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The Effect of Peer Observation on the Consumption of Temptation Goods: Experimental Evidence

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The Effect of Peer Observation on the Consumption of Temptation Goods: Experimental Evidence

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ABSTRACT

This paper uses a clean experiment to investigate the impact of peer observation on the consumption decisions of rural households in Thailand. We find that those groups that observe each other show lower within group standard deviation in their decisions. At the same time, we also find that individual choice is influenced by group choice. We find that unfamiliarity with product is counteracted by peer effects. We further find that individuals with higher cognitive ability are less affected by peer effects.

JEL classification: D12, C21, D85

Keywords: Consumption, Peer Effects, Conformity

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1 Introduction

The feeling of buying something just because someone else has it is a feeling familiar to many. Even though, the effects of one's peers on own consumption choices seem so obvious, it is rarely considered in standard economic theory. Instead consumption choices are traditionally considered as a function of budget, prices and personal preferences. Little consideration has been given to the effect of social factors in consumption choices. In this paper we aim to change this by studying the effect of peer observation on consumption choices using a simple experiment conducted in rural Thailand. We define peer effects as the simple effect that leads individuals to behave in a similar way to those around them. To the best of our knowledge, no experiment of peer effects in consumption decisions has been attempted so far.

We focus thereby in particular on temptation goods. Temptation goods are defined as goods that provide the current self with positive utility, but negative utility to any future self, for instance, alcohol, cigarettes or unhealthy foods (Banerjee and Mullainathan, 2010). We focus on the effect of peer's observation in temptation goods, as we believe that consumption choices for temptation goods are particularly susceptible to the influence of peer effects. At the same time, there is no real *need* for the temptation goods that are offered during the experiment.

We perform the experiment in rural Thailand. It provides the ideal platform to perform such as an experiment because of the prevalence of close-knit communities. Our respondents live in relatively small villages and often have lived there for many generations. Hence groups are made up of people that actually know each other. According to a recent study Mangyo and Park (2011), peer groups often form at the village level.

The design of our experiment is very simple; we test consumption choices by simply offering respondents the choice between a combination of sweet and salty snacks, i.e. the temptation good (called the tasty treat from here on) and money. The money amount offered is increased in every round in steps of ten Baht whereas the tasty treat (TT) stays the same. In the control group, respondents have to make their consumption choices on their own, separated from the rest of the respondents. In the treatment group, each respondent still makes her own decisions, but now all respondents play whilst observing each other.

In our analysis, we compare observing with non-observing groups. This type of experimental design has a number of advantages. First it tackles a number of problems

described by Manski (1993, 2000). One is the problem caused by correlated effects, which states that observed peer effect can be caused by unobserved characteristics that are common to a certain peer group, rather than by the presence of peers themselves. Given our large sample size, we assume that our villages are the same on average and that effects can simply be attributed to peer observation. Randomization of our sample in observing and non-observing groups on the village level also attempts to circumvent the problem of contextual effects. Thus, our research design enables us to directly compare outcomes for those groups that performed the experiment with and without peer-observation. Hence, our experiment provides a clear counterfactual.

Our study has another advantage; the experiment is part of a long running panel data study that has been collecting large amount of socio-demographic information on our respondents, their household and the village in which they live. Thus, we are able to control for a large number of characteristics that should reduce the number of unobservable characteristics.

A number of experimental studies use a similar experimental design; Falk and Ichio (2006), randomly assign participants either to a group or work alone in order to study the effect of peers on productivity. Baecker and Mechtel (2014) use a similar design in order to study the effect of peers on cheating behaviour. Garnder and Steinberg (2005) show that risk taking is increased when a computer game is played under the observation of friends, rather than alone. These studies have the advantage that they provide a clear counterfactual and control other factors, thus providing the cleanest evidence on peer effects.

In order to support our experimental analysis, we develop a theoretical framework. We adjust a standard model of consumer choice with a cost imposed on the decision maker when deviating from the group choice. We argue that this cost represents a social cost from not conforming to the group. We do not further discuss what exactly may be the reason for this cost. This social cost takes the value of zero when the experiment is performed in the control group or, alternatively, when the individual chooses exactly the same as the rest of the group. We can show from this model that under the peer treatment extreme choices are more costly and therefore, the demand curve for the tasty treat is flatter under peer treatment.

Our experimental data confirms the prediction of the model. Specifically, we find that observing groups have a higher group minimum and a lower group maximum. Consequentially, the standard deviation for those observing groups is lower than for

those groups that simply played at the same time, but without peer observation.

In further analysis, we confirm this finding by showing that the group average, which excludes the individual herself, has a positive and significant influence on the decisions made by the individual respondent; but only when the experiment is performed with peer observation. Most importantly, the effect is not significant when the experiment is performed non-observing groups. The fact the effect is only present in the observing groups shows us that it can be attributed to the presence of peers and not to other possible effects.

Next, we aim to explore the mechanisms behind the peer effect. There are two possible reasons for this; either the respondents feel that the others in a group have better information or they are gaining some kind of benefit from conforming with the others. This effect is also referred to as a network externality. We find evidence that unfamiliarity with a product is counteracted by peer observations. In non-observing groups, however, unfamiliarity leads to lower demand for the tasty treat.

Following this, we look at treatment heterogeneities to analyze whether there is a different magnitude of peer effects for individuals with different background characteristics. We show that those with the highest cognitive ability are less likely to choose the TT. Using the same technique, we do not find any effect for overconfident, underconfident or higher income respondents.

To sum up, we are able to show using a clean experiment that the observation of peers has a significant impact on consumption choices. We find that peers who observe each other make similar decisions. At the same time extreme choices are more commonly found when the experiment is performed in the individual treatment. Hence, preferences seem to converge in the peer treatment. In other words, we find that peer observation leads to conformity.

Studies of peer influences on consumption behavior evolved along two lines and are commonly based on observational data, thus do not normally look at the effect of peers using an experimental design. The first is the "keeping up with the Joneses" model (Luttmer, 2005, Frank et al. 2010) where a given households consumption is positively affected by the consumption of the households whose permanent income is just above theirs. A paper that argues along similar lines is Bertrand and Morse (2013). They show that medium income households who live near top income and consumption households have a higher propensity to consume, an observation not found if they live in medium or lower income neighborhoods. The only way these consumers can finance

further consumption is through debt. In this manner, Georgarakos et al., (2014) found that the higher the perceived income of the social circle is; the greater is the tendency of respondents to take up loans and borrow sizeable amounts, however not for long-term investment purposes but short-term visible consumption.

The second stream of literature revisits Veblens (1899) idea of conspicuous consumption and suggests that the allocation of consumption among goods may be tilted towards goods that are more "conspicuous" than others, such as jewelry, luxury cars, restaurant visits, and so forth. In this regard, Charles et al. (2008) found that college educated individuals spend about 13% less than their high school educated counterparts on visible goods controlling for current and permanent income. Roth (2014) uses a randomized cash transfer program in Indonesia to examine the impact of peers on conspicuous consumption. He found that untreated households in villages who received the payment increased the expenditure of visible goods because their neighbor who received the cash transfer increased his/her consumption of visible goods. Hence, peer effects do seem to affect overconsumption decisions.

Peer effects have also been studied more directly in the context of other human behaviour. They seem to have a positive impact in terms of workers productivity (Bandiera et al., 2010, Guryan et al., 2009). Mas and Morretti (2009), for instance, show that there are positive spill over effect on the productivity of other cashiers from a more productive supermarket cashier starting her shift. This effect is only present for those cashiers that observe their more productive colleagues. Another strand of the peer literature looks at natural experiments to overcome the reflection problem. Sacerdote (2001) uses the random assignments to US college dorms to study peer effects on education. There is further evidence for peer effects in saving and investment decisions (Duflo and Saez, 2003; Viscusi et al., 2011).

Something that has been rarely attempted so far when looking at peer effects is to distinguish between the different reasons that cause individuals to behave in a similar way to their peers. There are two reasons, which are notoriously hard to separate, especially when looking at observational evidence. One reason, why an individual is behaving in a similar way to their peers, may be that he is drawing information from those around him and that this results in the same behaviour. The other reason for the existence of peer effects is that the individuals are simply copying those around them, because their utility is higher when they behave in a similar manner those around them. A common example is, watching the same film as those around you may increase your

utility beyond the simple utility of having seen the film. To our knowledge, this distinction has so far only been attempted by using carefully designed field experiments. Cai et al. (2009), who look at an experiment with two treatments in a restaurant setting in order to distinguish the effect of social learning from the effect of salience. Bursztyyn et al. (2012) study the demand for a complex financial fund, using a brokerage firm in Brazil. The authors aim to distinguish between wanting what others have and the information effect of knowing that the other person thinks that the product is worth buying.

