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Income Inequality and Risk Taking: The Impact of Social Comparison Information

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Abstract

In contrast to the assumptions of standard economic theory, recent experimental evidence shows that the income of peers has a systematic impact on observed degrees of risk aversion. This paper reports the findings of two experiments examining the impact of income inequality on risk preferences and whether the knowledge of inequality mediates the decisions. In Experiment 1 participants who were recruited for a real effort task were paid either a low or a high wage. Half of the participants were aware of the income inequality while the other half were not. After completing their task, they were invited to invest a part of their salary in a risky asset. In Experiment 2, we replicated the same experiment in the laboratory with windfall endowments to test the consistency of results in the laboratory settings. The results of the first experiment show that high-wage subjects take higher risks than low-wage participants do if they are aware of the inequality in wages. This finding supports the idea that social comparisons shape risky decisions. In Experiment 2 on the other hand, we did not observe any significant differences in decisions. This may suggest that the income comparison is sensitive to house-money effect.

Keywords: Risk Preferences; Income Inequality; Relative Income; Social Comparison

1. Introduction

Economic inequality has risen over the last decades in both developed and developing countries (Picketty, 2014). This may be troublesome as many negative societal outcomes have been associated with income inequality. Examples include poor health, low social mobility, poor educational outcomes, reduced trust, and poorer community life (see Wilkinson and Pickett, 2009 for a review). On the other hand, income inequality may be also beneficial for economic prosperity and growth as it provides monetary incentives within the economy. One channel yielding a link between inequality and growth may be given by risky investments, evidenced by e.g. entrepreneurial activity (Parker, 2004). It has been suggested by Perotti (1993) that income inequality, particularly at the top end of the distribution skew, may therefore, promote growth as it can boost risky investments by rich agents. While in theory rich agents should indeed take higher risks, in case of *decreasing absolute risk aversion* the impact of inequality on actual risk taking behavior can be far more complex. Social comparisons, in particular, may play a significant role in risky decisions. The question whether inequality induces individual risk taking is difficult to answer with observational data as higher risk taking in turn increases inequality (Sinn, 1994). Therefore, the present study is based on experimental data.

In this paper, the findings of two experiments are reported. Experiment 1 is based on earned income in a quasi-field setting while in Experiment 2 the participants obtained windfall endowments. The three research questions of this study are: i) What is the impact of income inequality on individual risk taking decisions? ii) Is such an effect solely due to income or does the knowledge of inequality also play a role? iii) Do risk preferences differ in the standard laboratory setting where participants make their decisions with windfall gains?

In traditional decision theory and standard economic analyses risk taking of an individual is determined solely by her own state-dependent payoffs. In this case, inequality can only affect risk taking via a mere income effect. For example, in the case of *decreasing relative risk aversion* a higher degree of inequality increases risk taking of rich subjects disproportionately and, therefore, leads to a higher level of risky investments in society, which in turn promotes growth. However, since the work of Veblen (1899) it is well known that people compare their income and well-being to those of their peers. It is evident that such social comparisons should influence risk taking decisions as higher risk taking allows, on the one hand, for poorer peers to bridge the gap with richer peers if they are fortunate, while on the other hand, it involves the risk of falling behind poorer peers through bad luck.

In view of this relation between social comparison and risk taking, it is rather surprising that the behavioral literature on individual decision making under risk has only very recently started to integrate the social context into analyses. Hill and Buss (2010) demonstrated that concern for relative position leads to increased risk taking when there is the potential to be better off than a peer for decisions in the gain domain. Rohde and Rohde (2011), in contrast, found only a limited impact of social comparison on risk taking when analyzing whether people will opt to change their individually chosen lottery ticket if a social context is introduced. The fact that they observed only a few switches that may actually be caused by a type of status-quo bias motivated the use of a between-subject design in the present study. Also using a between-subject design, Schwerter (2013) found that decision makers are willing to take more risks if they are able to surpass a peer than to stay ahead of a peer. In a psychological study, Mishra et al. (2015) showed that victims of inequality engaged in higher risk taking than the beneficiaries of inequality. Further, Payne et al. (2017) showed that economic inequality might increase risk

taking. Evidence for risk taking of poor agents can be seen in risky activities like crime, drug abuse, violence, and sexual promiscuity, which have been shown to be associated with income inequality (Wilkinson and Pickett, 2009).

