2011

Trust, Reciprocity and Rules

Thomas A. Rietz

Eric Schniter
Chapman University, schniter@chapman.edu

Roman M. Sheremeta
Chapman University

Timothy W. Shields
Chapman University, shields@chapman.edu

Trust, Reciprocity and Rules

Comments

Working Paper 11-06

Trust, Reciprocity and Rules

Thomas A. Rietz[a]
Eric Schniter[b,*]
Roman M. Sheremeta[c]
Timothy W. Shields[c]

[a] Henry B. Tippie College of Business, University of Iowa
Iowa City, Iowa 52242-1994, U.S.A.
[b] Economic Science Institute, Chapman University
One University Drive, Orange, CA 92866, U.S.A.
[c] Argyros School of Business and Economics, Chapman University,
One University Drive, Orange, CA 92866, U.S.A.

September 6, 2011

Abstract

In the absence of enforceable contracts, many economic and personal interactions rely on trust and reciprocity. Research shows that although this reliance often works well, sometimes it breaks down. Simple rules mandating minimum standards on reciprocation prevent the most egregious trust violations, but may also undermine behavior that would have otherwise produced higher overall economic welfare. We test the efficacy of exogenously imposed minimum return rules using experimental trust games. We find that rules fail to increase trust and trustworthiness. Thus low minimum standards significantly decrease economic welfare. Although sufficiently restrictive rules restore welfare, trust and trustworthy behavior never returns.

JEL Classifications: C72, C91, D72
Keywords: trust games, experiments, reputation, information, reciprocity

* Corresponding author (email): schniter@chapman.edu
We thank Joyce Berg and John Dickhaut for inspiration, Ken Brown, Michael Gurven, Abel Winn, Steve Gjerstad, Roberto Gonzalez, Bryce Corgnet and participants at the 14th International Conference on Social Dilemmas for their insight and suggestions. Any errors are ours.

Most social and economic situations are not explicitly contracted (Davis, 1992). When behavior is not mandated by enforceable rules, people tend to rely on reputations of trust and trustworthiness.[1] Even when rules exist, people often rely on trust to facilitate interactions because it is often cheaper than a reliance on active monitoring and enforcement. Spouses trust partners not to cheat. Drivers trust that oncoming traffic will stay in the opposite lane. Investors trust businesses to act in the investors' best interests. Lenders trust borrowers to repay loans and depositors trust bankers to behave responsibly. In trust-based situations, people likely use a norm-based[2] propensity towards cooperation and constantly update these norms with information gleaned from sophisticated evolved psychologies designed to detect cheaters (Cosmides & Tooby, 1989 & 1992) and keep accounts of others' goodwill exchange efforts (McCabe & Smith, 2000, 2001, 2003).

Consider the two-player two-stage investment game of Berg, Dickhaut and McCabe (1995), now widely known as the Trust Game. In the original game, an investor can invest any portion of a $10 endowment by sending it to a trustee. Both investor and trustee know that the amount sent triples in value before reaching the trustee. Having received the tripled investment, the trustee can reciprocate by returning any portion of the funds to the investor. Non-cooperative game theory predicts that because there is no required return, investment will be foregone: anticipating that the trustee will keep all

[1]Reputation, as it is concerned in this discussion, is an entity's known history of demonstrating trust and/or trustworthiness. Trust is demonstrated by willfully ceding resources or control to another with the expectation that the other intends to reciprocate and not be opportunistic. Trustworthiness is demonstrated by not succumbing to opportunism so as to restitute the resources or control that another has ceded by extending trust. The amount of trustworthiness that can be demonstrated depends on the amount of opportunism available.

[2]In this paper, we use "norms" to mean context-based expectations about interactions that coordinate behavior.

funds received, the investor will invest zero. However, interactions in the trust game rarely end this way. Typically, investors send a share of the endowment and most trustees, in turn, reciprocate (Camerer, 2003). Given the high frequency of trustees who reciprocate, a self-interested investor with accurate expectations of trustees may invest rationally (Trivers, 1971; Kurzban & Houser, 2005). The development of norms among socializing groups is not surprising given the widespread importance of trust and reciprocity in everyday relationships. Axelrod (1984) demonstrates that an initially trusting behavior, capable of contingent adjustment when the exchange partner proves untrustworthy, can be an evolutionarily stable strategy. Research also shows the importance of long-term reciprocity relationships and exchange of scarce and valuable resources within small-scale subsistence societies (Kaplan et al., 1985; Hawkes et al., 1991; Gurven, 2004). This supports the notion that reciprocal exchange has an ancient origin and has been crucial to human evolution (Sahlins, 1972; Isaac, 1978; Lovejoy, 1981).[3]

While interpersonal interactions are often based on implicit trust-based expectations of reciprocity and mental accounting of reciprocation histories, modern society explicitly mandates many of the behaviors we rely on via formal rules and laws (Zucker, 1986). When a system based solely on trust does not work efficiently enough to prevent opportunism, we often rely on rules that establish minimum standards instead of rules that fully specify behavior. For example, the USDA imposes a minimum standard for meat inspection, corporations must meet minimum standards of disclosure

[3]Axelrod and Hamilton (1981) and Cosmides and Tooby (1989) suggest that natural selection has favored humans who had a propensity to establish reputations as cooperators and non-defectors, and who have been capable of gathering reputational information about others on which to condition their trust based exchange efforts.

to investors, and employers must pay a minimum wage. Minimum standards are attractive because they outlaw the worst abuses of trust relationships while being less costly than fully mandated interactions (both from compliance and enforcement standpoints). However, when used, incentives such as those provided by minimum standards may backfire (Bowles, 2009), leading a significant portion of people to conclude something akin to "the minimum must be good enough, otherwise it wouldn't be the minimum," thus lowering the median behavior from what it may have been without a minimum rule.[4]

We study how exogenously imposed minimum return rules affect behavior in experimental trust games. We modify the basic Berg, Dickhaut & McCabe (1995) trust game in three additional treatments where there are minimum return rules that require the trustee to return to the investor either 10%, 20% or 30% of the tripled investment amount received. Our results suggest that these rules erode trust that would otherwise occur. In most of the cases this erosion of naturally occurring trust and resulting reciprocity was so large that it decreased overall economic welfare. When a minimum return rule of 30% was imposed, which almost entirely removes downside risk, it did manage to effectively restore economic welfare, however, neither trust nor trustworthy behavior was restored.

In the baseline treatment with a mandated minimum-return of zero, subjects both invested and reciprocated more than classic economic theory predicts. Typical investors invested around half of their funds, signaling trust to trustees. Trustees who received investments of more than half of the endowment returned a median of 45% of the

[4]Recently, Fuster and Meier (2010) showed centralized norm enforcing mechanisms discouraged private development of norms, and thus decreased cooperation.

income, while the median return rate for those who received half or less of the endowment was only 12% (note that a return of 33.33% or more of the income is a positive return on investment for the investor).[5] Thus, trustees reciprocated conditional on amounts invested in a manner consistent with previous findings (Berg, Dickhaut and McCabe., 1995; Pillutla, et al., 2003). When mandated minimum returns were greater than zero, both return rates and investment distributions were affected. The 10% and 20% return rules actually resulted in smaller investments overall, while the largest 30% rule resulted in larger investments. Return rates by trustees who received more than half of the investor's endowment were comparatively smaller for 10% and 20% return rules. Compared to the 0% rule, trustees who received half or less of the investor's endowment had even lower return rates under 10% and 20% rule conditions. Trustees returned amounts close to the mandated minimum (10% median amount returned with the 10% rule, 24% with the 20% rule, and 30% with the 30% rule), as if believing the "minimum must be good enough."

In the next section, we review literature suggesting that rules may have unintended consequences in a variety of situations. In Section II, we present our experimental design, procedures and hypotheses. Sections III and IV contain our results and analyses. We summarize and discuss implications and future research in the last section.

[5]Returns can be defined from the point of view of the trustee or the investor. We define the "return rate" as the percentage of the amount received that is sent back by the trustee. Our rules are defined on return rates. We define "return on investment" as the rate of net profits on invested funds, that is the returned amount minus the investment divided by the investment. While there is a one-to-one correspondence between these measures, return rates are more intuitive when discussing behavior of trustees and returns on investment are more intuitive when discussing behavior of investors. See Table 2 for details.

I Literature Review

Since introduced by Berg, Dickhaut and McCabe (1995), the trust game has been the topic of intense research. A comprehensive review is beyond the scope of this paper but available elsewhere (e.g., Ostrom and Walker, 2003) for interested readers.

Research in several areas suggests that institutionalized structures may actually increase the very behavior they are designed to avoid. For example, Titmuss, Oakley and Ashton (1997) suggest that providing financial incentives to give blood results in less blood contributions than with no remuneration. Mellstrom and Johannesson (2008) provide supporting evidence from women's blood donations that these institutionalized incentives backfire. Gneezy and Rustichini (2000a) give another excellent example: when a formal rule (enforced by a fine) was implemented against late pick-ups, more parents (not fewer) picked up children late from day care. In the labor context, several studies (Frey, 1993; Dickinson and Villeval, 2008; Griffith, 1993) show that imposing monitoring or close supervision by authority actually decreases work effort. The "crowding out" of intrinsic motivation noted in these monitor-worker relationships may result from the reduced opportunity for the worker to demonstrate trustworthiness.[6] These examples demonstrate that, where behavior is not primarily controlled by reputational concerns, but instead is mandated by adherence to institutional structure and a calculus of its consequence, counter-productive effects may result.

In a game closely related to the trust game, Falk and Kosfeld (2006) studied the effect of a principal imposing a minimum performance requirement on an agent. In this

[6]High work effort provides an opportunity for demonstrating trustworthiness when a worker is not being monitored and could otherwise shirk responsibility. A closely monitored worker does not have the same opportunity to escape reprimand for shirking and so, under supervision, work effort does not serve to indicate trustworthiness.

principal-agent game, if the agent engages in a costly (to the agent) production process, he can increase the payoff to the principal. The principal can set a minimum effort level for the agent before the game begins. Falk and Kosfeld argue that setting a minimum effort level signals mistrust to the agent while setting no minimum signals trust and generates reciprocating behavior. In a control treatment, they exogenously set the minimum production level. In this treatment, the principal is not signaling mistrust by setting the minimum level. They find that, when restricted by the principals, agents actually delivered lower production for the principal than when they were unrestricted. If the restriction is imposed exogenously, production levels are similar to those observed when the principals choose not to restrict the agents.

Finally, Fehr and Rockenbach (2003) modified the trust game to allow investors to specify a “desired return” when sending money to trustees. In one treatment, the desired return is simply non-binding communication. In another, investors can impose a fine on trustees if the actual returned amount falls short of the desired return. Investors decide whether the fine will be imposed ex-ante and trustees learn this decision at the time of their choice. Thus, reliance on a fine signals mistrust to trustees. In either case, the desired return rate serves to communicate the specific expectations of investors. Return rates fall when a fine is set ex-ante and rise when a fine is not set. Thus, implementing sanctions reduces reciprocity, but both the desired return set by investors and whether a fine is implemented signals expectations and investor trust. Whether a rule alone matters is thus confounded making it impossible to isolate the effect of the rule alone on the trust/reciprocity relationship. In contrast, our rule treatments exogenously set a minimum level that cannot be violated. Thus, the minimum may set

the expectations of both players, but does not serve to communicate expectations from one party to the other.

The general idea embedded in the Falk and Kosfeld (2006) and Fehr and Rockenbach (2003) work, that rules have adverse consequences, is similar to our thesis. However, there are several important differences. First, by using and manipulating the trust game, we can separate trust and control. By setting the rule in their main treatment, the principal in Falk and Kosfeld's game signals mistrust to the agent. Like their control treatment, our return rule is exogenous, neither signaling trust nor distrust. In their control game, the principal makes no decisions and, as a result, neither signals trust nor distrust. In our game, the investor is still signaling trust in the trustee by sending money. Thus, in both versions of our game, sending money signals trust to the trustee. These differences are important to consider in situations where rules are designed to replace or work in conjunction with internal motivations.

II Experimental Design, Hypotheses and Procedures

A Experimental Procedures

The experiment was conducted at Chapman University's Economic Science Institute. Subjects who had not previously been recruited for trust-game experiments were recruited from a standard subject pool consisting primarily of undergraduate students and randomly assigned into treatments described in Table 1. Subjects interacted with each other anonymously over a local computer network. The experiment was programmed and conducted using z-Tree (Fischbacher, 2007). The computers were placed within individual cubicles in such a way that all subjects could only view their own computer screen.