The study of peer effects is crucial in advancing further understanding of human decision making. However, at a second look, peer effects can also have an important effect on economic policy. It may have an effect on aid programs, for instance, in the optimal design of a conditional cash transfer program (CCT). There is growing empirical evidence that CCT led to consumption behavior that is inconsistent with the Permanent Income Hypothesis. In a recent study of a CCT in Peru, Dasso and Fernandez (2014) found that expenditures on non-essential food items went up by 10-20 percent when beneficiaries have the cash transfer on their hands as opposed to when they do not have it. This shows that the success of an aid program of such as CCT could depend on the prevalence and size of peer effects.

The remainder of this article is organized as follows. In Section 2, we present our data and experimental design. Section 3 presents the conceptual framework and the identification strategy. We discuss descriptive statistics, inferences and results in Section 4. In Section 5 provides further robustness tests while Section 6 concludes.

2 Data

2.1 Sampling Procedure

Our experiment was conducted as part of a larger household survey of the research project Impact of shocks on the vulnerability to poverty: 'Consequences for development of emerging Southeast Asian economies' funded by the German Research Foundation. The household survey, containing wider socio-economic information such as demographic, health, consumption, borrowing and investments items, has been conducted since 2007. The survey covers more than 4,500 rural households in the North-eastern part of Thailand. Our peer experiment was conducted in the largest of the three provinces, Ubon Ratchathani.

Within each of the three provinces, we exclude the urban area around the provincial capital city and confine the sample to the remaining rural areas. Rural households have been selected according to a three-stage stratified sampling procedure. The sampling procedure is as follows: In the first stage sub-districts within a province were chosen with probability proportional to size and implicit stratification by population density. From each sampled sub-district two villages were sampled with probability proportional to size. In the third stage, a systematic random sample of ten households was drawn from household lists of the rural census ordered by household size. The generated sample is representative for the relatively poor rural population in Thailand's Northeast.

2.2 Experimental Design

The peer experiment was conducted in August 2013 with 521 respondents from 66 villages in the province Ubon Ratchathani. The study itself not only contained the peer experiment but also questions about risk attitude, financial literacy, overconfidence and cognitive ability. The experiment is complementary to the data from the household survey which contains baseline characteristics for all participants, including household dynamics, education, health and income.

The experiment was carried out by local enumerators with one of the research fellows being present at all times. Instructions were translated from English into Thai and back, and were cross-checked by a Thai economics professor to avoid semantic difficulties. Instructions were kept as simple as possible **Appendix A**. The interviewers were trained in sessions that together lasted a total of five days. During these five days,

a pilot study was conducted in three villages.

We randomly assigned the villages to their respective treatments. Selection was conducted at the village level to avoid information spillovers between treatment and control groups within one village. The survey was conducted by visiting two villages per day. For neighboring villages interviews were usually carried out simultaneously. The distance between villages was on average 18 km and respondents had to stay at the interview site until the completion of the survey. There were two experimental sessions conducted in each village, with up to five respondents in one session at the same time. All experimental sessions took place in the village hall.

The Tasty Treat consisted of very popular items that are widely known across the country, namely a can of coke, a piece of custard cake, a small package of lays classic crisps, a bar of chocolate, and a small pack of candies. It had a value of 40 Baht (approximately 1 Euro). We made sure that it not only included sweet but also savory items so that it appeals to a wider range of tastes. During the experiment, we made sure that the respondents did not get any food or sweet beverages to drink.

The experiment consists of a very simple choice. The respondent has to choose between the tasty treat (TT) and a certain money amount. In total, every respondent had to make this decision seven times. Each time the respondent had to make the decision, the amount of money increased by 10 Baht. Hence in the first round, the respondent had to choose between the TT and 10 Baht. In the seventh and last round the respondent has to choose between the TT and 70 Baht. In round four there is no price difference between the two choices. In the later rounds, it becomes increasingly unreasonable to choose the TT because of the significant price difference. The enumerator marks the decision in each round. Once all seven choices have been made, one decision was randomly played out. The respondents had to pick a number (1-7) from a non-transparent bag to determine whether the respondent would receive the tasty treat or money, depending on their choices. In case the respondent picked number 3 and choose the TT in row 3, she received the TT immediately. In case, the respondent picked money in that row, the respondent would receive 30 Baht at the end of the survey with an additional 50 Baht for participating in the survey.

Before these choices, respondents are asked to estimate the price of the temptation good. After their estimation, the respondents were told that the TT costs 40 Baht. Additionally, respondents were informed that TT were given immediately. In contrast, if they chose the money, they will receive it at the end of the entire study. Respondents

were reminded that after the experiment, they had to stay and answer further questions (mathematical, financial literacy etc.). After all seven rounds, respondents were asked how much he/she would be willing to pay at most to receive the TT.

In the control group, the TT game was played individually and was conducted with 261 individuals. To avoid peer observation, we made sure that respondents were separated across the town hall so that they could neither hear nor see the choices of the other respondents. Furthermore, it is unlikely that the decision of one respondent affects other respondent in the control group because individuals respond at different speeds.

The peer treatment was conducted with 260 individuals in 66 groups. The size of the group ranges from three to five people. The procedure of the treatment is the same as the individual treatment with the sole exception that decisions were conducted with peer observation. Each respondent is still responsible for their own decision, but respondents had to sit next to each other and perform the experiment. As in the control group, all the instructions were read out loud and show cards were used to demonstrate the choices between TT and money in each round. For instance, in the first round, the principal enumerator asks all respondents whether they would like to choose the TT or 10 THB. Respondents have to express their choices to their assigned enumerator out loud so that other participants could hear and see their choices. Once everyone has decided, the principal enumerator moved to the second round and the same procedure was followed. The difference between this and the control treatment is simply that choices are observable to peers.

3 Conceptual Framework and Identification

3.1 Conceptual Framework

In this section we present conceptual framework that explores the relationship between the choice of money m , the choice of a tasty treat tt and the groups choice of \bar{tt} . In this section we ignore the effect of individual preferences as denoted by x and \bar{x} in the next section. We can justify this with our experiment and that personal preferences are the same across treatments. Hence each participant's utility function is defined as:

$$U(tt, m; D, \bar{tt}) = u(tt, m) - D \cdot c(tt - \bar{tt})$$

The first component $u(tt, m)$ is both increasing and concave in both tt and m . It represents the utility that an individual receives from choosing the tt or m , whereas the choice in $tt \in \{0, 1\}$ and $m \in \{10, \dots, 70\}$. Because individuals have to decide between tt and m , $tt = 1$ implies $m = 0$ and $m > 0$ implies $tt = 0$. Also note that the difference $u(0, m) - u(1, 0)$ is increasing in m : the higher m , the smaller the share of individuals that will prefer tasty treatment to money, i.e.

$$\frac{\partial \Pr(tt \succ m | D)}{\partial m} < 0.$$

The utility function above includes a conformity cost function $c(tt - \bar{tt}) \geq 0$. This cost function is increasing, the larger the difference between own choice of the respondent and average consumption of the peers.

$$c(tt - \bar{tt}) \begin{cases} > 0 & \text{if } tt \neq \bar{tt} \\ = 0 & \text{if } tt = \bar{tt} \end{cases}$$

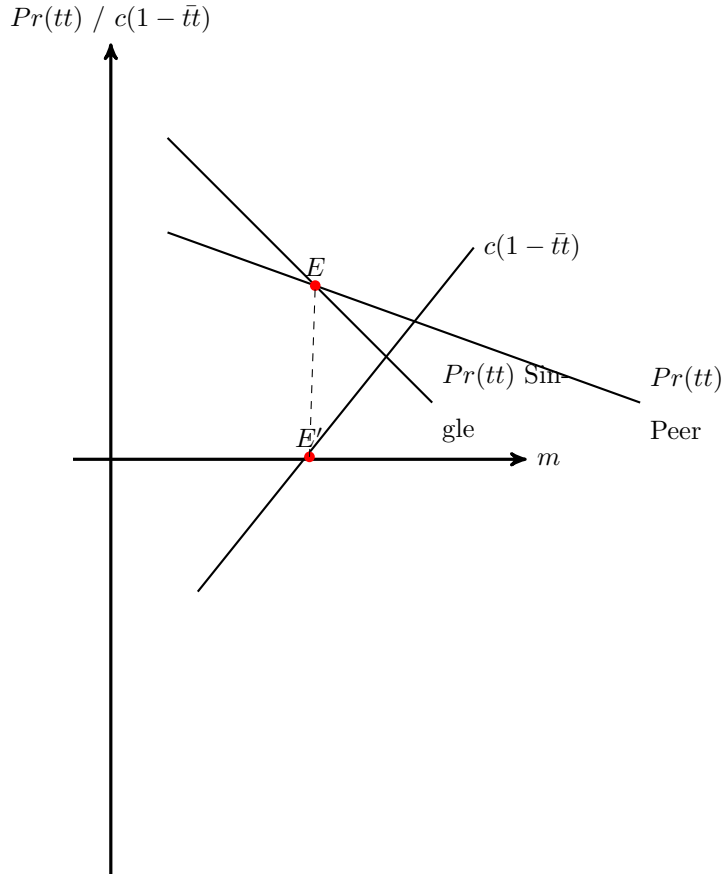
In this model we do not go into the source of this cost. In our view there could be a number of reasons behind this, which we discuss later on. More importantly note that this conformity cost only applies to those individuals that play in a group. In this case $D = 1$ and for individuals in the control group $D = 0$ hence the conformity cost function does not play a role in their decision making. In single treatment, the tt is preferred if

