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SUMMARY

In this paper we argue that there is a **social norm** of tax compliance that affects individual reporting decisions and that can be affected by government institutions. We use experimental methods to test these notions. Our experimental design captures the essential features of the fiscal and voting systems present in many countries: individuals receive income, they pay taxes on income voluntarily reported, taxes are used to provide a public good, individuals face some chance that unreported taxes will be detected and penalized, and individuals vote via majority rule on different aspects of the fiscal system. Our experimental results are consistent with a central role for social norms in tax compliance behavior. In all sessions, individual compliance behavior after a vote is announced is decidedly different from the pre-vote behavior under the identical fiscal regime. Of particular interest, when the group rejects greater enforcement, compliance always falls, often collapsing virtually to zero; we argue that this latter result demonstrates that the group decision destroys any pre-vote social norm of tax compliance, and post-vote compliance disappears. However, our results also suggest that the social norm of tax compliance can be affected by group communication. In several sessions, subjects are allowed to communicate before a vote is taken. After this "cheap talk," subjects select a greater level of enforcement. Importantly, the post-vote level of reporting with the cheap talk now approaches full compliance; that is, it is as if the cheap talk changes the social norm of tax compliance so that paying taxes is now the accepted mode of behavior. We also examine individual voting behavior.

I. INTRODUCTION

It is commonly observed that individuals often behave in a less self-interested way than is predicted by the standard homo economicus analysis. In public good contribution games, in ultimatum games, in charitable donations, and in many other similar settings, individuals typically behave in a much more public-spirited manner than economists predict (Frank, Gilovich, and Regan, 1993).

Various explanations for this behavior have been suggested. Although these theories differ substantially in their details, a common theme in many of them is the underlying assumption that an individual chooses how to behave based in part on his or her perceptions of how others will behave and how others will judge his or her actions. The notion of a **social norm** is particularly relevant here. Although difficult to define precisely, a social norm can be distinguished by the feature that it is process-oriented, unlike the outcome-orientation of individual rationality (Elster, 1989a, 1989b). A social norm therefore represents a pattern of behavior that is judged in a similar way by others and that therefore is sustained in part by social approval or disapproval. Consequently, if others behave according to some socially accepted mode of behavior, then the individual will also behave appropriately; if others do not so behave, then the individual will respond in kind.

A similar divergence between behavior that is observed and behavior that is predicted by economists exists in the analysis of tax compliance. A persistent puzzle in many countries is the presence of relatively high levels of compliance despite relatively low levels of enforcement (Graetz and Wilde, 1985; Smith and Kinsey, 1987; Cowell, 1990; Elffers, 1991; Webley, Robben, Elffers, and Hessing, 1991). Most theories of individual behavior under uncertainty typically assume that an individual is purely self-interested and maximizes the expected utility of the evasion gamble. These theories predict that there should be far higher levels of underreporting than are actually seen, because the likelihood of detection is uniformly low in most countries and the penalties are also seldom more than a small fraction of unpaid taxes. In part because of this

puzzle, the analysis of compliance has recently begun to incorporate a variety of influences other than detection and punishment, such as uncertainty of enforcement, the role of tax practitioners, overweighting of low probabilities, the presence of public goods, and strategic audit selection. Nevertheless, despite the many insights from these analyses and their success in explaining the changes in compliance in response to policy innovations, we are still unable to explain the high levels of compliance that are present worldwide.

However, the notion of a social norm of tax compliance -- or of tax noncompliance -- seems central to this puzzle. This view suggests that an individual will comply as long as he or she believes that compliance is the social norm. Conversely, if noncompliance becomes pervasive, then the social norm of compliance disappears.[1]

There is considerable intuitive appeal to the potential importance of social norms in tax compliance behavior. There is also much evidence that the social norms of compliance differ across countries and that these differences affect compliance.[2] However, largely unexplained in these analyses is how social norms arise in the first place. Of perhaps more importance, these analyses say little about how these norms can be -- if at all -- changed by deliberate government policies (Elster, 1989a, 1989b).