The most popular behavioral models of decision making under risk, i.e. (cumulative) prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) and the model of Köszegi and Rabin (2006, 2007) suppose that utility is reference-dependent. While usually it is assumed that the reference point is determined only by (expectations about) of the decision maker's own wealth, recent experimental studies have analyzed social reference points. Linde and Sonnemans (2012), Vendrik and Woltjer (2007), Schmidt et al. (2015) and Lahno and Serra-Garcia (2012) found evidence for what is called *behindness aversion* in the presence of social comparison; that is being behind a peer has a higher impact on utility than being ahead of her. Note that also the standard model of inequity aversion by Fehr and Schmidt (1999) implies behindness aversion if, as usually assumed, the coefficient for disadvantageous inequality aversion exceeds that for advantageous inequality aversion.

Given the evidence that the social context has a strong impact on risk preferences, the relation between income inequality and risk taking seems to be an open question. Even if poor individuals take higher risks in order to break even with richer individuals, rich individuals may take less risk due to a fear of falling behind poorer subjects, so that inequality may actually reduce societal risk taking. In fact, the models of Becker et al. (2005) and Ray and Robson (2012) imply that a concern for status leads to a negative relation between inequality and risk taking.

Eliciting risk preferences with windfall gains is the most conventional method in standard laboratory experiments in economics. Although it is suitable for measuring general risk preferences of individuals, it might not be the most appropriate tool to observe the impact of income inequality on risk preferences. First, several studies have shown that social decisions differ between windfall and gained endowments (See Carlsson et al. 2013). Second, there is evidence that lab behavior do not always match with the field (Carpenter et al., 2005; List, 2006; Antonivics et al. 2009). Third, according to the house money effect prior gains increase risk taking (Thaler and Johnson, 1990). The participants of our first experiment made their decisions with their earned money at stake. We then ran another experiment in the laboratory with windfall gains to see whether the results of first experiment holds in the laboratory.

In Experiment 1, university students were recruited to work on a real effort task of National Consumer Protection Organization¹ (NCPO) in Lithuania. They were paid either a low or a high wage and were invited to invest (a part of) their salary into a risky asset, so that the amount they chose to invest could be regarded as measure of their risk taking. In order to disentangle mere income effects from the impact of social comparison, the treatments were run with and without information of differing income levels. It was found that the high-wage participants choose riskier options than the low-wage if they were aware of the income inequality.

In Experiment 2, we tested whether the results of the first experiment were consistent in the standard laboratory settings. The experimental design, location of the experiment, the sample profile (university students of the same faculty) and procedures were identical to the first one but the participants received windfall endowments without working for it. Neither the

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¹ Lietuvos Nacionalinė Vartotojų Federacija.

endowment level, nor the social information had a significant impact on decisions in the second experiment.

2. Methods and Procedures

2.1. Experiment 1

Experimental Protocol:

The experiment was run at the Faculty of Economics of Vilnius University in Lithuania with 120 participants (88 women). All participants were undergraduate students of the faculty of economics with an average age of 22. The experiment lasted about 60 minutes. The average payoff in the experiment was on average 16 Lithuanian Litas (LTL) which is worth 4.65 Euros. It should be noted that minimum hourly wage in Lithuania was 1.82 Euros and the average hourly wage was 3.38 Euros and 1 Euro was worth 3.45 Litas at the time the experiment was conducted. Real effort task was offered by the NCPO. After completing their task and being paid, the participants were invited to participate in the risk elicitation task with the money they had earned at stake.

Participant Recruitment and Experimental Setup:

In order to increase external validity and to make the experiment as realistic as possible collaboration was carried out with the NCPO and the experiment was conducted following their task. Recruitment was done through posters on campus. Both the task and the experiment took place in a computer lab at the faculty. The participants were invited to participate in the experiment after they completed their task and had been paid. Following the payment, they were invited to buy a lottery ticket to elicit their risk preferences. All participants were briefed

that the participation was voluntary. After the risk elicitation task, they filled out a short questionnaire that included items on demographics, trust and subjective well-being.

