Using Framed Field Experiments to Understand Market Behavior in Developing Countries: Do Community-Sanctioned Social Pressures Constrain Microenterprise Growth?[1]

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Abstract: We conduct a framed lab-in-field experiment to explore the hypothesis that a number of stylized facts about microenterprise behaviour in developing countries – including product market homogeneity and lack of growth and innovation – can be explained by a social institution in which microentrepreneurs share the market to "buy a job." 280 present or prospective market trader women across four communities in rural Vietnam are anonymously randomized into pairs to play three "market game" treatments. The interactions are framed to simulate real-world retail market competition. The participants compete in an effort task, with performance determining market returns. A highly incentivized individual round allows us to extract a measure of individual "ability" in the effort task. The subjects then compete in successive treatments, where in the final treatment the losing participant in a round can elect to "burn" their competitor's output, which is framed as the application of social pressure. The behavioural responses are significant and fitting with a theoretical model of the social institution we have in mind: even though subjects are from the same community they are willing to punish ("apply social pressure"), the probability of punishment is increasing in the gap in ability in the pair, and this leads to a decrease in performance from higher-ability individuals. The study provides an example of the use of framed lab experiments to shed light on market behaviour in developing countries, for which full-blown RCTs may face serious feasibility or ethical challenges.

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1. Introduction

When walking through a typical marketplace in a developing country, one commonly sees clusters of directly adjacent microbusinesses, which are all roughly the same size and sell identical goods. Growth and innovation is rare amongst such microbusinesses (Mondragón-Vélez and Peña 2010). Microbusiness is a common part of the economic lives of the poor (Banerjee and Duflo 2011), so encouraging widespread microbusiness growth could have transformational effects in poverty alleviation (Yunus 2008). Numerous policy interventions have attempted to address this, targeting individual-level constraints such as lack of financial access and human capital deficiencies (Karlan and Morduch 2010, McKenzie and Woodruff 2012), yet "none on their own have proven to be a catalyst on the scale imagined by [their] chief proponents" (Karlan and Morduch 2010, pp. 2). Individual-level constraints may not be sufficient to explain the lack of growth, raising the question of whether perhaps market-level factors may also crucially hold back microenterprises. This paper considers a novel equilibrium mechanism by which poor microenterprises may be constrained: microentrepreneurs may be inhibited by the social environment in which they conduct business, as competitive market pressures may induce the formation of social institutions that restrain market performance.

In village economies that are isolated and consist mostly of the production and trade of a small range of homogeneous goods, stigmatisation or overt harassment of more productive microentrepreneurs may be instituted as a social norm. To explain, imagine a group of adjacent microbusinesses selling an identical good. In principle, they compete against each other for market share with a given number of potential consumers. If a more able microentrepreneur was to start attracting more customers, this would naturally have to come at the expense of the others since there is only so much market to be gained (Bohme

and Stiele 2012). This would decrease the piece of the proverbial 'pie' that the other microentrepreneurs received, along with increasing income risks due to competitive uncertainty. As many microentrepreneurs live just at the subsistence level, the increased success of just one microentrepreneur could lead to others being driven into ruin. Targeted social pressure could mitigate the risk of doing business by constraining those most capable of taking over a market. In effect, it could allow participants to 'buy a job' (Banerjee and Duflo 2011). An informal institution such as this may be in operation in markets within the developing world, creating localised market failures for those most capable of transforming these markets. While such an institution may be socially optimal in the short-run for the participants, it could constrain efficient market development in ways that harm other members of the market, and even the participants themselves in the long run.

In order to conduct an initial investigation of this premise in a controlled setting, a framed field experiment was run in Hải Dương province in north Vietnam. The experiment used a population of women from poor farming communities who were concurrently participating in a business education program aimed at helping them establish non-farm enterprises. The women played a competitive effort game where they could capture market share from other subjects by outperforming them. In a separate module of the experiment, costly punishment was introduced to this competitive structure. Subjects were found to be willing to punish each other despite belonging to close-knit communities, with this propensity to punish impinging disproportionately on those of higher ability. These results are consistent with the hypothesized presence of social institutions meant to constrain market risk.

To the authors' knowledge, this paper is the first to formally investigate whether this institution of community-sanctioned punishment could explain the stagnancy of microbusiness in developing countries. The paper also contributes to substantial, existing

literatures, including on punishment in experimental games, and community enforcement of behaviour (Ostrom 1990, Kandori 1992, Fehr and Gaechter 2000, Acemoglu and Robinson 2012). In particular, the former literature has relatively little work considering punishment in heavily framed market settings of market competition, while the latter literature has seen much more theoretical than empirical work. Furthermore, these literatures have seen relatively less application in the developing country setting, where unique social norms and institutions may be present. While significant literatures consider the role of social institutions in microeconomic behaviour in developing countries (Kimball 1988, Rosenzweig 1988, Fafchamps 1991, Coate and Ravallion 1993, Townsend 1994, Udry 1994, Fafchamps and Lund 2003), there has been much less work on this particular kind of market institution, though recent has started to illustrate potential pernicious effects (Grim et. al. 2010, Brune et. al. 2011, Jakiela and Ozier 2011).

The existence of such an informal institution of community social pressure could rationalise why most previous policy interventions, implemented at the individual microenterprise level, have failed to encourage widespread poverty alleviation amongst microentrepreneurs. It may even suggest that these interventions could in fact be detrimental to the wider community of microentrepreneurs, as it would provide participants of these programs an advantage over nonparticipants and may lead to lower incomes for the nonparticipants and even social conflict amongst the wider community. While this paper merely provides an initial proof of concept, it does suggest that market and community level constraints require greater consideration for poverty alleviation. With such possibilities in mind, policymakers may consider interventions that facilitate microentrepreneurs' access to markets beyond their locality.

The next section describes the experimental setting along with a basic description of subject characteristics. The subsequent section outlines the empirical hypotheses and empirical strategy, and is followed by a discussion of the results. A concluding section considers external validity and directions for future research. The Appendix collects further details on the experiments, further results and details on variable construction.

3. Experiment Setting and Data

This section will describe the socio-economic setting in which the experiment was held. A brief introduction of the partner organisation, the Vietnam Women's Union (VWU), will be given, followed by a description of the geographic location and field-lab conditions. This section will then conclude with an analysis of subject population characteristics.

3.1. Regional Setting of Experiment

The experiment was held during July 2012 in rural areas of Hải Dương province in north Vietnam. Hải Dương is approximately one hour's drive east of Hanoi and west of the port city Hai Phong. Due to its proximity to both large urban markets and shipping routes, Hải Dương has become one of the major industrial centres of Vietnam. Much of the manufacturing in north Vietnam is located in the areas surrounding Hải Dương City, the capital of Hải Dương province, and it is currently one of the three most attractive provinces for foreign investment (HAIDUONGNEWS 2012). Figure 1 displays a map of Hải Dương and its districts.

Due to rapid industrialisation, Hải Dương has undergone dramatic economic development and demographic change. Provincial economic growth between 2006 and 2010 was 9.7%, with industry and construction accounting for 45.3% of provincial GDP in 2010 (HAIDUONGNEWS 2012). Between 2000 and 2008, fertility dropped from 6.7% to 2.14% with mortality rates exhibiting similar trends.

Nevertheless, Hải Dương is not devoid of substantial poverty as many are left behind by its rapid growth. Approximately 85% of its population reside in rural areas, depending mostly on agricultural livelihoods (HAIDUONGNEWS 2012). Agriculture still forms a considerable amount of economic activity, contributing 23% of provincial GDP in 2010 (HAIDUONGNEWS, 2012). 10.8% of the population lives below the poverty line (Cuong et. al. 2010), mostly farmers in the rural districts. Many of the poorer districts are isolated from the city and neighbouring factories by poor roads and lack of public transport. Due to this isolation, many of the rural poor cannot take up opportunities of factory work unless they migrate to industrial zones.

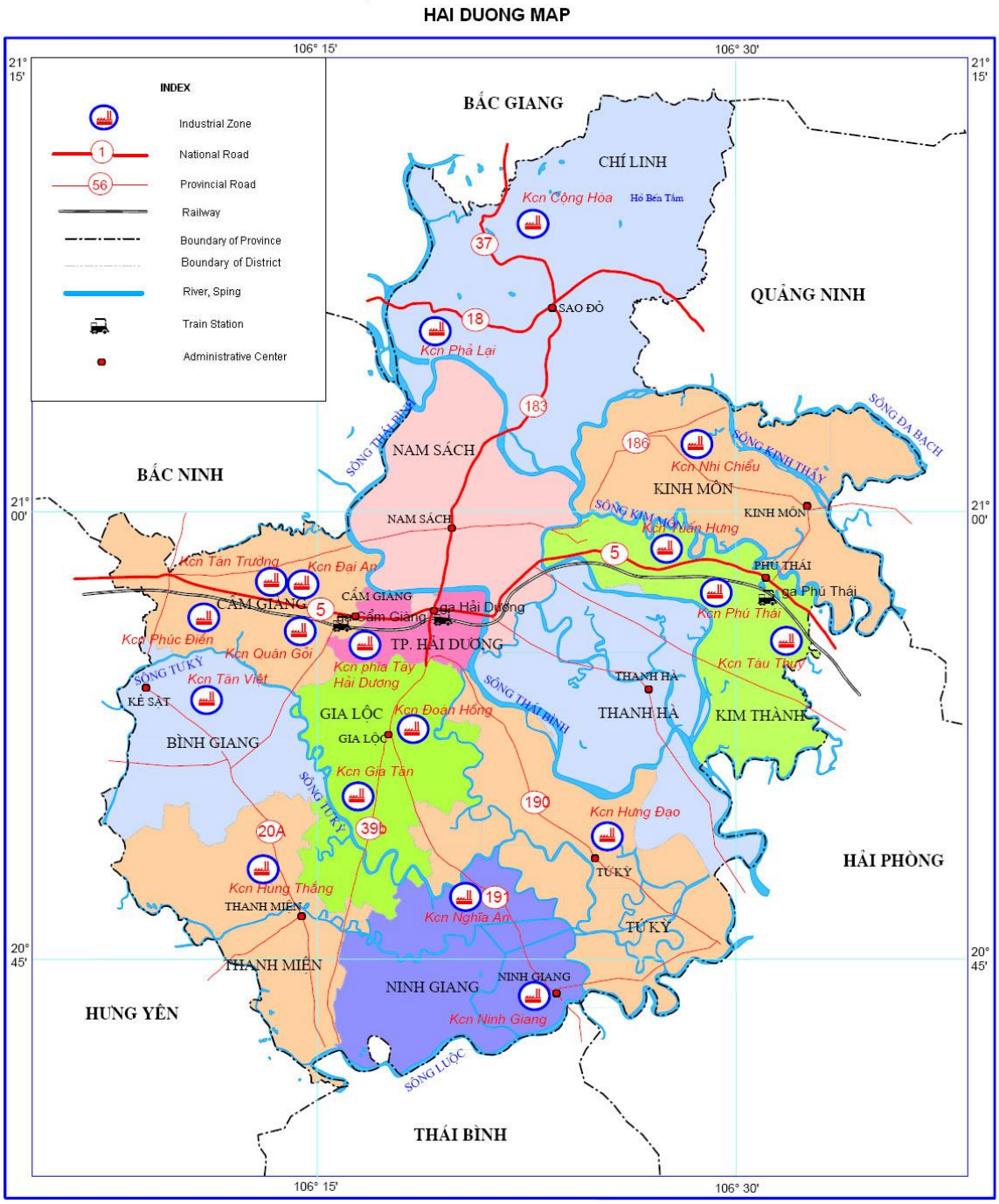
3.2. Partner Organisation Information: VWU

The experiment was facilitated by the partner organisation, the Vietnam Women's Union, one of Vietnam's six major mass organisations. In particular, the authors worked closely with the 8/3 Career Training Centre of the Hải Dương Women's Union. The VWU is the world's oldest national body for women (Mitchell 2000), forming a prominent role in both lobbying for women's rights and providing social services for women. The VWU also fulfils governance and organisational roles, as local divisions such as the Hải Dương Women's Union play important roles in the organisation and mobilisation of women.

Most provinces in Vietnam have centres such as the 8/3 Centre that provide vocational training, career opportunities and myriad other services for women. At the time of the study, the 8/3 Centre was running a business training course in conjunction with the University of Sydney and the University of Economics and Business, a faculty within Vietnam National University. Farmer women who are considering establishing businesses to supplement household income are taught basic skills to operate microbusinesses. At the time of the experiment, the 8/3 Centre had already run classes in seven communes with 400

students, and planned to roll it out to another 1000 students by the end of 2012. Post-course, the 8/3 Centre helps students to find jobs often at handicraft workshops. These workshops supply handicrafts for export and offer daily incomes of 2AUD, double a farmer's average daily earnings. The 8/3 Centre also helps prospective business owners with finding credit and providing other services to help new businesses.

