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Abstract

Many economic interactions rely on trust, which is sometimes violated. The fallout from business fraud and other malfeasance shows serious economic consequences of trust violations. Simple rules mandating minimum standards are attractive because they prevent the most egregious trust violations. However, such rules may undermine more trusting and reciprocal (trustworthy) behavior that otherwise would have occurred and, thus, lead to worse outcomes. We use an experimental trust game to test the efficacy of exogenously imposed minimum standard rules. Rules fail to increase trust and reciprocity, leading to lower economic welfare. Although sufficiently restrictive rules restore welfare, trust and reciprocity never return. The pattern of results is consistent with participants who are not only concerned with payoffs, but also use the game to learn about trust and trustworthiness of others.

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Relationships based on trust are critical because most social and economic situations are not explicitly contracted with behavior regulated by enforceable rules (Davis, 1992; Glaeser et al., 2000). Without enforceable rules, people rely on trust. Even when rules exist, people often rely on trust to facilitate interactions because it is cheaper than active monitoring and enforcement: investors trust that companies act in the investors' best interests, lenders trust borrowers to repay loans, depositors trust bankers to behave responsibly, etc.

Trust is built by (i) taking a risk and willfully ceding resources or control to another (i.e., trusting) and (ii) having the other avoid purely self-interested opportunism to voluntarily reward or reciprocate the trust (Rousseau et al., 1998). The ability to build trust depends on the amount of risk and opportunism available. Failure to reciprocate violates trust. When this occurs, minimum standards are often implemented. Minimum standards are used in many areas. For example, the USDA imposes a minimum standard for meat inspection, corporations must meet minimum standards of disclosure to investors, etc. While states universally expect safe driving behavior and expect drivers to drive without distractions, they only rule out specific distracting behaviors such as hand-held cell-phone use and texting. Such rules may eliminate the most egregious trust violations, but they also restrict the ability to demonstrate trust and reciprocity and, thus, hinder trust development.

Minimum standards rule out the worst abuses of trust relationships at lower costs than fully mandated interactions (both from compliance and enforcement standpoints). However, when used, such mechanisms may backfire (Bowles and Reyes, 2012), perhaps leading people to conclude something akin to "the minimum must be good enough; otherwise it wouldn't be the minimum." This can reduce reciprocity and inhibit trust development.

Consider the trust game of Berg et al. (1995) where an investor can invest any portion of a \$10 endowment by sending it to a trustee.[1] The amount sent triples. The trustee can choose (but is not obligated) to reciprocate by returning any portion of the tripled investment to the investor and the game ends. Non-cooperative game theory predicts zero investment

[1] See Ostrom and Walker (2003) for a review.

because a self-interested trustee will keep all funds received. However, interactions in the trust game rarely end this way. Typically, investors "trust" by sending some funds and most trustees reciprocate by returning positive amounts, often enough to make the original investment profitable (Camerer, 2003). Given enough reciprocation, a self-interested investor with accurate expectations may rationally invest , creating a trust-based, mutually-beneficial exchange relationship (Kurzban and Houser, 2005). On the other hand, many trustees return nothing, violating the trust relationship.

To study the trade-offs that rules have on trust development and economic efficiency, we modify the basic trust game by exogenously imposing minimum standards on trustee behavior: trustees must return at least 0%, 10%, 20% or 30% of the tripled investment amount received (depending on the treatment). Our purpose is to determine whether minimum standard rules provide best responses to trust failures, or should be avoided. In the language of Kahan (2000), we ask whether relatively "gentle nudges" (e.g., a 10% rule) or "hard shoves" (e.g., a 30% rule) are effective against undesirable trust violations. This question remains relevant today as the manipulation of people's "choice architecture" by financial and social planners becomes increasingly popular (Thaler and Sunstein, 2008; Münscher et al., 2015).

Overall, we find rules inhibit trust formation. Reciprocity, measured by median discretionary returns to investors, nearly disappears with rules. Further, the 10% rule reduces reciprocity the most. This runs counter to arguments that "[undesirable] norms stick when lawmakers try to change them with 'hard shoves' but yield when lawmakers apply 'gentle nudges'" (Kahan, 2000, p. 608). In our context, the opposite holds. The most gentle rule (10%) actually increases untrustworthy behavior the most. It also reduces trust along with its associated investment and economic efficiency. Only the "hardest shove" (the 30% rule) improves outcomes for investors and increases economic efficiency. Further, while more restrictive rules can force the return rate up, voluntary reciprocity never recovers. While investment levels rise under sufficiently high return rules, trust never returns.

Responses to different rules is a unique contribution of our research. Rules restrict the available action spaces. Thus, changing rules can change both the possible payoffs for participants and what participants can learn about each other based on their actions. This allows us to evaluate what kinds of preferences explain behavior in trust games. Specifically, we can differentiate between two types of interrelated preference models: (1) models that depend only on an agent's preferences over the distribution of payoffs across agents and (2) models where an agent's preferences also depend on perceptions of others learned through the interaction. We find that gentle rules backfire (reducing trust reciprocity and economic welfare) and that increasingly restrictive rules have differential effects on trust, reciprocity, investment and economic efficiency. Investment and efficiency rise with sufficiently restrictive rules, but trust and reciprocity never recover. This pattern is only consistent with participants using their actions to both (1) affect each other's payoffs and (2) learn about each other's type and/or intentions (i.e., their willingness to trust and reciprocate).

1 Prior Research

Research in several areas suggests that institutionalized structures may actually decrease the very behavior they are designed to encourage (Bowles and Reyes, 2012). Paying people to give blood results in less blood contributions than alternative approaches offering no financial incentives (Titmuss et al., 1997). When a fine is imposed against late pick-ups, more parents (not fewer) pick up children late from day care (Gneezy and Rustichini, 2000). Laboratory studies show that imposing monitoring or close supervision by authority actually decreases work effort (Dickinson and Villeval, 2008).

Three studies relate closely to ours. In the first, a dictator game is modified to study effects of minimum performance requirements set endogenously by a principle for an agent (Falk and Kosfeld, 2006). Endogenous requirements create a confound: setting a minimum signals mistrust. In a control treatment with an exogenous minimum, production levels are similar to those observed when principals choose not to regulate agents. This indicates that the principal's regulation of the agent, not the rule itself, impacts investment behavior. In any case, this game does not allow a study of trust: the principal cannot demonstrate trust or initiate a trust-based exchange because the principle takes no action. In the second study, a modified trust game allows investors to specify a "desired return" when sending money to trustees and, in one treatment, set fines for trustees who reciprocate less than desired (Fehr and Rockenbach, 2003). Return rates fall when fines are set. However, endogenously setting fines signals intentions and distrust. Fines also create incentives by punishing poor returns. In the last study, the setting is modified to remove the endogenous fine-setting confound by stochastically imposing fines with a known exogenous probability (Houser et al., 2008). Only the trustee knows whether a fine is imposed. This allows separation of the signaling and incentive effects of fines. Incentives, but not signaled intentions, affect returns. However, there remains a confound: investors signal expectations by endogenously setting the desired return. Further, the design makes the study of trust and its interaction with rules impossible because investors do not know how their actions affect trustee payoffs ex ante.[2]

The general idea that rules may have adverse consequences, is similar to our thesis. However, there are important differences. (1) Our study strips away as much institutional and contextual information as possible (e.g., we avoid using the words "rule," "investor" and "trustee") so as to cleanly focus on regulations that mandate minimum standards. (2) By setting known rules exogenously, we remove the confounds of rules, mistrust and expectations. The investor cannot signal expectations or trust by any means other than investing, the same as in the original trust game of Berg et al. (1995). Rules *do not* signal expectations and mistrust. This contrasts with Fehr and Rockenbach (2003) and the main treatments of Falk and Kosfeld (2006), where both expectations and mistrust are signaled simultaneously. Further, rules in our study *do not* signal expectations alone, which contrasts with Houser et al. (2008). (3) Because there is a known meaningful relationship between

[2]In Houser et al. (2008)'s own words: "We lose control over what investors believe regarding trustees earnings and the way that might affect their own earnings. Consequently, we draw no inferences regarding motivations for investor decisions."

trust, reciprocity and payoffs, we can study trust (investor behavior) directly. Again, this differs from Houser et al. (2008). (4) Only our study investigates the interaction between the restrictiveness of rules and trust formation. Thus, in contrast to other studies, we study a pure rule effect and study how trust and reciprocity change in response to different rules.