Treatments and Social Information:

Table 1 presents the experimental treatments. In order to induce inequality, (Low-wage) participants received 10 LTL in treatments L_noinfo and L_info . The wage was 20 LTL in the remaining treatments (High-wage). In order to disentangle the effect of social information from the mere income effect, in treatments (L_noinfo and H_noinfo), subjects were only informed about their own wages so they were not aware of the income inequality. In the other treatments (L_info and H_info), they knew that there existed a low (10 LTL) and a high (20 LTL) wage group in the experiment and that they were randomly assigned to one of these groups. The randomization was carried out as follows. Each participant drew a number from a non-transparent bag when they came in to the room. Then a coin is tossed publicly to decide which half of the participants was assigned a high or low wage. Consequently, participants were aware of income inequality and of their ranking in these treatments.

Table 1: Experimental Treatments

Treatment	Wage	Information	
L_noinfo	10 LTL (Low)	No	
H_noinfo	20 LTL (High)	No	
L_info	10 LTL (Low)	Yes	
H_info	20 LTL (High)	Yes	

Real-Effort Task:

In contrast with vast majority of the experiments using windfall gains or real effort tasks, the present study did not use a task that is especially designed to be used in experiments such as a

slider task (Gill and Prowse, 2012). The study also avoids using common laboratory tasks such as solving mazes (Gneezy et al., 2003), mathematical equations (Sutter and Weck-Hannemann, 2003) or filling envelopes (Konow, 2000). Instead, participants worked on a task that provided NCPO useful information on some products in the market. Participants' risk preferences were elicited with the money they earned after they completed the task.

Due to the fact that Lithuania switched to the Euro in January 2015, the NCPO needed to collect data on consumer goods. The NCPO needed the data for two reasons: first, to monitor the fairness of retailers, because, up until the end of 2014, all prices had to be written in the Lithuanian Litas and the Euro. Not all retailers acted fairly and converted prices correctly, with some stating a higher price in Euros than the equivalent price in Litas. Secondly, there was a fear that prices would rise in early 2015 after the adoption of the Euro. Therefore, the NCPO needed to collect price data in September of 2014, in order to later compare prices in 2015. Thus their need for data collection was paired with the experiment to achieve a more realistic approach.

The participants were invited to a one-time, paid task where they had to collect data on products sold at the largest retailers in Lithuania. The data which included the price in Euros, Litas, manufacturer, distributer, retailer and weight (if applicable) had to be recorded in an Excel document. Because the task was monotonous and simple, each data point input took almost the same amount of time for everyone and did not depend on the personal skills of subjects. Therefore, it was a unique opportunity to eliminate the shirking or decreasing work quality as each participant was assigned 20 products to gather data about and unlimited time to complete the task. All participants had to search for a different panel of products; this, along with no time control, excluded any possible competition among participants to complete their task faster.

Risk Elicitation Procedure:

After receiving their pay, participants were invited to buy a lottery ticket, which offered a 1/3 chance to win 20 LTL or nothing. Following Vieider et al. (2015a), each participant had to state her willingness-to-pay (WTP) for playing this lottery on a choice list. The choice list covered prices in the interval 2-10 LTL in 0.5 LTL increments. A price was drawn randomly and if the subject indicated that she was willing to buy the lottery ticket for this price, she had to pay the price and could play out the lottery. If the subject indicated that, she was not willing to buy the lottery ticket for the randomly drawn price she could leave with the money she earned.

Note that due to the possible prize of 20LTL it was possible for low wage subjects to overtake high wage subjects who did not buy the lottery or who bought the lottery and were unlucky. This design feature was motivated by the models of Becker et al. (2005) and Ray and Robson (2012), which show that the concern for status has a particular high impact if there is a chance for social mobility. Without the possibility to overtake someone or to be overtaken, income inequality would have had a lower impact in our experiment as participants competes only with people in their own class, i.e. situations with and without social information would have been strategically rather similar.

Hypotheses:

The first hypothesis of the current study concerns wage level. The typical empirical observation is *decreasing absolute risk aversion* (DARA) which means that increasing wealth leads to lower degrees of risk aversion. According to DARA, the WTP should be higher in the treatments with high wages.

The second hypothesis holds that the social comparison has an impact on subjects' decisions. The main effect of the treatment variable (*info*) is to allow for social comparison of the low endowment group with the opposite group with high endowments and vice-versa. As discussed in the introduction, behindness aversion was consistently found in previous studies on risk taking with social comparison present. For the present study, this implies that the low wage subjects may take higher risks in the information treatments as this allows them to close the gap with high endowment subjects. However, as the experimental design allows for high wage subjects to invest in the lottery too, this conclusion cannot be true.

