33.70% and the mean age was 24.5 years. There was no significant difference in the number of female and male subjects across treatment conditions. The experiment was programmed using the z-Tree software (Fischbacher, 2007). Each of the 19 sessions lasted for approximately 75 minutes. Including a show-up fee of €2.50 subjects earned an average of €9.27. The experiment was conducted in June, July and September 2017.

At the beginning of each session, participants were randomly seated in individual cubicles. To ensure anonymity, all cubicles were separated by screens. In the public treatments, gender in the buyer groups has been kept homogenous. The sellers were seated in a remote corner of the laboratory, as far away as possible from the buyers, to avoid that sellers could see the buyers and therefore to increase anonymity between buyers and sellers. After sitting down, subjects were welcomed and provided with printed instructions about the experiment. The instructions were the same for all subjects in the same session. This ensured that subjects paid the same attention to the information about both roles. Before the experiment started, the participants answered several control questions to ensure that they had properly understood the instructions. All questions were correctly answered by all subjects. Communication among subjects was not allowed throughout the experiment.

4 Results

4.1 Descriptive Statistics

Table 3 provides descriptive statistics split by treatment. Generally, between 82 and 89% of sellers decided to enter and almost all buyers made a purchase from sellers, independently of the treatment. From those buyers who made a purchase, more than two thirds decided to make a positive voluntary payment. Buyers paid, on average, 2.48 in *Stranger-Anonymous*. Average payments are higher in *Stranger-Public* (2.83, ranksum test, $p = 0.055$) and *Peer-Anonymous* (2.92, ranksum test, $p = 0.192$), compared to *Stranger-Anonymous*. Average payments in *Peer-Public* (3.37) are significantly higher than in *Stranger-Public* ($p = 0.023$) and *Peer-Anonymous* ($p = 0.007$). Figure 1 shows histograms of the payment distributions by treatment. On the aggregate level, payments are sufficiently high to generate, on average, positive profits for sellers in each treatment.

Comparing the results of our baseline (*Stranger-Anonymous*) to the results of the Schmidt et al. (2015) base treatment, we find that approximately the same fraction of sellers decided to enter (85.45% versus 85.6%). Also about the same fraction of buyers made a purchase from sellers (96.81% versus 96.7%). Aggregate average prices are overall slightly lower in our experiment (2.48 versus 3.14), also if