$$u(1, 0) > u(0, m).$$

In the group treatment, tt is chosen if

$$u(1, 0) - c(1 - \bar{t}t) > u(0, m) - c(0 - \bar{t}t).$$

As peers possess the same utility function $U()$, average peer tasty treat consumption $\bar{t}t$ must also be decreasing in m . Therefore, $\frac{c(1-\bar{t}t)}{\partial m} > 0$ and $\frac{c(0-\bar{t}t)}{\partial m} < 0$. It should be noted that $\bar{t}t$ also depends on tt and is therefore endogenous. Since choosing the tt is synonymous with not choosing m it is easier to think of one cost function that looks at the cost of choosing tt at different levels of m . In this case the cost of choosing tt would be positive for high values of m , but negative for low m . **Figure 1** shows the relationship between m , $Pr(tt)$ and $c(1 - \bar{t}t)$.



From this it becomes clear that the respondents under peer treatment react more strongly to a change in m than respondents under single treatment

$$\frac{\partial \Pr(tt > m | D = 0)}{\partial m} < \frac{\partial \Pr(tt > m | D = 1)}{\partial m}.$$

Intuitively, this seem logical as there in an extra benefit from choosing the tt when m

is small and an extra cost in choosing tt when m is large. This means that hence in the peer treatment, we expect that fewer people switch from m to tt very early or very late. In turn we expect this to lower standard deviation within a group. So far we have shown the different reactions of tt to a change in m , between the peer and the single treatment. We are now left to show that this conformity cost that we introduced above leads to a positive relationship between tt and \bar{tt} which can be defined as peer effects. From the original utility function we can see that

$$\frac{\partial \Pr(tt \succ m | D = 0)}{\partial \bar{tt}} = 0$$

Hence there is no change in tt as \bar{tt} change in the single treatment. Whereas under peer treatment

$$\frac{\partial \Pr(tt \succ m | D = 1)}{\partial \bar{tt}} > 0$$

There is a positive relationship between the number of people that choose tt and the average peer decision \bar{tt} .

3.2 Identification Strategy

We are interested in identifying causal peer effects and understanding whether and how much consumption is affected by the observation of peers. The identification of peer effects, however, suffers from a number of econometric issues (Manski 1993, Moffit 2001) which can be summarized into three categories: (a) contextual effects, (b) endogenous effects, and (c) correlated effects.

Contextual effects in consumption choices may emerge if socially-related individuals under study share preferences and characteristics that make them more likely to select in a peer and these characteristics are important determinants of the dependent variable. Correlated effects may emerge if individuals share common environments and unobserved shocks (i.e. rainfall in the village) that make their consumption move simultaneously independently of any genuine peer effects. Finally, endogenous effects represent the phenomenon where the group affects individual behavior through social interaction (i.e. is the individuals consumption choice are positively or negatively affected by the group consumption choice?). It is the third effect what we are trying to separate in this study.

Our experimental design (discussed in detail in Section 2) represents an attempt to surmount the challenge of identifying a causal peer effect. Much of the literature following Manski has focused on the econometric issue of separating the causal peer effect from that of correlated unobservables (Conley and Udry, 2010; Miguel and Kremer, 2004; Bandiera and Rasul, 2006). Two ways of disentangling these effects are to (1) randomize the peers (Sacerdote, 2001; Duflo and Saez, 2003) or (2) randomize an intervention or new technology (Oster and Thornton, 2012; Godlonton and Thornton, 2012; Kremer and Miguel, 2007). We follow the first approach.

The double randomization in our experimental design, that is, first randomly selecting households to perform the experiment given the sampling procedure and second randomizing peer and control treatments according to villages, circumvents the problem of correlated and contextual effects. Given our random assignment of individuals to play the game alone or in a group, we are able to create counterfactual groups out of those individuals that played the game at the same time as their peers, however, without directly observing their peers. We have two types of groups, those that performed the experiment directly observing each other and those that played the game at the same time in the same room, but not directly observing each other. Hence, the only difference between our treatment and control group is that the treatment group observed their peers and the control group did not.

As a check of the randomization, in **Table 2** and **Table 3** we present individuals' characteristics for the observing and non-observing groups, as well as tests of equality of characteristics across groups. As expected from the random assignment into each group, the sample is well balanced across the baseline variables. We try to overcome the reflection problem by the identification of endogenous peer effects with the so-called leave-out mean which is we use as the regressor in our main analysis to identify the effect of the group average consumption on the individual consumption choice.

To identify the effect of peer observation, we will estimate the main regression model in the following form using least squares estimation:

$$Y_{ij} = \alpha + \beta \bar{y}_{-i,j} + \gamma \bar{x}_{ij} + \delta x_{ij} + u_{ij}$$

In our framework, Y_{ij} is the consumption choice of TT for individual i who has group affiliation j (observing or non-observing group). In our main analysis Y_{ij} will be the last row in which they choose the TT before switching to money. However, we also run similar regressions using an indicator variable if they always chose TT over money or if they decided not to choose TT at all. The variable x_{ij} is a set of individual characteristics such as female, age, schooling, log consumption, household size, dependency ratio, algebra knowledge, and BMI that affect consumption decisions. In the robustness section, we also include specific village characteristics such as the travel distance to the district capital, the provincial capital, the average number of shocks a village experiences in the last two years and the number of households living in the village. \bar{x}_{ij} contains the averages of the x 's of individual i in group j . The error term is clustered u_{ij} on the village level. Following the literature, $\beta\bar{y}_{-i,j}$ measures the endogenous effect, δx_{ij} the exogenous effect, u_{ij} is the correlated effect.

The coefficient of interest is β which is the sample mean of the group outcomes, net of individual i 's outcome, a quantity commonly referred to as the leave-out mean denoted as $\beta\bar{y}_{-i,j}$ where

$$\bar{Y}_{-ij} = \frac{1}{N-1} \sum_{k \neq i}^{N-1} Y_{kj} = \frac{1}{N-1} (N\bar{y}_i - y_{ij})$$

For ease of exposition, we have assumed that the group sizes are the same across groups and it is designated by N . We let j denote the number of groups, and so the sample size in this simplified setup is Nj . Also, the fact that the data include every individual in a given group implies that we can use the leave-out mean as the peer group measure.

In many peer studies, often researchers would often use the group mean inclusive of the individual, \bar{y}_{ij} . However, outcome-on-outcome peer effects are vacuous, because regressing \bar{y}_{ij} on y_{ij} results in a coefficient of 1, entering unity. Therefore, any peer group measure must vary within groups in order to satisfy the rank condition. This would rule out taking the average outcome of the group as the regressor. Instead taking the leave-out mean allows inter-group correlation coefficients since there is a different group average for each respondent, calculated from the decision of the other group members. This approach has previously been used by Townsend (1994), Guryan et al. (2008), Duflo et al. (2011) and advocated by Angrist (2014).

For now, assume $E(u_{ij}|x_{ij}) = 0$, i.e., no correlated effects or self-selection into groups. In our particular case, the randomization of individuals into observing and non-observing groups rules out correlation between the individual effect and any endogenous

or exogenous effect, thus satisfying the condition, $Cov(E(\bar{y}_{-ij}|u_{ij}) \neq 0$. In other words, since u_{ij} is not mechanically correlated with \bar{Y}_{-ij} , we can avoid the classical simultaneity problem and infer a causal relationship. Thus, if we observe a difference in outcomes between observing and non-observing groups we can attribute this directly to the (on average) only difference between these groups - peer observation.

4 Results

4.1 Descriptive Statistics

Table 1 shows individual characteristics of our sample. First, we have significantly more women in our sample (60%). As we are deliberately sampling the household head, average age is relatively high at 54 years and 82% of respondents are married. Socio-demographic characteristics of our sample are typical for rural northern Thailand; education levels are still relatively low with less than six years on average. The average household has more than four members with a dependency ratio of 1.45 dependents for every working member. The vast majority of respondents name farming as their main occupation, with the rest being made up of government officials, business owners, students and housewives. As this study uses eatable goods to examine the consumption of temptation goods, it is interesting to look at BMI, a standardized measure of weight to height ratio. The average in our sample is 23. In terms village characteristics, it can be said that the average distance to the next district capital is 16 km, while to the provincial capital, Ubon, it is 60 km. We control for it in our robustness section because the demand for the temptation good may be larger the higher distant of the village to the nearest town. The average number of shocks in our 66 villages was 1.45 ranging from 1 to 3 shocks in total. The number of households in a village varies significantly from 813 households close to the provincial capital to 55 households only. Peer effects may be larger the smaller the village is because people may know each other more. Despite considerable growth in rural Thailand over the last decades, the north east is still relatively poor which is reflected in the average rate of consumption and average household wealth.