Figure 1



3.3. Field-Lab Conditions

The experiment was conducted in three rural districts surrounding Hải Dương City: Ninh Giang, Bình Giang and Thanh Hà. The experiment was held on four consecutive days between Monday July 16th and Thursday July 19th, with Monday and Tuesday being held in Ninh Giang, Wednesday in Bình Giang and Thursday in Thanh Hà. Within these districts, the experiment was held in four village communes, each commune having the experiment run on a separate day. The experiment was first held in Hồng Phong, then in Hồng Đức, followed by Cổ Bì and ending in Thanh Lang. Morning and afternoon sessions were held in each commune, making a total of eight experiment sessions. All four communes were taking part in the business education course described in the previous section. At the time of the experiment, Hồng Phong and Hồng Đức had just finished the course whilst Cổ Bì and Thanh Lang had only begun.

These communes are situated as far as 30km outside of the city, and are fairly isolated rural villages. The vast majority of inhabitants rely solely on agriculture and have mean daily incomes below 2AUD. Due to the lack of public transportation, few inhabitants have access to factory employment. Despite this, two of the communes had handicraft workshops providing alternative employment, located in Hồng Phong and Hồng Đức. Hence, some participants from these two communes were slightly more prosperous than those from Cổ Bì and Thanh Lang. However, differences are small and almost all experiment participants were farmers living near the poverty line. Thanh Lang was the least isolated and most developed while Hồng Đức was the most isolated and rural, largely composing of farming area. All communes are small enough that they are not included in regional maps.

The experimental sessions were conducted in a field laboratory, using the town halls of each commune. The vast majority of communes in Vietnam have a town hall where local

government meetings and rallies are held and are generally large enough to house one to two hundred people. Due to ample space within the halls and the lack of dividers to separate participants, participants were generously spaced out throughout the hall. Exhibit 1 displays a typical example of the field-lab conditions.

Exhibit 1
Experimental Field Laboratory

3.4.Data and Participant Characteristics

General information on participants' characteristics and demographics were collected during the experiment. Participants filled out a survey at the end of experimental sessions, collecting information on four main types of characteristics: general information, wealth, job type, and personality. The characteristics are listed in Tables 1, 2, and 3, which report the means and standard deviations for each community. Since the survey was voluntary, response rates for each survey question are also reported. An example of the survey is attached in the Appendices.

3.4.1. General Information

Basic demographic information was collected for age, education, whether the subject was married and was a mother, the number of children they had, and the number of relatives they had also participating in the experiment within the same session. The number of relatives participating within a subject's own session was collected to provide a possible proxy for social pressures (Jakiela and Ozier 2011), as it was possible that subjects may be more responsive to treatments if more of their relatives were present. Descriptive statistics are reported in Table 1 and variable construction is described in the Appendices.

Communities differed little in these characteristics. Hồng Phong, Cổ Bì and Thanh Lang were roughly the same across the variables, whilst statistically significant differences with Hồng Đức did exist. Participants from Hồng Đức were on average seven years older than the sample mean, and completed less education. They also had a greater probability of being married and 0.5 more children than the sample average. These differences are most likely due to Hồng Đức being more isolated and undeveloped than the other communes. Differences were not statistically different for the number of relatives present in the same session, with the mean being 1.2 relatives.

3.4.2. Wealth

Following Carter and Barrett (2006), ownership of key household assets was measured as a proxy for wealth. Data on whether subjects' residences had plumbing and the number of motorbikes, TVs and fridges owned were recorded. Participants were also asked whether

Table 1

Demographic Information

	Community				
Characteristic	**Hồng Phong**	**Hồng Đức**	**Cổ Bì**	**Thanh Lang**	**Total**
Age					
Mean	33.8	41.1	31.5	28.5	33.8
Sd	10.2	7.8	10.7	8.9	10.5
Response Rate	0.93	0.97	0.9	0.86	0.91
Education					
Mean	High	Secondary	High	High	High
Sd	1.1	0.8	0.9	1	1
Response Rate	0.93	0.97	0.94	0.94	0.95
Are Married					
Mean	0.8	1	0.8	0.7	0.8
Sd	0.4	0	0.4	0.4	0.4
Response Rate	1	0.95	1	0.97	0.98
Have Children					
Mean	0.9	1	0.8	0.7	0.8
Sd	0.4	0.2	0.4	0.4	0.4
Response Rate	0.81	0.91	0.93	0.97	0.89
# of Children					
Mean	2	2.2	1.5	1.2	1.7
Sd	1.1	0.5	1	0.9	1
Response Rate	0.77	0.86	0.94	0.9	0.87
# of Relatives Present					
Mean	1.1	1.1	1	1.4	1.2
Sd	0.5	1.2	0.6	0.8	0.8
Response Rate	0.64	0.67	0.9	0.77	0.75
Pipewater at Home					
Mean	0.2	0.4	0.9	0.2	0.5
Sd	0.4	0.5	0.3	0.4	0.5
Response Rate	0.94	0.89	0.99	0.93	0.94
Motorcycle					
Mean	0.8	1	1	0.8	0.9
Sd	0.5	0.7	0.5	0.6	0.6
Response Rate	0.77	0.82	0.9	0.81	0.83
Refridgerator					
Mean	0.8	0.8	0.8	0.7	0.8
Sd	0.4	0.4	0.4	0.5	0.4
Response Rate	0.76	0.67	0.76	0.77	0.74
Television					
Mean	0.9	0.9	1.1	0.9	1
Sd	0.4	0.3	0.5	0.3	0.4
Response Rate	0.79	0.82	0.89	0.83	0.83
Own a Business					
Mean	0.1	0.1	0.1	0.2	0.1
Sd	0.3	0.3	0.3	0.4	0.3
Response Rate	0.6	0.61	0.69	0.76	0.66
# of Employees					
Mean	0.5	0	25	0	4.9
Sd	1	0	50	0	21.8
Response Rate	0.06	0.05	0.06	0.14	0.08
N	70	66	70	70	276

they owned any businesses and the number of employees hired. Descriptive statistics are reported in Table 1.

Communities had similar asset ownership patterns. Most households own at least one motorbike, TV and fridge. Business ownership was fairly low at 10% and businesses generally employed no staff. Cổ Bì does have a much higher average number of employees, but that is driven by a single outlier who had 100 employees working for her and her household. Cổ Bì also had a higher likelihood of having piped water within a household, this being the only significant difference between communes. Response rates for these questions were lower than the other parts of the survey, so some caution is advised when analysing these figures.

3.4.3. Job Type

Data on the primary occupations worked was also collected with frequencies are presented in Table 2. Participants typically worked in a small range of sectors focused mostly on agriculture and community services. 62% of participants reported farming as their primary occupation. Some subjects worked as local government staff and officers while only four listed business owner as their primary occupation. Unemployed and homemakers were not included in the statistics below.

Some systematic differences do exist between communities in the occupations worked. Hồng Đức almost exclusively comprised of farmers, whilst in Thanh Lang less than 50% worked in agriculture. These differences reflect the overall differences between Hồng Đức and Thanh Lang as mentioned previously. Thanh Lang also had a greater proportion of students and service sector workers such as nurses and business owners. Additionally, Cổ Bì contained a higher proportion of workers in the textile industry than the other communes, though whether this work was in factories or home production is unknown.

Table 2

Primary Occupation

	Community				
Job Type	**Hồng Phong**	**Hồng Đức**	**Cổ Bì**	**Thanh Lang**	**Total**
Accountant	0	0	0	1	1
Business Owner	0	0	0	4	4
Farmer	45	59	38	30	172
Handicrafts	3	0	0	0	3
Local Staff	1	2	0	0	3
Nurse	0	0	0	4	4
Local Officer	0	0	2	1	3
Shopkeeper	1	2	0	0	3
Student	8	0	4	13	25
Teacher	1	0	2	1	4
Textiles	1	0	18	1	20
Response Rate	0.86	0.95	0.91	0.79	0.89
N	70	66	70	70	276

3.4.4. Personality Measures

A psychometric test was also included in the survey, which measured particular character traits. Namely, questions were asked gauging subjects' altruism, envy and vengefulness. These traits were chosen as likely to be important to observed behaviour in the experiment. Traits were measured along a five-point Likert scale in ascending order of intensity, with one being low and five being high. Much care was taken in getting survey respondents to understand these questions as research staff spent roughly twenty minutes carefully explaining these questions. Descriptive statistics are presented in Table 3 and the test is included within the survey in the Appendices.

Communities were roughly similar in personality traits with no significant differences. Generally, subjects responded that they had low levels of the negative feelings of envy and vengefulness and high levels of the positive feeling of altruism. Some caution when analysing these results is advised due the fact that subjects were unfamiliar with these types of questions, many struggling with the more abstract nature of these questions.

Table 3

Personality Measures

	Community				
Trait	**Hồng Phong**	**Hồng Đức**	**Cổ Bì**	**Thanh Lang**	**Total**
Humanitarian Q1					
Mean	3	4.6	4	4.1	3.9
Sd	1.6	1	1.1	1.1	1.4
Response Rate	0.99	1	0.99	0.99	0.99
Humanitarian Q2					
Mean	2.9	4.2	3.9	4	3.7
Sd	1.4	1.3	1.2	1.2	1.4
Response Rate	0.99	0.68	0.96	0.99	0.98
Vengefulness Q1					
Mean	2.1	1.7	1.7	1.9	1.9
Sd	1.3	1.2	1.2	1	1.2
Response Rate	0.99	0.97	0.96	0.99	0.97
Vengefulness Q2					
Mean	2	1.6	1.8	2.1	1.9
Sd	1.2	1.3	1	1.2	1.2
Response Rate	0.97	0.94	0.97	0.96	0.96
Enviousness Q1					
Mean	1.7	1.3	1.7	1.9	1.7
Sd	1.1	1	1.2	1.1	1.1
Response Rate	0.94	0.92	0.99	0.97	0.96
Enviousness Q2					
Mean	2.1	1.4	1.9	2.3	1.9
Sd	1.2	1.1	1.1	1.2	1.2
Response Rate	0.96	0.95	0.97	0.96	0.96
Enviousness Q3					
Mean	1.8	1.4	1.7	2	1.7
Sd	1.1	1.1	1.2	1.1	1.1
Response Rate	0.97	0.95	0.97	0.96	0.96
N	70	66	70	70	276

4. Experimental Design

The main aim of this experiment was to see whether an informal institution of targeted social pressure to underperform would (i) arise as a result of tight market conditions and (ii) constrain higher ability microentrepreneurs disproportionately. To accomplish this, the experiment needed to first simulate a competitive market where the success of one business

dampened demand for others. Next, it had to reproduce an informal institution whereby the punishment of microentrepreneurs was allowed in response to them trying to capture the market. By doing this, one could observe whether subjects would be willing to punish others from their own close-knit community and whether this would lead to a substantial loss in efficiency.

A field-lab design was vital in exploring these issues due to the inappropriateness of other approaches. An empirical survey approach would not have sufficed as it can be notoriously hard to observe effects on equilibrium, such as shifts in demand between different microbusinesses, using observational data alone. A field experimental approach would be difficult due to the ethical issues of trying to induce punishment amongst poor microentrepreneurs, which could result in social conflict. A traditional lab experiment using a student population would have had little external validity due to substantial differences in living standards and cultural context between university students and microentrepreneurs. The field component of this experiment escaped this by using an authentic population of prospective microentrepreneurs. The lab aspect of the experiment allowed both the introduction of punishment in a controlled and ethical manner, and clean observation of its effects.

Despite its advantages, a field-lab approach does have its weaknesses. First, it cannot provide a complete and exhaustive litmus test of whether this kind of institution does exist. Second, external validity concerns still persist due to the trade-off between realistically simulating microbusiness activity and keeping it simple for subjects who are not yet microentrepreneurs. The experiment attempted to limit these concerns by using an effort task where subjects exerted real effort and incurred mental costs from such effort. The effort task provided a general proxy for microbusiness activity and the effort required to

succeed in such ventures. Furthermore, the experiment was also heavily framed so as to encourage any heuristics relevant to the real-world environment being analysed.

This section outlines how these issues and aims were addressed by the experimental design. First, a basic overview and timeline of the experiment will follow. Second, a description of the effort task will ensue. The sections following that will describe the modules and treatments implemented. Finally, implementation details will be outlined. An example of the English translation of experimental instructions is included in the Appendices.

4.1. Experiment Overview

The experiment centred on a highly framed market game where subjects were organised into pairs and could take earnings away from their partner simply by outperforming them. Subjects posed as microbusiness owners trying to capture market share by attracting customers, exerting effort in a simple maths task in order to do so. When a subject solved more math problems than their partner, they would take away half of their partner's earnings. Additionally, subjects who had been outperformed were allowed to punish their partner by paying a cost to reduce their partner's earnings. Through this design, the experiment could simulate a situation where competitive pressures can be nullified through social pressure.