2 Experiment and Hypotheses

2.1 Description of the Experiment

We conducted the experiment at Chapman University's Economic Science Institute (ESI). We recruited participants, who had not participated in trust-game experiments at the ESI, from a standard subject pool consisting primarily of undergraduate students. Subjects were randomly assigned into one of four treatments. Participants interacted with each other anonymously over a local computer network. We programmed and conducted the experiment using z-Tree (Fischbacher, 2007). Each participant, visually isolated from others, could only see their own computer screen. Sessions lasted about 35 minutes. First, an experimenter read the instructions aloud while each participant followed along with their own printed copy of the instructions. The instructions (available in the Appendix) explained the experimental procedures and payoffs. After reviewing instructions, participants were given five minutes to answer several questions to ensure they understood the instructions. After participants completed the quiz, the experimenter distributed a printed copy of the correct quiz answers and privately answered any questions regarding the experimental procedures.

Each participant was assigned a role, labeled "Person 1" for the investor and "Person 2" for the trustee. The participants interacted only once in the trust game. Each participant was paid $7 for participation and any additional payoffs from the trust game. On average participants earned $9.75 beyond their participation payment.

We used neutral language and did not use words such as "rules." Moreover, to avoid any confounding effects, we used the following language in the baseline treatment for the trustee: “Person 2 can send back none, more than none, or all of the amount in Person 2’s account.” In the other three treatments we used: “Person 2 can send back 10% [20%, 30%], more than 10% [20%, 30%], or all of the amount in Person 2’s account.” In these three treatments the trustee had to send back at least 10%, 20% or 30% of the tripled investment amount received. A button was placed on the trustees’ screen that, if selected, would trigger a pop-up window displaying the minimal amount in dollars that could be returned.

Subjects were randomly assigned into a single treatment. In each of the four treatments the investor was endowed with $10 and could send any portion of it to the trustee, which was tripled on the way. The trustee then decided how much to send back contingent upon the minimum return rule (either 0%, 10%, 20% or 30%). In the 0% rule baseline treatment the trustee could send back none of the amount received.

In the standard trust game, investors put all invested funds at risk because the trustee is under no obligation to return anything. For the same reason, any funds returned by the trustee represent (voluntary) reciprocity. Minimum return rules imply that not all investment is at risk and not all returns are voluntary. Consequently, we need some terminology to distinguish investment from the amount that is at risk and to distinguish returns mandated by the rule from voluntary returns. Table 1 defines our terminology for the trust game with minimum return rules. The return rate determines whether the investor profits from investing and is the usual measure of reciprocity in trust games. Here, because the rule mandates some return, we define the discretionary return rate (return rate minus the mandated rule) as reciprocity. It represents the returns trustees do not have to give to investors. The investment rate is the same as in normal trust games. However, we argue that trust is only displayed by the amount of this investment that is at risk represented by value at risk (VAR). Here, the trustee must return the rule percentage times the tripled amount invested. Thus, the value at risk is the amount invested times (1-(3 x rule)). This essentially shows how much the rule attenuates downside risk for the investors per dollar invested and, as a result, attenuates the ability to demonstrate trust. The rest of the variables are standard definitions.

Table 1: Definitions of Terminology

Term	:=	Definition
Return Rate	:=	$\begin{cases} \dfrac{\text{Amount Returned}}{\text{Amount Received}} & \text{if Amount Received} > 0 \\ \text{Not Defined} & \text{if Amount Received} = 0 \end{cases}$
Discretionary Return Rate (Reciprocity)	:=	$\begin{cases} \dfrac{\text{Amount Returned}}{\text{Amount Received}} - \text{Rule} & \text{if Amount Received} > 0 \\ \text{Not Defined} & \text{if Amount Received} = 0 \end{cases}$
Investment Rate	:=	$\dfrac{\text{Amount Sent}}{\text{Endowment}}$
Value at Risk or VAR (Trust)	:=	$(\text{Amount Sent}) \times (1 - (3 \times \text{Rule}))$
Return on Investment or ROI	:=	$\begin{cases} \dfrac{\text{Amount Returned} - \text{Amount Sent}}{\text{Amount Sent}} & \text{if Amount Sent} > 0 \\ \text{Not Defined} & \text{if Amount Sent} = 0 \end{cases}$
Investor Net Profit Rate	:=	$\dfrac{\text{Amount Returned} - \text{Amount Sent}}{\text{Endowment}}$

2.2 Hypothesis Development

Minimum return rules limit investor's losses by bounding the distribution of return rates from below. We hypothesize that this will affect the distribution of investment levels. Further, by restricting the action space and the value at risk to investors, rules may affect the ability of investors and trustees to both (1) affect each other's payoffs and (2) signal intentions. If the investors and trustees are influenced by each other's payoffs, then rules can affect the distribution of returns and investment levels in other ways. To show how interdependent preferences give rise to our hypotheses, we borrow a simple utility function from Sobel (2005). A decision maker i who faces agent j has the utility function:

$$U_i(x_i, x_j) = u(x_i) + \lambda_{i,j}(.) \times v(x_j) \tag{1}$$

where x_i is the decision maker's payoff, x_j is the other agent's payoff, $u(.)$ is the utility of the decision maker's own payoff, $v(.)$ is the utility to the decision maker resulting from agent j's payoff, and $\lambda_{i,j}(.)$ is a weighting function. The weighting function may depend on payoffs, attributes of the decision maker and/or perceived attributes of agent j. A positive value of the weighting function reflects altruism while a negative value reflects spite. We show how models examining equity and reciprocity concerns advocate specific functional forms of $\lambda_{i,j}(.)$ and what effect minimum return rules would have on predicted behavior given the specific form of this utility function.

According to classical economic theory $\lambda_{i,j}(.) \equiv 0$, as the decision maker only cares about her own payoffs. In this case, the rules we impose should make no difference. Income maximizing trustees would not return more than the rule imposes. For the rules we use, even the highest value of the minimum mandated return would result in losses for investors and, therefore, investors would not invest. However, in prior research, there is typically a distribution of voluntary trustee return rates (Ostrom and Walker, 2003) inconsistent with $\lambda_i(.) \equiv 0$.

Several authors have proposed specific functional forms for equation (1). For example, Fehr and Schmidt (1999) model $\lambda_{i,j}(.)$ as independent of agent types (i.e., no types) and dependent on the sign of $x_i - x_j$, the relative differences in payoffs. This results in a decision maker who cares not only about her own payoff, but wants to reduce the inequity in the relationship.

Alternatively, $\lambda_{i,j}(.)$ could depend on the decision maker's type as it does in Bolton and Ockenfels (2000). Their model has similar motivation, but proposes a different functional form for equation (1):

$$U_i(x_i, x_j) = x_i - \alpha_i \left(\frac{x_i}{x_i + x_j} - 1/2 \right)^2 \tag{2}$$

where α_i is the decision maker's type and is independent of agent j. Heterogeneous decision makers place different weight on inequity and therefore on agent j's payoff. Both Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) lead to preferences that are increasing (not necessarily linearly) in x_i, but (weakly) decreasing in inequity.