In addition to standard socio-demographic variables we also collected a number of variables that are designed to measure cognitive abilities. This allows us to study the peer effect on a sample with different levels of cognitive ability. The survey collected two types of questions in order to get this information. Exact questions are reported in **Appendix B**. Firstly, we collected a number of math based questions. In total there were six questions, the first four are based on the hardest four out of eight math questions in Cole et al. (2011), the last two questions are based on question used in the Survey of Health, Ageing and Retirement in Europe (SHARE) and have previously been used to measure numeracy in studies such as Christalis et al. (2011). In a first step, we awarded one point for each question answered correctly. The average score achieved

is 3.6 out of six. Numeracy shows a near normal distribution with 1.99% scoring no point and only 4,81% scoring full six points. In addition to this we, included a question that asked respondents to name as many animals as they can in 60 seconds. This is a measure of word fluency and has the advantage that it is related to more innate forms of intelligence and especially measures processing speed. This test for word fluency has also been used in a number of other studies as part of cognitive ability measures such as Falk et al. (2010). The average number of animals named is 17.29; however the standard deviation for this measure is rather large at 5.86. The correlation between the two cognitive ability measures is 0.355 (Spearman; p-value<0.001). Thus, the two tests capture a similar underlying trait but also distinct aspects of cognitive ability. We follow the same procedure as Dohmen et al. (2010) and use a single combined measure of cognitive ability. In further analysis we combine these two measures of cognitive ability using principal component analysis and standardize it in order to ease interpretation.

Lastly, we asked respondents to judge, how many of these questions they answered correctly to measure overconfidence. Overconfidence results in unrealistically positive self-evaluations. In other words, people are unrealistically optimistic and overestimate personal success probabilities. Our primary measure of confidence is the difference between the predicted math score and the achieved score. Thus, a subject whose prediction is higher than her actual score is called overconfident, and a subject whose prediction is below her actual score is called underconfident. Using this measure, 40% of our sample are overconfident. We find a positive correlation between cognitive ability and over/underconfidence. Overconfidence is positively correlated with lowest 10% of cognitive tests (0.2565, p-value<0.001). In contrast, the correlation between high cognitive skills (highest 10%) and underconfidence are 0.0920 with a p-value of 0.001.

Table 2 shows results of t-tests to check for differences between treatment and control groups. This shows that randomization was mostly successful and that there is no significant differences in observables between those that played the TT game alone and those that played that the game with peer observation. The only difference that can be seen is that those that played in a group on average have more children and that the distance to Ubon, the provincial capital, is larger. We will hence control for this difference in further analysis.

As this study not only compares the behavior of individuals but also looks at the behavior of groups, it is important to check that group composition is the same between

those that played in observing and those that played in non-observing groups. There are 126 groups in total. 60 played in an observing group, while the rest played in a non-observing group. **Table 3** shows that group composition is the same on average when looking at measured observables.

4.2 Comparing Groups

We begin our analysis of the effects of peer observation, by studying the difference between those groups that played the game observing each other and those that played the game at the same time and under the same conditions but not observing each other. T-tests with results that compare decisions between the two types of groups are shown in **Table 4**. Most striking at first is that there is no difference in the average of the last row that was chosen in each playing situations. Hence, the average last row chosen in observing as well as non-observing groups is the same. However, we can see a difference between the standard deviation between those groups that played together and those that did not. The standard deviation within a group for those groups that observed each other is significantly lower than for those groups that did not observe each other. Those that play in a group are less likely to switch either very early or very late. This can also be seen when looking at the group minimum and the group maximum. The group minimum is the lowest switching point within the group, whereas the group maximum is the highest switching point within a group. We can see that the group minimum is significantly higher and the group maximum is significantly lower when the game is played with peers observing each other.

We further test the finding described above, using regression analysis with results shown in **Table 5**. Outcome variables are the same as above, namely group mean, group minimum, group maximum, and group standard deviations. Peer is a dummy that is unity if the group that played with peer observation. In these regressions we control for group level characteristics. We confirm our finding from above. When the experiment is played with peer observation, standard deviation of choices within the group is lower. The same can be seen when looking at the group minimum and maximum. The coefficient on the peer dummy is positive in the regression estimating the group minimum and negative and significant in the regression estimating the group maximum. Again there is no effect on the group average choice. Interestingly, group composition seems to otherwise only have a limited influence on the tasty treat choice. Groups with more women switch from tasty treat to money earlier. Similarly, there

seems to be an effect of groups that are richer i.e. that have higher average consumption where the group minimum is significantly higher.

4.3 Peer Effects

As a next step it is interesting to look at these results in more detail. In order to do this we follow an approach commonly used in the literature on peer effects. We study the effect of a group average on the individual decisions. We calculate the group average by excluding the individual herself. This way there is a different group average for each respondent, calculated from the decision of the other group members. This approach has previously been used by Townsend (1994). Other than most papers that use this approach, we are also able to look at a clear counterfactual, by running the same regression for observing as well as for non-observing groups. Results are presented in **Table 6**. The first two columns show that there is a positive relationship between the average switching point in the group and individuals switching point. The first two rows cover the entire sample, when looking at these results only it is conceivable that this relationship may be caused by unobserved variables as described by Manski (1993).

In the next four columns however, we split out sample into those that played the game in observing groups and those that played on non-observing groups. Here we can clearly see that the effect observed above is caused by peers observing each other directly and not caused by unobserved correlated variables. In columns 3 and 4 we show results for those individuals that played in observing groups. We can see that the effect here is significant and stronger than for the full subject pool. Columns 5 and 6 show the same regression but for respondents that play the game without peer observation. Here the effect of the average peer choice has no effect on the individuals switching row. Similarly, in columns 7 we introduce an interaction term between the group average and a dummy that is one if the game was played in an observing group. The interaction term is positive and significant and so we can conclude that the relationship between the group average and the point of switching is not the same between observing and unobserving groups.

These results described above indicate to us that the peer effects that we observe in columns 3 and 4 above is not caused by unobserved variables but rather by peers observing each other and making the same observation at the same time.

In **Table 7** and **Table 8** we perform the same exercise, but with a different depen-

dent variables. Firstly we have a dependent term that is a dummy taking the value of 1 if the respondent chose to the TT in every round and second a dummy that is 1 if the respondent never chose the TT. These two tables show the same pattern as the previous table. The groups average does influences the individuals choice in both tables. In **Table7**, if the groups average is higher, it is more likely that the respondent chooses the TT in every round. Conversely, if the group average is higher it is less likely the respondent never chooses the TT. Most importantly, this relationship only holds if the decisions are made under peer observation and does not hold, if the game is played at the same time but without observation.

4.4 Mechanisms

So far we have shown that the standard deviation of choices in groups is smaller, as the maximum switching row in groups is lower and the minimum switching point is lower if the experiment is conducted with peer observation. At the same time, we were able to show that individuals are clearly influenced by their groups, as group averages have an influence on the individual decision.

In this section, we will now attempt to look into the mechanism that operates these observed effects further. In the literature a number of reasons behind peer effects are discussed (Cai et al., 2009, Bikhchandani et al., 1998). We here attempt to look at two factors. Firstly, peers effects have been argued to be caused because respondents believe that others have better information. Secondly, individuals could simply follow their peers because they are gaining some kind of network externality from doing the same as others in their group. Due to the set up of our experiment, we are unable to provide definite answers. None the less, these results provide some interesting insights into the mechanisms that are behind our observed peer effects.

We will here discuss the effect of information. As described above, we asked respondent to estimate how much the tasty treat costs to buy in a shop. We use this response as a proxy for how familiar the respondents are with the product. We create a dummy that is unity if the respondent wrongly estimates the price. We introduce this dummy, together with an interaction term between the dummy and the leave-out-mean into the regression as described above. Results are shown in **Table 9**. Interestingly, unfamiliarity with the tasty treat makes the respondent less likely to choose it, but only in the single treatment. Not knowing the price of product has no effect on the on the choice likelihood to choose the tasty treat in the peer treatment.

These results indicate to us, that peer observations counteract the effect of a lack of information on a product. Gaining information from peers, therefore seems to play a role in peer effects. At the same time we find evidence of people following each other. However, we cannot draw definite conclusions about the mechanism behind peer effects. Network externalities could be at play here in addition to information effects.

4.5 Treatment Heterogeneity

In this section, we test whether certain personality types are more likely to succumb to peer effects. It is conceivable that high (low) skilled individuals within their group are able to resist (succumb) to peer effects. We hypothesize that highly skilled individuals should be less subject to peer pressure while the opposite should be true for low skilled respondents.