The eight sessions each consisted of 18 to 24 subjects, lasted approximately thirty-five minutes, and were sequenced as follows. First, an experimenter read the instructions aloud while each subject followed along with their own copy of the instructions. The instructions explained the experimental procedures and payoffs used in the experiment (instructions are available in the appendix). After finishing the instructions, subjects were given five minutes to write down their answers to several questions to ensure that they understood the instructions. Subjects' answers remained confidential from other subjects. After subjects completed the quiz, the experimenter distributed a printed copy of the correct quiz answers. The experimenter privately answered any questions regarding the experimental procedures.

Each subject was assigned a role, labeled person 1 for the investor and person 2 for the trustee. The subjects participated once in the trust game described below. Each subject was paid a $7 participation fee and the payoffs from the trust game after signing a receipt. On average subjects earned $9.75 in addition to their participation fee.

B Experimental Design

Subjects participated in one of the four treatments. In each treatment, the investor could send any portion of his $10 endowment to the trustee and the investment amount was tripled on the way. The trustee then decided how much to send back contingent upon the minimum return rule. In the baseline treatment (R0), the trustee could send back none of the amount received. In treatments R10, R20 and R30 trustee had to send back at least 10%, 20% and 30% of the tripled investment amount received, respectively.[7]

[7] A button was placed upon the trustees' screen that, if selected, would trigger a pop-up window displaying the minimal amount that could be returned.

C Hypotheses

If investors and trustees behaved strictly according to classical economic theory, the rules we impose should make no difference. In the single shot games we study, income maximizing trustees would arguably have no incentive to return more than the rule imposes. For the parameter values of the rules we use, the returns that equal the minimum mandated return would result in loses for investors and, therefore, investors would be expected to invest nothing in the first place. Of course, prior research on the game shows that these expected behaviors are not typical. Instead, there is a distribution of voluntary trustee return rates that on average justifies some positive initial investment. Our first set of hypotheses therefore concerns how minimum required return rules affect this distribution of trustee return rates.

Given the distribution of voluntary trustee return rates that typically arises without a rule, any minimum return rule might mechanically truncate the lower tail of this distribution. Our first hypothesis is that a minimum return rule leaves all other aspects of the rule-free distribution unaffected. We call this the "truncation" hypothesis. This would increase the mean return but, unless the median return is truncated, it would leave the median unaffected.

Alternatively, Berg, Dickhaut and McCabe (1995) observe that reported social histories increase return rates even when the histories reveal that some prior subjects returned zero and the average return on investment is negative. The social histories seem to reinforce norms of reciprocity. It is possible that minimum return rules also reinforce reciprocity.[8] Minimum return rules may suggest selfish behavior is

[8]In other contexts, rules have been shown to have both positive and negative potential effects on otherwise cooperative behaviors. For example, Ostrom (2000) discusses some situations where poorly

unacceptable or undesirable, reinforcing pro-social behavior and resulting in greater reciprocation. In this case, minimum return rules will both (1) truncate the lower tail and (2) increase return rates in the rest of the distribution as well. We call this the "reinforcement" hypothesis. Observationally, this would increase both the mean and median return rates.

In contrast, if rules substitute for norms, the incentives presumably provided by rules may backfire as Bowles (2009) suggests. That is, the mandated return rate increases the noise-to-signal ratio for trustees wishing to gain reputations as cooperators and limits the reputational benefits to trustees of costly signaling via returns (Bénabou and Tirole, 2006). Rules may cause trustees to abandon their own norms of how much to return, substituting the rule instead. Alternatively, rules may serve as focal points, attracting the entire distribution of return rates. In either case, while minimum return rules truncate the lower tail of the distribution, they also pull down the rest of the distribution toward the rule as well. We argue that this effect may hold in a strong form wherein the rule completely replaces other norms and return rates fall to the rule. We call this the "pure replacement" hypothesis. It may also hold in weak form, where the rule partially substitutes for norms of behavior, but does not completely replace norms of reciprocating. We call this partial substitution the "attraction" hypothesis. Observationally, this will decrease the median return. Two factors affect the mean: truncation of the lower tail and the downward shift in the rest of the distribution. The overall effect on the mean is ambiguous for the attraction hypothesis, but complete and

designed external rules have negative impacts, but appropriately designed internally developed and enforced rules may increase cooperative behavior in common pool resource games.

partial substitution are the only cases where the mean may actually fall because of a minimum return rule.

The following four alternative hypotheses summarize the posited effects of rules on return rates.

Hypotheses Set 1: Effect of Rules on Return Rates

Truncation **Hypothesis:** Minimum return rules truncate the lower tail of the return rate distribution as mandated by the rule and leave other aspects of the distribution unaffected. As a result, the mean return rate increases from R0 through R30 and the median is unaffected unless it would otherwise have fallen below the rule.

Reinforcement **Hypothesis:** When a minimum return rule is implemented it (1) eliminates returns that would otherwise have fallen below the rule and (2) also reinforces norms of reciprocating, increasing return rates that would otherwise have fallen above the rule. As a consequence, the mean and median return rates increase from R0 through R30 because of upward shifts in the entire distribution.

Pure Replacement (Complete Substitution) **Hypothesis:** When a minimum return rule is implemented, it completely replaces norms of reciprocating more than the rule dictates. As a result, all return rates equal the mandatory minimum, decreasing the mean and median return rates to the rule. As the rule increases, return rates will increase accordingly.

Attraction (Partial Substitution) **Hypothesis:** When a minimum return rule is implemented it (1) eliminates returns that would otherwise have fallen below the rule, but also (2) substitutes partially for norms of reciprocating, effectively decreasing returns that would otherwise have fallen above the rule by attraction towards the minimum

allowed. Specifically, the further a minimum return rate is below the “default” level of return rate otherwise seen in R0, the more it will lower the return rate. As a consequence the median return rate decreases because of the downward shift in the distribution above the rule. There is an ambiguous effect on the mean because, while returns above the rule are shifted downward, returns below the rule are raised. As rules increase to their maximum possible levels, both mean and median return rates will ultimately increase because eventually the truncation effect must dominate for sufficiently high rules.

Our second set of hypotheses concern investor behavior. If investors are categorically predisposed to never invest, or believe that given their investment levels return rates will not be changed by minimum return rules, then rules should not affect investor behavior. These predictions form our “neutral” hypothesis.

By imposing an explicit rule mandating minimum returns on investment, we unarguably decrease the downside risk to the investor. Specifically, R0 leaves the entire investment at risk, while R10, R20, and R30 leave 70%, 40%, and 10% of the original investment at risk, respectively. If investors respond solely to the value-at-risk, rules should increase investment. We call this the “value-at-risk” hypothesis. A similar outcome would arise if investors believed in the reinforcement effect on trustee behavior (see reinforcement hypothesis above), encouraging a stronger investment response.

Alternatively, rules can create incentive tradeoffs by simultaneously limiting downside risk (encouraging investment) while also constraining information gathering

opportunities (discouraging investment)[9], leading to a "U-shaped" investment response function. Minimum return rules decrease the availability of discretionary funds on which trustees can make decisions. As trustees are increasingly constrained with regards to the proportion of income that they can decide to return, investors are consequently provided less of the reputational information about what could have been done but was not. At the same time, the mandated return rate increases the noise-to-signal ratio for investors desiring to gain reputations as cooperators, lowering reputational benefits gained from exhibiting trust (Bénabou and Tirole, 2006). In accord with evolutionary theorists (Axelrod & Hamilton, 1981; Cosmides & Tooby, 1989), we propose that natural selection has favored humans who had a propensity to establish reputations as cooperators and non-defectors, and who have been capable of gathering reputational information about others on which to base their trust based exchange efforts (see also discussions of "Goodwill Accounting" in McCabe & Smith, 2000, and Coricelli, McCabe & Smith, 2000). According to this theory, both the presence of potential monetary gains and reputational knowledge to be gleaned from risky investment in a novel exchange partner, both parts of the trust game, evoke trusting behavior. Specifically, the "information" hypothesis proposes that investors in the trust game are not only making choices that will generate material gains from payouts, but are also making choices which will generate reputational information about the trustee with whom they can interact. A trade-off between downside risk and information seeking benefits causes a U-shaped investment response function according to the "information" hypothesis.

[9]It is also possible that investors may have beliefs that rules will shift the entire distribution of return rates according to the substitution hypotheses. Such beliefs can also discourage investments.

Finally, we note that the economic efficiency of this institution is driven entirely by the investment rates. Thus, efficiencies move in lockstep with investment rates. So, any hypothesis on investment rates applies equally to levels of economic efficiency.

The following three alternative hypotheses summarize the posited effects of rules upon investments and the resulting efficiency.

Hypotheses Set 2: Effect of Rules on Investment Rates and Efficiency

***Neutral* Hypothesis:** Investment levels do not respond to minimum return rules.

***Value-at-Risk* Hypothesis:** Investors respond to rule-truncated return distributions with monotonically higher investment levels as rules increase from R0 through R30.

***Information* Hypothesis:** Minimum return rules create incentive trade-offs by simultaneously limiting both downside risk and information seeking benefits. These tradeoffs result in a U-shaped investment response function.

We test these hypotheses using the observed distributions of return rates and investment levels. First, we ask how the return on investment varies with the rule and investment levels.. Second, prior research suggests a more complex relationship between investment levels and returns than our simple hypotheses do. In particular, starting with Berg, Dickhaut and McCabe (1995), researchers have noted that higher investment levels generate both higher absolute returns, higher return rates and higher returns on investment. We believe that higher investment levels generally signal more trust and, in response to more demonstrable trust, trustees reciprocate with more trustworthiness (returning more than the minimum). However, rules like the ones implemented in this study affect the amounts of trust and trustworthiness that can be

demonstrably signaled. Rules restrict the discretionary space that trustees have available for demonstrating reciprocation. If investors trust because they are seeking information about trustworthiness and rules about mandated minimum returns decrease this information content, then rules, investment levels and return rates will interact in a complex way. We investigate these relationships more fully with a regression analysis.

III Results

Table 2 gives several definitions that we use in the discussion of investments and returns. Figure 1 shows the mean and median amounts sent and returned under each rule. Examining the trustee and investor behaviors we find the "U-shaped" responses predicted by some hypotheses. Next, we closely examine impact of rules on returns and investments.

A Effect of Rules on Return Rates

Figure 2 shows the distribution of return rates (defined at the percentage of funds received that are returned by the trustee) under each rule. The two colors in the histogram bars represent return rates when the investment levels were above or below $5 (50% of the initial endowment). Evidently, rules affect return rates.

Under a 0% minimum return rule, there are two modes, one near 0% and one centered somewhat below 50%. Table 3 Panel A gives the overall mean return ($6.65 or 29% of the amount received), median return ($7.00, 35%) and the percentage of observations where the return rate was within $0.01 of 0% (17%). It also shows the median excess return rate above the mandated minimum. We interpret this as trustworthiness. In this case, it is simply the median return rate (30%) because the minimum required return is 0%.

Under a 10% minimum return rule, there remain some returns in the 35% to 50% range, but the dominant mode is 10%. The mean return drops (to $4.36, 22%) as does the median (to $1.50, 10%). The median excess return rate falls to 0% because more than half (57%) of the subjects return within $0.01 of the 10% minimum mandated return rate. Thus, as represented by the discretionary returns above the mandated median rate, trustworthiness disappears for the typical trustee. That is, the rule drives out otherwise trustworthy behavior.

Under the 20% and 30% rules, the return rate distribution is forced up by the rule, but the dominant mode remains the rule. The excess median return rates are 7% and 6%, far below the 35% excess median return rate that arose under a 0% rule. Thus, voluntary discretionary reciprocity (trustworthiness) never returns to the levels observed under the 0% rule.

In summary, the immediate effect of a low minimum return rule is to decrease the mean and median return rates, reduce the level of reciprocity and increase the percentage of trustee's who return no more than the minimum required. As the minimum rule increases, the mean and median return rates rise mechanically as a result, but reciprocity remains low while the percentage of trustees returning no more than the rule remains high. Unambiguously, rules reduce trustworthiness. A Kruskal-Wallis Test (given in Table 3 Panel A) shows that these effects show up as significant differences in the distributions of return rates. This pattern is only consistent with the weak form of the substitution hypothesis giving our first result:

Result 1: Rules have significant effects on the distribution of return rates that are consistent only with the attraction hypothesis.