Bolton and Ockenfels (2000, p. 187) suggest a distribution of types, here denoted by $\alpha_i \in [0, \bar{\alpha}]$. The lowest trustee type chooses a return rate of zero. The highest trustee type chooses to return enough so that investor and trustee payoffs are equal. In our treatments, where the investor ($i = 1$) is endowed with \$10, the trustee ($i = 2$) with \$0, and the multiplier is 3, the amount returned (s_2) that generates equity of payoffs is a function of the amount invested (s_1), $\bar{s_2} = max\{0, 2s_1 - 5\}$. So the highest trustee type returns $s_2 > 0$ when the investor invests at least \$2.5. Interior values of α_i can recreate any distributional preference, including equity, in the feasible space of the baseline treatment.

When decision makers are concerned with distributions (e.g. inequality, efficiency, fairness), but not intentions (e.g., Fehr and Kirchsteiger, 1994; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), the weighting functions are either constants (possibly differing across individuals), depend on the sign of $x_i - x_j$, or depend upon the decision maker's type. In these cases, rules will have no effect on the weighting functions.

If rules do not affect the weighting or value functions, the only effect of rules would be to mechanically truncate the return distribution. This leads to our first hypothesis, which is what people seem to have in mind when they propose minimum standard rules:

Truncation Hypothesis: *Imposing a minimum return rule bounds the lower tail of the possible return rate distribution and leaves higher return rates otherwise unaffected. Investors will select the optimal investment by trading off potential returns with value at risk (VAR), which is capped by the the minimum return rule that truncates the lower tale of the return rate distribution. Thus, investment is weakly increasing with the rule.*

Truncation alone should increase mean return rates as rules are imposed and increase. However, up to the point that the rule surpasses the median return rate, the median should remain unchanged. Because rules restrict the available discretionary return space, discretionary return rates will fall with increasing rules simply because less of the return is discretionary. With the rest of the distribution unchanged, rules increase mean returns to investors while reducing variance and downside risk. This will increase investment levels uniformly with increasingly restrictive rules.[3] The idea that decreasing value at risk increases investment is similar to observed behavior in threshold public goods experiments.[4] If investors can, they may choose to keep VAR unaltered until the rule is sufficiently restrictive that it mechanically reduces VAR. This investment behavior would result in VAR remaining constant for less restrictive rules and falling for more restrictive rules.

The Truncation Hypothesis argues that minimum standards improve welfare by eliminating the most egregious trust violations and encouraging trust. However, minimum return rules may also shift the rest of the return distribution, imposing unintended effects on investment. A minimum return rule might reinforce pro-social behavior and reciprocity if it suggests that selfish behavior is unacceptable or undesirable (Kahan, 2000). We also note that, in threshold public goods games, higher thresholds elicit higher contribution levels (see Croson and Marks 2000). Higher thresholds may be reinforcing contribution levels by communicating higher contributions are expected. Here, if investment increases due to the rule, then return rates may also increase. This might occur through normative social influence (e.g., experimenter demand) effects and/or conformity (e.g., social proof) effects. This is most easily illustrated by equation (2), where in the context of our game, the highest trustee type returns $s_2 = (2s_1 - 5)$ for investments $s_1 > \$2.5$, yielding a return rate of $(2s_1 - 5)/s_1$, which is strictly increasing in investment s_1. This leads to a competing hypothesis:

Reinforcement Hypothesis: *When a larger minimum return rule is implemented, it will increase non-truncated return rates. Investment and VAR will both respond to minimum return rules. Investment will increase with the rule as the investor's ability to put value at risk becomes increasingly limited.*

The combined effect is that rules strictly increase return rates. Mean return rates should rise on average beyond that implied by pure truncation effects. Median return rates should

[3] If investors avoid downside risks in particular (as postulated by Menezes et al. (1980) and Kimball (1990), etc.), eliminating the lower tail would create a strong incentive to invest more.

[4] See, for example, the meta-analysis by Croson and Marks (2000), who show that refunding contributions if a threshold is not met lowers risk for participants and increases contributions.

also rise.[5] For less restrictive rules, discretionary return rates may rise, but will fall for sufficiently restrictive rules because restrictive rules leave less room for discretionary returns (i.e., display an "inverted U-shape"). Investment will increase at a faster rate than predicted by the *Truncation Hypothesis*. VAR will rise with less restrictive rules, then fall with sufficiently restrictive rules (i.e., display an "inverted U-shape"). Overall, the *Reinforcement Hypothesis* predicts that return rates will increase beyond the mechanical lower-bound truncation effect of the rule.

In contrast, Bowles and Reyes (2012) suggests that incentives, including those provided by rules, may backfire, causing trustees to abandon their own rationale for returning cash, substituting the rule instead.[6] By reducing the opportunity for investors to take on risk and for trustees to make discretionary returns, minimum return rules restrict the information content about an investor's intention to demonstrate trust and a trustee's intentions to demonstrate reciprocity. This requires that decision makers consider both the payoffs and intentions of the other agent (e.g., Rabin, 1993; Dufwenberg and Kirchsteiger, 2004; Segal and Sobel, 2007). In this case, not only does the decision maker's weighting function depend upon their own type, it also depends upon beliefs about the other agent's type. For example, Levine (1998) models the decision maker's utility as:

$$U_i(x_i, x_j) = u(x_i) + \frac{\alpha_i + \beta_i \alpha_j}{1 + \beta_i} v(x_j) \tag{3}$$

where α_i is the decision maker's type, α_j is the other's type, and β_i is the weight the decision maker places on the other's type. Here, the weighting parameter is a weighted average of the decision maker's type and the other agent's type. Overall, the decision maker wants to be kind (or kinder) to a kind agent. When a decision maker is uncertain about the other's type, she draws inferences by observing the other's behavior.

When concern for the other's payoffs is governed by only the decision maker's type (or

[5] This allows us to distinguish between the *Truncation Hypothesis* and the *Reinforcement Hypothesis*.

[6] Rules may act as focal points (Schelling, 1960), disrupt implicit relational contracts (Bernheim and Whinston, 1998), or restrict the ability to provide information cues about trust (Bénabou and Tirole, 2006).

by the sign of $x_i - x_j$, or a constant), then increasing minimum return rates can lead to higher investment and possibly higher reciprocity as predicted by the *Truncation* and the *Reinforcement* hypotheses. In contrast, if the decision maker incorporates beliefs about the other's type, then minimum return rules can have the opposite effect.

By restricting the strategy space (i.e., the discretionary amount returned), rules can interfere with inferences about the types of others. For example, the trustee observes the amount invested. For a given rule, trustees might believe that maximum investments are sent by investors whose type is above some benchmark. However, as rules decrease investment risk, this benchmark may change, creating greater pooling of investors with sufficiently high types. This weakly decreases the trustee's expectation of the investor's type, which decreases the weight the trustee places on the investor's payoff in equation (3). Likewise, as rules increase, the minimum amounts returned by trustees increase. Thus, lower types of trustees are pooled together, which diminishes the investor's ability to infer the trustee's type, which decreases the weight the investor places on the trustee payoff in equation (3). Thus, while increasing minimum return rules decrease investor risk, they also obfuscate the ability of both the investor and the trustee to infer each other's types.[7]

In this case, minimum return rules reduce information about types, affecting both the trustee's beliefs about the investor and the investor's beliefs about the trustee. In response to reduced information regarding trustee types, investors may reduce investment until the rules reduce downside risk sufficiently to restore investment levels. Similarly, trustees may reduce return rates because of reduced information about investor types. Then, rules would create a return trade-off: truncating the lower tail of the return rate distribution, but shifting the rest of the distribution down. This leads to another competing hypothesis:

Replacement Hypothesis: *When a minimum return rule is implemented, it not only*

[7] Dufwenberg and Kirchsteiger (2004) also model reciprocity, where concerns for others' payoffs are increasing not only with the decision maker's type and the perception of the other's intentions, but also with the other's perception of the decision maker's intentions. Their model would predict that increasing minimal rules reduce both the investor's and trustee's ability to separate from other agents, which diminishes the other's perception of the decision maker's intentions, decreasing reciprocity.

truncates the lower tail of the return rate distribution, but will decrease non-truncated return rates, which fall toward the rule. Investors will trade off the risk reduction benefits due to truncation of the lower tail of the return rate distribution with otherwise lower expected returns in the non-truncated portion.