As discussed above we included a number of question designed to study cognitive ability. **Table 10** shows results. We created a dummy for those that score the highest and lowest cognitive ability score compared to their peers within the group. As before standard errors are adjusted for clustering at the village level. We find that the high cognitive ability individuals are less likely to choose the TT at higher rows keeping the peer effects constant. In other words, they are more able to resist peer effects. The result is statistically significant (p-value \leq 10%) and robust even after we control for socioeconomic characteristics. We, however, do not find statistically significant results for low skilled people.

In the next part, we would like to investigate whether overconfidence and intelligence drives economic decision in our peer experiment. We hypothesize that those who are overconfident may drive the groups decision towards taking more TT.

Similar to the procedure with cognitive ability, we created a dummy for those in the group who are overconfident. While we do get the expected sign, that is to say, that overconfident people take more TT, the results are statistically insignificant. This also applies to the interaction term between low cognitive skills (lowest 10%) and overconfidence. Hence, we do not find is that overconfidence matters in terms of peer decisions (Details upon request).

The same analysis as in **Table 10** has been performed for higher and lower consumption for individuals within the groups. We generate a dummy for the highest and lowest consumption of individuals compared to their peers in the group and do not find

any effect (Details upon request). We also use the interaction between cognitive ability and income but results remain unchanged. Groups were peers are able to observe each other make convergent consumption decisions. The only influence we find is that those that performed better in the maths test are more able to resist the peer effects in choosing the temptation goods.

5 Robustness and Discussion

Strictly speaking it is conceivable that the peer effects that we observe in section 4.2 are not caused by peer effects since our randomization took place on the village level rather than the individual level, however this seems very unlikely. For this to happen the randomization would have had to work in a way that means that those that played in observing groups are more alike than those that played in non observing groups. Since the number of groups is fairly large and we are also able to control for a large number of observable factors, we believe that such concern can be neglected. However, to further exclude doubt, we test whether standard deviations of observed variables, are the same between observing and non-observing groups. Results are shown in **Table 11**. From the ttest in this table we can see that standard deviations are the same for observing and non-observing groups. We therefore reject the idea that our results are caused by observing groups being more similar to non-observing groups.

Furthermore, we check whether in addition to the distance of the villages to Ubon, the provincial capital city, or the nearest district capital has an impact on the demand for temptation goods since it is assumed that villages that are close to urban areas could get the tasty treat more easily. This could determine the impact of peer effect. We do not find that the distance to the provincial capital or the district capital has any impact on the peer effects and results found in Table 6 stay the same.

Furthermore, we check if there is an effect of higher food consumption on the likelihood of choosing the TT. We find no effect of food consumption. Next, we also check if the main results hold when we change the way the dependent variable is coded. In order to do this, we create two dummies. The first takes the value of one if the respondent either switched before the money amount increased to 40 Baht, the second takes the value of one if the respondent switches after the money amount is increased to 40 Baht. We run all the regressions again and find that the results do not change. **Table 12** and **Table 13** report results. The group average still has a significant effect on these outcome variables.

6 Conclusion

In a standard economic model of consumption choice, the effect of peers is largely ignored. Our study shows that peers observation has an effect on consumption of temptation goods.

We start of with introducing a conceptual framework that introduces a cost if the individual makes a decision that deviates from that of the group. From this framework we can see that the demand function of the temptation good is less steep under peer observation. We can also derive a positive relationship between the average group choice and the individual choice.

In a clean experiment conducted in Thailand, we compare the decision between the tasty treat and an increasing amount of money. In the control group, respondents perform the experiment at the same time as their peers but without observing each other. In the treatment group peers still make individual choices, but observe each other whilst doing it.

Due to the experimental nature and the large number of control variables, we can circumvent the identification problems normally associated studies on peer effects. We find that standard deviations of those groups that observe each other are higher than for those groups that do not observe each other. At the same time, we show that individual choices are higher when the leave me out group mean is higher. Most importantly, we only observe this when the experiment is performed with peer observations. We hence show clean evidence of peer effects and conclude that peer observation leads to conformity between peers.

We further study the effect of familiarity with the product and find that peer observation can counteract the effect of a lack of knowledge of a product. Looking into treatment heterogeneities, we find that individuals with high cognitive ability, compared to their group, are less likely to choose the temptation good, while the same effect is not to be found for low income, overconfident or high-income individuals.

Despite these findings, a lot of open questions remain that call for further research into peer effects and its effect of consumption choices. First, more research is needed that looks into the mechanisms behind peer effects. A more structured experiment may be able to disentangle the effect of information and network externality and so explain why we find this conformity when peers observe each other. In addition, research could be done into the effect of key individuals within a group. It would be interesting to see, who leads a group and who in a group follows. More research in this field is needed.

References

- [1] Ashraf, Nava, Dean Karlan, and Wesley Yin, 2006, Tying Odysseus to the Mast: Evidence from a Commitment Saving Product in the Philippines, *Quarterly Journal of Economics*, 2, 635-672.
- [2] Baecker, Agnes and Mario Mechtel, 2014, Peer Effects in Cheating on Task Performance, unpublished manuscript.
- [3] Bandiera, Oriana, Iwan Barankay and Imran Rasul, 2010, Social Incentives in the Workplace, *Review of Economic Studies*, 77, 417-458.
- [4] Banerjee, Abhijit and Sendhil Mullainathan, 2010, The Shape of Temptation: Implications for the Economic Lives of the Poor, Working Paper No. 257.
- [5] Banerjee, Abhijit and Ester Duflo, 2007, The Economic Lives of the Poor, *Journal of Economic Perspectives*, 21, 141-167.
- [6] Bertrand, Marianne and Adair Morse, 2013, Trickle-down Consumption. NBER Working Paper Series 18883.
- [7] Bikhchandani, Sushil, David Hirschleifer and Ivo Welch, 1998, Learning from the Behavior of Others: Conformity, Fads and Information Cascades, *Journal of Economic Perspectives*, 12, 151-170.
- [8] Brown, Alexander L., Colin F. Camerer, and Eric Z. Chua, 2009, Learning and Visceral Temptation in Dynamic Saving Experiments, *Quarterly Journal of Economics*, 1, 197-231.
- [9] Bursztyn, Leonardo, Florian Ederer, Bruno Ferman, Noam Yuchtman, 2013, Understanding Peer Effects in the Financial Decisions: Evidence From a Field Experiment, NBER Working Paper Series 1824.
- [10] Cai, Hongbin, Yuyu Chen, Hanming Fang, 2009, Observational Learning: Evidence from a Randomized Natural Field Experiment, *American Economic Review*, 99, 864-882.
- [11] Calv-Armengol, Antoni, Eleonora Patacchini and Yves Zenou 2009, Peer Effects and Social Networks in Education, *Review of Economic Studies*, 76, 1239-1267.
- [12] Carrell, Scott, Mark Hoekstra and James E. West, 2011, Is Poor Fitness Contagious? Evidence from Randomly Assigned Friends, *Journal of Public Economics*, 95, 657-663.
- [13] Charles, Kerwin K., Erik Hurst, and Nikolai Roussanov, 2009, Conspicuous Consumption and Race, *Quarterly Journal of Economics*, 2, 425-467.
- [14] Christalis, Miiiris, Tullio Jappelli, Mario Padula, 2010, Cognitive Ability and Portfolio Choice, *European Economic Review*, 54, 18-38.
- [15] Cole, Shawn, Thomas Sampson and Bilal Zia, 2011, Price or Knowledge? What Drives Demand for Financial Services in Emerging Markets? *Journal of Finance*, 66, 1933-1967.
- [16] Dasso, Rosamaria and Fernando Fernandez, 2014, Temptation Goods and Conditional Cash Transfer Programs in Peru, Unpublished Manuscript.
- [17] De Giorgi, Giacomo, Michele Pellizzari and Silvia Redaelli, 2010, Identification of Peer Effects through Partially Overlapping Peer Groups, *American Economic Journal: Applied Economics*, 2, 241-275.