This latter omission is no doubt understandable. However, it is still troubling. Governments everywhere wish to increase tax compliance -- indeed they wish to increase compliance with the law more

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[1] There are other concepts that loosely describe the same basic phenomenon as social norms, such as **psychic cost** (Gordon, 1989), **tax morale** (Pommerehne, Hart, and Frey, 1994), **moral sentiments** (Erard and Feinstein, 1994), or **group conformity and social customs** (Myles and Naylor, 1996); the notion of **intrinsic motivation** is also clearly related to social norms (Frey, 1992, 1994). In their entirety, these various influences can be classified into two basic categories. One relates to how the taxpayer judges his or her own compliance behavior in light of the individual's own feelings of what is proper behavior, or what might be termed "internal norms". The other relates to how the taxpayer feels he or she is treated by government in such areas as the payment of taxes, the receipt of government services, and the responsiveness of government decisions (or "external norms").

[2] This evidence comes from numerous approaches, such as taxpayer surveys (Westat, Inc. 1980; Yankelovich, Skelly, and White, Inc., 1984), empirical work (Frey and Weck-Hannemann, 1984), experimental economics (Alm, Jackson, and McKee, 1993; Alm, Sanchez, and de Juan, 1995), and simulation analyses (Pommerehne, Hart, and Frey, 1994).

generally. There are obvious limits to a government's ability to increase compliance via the traditional policies of greater audits and fines.[3] If social norms are indeed an important factor in compliance, and if a government can influence these norms by its policies, then such policies represent another, potentially significant tool in government's battle with tax evaders.

In this paper we argue that there is what might be termed a social norm of tax compliance that affects individual reporting decisions and that this social norm can be affected by government institutions. In particular, we argue that voting on different aspects of the fiscal system is likely to change this social norm in ways that are predictable and that have predictable effects on tax compliance.

We develop a theoretical framework in which the existence of a social norm affects an individual's decisions on tax compliance and voting, and we then use experimental methods to test these social norm effects. Laboratory experiments are particularly well-suited for this analysis. Unlike analytical work, experiments are not as constrained by the same degree of simplification required by theoretical analysis. Unlike empirical work, experiments generate data under different settings in which there is substantial control over extraneous influences, control that enables the researcher to isolate the factors that generate the behavior of interest. There are reasons for caution in the use of and generalization of laboratory experiments, since they are based upon a somewhat artificial setting with student subjects. Still, it seems likely that laboratory methods can contribute to our understanding of the role of social norms, and there is a large and growing literature that argues convincingly that experimental studies can contribute significantly to policy debates (Davis and Holt, 1993).

Our experimental design captures the essential features of the fiscal and voting systems present in many countries. Individuals receive income; they pay taxes on income voluntarily reported; the total taxes

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[3] Indeed, there is some evidence that greater enforcement can actually reduce compliance, if the enforcement crowds out the intrinsic motivation that leads an individual to pay his or her taxes. See Frey (1992, 1997) for further discussion.

paid by all individuals are used to provide a public good; and individuals face some chance that unreported taxes will be detected and penalized. Subjects start the experiment facing a given level of the tax rate, the fine rate, and the audit rate; these parameters are chosen to approximate the actual levels either faced or perceived by taxpayers in the United States. After several rounds, subjects then vote via majority rule with secret ballots on different aspects of the fiscal system that they face, where the vote is always on only two alternative levels of a single parameter. In some sessions, subjects vote on the tax rate; in other sessions, they vote on the audit rate; and in other sessions, the vote occurs over alternative levels of the fine rate on detected evasion. Subjects then face the fiscal system selected by the group vote for several more rounds.