The trade-offs implied by the *Replacement Hypothesis* predict "U-shaped" relationships between rules and investments and between rules and returns. For trustees, median return rates will fall for less restrictive rules and rise back up only for sufficiently restrictive rules. Mean return rates may also fall if the replacement effect is larger than the rule's pure truncation effect. For Investors, investment will rise for sufficiently restrictive rules because, eventually (e.g., with the 30% rule), almost all downside risk is eliminated. However, investment may fall initially (for less restrictive rules) because of the downward shift anticipated in the rest of the return distribution. Value at risk will fall uniformly because of the combination of lower discretionary return rates and lower information returns to placing funds at risk.

It is important to note that all of our hypotheses are motivated by potential underlying causes of trust formation and rule effects. In order to get a complete understanding of investment and return behavior, we need to understand not just how agents respond to the *existence* of minimum return rules, but also how they respond to *different levels* of these rules. Therefore, our analysis and conclusions will depend not just on the shift in mean behavior due to a rule, but on the relative shifts in the entire distribution of behaviors in response to changing levels of rules (captured by median statistics). This is both a unique and critically important contribution of our study.

As noted above, some forms of $\lambda_{i,j}(.)$ suggest that investment levels themselves play a significant role in determining return rates, with higher investments increasing return rates, consistent with others' observations (Ostrom and Walker, 2003). As a result, we examine the interaction of rules, investment levels, and return rates in multivariate analysis.

3 Results

3.1 Univariate Results

Result 1. *Return rates and observed reciprocity are only consistent with the Replacement Hypothesis. As a result, rules reduce reciprocity and can hurt investors on average.*

The left hand side of Figure 1 shows the mean and median return rates (as percents of amounts received by trustees) and reciprocity (measured by the voluntary return rates above the minimum mandated) under each rule.[8] Panel A of Table 2 gives more detail and presents some univariate tests for treatment effects.

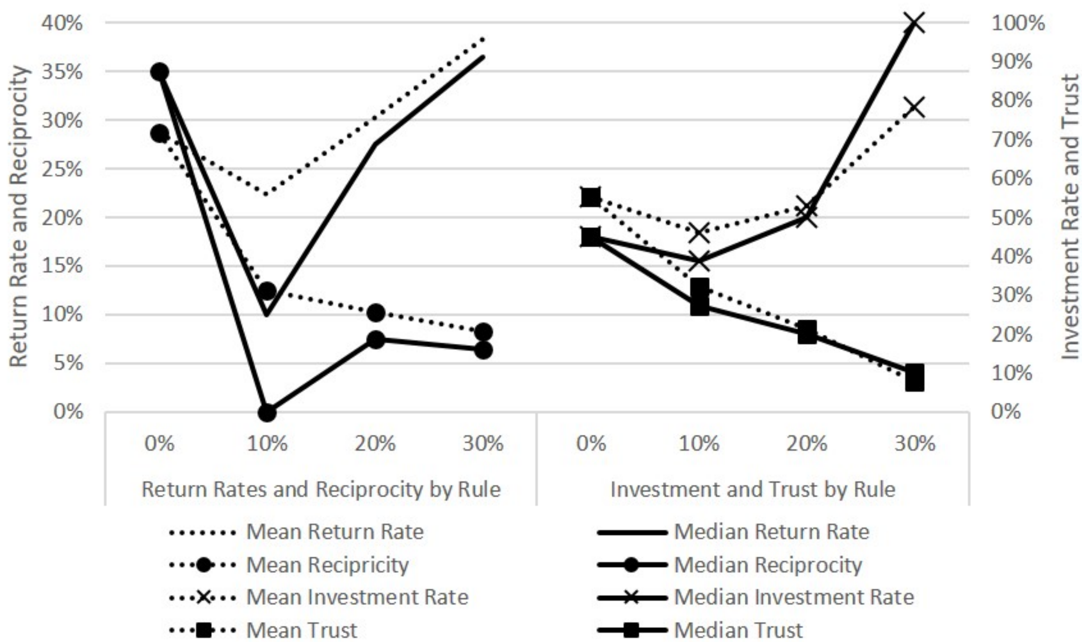


Figure 1: Minimum return rule effects on investment, trust, returns and reciprocity.

Return rates display the "U-shaped" pattern that is only consistent with the *Replacement Hypothesis*. Under a 10% rule the return rates and voluntary reciprocity fall while the percentage of trustee's who returned only the minimum required increases. The drop is dramatic. The median return rate drops from 35% to the mandated minimum of exactly

[8]See Table 1 where all terminology is explicitly defined.

Table 2: Return Rates, Reciprocity, Investment Rates and Trust by Rule

Panel A: Return Rates and Reciprocity

Rule	Obs.	% Returning within $0.01 of Minimum	Return Rate Mean	Return Rate Med.	Discretionary Return Rate (Reciprocity) Mean	Discretionary Return Rate (Reciprocity) Med.
0%	18	16.7%	28.7%	35.0%	28.7%	35.0%
10%	21	57.1%	22.4%	10.0%	12.4%	0.0%
20%	19	42.1%	30.3%	27.5%	10.3%	7.5%
30%	24	37.5%	38.2%	36.4%	8.2%	6.4%
		Kruskal-Wallis Test Stat.:	21.931**		20.153**	
		P-value:	0.0001		0.0002	

Panel B: Investment Rates, Trust and Return on Investment

Rule	Obs.	% that Invest $0	Investment Rate Mean	Investment Rate Med.	Value at Risk (Trust) Mean	Value at Risk (Trust) Med.	Return on Investment Mean	Return on Investment Med.
0%	21	14.3%	55.4%	45.0%	55.4%	45.0%	-14.0%	5.0%
10%	24	12.5%	46.0%	38.8%	32.2%	27.1%	-32.7%	-69.9%
20%	20	5.0%	53.0%	50.0%	21.2%	20.0%	-9.1%	-17.6%
30%	24	0.0%	78.3%	100%	7.8%	10.0%	14.7%	9.3%
Kruskal-Wallis Test Stat.:			10.615**		21.735**		10.920**	
		P-value:	0.0140		0.0001		0.0122	

**Significant at the 95% level of confidence.

10%. The median level of reciprocity falls from 35% to 0% as indicated by discretionary returns falling to 0%. For the investor, this drives the median ROI down from 5% to -70%. Without a rule, 57% of investors who send positive amounts have a net positive ROI. The rules drives this down to 38%. As the minimum rule increases, the mean and median return rates are forced up, but reciprocity remains low while the percentage of trustees returning no more than the rule remains high. Even at the 30% rule, only 50% of investors experience positive ROI, still less than under no rule at all. Unambiguously, rules reduce reciprocity and can hurt investors. The "U-shaped" response function is significant and only consistent with the *Replacement Hypothesis*.