Figure 2 shows that under all rules, the distribution of return rates under each rule is higher conditional on the amount sent being larger than $5. Comparing Table 3 Panel A to Panel B shows that the mean, median and median excess return rates are uniformly lower when the investor sends less than $5. The percentage of trustee's who return the minimum is uniformly higher. While return rates are universally lower, rules still have a significant impact on the distribution of return rates in this subsample. Comparing Table 3 Panel A to Panel C shows that the mean, median and median excess return rates are uniformly larger when the investor sends more than $5. The percentage of trustee's who return the minimum is uniformly lower. However, in this subsample, rules do not appear to have a significant impact on the return rate distribution. This leads to our second result:

Result 2: Return rates and levels are affected by the amounts sent.

In both Table 3 Panel B and Panel C, the mean return rates drop between the 0% and 10% rules. Then, they rise as the rule increases. For investments of less than $5, a Kruskal-Wallis Test Statistic on return rates is 11.597 (3 d.o.f.) with a p-value < 0.01. In contrast, for investments of $5 or more, the statistic is 5.174 (3 d.o.f.) with a p-value of 0.1595. Thus, the impact of rules on overall return rates is highest for low investment levels, leading to our third result:

Result 3: Rules affect the overall return rates most significantly when low amounts are invested.

In both Table 3 Panel B and Panel C, rules decrease the median excess return rates that represent voluntary discretionary reciprocity or trustworthiness. For investments of less than $5, a Kruskal-Wallis Test Statistic on *excess* return rates is

5.060 (3 d.o.f.) with a p-value of 0.1675. In contrast, for investments of $5 or more, the statistic is 16.984 (3 d.o.f.) with a p-value < 0.01.[10] Thus, in contrast to the total return effect, the impact of rules reducing trustworthiness is highest when high amounts are invested.

Result 4: The trustworthiness reducing effect of rules is strongest for high amounts invested.

Combined, Results 3 and 4 tell a particularly interesting story. Rules have a large impact on overall return rates (Table 3, Panel A), but this shows up primarily when investors show little trust (Table 3, Panel B). Overall return rates drop significantly under the 10% rule and then rise as the rule increases (Result 3). But, this rise is primarily driven by the direct effect of the rules increasing the mandatory return rates. The discretionary return rate is low when investors invest less (i.e. <$5) regardless of the rule (Result 4). In contrast, overall return rates are high when investors invest $5 or more (Table 3 Panel C). The substitution effects seen between rules and trustworthiness (discretionary return rates) offset each other as rules are imposed and increased. However, even when investors invest more than $5, trustworthiness drops dramatically when rules are imposed and stays low as rules rise. We explore this in greater detail in the multivariate analysis in Section IV.

B Effect of Rules on Investment Levels

Table 4 Panel A gives the overall mean and median investor (net) profit rates, defined as the investor's payoff minus the endowment divided by the endowment. Under the 0% rule, the mean profit rate is near zero (mean=1.7%) and the median is zero. Under the 10% and 20% rules the mean and median are negative. Under the 30% rule typical

[10]In running this test we round the excess return rate to four decimal places, as the subjects were required to return amounts in penny increments. Allowing increased decimal places alters the number of ties, and thus reported statistics, but does not alter significance or interpretation.

profit rates achieve their highest value (mean=15.9% and median=6.3%) and return to positive levels. If the rule is intended to avoid investors' losses, it is ineffective unless the minimum return rate is sufficiently high.

Table 4 Panels B and C give the overall mean and median profit rates when the amount sent is less than $5 and greater than or equal to $5. For lower levels of investment in Panel B, rules seem to positively increase profitability, but at higher levels of investment the effect is non-monotonic. Overall rules initially dampen profit rates in R10 and R20 compared to R0, but profits return with R30.

Result 5: Investor net profit rates fall when a rule is first imposed, then rise as the rule rises.

What drives this U-shaped result? Is it the investors changing their investment pattern? Or do returns on investment change? To gain insight we decompose investor profit rate into two components: investment rate and return on investment (defined in Table 2). Investment levels create the opportunities for profit, while the returns on investment proxy for reciprocity indicating directly whether investments are justified. We examine each separately.

Figure 3 shows the distribution of investments under each rule. The two colors in the histogram bars represent investments with positive versus negative net returns on investment. Clearly, rules affect the investment distributions with the largest apparent impact arising under the 30% rule, where only 10% of the investment is at risk. Under a 0% minimum return rule, there is a fairly disperse distribution of investments with modes at $0, near $4 and $10. Most of the investments of more than $5 are profitable.

Table 4 Panel A gives the overall mean investment rate (55.4%), median investment rate (45.0%) and the percentage of observations where the investment was zero (14%) under a 0% minimum return rule. It also shows the mean (-12%) and median (0%) overall return on investment. The results here accord with prior research.

The median investor invests just under half of the endowment and approximately breaks even.

Under the 10% minimum return rule, the investment distribution remains disperse, but drops on average (mean=46.0%, median=38.8%). Returns on investment drop significantly (mean=-29%, median=-65%). With a lone exception, positive returns on investment only accrue to investors who invest $7 or more. Because the investment level falls, investors are responding to the rule but not according to the value-at-risk hypothesis. Under the 20% and 30% rules, the investment distributions come back up as do typical returns on investment. Only under the 30% rule do the mean and median returns on investment exceed those observed under the 0% rule.

In summary, the immediate effect of a low minimum return rule is to decrease investment levels and returns on investment. As the minimum rule increases, the mean and median investment levels rise as do the returns on investment. However, only for the highest rule do the overall returns on investment rise above the 0% rule. As with the return rates, we observe a “U-shaped” response function. A Kruskal-Wallis Test Statistic shows that the effect is significant. The shape is only consistent with the information hypothesis. This gives our next result:

Result 6: Rules have significant effects on the distribution of investment levels that are consistent only with the information hypothesis.

Because there is a one-to-one direct relationship between investment rates and efficiency, the same result holds for economic efficiency. The implication is that if the rule is intended to encourage investment and economic efficiency, it is ineffective until the minimum return rate is sufficiently high. Consistent with Gneezy and Rustichini

(2000a), and Falk and Kosfeld (2006), instituting a (weak) rule has the unintended consequence of dampening behavior the institution was promoting.

In Table 4, we report two measures of return on investment, for both all and only positive amounts sent. Regardless of the metric, we find initially that rules erode median returns on investment regardless of the amount invested. Increasing rules generally increase returns on investment. As shown in Panel A this effect is significant overall. However, the effects are not significant for high investment levels as shown in Panel C.

Result 7: Overall, the returns on investment are "U-shaped" with respect to rules. While there is a significant relationship for low investment levels, there is no significant relationship for high investment levels.

Notice that the mixture of investment levels changes with the rule. Trustees respond to higher investment levels with higher returns on investment (trustworthiness). There are relatively more high investment investors under a 30% rule than a 10% rule. In Panel B note that average returns on positive investments are negative and almost mirror the value-at-risk for low investment levels when rules other than zero are implemented. Consequently, if the rule is intended to protect investors, it is ineffective until the minimum return guaranteed is sufficiently high. The combined shift in investment levels and trustee responses across rules explains the significance overall. We explore this in more detail in the regression analysis next.

IV Regression Analysis

Our analysis so far suggests that outcomes are driven by three effects: (1) rules directly affect trustee returns by imposing a floor; (2) rules affect investment levels; (3) investment levels affect trustworthiness as measured by the discretionary returns given

by trustees. The first is a direct rule effect on returns. The second and third create an indirect effect. Of course, there may be interaction effects as well. These are illustrated in Figure 4. First, we will estimate the effect of rules on investment and trust, then estimate the combined effects of rules, investment and trust on return rates and trustworthiness.

A Investment and Trust Levels

Our prior analysis suggests a non-linear relationship between rules and investment levels and the distribution of investments are decidedly non-normal. Thus, we estimate the relationship between the rule and investment level using median regression of a quadratic function, giving the following estimated relationship:

$$\underset{Invested}{Amount} = \underset{13.27^{***}}{\$4.50} - \underset{-4.08^{***}}{\$21.67 Rule} + \underset{8.39^{***}}{\$133.33 Rule^2} + \varepsilon \qquad \begin{matrix} Obs. = 89 \\ Pseudo\ R^2 = 14.46\% \end{matrix} \tag{1}$$

where t-statistics are given below each coefficient, "***" denotes significance at the 99% level of confidence and *Rule* is measured as a decimal.

However, investment does not necessarily indicate a high degree of trust. High investment under a high minimum return rule may reflect a high level of assurance as reflected by the minimum return rate. We argue that trust based investments occur when one willingfully cedes resources with the expectation of being reciprocated by another (more often than not accompanied by expected profits), though it is known that other could opportunisitically profit. is deliberately making oneself vulnerable. This form of trust may be better proxied by the total value the investor puts at risk as a consequence of chosen investment level. Using value at risk as the dependent variable gives similar results:

$$\underset{Risk\ (VAR)}{Value\ At} = \underset{23.82^{***}}{\$4.50} - \underset{-6.31^{***}}{\$18.67 Rule} + \underset{8.85^{***}}{\$23.33 Rule^2} + \varepsilon \qquad \begin{matrix} Obs. = 89 \\ Pseudo\ R^2 = 23.75\% \end{matrix} \tag{2}$$

where t-statistics are given below each coefficient, "***" denotes significance at the 99% level of confidence and *Rule* is measured as a decimal. Of course, some of the rule effect here is mechanical. For any given level of investment, the VAR is lower with a higher rule.

In either case, the negative coefficient on *Rule* captures the decrease in investment level and trust between a 0% to 10% rule and the positive quadratic coefficient captures the curvature. Figure 5 shows the mean, median and estimated median (according to equation 1) investment levels along with the maximum value at risk for each rule (which directly reflects the percentage of the investment at risk). The predicted and actual median investment levels track closely. The immediate effect of imposing a rule is to decrease the investment level. As the rule increases, the percentage of the investment that is at risk falls and the investment levels rise in response. Figure 6 presents a similar graph for the total value that the investor places at risk. Again, predicted and actual levels track closely. Minimum return rules cap the total value that can be placed at risk, thereby decreasing the percentage of potential value at risk. The end result is an overall inverse relationship between the rule and value placed at risk.

B Return Rates and Trustworthiness

Prior analysis suggests that rules affect trustee behavior in a non-linear fashion. Using similar analysis as in estimation of equations (1) and (2), we estimate a median

regression assuming quadratic relationship for the percentage of funds returned by trustees (*Return Rate*) and rules:

$$\underset{Rate}{Return} = \underset{4.16^{***}}{33.33\%} - \underset{-2.01^{**}}{241.15\%}Rule + \underset{2.32^{**}}{872.43\%}Rule^2 + \varepsilon \qquad \begin{matrix} Obs. = 82 \\ Pseudo\ R^2 = 7.28\% \end{matrix} \tag{3}$$

where t-statistics are given below each coefficient, "**" denotes significance at the 95% level of confidence and *Rule* is measured as a decimal. The number of observations has fallen because *Return Rate* is not defined if the investment level is zero.

Similar to prior research, trustees return about a third of funds received without a rule (more properly, with a 0% minimum return rule). This makes the investor break even for the median trustee. The negative coefficient on *Rule* captures the decrease in return rates moving between 0% to 10% rules and the positive quadratic coefficient captures the curvature. While there is significant curvature, the estimated median return rate (according to equation 3) in Figure 7 does not match the data nearly as well as the estimated investment rate (from equation 1) in Figure 5. This suggests that there is significantly more to determining median return rates than the rule alone.

Indeed, we would not expect rules alone to explain behavior. We hypothesize that there is a complex direct, indirect, and interaction effect between rules, investment levels or trust, and returns. The simplest way to consider these effects in terms of estimation and interpretation of the result is to estimate the direct trust effects at the same time as the direct rule and interaction effects of Figure 4. We start with a median regression, measuring return rates as the percentage of funds received that are actually

returned by the trustee and using investment level as the independent variable.[11] This results in the following estimated relationship:

$$\begin{array}{l} Return \\ Rate \end{array} = \begin{array}{l} -5.56\% + \underset{-1.16}{} 5.56\% Investment \\ +106.34\% Rule - 13.97\% Interaction + \varepsilon \\ \qquad\qquad\qquad\qquad\quad \underset{3.91^{***}}{} \qquad\qquad\quad \underset{-4.13^{***}}{} \end{array} \qquad \begin{array}{c} Obs. = 82 \\ Pseudo\ R^2 = 28.60\% \end{array} \tag{4}$$

where t-statistics are given below each coefficient, "***" denotes significance at the 99% level of confidence, *Investment* is measured by the amount sent, *Rule* is measured as a decimal and *Interaction* is *Investment* times *Rule*.[12]

According to the Pseudo R^2, including investment and interaction terms in this regression results in much more explanatory power. The result shows a positive impact of rules on overall return rates. There is also an indirect effect through the significant, positive investment effect. But, that is not the entire story. According to the interaction term, rules significantly dampen the ability for investors to elicit higher returns through higher investment levels. Further, part of the increase in the overall return rate is driven by the mechanical effect of increasing lower bounds on returns. This does not address whether rules affect reciprocity or trustworthiness itself.