To accentuate this, the experiment was framed in microbusiness terms to better contextualise it. Subjects were framed as shopkeepers, partners were labelled competitors and the effort task was described to subjects as a way to attract customers by showcasing one's organisational and thinking skills. Applying such realistic context was done to place subjects in a familiar environment that could trigger natural heuristics. Moreover, lessening the foreign nature of the experiment also served to lower confusion. In the case where one is investigating whether the behaviour of interest is a natural result of certain conditions, a

more abstract and context-free approach would not provide findings with greater external validity (Harrison and List, 2004).

Table 4 presents the main facets of the experiment design. Subjects experienced three modules: the No Competition Module, the Competition Module and the Punishment Module. Each module was an alternate version of the effort task under different competition and interaction structures, with subjects sequentially experiencing no competition, competition for market share, and competition for market share with punishment. These modules provided within-group variation in treatments as all subjects experienced each module. Further detail on the modules is included in latter sections.

Between-group variation in treatments was also utilised in the experiment by implementing different treatments across experimental sessions. The cost to punish and the framing of punishment were altered for different sessions and communes. In addition, the Punishment Module was replaced by the Sharing Prime Module in two sessions, where subjects listened to a priming story before repeating the Competition Module. These treatments were implemented in order to get a more general understanding of when and how punishment can be sustained as a social norm, along with investigating whether other mechanisms were constraining microenterprise growth. Latter sections will describe treatments in more detail.

Table 4

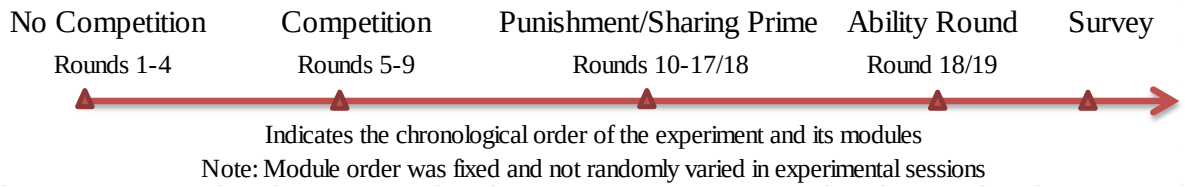
Summary of Experimental Design

Component	Description
Basic Elements:	
Effort Task	Addition of 4 single-digit numbers; e.g. 4 + 5 + 6 + 8 = ? ; given 1 minute to solve as many of these problems as possible; played 18 or 19 rounds
Matching Protocol	Pairs; randomly and secretly matched; pairs fixed for entire session
Modules:	
No Competition	Effort task with payoffs independent of partner.
Competition	Effort task with payoffs dependent on partner; can win half of her partner's earnings by solving 2 or more problems than her partner
Punishment	Competition Module but with punishment; when a subject's partner solves two or more problems than her, she can pay a cost to reduce her partner's earnings
Ability Round	Highly incentivised effort task without any interaction between partners
Treatments:	
Cost of Punishment	Cost varied from 0 to AUS10c
Framing of Punishment	Punishment framed as either aggressive or subtle
Sharing Prime	Subjects heard a priming story that encouraged sharing and altruism towards their competitors; repeated Competition Module instead of Punishment Module
Payoffs:	
No Competition	Per-Problem piece-rate = AUS10c
Competition	If solved equal, 1 more or 1 less problems than partner: Piece-rate*# of problems solved If solved 2 or more problems than partner: Piece-rate*# of problems subject solved + half*# of problems solved by Partner*Piece-rate If partner solved 2 or more problems than subject: Half*# of problems subject solved*Piece-rate
Punishment	If punished: AUS10c If punishing: Half*# of problems subject solved*Piece-rate - Cost of Punishment
Ability Round	Per-Problem piece-rate = AUS20c

The experiment consisted of 18 to 19[3] one minute rounds of the effort task. Figure 2 displays the module order and the rounds they were run in. Module order was not randomised so as to reduce subject confusion by gradually introducing decisions and complexity to the game. As subjects were semi-literate and unfamiliar with a lab environment, the author wanted to avoid inundating subjects with experimental details all at once. However, this leaves results susceptible to order effects. In the next section, it is shown that this is only a small concern.

Figure 2

Experiment Timeline



Indicates the chronological order of the experiment and its modules

Note: Module order was fixed and not randomly varied in experimental sessions

4.2. Effort Task

A math effort task was used as a proxy for entrepreneurial activity so as to provide subjects a tangible task with real effort costs. The effort task entailed the addition of four, single-digit numbers, each problem following the format of the example below:

- 9 + 8 + 5 + 7 = ?

This task was chosen as simple maths skills are likely correlated to mental aptitudes which contribute to entrepreneurial ability (de Mel et. al. 2009). Furthermore, it was chosen as it provided ample variance in ability and performance analogous to the heterogeneity in entrepreneurial ability. Ability was measured through a highly incentivised, non-interactive final round of the experiment, where subjects were paid double the piece-rate and earnings in this round were independent of other subjects' performances.

[3] In one session, a round had to be repeated due to a mistake in marking.

4.3.Competition Modules

Two competition structures were imposed on the market game, no competition with independent payoffs and competition with co-dependent payoffs between partners. First, subjects would play the No Competition Module and did not interact with each other. Subjects simply solved as many problems as possible and were paid a piece-rate. This was followed by the Competition Module. In this module, earnings were now dependent on how well one performed relative to her partner: if a subject solved two or more problems than her partner, she would earn half of her partner's earnings for the round in addition to her own, and vice versa. For example, if Player A solved 17 problems and Player B solved 12, Player A would receive their earnings from solving 17 problems plus half of Player B's earnings, equivalent to solving 6 more problems. This simulated the theoretical situation as outlined in Section 3 where through higher performance, one can capture market share from competitors.

If players solved either the same number of problems, one more or one less, then earnings were calculated according to the piece-rate. Allowing subjects to solve within a one problem range of each other and still be even was done to allow some room for partners to coordinate at equal market share. Having relative performances determine pay-offs was the only form of interaction in the Competition Module.

Subjects had information updated at the end of each round. After earnings were calculated for each round, participants would receive an information slip containing information on:

- the number of problems they solved
- their actual earnings after accounting for their partner's performance
- whether they solved two or more problems than their partner
- whether they solved two or more problems less than their partner

From this information, a subject can easily find out whether she lost, won or came even with her partner as well as know when she was punished. As this was done every round, subjects could update their expectations of partners' performances. Subjects were not informed of the identity or the ability of their partner. Justification for this follows in the Implementation Details section later in this section.

4.4. Punishment Module

The Punishment Module was run prior to the final ability round. This module was identical to the Competition Module except subjects were now allowed to punish their partner at a cost by money-burning. If a player solved two or more problems less than their partner, they could pay a fee to 'burn' their partner's earnings, reducing it to 10c, the set minimum one could earn in each round. Punishment could only occur when one player solved two or more problems than their partner and at no other time, mimicking the social contract described in Section 3.

As the focus of this paper is on social pressure as a socially optimal way to reduce harmful competition, the two or more condition for punishment was implemented to minimise noise from spite and other preferences that could influence punishment. However, one has to admit that this comes with the trade-off of possibly making results fit hypotheses by design. This worry is partly dispelled by the observation that some subjects refused to lower their performance in the face of unrelenting punishment. In addition, results outlined in Section 6 also allay fears of results-by-design.

A number of alternative treatments were implemented across different sessions. First, the cost to punish varied between three prices: 10c (2000VND), 2.5c (500VND) and 0. This was to test whether punishment was monotonic in cost. The locations and sessions these treatments were implemented is displayed in Table 5.

Second, the framing of punishment altered between communities. Punishment was either framed in an aggressive or subtle manner. In the aggressive framing, punishment was described as "scaring away" a competitor's customers. In the subtle framing, subjects were informed that customers had gotten sick at their competitor's food stall, and that they could choose to tell this to their competitor's customers, driving them away. In the subtle framing, subjects were simply telling the truth whilst in the aggressive framing, punishment was more confrontational. These treatments were included to gauge whether subjects would be averse to using more direct and belligerent forms of social pressure. Considering that they are all women from communities with engrained social and kinship networks, one would expect social preferences to discourage punishment. For example, some subjects noted in the survey that they refused to punish as they did not want to break community unity. It is important to note that framing was a mere semantic change and that the severity of punishment did not change. Thus any framing effects could show that it is important for punishment to be viewed as socially acceptable for it to occur. Framing was implemented across communities, indicated in Table 5.

Table 5

Treatment Implementation Plan

		Community			
		Hồng Phong	**Hồng Đức**	**Cổ Bì**	**Thanh Lang**
		Monday	**Tuesday**	**Wednesday**	**Thursday**
Session	**Morning**	Sharing Prime	Sharing Prime	Punish/Free	Punish/Free
	Afternoon	Punish/10c	Punish/2.5c	Punish/2.5c	Punish/Free
		Scare away customers		**Spread rumours**	
		Frame of Punishment			

4.5. Sharing Prime Module

Finally, in some sessions the Punishment Module was replaced by the Sharing Prime Module. The Sharing Prime Module was identical to the Competition Module, except that a

priming story was read out loud to subjects before the module began. The priming story aimed to encourage lowering of effort in a bid to share the market equitably, attempting to increase feelings of altruism and sympathy towards one's competitors. After it was read out, the Competition Module was repeated without any alterations. The sessions it was implemented are indicated in Table 5.

Priming was used to see whether social preferences such as compassion may be another mechanism by which microenterprise growth is constrained. If individuals are concerned about their own effect on their competitors' welfare, they could voluntarily limit growth and innovation in order to share market demand more equitably with others. The prime is included in the Appendices.

4.6. Implementation Details

In this section, an explanation of experiment logistics will be given. First, this experiment used paper and pen due to budget constraints and the subjects' unfamiliarity with computers. This had a number of logistical impacts. Decision sheets were all physically handed out to participants and collected by experiment assistants. Math problems were presented on problem sheets in multiple-choice format and were hand-marked by experiment assistants, who then calculated earnings in Excel spreadsheets. All instructions were read aloud, while to ensure the game was understood, subjects were publically asked as a group to calculate earnings from different experiment scenarios prior to each module. Furthermore, instruction sheets were not given out to subjects as many women were semi-literate. These methods did cause minor problems such as delays but measures were taken to ensure the accuracy of results. For example, answers were arranged in patterns that could only be deciphered with an answer sheet, allowing quick, precise marking.

The experiment ran for approximately two-and-a-half hours. Due to the length of the experiment, there may be time effects from subjects tiring over the course of a session. However, Section 6 will show that ability round scores indicate that this is not a concern.

The halls where the sessions were held were arranged so that subjects were spaced generously apart. Subjects were randomly allocated seats and partners, with subjects arranged such that they could not be seated near their partner. Approximately 35 women participated per session, with session sizes ranging from 30 to 36.

Importantly, subjects were not informed of who their partner was in order to limit out-of-experiment interactions which could skew results. Subject pairs may try to manipulate the experiment to maximise their joint pay-offs and share it outside the experiment, or they may fear post-experiment retribution for their actions. Considering attempts to 'game' the experiment, this is less of a worry as subjects were wholly unfamiliar with the market game and how to best manipulate it before beginning the sessions. Also, as communication was not allowed between subjects, chances to coordinate were further reduced. Subjects' fear of post-game retribution was also mitigated by firmly informing them that they could never learn the identity of their partner nor their partner learn theirs, with precautions such as never documenting subjects' names or seating partners near each other taken to ensure this. Anecdotal evidence indicates that these measures were enough, for example, an aunt and her niece were seen to be happily unaware of being each other's partner, despite having punished each other throughout the session.

Finally, subjects faced substantial monetary incentives. Subjects on average earned $4 to $5 (80,000-100,000VND), roughly double their daily incomes. A show-up fee of $1.50 (30,000VND) was paid to every subject unconditional on their completion of the experiment. Subjects were always guaranteed to earn at least 10c (2000VND) per round,

equivalent to solving one problem. Even if half their earnings were taken away when they were outperformed or they were punished, subjects would still earn at least 10c per round.

5. Empirical Methodology and Results

In this section, descriptive analysis is first carried out to give an overview of the hypotheses' accuracy in predicting experimental behaviour. Second, the empirical methodology will be outlined. Random effects (RE) and instrumental variable (IV) models are used to control for other covariates factors and endogeneity issues. Third, regression results pertaining to treatment effects on effort and the reasons for punishment are presented. The gap in ability between partners is found to have a significant effect on the likelihood of being punished. Furthermore, the effect of being punished is found to be binding, with subjects reducing effort by significant amounts. Finally, the robustness of results is verified using alternative specifications. Results are found to be fairly robust.

5.1. Descriptive Analysis and Overview of Hypotheses

In this section, predictions will be verified by a descriptive analysis of aggregated and disaggregated data. Summary statistics from aggregated data will overall treatment effects before controlling for other covariates while analysis of data disaggregated by round will allow time effects to be accounted for.

Hypothesis 1: *Subjects will be willing to punish each other at a cost even if it lends no immediate advantage.*

It is clear from the summary statistics presented in Table 6 that subjects are willing to punish others, with punishment chosen on average 36% of the time as shown in the third column. Although the likelihood of punishment seems small, one must remember these are women from close-knit communities. In interviews with the subjects, they admit that they

are so close that everything is shared within communities, for example, rice to feed another family. Social preferences can be so strong within these communities that in one session in Hồng Đức, punishment was observed twice out of 270 observations. This puts into perspective the significance of subjects' willingness to punish.