Result 2. *Investment levels and demonstrated trust are only consistent with the Replacement Hypothesis. As a result, rules can reduce economic efficiency and social welfare.*

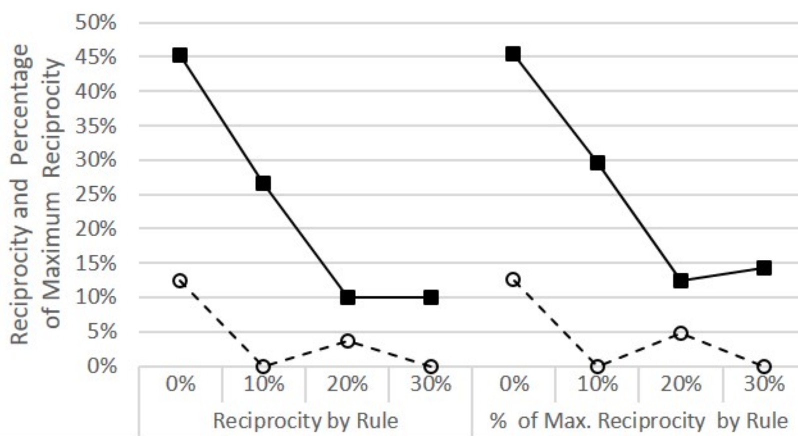
The right hand side of Figure 1 shows the mean and median amounts sent and trust (measured by VAR) under each rule. Panel B of Table 2 gives more details and shows some univariate significance testing results for treatment effects.

Like reciprocity, investment also displays the "U-shaped" pattern that is only consistent with the *Replacement Hypothesis*. Investment drops under the 10% rule and rises as risk is mitigated by more restrictive rules. Only for the 30% rule does investment rise above the 0% rule. This is a sensible response to the pattern of returns observed. The median return on investment (ROI) drops from 5% under no rule to -70% under the 10% rule. ROI remains below zero (-18%) under the 20% rule and rises to 9% under the 30% rule. Rules do mitigate downside risk, VAR falls uniformily and significantly with increasingly restrictive rules. Eventually investment becomes sensible, but trust continues to fall as rules increase. Thus, again, the "U-shaped" response function is significant and only consistent with the *Replacement Hypothesis*.

Because there is a one-to-one direct relationship between investment rates and economic efficiency, the same result holds for economic efficiency. The implication is that, if minimum return rules of these sorts are intended to encourage investment and economic efficiency, they may be ineffective, at least until the minimum return rate is sufficiently high.

Result 3. *The interaction of investment levels and rules result in return rates that are consistent only with the Replacement Hypothesis. As a result, (1) higher investment levels increase return rates for a given rule, however (2) rules reduce the ability of investors to elicit higher returns through higher investment levels.*

The *Replacement Hypothesis* is driven by the idea that investors send money to signal trust, learn about trustee types and elicit a return. Trustees learn about investors and reward trust. As a result, return rates should be affected by the amount invested through value at risk. Rules hamper that ability to signal trust through value at risk as shown by the right hand side of Figure 1,where trust falls even through investment increases under the 20% and 30% rules. As a result, rules may degrade the ability of investors to elicit higher returns through higher investment.



	Reciprocity by Rule 0%	10%	20%	30%	% of Max. Reciprocity by Rule 0%	10%	20%	30%
Send <$5	12%	0%	4%	0%	12%	0%	5%	0%
Send >=$5	45%	27%	10%	10%	45%	30%	13%	14%
Difference	33%	27%	6%	10%	33%	30%	8%	14%

Figure 2: Median Discretionary Return Rates and Percentage of Maximum Discretionary Return Rates for Investments above and below $5 by Rule Treatment

Figure 2 clearly shows this effect and Table 3 gives more details and does significance testing. Both show how rules interact with investment levels by dividing the data into investments weakly above and strictly below \$5. The left hand side of Figure 2 shows the median discretionary return rate (i.e., reciprocity) for investments above or equal to \$5 and investments below \$5 as the rule varies. Under the 0% rule, investors who send less than \$5 elicit a median discretionary return rate of 12% (36% of the amount sent). This jumps to 45% (135% of the amount sent) when investors send \$5 or more, a difference of 33 percentage points. Under the 10% rule, the median overall discretionary return rate falls to zero as does the rate for investors who send less than \$5. But, investors who send \$5 or more still elicit positive median discretionary returns of 27% (which is 30% of the maximum total discretionary returns that could be given under a 10% rule as shown on the right hand side of Figure 2). Under the 20% rule, the median discretionary return rates are 4% for investors sending less than \$5 and 10% for investors sending \$5 or more, a 6 percentage point difference. Under the 30% rule, the rates fall to 0% and 10%, respectively.

Overall, Figures 1 and 2 and Tables 2 and 3 indicate that higher investment (more trust) leads to higher return rates and more reciprocal behavior. However, high rules significantly reduce this effect. Compare, in particular, the differences between investments overall, for less than \$5 and for \$5 or more in Tables 2 and 3. Overall investment increases with more restrictive rules, but Trust (VAR) falls (Table 2, Panel B). Under a 30% rule, about half of investors invest \$5 or more (Table 3, Panel B). This increases to nearly 4 in 5 under a 30% rule (Table 3, Panel B). But, these investors demonstrate less trust overall as shown by the falling VAR (Table 3, Panel B). While rules increase return on investment significantly for those who invest less than \$5, no such effect holds for those investing \$5 or more (Table 3, Panel B). This is because reciprocity falls significantly under more restrictive rules overall (Table 2, Panel A). However this drop is only significant for investors who invest \$5 or more (Table 3, Panel A). There is no significant effect for those who invest less than \$5 (Table 3, Panel A). Both results are consistent with the idea that demonstrating trust elicits reciprocal behavior and that a high rule restricts demonstrations of trust. To fully understand both the non-linear responses and interactions effects, we conduct the following regression analyses to

Table 3: Return Rates, Reciprocity, Investment Rates and Trust by Rule dividing by Investment weakly above and strictly below $5

Panel A: Return Rates and Reciprocity for Investments <$5 and Investments >= $5

Rule	Obs. <$5	Obs. >= $5	% Returning within $0.01 of Minimum <$5	% Returning within $0.01 of Minimum >= $5	Return Rate <$5 Mean	Return Rate <$5 Med.	Return Rate >= $5 Mean	Return Rate >= $5 Med.	Discretionary Return Rate (Reciprocity) <$5 Mean	Discretionary Return Rate (Reciprocity) <$5 Med.	Discretionary Return Rate (Reciprocity) >= $5 Mean	Discretionary Return Rate (Reciprocity) >= $5 Med.
0%	8	10	25.0%	10.0%	14.6%	12.4%	39.9%	45.3%	14.6%	12.4%	39.9%	45.3%
10%	11	10	81.8%	30.0%	14.9%	10.0%	30.8%	36.7%	4.9%	0.0%	20.8%	26.7%
20%	8	11	50.0%	36.4%	28.7%	23.7%	31.4%	30.0%	8.7%	3.7%	11.4%	10.0%
30%	5	19	80.0%	26.3%	30.7%	30.0%	40.2%	40.0%	0.7%	0.0%	10.2%	10.0%
			Kruskal-Wallis Test Stat.:		11.518**		5.174		5.543		15.069**	
			P-value:		0.0092		0.1595		0.1361		0.0018	

Panel B: Investment Rates, Trust and Return on Investment for Investments <$5 and Investments >= $5