2.2. Experiment 2

The second experiment was the replication of the first in the laboratory conditions. We recruited 120 (83 women) participants with posters in the Faculty of Economics of Vilnius University to test whether our results would hold in the laboratory. Experiment 2 took place in the same computer lab as in Experiment 1. Upon arrival, participants were randomly and anonymously allocated to either high or low endowment group and were given the option to buy a lottery ticket with their endowments. They followed the same procedure as in Experiment 1. The total duration of the experiment was around 20 minutes. See Table 1 for the number of observations in each treatment. Note that several observations were dropped due to multiple switches in the price list and/or unfilled forms.

3. Results

3.1. Experiment 1

Aggregate Results

Figure 1 presents the mean WTP along different treatments. The bars on the left hand side present the treatments without social information and the ones on the right hand side present the treatments with social information. The average WTP in L_noinfo treatment is 3.2 (SD=1.447) and in H_noinfo it is 3.65 (SD=1.777). This difference is not statistically significant (p=0.179; z=-1.343). In the case of treatments with social information, the average WTP is 3.464 (SD=1.459) in L_nifo and it is 4.554 (SD=2.047) in H_nifo . This difference is statistically significant (p=0.026; z=-2.224).

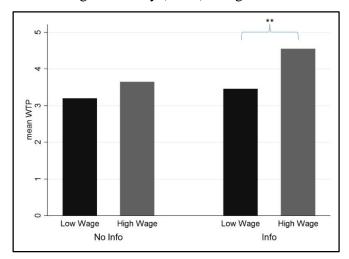


Figure 1: Mean Willingness to Pay (WTP) along treatments in Experiment 1

Note: *p<0.1, **p<0.05, ***p<0.01. Wilcoxon rank-sum tests

Regression Analysis

Table 4 presents the regression analysis. OLS regressions were used where the dependent variable is WTP [0,10] in all models. As dependent variables, a high_w dummy was used to identify the high and low wage treatments where the info dummy takes the value of I for the treatments with social information or 0 without. An interaction variable high_wXinfo was also included in model (2) to disentangle the treatment specific effects. The first two models include all the treatments regardless of the wage level or information. Models (3) and (4) are devoted to only high wage and low wage treatments to observe the specific impact of information on WTP. In the same manner, the columns (5) and (6) include the info and noinfo treatments respectively. The gender dummy female is the only control variable included in the regression analysis. p-values are given in parentheses.

Table 2: Regression Analysis of Experiment 1

			$high_w=1$	$high_w=0$	info=1	info=0
	(1)	(2)	(3)	(4)	(5)	(6)
$high_w$	0.737**	0.450			1.036**	0.450
	(0.316)	(0.438)			(0.478)	(0.422)
info	0.516	0.219	0.879	0.183		
	(0.322)	(0.448)	(0.524)	(0.382)		
high_wXinfo		0.598				
		(0.632)				
female	-0.406	-0.383	-0.107	-0.687	-0.500	-0.210
	(0.372)	(0.373)	(0.586)	(0.457)	(0.505)	(0.566)
constant	3.394***	3.520***	3.739***	3.772***	3.821***	3.375***
	(0.418)	(0.439)	(0.602)	(0.463)	(0.493)	(0.558)
N	116	116	58	58	56	60
\mathbb{R}^2	0.085	0.092	0.055	0.048	0.105	0.022

OLS regressions. Dependent variable is WTP [0,10]. All presented independent variables are binary variables. Standard errors are given in parentheses. *p<0.1, **p<0.05, ***p<0.01.

In model (1), $high_w$ is significant with a positive coefficient (p=0.021; coefficient=0.737) where neither info not female is significant (p-values are 0.113 and 0.278 respectively). Interaction effects are exploited in model (2). When the interaction variable $high_wXinfo$ in is included in the model, the significance of $high_w$ disappears (p=0.307; coefficient=0.450). The interaction variable $high_wXinfo$ is not insignificant (p=0.346; coefficient=0.598). Both info and female remain insignificant with p-values of 0.627 and 0.306 respectively. Models (3) and (4) compare the impact of social information on the WTP of high wage and low wage participants separately. info is not significant in either of these models. p-values are 0.100 in model (3) and 0.634 in model (4). We do not observe any gender differences as female variable is not significant in models (3) and (4) (p-values are 0.856 and 0.139 respectively). The remaining two models focus on the income effect with or without social information. $high_w$ is significant in model (5) (p-value= 0.035; coefficient=1.036) but not in model (6) (p-value= 0.290; coefficient=0.450). No gender effects were observed in either of the models (p-values are 0.327 and 0.712 respectively).