Hypothesis 2: *Subjects will reduce effort and performance in the presence of punishment.*

Predictions appear to be inaccurate when analysing aggregated data. At the treatment level, no detectable effect on effort exists for punishment as Table 5 shows in the first column that there is no significant difference in the mean number of problems solved for the Punishment and Competition modules. Also, effort does not monotonically decrease as the cost to punish increases despite punishment increasing, as seen in the first column.

In the disaggregated data, treatment effects are much more pronounced. Figure 3 shows that subjects perform below their ability[4] past the 10^{th} round, when the Punishment and Sharing Prime modules begin. This cannot be due to order effects such as fatigue as ability is measured at the end of session, thus evidence of how subjects purposely reduce effort to escape punishment.

[4] Ability as measured by the high incentive round is approximately normally distributed with sizable variance, displayed in Figure 5 in the Appendices.

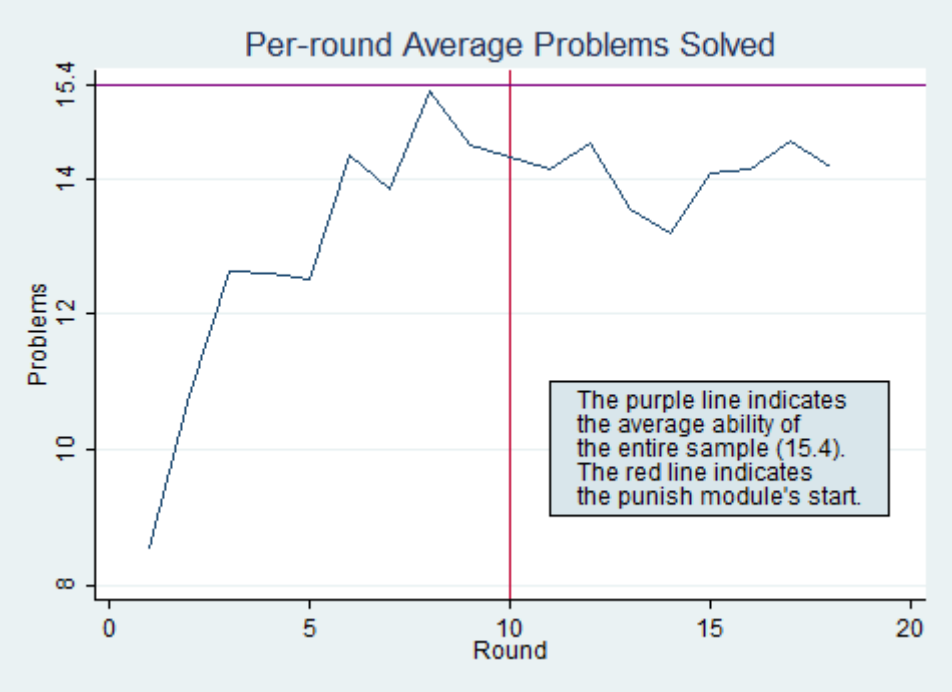
Table 5

Summary Statistics

Treatment	Problems Solved	Per-Round Probability of a subject receiving Punishment	Per-Round Probability of a subject choosing to Punish	Ability
No Competition	11.13			
	(6.42)			
Competition	14.1			
	(6.65)			
Prime	13.68			
	(5.77)			
Punishment	14.23	0.17	0.36	
	(6.7)	(0.38)	(0.48)	
Cost to Punish (VND)				
0	15.04	0.25	0.5	
	(6.65)	(0.43)	(0.5)	
500	11.29	0.08	0.21	
	(5.69)	(0.27)	(0.41)	
2000	17.2	0.12	0.24	
	(6.57)	(0.32)	(0.43)	
Punishment Frame				
Rumour	14.37	0.22	0.48	
	(6.62)	(0.42)	(0.5)	
Scare	13.94	0.07	0.13	
	(6.85)	(0.25)	(0.34)	
Community				
Hồng Phong	15.34	0.12	0.24	17.82
	(6.7)	(0.32)	(0.43)	(6.32)
Hồng Đức	9.82	0.01	0.01	10.71
	(4.92)	(0.09)	(0.09)	(4.78)
Cổ Bì	11.93	0.24	0.51	14.28
	(6.05)	(0.43)	(0.5)	(5.31)
Thanh Lang	16.4	0.21	0.46	18.63
	(6.51)	(0.41)	(0.5)	(5.65)
Session Time				
Morning	13.28	0.27	0.52	15.48
	(6.28)	(0.44)	(0.5)	(5.95)
Afternoon	13.53	0.12	0.28	15.33
	(6.98)	(0.32)	(0.45)	(6.77)
Mean	13.41	0.17	0.36	15.41
Sd	6.63	0.38	0.48	6.36
n	4786	1696	1696	276

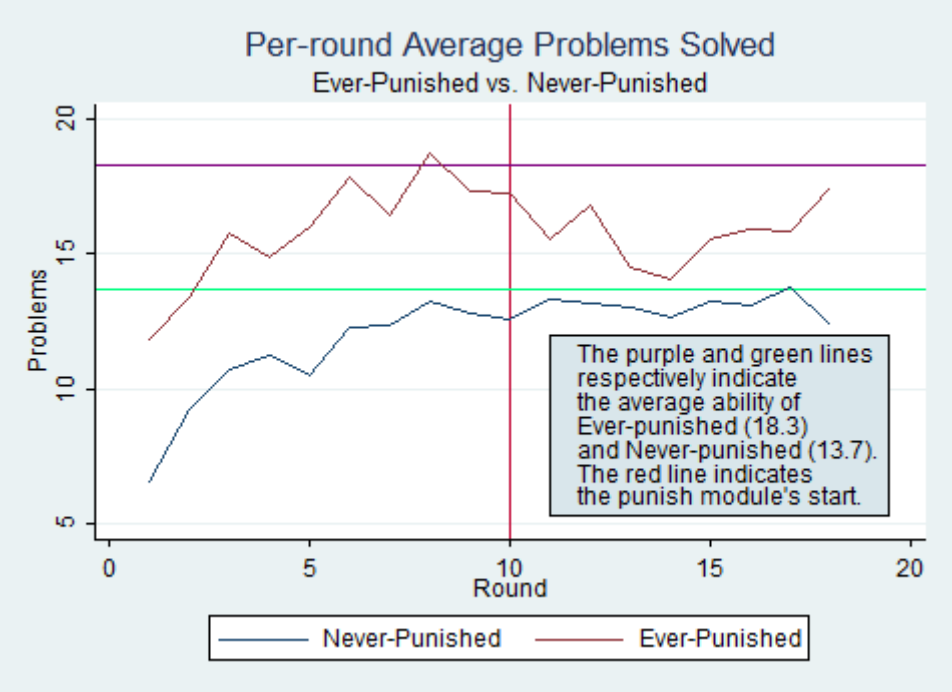
Note: Standard Deviations in parentheses.

Figure 3



This intentional lowering of effort is likely driven solely by those who were punished. Splitting subjects into those punished at least once (Ever-Punished), and those who were not punished

Figure 4



(Never-Punished), Figure 4 shows that subjects respond to being punished rather than the mere threat of punishment. Prior to the Punishment Module, both groups show similar patterns of behaviour, exhibiting learning effects until reaching their ability around the 8th round[5]. After, Never-Punished seem to converge to their steady state performance level, consistently performing near their ability. In contrast, Ever-Punished reduce their performance sharply once the punishment module begins, performing below their ability from then on. It is likely that without punishment, Ever-Punished would display convergent behaviour similar to Never-Punished. This may be true considering that fatigue does not seem to be a constraint as subjects' performance was greatly increased in the final ability round. Tentative evidence that high ability subjects were converging to the performance levels of low ability subjects also exists[6]. This supports the notion that punishment could be used to handicap high ability individuals so as to lower negative externalities on their competitors.

Hypothesis 3: *The probability of punishment will increase with the gap in abilities between partners and a subject's probability of receiving punishment will increase with her ability.*

Studying Figure 4, Ever-Punished substantially outperformed Never-Punished: the per-round means are always higher for Ever-punished while their mean ability was roughly two-thirds of a standard deviation (σ) greater than Never-Punished. Hence, Hypothesis 3 is accurate for the case of absolute ability and will be shown to also be true for ability gap.

Hypothesis 4: *The probability of punishment will be decreasing with the cost of punishment.*

[5] These time effects rather than incentive effects, most likely explain the difference between performances in the No Competition and Competition modules. Similar behaviour was observed in trials that did not run the No Competition Module prior to the Competition Module.

[6] This is at best tentative due to endgame effects: subjects were observed to tire of choosing to punish while those punished began to gamble by increasing performance to gain in the off chance they were not punished.

Table 6 suggests that this prediction is generally correct: when cost dropped from 500VND to 0, the likelihood of choosing to punish increased by 29 percentage points (pp). Although this seems unsurprising, it is reasonable to assume that the cost to punish is free in monetary terms. The kind of punishment one would envisage when considering social pressures would typically be in various forms of peer pressure. Hence, the cost would mostly consist of moral costs due to innate social preferences, which, as argued above, is a factor in punishment decisions within the experiment. That the propensity to punish was only 50% despite being free is indicative of this.

Hypothesis 5: *Punishment will be less in an aggressive framing and effort will be less in response to a prime encouraging sharing as a result of social preferences.*

Mixed evidence exists in support of this. As predicted, the probability of choosing to punish is significantly greater in the Rumour framing, an increase of 35pp over Scare framing as seen in Table 5. Antithetically, the prime had an insignificant effect on effort when looking at the aggregate. Greater willingness to punish when punishment is framed less aggressively is further evidence that moral cost is an important consideration in direct interactions such as punishment, but appears to be less prominent when detrimental effects are indirect, such as imposing lower payoffs on a partner when outperforming them. After having just spoken of sharing everything, women freely admitted that they would not be willing to lessen effort so as to help a struggling business rival. This suggests that moral costs bear more weight when interactions are direct.

From the disaggregated data, subjects may reduce effort in response to the prime. As mentioned above for Hypothesis 2, Figure 3 shows that effort clearly dipped once the Sharing Prime and Punishment Modules started. To demarcate the effects, statistical analysis will now be undertaken.

5.2.Empirical Methodology

The preliminary results in the preceding section suggest that time effects and other covariates have important influence on performance. In order to quantify treatment effects controlling for these covariates, regression analysis was undertaken using RE and IV models.

5.2.1. Effects of Treatment Modules on Performance

An RE model was estimated due to the panel nature of the data, where autocorrelation and clustering of standard errors by individual needed to be accounted for. Overall treatment effects on performance were estimated using linear RE models.

The first regression specification tests whether overall effects of Punishment and Prime treatments on performance would be negative in line with predictions. The number of problems solved is regressed on the Punishment and Prime indicators, ability, the ability gap between partners, round, the vector of subject, community and session characteristics, *X*, time-invariant random effects, α_i, and mean-zero error term, $\varepsilon_{i,t}$:

$$\begin{aligned} &\#ofProblemsSolved_{i,t} \\ &\quad = \beta_0 + \beta_1 Ability_i + \beta_2 PunishTreatDummy_{i,t} + \beta_3 PrimeDummy_{i,t} \\ &\quad + \beta_4 AbilityGap_i + \beta_5 Round_t + X'\theta + \alpha_i + \varepsilon_{i,t} \end{aligned}$$

The second regression replaces Punishment and Prime treatments with Cost to Punish and Framing treatment variables[7]:

$$\begin{aligned} &\#ofProblemsSolved_{i,t} \\ &\quad = \beta_0 + \beta_1 Ability_i + \beta_2 CosttoPunish_i + \beta_3 ScareFrameDummy_i \\ &\quad + \beta_4 AbilityGap_i + \beta_5 Round_t + X'\theta + \alpha_i + \varepsilon_{i,t} \end{aligned}$$

[7] Cost to Punish and Framing variables are perfectly collinear with the Punishment Treatment and could not be included together with Punishment or Prime indicators.

5.2.2. Effects of Punishment on Performance

To test whether effects of receiving punishment on performance would be negative as predicted, IV models were run due to endogeneity in the decision to punish, resulting from strategic interactions in the experiment. Taking this into account, the probability of being punished is instrumented by the treatment indicators. The ability gap between partners is also used as an instrument as random matching made a partner's ability exogenous.

The first IV model uses a linear probability model for the first stage, regressing the probability of being punished in the previous round, *LagPunished*, on the Punishment treatment dummy, ability, round, the ability gap, *X*, α_i and a mean-zero error term, $\epsilon_{i,t}$:

1^{st}-Stage:

$$\Pr[LagPunishedDummy_{i,t} = 1] = \beta_0 + \beta_1 Ability_i + \beta_2 PunishTreatDummy_{i,t} + \beta_3 AbilityGap_i + \beta_4 Round_t + X'\theta + \alpha_i + \epsilon_{i,t}$$

First-stage regressions also performed the task of determining the reasons for punishment.