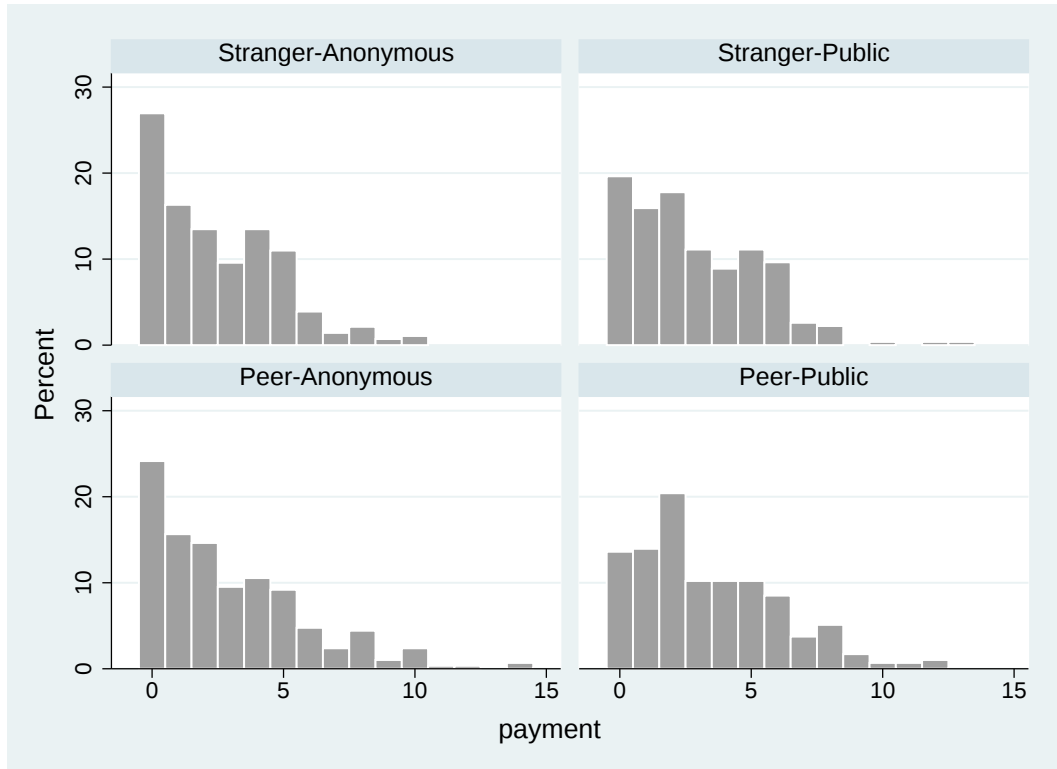


Figure 1: Distribution of the payment, by treatment

sellers invested in product quality (2.70 versus 3.46) or did not invest (0.94 versus 1.47). As our *Stranger-Anonymous* treatment differs only in the previously mentioned three aspects (number of rounds, random rounds paid out, different conversion rate) from the baseline treatment in Schmidt et al. (2015) and we still find similar results, we can conclude that we replicated the descriptive results of Schmidt et al. (2015)'s baseline.

Table 3: Summary statistics by treatments

	<i>Stranger-Anonymous</i>	<i>Stranger-Public</i>	<i>Peer-Anonymous</i>	<i>Peer-Public</i>
Percentage of Buyers (%)	96.81	94.87	93.81	97.96
Paid Price	2.48	2.83	2.92	3.37
Price if seller invested	2.71	3.20	3.27	3.79
Price if seller did not invest	.94	1.75	1.91	1.84
Zero payments (%)	26.95	19.78	24.05	13.61
Sellers entry (%)	85.45	82.73	88.18	89.09
Sellers invest (%)	77.36	61.82	69.23	70.00
Seller profit	.032	1.86	1.34	2.66
Seller profit if invested	.54	2.53	2.28	3.71
Seller profit if not invested	-3.42	-.13	-1.36	-1.19
Observations	440	440	440	440

Regarding the variables of interest in this study, the descriptive analysis of our data indicates that both of the treatment variables (Public and Peer) seem to affect the payment decisions of buyers in a positive way. Payments increase if observed by an audience and they increase if buyers are together with peers. In order to get more insights about the motives of buyers to make voluntary payments, we

conduct a regression analysis.

4.2 Regression Analysis

Table 4 provides results from panel regression models controlling for individual heterogeneity. Standard errors are robust and clustered at the buyer level. In each of the three specifications the dependent variable is the payment of the buyer. Explanatory variables include treatment dummies (Public, Peer) which are 1 for the corresponding treatment and zero otherwise. They also include the variables Period and Block (and the interaction of both) to control for potential time trends in prices paid by buyers. Furthermore, all regressions control for buyers' valuations. Specification 2 adds a dummy with respect to the sellers' investment decision. Specification 3 adds an interaction term between Public and Peer.

Table 4: Determinants of the paid price

	(1)		(2)		(3)	
Public	0.52***	(0.1)	0.53***	(0.1)	0.65***	(0.1)
Peer	0.60***	(0.1)	0.61***	(0.1)	0.73***	(0.2)
Buyer valuation	0.29***	(0.01)	0.27***	(0.03)	0.27***	(0.03)
Seller invests			0.36	(0.2)	0.38*	(0.2)
Seller invests $\times$ Buyer valuation			0.0021	(0.03)	0.000096	(0.03)
Period	-0.13**	(0.06)	-0.11*	(0.06)	-0.10*	(0.06)
Block	0.41	(0.5)	0.18	(0.5)	0.18	(0.5)
Period $\times$ Block	0.046	(0.08)	0.059	(0.08)	0.058	(0.08)
Public $\times$ Peer					-0.24	(0.2)
Constant	-0.20	(0.2)	-0.46*	(0.2)	-0.54**	(0.2)
Observations	1,140		1,140		1,140	
R^2	0.39		0.39		0.39	

Notes: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; panel regressions with robust standard errors, random terms associated with buyers; dependent variable: payment of the buyer.