It can therefore be concluded that the positive impact of *high_w* is due to the treatments with social information. According to these results, the participants with higher wage have higher WTP if they are aware that they have a higher wage. When the subjects are not aware of wage inequality, their WTP was not significantly different than each other.

3.2. Experiment 2

Aggregate Results

Figure 2 presents the mean WTP along different treatments. The average WTP in L_noinfo treatment is 5.130 (SD=1.904) and in H_noinfo it is 4.611 (SD=1.423). This difference is not statistically significant (p=0.654; z=0.448). In the case of treatments with social information, the average WTP is 4.292 (SD=1.811) in L_info and it is 4.384 (SD=1.951) in H_info . The difference is not statistically significant here either (p=0.921; z=-0.099). The average WTP is higher in Experiment 2, which gives support to the House Money Effect (Thaler and Johnson, 1990). In Experiment 1 the average WTP was 3.707 (SD=1.751) and in Experiment 2 it is 4.615 (SD=1.786). This difference is statistically significant (p<0.01; z=3.858). See Appendix for the distribution of WTPs in both experiments.

Low Wage High Wage Low Wage High Wage Info

Figure 2: Mean Willingness to Pay (WTP) along treatments in Experiment 2

Regression Analysis

Table 5 presents the regression analysis of Experiment 2. Both the properties of the table and the statistical analysis are identical with Experiment 1. The results are in line with the non-

parametric analysis. Neither the main variables, nor the *female* variable is significant in our models. To sum up, we do not observe any significant effect of social information or the wage level on WTPs of the participants in the laboratory setting.

Table 3: Regression Analysis of Experiment 2

			high_w=1	$high_w=0$	info=1	info=0
	(1)	(2)	(3)	(4)	(5)	(6)
high_w	-0.255	-0.545			-0.060	-0.466
	(0.356)	(0.490)			(0.540)	(0.465)
info	-0.512	-0.821	-0.227	-0.795		
	(0.352)	(0.503)	(0.473)	(0.528)		
high_wXinfo		0.606				
		(0.703)				
female	-0.185	-0.179	-0.015	-0.461	-0.854	0.325
	(0.391)	(0.391)	(0.488)	(0.641)	(0.615)	(0.494)
constant	5.121***	5.262***	4.602***	5.471***	5.003***	4.868***
	(0.419)	(0.450)	(0.440)	(0.596)	(0.639)	(0.489)
N	104	104	53	51	50	54
\mathbb{R}^2	0.028	0.028	0.004	0.060	0.040	0.489

OLS regressions. Dependent variable is WTP [0,10]. All presented independent variables are binary variables. Standard errors are given in parentheses. *p<0.1, **p<0.05, ***p<0.01.

4. Conclusion and Discussion

This paper presents the findings of two experiments on the impact of income inequality and social comparison on risk preferences. In Experiment 1, participants who were recruited for a real effort task earned either a low or a high salary and only half of them were aware of the wage inequality. After the participants completed their task, they were offered to buy a lottery with their earnings. The results show a significant impact of social comparison on WTP. The experiment was then repeated in the laboratory with windfall gains. Participants' decisions were

more risk seeking with windfall endowments. However, the treatment effects observed in the Experiment 1 vanished in Experiment 2.

DARA indicates that risk aversion is a decreasing function of wealth (Pratt, 1964; Arrow, 1965) which is also supported both experimentally and empirically (Levy, 1994; Guiso and Paiella, 2008). Yet, certain behavioral phenomena may have restrict its validity. For instance, in a recent study Cherbonnier and Gollier (2015) show that DARA does not hold under general ambiguity aversion. Findings of the present study indicate that DARA holds only if the wage difference is common knowledge to both the winners and losers of inequality. If the subjects are unaware of income inequality, their decisions are similar. Note that the present results are majorly driven by the higher WTP of the *H_info* subjects as the decisions of the low wage subjects seem unaffected by information. Yet, the equality of WTP between H_info and L_info cannot be rejected statistically. Social Comparison Theory (Festinger, 1954) indicates that people tend to compare their opinions and abilities with others if the information, which allows for social comparison is available. As our design clearly disentangles the income effect from social comparison, it can be concluded that when people are aware of income inequality, high income yields higher risk taking. In other words, we do not observe a pure income effect on risk preferences. The behavior of the high wage participants can be explained by two hypotheses. First, they may be afraid of being overtaken by low wage participants who buy the lottery. Second, they may regard risk taking as some kind of conspicuous consumption as per Veblen (1899), which gives them additional utility.