The second-stage equations regressed performance on the estimated probability of being punished the previous round:

$$2^{nd}\text{-Stage: } \#ofProblemsSolved_{i,t} = \beta_0 + \beta_1 Ability_i + \beta_2 \widehat{LagPunishedDummy}_{i,t} + \beta_3 AbilityGap_i + \beta_4 Round_t + X'\theta + \alpha_i + \varepsilon_{i,t}$$

The second IV model replaced the punishment and prime treatments with the cost and framing treatments in order to quantify the effects of increased punishment, when free and with subtle framing, on performance:

$$1^{st}\text{-Stage: } \Pr[LagPunishedDummy_{i,t} = 1] = \beta_0 + \beta_1 Ability_i + \beta_2 CosttoPunish_i + \beta_3 ScareFrameDummy_i + \beta_4 AbilityGap_i + \beta_5 Round_t + X'\theta + \alpha_i + \epsilon_{i,t}$$

$$2^{nd}\text{-Stage: } \#ofProblemsSolved_{i,t} = \beta_0 + \beta_1 Ability_i + \beta_2 \widehat{LagPunishedDummy}_{i,t} +$$

$$\beta_3 AbilityGap_i + \beta_4 Round_t + X'\theta + \alpha_i + \varepsilon_{i,t}$$

5.2.3. The Causes of Punishment

Furthermore, limited dependent variables models are used to better understand why subjects chose to punish their partners. Understanding the correlates of the decision to punish could be vital to understanding the mechanisms by which this institutional constraint on microenterprise could be sustained. It is important to differentiate between a subject choosing to punish and their partner actually being punished as the experiment implemented asymmetry between these two through the two-or-more-problems rule specified in Section 5. Accounting for this, specifications were estimated using the choice to punish as the dependent variable. Linear probability models (LPM) regressed the choice to punish dummy on whether the subject had lost in the previous round, *LagLoss*, whether the subject had been punished the previous round, *LagPunished*, and other covariates previously included in the first-stage IV regressions:

$$\begin{aligned}\Pr\left[ChosetoPunishDummy_{i,t} = 1\right] &= \beta_0 + \beta_1 Ability_i + \beta_2 CosttoPunish_i + \beta_3 ScareFrameDummy_i \\ &+ \beta_4 AbilityGap_i + \beta_5 Round_t + \beta_6 LagLossDummy_{i,t} \\ &+ \beta_7 LagPunishedDummy_{i,t} + X'\theta + \alpha_i + \epsilon_{i,t}\end{aligned}$$

Probit and Logit models were also run to check the robustness of LPM results:

$$\begin{aligned}\Pr[ChosetoPunishDummy_{i,t} = 1] &= \Phi(\beta_0 + \beta_1 Ability_i + \beta_2 CosttoPunish_i + \beta_3 ScareFrameDummy_i \\ &+ \beta_4 AbilityGap_i + \beta_5 Round_t + \beta_6 LagLossDummy_{i,t} \\ &+ \beta_7 LagPunishedDummy_{i,t} + X'\theta + \alpha_i + \epsilon_{i,t})\end{aligned}$$

The dummy variables *LagPunished* and *LagLoss* were included to check what kind of strategic interactions were influencing the choice to punish. *LagLoss* indicates whether a subject lost (scored less than their partner by two or more) in the previous round and was included to see whether punishment was chosen for its disincentive effects. *LagPunished* was included to see whether punishment was motivated by revenge from being punished; the effect of *LagLoss* could also indicate vindictiveness.

5.2.4. Other Controls

Time effects were controlled by *Round* while community and session were controlled for by *X*. Importantly, gap in ability between partners was controlled for by adding an interaction term between the dummy for being the higher ability partner and the difference between a subject's ability and their partner's. Thus, *AbilityGap* took on positive values for the higher ability partner and zero for the lower ability partner and when partners had equal ability.[8] Furthermore, the number of problems solved was standardised to have a mean of zero and variance of 1. All non-dummy variables were also standardised, such as ability and cost of punishment. All models were estimated with robust standard errors, clustered by individual, to control for autocorrelation and heteroskedasticity. Cost of punishment was coded to integer values corresponding to the price in VND (0, 500 or 2000). Note that regressions with Cost and Framing treatments were run only on observations in the Punishment module, reducing the number of observations from 4786 to 1696.

5.3. Regression Results

This section proceeds in two parts: (i) regression results for treatment effects on effort and performance; and (ii) regression results on the determinants of punishment.

[8] For the Choice of Punishment regressions, *AbilityGap* was reverse-coded so it became the interaction term between the dummy of being the low ability partner and the difference in abilities. This was done so as to make *AbilityGap* effects more intuitive to understand as it now took on positive values for the lower ability partner.

5.3.1. Effects on Effort

In support of the results from the disaggregated data, the punishment treatment is found to have a significant negative effect on effort. Overall, punishment decreased performance by -0.4σ in regression (1) and (3) in Table 7. However, the RE model cannot make a distinction between whether this effect was due to pre-emptive lowering of effort to avoid punishment or whether the effect was dominated by a post-punishment response from having just been punished.

Table 7

Problems Solved Per Round, estimated in Standard Deviations

	Random Effects			IV					
Model	(1)	(2)	(3)	(4)1stStage	(4)2ndStage	(5)1stStage	(5)2ndStage	(6)1stStage	(6)2ndStage
Standardised Ability	0.772***	0.836***	0.771***	0.025***	0.799***	0.010	0.799***	0.021	0.850***
	(0.030)	(0.041)	(0.031)	(0.006)	(0.031)	(0.006)	(0.031)	(0.019)	(0.050)
Punishment Treatment	-0.400***		-0.397***	0.146***		0.146***			
	(0.041)		(0.041)	(0.014)		(0.014)			
Sharing Prime	-0.112**		-0.023						
	(0.046)		(0.071)						
Sharing Prime*Hồng Đức			-0.200**						
			(0.078)						
Round	0.060***	-0.004	0.060***	0.001**	0.056***	0.001*	0.056***	0.008**	0.007
	(0.003)	(0.006)	(0.003)	(0.001)	(0.004)	(0.001)	(0.004)	(0.003)	(0.009)
Ability Gap	-0.084*	-0.234***	-0.077*			0.041***		0.116***	
	(0.045)	(0.077)	(0.046)			(0.010)		(0.029)	
Standardised Cost to Punish		-0.061						0.018	
		(0.046)						(0.019)	
Scare Frame		0.168*						-0.126***	
		(0.093)						(0.032)	
Lagged Punished					-2.250***		-2.233***		-1.614**
					(0.364)		(0.367)		(0.640)
Constant	-0.343***	0.207**	-0.423***	-0.049***	-0.456***	-0.063***	-0.454***	0.008	0.206*
	(0.054)	(0.101)	(0.048)	(0.012)	(0.056)	(0.012)	(0.056)	(0.043)	(0.121)
R-Squared	0.611	.5797866	.6084209	0.106	0.352	0.111	0.356	.071647	.227079
N	4786	1696	4786	4790	4786	4790	4786	1696	1696

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are robust and clustered by individual, and are in parentheses.

All models control for community and whether the session was held in the morning or afternoon, except for regressions (2) and (6) which do not control for community due to collinearity between Punish Framing Treatment and community.

IV regressions instrument for Lagged Punishment; instruments indicated in 1st Stage Regressions. Instruments used are Punishment Treatment, Cost to Punish, Scare Frame, and Ability Gap. These make valide instruments due to randomisation as treatment variables and the ability gap between partners are exogenously varied and hence orthogonal to Lagged Punished.

The prime treatment was also found to significantly decrease performance by -0.12σ in regression (2). Interestingly, when an interaction term between the Prime dummy and the

dummy for Hồng Đức was included in regression (3), the Prime was insignificant while the interaction term had a significant effect of -0.2σ. Hence, only the session in Hồng Đức responded to the treatment. In Hồng Đức, social preferences seem to have a strong effect as shown by their actions (responding to the prime and not punishing) and their self-reported values[9]. Thus, social preferences may pose a significant factor in microenterprise performance by individuals voluntarily lessening competitive pressures in an effort to aid their competitors. However, this evidence is from a single community so inferences should be made with caution.

The above-mentioned effects were only significant after controlling for ability and round. As expected, ability can explain a large component of the variance in performance, with a σ increase in ability increasing performance by 0.7σ. Time effects were also present, with round having a small but highly significant positive effect. The lack of clear evidence of treatment effects following the analysis of the aggregated data can be explained by these covariates obscuring analysis.

In contrast, between-group variation in the cost and framing of punishment do not have significant effects on performance, shown in regression (2). Cost to punish was insignificant while the framing was only marginally significant. This may be caused by community heterogeneity as community could not be controlled for due to collinearity between treatment implementation and community. On the other hand, this insignificance is not completely surprising, as one would expect that the effects would be indirect, mostly through encouraging more punishment. This would lessen the average effects of changes in cost and framing. Similarly, ability gap does not have a strong effect initially in regression (1) and (3) but does once the focus is only on Punishment Module observations in

[9] Hồng Đức had the highest humanitarian and lowest envy and vengefulness mean scores, reported in Table 3.

regression (2), decreasing performance by -0.2σ. This highlights how relative ability does not greatly affect performance until punishment is present, and in its presence, the effect of punishment becomes increasingly binding with relative ability.

IV models (4), (5) and (6) quantify these indirect effects on performance. In regressions (4) and (5), once endogeneity was controlled for, lagged punishment had a substantial effect, -2.3σ. Considering that median ability was 16 problems and 2.3σ is approximately 15, subjects that had been punished in the previous round lowered their performance by more than the ability of almost 50% of subjects. Even when restricting analysis to just observations in the Punishment Module, the effect was still large and significant (-1.6σ in regression (6)). These are sizable losses in efficiency, with punishment forming a binding constraint. If this is true of microenterprise, such an institution would cause substantial market failure. As well as inducing a rational response to lower effort, this institution could also have psychological ramifications. Women who had been punished spoke of losing enthusiasm for the task, which if widespread outside the lab, could lead to an aspirations poverty trap (Ray 2006) where individuals could be trapped by feelings of hopelessness. This is outside the bounds of this experiment so at this point it is mere speculation.

However, some caution must be taken when making inferences due to community heterogeneity in ability and preferences. Hồng Đức could be especially problematic as it significantly differs from the other communes. Referring to Table 6, mean ability is almost a full standard deviation below the sample mean, while the probability of punishment is only 1%. Moreover, Hồng Đức appears to be more homogenous in performance, ability and punishment preferences, as standard deviations are relatively smaller for Hồng Đức, similar to findings for subject characteristics in Section 4. These may be symptomatic of Hồng Đức's relative underdevelopment. This is problematic as the framing and cost treatments

were implemented across communities, with one session of the Scare frame and one session of 500VND cost was conducted in Hồng Đức. Hồng Đức's lower ability can explain why performance was insignificantly responsive to cost as performance was non-monotonic in cost and lowest for 500VND.

5.3.2. Determinants of Punishment

5.3.2.1. Receiving Punishment

From the first stage results reported in Table 7, punishment falls heaviest on relatively higher ability individuals. In regressions (5) and (6), the probability of being punished is significantly increasing with ability gap, with a σ increase in ability gap increasing the probability of being punished by 12% in regression (6). This result may seem obvious as by design a subject was only punished if they outperformed their partner, which generally happened when a subject had higher relative ability. However, since ability gap is highly significant and positive, probability of punishment is dependent on relative ability rather than just having higher ability than one's partner.

In contrast, raw ability did not have an effect on the probability of receiving punishment once ability gap was controlled for. This highlights how it is important that the ability of competitors be uneven for punishment to sustain, rather than there simply being high ability competitors within the market. When high ability individuals were matched with other high ability individuals in the experiment, punishment was observed less, producing less inefficiency. Especially considering how many people have to 'buy jobs', these results suggest that the resulting competition between many low ability entrants and some high ability incumbents encourages the punishment mechanism.

Framing was found to have a significant effect, again showing that social preferences may be a significant factor. When punishment was more direct and aggressive, the probability of

being punished decreased by 13% in regression (6). Moral costs in punishing do seem to weigh heavy on these decisions. On the other hand, monetary cost does not seem to have an effect: cost to punish had an insignificant effect, though this will be verified in the following section.

5.3.2.2. Choosing to Punish

Results for when the choice to punish was the dependent variable were consistent across the different model types. In Table 8 in the Appendices, LPM, Probit and Logit models all gave effects of the same direction and similar significance. Also, some results were consistent with those for receiving punishment, such as aggressive framing which had a large significant effect of -43.6% in the LPM specification. This provides stronger evidence that moral costs are substantial barriers to punishment, signifying that taste for punishing may be tempered within strong social networks.