Rule	Obs. <$5	Obs. >= $5	% that Invest $0 <$5	% that Invest $0 >= $5	Investment Rate <$5 Mean	Investment Rate <$5 Med.	Investment Rate >= $5 Mean	Investment Rate >= $5 Med.	Value at Risk (Trust) <$5 Mean	Value at Risk (Trust) <$5 Med.	Value at Risk (Trust) >= $5 Mean	Value at Risk (Trust) >= $5 Med.	Return on Investment <$5 Mean	Return on Investment <$5 Med.	Return on Investment >= $5 Mean	Return on Investment >= $5 Med.
0%	11	10	27.3%	0.0%	23.4%	30.0%	90.5%	100%	23.4%	30.0%	90.5%	100%	-56.1%	-62.7%	19.6%	35.9%
10%	14	10	21.4%	0.0%	20.4%	17.5%	82.0%	95.0%	14.3%	12.3%	57.4%	66.5%	-55.4%	-70.0%	-7.7%	10.0%
20%	9	11	11.1%	0.0%	19.5%	20.0%	80.5%	90.0%	7.8%	8.0%	32.2%	36.0%	-13.8%	-28.8%	-5.7%	-10.0%
30%	5	19	0.0%	0.0%	25.5%	30.0%	92.2%	100%	2.6%	3.0%	9.2%	10.0%	-8.0%	-10.0%	20.7%	20.0%
	Kruskal-Wallis Test Stat.:				0.900		4.107		5.510		44.629**		11.885**		5.174	
	P-value:				0.8255		0.2502		0.1380		0.0001		0.0078		0.1595	

**Significant at the 95% level of confidence.

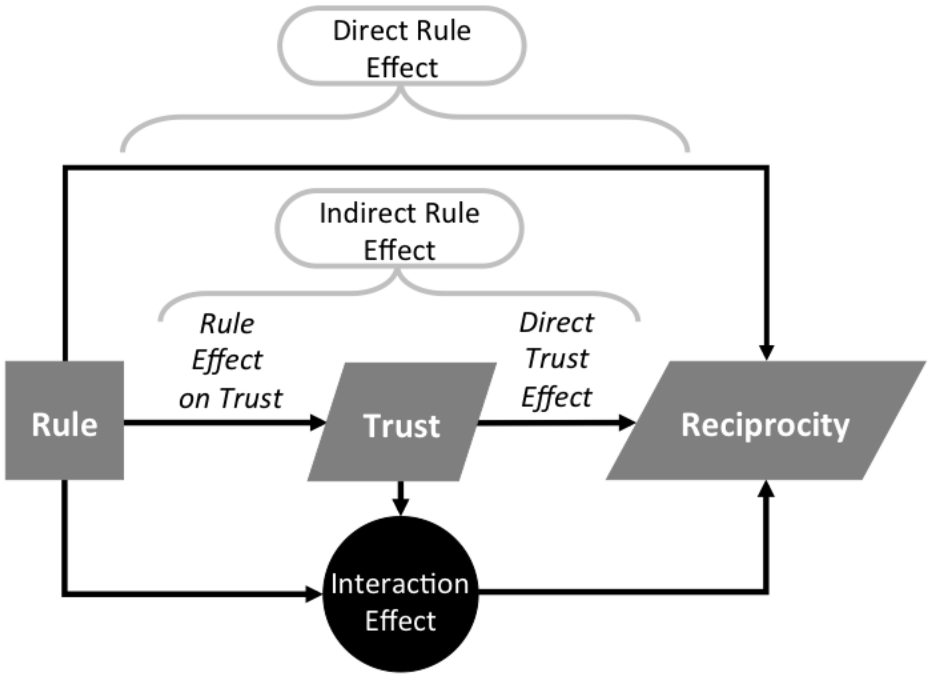


Figure 3: Direct, indirect and interaction effects of rules

show the significance of and relationships between these effects.

3.2 Regression Results

We hypothesize that results are driven by: (i) a direct effect of rules restricting the return space; (ii) changes in investment levels conditional on rules; and (iii) how investment levels affect reciprocity. Of course, there may be interaction effects as well. In particular, the *Replacement Hypothesis* suggest an interaction between rules and investment/trust due to rules interfering with the ability to demonstrate trust and learn about reciprocity. All of these effects are illustrated in Figure 3. First, we estimate the effect of rules on investment and trust, then estimate the combined effect of rules, investment, and trust on return rates and reciprocity. We find that the results mirror the univariate analysis: the pattern of responses is only consistent with the *Replacement Hypothesis*.

3.2.1 Investment and Trust

Figure 1 clearly shows a non-linear relationship between rules and investment levels. Investment levels are capped at \$10 and have a floor at \$0. Thus, we estimate the relationship between the rule and investment level using a censored normal regression of a quadratic function, giving the following estimated relationship:[9]

$$\begin{array}{c} Amount \\ Invested \end{array} = \underset{\substack{(0.07) \\ 84.42^{***}}}{\$6.13} - \underset{\substack{(2.63) \\ -11.30^{***}}}{\$29.67} Rule + \underset{\substack{(10.26) \\ 14.57^{***}}}{\$149.62} Rule^2 \tag{4}$$

with 89 observations (F(2,87)=120.86). Standard errors (in parentheses) and t-statistics are given below each coefficient, "***" denotes significance at the 99% level of confidence, and *Rule* is measured as a decimal (for simplicity, we use a continuous variable rather than categorical). The estimates show reduced investment with 10% and 20% rules with relatively high investment under the 30% rule, where nearly all downside risk is eliminated. Again, the "U" shape is significant and only consistent with the *Replacement Hypothesis* as stated in Result 2.

While regression 4 shows how investment responds to rules, high investment does not necessarily indicate a high degree of trust. Rules limit demonstrable trust by limiting the total amount an investor can put at risk. We measure an investor's level of trust according to the value put at risk (VAR). Using VAR directly as a dependent variable in a regression presents a problem: as part of the definition of VAR, the rule is guaranteed to affect VAR for a given investment level and cannot appear on both sides of a regression equation. We address this problem and ask whether investors adjust investment to affect VAR beyond the direct rule effects by working with the log of VAR and using ln(1- 3×*Rule*) as the independent variable.[10] Again, a quadratic term captures non-linear effects, resulting in the

[9]In this case, the censored normal regression and Tobit regression are the same because the censoring limits are the same across all observations. There are 7 observations of \$0 invested and 31 observations of \$10 invested. We cluster standard errors on the rule as the inter-rule variance is much higher than the intra-rule variance. We report Stata 14's default estimates of standard errors here. Bootstrapped estimates using stratified sampling by rule also accord with these estimates.

[10]The reason this solves the econometric problem is because of the definition of VAR. The log of VAR is

following censored normal regression:[11]

$$ln(VAR) = \underset{\substack{(0.11)\\16.43^{***}}}{1.76} + \underset{\substack{(0.23)\\7.82^{***}}}{1.77} \times XRule + \underset{\substack{(0.09)\\4.24^{***}}}{0.36} \times XRule^2 \quad (5)$$

with 82 observations (F(2,80)=219.08). $XRule = \ln(1 - 3 \times Rule)$. Standard errors (in parentheses) and t-statistics are given below each coefficient and "***" denote significances at the 99% level of condfidence. The coefficient greater than one on $\ln(1 - 3 \times Rule)$ implies that, with the imposition of the rule, investors reduce investment enough to reduce risk *beyond* the pure mechanical effects of the rule. The quadratic term coefficient less than one implies that more restrictive rules attenuate this effect. Combined, the two regression results are only consistent with the *Replacement Hypothesis* as stated in Result 2.

We summarize the combined regression results as follows:

Result 4. *The immediate effect of imposing a rule is to decrease the investment level and VAR (beyond the VAR reduction resulting from the rule alone). As the rule's restrictiveness increases, VAR falls mechanically and the investment levels rise in response. This is exactly the pattern predicted by the Replacement Hypothesis.*

3.2.2 Return Rates and Reciprocity

Our regressions on return rates model differential truncation and distributional shifts in the return distributions. The *Truncation Hypothesis* predict rules only truncate the lower tail of the return rate distribution, increasing the conditional mean while leaving the median unaffected. The other hypotheses change the entire distribution including the mean and median. Therefore, to identify replacement and reinforcement effects, we run regressions based on medians.