- [18] Dohmen, Thomas, Armin Falk, David Huffman and Uwe Sunde, 2010, Are Risk Aversion and Impatience Related to Cognitive Ability? *American Economic Review*, 100, 3, 1238-1260.
- [19] Duflo, Esther and Emmanuel Saez, 2003, The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment, *Quarterly Journal of Economics*, 118, 815-842.
- [20] Falk, Armin, and Andrea Ichino, 2006, Clean Evidence on Peer Effects, *Journal of Labour Economics*, 24, 39-57.
- [21] Frank, Robert H., 1985, The Demand for Unobservable and other Non-Positional Goods, *American Economic Review*, 75, 10116.
- [22] Frank, Robert H., Adam Seth Levine and Oege Dijk, 2010, Expenditure Cascades, Social Science Research Network Working Paper.
- [23] Gardner, Margo and Laurence Steinberg, 2005, Peer Influence on the Risk Taking, Risk Preference, and Risky Decision Making in Adolescence and Adulthood: An Experimental Study, *Development Psychology*, 41, 625-635.
- [24] Georgarakos, Dimitris, Micheal Heliassos, and Giacomo Pasini, 2014, Household Debt and Social Interactions, *Review of Financial Studies*, 27, 1404-1433.
- [25] Guryan, Jonathan, Kory Kroft and Matt Notowidigdo, 2009, Peer Effects in the Workplace: Evidence from random Groupings in Professional Golf Tournaments, *American Economic Journal: Applied Economics*, 1, 34-68.
- [26] Imberman, A. Scott, Adriana D. Kugler and Bruce I. Sacerdote, 2012, Katrinas Children: Evidence on the Structure of Peer Effects from a Hurricane Evacuees, *American Economic Review*, 102, 2048-82.
- [27] Kremer, Michael and Dan Levy, 2008, Peer Effects and Alcohol Use among College Students, *Journal of Economic Perspectives*, 22, 189-206.
- [28] Luttmer, Erzo P.F., 2005, Neighbors as Negatives: Relative Earnings and Well-being, *Quarterly Journal of Economics*, 120, 9631002.
- [29] Mangyo, Eiji and Albert Park, 2011, Relative Deprivation and Health: Which Reference Groups Matter? *Journal of Human Resources*, 46, 459-481.
- [30] Manski, Charles, 1993, Identification of Endogenous Social effects: The Reflection Problem, *Review of Economic Studies*, 60, 531-542.
- [31] Manski, Charles, 2000, Economic Analysis of Social Interaction, NBER Working Paper Series 7580.
- [32] Mas, Alexander and Enrico Moretti, 2009, Peers at Work, *American Economic Review*, 99, 112-145.
- [33] Moffit, Robert, 2001, Policy Interventions, Low-Level Equilibria, and Social Interactions, in S. N. Durlauf and H. P. Young. (eds.) *Social Dynamics* (Washington, DC: Brookings Institution Press).
- [34] Moav, Omer and Zvika Neeman (2012), Saving Rates and Poverty: The Role of Conspicuous Consumption and Human Capital, *Economic Journal*, 563, 933956.
- [35] Roth, Christopher P., 2014, Conspicuous Consumption and Peer Effects among the Poor: Evidence From a Field Experiment, CSAE Working Paper Series, No. 29.

- [36] Sacerdote, Bruce, 2001, Peer Effects with Random Assignment: Results for Dartmouth Roommates, *Quarterly Journal of Economics*, 116, 681-704.
- [37] Townsend, Robert. M, 1994, Risk and Insurance in Village India, *Econometrica*, 62, 539-591.
- [38] Veblen, T., 1899. The Theory of the Leisure Class: an Economic Study of Institutions. London: Macmillan Publishers.
- [39] Viscusi, W. Kip, Owen R. Phillips and Stephan Kroll, 2011, Risky Investment Decisions: How Are Individuals Influenced by Their Groups? *Journal of Risk and Uncertainty* 43, 81-106.

TABLES

Table 1: Summary statistics of Socio-demographic Variables and Village Characteristics

Variable	Mean	Std. Dev.	Min.	Max.	N
Female	0.597	0.491	0	1	543
Age	54.206	13.84	14	86	543
Married	0.826	0.379	0	1	541
Years of Schooling	5.629	3.105	1	17	529
Household Size	4.046	1.716	1	12	502
Number of children	1.129	1.058	0	7	513
Dependency Ratio	1.477	0.67	0	6	491
Farmer	0.685	0.465	0	1	502
Self-employed	0.056	0.23	0	1	502
Public Servant	0.02	0.14	0	1	502
Body Mass Index (BMI)	22.993	3.771	11.755	36.982	494
Per Capita Consumption	2397.427	1879.337	395.568	15638.178	548
Total Asset Value	10837.222	17783.051	-408.089	209066.234	502
Algebra Knowlegde	3.555	1.39	0	6	555
Overconfidence	0.365	0.482	0	1	298
Number of Animals	17.215	6.035	4	44	553
Cognitive Ability Measure	-0.028	1.404	-3.655	4.61	553
Distance to district capital	15.964	9.676	2	40	550
Distance to Ubon	59.438	35.492	2	145	550
Number of village shocks	1.449	0.626	1	3	265
Number of households in village	167.007	89.453	55	813	535

Household size is the headcount of persons living in the household for at least 180 days. Body Mass Index is computed weight/height. Numeracy is the score out of six math questions (Details can be found in Appendix B). Number of animals named is the number of animals that someone can name in 60 seconds. Overconfident is a dummy that is unity if the respondent is overconfident. Cognitive Ability Measure is a PCA generated by performing principal component analysis on the numeracy score and the number of animals named in 60 seconds. Distance to Ubon is the average distance of the village to the provincial capital.

Table 2: Comparing Treatment and Control Group

Variable	Control	Treatment	t	p-value
Female	0.57	0.62	-1.09	0.28
Age	54.17	54.11	0.05	0.96
Married	0.80	0.85	-1.53	0.13
Years of Schooling	5.61	5.67	-0.19	0.85
Household Size	4.08	4.01	0.47	0.64
Number of children	1.22	1.01	2.26	0.02
Dependency Ratio	1.53	1.41	1.92	0.06
Farmer	0.69	0.69	-0.03	0.98
Self-employed	0.05	0.06	-0.53	0.60
Public Servant	0.03	0.01	1.08	0.28
Body Mass Index (BMI)	23.03	22.93	0.29	0.77
Per Capita Consumption	2299.92	2507.79	-1.29	0.20
Total Asset Value	10699.97	11095.22	-0.25	0.81
Algebra Knowledge	3.55	3.57	-0.19	0.85
Number of Animals	17.22	17.20	0.04	0.97
Overconfidence	0.38	0.43	-1.18	0.24
Cognitive Ability Measure	-0.03	-0.03	0.04	0.97
Distance to district capital	16.16	15.67	0.59	0.55
Distance to Ubon	65.05	53.68	3.79	0.00
Number of village shocks	1.47	1.41	0.71	0.48
Number of households in village	163.23	171.78	-1.10	0.27
N (Individuals)	552			

The Table reports T-Test between treatment and control groups. Control Variables stay the same as above.

Table 3: Comparing Observing and Non-Observing Peer Groups

Group Mean	Non-Obs.Peer Groups	Obs.Peer Groups	t	p-value
Female	0.58	0.63	-1.05	0.30
Age	54.32	54.18	0.11	0.91
Married	0.81	0.85	-1.49	0.14
Years of Schooling	5.55	5.68	-0.40	0.69
Household Size	4.09	4.02	0.45	0.65
Number of children	1.23	1.02	2.26	0.03
Body Mass Index (BMI)	23.09	23.07	0.06	0.95
Per Capita Consumption	7.57	7.63	-1.14	0.26
Feeling	2.22	2.26	-0.46	0.64
Overconfidence	0.43	0.43	-0.06	0.95
Cognitive Ability Measure	-0.03	-0.02	-0.07	0.94
N (Groups)	126			

The Table reports T-Test between observing and non-observing peer groups. We only report the averages of these control variables that will be used in the subsequent regressions with the exception of feeling which asks how the respondent feels today before the start of the experiment. It is coded from 1(very good) to 5 (very bad).

Table 4: Comparing Outcomes for Observing and Non-Observing Peer Groups

Outcome of PayTT	Non-Obs.Peer Groups	Obs.Peer Groups	t	p-value
Mean	2.96	2.93	0.11	0.91
Standard Deviation	2.26	1.70	3.61	0.00
Group maximum	5.74	4.93	2.52	0.01
Group minimum	0.68	1.21	-2.14	0.03
N (Groups)	126			

The Table reports difference of the outcome choice between observing and non-observing peer groups. We use the payTT which is the last row subjects choose the tasty treat before swichting to money.