The negative interaction term in equation (4) indicates that higher minimum return rules dampen the ability of investors to elicit trustworthy behavior through higher investment levels. We conjecture that this arises because higher rules constrain the information space available capable of demonstrating to trustees whether investors are actually "trustors". Increasing minimum return rules reduces demonstrable trust by

[11]Of course, we could effectively estimate the same combined effects by first estimating the effect of rules on trust by estimating equation (1), then using the residual trust from that regression, linear and squared rules and combinations of interaction terms. However, this unnecessarily complicates the interpretation of the results.

[12]Note that the non-linear effects of rules on investment capture a non-linear indirect effect that can account for a "U-shaped" response function. Adding a second order term on rules along with the interaction between investment and the rule squared changes some point estimates, but it doesn't change signs, significance levels or interpretations of this or any of the subsequent regressions.

increasing the limits on downside risk that investors can demonstrate. To understand how much of the interaction effect is due to this reduction in value at risk caused by increasing minimum return rules, we re-run the regression using value at risk as the independent variable representing trust directly. As a result, we will label VAR as *Trust* in the regression. This results in the following estimated relationship:

$$\begin{array}{c} Return \\ Rate \end{array} = \begin{array}{c} -5.56\% + \underset{-1.17}{} 5.56\% \underset{8.13^{***}}{Trust} \\ +122.22\% \underset{3.92^{***}}{Rule} - 7.94\% \underset{-1.17}{Interaction} + \varepsilon \end{array} \qquad \begin{array}{c} Obs. = 82 \\ Pseudo\ R^2 = 27.90\% \end{array} \tag{5}$$

where t-statistics are given below each coefficient, "***" denotes significance at the 99% level of confidence, *Trust* is measured by the dollar Value at Risk (VAR) taken on by the investor (jointly determined by the investment level and the rule), *Rule* is measured as a decimal and *Interaction* is *Trust* times *Rule*. Notice that the interaction term ceases to be significant. According to the pseudo R^2, we have lost little explanatory power.

To understand how much of the direct rule effect is due to the mechanical increase in minimum mandated returns and separate out the effects on discretionary returns, we re-run the regression using the discretionary return rate as the dependent variable. This subtracts out the non-voluntary component of the return rate and focuses solely on the discretionary reciprocity or trustworthiness voluntarily displayed by the trustee (that is, the return rate given above the mandatory minimum). Estimation of this relationship gives:

$$\begin{array}{c} Discrentionary \\ Return\ Rate \\ (Trustworthiness) \end{array} = \begin{array}{c} -5.56\% + \underset{-1.17}{} 5.56\% \underset{8.13^{***}}{Trust} \\ +22.22\% \underset{1.08}{Rule} - 7.94\% \underset{-1.17}{Interaction} + \varepsilon \end{array} \qquad \begin{array}{c} Obs. = 82 \\ Pseudo\ R^2 = 29.53\% \end{array} \tag{6}$$

where t-statistics are given below each coefficient, *Trust* is measured by the value at risk (VAR), *Rule* is measured as a decimal and *Interaction* is *Trust* times *Rule*.[13]

Notice that the only thing that has changed is the coefficient on *Rule* and its significance. This is because we have subtracted out exactly one times the rule (see Table 1 for the exact definition) in each observation to arrive at the discretionary returns. All other variations in returns are purely discretionary. The remaining direct effect of the rule on trustworthiness is not significant. That is, the entire significance of the rules' direct effect is in the effect on higher mandated returns, not on the discretionary behavior of trustees. In the end, the only significant effect on trustworthiness is through the amount of trust displayed in the value at risk undertaken by the investors.

C Summary of Regression Results

Combined, these regressions tell an interesting story. Equation (1) shows that investment levels initially fall with 10% rule and, eventually, rise as the rule increases. However, this rise is not due to more trust. Equation (2) shows that trust, as displayed by the value the investors place at risk (VAR) declines with the rule. While the relative amount invested increases, the rules prevent an overall increase in trust displayed by VAR.

Equations (3) through (6) show that any positive impact of higher rules on return rates does not result from the impact of higher rules on trustworthiness. Instead, any potential positive effects come indirectly by promoting more investment or more trusting behavior from investors. However, when rules are implemented, investment and trust

[13] Nearly identical results hold if we scale the discretionary return when dividing by the amount available (i.e., dividing by one minus the rule).

both fall. This leads to lower return rates. As rules increase the minimum mandated return, investment rates rise and increasing rules increase return rates.

Despite evidence that they encourage higher relative investment in their extremes, higher rules inhibit the ability of investors to place themselves at risk and, hence, demonstrate trust by placing value at risk. Further, as equation (6) shows, the only significant factor driving trustworthy behavior (defined as returning more than the mandated minimum) is the amount of trust demonstrated. With the 0% minimum return rule, each additional dollar invested generates 5.56% in discretionary returns from the trustee (increasing return on investment by more than 16 percentage points). With a 30% rule, the amount each additional dollar invested generates in discretionary returns is cut to 1.37% (increasing return on investment by just over 4 percentage points).

In summary, with a 0% minimum return rule, investors break even on average. However, investors can generate high returns by displaying trust through high levels of value at risk. With a 0% rule, all of the reciprocity results from trustworthiness. Thus, trust elicits trustworthiness. As larger minimum return rules are implemented, return rates drop on average, then finally rise. The fall results from (1) less trust displayed by investors *and* (2) less trustworthy behavior by trustees *given* a level of trust. As the rule rises, return rates rise. However, this rise is driven by the higher mandated minimum returns. While investment rises back up, increasing minimum return rules inhibit displays of trust (as displayed by greater value at risk). As a result, trustworthy behavior does not return.

Figure 9 shows the overall relationship between rules, investment, trust and trustworthiness. Level of investment is measured by the percentage of the endowment

invested. Level of trust is measured by the amount investors put at risk (VAR). The levels of trustworthiness are measured as the discretionary return rate (i.e., the return rate minus the required return rate). Notice that in spite of skyrocketing investment as the rule rises to 30%, the levels of trust and trustworthiness remain low.

V Discussion and Conclusions

We study the interaction of exogenously imposed formal rules and behavior in games where economic efficiency and the distribution of resources depend on trust and reciprocity. Understanding this interaction is important. Social contracts commonly depend on trusting and reciprocating relationships. They enable resource exchange in small-scale subsistence societies and in modern economies these relationships determine outcomes in conjunction with formal rules and explicit contracting. Trust and trustworthiness remain fundamental components of efficient interactions.

Interactions that require trust involve a basic social dilemma where agents have to trade off self-interest and safety with the potential social benefits that arise from trusting behavior. For example, in the trust game, trust leads to net gains overall and creates possible profits for investors but also creates a risk of net loss if trustees do not reciprocate. On the other hand, failure to trust eliminates entirely the potential gain. Effectively, this is a situation of nothing ventured, nothing gained. Trustees must trade off personal gains from keeping money given to them with generating social reputational value by demonstrating trustworthiness through voluntarily returning funds to investors.

We argue that one incentive for investors offsetting the financial risk of investing in trustees is that they acquire information about the trustworthiness of exchange

partners in general.[14] Trustees demonstrate trustworthiness by voluntarily giving back some of their profits to investors. While minimum return rules reduce downside risk for investors, they may also limit the information generating potential of the exchange by constraining the amount that can be returned voluntarily.[15] While reduced downside risk should encourage investment, limited information potential may discourage it. Our results indicate both factors are important.

We argue that, by voluntarily returning funds, trustees invest in the general stock of social/informational capital at their own expense. Without minimum return rules, trustees have to decide how much to return based on their own expectations about the value of information and what should be done in context. Rules restrict their ability to show trustworthiness through voluntary discretionary reciprocity. Rules may also serve to calibrate expectations indicating what return rates are "good enough" and, as a result, behavior may effectively fall to the rule. For either or both of the above reasons, our results indicate that this is exactly the case. Without a rule, trustee return rates rise above self-interest. With a rule, they fall to near the minimum necessary.[16]

[14]While we study a single, anonymous interaction, we believe trust and reciprocity are rooted in a complex set of social interactions, experience, and evolved computational psychology that integrate information and apply our gathered knowledge. Every opportunity to show trust and trustworthiness builds the stock of reputational information that people can potentially capitalize on or computationally apply to contextualized interactions. In the trust game, investors are making choices that not only affect their immediate payoffs, but also allow them to learn about the reputations of the trustees that they may find valuable in their own right, in future trust and investment games, or in other potential interactions or applications.

[15]Consider a real world situation: credit scores. One way to establish a high credit score is to take out a loan and pay it back. A simple way to do this is to put a balance on a credit card and pay it off. This shows that you are a responsible borrower; you establish a reputation for repayment through your credit score and, in turn, affect future borrowing opportunities. We argue that, if a borrower repays a loan when there is no minimum payment, it would generate the most reputational information. Paying off the loan over time by making minimum payments mandated by a minimum payment rule inhibits reputation formation and, hence, may limit future opportunities that depend on credit ratings such as future loans, job opportunities, security clearances, etc.

[16]Alternatively, the rules may form a focal point that attracts both investor and trustee behavior. Among others, Cooper, DeJong, Forsythe and Ross (1990) and Mehta, Starmer and Sugden (1994) argue that

Modern economic and social systems present many challenges to building and maintaining trust relationships. In large systems, relationships become numerous, impersonal and onerous to monitor. It becomes difficult to socially sanction untrustworthy behavior (e.g. with ostracism, shunning, or negative gossip). Trust may be compromised (Khalil, 1994). Nevertheless, cross-national studies of trust indices suggest that populations that can rely upon well-developed social and legal mechanisms for limiting opportunism have higher levels of trust (Zak and Knack, 2001).

At the margin, do simple minimum return rules encourage or discourage trust and trustworthy behaviors? Overall, we find that by experimentally increasing rules' control over returned investments trust and trustworthiness does not increase. Trustworthiness measured by the median level of voluntary discretionary returns to investors, virtually disappears with rules. Further, while returns increase when the minimum required return increases, voluntary displays of trustworthiness never recover. The median investment level also falls when a minimum return rule is imposed. While investment levels rise under sufficiently high return rules, this does not represent a return to trusting behavior. It reflects the simple fact that investors have less at risk. Thus, rules limiting investors' downside-risk decrease both trust and trustworthy behavior. Only sufficiently restrictive rules increase investment in spite of the lost of trust.

---

focal points serve as equilibrium selection criteria in coordination games. Binmore, Swierzbinski and Proulx (1993) argue specifically that common experience can create focal points that determine equilibrium selection in bargaining games. Here, a 50/50 split of the cash is a simple focal point that may explain behavior in the absence of a return rule. When a rule is introduced, the rule may serve as a second possible focal point. As a result, trustees may return exactly the amount mandated by the rule. Fearing this, investors may not send any cash in the first place. In the context of our one-shot experiment, any reduction in investment resulting from the reduced information space or from the focal point is observationally equivalent. Future research should focus on how to distinguish between these two alternative motivations.

We study a relatively abstract and simple game, stripping away many of the complexities of social context. This allows a detailed understanding of a simple interaction. However, there are many analogs in more complex environments and some tantalizing field evidence on the interaction between rules and behavior that accord with our results. While it can create benefits, adding rules or enforcing them can be counter-productive, as the day care and worker monitoring examples show. Removing them can improve outcomes. For example, the "Monderman Principal" of traffic control (e.g., Clarke, 2006) shows that removing curbs, lane markings, traffic signs, etc., can improve traffic safety and reduce congestion. As Clarke (2006, p. 291) puts it: "The driver…becomes an integral part of the social and cultural context. As a result, behavior is controlled by everyday norms…" Our results are consistent with this from the opposite direction: here, rules replace the behavior trustees would otherwise use.

We believe the implications are clear: If a system based on trust is not broken or violations of trust are infrequent, it is wise to not tamper with it via rules imposing minimum standards of behavior. Let sleeping dogs lie. However, if a trust-based system is not functioning well in the absence of rules, it might be improved with the addition of rules, but only rules that sufficiently restrict behavior.