Obviously, return rates fall when the 10% rule is implemented (Figure 1). A direct

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$\ln(Investment) + \ln(1–3\times Rule)$. This creates a fixed linear relationship between the dependent variable and the independent variable. Then, we can move $\ln(1 - 3 \times Rule)$ to the right side of the regression equation. It becomes an independent variable with a null coefficient hypothesized to be -1.

[11] Here, censoring at the maximum VAR varies by rule. We note that, when we take the log of VAR we lose the 7 observations with \$0 investment and, hence, zero VAR. A median regression is robust to this and gives similar positive coefficients greater than 1 on $\ln(1\text{-}3\times Rule)$ and less than 1 on $\ln(1\text{-}3\times Rule)^2$.

regression of *Rule* and $Rule^2$ on the return rate shows a significant drop in median returns with the 10% rule and a subsequent increase as the rule mechanically forces return rates up. However, we hypothesize a complex direct, indirect, and interaction effect between rules, investment levels or trust, and returns. We estimate the direct trust effects at the same time as the direct rule and interaction effects of Figure 3. To estimate the effects, we start with a median regression, measure return rates as the percentage of funds received that are actually returned by the trustee and use investment level as the independent variable. This results in the following estimated relationship:

$$\begin{array}{c} Return \\ Rate \end{array} = \begin{array}{cc} \underset{\substack{(7.43\%) \\ -0.75}}{-5.56\%} & \underset{\substack{(1.06\%) \\ 5.25^{***}}}{+5.56\% Inv.} \\ \underset{\substack{(41.88\%) \\ 2.54^{**}}}{+106.34\% Rule} & \underset{\substack{(5.45\%) \\ -2.56^{**}}}{-13.97\% Inv. \times Rule} \end{array} \tag{6}$$

with 82 observations (Pseudo $R^2 = 28.6\%$). Standard errors (in parentheses) and t-statistics appear below each coefficient. "**" and "***" denote significance at the 95% and 99% levels of confidence, respectively. *Inv.* is investment measured by the amount sent. *Rule* is measured as a decimal.[12]

The overall effect of rules is positive, reflecting the forced increase in the 10% through 30% range. The drop between 0% and 10% is picked up in the indirect investment and interaction effects. Higher investment elicits higher returns, but we already know investment drops with the 10% rule (see regression equation 4). This is consistent with Result 1. Further, according to the interaction term, rules significantly dampen the ability for investors to elicit higher returns through investment. This is consistent with Result 3 that investors are unable to demonstrate trust by putting the full amount of their investment at risk.

The negative interaction in regression equation 6 indicates that rules dampen the ability

[12]The interaction term can capture non-linear effects and account for a "U-shaped" response function. Alternatively, we could add a second order term on rules along with the interaction between investment and the rule squared to account for it. Doing this changed some point estimates, but it did not change signs, significance levels or interpretations of this or any of the subsequent regressions.

of investors to elicit reciprocal behavior through higher investment levels. We conjecture that this arises because more restrictive rules constrain the trustees' capabilities to take risk (VAR) and demonstrate trust. To understand how much of the interaction effect is due to rules reducing VAR or trust, we re-run the regression using VAR as the independent variable representing trust directly. This results in the following estimated relationship:

$$\begin{array}{c} Return \\ Rate \end{array} = \begin{array}{cc} \underset{\substack{(6.27\%) \\ -0.89}}{-5.56\%} & \underset{\substack{(0.97\%) \\ 5.76^{***}}}{+5.56\% VAR} \\ \underset{\substack{(25.89\%) \\ 4.72^{***}}}{+122.22\% Rule} & \underset{\substack{(8.48\%) \\ -0.94}}{-7.94\% VAR \times Rule} \end{array} \tag{7}$$

with 82 observations (Pseudo $R^2 = 27.9\%$). Standard errors (in parentheses) and t-statistics appear below each coefficient. "***" denotes significance at the 99% level of confidence. *VAR* is trust measured by the value placed at risk by the investor (jointly determined by the investment level and the rule). *Rule* is measured as a decimal. Notice that, without loss of explanatory power, the interaction term ceases to be significant. But, we still are not measuring reciprocity: discretionary return rates.

To understand how much of the direct rule effect is due to the 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 voluntarily displayed by the trustee (that is, the return rate given above the mandatory minimum). Estimation of this relationship gives:

$$\begin{array}{c} Discretionary \\ ReturnRate \end{array} = \begin{array}{cc} \underset{\substack{(6.27\%) \\ -0.89}}{-5.56\%} & \underset{\substack{(0.97\%) \\ 5.76^{***}}}{+5.56\% VAR} \\ \underset{\substack{(25.90\%) \\ 0.86}}{+22.22\% Rule} & \underset{\substack{(8.48\%) \\ -0.94}}{-7.94\% VAR \times Rule} \end{array} \tag{8}$$

with 82 observations (Pseudo $R^2 = 28.8\%$).[13] Notice that the only thing that changes is the coefficient on *Rule* and its significance. This is because we subtract out exactly one times the rule 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 reciprocity 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 reciprocity is through the amount of trust displayed in the value at risk undertaken by the investors. (However, the amount of trust that *can* be displayed is limited by the rule.) Again, this pattern is consistent with the *Replacement Hypothesis*, here combined with a positive effect of trust on reciprocal behavior.

Combined, these regressions lead to the following summary result:

Result 5. *The immediate effect of imposing a low minimum return rule is to decrease average return rates. Return rates rise as increasingly restrictive rules force them up. Reciprocity falls when rules are imposed and does not rise as rules become increasingly restrictive. Reciprocity responds positively to trust displayed by investors through value at risk.*

3.2.3 Summary of Regression Results

Combined, the regressions tell an interesting story. Investment falls when rules are imposed and only rise with high levels of the rule. However, this rise is not due to more trust. Trust, measured by VAR, is reduced by rules. While the amount invested increases with the 30% rule, the rule itself prevents an overall increase in trust. This is consistent with the *Replacement Hypothesis*, with trust falling when rules are exogenously imposed.

Higher return rates associated with more restrictive rules do not result from greater reciprocity. Instead, any potential positive effects come indirectly from investors investing more. Overall, when rules are implemented, investment and trust both fall, leading to lower

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

return rates. As rules increase the minimum mandated return, investment rates rise and, consequentially, return rates increase. However, trustworthy reciprocity never returns.

Despite evidence that they encourage higher investment, “harder” rules hamper investors from placing themselves at risk and demonstrating trust. The only significant factor driving reciprocity (defined as returning more than the mandated minimum) is the amount of trust demonstrated. But demonstrating trust is difficult under more restrictive rules. 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).

4 Discussion

Interactions that require trust involve a basic social dilemma where agents have to trade off self-interest and safety with the potential delayed benefits (both monetary and information) that arise from trusting and reciprocal behavior. Trust is important because not all aspects of exchange can be contracted or monitored. When trust violations harm agents, minimum standards are attractive because they eliminate the worst trust violations while minimizing monitoring and enforcement costs. However, rules may supplant naturally occurring trust and, thus, cause more harm than good.

Trust based exchange systems have the advantage of not needing extensive contracting and enforcement. However, sometimes trust is violated. To reduce the most egregious violations, we often rely on rules that establish minimum standards. Such rules prevent the worst abuses of trust relationships. They may also reinforce trusting and reciprocal behavior by signaling that abusing trust is not acceptable. However, rules may also serve to calibrate expectations about socially acceptable behaviors, indicating what return rates are “good enough,” or they may serve as focal points, in which case behavior may fall to the rule.