Table 5: Group level treatment effect on payTT

	(1)	(2)	(3)	(4)
	Mean PayTT	Std.Dev. PayTT	Max PayTT	Min PayTT
Peer Treatment	0.042 (0.14)	-0.477*** (-2.77)	-0.111* (-1.67)	0.635** (2.26)
Mean Female	-1.346** (-2.40)	-0.695** (-2.02)	-0.408*** (-2.94)	-0.480 (-0.94)
Mean Consumption	0.744 (1.37)	-0.293 (-0.96)	0.056 (0.50)	1.193** (2.11)
Mean Age	-0.013 (-0.73)	-0.016 (-1.33)	-0.003 (-0.84)	0.004 (0.17)
Mean Cognitive Ability	-0.106 (-0.49)	-0.119 (-1.06)	-0.055 (-1.17)	0.090 (0.49)
Mean Married	-0.825 (-1.06)	-0.738 (-1.60)	-0.324** (-1.97)	-0.368 (-0.47)
Mean No. of children	0.036 (0.12)	0.033 (0.20)	0.057 (0.77)	0.260 (0.97)
Mean Schooling	0.072 (0.80)	0.084 (1.38)	0.032 (1.62)	-0.077 (-0.86)
Mean Household Size	0.020 (0.11)	-0.057 (-0.60)	-0.000 (-0.00)	0.033 (0.20)
Mean Feeling	-0.201 (-0.72)	-0.030 (-0.17)	-0.012 (-0.16)	-0.132 (-0.56)
Mean Overconfidence	0.396 (0.61)	-0.185 (-0.52)	-0.062 (-0.45)	0.715 (1.15)
Mean BMI	-0.015 (-0.22)	0.045 (0.99)	-0.011 (-0.69)	-0.057 (-1.10)
Constant	-0.409 (-0.09)	5.170** (2.13)	2.03** (2.29)	-7.826 (-1.53)
Observations	126	126	126	126

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Peer observation is a dummy that is 1 if the game is played with peers observing each other. Mean (Variables) are the average group composition in the observing groups. Columns 3 and 4 show poisson results.

Table 6: Group Average Without Self and Individual choice on payTT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment	All
Group Mean without Self	0.437*** (5.28)	0.413*** (4.22)	0.670*** (10.22)	0.627*** (5.19)	0.008 (0.04)	0.031 (0.16)	0.304* (2.64)
Female		0.570 (1.91)		1.227* (2.69)		0.295 (0.77)	0.628* (2.14)
Age		-0.012 (-1.01)		0.011 (0.67)		-0.030 (-1.99)	-0.010 (-0.86)
Years of Schooling		-0.051 (-0.99)		0.051 (0.66)		-0.094 (-1.51)	-0.031 (-0.65)
Married		-0.348 (-0.91)		0.155 (0.22)		-0.972* (-2.57)	-0.358 (-0.94)
Number of children		0.109 (1.06)		0.151 (0.89)		0.051 (0.41)	0.093 (0.93)
Dependency Ratio		0.071 (0.28)		-0.260 (-0.57)		0.358 (1.14)	0.095 (0.38)
Feeling		-0.449 (-1.79)		-0.040 (-0.10)		-0.737* (-2.33)	-0.451 (-1.78)
Log per capita consumption		-0.198 (-1.05)		-0.341 (-1.25)		-0.172 (-0.66)	-0.238 (-1.26)
Body Mass Index		-0.00211 (-0.06)		-0.004 (-0.09)		-0.021 (-0.42)	-0.007 (-0.18)
Distance to Ubon		0.003 (1.02)		0.004 (1.47)		0.004 (0.67)	0.004 (1.27)
Peer*Group Mean Without Self							0.174* (2.29)
Constant	1.588*** (6.28)	1.876 (0.72)	0.907*** (4.29)	0.926 (0.22)	2.837*** (5.33)	7.187 (1.67)	2.652 (1.03)
Further Mean Group Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	537	442	256	203	278	236	439

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 7: Group Average Without Self and Individual choice on MaxTT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Always TT	Always TT	Always TT	Always TT	Always TT	Always TT	Always TT
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment	All
Group Mean without Self	0.156** (3.08)	0.186** (3.20)	0.261*** (4.26)	0.361*** (3.35)	-0.006 (-0.06)	0.084 (0.83)	0.134 (1.91)
Female		0.303 (1.41)		1.154*** (3.98)		0.0710 (0.25)	0.328 (1.48)
Age		-0.003 (-0.29)		0.016 (0.74)		-0.006 (-0.56)	-0.001 (-0.10)
Years of Schooling		-0.0852 (-1.58)		0.0101 (0.12)		-0.129 (-1.45)	-0.0672 (-1.27)
Married		-0.062 (-0.22)		-0.251 (-0.49)		-0.419 (-1.76)	-0.106 (-0.37)
Number of children		-0.064 (-0.73)		0.139 (0.82)		-0.126 (-1.21)	-0.081 (-0.93)
Dependency Ratio		-0.006 (-0.03)		-0.741 (-1.89)		0.108 (0.51)	-0.005 (-0.03)
Feeling		-0.479** (-2.78)		-0.412 (-1.31)		-0.717** (-3.07)	-0.483** (-2.72)
Log per capita consumption		-0.249 (-1.63)		-0.868** (-2.74)		0.052 (0.26)	-0.280 (-1.81)
Body Mass Index		0.016 (0.66)		0.103* (2.15)		-0.052 (-1.62)	0.014 (0.57)
Travel distance to Ubon		0.001 (0.54)		0.001 (0.24)		0.005 (1.26)	0.002 (0.88)
Peer*Group Mean Without Self							0.077 (1.58)
Constant	-1.713*** (-10.08)	-0.805 (-0.33)	-2.092*** (-8.45)	8.294 (1.88)	-1.241*** (-4.81)	-3.902 (-0.87)	-0.299 (-0.12)
Further Mean Group Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	537	442	256	203	278	236	439

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 8: Group Average Without Self and Individual choice on NoTT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Only Money	Only Money	Only Money	Only Money	Only Money	Only Money	Only Money
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment	All
Group Mean without Self	-0.147** (-2.86)	-0.156** (-2.75)	-0.247*** (-3.67)	-0.266** (-3.18)	0.023 (0.29)	-0.016 (-0.19)	-0.115 (-1.73)
Female		-0.280 (-1.53)		-0.618 (-1.77)		-0.206 (-0.88)	-0.313 (-1.69)
Age		0.002 (0.31)		-0.007 (-0.70)		0.009 (1.11)	0.001 (0.13)
Years of Schooling		0.015 (0.55)		-0.021 (-0.49)		0.029 (0.77)	0.009 (0.32)
Married		0.206 (0.80)		-0.447 (-1.21)		0.879* (2.44)	0.190 (0.74)
Number of children		-0.039 (-0.60)		0.015 (0.17)		-0.055 (-0.54)	-0.038 (-0.58)
Dependency Ratio		0.026 (0.21)		0.091 (0.44)		-0.106 (-0.57)	0.022 (0.18)
Feeling		0.141 (0.95)		-0.109 (-0.41)		0.403* (2.29)	0.132 (0.88)
Log per Capita Consumption		0.104 (0.91)		0.157 (1.05)		0.147 (0.85)	0.118 (1.03)
Body Mass Index		0.007 (0.31)		0.006 (0.24)		0.023 (0.65)	0.008 (0.34)
Travel distance to Ubon		-0.002 (-1.08)		-0.001 (-0.18)		-0.005 (-1.49)	-0.002 (-1.13)
Peer*Group Mean Without Self							-0.078 (-1.55)
Constant	-0.284 (-1.83)	-0.489 (-0.24)	-0.016 (-0.08)	3.788 (1.17)	-0.794*** (-3.36)	-6.507 (-1.86)	-0.729 (-0.34)
Further Mean Group Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	537	442	256	203	278	236	439

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 9: Familiarity with the Tasty Treat

	(1)	(2)	(3)	(4)	(5)	(6)
	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment
Group Mean without Self	0.442** (2.89)	0.391* (2.26)	0.827*** (6.22)	0.841*** (4.97)	-0.384 (-1.72)	-0.362 (-1.41)
Unfamiliarity with TT	-0.125 (-0.21)	-0.288 (-0.46)	0.917 (1.59)	1.335 (1.88)	-2.101** (-2.84)	-2.227* (-2.60)
Peer*Unfamiliarity	-0.008 (-0.05)	0.0227 (0.12)	-0.203 (-1.15)	-0.274 (-1.17)	0.479* (2.16)	0.483 (1.77)
Female		0.568 (1.89)		1.246* (2.65)		0.244 (0.66)
Age		-0.011 (-0.94)		0.010 (0.55)		-0.025 (-1.65)
Years of Schooling		-0.051 (-0.99)		0.050 (0.67)		-0.089 (-1.42)
Married		-0.323 (-0.83)		0.104 (0.15)		-0.984* (-2.58)
Number of children		0.111 (1.08)		0.150 (0.88)		0.048 (0.39)
Dependency Ratio		0.060 (0.23)		-0.178 (-0.37)		0.369 (1.13)
Feeling		-0.454 (-1.80)		0.016 (0.04)		-0.654 (-1.99)
Log per capita consumption		-0.195 (-1.05)		-0.348 (-1.23)		-0.140 (-0.55)
Body Mass Index		-0.001 (-0.02)		-0.016 (-0.34)		-0.015 (-0.30)
Travel distance to Ubon		0.003 (1.01)		0.005 (1.37)		0.005 (0.86)
Constant	1.687** (3.12)	1.865 (0.72)	0.202 (0.49)	0.862 (0.19)	4.545*** (6.14)	8.463* (2.13)
Further Mean Group Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	537	442	256	203	278	236

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 10: The Effect of Cognitive Ability on the Demand of TT