Conversely, some effects are inconsistent with previous results. Cost of punishment is now significant and positive, contrary to predictions. This is also puzzlingly contrary to results from the aggregated data. Ability gap now no longer has a significant effect but other specifications reverse this result and will be discussed in the section regarding robustness checks. The effect on round now has a significant but small negative effect, each round decreasing the probability of choosing to punish by 1.6% in the LPM. This explains the endgame results found in the disaggregated results section, where Ever-Punished reversed their pattern of convergence towards Never-Punished performance levels. Here, subjects appear to tire of punishing their partner, relaxing constraints on high ability individuals.

Strategic interaction between subjects does motivate the choice to punish. Either being punished or losing in the previous round had significant positive effects of 7% and 6% respectively in the LPM. It is evident that heterogeneity in the reasons for punishment

exists, with some individuals motivated so as to increase their competitive advantage, others to wreak revenge, and some motivated by both. This was reflected in survey responses where self-reported reasons were quite varied.

5.4. Robustness Checks

A number of alternative specifications were run to test whether the previous results were robust. Four main classes of models were chosen to control for omitted variable bias, clustering, fixed effects, and non-linear probability functions. All tables of results are in the Appendices.

5.4.1. Robustness Testing Methodology

The first set of models run was to control for omitted variable bias by including the full set of idiosyncratic characteristics. Characteristics such as wealth, education and personality were collected from the survey described in Section 4. Various interaction terms between treatments and characteristics, as well as polynomials for Round and Age were added to control for non-linear effects. Variable construction is discussed in the Appendices.

The next set of models controlled for clustered standard errors. The substantial heterogeneity in behaviour between communities and even sessions suggests that there may be significant correlation between standard errors within a session. To control for this, models were re-estimated using multi-way clustering regression techniques developed by Cameron, Gelbach and Miller (2011), clustering standard errors by player, round, community, and time of session. These techniques mostly extend techniques for one way clustering to an arbitrary number of cluster variables and rely on similar relatively general assumptions. For IV regressions, two-way clustering was implemented by using techniques developed by Baum, Schaffer and Stillman (2002), clustering standard errors by individual

and community. Clustering models were not run with full controls due to inadequate sample sizes and small cluster numbers.

In the third set of models, fixed effects models were run in place of RE models. This controlled for possible time-invariant errors that may not be captured by ability and other observed characteristics. Fixed effects models did not include any time-invariant covariates such as ability.

In the last set of models, limited dependent variables models controlling for the above-mentioned issues were also run. Clustered Logit models as per Cameron, Gelbach and Miller (2011) were estimated for both dependent variables of receiving punishment and choosing to punish while full controls were also added in some specifications.

For this section, all results tables are included in the Appendices.

5.4.2. Robustness Results

Overall, results are largely robust to alternative specifications. In Table 9, Punishment treatment is still found to be significant no matter the specification, with size relatively unchanged, ranging from -0.3 to -0.4σ. Prime was found insignificant in all alternatives similar to regression (3) in Table 7. Cost, framing and ability gap were also generally found to be insignificant. Interaction terms, characteristics and personality were found to also not have consistently significant effects. The direction of round effects varied according to specification, but non-linearity wasconsistent as Round and Round Squared were jointly significant.

Tests from the IV first stage shown in Table 10 also show that results are robust. Ability gap was significant in almost every specification while absolute ability was not. Framing also had robust effects, even when clustering by community. Interestingly, having a more

vengeful partner substantially increased the likelihood of being punished in all specifications that included partner personality controls. In Table 11, receiving punishment the previous round has a robust effect on deciding to punish across all specifications except in the fixed effects model. This is likely due to omitted variable bias as most other covariates were time-invariant and hence could not be included. Excluding the fixed effects model, the effect of being punished varied between -2.2 to -1.7σ, still large effects.

Some differences do exist when choosing to punish was the dependent variable, presented in tables 8 and 12. When sample sizes are large enough, standard errors are clustered, or personality is controlled for, then ability gap has a significant positive effect, increasing the probability of choosing punishment as much as 15.7% in regression (1) of Table 12. The similar effect from ability gap despite the asymmetry between choice to punish and being punished suggests that punishment is partly strategic in nature rather than being wholly due to emotional disposition and personality. Effect of losing previously partially supports this, as it remains significant and positive when clustering standard errors but is not robust to the inclusion of characteristics.

Nonetheless, punishment seems to still be partially an emotional response. Vengefulness and Lagged Punished both significantly increased the likelihood of choosing to punish, symptomatic of how punishment could result from reciprocity towards a competitor's efforts to sabotage them. The robustness of Round and its negative effect also shows that people tire of punishing, possibly as the moral and emotional burden may increase over time.

6. Conclusion

This paper attempted to test a novel mechanism of community social pressures as an explanation for stylized facts about microenterprise behaviour in developing countries.

A social institution of punishment targeting successful microentrepreneurs may rationalise why microenterprises are so often characterised by homogeneity and stagnancy, particularly as other theories have proven to not be wholly satisfactory. A framed field experiment was an ideal starting point for investigating this issue due to its advantages of cleaner identification of causal effects and increased external validity from the use of a relevant sample. By using this methodology, the paper aimed to find suggestive evidence for this theory of institutionalised punishment in a controlled lab setting.

The three key empirical questions this paper tested was (i) whether people from the same community were willing to punish each other; (ii) whether high-ability individuals were more likely to be punished; and (iii) whether it would lead to lower effort and inefficient outcomes. What was found was that subjects disproportionately punished relatively high ability individuals despite being from the same tight-knit communities, leading to lower performance by these more capable subjects. This is the first paper to show that in spite of strong social preferences and moral costs, willingness exists amongst the poor to punish fellow community members in order to enforce inefficient market norms. Furthermore, it is the first to show that this tendency predominantly targets high ability individuals, constraining the effort and performance of those with greater potential to grow. These findings provide suggestive evidence in favour of the existence of a social constraint on microenterprise performance.

Numerous avenues of further research extend from this paper. The next logical would be to develop more robust evidence of this institution occurring in the field, perhaps by exploiting exogenously-occurring variation in the appropriate settings, and to understand its characteristics and effects on local microenterprises. A notable result of our work was that the most isolated and undeveloped community was the most averse to punishment, which

was correlated to their strong social preferences. Particularly as this theory is relevant for markets with fixed demand such as isolated village economies, the result alludes to how the balance between social preferences and competitive pressures which exist in village economies may determine whether community enforcement norms arise. Further research could develop policy implications from this work, by focusing less on microenterprise interventions at the individual firm level, and more on understanding how to overcome market institutions that might mitigate individualized interventions. This could include a greater focus on enabling microenterprises to gain access to markets beyond a narrow geographic window.

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Appendix A: Experiment Design

A.1 English Translation of Experiment Instructions Script

The following is the script of the experiment instructions which was read aloud by the experimenter announcer. As women were mostly semi-literate, instruction sheets were not given out. The example script here is for the Scare Frame Treatment and 500VND cost to punish but only differs from other scripts in the introduction of the Punishment Module and the calculation of earnings examples given in the instructions.

Beginning Instructions

Welcome to the study, "Entrepreneurship Education Experiment". Today you will play games where you will compete in a market and have to compete with another participant for customers. There are three games with a total of 18 rounds. The first game has 4 real rounds and no trials, the second has 4 real rounds and 1 trial, and the third game has 7 real rounds and 1 trial. At the end you will play one more real round of the first game. You will be paid for playing these games, with your payment depending on your performance in the real rounds. All of you will be paid a show-up fee of 30,000d and any earnings you make from the games will be added to that. You can all expect to make 60,000d, with a chance you could even make as much as 300,000d if you play really well and are very lucky. 2 rounds from the real rounds will be randomly chosen to be paid, so make sure to try hard every round so that you can make as much money as possible. The rounds will be chosen by drawing 1 of 9 horses from this bag. Each horse has a number that corresponds to a round. This will be done once for the first 9 rounds and once for the last 9 rounds, totalling 2 rounds picked altogether. The prices you will see in the games are equal to the amounts you will be paid. Throughout the entire experiment, you will be paired with another participant in this room. You will not know who your partner is but you will have the same partner the entire experiment. We will now begin the first game.

Game A

You have just opened a new shop in a big market. To make money, you need to put in effort to attract customers. There are two kinds of customers, new and old customers. You attract new customers by putting in effort which is represented by solving maths problems. This shows to your potential customers that you are well organised. Every problem you solve attracts one extra customer and each customer will pay you:

- 1 Customer = 2000d

You have one old customer who is a friend of yours. They will always buy from you even if you solve no problems. That means that if you solve 0 problems, you will make:

- Pay for solving 0 problems = Pay for 1 customer = 2000d

Each problem you solve will attract 1 more new customer. That means that the number of customers you have is:

- Number of customers = 1 + the number of problems you solve

The amount of money you will make in one round is:

- Pay = Number of customers X 2000d

For example, if you solve 4 problems, you will make:

- Number of customers = 1 + 4 problems solved
- Pay for 5 customers = 5 X 2000d = 10000d

If you solve 8 problems, you will make:

- Number of customers = 1 + 8 problems solved
- Pay for 9 customers = 9 X 2000d = 18000d

Each round, you will have 1 minute to solve as many problems as you can. We will now ask you questions about the game and then start the 4 rounds. Good luck.

Game B

This is similar to the last game but you now have a new shop right next to yours that sells the same goods. You must compete with them for new customers as you can attract new customers from their shop to come to yours and they can do the same thing to you. New customers will want to buy from whoever solves the most problems. If you solve 2 or more problems more than your competitor, then you will attract half of their new customers:

- Number of extra customers attracted by solving 2 or more problems
  = Number of problems your competitor solves ÷ 2

That means you will earn half of how much your competitor makes from solving problems. You will earn:

- Pay = Number of your customers X 2000d + competitor's earnings ÷ 2

For example, if you solve 7 problems, and your competitor solves 5 problems, you will make:

- Number of your customers = 1 + 7 customers = 8
- Their earnings from attracting customers
  = Number of problems they solve X 2000d
  = 5 x 2000d = 10000d
- Half of their earnings from attracting customers = 10000d ÷ 2

= 5000d

- Your Pay = 8 X 2000d + 5000d = 16000d + 5000d
  = 21000d

If your competitor solves 2 or more problems than you, you will lose half of your new customers and half of your earnings. For example, if your competitor solves 6 problems and you solve 3 problems, you will make:

- Your earnings from attracting new customers = 3 X 2000d = 6000d
- Half your earnings from new customers = 6000d ÷ 2 = 3000d
- Your pay = 3000d + 3000d = 6000d

As you have one old customer, you will always make at least 2000d no matter how many problems you and your competitor solve.

If neither of you solve 2 or more problems than the other, no customers will be attracted away. No customers will be lost when:

- You both solve the same number of problems
- You solve 1 more problem than your competitor
- You solve 1 less problem than your competitor

We will now ask you questions about the game and then start the trial round and the 4 real rounds.

Game C

We will now play a new game. This game is identical to the last game, but one more option will now be added.

When your competitor outperforms you and attracts customers away from you, you will be given the choice to scare away their new customers. When you scare away their customers, you reduce their earnings as they lose all their business from attracting customers. Their one old customer will still buy from them, but all new customers will leave. To scare their customers away, you must pay a price. The price is:

- Price to scare away your competitor's customers = 500d

If you decide to scare their customers away, then 500d will be taken out of your pay. For example, you solve 6 problems and your competitor solves 8. If you decide to scare, you will make:

- Earnings from maths problems = 6 X 2000d = 12000d
- Earnings after customers attracted away by your competitor
  = 12000d ÷ 2 = 6000d
- Amount you paid to scare their customers away = 500d
- Your Total Pay = 2000d + 6000d – 500d
  = 7500d

When you scare your competitor's customers away, they will lose all of the income they made from attracting customers. For example, if they solve 8 problems and you solve 6 and then reduce their pay, their pay is:

- Their pay = 2000d

If you outperform your competitor, and they decide to reduce your earnings, then you will lose all of your earnings from solving maths problems. For example, you solve 5 problems and they solve 2. If they decide to scare away your customers, you will make:

- Your pay = 2000d

You can only scare customers away and reduce your competitor's earnings when they solve 2 or more problems than you. Similarly, your competitor can only reduce your income when you solve 2 or more problems than they do. You cannot scare their customers away when:

- You solve only 1 less problem than your competitor
- You solve the same number of problems as your competitor
- You solve more problems than your competitor

Your competitor cannot scare your customers away when:

- You solve only 1 more problem than them
- You solve the same number of problems as them
- You solve less problems than them

For example, if you both solve 10 problems, then no customers can be scared away. Another example is when you solve 13 problems and they solve 12. Again, no customers can be scared away.

Other than being able to reduce your competitor's earnings, the game is the same as before. You will first choose if you want to reduce your competitor's income or not, and then solve maths problems for 1 minute. We will now do one trial round after which 7 real rounds will be played.

Final Round

You will now do one more round of maths problems. This time you will simply be paid 4,000d for every problem you solve. Your partner cannot affect your earnings in any way. After this round, a survey will be handed out for you to answer. After surveys have been answered, rounds to be paid will be picked and you will then be asked to come to the front one at a time to be paid. We will now start the final round.