VI References

Axelrod, R. (1984). The Evolution of Cooperation. New York, New York: Basic Books.

Axelrod, R. and Hamilton, W.D. (1981). “The evolution of cooperation.” Science, 27(211): 1390–1396.

Bénabou, R. & Tirole, J., 2005. “Incentives and prosocial behavior.” The American Economic Review, 95(5): 1652–1678.

Berg, J., Dickhaut, J., and McCabe, K. (1995). “Trust, reciprocity and social history.” Games and Economic Behavior, 10(1):122–142.

Binmore, K., Swierzbinski, J., Hsu, S., and Proulx, C. (1993) “Focal points and bargaining.” International Journal of Game Theory, 22(4): 381-409.

Bowles, S. (2009). “When economic incentives backfire.” Harvard Business Review, 87(3): 22-23.

Camerer, C. (2003). Behavioral Game Theory: Experiments in Strategic Interaction. Princeton, New Jersey: Princeton University Press.

Clarke, E. (2006). “Shared space: The alternative approach to calming traffic.” Traffic Engineering & Control, 47(8): 290-292.

Cooper, R.W., DeJong, D.V., Forsythe, R., and Ross, T.W. (1990) “Selection criteria in coordination games: Some experimental results.” The American Economic Review, 80(1): 218-233.

Coricelli, G., McCabe, K., and Smith, V. (2000). “Theory-of mind mechanism in personal exchange.” In G. Hatano, N.Okada, and H. Tanabe (eds.). Affective Minds. Amsterdam: Elsevier, 249–259.

Cosmides, L. and Tooby, J. (1989). “Evolutionary psychology and the generation of culture, Part II. Case study: A computational theory of social exchange.” Ethology and Sociobiology, 10(1-3): 51–97.

Cosmides, L. and Tooby, J. (1992). Cognitive adaptations for social exchange. In J. Barkow, L. Cosmides, and J. Tooby (Eds.), The Adapted Mind: Evolutionary Psychology and the Generation of Culture. New York: Oxford University Press.

Davis, J. (1992). Exchange. Minneapolis, MN: University of Minnesota Press.

Dickinson, D. and Villeval, M.C. (2008). “Does monitoring decrease work effort? The complementarity between agency and crowding-out theories.” Games and Economic Behavior, 63(1):56–76.

Falk, A. and Kosfeld, M. (2006). “The hidden costs of control.” The American Economic Review, 96(5): 1611–1630.

Fehr, E. and Rockenbach, B. (2003). “Detrimental effects of sanctions on human altruism.” Nature, 422(March): 137–140.

Fischbacher, U. (2007). “z-tree: Zurich toolbox for ready-made economic experiments.” Experimental Economics, 10(2): 171–178.

Frey, B. S. (1993). “Does monitoring increase work effort? The rivalry with trust and loyalty.” Economic Inquiry, 31(4): 663–670.

Fuster, A. and Meier, S. (2010). “Another hidden cost of incentives: The detrimental effect on norm enforcement.” Management Science, 56(1): 57–70.

Gneezy, U. and Rustichini, A. (2000). “A fine is a price.” The Journal of Legal Studies, 29(1): 1-17.

Griffith, T. L. (1993). “Monitoring and performance: A comparison of computer and supervisor monitoring.” Journal of Applied Social Psychology, 23(7): 549–572.

Gurven, M. (2004). “To give and to give not: The behavioral ecology of human food transfers.” Behavioral and Brain Sciences, 27(4): 543–583.

Hawkes, K., O’Connell, J., Jones, N., Oftedal, O., and Blumenschine, R. (1991). “Hunting income patterns among the Hadza: Big game, common goods, foraging goals and the evolution of the human diet.” Philosophical Transactions: Biological Sciences, 1270(Nov): 243–251.

Isaac, G. (1978). “The food-sharing behavior of protohuman hominids.” Scientific American, 238(4): 90–108.

Kaplan, H., Hill, K., Cadelina, R., Hayden, B., Hyndman, D., Preston, R., Smith, E., Stuart, D., and Yesner, D. (1985). “Food sharing among Ache foragers: Tests of explanatory hypotheses.” Current Anthropology, 26(2): 223–246.

Khalil, E. (1994). Elgar Companion to Institutional and Evolutionary Economics. Chapter: Trust. Hants, England: Edward Elgar.

Kurzban, R. and Houser, D. (2005). “Experiments investigating cooperative types in humans: A complement to evolutionary theory and simulations.” Proceedings of the National Academy of Sciences of the United States of America, 102(5): 1803–1807.

Lovejoy, C. (1981). “The origin of man.” Science, 26(Jan): 341–350.

McCabe, K. and Smith, V. (2000). “A comparison of naive and sophisticated subject behavior with game theoretic predictions.” Proceedings of the National Academy of Sciences of the United States of America, 97(7): 3777–3781.

McCabe, K. and Smith, V. (2001). “Goodwill accounting in economic exchange.” In Gigerenzer, G., and Selten, R., (eds.). Bounded Rationality: The Adaptive Toolbox. Cambridge Massachusetts: MIT Press.

McCabe, K. and Smith, V. (2003). “A Cognitive theory of reciprocal exchange.” In Ostrom, E., and Walker, J., (eds.). Trust and Reciprocity. New York: Russell Sage Foundation.

Mehta, J., Starmer, C. and Sugden R. (1994) “Focal points in pure coordination games: An experimental investigation,” Theory and Decision, 36(2): 163-185.

Mellstrom, C. and Johannesson, M. (2008). “Crowding out in blood donation: Was Titmuss right?” Journal of the European Economic Association, 6(4): 845–863.

Ostrom, E. and Walker, J. (2003). Trust and Reciprocity: Interdisciplinary Lessons from Experimental Research. New York: Russell Sage Foundation Publications.

Ostrom, E., 2000, “Collective action and the evolution of social norms,” The Journal of Economic Perspectives, 14(3): 137-158.

Pillutla, M.M., Malhotra, D., Murnighan, J.K. 2003. “Attributions of trust and the calculus of reciprocity.” Journal of Experimental Social Psychology, 39(5): 448-455.

Sahlins, M. D. (1972). Stone Age Economics. New York, NY: Aldine Publishing Co.

Titmuss, R. M., Oakley, A., and Ashton, J. (1997). The Gift Relationship: From Human Blood to Social Policy. New York, NY: New Press.

Trivers, R.L. (1971). “The evolution of reciprocal altruism.” Quarterly Review of Biology, 46(1): 35–57.

Zak, P.J. and Knack, S. (2001). “Trust and growth.” The Economic Journal, 111(470): 295– 321.

Zucker, L. G. 1986. “Institutional theories of organization.” Annual Review of Sociology. 13: 443-464.

VII Tables and Figures

Table 1: Summary of Treatments

Treatment	Description of Treatment	Number of Subjects
R0	Trustee returns any portion of amount received	42
R10	Trustee must return at least 10% of amount received	48
R20	Trustee must return at least 20% of amount received	40
R30	Trustee must return at least 30% of amount received	48

Table 2: Definitions of Investment, Return and Profit Rates

Term	Definition
Return Rate (Reciprocity)	(Amount Returned)/(Amount Received) if Amount Received > 0 and not defined otherwise
Discretionary Return Rate (Trustworthiness)	(Amount Returned)/(Amount Sent) - Rule
Investment Rate	(Amount Sent)/Endowment
Value at Risk (Trust)	(Amount Sent)x(1-Rule)
Return on Investment	(Amount Returned – Amount Sent)/(Amount Sent) if Amount Sent > 0 and 0 otherwise
Investor Net Profit Rate	(Investor Payoff – Endowment)/Endowment = (Amount Returned – Amount Sent)/Endowment
Investor Percentage of Payoffs	(Investor Payoff)/(Investor Payoff + Trustee Payoff)

Table 3: Amounts Returned and Return Rates by Rule and Amount Sent

Panel A: Amount Sent > $0

Rule	% of Obs.	% Returned within $0.01 of Minimum	Return Levels			Return Rates		
			Mean	Median	Median Excess	Mean	Median	Median Excess
0%	86%	17%	$6.65	$7.00	$7.00	29%	35%	35%
10%	88%	57%	$4.36	$1.50	$0.01	22%	10%	0%
20%	95%	42%	$5.23	$3.30	$0.55	30%	28%	7%
30%	100%	38%	$9.42	$10.00	$1.46	38%	36%	6%
Kruskal-Wallis Test Statistic on Equality of Populations of Return Rates (3 d.o.f.):							10.898**	
						P-value:	0.0123	

Panel B: Amount sent greater than $0 and less than $5

0%	38%	25%	$1.59	$1.25	$1.25	15%	12%	12%
10%	46%	81%	$1.09	$1.05	$0.00	15%	10%	0%
20%	40%	50%	$1.64	$1.53	$0.15	29%	24%	4%
30%	21%	80%	$2.36	$2.70	$0.00	31%	30%	0%
Kruskal-Wallis Test Statistic on Equality of Populations of Return Rates (3 d.o.f.):							11.597**	
						P-value:	0.0089	

Panel C: Amount sent greater than or equal to $5

0%	48%	10%	$10.70	$11.50	$11.50	40%	45%	45%
10%	42%	30%	$7.95	$7.50	$5.55	31%	37%	27%
20%	55%	36%	$7.85	$8.00	$3.00	31%	30%	10%
30%	79%	26%	$11.29	$12.00	$3.00	40%	40%	10%
Kruskal-Wallis Test Statistic on Equality of Populations of Return Rates (3 d.o.f.):							5.174	
						P-value:	0.1595	

**Significant at the 95% level of confidence.

Table 4: Amounts Invested and Returns on Investment by Rule

Panel A: All Data

Rule	No. of Obs.	Fraction that Invest $0	Investor Profit Rate		Investment Rate		Return on Investment: Overall		Return on Investment: Positive Investments		Investor Percentage of Payoff	
			Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
0%	21	14%	1.7%	0.0%	55.4%	45.0%	-12.0%	0.0%	-14.0%	5.0%	54.5%	50.0%
10%	24	13%	-7.9%	-7.0%	46.0%	38.8%	-28.6%	-64.9%	-32.7%	-69.9%	55.0%	50.0%
20%	20	5%	-3.3%	-7.8%	53.0%	50.0%	-8.6%	-15.1%	-9.1%	-17.6%	52.9%	50.0%
30%	24	0%	15.9%	6.3%	78.3%	100.0%	14.7%	9.3%	14.7%	9.3%	47.5%	47.7%
Kruskal-Wallis Test Statistic			9.063**		10.615**		9.539**		10.920**		1.241	
P-value			0.0285		0.014		0.0229		0.0122		0.7432	

Panel B: Amount sent less than $5

Rule	No. of Obs.	Fraction that Invest $0	Investor Profit Rate		Investment Rate		Return on Investment: Overall		Return on Investment: Positive Investments		Investor Percentage of Payoff	
			Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
0%	11	27%	-11.8%	-10.0%	23.4%	30.0%	-40.8%	-50.0%	-56.1%	-62.7%	65.8%	60.0%
10%	14	21%	-11.8%	-7.0%	20.4%	17.5%	-43.6%	-69.9%	-55.4%	-70.0%	67.6%	71.9%
20%	9	11%	-4.9%	-7.5%	19.5%	20.0%	-12.2%	-17.6%	-13.8%	-28.8%	71.0%	65.7%
30%	5	0%	-1.9%	-2.0%	25.5%	30.0%	-8.0%	-10.0%	-8.0%	-10.0%	66.1%	62.5%
Kruskal-Wallis Test Statistic			2.117		0.900		4.184		11.885**		0.341	
P-value			0.5484		0.8255		0.2423		0.0078		0.9521	

Panel C: Amount sent greater than or equal to $5

Rule	No. of Obs.	Fraction that Invest $0	Investor Profit Rate		Investment Rate		Return on Investment: Overall		Return on Investment: Positive Investments		Investor Percentage of Payoff	
			Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
0%	10	N/A	16.5%	27.5%	90.5%	100.0%	19.6%	35.9%	19.6%	35.9%	42.0%	48.2%
10%	10	N/A	-2.5%	10.0%	82.0%	95.0%	-7.7%	10.0%	-7.7%	10.0%	37.3%	42.7%
20%	11	N/A	-2.0%	-10.0%	80.5%	90.0%	-5.7%	10.0%	-5.7%	10.0%	38.1%	40.0%
30%	19	N/A	20.6%	20.0%	92.2%	100.0%	20.7%	20.0%	20.7%	20.0%	42.6%	46.2%
Kruskal-Wallis Test Statistic			5.529		4.107		5.174		5.174		2.352	
P-value			0.1369		0.2502		0.1595		0.1595		0.5027	