With respect to our hypotheses, we find that both treatments, Public and Peer, have a significant positive effect on voluntary payments of buyers; that is, voluntary payments are higher when buyers' payments will become publicly known (coefficient = 0.65, $p < 0.01$), and when buyers are surrounded by peers (0.73, $p < 0.01$). This confirms Hypotheses 1 and 2. Hypothesis 3 is tested by means of the interaction term between Public and Peer, that is, by the effect of making payments publicly available to peers. Our analysis indicates that besides the additive effect there is no significant interaction effect between Public and Peer (-0.24, $p = 0.36$). If peers observe, payments are highest, but the effect of public exposure does not seem to be more pronounced, if the audience consists of peers instead of strangers.

Overall, our findings indicate a slight negative time trend over periods (-0.10, $p = 0.06$) (suggesting that subjects anticipate end play behavior) but not between blocks (0.18, $p = 0.78$) (suggesting that being in another matching group with another seller did not affect the payments of buyers). Moreover, similar to Schmidt et al. (2015), we find that buyer valuations increase payments (0.27, $p < 0.01$). Specifications with the SVO angle as a proxy for buyers' distributional preferences confirm a correlation

between the SVO angle and payments. The reported significance levels of our key variables remain unchanged. Finally, further control variables like gender or age are not significant, also in interaction with the Public or Peer dummy.

4.3 Manipulation and robustness checks

To test whether our manipulation was successful, we implemented a manipulation check. We induced closeness by making the three buyers of a group stand up and look into each other's eyes before the experiment started. This closeness manipulation resulted in a mean IOS score of 1.90 in the Peer condition, while the mean is 1.56 in the Stranger condition (ranksum test, $p = .04$). For comparison, Aron et al. (1997) manipulated closeness via several questionnaires and interaction tasks and report a mean IOS score of 3.82 (p. 371). Thus our design led to an increase of closeness among buyer groups. In our post-experimental questionnaire we asked, whether buyers in the *Peer* condition knew each other already. The responses do not indicate that any buyer knew another buyer before our experiment.

In order to keep the *Public* treatments comparable, the first names of the buyers were shown in the *Stranger* as well as in the *Peer* condition. Knowledge about the first name might be another channel to allow an identification process between the buyers already in the *Strangers* treatment. In turn, this may lead to an increase in perceived interpersonal closeness (Bohnet and Frey, 1999). To test this possible interference we ran a control *Stranger-Public* treatment in which we replaced the first names of the buyers with their respective buyer number which cannot be associated with the subject. The results (available upon request) show similar levels of perceived interpersonal closeness and payments as in the original *Stranger-Public* treatment, suggesting that the first name does not increase the perceived level of closeness and thus does not lead to higher payments.

4.4 Discussion

Does the observability of the payment and the interpersonal closeness between buyers influence behavior in a PWYW context? The purpose of the present study was to explore these audience and peer effects in a laboratory experiment. This controlled environment allowed us to make clean treatment comparisons and disentangle between the two manipulated factors, audience and peers, as well as the interaction between them. In contrast, previous studies considered the experimental variation of payment observability towards the seller (Gneezy et al., 2012; Regner and Riener, 2017) or towards the seller and buyers but along both dimensions (audience and peers) at the same time (Hilbert and Suessmair, 2015; Schlüter and Vollan, 2015; Dorn and Suessmair, 2016, 2017).

The first main result supports the predicted audience effect: if payments are made public, they increase significantly. Hence, buyers seem to care whether their payment is made public even though

their potential association with this payment is limited at best. Putting this result into practice, it can be concluded that payment observability could be a crucial element in implementing an effective PWYW scheme.

Our second main result shows that payments increase significantly, if buyers feel close to each other. This is in line with the predicted peer effect. A higher level of interpersonal closeness induces a generalized prosocial mindset and leads to higher payments compared to buyers who do not feel close to each other. Irrespective of exposure of the actual payments, the perceived level of interpersonal closeness seems to be a relevant driver for higher payments. Transferring this result into a practical application of PWYW means that buying situations where buyers know each other might already be sufficient to induce higher payments.