A.2 Priming Story

The following is the story that was read aloud to subjects in the Sharing Prime Treatment:

> Before we begin this set of rounds, I want you all to think about a poor but happy community. All of them don't have much money, many nice things or big fancy houses, but they appreciate what they have. What they have is their family, their friends and their community. They love their community and would do anything to make sure that their family, their friends and their community were taken care of. If one of them was struggling with money and couldn't feed their children, the whole community would help them out, even if they had to give up what little extra rice or money they had. If they ran the same kind of shops just like their neighbours, they would refuse to take away each other's customers. They may not make as much money from not taking each other's customers, but at least everybody will have a little bit of business and be able to feed their children. For people who don't have much more than their community, sharing is important so that everybody can survive and be happy.
>
> Finally I want you to consider that when you do better than your neighbour, you are taking business away from them. Before you opened your shop, their business was struggling to make money but they were still making just enough to feed their family. But then you began to take away their customers. They are your neighbour, and it must be hard to see someone from your community suffer. They could be your friend you work with, your neighbour you farm with, or maybe your family.

A.3 Subtle Framing

The following is the opening paragraph of the instructions for the Punishment Module. This is the only part different from the example given above for the Scare Frame.

> When your competitor outperforms you and attracts customers away from you, you will be given the choice to spread a rumour about your competitor. You have heard that customers have been getting sick from eating at your competitor's shop. If your competitor attracts customers away from you, you can choose to go talk to her customers and tell them the truth about people getting sick. If you choose to do this, then these customers will stop buying from your competitor. Their one old customer will still buy from them, but all new customers will leave.

Appendix B Supplemental Figures and Tables

Figure 5

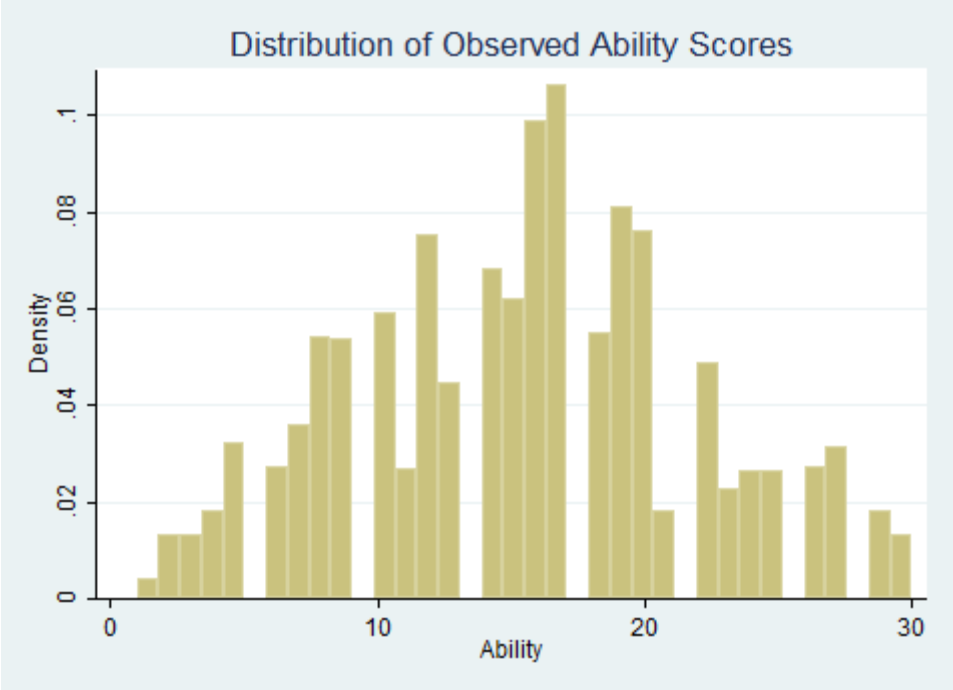

Table 8

Reasons for Choosing to Punish

Model	**LPM**	**Probit**	**Logit**	**Clustered LPM**	**Clustered Logit**
Ability Gap	0.038	0.068	0.065	0.039**	0.044***
	(0.035)	(0.049)	(0.047)	(0.020)	(0.016)
Round	-0.016***	-0.024***	-0.023***	-0.017*	-0.021*
	(0.004)	(0.005)	(0.005)	(0.009)	(0.011)
Standardised Cost to Punish	0.090***	0.288***	0.287***	0.091***	0.196**
	(0.020)	(0.059)	(0.058)	(0.022)	(0.081)
Scare Frame	-0.436***	-0.618***	-0.636***	-0.436***	-0.530***
	(0.048)	(0.062)	(0.067)	(0.048)	(0.089)
Morning	0.095	0.198**	0.196**	0.093	0.121
	(0.060)	(0.078)	(0.080)	(0.095)	(0.117)
Lagged Loss	0.059***	0.084**	0.078**	0.055***	0.067***
	(0.022)	(0.033)	(0.032)	(0.021)	(0.016)
Lagged Punished	0.072**	0.088***	0.088***	0.085**	0.102**
	(0.035)	(0.030)	(0.032)	(0.040)	(0.043)
Constant	0.646***			0.663***	
	(0.077)			(0.145)	
R-Squared	0.157			0.157	
ρ	0.388	0.583	0.561		
N	1696	1696	1696	1696	1696

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are in parentheses. In Regression LPM, standard errors are clustered by individual.

In Clustered regressions, standard errors are clustered by individual, round and community.

Marginal effects at the means are presented for Probit, Logit and Clustered Logit models.

Table 9

Robustness Checks for Random Effects Model

	Full Controls		**Clustering**		**Fixed Effects**
Model	(1)	(2)	(3)	(4)	(5)
Standardised Ability	0.708***	0.773***	0.775***	0.835***	
	(0.077)	(0.112)	(0.050)	(0.065)	
Standardised Ability Squared	0.046	0.058	0.016	0.002	
	(0.040)	(0.062)	(0.011)	(0.014)	
Punishment Treatment	-0.438***		-0.336**		-0.342***
	(0.110)		(0.131)		(0.040)
Sharing Prime	0.153		-0.087		-0.073
	(0.175)		(0.067)		(0.046)
Round	0.176***	-0.453***	0.157***	-0.326***	0.157***
	(0.013)	(0.116)	(0.024)	(0.097)	(0.007)
Round Squared	-0.006***	0.016***	-0.006***	0.012***	-0.006***
	(0.001)	(0.004)	(0.001)	(0.003)	(0.000)
Morning	-0.087	-0.029	-0.107***	-0.157*	
	(0.082)	(0.161)	(0.019)	(0.088)	
Ability Gap	-0.034	-0.123	-0.091	-0.228*	
	(0.075)	(0.139)	(0.071)	(0.132)	
Standardised Cost to Punish		0.509		-0.059	
		(0.416)		(0.042)	
Scare Frame		-1.543		0.152**	
		(1.137)		(0.072)	
Community: Hồng Đức	-0.032		0.025		
	(0.137)		(0.060)		
Community: Cổ Bì	0.008		-0.036		
	(0.115)		(0.032)		
Community: Thanh Lang	0.250*		0.121***		
	(0.131)		(0.033)		
Age	0.005	0.074			
	(0.036)	(0.060)			
Age Squared	-0.000	-0.001			
	(0.000)	(0.001)			
Wealth	-0.001	-0.006*			
	(0.003)	(0.003)			
Education	0.018	-0.066			
	(0.037)	(0.059)			
Married Dummy	0.175	-0.059			
	(0.175)	(0.258)			
Have Children Dummy	-0.003	-0.328			
	(0.196)	(0.293)			
# of Children	0.023	0.268			
	(0.097)	(0.183)			
# of Relatives Present	0.051	0.278***			
	(0.069)	(0.100)			
Enviousness	-0.003	-0.029			
	(0.045)	(0.076)			
Vengefulness	-0.089***	-0.019			
	(0.035)	(0.062)			
Humanitarian	0.009	-0.023			
	(0.040)	(0.054)			
Prime*Humanitarian	-0.071				
	(0.048)				
PunishTreat*# of Relatives Present	0.025				
	(0.065)				
Prime*# of Relatives Present	-0.047				
	(0.038)				
ScareFrame*# of Relatives Present		1.560			
		(1.105)			
Cost to Punish*# of Relatives Present		-0.001			
		(0.001)			
Constant	-0.911*	2.592**	-0.662***	2.382***	-0.711***
	(0.486)	(1.150)	(0.110)	(0.685)	(0.030)
R-Squared	0.607	0.562	.6261361	.5835514	0.178
N	1576	598	4786	1696	4786

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are robust and clustered by individual, and are in parentheses, except in Regressions (3) and (4) where they are clustered by individual, round, community and time of session

Table 10

Robustness Checks for IV First Stage

	Full Controls		Clustering		Fixed Effects	Probit		Probit with Controls	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Standardised Ability	0.018	0.035	0.010	0.021		0.000	0.014	0.000	0.031
	(0.018)	(0.047)	(0.009)	(0.037)		(0.000)	(0.012)	(0.000)	(0.052)
Standardised Ability Squared	-0.009	-0.013	0.002	-0.004				-0.000	-0.028
	(0.012)	(0.032)	(0.006)	(0.035)				(0.000)	(0.028)
Punishment Treatment	0.189***		0.145***		0.147***	0.041***		0.001	
	(0.025)		(0.054)		(0.014)	(0.013)		(0.003)	
Round	-0.003	0.281***	0.000	0.250***	-0.000	0.000**	0.005*	0.000***	0.238***
	(0.004)	(0.103)	(0.004)	(0.048)	(0.002)	(0.000)	(0.003)	(0.000)	(0.087)
Round Squared	0.000	-0.010***	0.000	-0.009***	0.000			-0.000***	-0.008***
	(0.000)	(0.004)	(0.000)	(0.002)	(0.000)			(0.000)	(0.003)
Morning	0.010	0.027	0.041**	0.085		0.000	0.100***	0.000	0.087
	(0.025)	(0.072)	(0.018)	(0.059)		(0.000)	(0.032)	(0.000)	(0.065)
Ability Gap	0.044*	0.075	0.040**	0.115		0.000***	0.081***	0.000**	0.092**
	(0.023)	(0.062)	(0.019)	(0.097)		(0.000)	(0.020)	(0.000)	(0.047)
Standardised Cost to Punish		0.009		0.020			0.064***		0.104*
		(0.059)		(0.012)			(0.021)		(0.057)
Scare Frame		-0.123		-0.116***			-0.155***		-0.192***
		(0.088)		(0.029)			(0.034)		(0.052)
Community: Hồng Đức	-0.048		-0.011			-0.000		-0.000	
	(0.039)		(0.011)			(0.000)		(0.000)	
Community: Cổ Bì	0.043		0.049***			0.000		0.000	
	(0.034)		(0.007)			(0.000)		(0.000)	
Community: Thanh Lang	0.024		0.031			0.000		-0.000	
	(0.034)		(0.024)			(0.000)		(0.000)	
Age	-0.007	-0.019						-0.000	-0.018
	(0.008)	(0.020)						(0.000)	(0.025)
Age Squared	0.000	0.000						0.000	0.000
	(0.000)	(0.000)						(0.000)	(0.000)
Wealth	0.000	0.021						-0.000	-0.004
	(0.010)	(0.026)						(0.000)	(0.019)
Education	0.012	0.022						0.000	0.009
	(0.010)	(0.029)						(0.000)	(0.028)
Married Dummy	0.048	0.084						0.000	0.097
	(0.044)	(0.115)						(0.000)	(0.140)
Have Children Dummy	-0.027	-0.095						-0.000	-0.121
	(0.058)	(0.136)						(0.000)	(0.247)
# of Children	0.005	0.056						0.000	0.047
	(0.026)	(0.071)						(0.000)	(0.062)
# of Relatives Present	-0.002	-0.022						0.000	0.006
	(0.021)	(0.047)						(0.000)	(0.037)
Enviousness	0.005	0.016						-0.000	-0.018
	(0.014)	(0.038)						(0.000)	(0.036)
Vengefulness	0.014	0.057						0.000*	0.055
	(0.016)	(0.042)						(0.000)	(0.034)
Humanitarian	-0.001	0.013						0.000	0.002
	(0.013)	(0.032)						(0.000)	(0.027)
Partner Humanitarian	0.004	-0.001						0.000	-0.004
	(0.009)	(0.019)						(0.000)	(0.027)
Partner Vengefulness	0.046**	0.191***						0.000***	0.142***
	(0.018)	(0.053)						(0.000)	(0.046)
Partner Enviousness	-0.023	-0.108*						-0.000	-0.081*
	(0.020)	(0.060)						(0.000)	(0.043)
Constant	-0.062	-1.942**	-0.061***	-1.613***	-0.004				
	(0.131)	(0.778)	(0.020)	(0.356)	(0.006)				
R-Squared	0.115	0.095	0.112	0.084	0.084				
ρ	0.035	0.082			0.122	0.309	0.320	0.171	0.197
N	1405	541	4790	1696	4790	4790	1696	1405	541

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are robust and clustered by individual, and are in parentheses, except in Regressions (3) and (4) where they are clustered by individual, round, community and time of session. In Regression (6) - (9), standard errors are not clustered.