** Significant at the 95% level of confidence.

Figure 1: Mean and Median Sent and Returned by Treatment

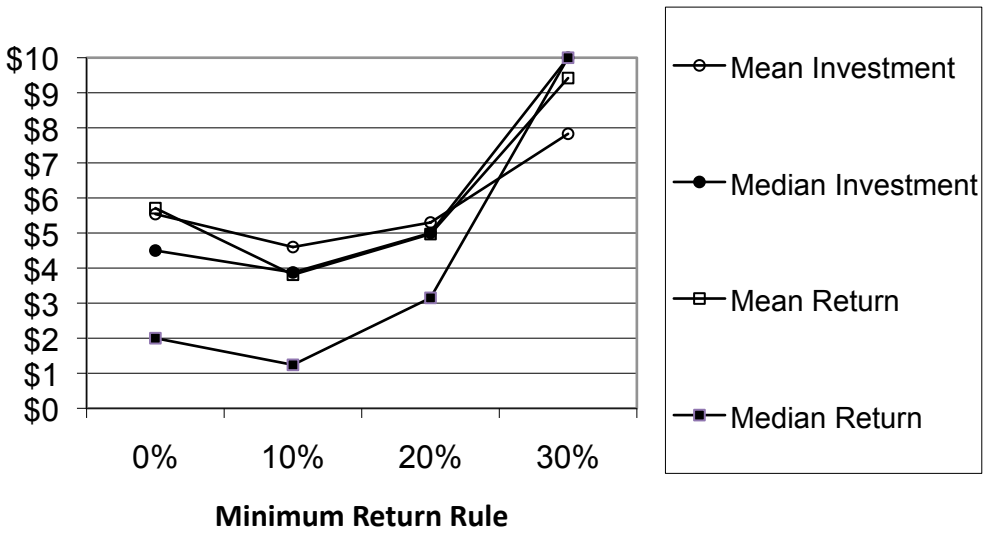
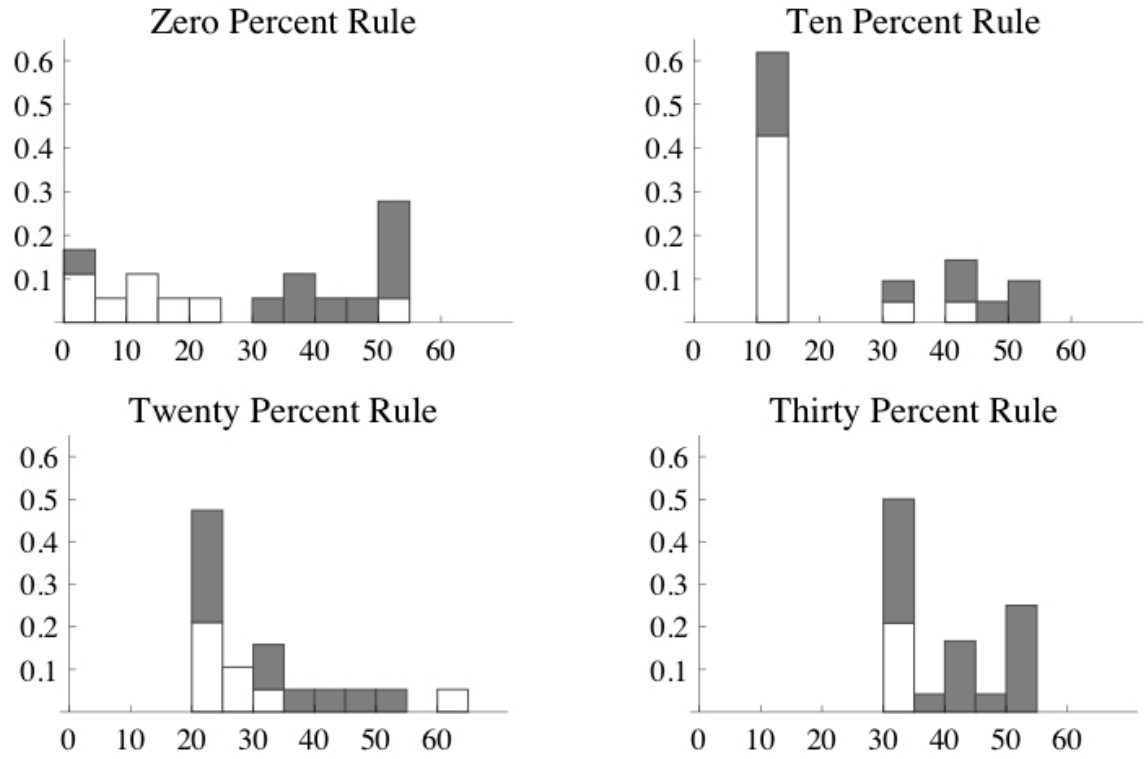
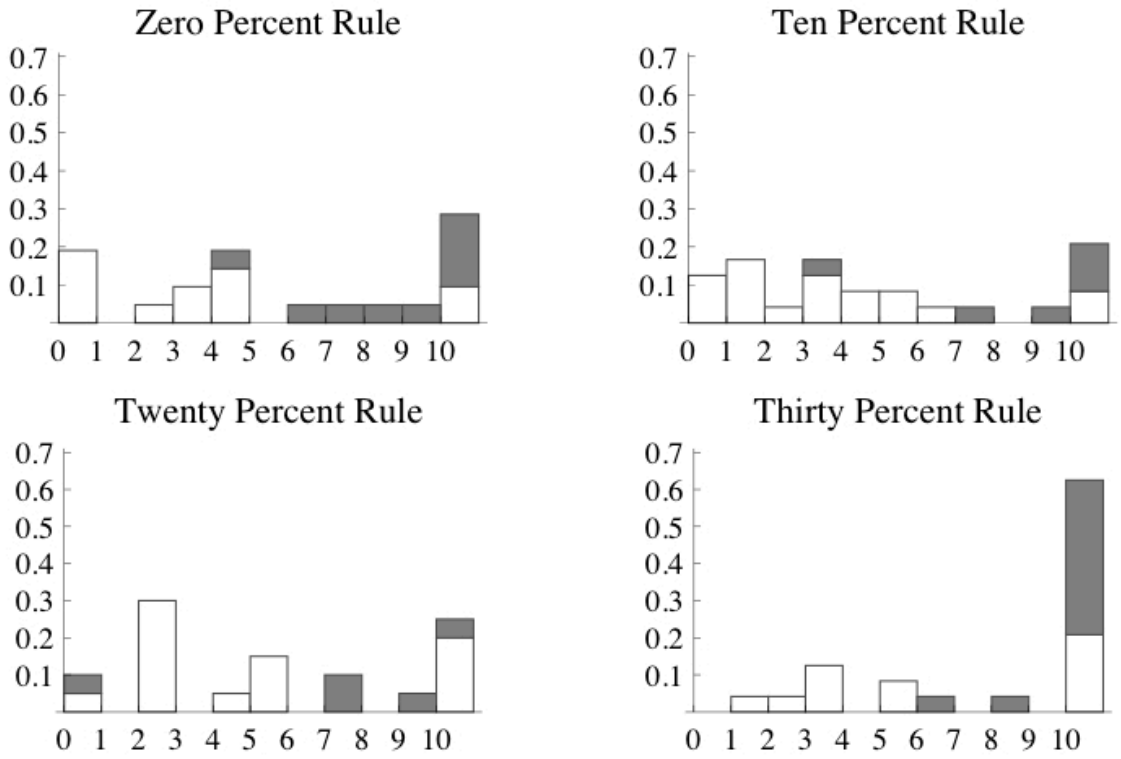


Figure 2: Histograms of Return Rate as Fraction of Amount Received by Treatment



Axis reports the percentage returned by the trustee given investment. Light bars represent investments of less than $5, darker bars greater than $5.

Figure 3: Histograms of Investments by Rule



Axis reports the dollar amount invested. Light bars represent investments leading to zero or negative return, while darker bars represent positive return.

Figure 4: Direct and Indirect Effects of Rules

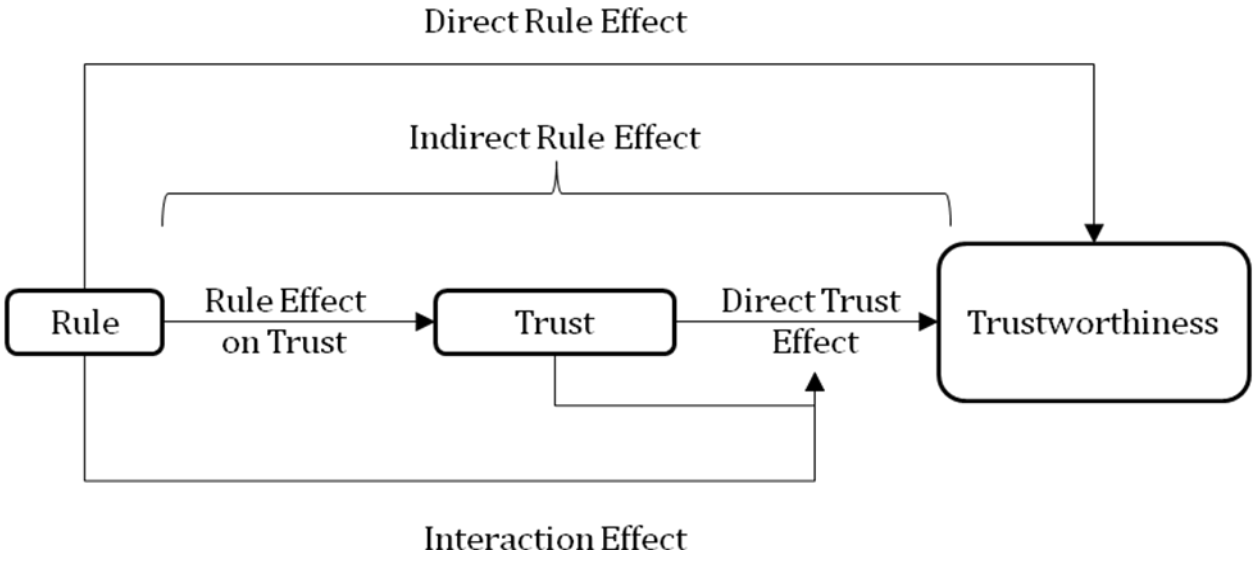


Figure 5: Mean, Median and Predicted Median Investment Levels by Rule (According to Equation 1)

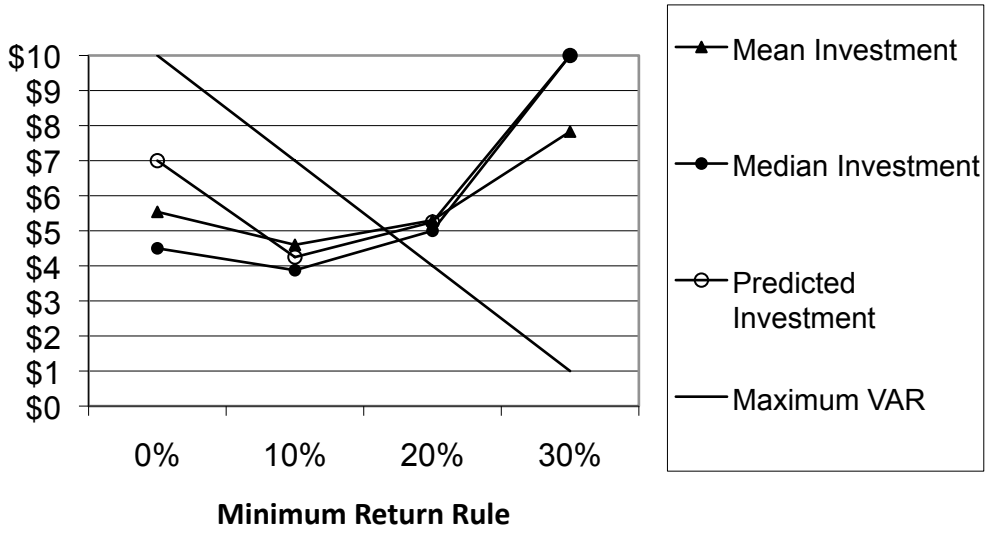


Figure 6: Mean, Median and Predicted Trust (as measured by Value at Risk) Levels by Rule (According to Equation 2)