Therefore, the impact of rules on trust and reciprocity is ambiguous. We study trust based exchange in a simple trust game by varying minimum standard rules.

In the trust game, trust leads to net monetary gains overall, may lead to profits for investors, and allows participants to learn about each other through demonstrating trust and reciprocity. Investors demonstrate trust by risking cash sent to trustees. Trustees demonstrate trustworthy reciprocity by voluntarily giving back some money to investors. Failure to trust eliminates potential monetary gains for both parties while the investor loses the ability to learn about the trustworthiness of the trustee. Effectively, this is a situation of nothing ventured, nothing gained. While minimum return rules reduce downside risk for investors, they also limit the potential of the exchange to build trust, reciprocity, and generate information about the exchange partner.

Overall, we find that experimentally creating and increasing a minimum standard destroys reciprocal behavior and significantly reduces demonstrated trust. As rules increase, investment increases, but trust never recovers nor do voluntary displays of reciprocity.[14]

Our results shed light on theory and have practical implications. First, our results indicate both payoff and information effects of rules are important. Low minimum standard rules can impose significant economic costs while driving down demonstrated trust and reciprocity. With sufficiently restrictive rules, economic welfare may return. However, trust and reciprocity never do. Thus, if a trust-based system functions well, imposing minimum standards is unwise. However, if the unregulated system functions poorly, rules may bring improvement, but only if sufficiently restrictive.

Second, our results are only consistent with agents who use the game to learn about each other. By imposing rules on a trust based exchange, we disrupt an unambiguous demonstra-

[14] Our results are consistent with other research where instituting a gentle rule has the unintended consequence of dampening exactly the behavior the rule was intended to promote (Gneezy and Rustichini, 2000; Falk and Kosfeld, 2006). However, our results are inconsistent with research where gentle rules are the most effective at bringing about desired behavior (Kahan, 2000). While our exogenous, simple rules give us clean results, further research on the interplay of expectations and intentions with rules, nudges and suggestions could prove valuable in teasing out how interrelated preferences form and are affected by perceptions of others.

tion of trust and reciprocity. Voluntary displays of reciprocity fall dramatically. Investment also falls under a minimum return rule. Further, by increasing rules' restriction on discretionary returns, we show how demonstrated trust, investment, reciprocity, and economic welfare respond to increasingly restrictive rules. While investment levels and economic welfare rise under sufficiently restrictive rules, this does not represent a response to trust. It reflects the simple fact that investors invest more when they have less at risk. This is only consistent with participants who use the game to learn about their exchange partners.

Third, our findings that regulations may have adverse consequences are consistent with the literature on crowding-out of economic incentives (Bowles and Reyes, 2012). Although sufficiently restrictive minimum standard rules may increase economic welfare, they still reduce demonstrated trust and reciprocity. There may also be a negative external effect left for future research: not learning to trust because of restrictive rules in one context may inhibit trust and reciprocal behavior in other situations where trust relationships would be beneficial.

We study a relatively abstract and simple game that strips away many of the complexities of face to face, business, or social context. The trust game's simplification allows us a detailed understanding of a simple trust based 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 imposing minimum requirement rules can create benefits, adding rules or enforcing them can also be counter-productive, as the day care and worker monitoring examples show.

In fact, in some situations, removing rules can improve outcomes. For example, the "Monderman Principal" of traffic control (Clarke, 2006) shows that removing curbs, lane markings, traffic signs, and other regulatory conventions, 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: while the Monderman principal demonstrates how fewer rules can increase desirable behaviors, we show that rules depress the desirable behaviors that trustees would otherwise demonstrate.

We believe the implications are clear: If a system based on trust is not broken or violations of trust are infrequent, it is not wise to tamper with it by imposing minimum standards of behavior. 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 opportunistic behavior.

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A Instructions for the R10 Treatment

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 dollars to _1_ dollar. At the end of 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 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.

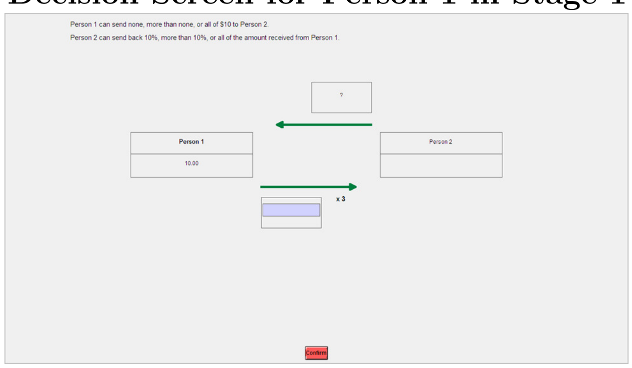
In stage 1, Person 1 receives $10 and then decides how many dollars to send to Person 2. Person 1 can send none, more than none, or all of the $10 to Person 2. The amount sent by Person 1 is tripled before reaching Person 2. In stage 2, Person 2 decides how many of the dollars they received to send back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

Next we describe in detail 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.

Decision Screen for Person 1 in Stage 1

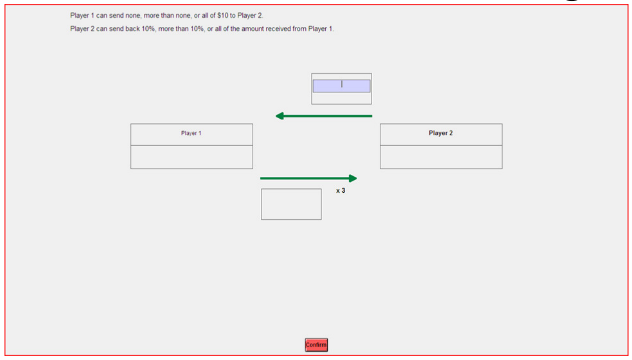


Stage 2

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 10%, more than 10%, 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

Decision Screen for Person 2 in Stage 2



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 10%, more than 10%, 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	0.08 - 0.75
0.50	1.50	0.15 - 1.50
0.75	2.25	0.23 - 2.25
1.00	3.00	0.30 - 3.00
1.25	3.75	0.38 - 3.75
1.50	4.50	0.45 - 4.50
1.75	5.25	0.53 - 5.25
2.00	6.00	0.60 - 6.00
2.25	6.75	0.68 - 6.75
2.50	7.50	0.75 - 7.50
2.75	8.25	0.83 - 8.25
3.00	9.00	0.90 - 9.00
3.25	9.75	0.98 - 9.75
3.50	10.50	1.05 - 10.50
3.75	11.25	1.13 - 11.25
4.00	12.00	1.20 - 12.00
4.25	12.75	1.28 - 12.75
4.50	13.50	1.35 - 13.50
4.75	14.25	1.43 - 14.25
5.00	15.00	1.50 - 15.00
5.25	15.75	1.58 - 15.75
5.50	16.50	1.65 - 16.50
5.75	17.25	1.73 - 17.25
6.00	18.00	1.80 - 18.00
6.25	18.75	1.88 - 18.75
6.50	19.50	1.95 - 19.50
6.75	20.25	2.03 - 20.25
7.00	21.00	2.10 - 21.00
7.25	21.75	2.18 - 21.75
7.50	22.50	2.25 - 22.50
7.75	23.25	2.33 - 23.25
8.00	24.00	2.40 - 24.00
8.25	24.75	2.48 - 24.75
8.50	25.50	2.55 - 25.50
8.75	26.25	2.63 - 26.25
9.00	27.00	2.70 - 27.00
9.25	27.75	2.78 - 27.75
9.50	28.50	2.85 - 28.50
9.75	29.25	2.93 - 29.25
10.00	30.00	3.00 - 30.00