Marginal effects at the means are presented for Regression (6) - (9).

Table 11

Robustness Checks for IV 2nd Stage

	Full Controls		Clustering		Fixed Effects
Model	(1)	(2)	(3)	(4)	(5)
Lagged Punished	-2.205***	-1.669	-2.043***	-1.666**	0.795
	(0.426)	(2.888)	(0.483)	(0.811)	(0.673)
Standardised Ability	0.726***	0.821**	0.793***	0.856***	
	(0.088)	(0.360)	(0.024)	(0.056)	
Standardised Ability Squared	0.040	0.062	0.019	-0.010	
	(0.049)	(0.177)	(0.017)	(0.016)	
Round	0.170***	-0.019	0.154***	0.106	
	(0.019)	(0.838)	(0.006)	(0.180)	
Round Squared	-0.006***	0.001	-0.005***	-0.004	
	(0.001)	(0.029)	(0.000)	(0.006)	
Morning	-0.149	0.009	-0.035	0.039	
	(0.108)	(0.362)	(0.026)	(0.084)	
Community: Hồng Đức	0.069		0.000		
	(0.205)		(0.019)		
Community: Cổ Bì	0.232		0.076*		
	(0.169)		(0.040)		
Community: Thanh Lang	0.502***		0.195***		
	(0.181)		(0.029)		
Age	0.034	0.095			
	(0.044)	(0.146)			
Age Squared	-0.001	-0.002			
	(0.001)	(0.002)			
Wealth	0.062*	0.094			
	(0.037)	(0.146)			
Education	0.000	-0.054			
	(0.051)	(0.183)			
Married Dummy	0.176	-0.152			
	(0.301)	(1.346)			
Have Children Dummy	-0.323	-0.593			
	(0.352)	(1.474)			
# of Children	0.109	0.385			
	(0.123)	(0.443)			
# of Relatives Present	0.113	0.164			
	(0.080)	(0.245)			
Enviousness	-0.006	0.017			
	(0.058)	(0.222)			
Vengefulness	-0.038	0.080			
	(0.058)	(0.298)			
Humanitarian	-0.013	-0.038			
	(0.052)	(0.184)			
Partner Humanitarian	-0.071	-0.035			
	(0.050)	(0.179)			
Partner Vengefulness	0.113	0.232			
	(0.077)	(0.685)			
Partner Enviousness	-0.126*	-0.159			
	(0.073)	(0.443)			
Constant	-1.277*	-1.111	-0.776***	-0.446	
	(0.676)	(6.673)	(0.048)	(1.214)	
R-Squared	0.368	0.283	0.416	0.203	-0.177
N	1405	541	4786	1696	4786

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are robust and clustered by individual and are in parentheses. In Regressions (3) - (5), standard errors are clustered by individual and community.

In Regressions (1), (3) and (5), Punishment Treatment Dummy and Ability Gap are the instruments. In Regressions (2) and (4), Ability Gap, Standardised Cost to Punish and Punish Framing are the instruments.

Table 12

Robustness Checks for Reasons for Choosing to Punish

	Linear Probabilty Model		Probit		Logit		Clustered Logit	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ability Gap	0.157*	-0.145	0.244**	-0.177	0.229**	-0.183	0.209***	-0.015
	(0.080)	(0.303)	(0.118)	(0.458)	(0.114)	(0.452)	(0.080)	(0.311)
Round	-0.014***	-0.010	-0.021***	-0.017*	-0.020***	-0.017*	-0.019**	-0.017**
	(0.005)	(0.008)	(0.006)	(0.010)	(0.006)	(0.010)	(0.009)	(0.008)
Standardised Cost to Punish	0.049*	0.043	0.258***	0.263*	0.257***	0.270*	0.167***	0.115
	(0.026)	(0.064)	(0.068)	(0.154)	(0.066)	(0.152)	(0.030)	(0.104)
Scare Frame	-0.389***	-0.437***	-0.602***	-0.523***	-0.618***	-0.530***	-0.521	-0.474
	(0.055)	(0.137)	(0.068)	(0.099)	(0.074)	(0.110)	(.)	(.)
Morning	0.081	0.056	0.189**	0.171	0.189**	0.173	0.110	0.076
	(0.063)	(0.105)	(0.084)	(0.163)	(0.085)	(0.167)	(0.091)	(0.160)
Lagged Loss	0.072	0.079	0.146	0.177	0.146*	0.192	0.061	-0.025
	(0.066)	(0.094)	(0.092)	(0.206)	(0.088)	(0.204)	(0.127)	(0.135)
Lagged Punished	0.174***	0.129**	0.270***	0.275	0.264***	0.267	0.269	0.270**
	(0.064)	(0.065)	(0.099)	(0.174)	(0.098)	(0.175)	(.)	(0.110)
Enviousness	-0.004	-0.131*	-0.016	-0.191*	-0.015	-0.188*	-0.021	-0.156
	(0.038)	(0.068)	(0.051)	(0.112)	(0.049)	(0.114)	(0.033)	(0.128)
Humanitarian	-0.032	-0.061	-0.048	-0.124	-0.045	-0.117	-0.034	-0.067
	(0.023)	(0.055)	(0.030)	(0.083)	(0.029)	(0.083)	(0.037)	(0.120)
Vengefulness	0.087**	0.128***	0.152***	0.245**	0.147***	0.246**	0.120***	0.170***
	(0.035)	(0.044)	(0.053)	(0.102)	(0.052)	(0.106)	(0.009)	(0.041)
Enviousness*Lagged Loss	0.001	0.010	-0.006	-0.004	-0.008	-0.011	0.045	0.075
	(0.046)	(0.048)	(0.044)	(0.100)	(0.041)	(0.099)	(.)	(.)
Vengefulness*Lagged Loss	-0.003	-0.014	-0.017	-0.023	-0.018	-0.026	-0.033	-0.021
	(0.035)	(0.040)	(0.052)	(0.108)	(0.049)	(0.107)	(0.027)	(0.042)
Enviousness*Ability Gap	-0.078	0.136	-0.115*	0.197	-0.107*	0.200	-0.102*	0.084
	(0.048)	(0.153)	(0.061)	(0.255)	(0.059)	(0.253)	(0.061)	(0.183)
Vengefulness*Lagged Punished	-0.050	-0.049	-0.091*	-0.112	-0.087*	-0.110	-0.084***	-0.092*
	(0.032)	(0.032)	(0.048)	(0.085)	(0.047)	(0.085)	(0.020)	(0.050)
Age		0.011		0.028		0.028		0.008
		(0.036)		(0.064)		(0.063)		(0.050)
Age Squared		-0.000		-0.000		-0.000		-0.000
		(0.000)		(0.001)		(0.001)		(0.001)
Wealth		0.003		0.004		0.004		0.003**
		(0.002)		(0.006)		(0.005)		(0.002)
Education		0.004		-0.006		-0.008		0.000
		(0.045)		(0.072)		(0.071)		(0.011)
Married Dummy		0.067		0.011		0.009		0.078
		(0.154)		(0.493)		(0.483)		(0.246)
Have Children Dummy		-0.204		-0.303		-0.310		-0.245**
		(0.205)		(0.620)		(0.657)		(0.123)
# of Children		0.041		0.034		0.032		0.047
		(0.109)		(0.187)		(0.184)		(0.110)
# of Relatives Present		-0.035		-0.033		-0.031		-0.023
		(0.060)		(0.092)		(0.090)		(0.058)
Constant	0.594***	0.634						
	(0.151)	(0.580)						
R-Squared	0.181	0.197						
ρ	0.394	0.495	0.576	0.634	0.555	0.619		
N	1527	598	1527	598	1527	598	1527	598

* p<0.10, ** p<0.05, *** p<0.01.

Standard Errors are robust and clustered by individual and are in parentheses, except in Regressions (3) - (6) where they are neither robust or clustered. In Regressions (7) and (8), standard errors are clustered by individual, round, community and time of session.

In Regressions (7) and (8), some standard errors were unable to be computed due to small cluster numbers for community and time of session.

Marginal effects at the means are presented for Regressions (3) - (8).

Appendix C: Survey and Psychometric Test

1. In what year were you born? …….
2. What is the highest level of education you have completed? Please circle best option:
    - Primary
    - Secondary
    - High
    - Vocational
    - University
3. Are you married? Please circle best option:
    - Yes
    - No
    a. Do you have children? (If no, skip to question 4)
        - Yes
        - No
    b. How many children do you have? .....
4. What is your current form of employment? ……..
5. Does your household have access to pipe water in your home? Please circle best option:
    - Yes
    - No
6. Do you own a motorbike? If yes, how many do you own? …….
7. Do you own a refridgerator? If yes, how many do you own? …….
8. Do you own a television? If yes, how many do you own? …….
9. Do you own a business? ……. …
    a. How many employees do you have? …….
10. How many of your family members are now in this room for the experiment?
11. When you played this game the 2nd time, did you try to answer fewer questions than the first one?

    A. Yes

    B. No (Go to question 13)

12. If Yes, Why did you do that? Circle the best answer

    A. I do not want to take away customers from my neighbours and relatives.

    B. I'm tired and do not want to try more.

    C. The question becomes more difficult.

    D. Other (please write your answer):

13. Think about how much money you made in this experiment. If someone was to offer you money not to play these games, what would be the smallest amount you would accept? In other words, if you disliked this game and played it only because you made money doing it, how little would someone have to pay you to stop playing this game? Please circle the best option.

30,000d or less 50,000d 70,000d 90,000d 110,000d

130,000d or more

Psychometric Test

Using the scale to the right, please indicate the extent to which you agree or disagree with the following statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
One should find ways to help others less fortunate than oneself.	1	2	3	4	5
Those who are unable to provide for their own basic needs should be helped by others.	1	2	3	4	5
If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.	1	2	3	4	5
If somebody offends me, I will offend him/her back.	1	2	3	4	4
I feel envy every day.	1	2	3	4	5
It is so frustrating to see some people succeed so easily.	1	2	3	4	5
The success of my neighbours makes me resent them.	1	2	3	4	5

Appendix D: Variable Construction

Variable	Type	Description
# of Children	Discrete	The number of children a subject had
# of Relatives Present	Discrete	The number of relatives a subject had in the same experiment session
Ability Gap	Interaction	The interaction term between the dummy of having ability greater than partner and the difference in standardised ability between a subject and her partner
Age	Discrete	Age in years
Age Squared	Polynomial	Age in years squared
Standardisd Cost to Punish*# of Relatives Present	Interaction	Interaction term between standardised cost to punish and the number of relatives in the same session
Education	Categorical	Highest level of completed education coded to integer between 1 and 5; 1 = Primary, 2 = Secondary, 3 = High, 4 = Vocational Tertiary, 5 = Univesity
Enviousness	Index	Unweighted average of Enviousness Q1, Q2 and Q3
Enviousness*Ability Gap	Interaction	The interaction term between the Ability Gap interaction term and the Enviousness index
Enviousness*Lagged Loss	Interaction	The interaction term between the dummy of losing the previous round and the Enviousness index
Have Children Dummy	Binary	The dummy of being a mother
Humanitarian	Index	Unweighted average of Humanitarian Q1 and Q2
Lagged Loss	Indicator	The dummy of losing the previous round
Lagged Punished	Indicator	The dummy of being punished the previous round
Married Dummy	Indicator	The dummy of being married
Morning	Indicator	The dummy of being in a morning session
Partner Enviousness	Index	Partner's Enviousness index
Partner Humanitarian	Index	Partner's Humanitarian index
Partner Vengefulness	Index	Partner's Vengefulness index
Prime*# of Relatives Present	Interaction	The interaction term between the Prime dummy and the number of relatives present

Variable	Type	Description
Prime*Humanitarian	Interaction	The interaction term between the Prime
Punishment Treatment	Indicator	The dummy of being in the Punishment Module
PunishTreat*# of Relatives	Interaction	The interaction term between the Punishment
Round	Discrete	The current round
Round Squared	Quadratic	The current round squared
Scare Frame	Indicator	The dummy of experiencing the Scare framing
ScareFrame*# of Relatives Present	Interaction	The interaction term between the ScareFrame dummy and the number of relatives present
Sharing Prime	Indicator	The dummy of being in the Sharing Prime
Standardised Ability	Standardised Discrete	Ability score standardised with mean 0 and variance 1
Standardised Ability Squared	Polynomial	Standardised ability squared
Standardised Cost to Punish	Standardised Discrete	Cost of punishment coded to integer value equal to monetary price, then standardised
Vengefulness	Index	Unweighted average of Vengefulness Q1 and Q2
Vengefulness*Lagged Loss	Interaction	The interaction term between the dummy of losing the previous round and the Vengefulness index
Vengefulness*Lagged Punished	Interaction	The interaction term between the dummy of being punished the previous round and the Vengefulness index
Wealth	Index	Sum of number of Motorbikes, Fridges and