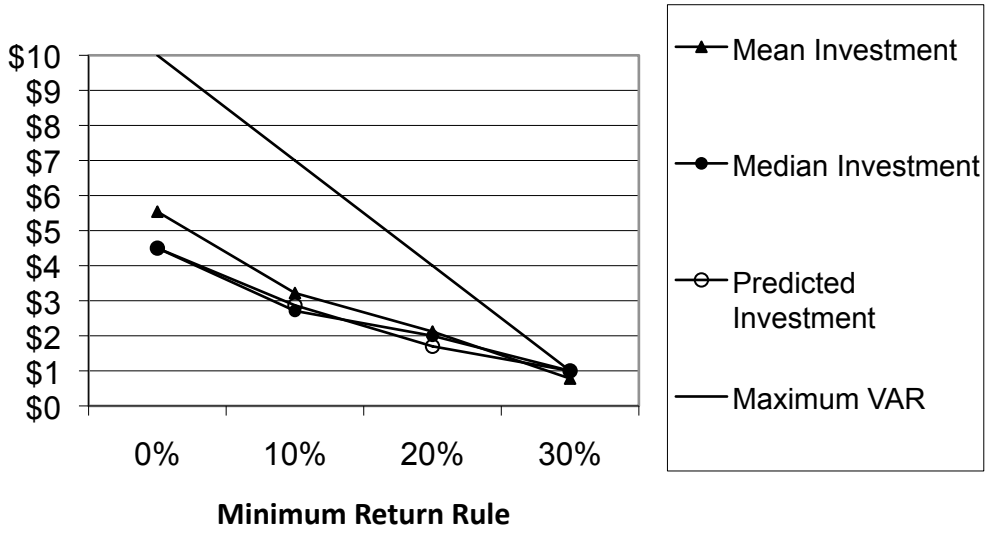


Figure 7: Mean, Median and Predicted Median Return Rates by Rule (According to Equation 3)

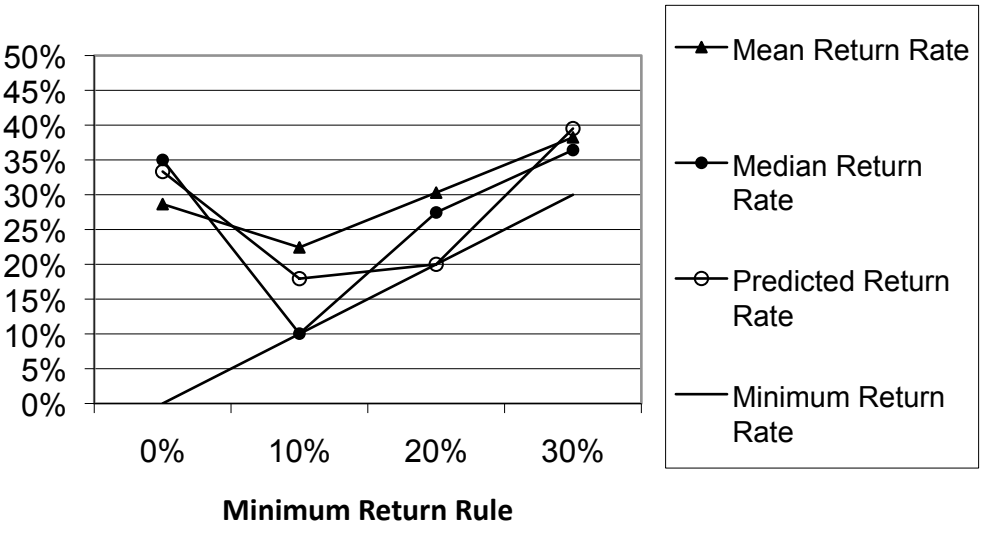


Figure 8: Mean, Median and Predicted Median Discretionary Return Rates (Trustworthiness) by Rule (According to Equation 6)

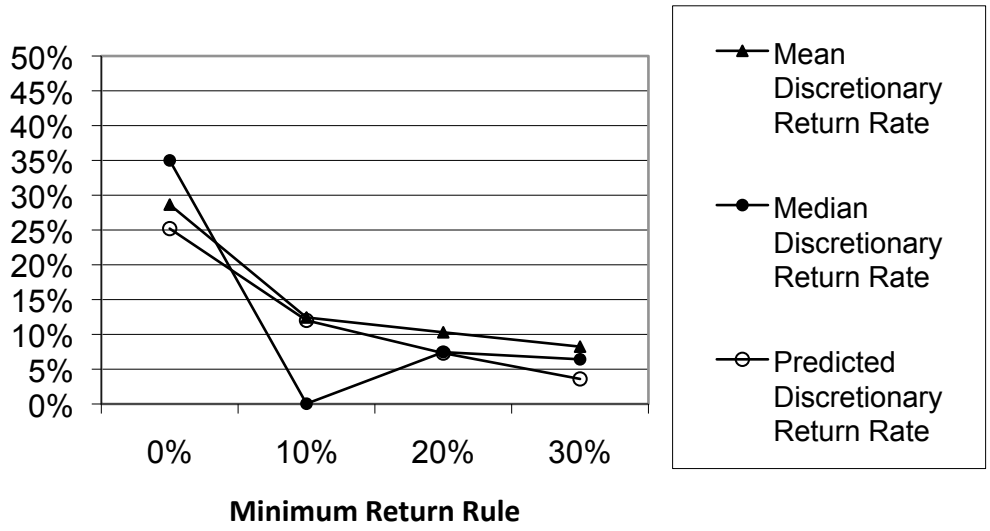
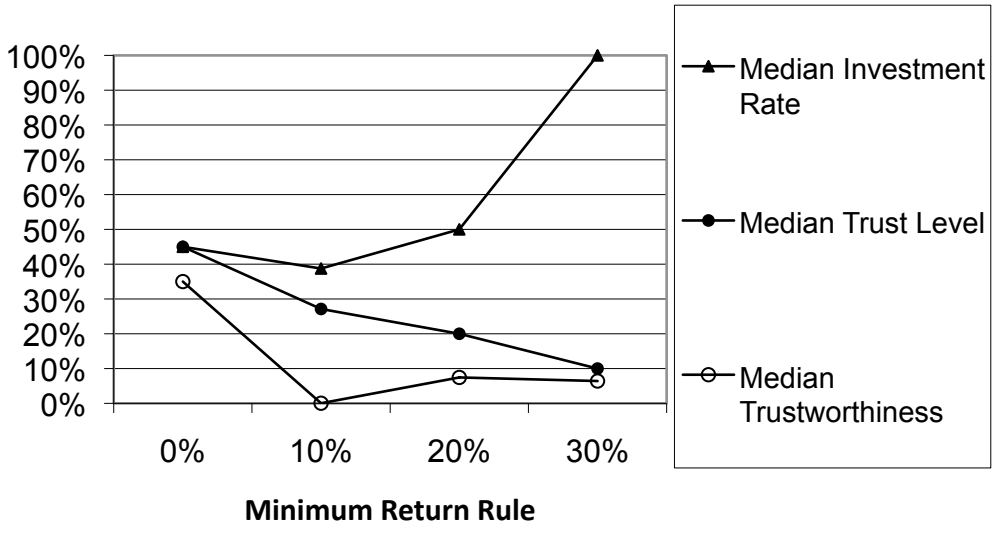


Figure 9: Median Investment Rates, Values at Risk (Trust) and Discretionary Return Rates (Trustworthiness) by Rule



VIII Appendix: Instructions for the R20 Treatment

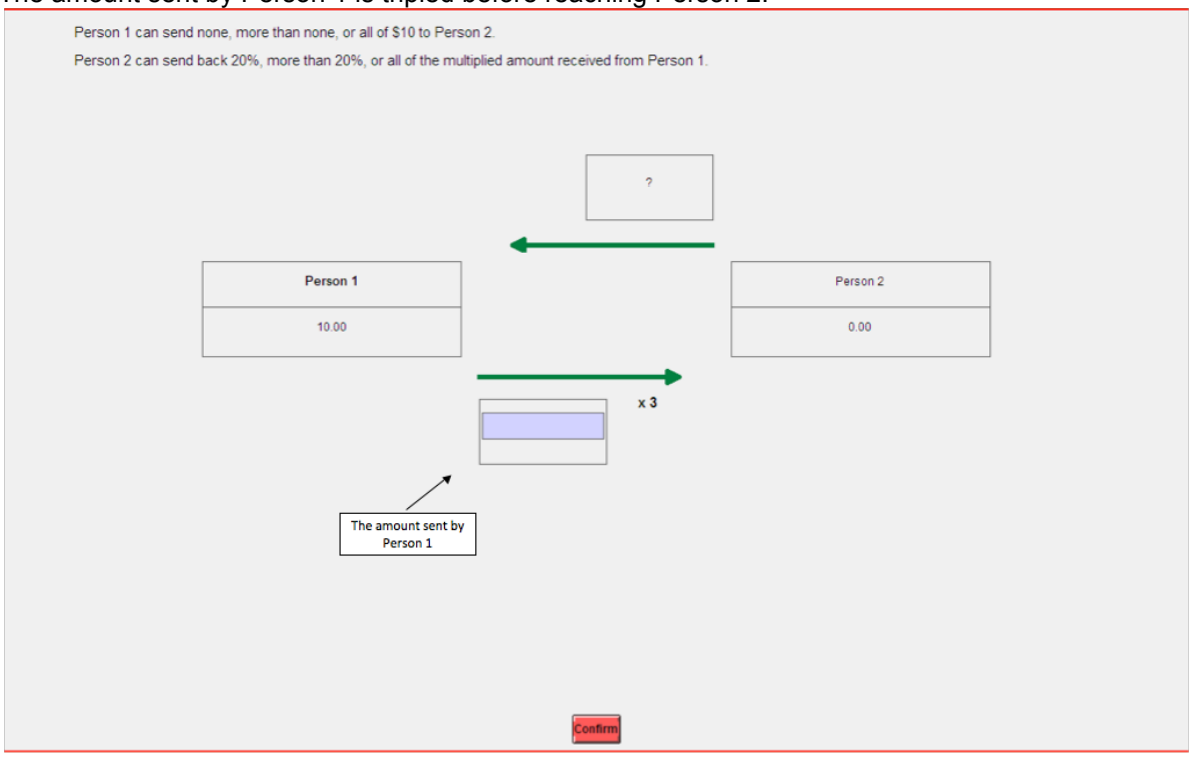
INSTRUCTIONS
This is an experiment in the economics of decision-making. Various research agencies have provided funds for this research. The currency used in the experiment is experimental dollars, and they will be converted to U.S. Dollars at a rate of 1 experimental dollar to 1 dollar. At the end of the experiment your earnings will be paid to you in private and in cash. It is very important that you remain silent and do not look at other people's work. If you have any questions, or need assistance of any kind, please raise your hand and an experimenter will come to you. If you talk, laugh, exclaim out loud, etc… you will be asked to leave and you will not be paid. We expect, and appreciate, you adhering to these policies.

THE EXPERIMENT
The participants in today's experiment will be randomly assigned into two-person groups. In addition to the group assignment each participant will also be randomly assigned to a specific **type** in the group, designated as **Person 1** or **Person 2**. You and the other participant in your group will make choices that will determine your payoffs. The experiment consists of two decision stages.