The experimental results are consistent with a central role for social norms in tax compliance behavior. In all sessions, individual compliance behavior after the vote is announced is decidedly different from the pre-vote behavior under the identical fiscal regime. Of particular interest, when the group rejects any attempt to raise the level of enforcement, compliance always falls, often collapsing virtually to zero. Although several interpretations of these results are possible and are explored here, we believe that these results indicate that the group decision to reject greater enforcement ratifies any individual tendency to evade taxes, so that individual noncompliance is in some sense now justified by the revealed actions of others in their voting. Put differently, we believe that these results demonstrate that the group decision destroys any pre-vote social norm of tax compliance, and, in the absence of the social norm, post-vote compliance disappears.

However, our results also suggest that the social norm of tax compliance can be affected by group communication. In several sessions, subjects are allowed to communicate before a vote is taken. After this "cheap talk," subjects select a greater level of enforcement, in contrast to their rejection of greater enforcement in those sessions in which talk was not allowed. Importantly and strikingly, the post-vote level of reporting with the cheap talk now approaches full compliance; that is, it is as if the cheap talk changes the

social norm of tax compliance so that paying taxes is now the accepted mode of behavior.[4]

Because of the presence of voting in our analysis, we are also able to examine voting behavior at the individual level. Information that relates an individual's voting behavior to his or her attitudes toward government is often difficult to obtain.[5] Further, little is known about how an individual will vote in response to objective and known changes in the benefits from and costs of government activities, or about how individuals will vote when they may choose the enforcement system that they face. Our experiments provide detailed information on individual voting behavior under a variety of circumstances. These data suggest that individuals often vote in accordance with their individual payoffs, regardless of the social consequences of their decisions. For example, even when compliance with the tax laws is quite low, individuals vote in favor of a tax increase when the public good provided by their taxes generates some consumer surplus, and vote against an identical tax increase when they receive as a group less from the government than they pay in taxes. Individuals also vote against an increase in the levels of audit rates and penalties imposed on tax evaders, even when these sanctions could increase compliance to quite high levels. However, voting behavior is affected by the group communication. Although greater enforcement levels are always voted down in the absence of cheap talk, they are always supported in otherwise identical sessions with cheap talk.

Section II presents the theoretical framework, and section III discusses the experimental design. Experimental results are presented in section IV. Conclusions are in section V.

II. THEORETICAL FRAMEWORK

This section first develops a theoretical framework of individual behavior under the usual assumption

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[4] See Crawford (1998) for discussion of the role of cheap talk in experiments.

[5] Note, however, that there is some evidence on the ways in which citizens' general attitudes toward government affect their voting behavior on tax limitations. See, for example, Courant, Gramlich, and Rubinfeld (1980).

of self-interested individual behavior. Two aspects of this behavior are examined: the individual's choice of how much income to declare to the tax authority, and the individual's choice of how to vote on different aspects of the fiscal system. This theoretical model is then revised to incorporate the role of social norms in compliance and voting behavior.

A. Self-interested Behavior

Optimal Pre-vote and Post-vote Compliance Behavior.[6] Consider an individual member of a larger group. Individual i receives a fixed amount of income I_i, and must choose the amount D_i to declare to the tax authorities. The individual pays taxes at rate t on each dollar of declared income. The total taxes paid by all individuals in the group are then summed, increased by a multiple m (the "group surplus multiplier") that may be greater than or less than one, and divided in equal shares s among all members of the group.[7] Undeclared income is not taxed. However, the individual may be audited with probability p, at which point a fine f is imposed on each dollar of unpaid taxes.

It is straightforward to determine the optimal compliance strategy for an individual when his or her goal is to maximize the expected value of the individual payoff. The expected value EV_i from the choice of declared income is

$$EV_i = I_i - tD_i + mst(\sum_j D_j) - pft(I_i - D_i). \quad (1)$$

Maximization of EV_i by the choice of declared income D_i indicates that individual i will optimally report all income if

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[6] See Cowell (1990) and, more recently, Andreoni, Erard, and Feinstein (1998) for comprehensive surveys of the theoretical and empirical literatures on tax compliance.