One explanation for the contrast between the results of the two experiments may be that risk preferences of individuals vary depending on the source of endowment. This argument is in line with the House Money Effect (Thaler and Johnson, 1990), according to which, agents take more

risk seeking decisions with prior gains. The average WTP is indeed higher in Experiment 2 than Experiment 1 in our study. External validity issue of laboratory experiments (see Lewitt and List, 2007) and possible inconsistencies between the laboratory and the field (for examples see Carpenter et al., 2005; List, 2006) might also have caused these differences between the two experiments. One can argue that self-selection has also played a role as real effort task was offered by a real organization in Experiment 1. As the initial research question of this study was based on income inequality, this was a deliberate choice to mimic a real job. To minimize self-selection issues both experiments were run with university students of the same faculty, with the same monetary incentives and even in the same computer laboratory. However, our results call for more research on risky decisions taken with the earned money at stake and also on the social drives of risk taking. Moreover, in the present study inequality in wages was determined randomly. An additional question that has not been answered with this study is whether the source of inequality would yield to different results.

Our statistical analysis involves also gender variable (*female*), which is our only control variable. We observe that men in our sample are slightly more risk seeking, yet the difference is not statistically significant. The literature on gender differences in risk taking shows that in general women are more risk-averse than men (Eckel and Grossman, 2008) yet, there also exist numerous studies where no significant gender differences were found. Filippin and Crosetto (2016) reviews the literature in depth and suggest that the inconsistent results might be due to variations in risk elicitation tasks. One other reason behind insignificant gender effect in our study might be slight gender imbalance in the recruited sample (%71.25 women). Since the real effort task in the first experiment was an actual mini-job offered by an official institution (NCPO), the recruitment did not involve a gender quota. For consistency, we followed the same

recruitment strategy in Experiment 2. As a result, gender ratio is highly similar between two experiments, yet number of female participants are higher than male participants in total (see also Croson and Gneezy, 2009). Lastly, Vieider (2015a) note that the gender differences might be domain specific as men are more risk seeking in the gain domain but not in loss domain in their study.

The limitations of the study should also be discussed. First, the risk elicitation method used in the current study does not allow for a thorough analysis of risk preferences, e.g. eliciting separate parameters of prospect theory. This was also a deliberate choice due to time constraints in the first experimental procedure. The participants spent approximately an hour to complete their task. As participation was voluntary, a more demanding risk elicitation method was not chosen to avoid fatigue effects on the data and participation in the experiment. Using a more detailed risk elicitation procedure may be an important improvement in future research. Note that although the endowments and stakes of the experiment may seem low (\approx €4.61), the average hourly wage in Lithuania was around €3.38 in 2014, when the study was conducted.

It should also be acknowledged that our participants represent only a certain income group as the participants were students below the age of 26 and almost 90% of the participants in our sample had an income of €400 or less. Therefore, results may vary across different wage groups in society. Furthermore, the experiment was conducted in Lithuania and there is repeated evidence of the impact of cultural differences on risk preferences (See Vieider et al., 2015a; 2015b). The examination of the impact of inequality and social information on risk preferences in different cultures calls for attention in future research.

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Appendix

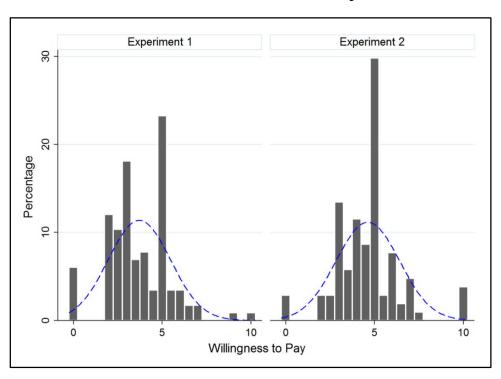


Table A1: Distribution of WTP levels in experiments