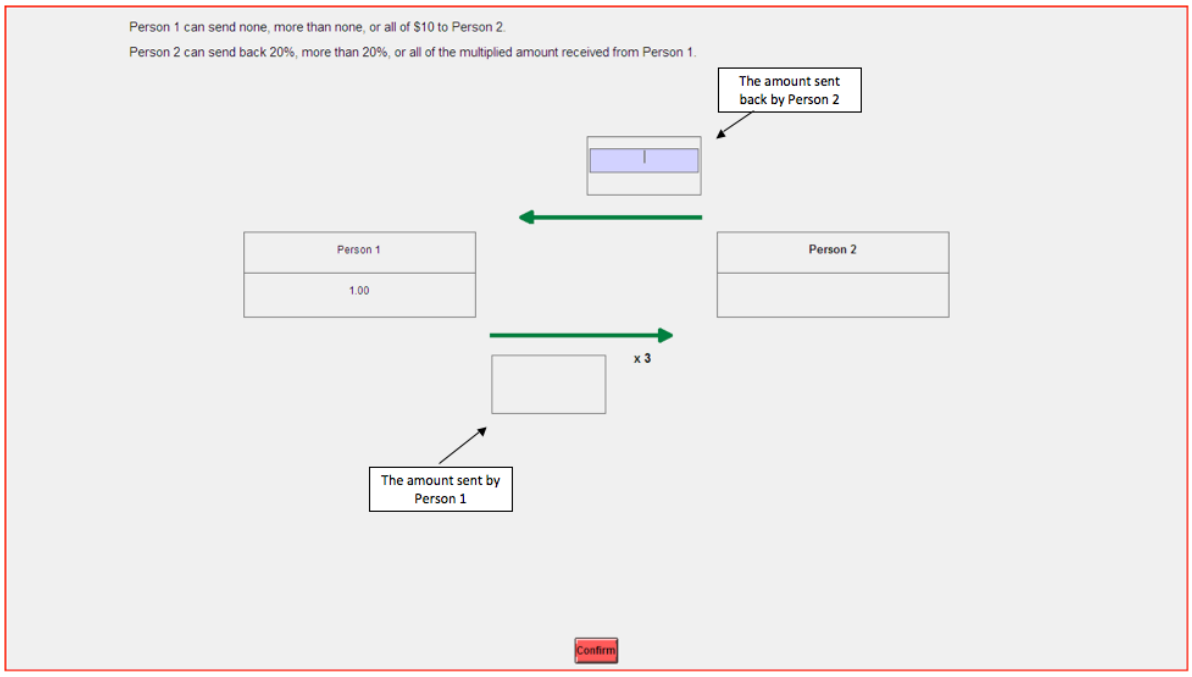
In stage 1, Person 1 receives $10 and then decides how many dollars to send to Person 2. Person 1 can send none, more than none, or all of the $10 to Person 2. The amount sent by Person 1 is tripled before reaching Person 2. In stage 2, Person 2 decides how many of the dollars they received to send back to Person 1. Person 2 can send back 20%, more than 20%, or all of the amount received back to Person 1. At that point the experiment is over.

Next we describe in details the decisions made by both persons in each stage of the experiment.

Stage 1: Person 1 receives $10 and then decides how many dollars to send to Person 2. Person 1 can send none, more than none, or all of the $10. Person 1 enters the amount sent to Person 2 in the box labeled “The amount sent by Person 1” below. Person 1 keeps any amount that is not sent to Person 2. The amount sent by Person 1 is tripled before reaching Person 2.



Stage 2: After learning the amount sent by Person 1, Person 2 decides how many dollars to send back to Person 1**.** Person 2 can send back 20%, more than 20%, or all of the amount in Person 2's account at that time. Person 2 enters the amount sent back to Person 1 in the box labeled “The amount sent back by Person 2” below. The amount sent back by Person 2 is NOT multiplied. Person 2 keeps any amount that is not sent back to Person 1.



Finally, at the end of the Stage 2 the total earnings are reported to each person.

- Person 1's earnings will equal $10 less the amount sent to Person 2 plus the amount sent back by Person 2.
- Person 2's earning will equal three times the amount sent by Person 1 less the amount sent back to Person 1.

Please record the decisions and your earnings on your record sheet under the appropriate heading.

SUMMARY

The computer will assign you and one other participant to a two-person group, consisting of **Person 1** and **Person 2**. In stage 1, Person 1 receives $10 and then decides how many dollars to send to Person 2. Person 1 can send none, more than none, or all of the $10. The amount sent by Person 1 is tripled. In stage 2, Person 2 decides how many dollars to send back to Person 1. Person 2 can send back 20%, more than 20%, or all of the amount in Person 2's account at that time. At the end of Stage 2 the total earnings are reported to each person. This experiment is now over and your earnings will be part of the total you will be paid.

NUMERICAL EXAMPLES

We list hypothetical amounts below at $0.25 intervals to illustrate how the amount sent by Person 1 is tripled, and how much Person 2 has to send back.

If Person 1 sends	Then Person 2 Receives	Person 2 can send back between
0.00	0.00	0.00 - 0.00
0.25	0.75	0.15 - 0.75
0.50	1.50	0.30 - 1.50
0.75	2.25	0.45 - 2.25
1.00	3.00	0.60 - 3.00
1.25	3.75	0.75 - 3.75
1.50	4.50	0.90 - 4.50
1.75	5.25	1.05 - 5.25
2.00	6.00	1.20 - 6.00
2.25	6.75	1.35 - 6.75
2.50	7.50	1.50 - 7.50
2.75	8.25	1.65 - 8.25
3.00	9.00	1.80 - 9.00
3.25	9.75	1.95 - 9.75
3.50	10.50	2.10 - 10.50
3.75	11.25	2.25 - 11.25
4.00	12.00	2.40 - 12.00
4.25	12.75	2.55 - 12.75
4.50	13.50	2.70 - 13.50
4.75	14.25	2.85 - 14.25
5.00	15.00	3.00 - 15.00
5.25	15.75	3.15 - 15.75
5.50	16.50	3.30 - 16.50
5.75	17.25	3.45 - 17.25
6.00	18.00	3.60 - 18.00
6.25	18.75	3.75 - 18.75
6.50	19.50	3.90 - 19.50
6.75	20.25	4.05 - 20.25
7.00	21.00	4.20 - 21.00
7.25	21.75	4.35 - 21.75
7.50	22.50	4.50 - 22.50
7.75	23.25	4.65 - 23.25
8.00	24.00	4.80 - 24.00
8.25	24.75	4.95 - 24.75
8.50	25.50	5.10 - 25.50
8.75	26.25	5.25 - 26.25
9.00	27.00	5.40 - 27.00
9.25	27.75	5.55 - 27.75
9.50	28.50	5.70 - 28.50
9.75	29.25	5.85 - 29.25
10.00	30.00	6.00 - 30.00

QUIZ

Before starting, we want you to answer some questions regarding the experiment to be sure you understand what will follow. After five minutes an experimenter will return to privately review your answers. Afterwards you will participate in the experiment only one time.

1. True or false: the amount sent by Person 1 is tripled before reaching Person 2's account.
2. True or false: the amount sent back by Person 2 is tripled before reaching Person 1's account.
3. What is the largest amount Person 1 can send to Person 2?
4. What is the smallest amount Person 1 can send back to Person 1?
5. If Person 1 sent $4.20 to Person 2, what is largest amount Person 2 can send back to Person 1?
6. If Person 1 sent $9.00 to Person 2, what is smallest amount Person 2 can send back to Person 1?
7. True or false: If Person 1 sends something to Person 2, then Person 2 has to send something back to Person 1.
8. True or false: you will participate in the experiment one time.

Economic Science Institute Working Papers

2011

11-05 Corgnet, B., Hernan-Gonzalez, R., and Rassenti, S. Real Effort, Real Leisure and Real-time Supervision: Incentives and Peer Pressure in Virtual Organizations.

11-04 Corgnet, B. and Hernán-González R. Don't Ask Me If You Will Not Listen: The Dilemma of Participative Decision Making.

11-03 Rietz, T., Sheremeta, R., Shields, T., Smith, V. Transparency, Efficiency and the Distribution of Economic Welfare in Pass-Through Investment Trust Games.

11-02 Corgnet, B., Kujal, P. and Porter, D. The Effect of Reliability, Content and Timing of Public Announcements on Asset Trading Behavior.

11-01 Corgnet, B., Kujal, P. and Porter, D. Reaction to Public Information in Markets: How Much Does Ambiguity Matter?

2010

10-22 Mago, S., Sheremeta, R., and Yates, A. Best-of-Three Contests: Experimental Evidence.

10-21 Kimbrough, E. and Sheremeta, R. Make Him an Offer He Can't Refuse: Avoiding Conflicts Through Side Payments.

10-20 Savikhim, A. and Sheremeta, R. Visibility of Contributions and Cost of Inflation: An Experiment on Public Goods.

10-19 Sheremeta, R. and Shields, T. Do Investors Trust or Simply Gamble?

10-18 Deck, C. and Sheremeta, R. Fight or Flight? Defending Against Sequential Attacks in the Game of Siege.

10-17 Deck, C., Lin, S. and Porter, D. Affecting Policy by Manipulating Prediction Markets: Experimental Evidence.

10-16 Deck, C. and Kimbrough, E. Can Markets Save Lives? An Experimental Investigation of a Market for Organ Donations.

10-15 Deck, C., Lee, J. and Reyes, J. Personality and the Consistency of Risk Taking Behavior: Experimental Evidence.

10-14 Deck, C. and Nikiforakis, N. Perfect and Imperfect Real-Time Monitoring in a Minimum-Effort Game.

10-13 Deck, C. and Gu, J. Price Increasing Competition? Experimental Evidence.

10-12 Kovenock, D., Roberson, B.,and Sheremeta, R. The Attack and Defense of Weakest-Link Networks.

10-11 Wilson, B., Jaworski, T., Schurter, K. and Smyth, A. An Experimental Economic History of Whalers' Rules of Capture.

10-10 DeScioli, P. and Wilson, B. Mine and Thine: The Territorial Foundations of Human Property.

10-09 Cason, T., Masters, W. and Sheremeta, R. Entry into Winner-Take-All and Proportional-Prize Contests: An Experimental Study.

10-08 Savikhin, A. and Sheremeta, R. Simultaneous Decision-Making in Competitive and Cooperative Environments.

10-07 Chowdhury, S. and Sheremeta, R. A generalized Tullock contest.

10-06 Chowdhury, S. and Sheremeta, R. The Equivalence of Contests.

10-05 Shields, T. Do Analysts Tell the Truth? Do Shareholders Listen? An Experimental Study of Analysts' Forecasts and Shareholder Reaction.

10-04 Lin, S. and Rassenti, S. Are Under- and Over-reaction the Same Matter? A Price Inertia based Account.

10-03 Lin, S. Gradual Information Diffusion and Asset Price Momentum.

10-02 Gjerstad, S. and Smith, V. Household expenditure cycles and economic cycles, 1920 – 2010.

10-01 Dickhaut, J., Lin, S., Porter, D. and Smith, V. Durability, Re-trading and Market Performance.

2009

09-11 Hazlett, T., Porter, D., Smith, V. Radio Spectrum and the Disruptive Clarity OF Ronald Coase.

09-10 Sheremeta, R. Expenditures and Information Disclosure in Two-Stage Political Contests.

09-09 Sheremeta, R. and Zhang, J. Can Groups Solve the Problem of Over-Bidding in Contests?

09-08 Sheremeta, R. and Zhang, J. Multi-Level Trust Game with "Insider" Communication.

09-07 Price, C. and Sheremeta, R. Endowment Effects in Contests.

09-06 Cason, T., Savikhin, A. and Sheremeta, R. Cooperation Spillovers in Coordination Games.

09-05 Sheremeta, R. Contest Design: An Experimental Investigation.

09-04 Sheremeta, R. Experimental Comparison of Multi-Stage and One-Stage Contests.

09-03 Smith, A., Skarbek, D., and Wilson, B. Anarchy, Groups, and Conflict: An Experiment on the Emergence of Protective Associations.

09-02 Jaworski, T. and Wilson, B. Go West Young Man: Self-selection and Endogenous Property Rights.

09-01 Gjerstad, S. Housing Market Price Tier Movements in an Expansion and Collapse.

2008

08-10 Dickhaut, J., Houser, D., Aimone, J., Tila, D. and Johnson, C. High Stakes Behavior with Low Payoffs: Inducing Preferences with Holt-Laury Gambles.

08-09 Stecher, J., Shields, T. and Dickhaut, J. Generating Ambiguity in the Laboratory.

08-08 Stecher, J., Lunawat, R., Pronin, K. and Dickhaut, J. Decision Making and Trade without Probabilities.

08-07 Dickhaut, J., Lungu, O., Smith, V., Xin, B. and Rustichini, A. A Neuronal Mechanism of Choice.

08-06 Anctil, R., Dickhaut, J., Johnson, K., and Kanodia, C. Does Information Transparency Decrease Coordination Failure?

08-05 Tila, D. and Porter, D. Group Prediction in Information Markets With and Without Trading Information and Price Manipulation Incentives.

08-04 Caginalp, G., Hao, L., Porter, D. and Smith, V. Asset Market Reactions to News: An Experimental Study.

08-03 Thomas, C. and Wilson, B. Horizontal Product Differentiation in Auctions and Multilateral Negotiations.

08-02 Oprea, R., Wilson, B. and Zillante, A. War of Attrition: Evidence from a Laboratory Experiment on Market Exit.

08-01 Oprea, R., Porter, D., Hibbert, C., Hanson, R. and Tila, D. Can Manipulators Mislead Prediction Market Observers?