Finally, the third main result suggests that if both channels (audience and peer effects) are activated, both the presence of peers as well as the observability of the payment influence the payment decision. Payments are highest if peers observe the payments, however, we do not find an interaction effect on top of this additive effect of peers and audience. We thus cannot conclude that buyers have higher incentives to use their payment as a signal to obtain a generous social image, if the audience is one the buyer feels close to. It seems to be the case that activating one channel is already sufficient to increase payments: either making the payments observable or making the payment decision in the presence of known others.

This finding is quite unexpected as theoretical approaches to model social image concerns (e.g., Ellingsen and Johannesson, 2008) propose that more relevant audiences induce stronger incentives to signal a positive social image. At the same time the results do not contradict these models as our manipulation of interpersonal closeness was rather modest and does not rule out that higher levels of closeness might lead to higher signaling incentives. For PWYW in practice the results imply that it may not be necessary to make the payments public, if the buyer structure consists of people who know each other (peer context) and who are present during the payment decision. This could be the case for purchasing situations, where people, for instance, stand together in queues at ticket counters or who buy a product online, knowing that friends are buying the product at a similar time as well.

One possible explanation for this result is that our manipulation of interpersonal closeness was quite modest. Interpersonal closeness between the three buyers has been manipulated in our *Peers* condition via standing up and looking each other into the eyes at the very beginning of the experiment. No further personal information have been exchanged, no further personal interaction took place between the peers. It might be the case that this manipulation only led to a low level of perceived closeness – sufficient to induce a peer effect on payments – but not enough to activate an incentive to use higher payments as a signal towards the peers.

5 Conclusion

In this paper we synthesize two research fields that are relevant to payments in voluntary settings: the effects of audience and peers. The paper contributes to the ongoing discussion in economics and psychology, how audience and peer effects influence the decision-making process. It is widely known in psychology that the observability of an action influences behavior (Zajonc, 1965). This influence is known as audience effect. A second widely accepted concept in sociology and psychology is the conjecture that close social relationships influence decision-making (Cooley, 1909). This is also known as peer effect. The strength of a social relationship is defined by the level of perceived interpersonal closeness (Aron et al., 1992, 1997). Recent psychological research shows that being together with peers leads to entering a prosocial mindset, inducing more prosocial behavior (Wiltermuth and Heath, 2009; Reddish et al., 2013, 2016). Current economic theories, models of social image concerns, consider both dimensions as explanatory factors of pro-social behavior: people care about what others think of them, especially if these are their "peers", and derive a positive utility from signaling generous behavior to them (Andreoni and Bernheim, 2009; Ellingsen and Johannesson, 2008; Bénabou and Tirole, 2006).

Previous studies exploring audience and peer effects in a Pay-What-You-Want context do not identify these effects separately.⁷ Other buyers as audience seem to increase payments (Hilbert and Suessmair, 2015; Dorn and Suessmair, 2016, 2017; Schlüter and Vollan, 2015), however it remains unclear, whether people pay more because they are observed by others or because they are together with other close buyers in the buying situation. It might be the case that the positive effect is rather driven by the actual presence of peers not by the fact that they observe the payment. Previous studies do not allow to draw conclusions on whether the higher payments in the public scenarios are driven by the audience, by peer effects or by both effects jointly. Our design enables us to disentangle audience and peer effects and to investigate whether higher payments are driven by payment observability, the presence of other known buyers or both.

Our experimental results confirm the predicted main effects of audience and peers. While we find evidence for a positive additive effect, there is no positive interaction between audience and peer effects. Payments in *Peer-Public* are highest but the difference to the other treatments is not significant. We conclude that payment observability among buyers and perceived interpersonal closeness influence the decision of how much to pay in a PWYW context. However, the interplay of both channels results in an additional increase of payments, but not in an interaction effect.

Thus, it remains open to what extent the interaction between audience and peer effects influences the voluntary payments for closer levels of perceived interpersonal closeness as, for instance, friends or family. One assumption could be that close people might be a more relevant audience to the individual and thus

⁷The findings of Gneezy et al. (2012) and Regner and Riener (2017) are in the context of payment observability towards the seller as audience only, which does not seem to be sufficient to increase voluntary payments.

the incentive to signal generous behavior increases. At the same time one could argue that this positive relationship only holds up to a certain threshold of closeness and beyond that the signaling incentives decrease. For close family members or best friends, for instance, it seems plausible that individuals do not need to signal generous behavior, since these individuals know each other very well such that a payment would not be diagnostic for a specific social image anymore. Clearly, further research will be required to investigate the question of whether a higher level of interpersonal closeness leads to higher payments or whether the incentive to pay more as a signal decreases at a certain point again. Further research thus is necessary to extend our knowledge of the interaction between audience and peer effects. Getting more insights about this interplay is of direct practical importance, as it may help to understand the determinants of voluntary payments in anonymous and public PWYW situations.