	(1)	(2)	(3)	(4)	(5)	(6)
	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT	Last row TT
	Peer Treatment	Peer Treatment	Peer Treatment	Peer Treatment	Peer Treatment	Peer Treatment
Group Mean without Self	0.681*** (10.82)	0.682*** (10.73)	0.622*** (5.09)	0.670*** (10.20)	0.640*** (8.87)	0.596*** (4.46)
High aptitude	-0.788* (-2.10)	-0.785 (-1.78)	-0.849 (-2.03)			
Peer*High Aptitude		-0.002 (-0.02)	0.099 (1.02)			
Female			1.268** (2.76)			1.168* (2.48)
Age			0.008 (0.46)			0.009 (0.51)
Years of Schooling			0.076 (0.93)			0.027 (0.33)
Married			0.273 (0.40)			0.088 (0.12)
Number of children			0.168 (1.00)			0.143 (0.89)
Dependency Ratio			-0.216 (-0.47)			-0.171 (-0.36)
Feeling			-0.101 (-0.24)			-0.085 (-0.20)
Log per capita consumption			-0.307 (-1.06)			-0.363 (-1.47)
Body Mass Index			-0.012 (-0.25)			-0.005 (-0.09)
Travel distance to Ubon			0.004 (1.43)			0.004 (1.44)
Low aptitude				-0.241 (-0.62)	-0.390 (-1.11)	-0.628 (-1.27)
Peer*Low aptitude					0.114 (1.18)	0.116 (0.89)
Constant	1.052*** (4.48)	1.052*** (4.37)	0.936 (0.23)	0.966*** (4.57)	1.010*** (4.69)	-0.829 (-0.18)
Further Mean Group Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	256	256	203	256	256	203

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 11: Comparing Observing and Non-Observing Peer Groups (Std. Dev.)

Standard Deviation	Non-Obs.Peer Groups	Obs.Peer Groups	t	p-value
Female	0.42	0.42	0.17	0.87
Age	12.79	12.23	0.54	0.59
Married	0.31	0.25	1.33	0.18
Years of Schooling	2.24	2.22	0.06	0.95
Household Size	1.51	1.52	-0.07	0.94
Number of children	1.23	1.02	2.26	0.03
Body Mass Index	3.32	3.51	-0.61	0.54
Per Capita Consumption	0.54	0.58	-0.90	0.37
Feeling	0.79	0.77	0.36	0.72
Overconfidence	0.46	0.42	0.99	0.32
Cognitive Ability Measure	1.28	1.19	1.05	0.29
N (Groups)	126			

The Table reports T-Test between observing and non-observing peer groups.

Table 12: Group Average Without Self and Individual choice on Overprice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Overprice	Overprice	Overprice	Overprice	Overprice	Overprice	Overprice
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment	All
Group Mean without Self	0.156*** (3.49)	0.160*** (3.31)	0.280*** (5.93)	0.297*** (4.40)	-0.051 (-0.57)	-0.036 (-0.39)	0.091 (1.66)
Female		0.268 (1.35)		0.574 (1.71)		0.238 (0.97)	0.301 (1.52)
Age		-0.005 (-0.59)		0.013 (1.04)		-0.016 (-1.53)	-0.004 (-0.48)
Years of Schooling		-0.044 (-1.63)		0.042 (0.78)		-0.088* (-2.47)	-0.029 (-0.96)
Married		-0.176 (-0.84)		-0.345 (-1.02)		-0.212 (-0.71)	-0.196 (-0.86)
Number of children		0.025 (0.35)		0.101 (0.83)		-0.040 (-0.42)	0.016 (0.22)
Dependency Ratio		0.012 (0.09)		-0.094 (-0.30)		0.113 (0.67)	0.023 (0.17)
Feeling		-0.142 (-1.08)		0.024 (0.12)		-0.211 (-1.16)	-0.152 (-1.15)
Log per Capita Consumption		-0.143 (-0.99)		-0.478* (-2.01)		0.068 (0.40)	-0.167 (-1.15)
Body Mass Index		0.012 (0.66)		0.026 (0.94)		-0.007 (-0.27)	0.010 (0.55)
Travel distance to Ubon		-0.002 (-1.10)		0.002 (0.67)		-0.003 (-1.14)	-0.001 (-0.82)
Peer*Group Mean Without Self							0.105** (2.84)
Further Group Average Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.086*** (-7.39)	0.051 (0.03)	-1.458*** (-8.19)	2.052 (0.75)	-0.511 (-1.93)	0.481 (0.16)	0.594 (0.32)
Observations	554	456	264	209	287	244	453

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

Table 13: Group Average Without Self and Individual choice on Underprice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Underprice	Underprice	Underprice	Underprice	Underprice	Underprice	Underprice
	All	All	Peer Treatment	Peer Treatment	Single Treatment	Single Treatment	All
Group Mean without Self	-0.216*** (-4.92)	-0.211*** (-4.45)	-0.349*** (-7.06)	-0.329*** (-4.77)	-0.010 (-0.12)	-0.0114 (-0.13)	-0.153** (-2.88)
Female		-0.326 (-1.80)		-0.456 (-1.63)		-0.375 (-1.57)	-0.357* (-1.97)
Age		0.010 (1.46)		-0.003 (-0.26)		0.021* (2.24)	0.001 (1.33)
Years of Schooling		0.017 (0.64)		-0.013 (-0.29)		0.032 (0.84)	0.006 (0.22)
Married		0.175 (0.90)		0.124 (0.38)		0.417 (1.53)	0.188 (0.92)
Number of children		-0.091 (-1.47)		-0.196 (-1.90)		-0.005 (-0.07)	-0.083 (-1.35)
Dependency Ratio		-0.0430 (-0.32)		0.308 (1.00)		-0.282 (-1.85)	-0.0553 (-0.43)
Feeling		0.161 (1.28)		-0.027 (-0.13)		0.233 (1.37)	0.167 (1.32)
Log per capita consumption		0.122 (1.07)		0.183 (0.97)		0.010 (0.69)	0.141 (1.22)
Body Mass Index		-0.007 (-0.35)		0.018 (0.61)		-0.021 (-0.78)	-0.005 (-0.26)
Travel distance to Ubon		-0.001 (-0.38)		-0.003 (-1.38)		-0.001 (-0.27)	-0.001 (-0.64)
Peer*Group Mean Without Self							-0.097* (-2.44)
Further Group Average Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.858*** (6.20)	-0.449 (-0.23)	1.206*** (7.50)	0.404 (0.12)	0.298 (1.17)	-4.031 (-1.77)	-0.877 (-0.47)
Observations	554	456	264	209	287	244	453

The table reports regression results with clustered standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Group Mean controls include all the controls from Table 3.

A Appendix

Experimental Instructions

We would now like to play a game with you in which you have to choose between some tasty goods or money. At the end of the game you can keep either the tasty goods or the money. We will ask you to choose between the two options 7 times. Each time we ask you, we increase the amount of money. The amount of tasty goods will always be the same. The enumerator will write down your choice each time we ask you. After the game, we will draw a number from a bag. This determines which of the two options you get. The tasty good will be given to you straight after the game. The money, however, will be given to you at the end of the whole survey. You will only receive one option. Either money or tasty good.

Example: No.3 is drawn from the bag. For the third decision you chose the tasty treat, so you will get the tasty treat immediately. *Enumerator put tasty good on the table.*

Enumerator will present the tasty good and ask the following question. **Please estimate the price of the tasty treat in the market.**

Price of tasty treat _____ (THB)

Enumerator tells respondent that the price of the tasty present is THB 40 and put up the sign that shows the price.

Please choose!

Row	Tasty Good	Tick Box	Money
1	Tasty Good		10 THB
2	Tasty Good		20 THB
3	Tasty Good		30 THB
4	Tasty Good		40 THB
5	Tasty Good		50 THB
6	Tasty Good		60 THB
7	Tasty Good		70 THB

What is the maximum you would to pay for the tasty good? _____ (THB)

Now chance will decide! Please draw a number. Number drawn: _____ (THB)

B Appendix

Measurement of Numeracy and Overconfidence

Details	
Questions	Description
Word fluency	I would like you to name as many different animals as you can in 60 seconds.
Numeracy Q.1	What is $45 + 72$?
Numeracy Q.2	You have 4 friends and you want to give each friend sweets. How many sweets do you need?
Numeracy Q.3	What is 5% of 200?
Numeracy Q.4	You want to buy a bag of rice that costs 270 Baht, You only have one 1000 Baht note. How much change will you get?
Numeracy Q.5	In a sale, a shop is selling all items at half price. Before the sale a mattress costs 3000 Baht. How much will the mattress cost in the sale?
Numeracy Q.6	A second-hand motorbike dealer is selling a motorbike for 12000 Baht. His is two thirds of what it costs new. How much did the motorbike cost new?
Overconfidence	How many of the 6 maths questions above, do you think you have answered correctly?