[7] A group surplus multiplier greater than one reflects the positive consumers' surplus associated with government provision of a public good. A multiplier less than one implies potential misuse or waste in government provision.

$$pf + ms > 1, \tag{2}$$

while the individual will report zero income if the inequality is reversed. The individual's decision here is therefore all-or-none: the individual reports either all income or zero income.[8]

Note that this framework suggests that the compliance behavior of the individual should be the same before and after any vote on fiscal parameters, if the underlying fiscal variables are unchanged. A rational, self-interested individual who maximizes the expected value of the evasion gamble will make the same reporting decisions if the fundamentals of the evasion gamble are unchanged.

Optimal Voting Behavior. Suppose that members of the group have the opportunity to vote by simple majority rule on various aspects of the fiscal system that they face. The individual's optimal voting behavior will depend upon the way in which a change in a given fiscal variable (t, p, or f) affects the expected value of the compliance gamble.

Consider first the impact of a change in the tax rate. An increase in the tax rate t will increase the expected payoff if

$$ms(\sum_j D_j) > D_i + pf(I_i - D_i), \tag{3}$$

and will decrease EV_i if the inequality is reversed. Condition (3) clearly depends upon the optimal compliance choices of other individuals; that is, it depends upon whether or not condition (2) is met for all other individuals.[9]

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[8] The presence of risk aversion modifies the all-or-none behavior of the individual, although the comparative statics of the behavior are largely unaffected. See, for example, Cowell (1990).

[9] Note that condition (2) implies that the response of each individual to a change in the tax rate is zero, since each individual will be responding to the tax rate change from either full or zero compliance. More generally, if these responses are nonzero, a change in the tax rate will increase the individual's expected payoff if

Assume first that condition (2) is satisfied, so that $D_i=I_i$ for all individuals. Without loss of generality, assume also that all individuals have the same expected income EI, and replace I_i by EI for all individuals. Condition (3) then reduces to m>1. This inequality suggests that an individual who assumes that everyone complies fully will optimally vote for a tax increase if the group surplus multiplier exceeds 1, while this same individual will vote against a tax increase if m<1.

Assume instead that condition (2) is not satisfied, so that $D_i=0$ for all individuals. Condition (3) now reduces to 0>pfEI, which clearly cannot be satisfied. In this case the individual will vote against an increase in the tax rate; that is, when there is zero compliance, a rational individual will vote against higher levels of taxes.

An increase in the probability of detection has more complicated effects. Consider first the impact of p on compliance. Condition (2) implies that there is some "critical probability" p_C at which subjects will comply fully if the actual probability p exceeds p_C, and will report zero income if $p<p_C$. From condition (2), this critical probability is given by

$$p_C = (1 - ms)/f. \tag{4}$$

Figure 1 shows the relationship between declared income D_i and the probability of detection, and indicates that compliance is a step function in which $D_i=0$ for $p<p_C$ and $D_i=I_i$ for $p>p_C$. Under these circumstances, each individual should assume that $D_j=0$ for $p<p_C$ and $D_j=I_j$ for $p>p_C$. Each should also assume that $\sum_j \partial D_j/\partial p=0$, both for $p<p_C$ and for $p>p_C$.

Individuals voting on a slight increase in the probability to, say, $p_1<p_C$ will therefore assume that

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$$ms(\sum_j D_j + t\sum_j \partial D_j/\partial t) > (D_i + t\partial D_i/\partial t) + pf(I_i - D_i - t\partial D_i/\partial t),$$

and will decrease EV_i if the inequality is reversed. The effect of t on EV_i is uncertain in general, but is more likely to be positive the greater is the level of compliance, the greater is the payoff from the public good, and the smaller is the response of D_j to t.

compliance will be zero and that no increase in compliance will occur from the higher probability. The impact on the expected individual payoff is then

$$\partial EV_i/\partial p = -ftI_i < 0. \quad (5)$$

In these circumstances, an individual will not vote for an increase in the audit rate. More generally, as long as the p_C threshold is not crossed by the proposed probability, an individual should always vote against a larger probability (and should in fact always vote to lower p).