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Instructions

The text in curly brackets { . . . } indicates treatment differences.

Welcome to the experiment and thank you for your participation!

From this moment on, please do not talk to any of the other participants.

1. General information about the experiment

The purpose of this experiment is to study economic decision-making behavior. Any amount of money you earn will be paid to you at the end of the experiment.

During the course of the experiment, you and other participants will be asked to make decisions. Your decisions as well as those of the other participants will determine your payment according to the following rules.

The duration of the experiment is 1 hour and 15 minutes. You will receive detailed instructions at the beginning of the experiment. Please raise your hand after reading the instructions or during the experiment, should you have any questions. One of the experimenters will come to you and answer them in private. For the sake of language simplicity, we only use masculine pronouns.

It is not allowed to communicate with other participants during the experiment. It is also not allowed to use your phone. Breaking any of these rules will result in exclusion from the experiment and any payment. Please turn off your phone now.

1.1 Payment

In the experiment we do not use the Euro as a monetary unit, but instead ECU (Experimental Currency Unit). At the end of the experiment, the payout will be converted from ECU to Euro. The exchange rate is:

1 ECU = 1.25 Euros.

At the beginning of the experiment you will receive €2.50, henceforth, show-up fee, for your participation.

Overview of the experiment:

- Reading of the instructions and control questions
- Decision-making scenarios (10 periods divided in 2 blocks of 5 periods, respectively)
- Completion of a questionnaire
- Payout and end of the experiment

1.2 Resources

You will find pen and paper at your workstation. Please leave them on the table at the end of the experiment.

1.3 Anonymity

We will use the data collected in the experiment as a whole, and never in conjunction with names. At the end of the experiment, you will be asked to sign a receipt for accounting purposes only.

2 Experiment

2.1 Roles

There are two roles in the experiment that we will henceforth refer to as “**buyer**” and “**seller**”. Your role will remain unchanged during the experiment. The role to which you have been assigned will be displayed on the screen right after the control questions have been answered.

2.2 Decision-making scenarios

The experiment comprises **10 periods**, divided in **2 blocks of 5 periods each**. The same type of decisions is to be made in each periods.

At the beginning of each block, each of the sellers will be assigned three buyers at random. Each buyer will only be assigned one seller. The seller can sell one unit of his good to each of the buyers during one period.

Each period consists of **two stages**:

- In the **first stage**, the seller must decide whether to sell his good or not. If he refuses to sell, he and the buyers assigned to him will receive a payout of 0 ECU. This brings the first stage to an end. If he decides to sell, he must decide whether he would like to make an investment to improve the quality, and in turn, the value of his product. The production costs per unit are then made known to him after he makes the investment decision.
- In the **second stage**, the buyers will learn their “valuation” for the good. The valuation refers to the payment that the buyer will receive for the good at the end of the experiment, once he has bought it. In addition, each buyer will learn the costs the seller incurred due to investment or will incur for producing the good. Now, each buyer will decide whether he wants to purchase the good and at what price.

Please note that when the seller offers his good, he does so in accordance with the “pay what you want” method. That means that each buyer may decide how much he wants to pay for the good. The seller is obliged to sell the good at any price offered by the buyer, including zero, even if doing so will make him incur a cost.

One block consists of five periods. At the beginning of each new block, each seller will be randomly assigned to three other buyers for the next block. The group of three buyers remains fixed during the whole experiment.

2.3 Exact procedure of the experiment

During a block (consisting of 5 periods), the seller and three buyers remain linked to each other. Thus, they can trade with each other during five periods. Each period of a block takes place according to the following two stages:

Stage 1

The seller decides **whether he wants to sell his good in this period or not**. If he decides not to sell, the period ends and the seller as well as the three buyers assigned to him receive 0 ECU.