Suppose instead that the vote is on an increase in the probability that will increase p from below to above the critical probability p_C, such as from p_1 to p_2 in Figure 1. Assuming that all individuals do not comply at the lower probability and fully comply at the higher probability, then subjects should vote for p_2 if m>(1-pf). Consequently, a group surplus multiplier that exceeds one is sufficient to ensure that individuals should vote for p_2 over p_1.

Suppose finally that individuals vote on an increase in the probability when the critical probability is already exceeded. Then the impact of a change in the audit rate on the expected value to individual i becomes $\partial EV_i/\partial p=0$, and individuals should be indifferent to a (still) higher audit rate.[10]

The analysis of the fine rate f is similar to that for the audit rate. The critical value f_C of the fine rate is

$$f_C = (1 - ms)/p. \quad (6)$$

When $f_1<f_C<f_2$, subjects who maximize the expected value will vote against an increase in the fine rate when

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[10] More generally, when $\sum_j \partial D_j/\partial p \neq 0$, an increase in the probability will increase the individual's expected payoff if

$$mst\sum_j \partial D_j/\partial p > ft(I_i - D_i) + t(1 - pf)\partial D_i/\partial p,$$

and will decrease the payoff if the inequality is reversed.

the increase does not cross the critical threshold, will vote for f_2 over f_1 if m>(1-pf), and should be indifferent to an increase in the fine rate when f_C is already exceeded. In fact, individual rationality implies that subjects should vote for the minimum probability and fine required to assure compliance.

B. The Role of Social Norms

There are several ways in which the role of social norms can be introduced in the model of self-interested individual behavior. Perhaps the simplest way is suggested by Kahneman and Tversky (1979), who incorporate what they term a **reference point** as a form of social norm in prospect theory. They assume that a loss in utility occurs if individuals do not achieve some reference point, a phenomenon they call loss aversion. The social norm may be achieved by reporting all income and paying all taxes; individuals who declare less than their full income and pay less than their full taxes will suffer a loss in utility.[11]

More formally, assume that each individual i now maximizes EV_i^*, defined as

$$\begin{aligned} EV_i^* &= I_i - tD_i + mst(\textstyle\sum_j D_j) - pft(I_i - D_i) - \gamma_i t(I_i - D_i) \\ &= EV_i - \gamma_i t(I_i - D_i), \end{aligned} \tag{7}$$

where EV_i is defined by equation (1). The individual now is assumed to suffer a psychological loss in expected income proportional to undisclosed taxes, and the coefficient γ_i measures as a fraction how much individual i would pay to avoid the loss associated with each dollar of unreported taxes. Condition (2) for compliance now becomes modified to

$$pf + ms > 1 - \gamma_i, \tag{8}$$

[11] Again, see Gordon (1989), Pommerehne, Hart, and Frey (1994), Erard and Feinstein (1994), Myles and Naylor (1996), and Frey (1992, 1997) for similar notions and alternative approaches.

which is more easily satisfied than condition (2) and is more easily satisfied the larger is γ_i. Note that the optimal decision of the individual remains all-or-none.

Clearly, γ_i, which is a measure of the loss associated with the individual's failure to comply, is likely to be sensitive to the social norm of tax compliance. The stronger is the social norm, the more deviant the behavior of a non-compliant individual becomes, and the more loss the individual feels. Importantly, γ_i is also likely to be sensitive to the voting outcome, especially when the vote is on the level of enforcement. A larger plurality for stricter enforcement will imply a stronger social norm of tax compliance, which in turn will generate greater compliance, independent of the levels of audit and fine rates. However, in the absence of information on the magnitude of γ_i, it is not possible to determine how the optimal voting behavior of the individual will be affected by the presence of γ_i.

C. Summary

These theoretical frameworks suggest a number of specific hypotheses about compliance and voting behavior. Experiments designed to test these hypotheses are discussed in the next section.

III. EXPERIMENTAL DESIGN

The subjects used in the experiments are volunteers drawn from undergraduate classes at the University of Colorado at Boulder, and they are allowed to participate only once in the experiment. The experiments are conducted in the Laboratory for Economics and Psychology (LEAP) at the University of Colorado at Boulder. All entries are made and recorded on computer terminals, and all calculations are performed by the LEAP MicroVAX computer. The experimental design is summarized in Table 1, and a

sample set of instructions is included in the Appendix.[12]

In each session there are eleven subjects. Each session consists of several rounds. At the beginning of a round, each of the eleven subjects is given one of eight incomes between $.25 and $2.75 in $.25 increments, randomly chosen by the computer. The subject must decide how much income to report, and must pay taxes on all reported income at an announced tax rate. The subject pays no taxes on unreported income; however, the subject is told that there is a fixed probability he or she will be audited, at which point all underreporting will be discovered and he or she must pay a penalty equal to a specified multiple of unpaid taxes in that round. An audit is determined by the draw of a chip from a bag that contains a total of 100 red and white chips. If a red chip is drawn, an audit of all subjects occurs; if a white chip is drawn, no audit occurs.[13] The tax rate, the penalty rate, and the audit rate vary across sessions.

After taxes are paid and penalties if any are assessed, the total taxes paid by all subjects are summed to give the "group tax fund". The group tax fund is increased in some sessions by a multiple of 2 (or the "group surplus multiplier") to reflect the consumers' surplus that individuals derive from government provision of a public good; in other sessions the fund is decreased by multiplying it by 1/2, to reflect potential misuse or waste in government expenditures. In both cases the resulting fund is divided equally among the eleven subjects. The net balance for each subject is calculated (the original income less taxes less penalties plus the share of the multiplied group tax fund). A new round then begins, with the subject's balance carried over from the previous round.

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[12] Note that the instructions use "neutral" terminology (e. g., "check" versus "audit") in order to avoid context or framing effects that may bias subject choices unpredictably. The discussion in the text uses "tax" terminology for ease of exposition.

[13] Note that the audit mechanism here is a "random audit rule," in which an individual's chances of detection are independent of his or her actions. Although there is evidence that many tax returns are selected strategically by the Internal Revenue Service (and other tax agencies), there is also some survey evidence by Aitken and Bonneville (1980) that indicates that as many as fifty percent of taxpayers believe that returns are selected randomly.

After 10 rounds (or "part I") are completed at initial values of all fiscal parameters, the value of a single parameter is changed. The subjects then face the new level of the parameter for another 10 rounds in part II of the session. After these rounds are completed, the subjects vote via majority rule with secret ballots on the two alternative levels of the fiscal parameter that they wish to face for the remaining 10 rounds of the session in part III. The value of the parameter that receives a simple majority of the votes is used for these last 10 rounds. The subjects are never told the number of rounds in any part of the session, although they are told that the number of rounds is predetermined. The order in which subjects face the parameters is altered across sessions to avoid order effects.

At the completion of the experiment, the subject keeps a multiple of all the money that he or she has accumulated. Each is guaranteed a minimum of $5 for participating, and subject earnings range from $12 to $22. A session typically lasts less than one hour.

Several sessions are conducted, each with a different set of eleven subjects. In sessions 1 and 2 (or S1 and S2), the subjects vote on the level of the tax rate t (0.2 versus 0.5). In both S1 and S2 the group surplus multiplier is equal to 1/2, so that individuals receive as a group less than the value of their taxes. Subjects face the 20 percent tax rate for the first 10 rounds of S1 and then face the 50 percent tax rate for the next 10 rounds, at which point they vote on the tax rate that they will face for the last 10 rounds of the session. The order in which subjects face the tax rates is reversed in S2. In sessions 3 and 4 (or S3 and S4), the group surplus multiplier equals 2 to reflect the net benefit that may be present in public goods. Subjects again vote on the level of the tax rate (0.2 versus 0.5).