If he decides to sell, he must decide whether he wants to **invest** in the quality of his product **or not**. This investment costs the seller 2 ECU and doubles the valuation of the three buyers for that good.

Afterwards, the buyer learns what his production costs are. These costs lie somewhere between 0 and 4 ECU and are determined at random for each period of a block.

Stage 2

The buyers learn the valuation of the good, which depends on whether the seller invested in the quality of the good.

- If the seller did not invest in the quality of the good, the valuation will either be 2, 6 or 10 ECU. How high the valuation of the three sellers will be is chosen at random between these values. Please note: the three buyers assigned to a seller share a common valuation of the good.
- If the seller invested in the quality of his good, the valuation will be doubled, and will either be 4, 12 or 20 ECU.

In addition, the three buyers will learn whether the seller invested to improve the quality of the good and what his unit costs are.

Each buyer will then decide whether he wants to buy the good and at what price. It is up to the buyer to determine the price for the good. Every amount between 0 ECU and his valuation is permitted. All buyers make their decision simultaneously without discussing it prior to or after making their decision. Please bear in mind that you would not be able to change your paying decision, once you have made it.

End of a block

After a block of five periods, the seller and buyers will be separated, and each seller will be reassigned to three new buyers at random. After two blocks (consisting of 10 periods in total), the experiment will conclude.

2.4 Calculation of profit and income at the end of a period

If the seller decides not to sell during a given period, then the seller and the three buyers assigned to him will receive 0 ECU.

The **income of a buyer**, if he purchased the good, is his valuation W minus the price paid P .

$$\text{Buyer's income } (E) = \text{Valuation } (W) - \text{Price paid } (P)$$

Please bear in mind that the valuation depends on whether the seller **invested** in the quality of the good. If he invested, the valuation of the buyer will be **doubled**.

If the buyer did not purchase the good because he did not want to or because the seller did not offer it in this period, his income for this period will be **0 ECU**.

The **profit or loss of a seller** is his revenue minus his costs.

- His revenue is the sum of the individual prices paid.
- His costs are the unit costs (K) multiplied by the number of sold goods plus his investment costs in the amount of 2 ECU (if he made an investment).

Thus, his income, in case he sold to all three buyers, is calculated as follows:

$$\text{Profit/Loss of the seller} = \text{sum of the individual prices paid } (P_1 + P_2 + P_3) - \text{sum of the unit costs } (3 \cdot K) - \text{investment cost } (2 \text{ if he made the investment, } 0 \text{ otherwise}).$$

If a customer does not wish to purchase the good, the seller will not incur any unit costs for that customer and he will not receive any revenue from this customer.

If the seller or the buyer incurs a loss in a given period, they must pay off this loss from their show-up fee.

2.5 Feedback

The sellers learn the paying decisions of their three respective buyers at the end of each period. The buyers will remain anonymous to the seller, as well as the seller to the buyers. At the end of each period, each buyer will learn only about his own paying decision. He will not learn about those of others.

{only treatment Stranger Anonymous:

The buyers will also remain anonymous. This means that the identity of the two other buyers to which they were linked will not be revealed during the course of the experiment or afterwards.

}

{only treatments Stranger Public and Acquaintance Public:

However, the buyers will not remain anonymous to each other. At the beginning of the experiment, the buyers get to know the first names of the two other buyers they are linked with. At the end of the experiment, the paying decisions of the two other buyers will be revealed. Likewise, the two other buyers will learn about the decision

of the other buyer. This means that at the end of the experiment the buyers will receive information about their own decisions as well as those of the other two buyers. To assign the payment decisions to the buyers, also the first names of the three buyers will be shown. This is applicable to all periods including the one that is relevant for payment. This information will be displayed on each buyer's screen at the end of the 10 periods.

}

2.6 Payment

Your income from a given period will be calculated as outlined above.

Two of the ten periods will be relevant for your payment, one period from block 1, and one period from block 2. At the end of the experiment, two of the ten periods will be selected at random (one from each period), and the decisions you made in said periods will determine your payment.

Your payment is computed as the average between these two periods. For this reason, it is sensible to act in each period as if it were to be paid out.

Do you have any questions?