In all remaining sessions the group surplus multiplier equals 2 and the tax rate is 0.2. In S5 and S6 the subjects vote on the level of the probability of detection p (0.02 versus 0.1), while in S7 and S8 they vote on 0.1 versus 0.5. The 2 percent audit rate is chosen to reflect the actual, or "objective" probability of audit, since the Internal Revenue Service annually audits approximately 1 percent of all tax returns in recent years.

However, surveys of taxpayers indicate that the perceived, or "subjective" probability of audit for most taxpayers is considerably higher, averaging about 12 percent and approaching as high as 50 percent for "large" amounts of tax evasion (Aitken and Bonneville, 1980; Westat, Inc., 1980; Yankelovich, Skelly, and White, Inc., 1984). The choice of 10 and 50 percent audit rates reflects these subjective beliefs, and in S7 and S8 these high subjective levels of the audit rate are voted upon. As with the tax rate sessions, the order in which subjects face the different probabilities varies across the paired sessions.[14]

Subjects vote on the fine rate on unpaid taxes f in S9, S10, S11, and S12 (5 versus 25).[15] In S9 and S10 they vote on the fine rate at the low, objective level of the probability (p=0.02). In S11 and S12 the vote occurs at a higher, subjective audit rate (p=0.1).

In S1 to S12 subjects are not allowed to communicate with one another during the experiment. However, two additional sessions are conducted in which subjects are allowed to discuss issues surrounding the vote prior to the vote itself. In these sessions (S13 and S14) subjects vote on the audit rate (0.1 versus 0.5), just as in S7 and S8. However, in S13 and S14 subjects discuss for five minutes the benefits and the costs of greater enforcement after the completion of parts I and II and before the vote is taken; these discussions occur with no direction from the experimenter. These sessions are called "cheap talk" sessions, and are conducted to examine the potential influence of communication on the formation of social norms.

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[14] Recall that the probability of audit is determined by the number of red and white chips placed in a bag. For example, a probability of 2 percent is determined by placing 2 red chips and 98 white chips in the bag, a probability of 10 percent requires 10 red chips and 90 white chips, and so on.

[15] A penalty multiplier of 5 or 25 times unpaid taxes may seem relatively large, since actual penalties for income tax fraud are currently 75 percent of unpaid taxes plus the unpaid taxes. However, it is important to recognize that the discovery of income tax fraud in one year leads to investigation of potential fraud in previous years. The Income Tax Code (Section 6501 (C)) specifies that taxes and penalties may be assessed at any time for fraud; that is, the authority can extend its investigation any number of years in the past when it discovers fraud. If, for example, the investigation is extended for only three years into the past, then the effective penalty multiplier is 5.25 (or 3 x 1.75). Further, when interest penalties and, more significantly, legal costs are also considered, a penalty multiplier far in excess of 5 does not seem unreasonable. Finally, a large penalty multiplier captures the type of catastrophic loss that the detection of evasion often brings.

They are discussed in more detail later.

The theoretical framework of self-interested behavior in section II makes several predictions about individual compliance and voting behavior in these sessions. As implied by condition (2), the theory suggests that a risk-neutral individual who maximizes the expected value of the evasion gamble will optimally report zero income whenever [pf+ms<1], and will report all income when the inequality is reversed. An individual should therefore report zero income in all rounds of S1 to S6 and S9 and S10, in part I of S7 and S11, and in part II of S8 and S12. The individual should report all income in the initial 10 rounds of S8 and S12 and in the second 10 rounds of S7 and S11, or in those rounds in which the audit or the fine rate is at its higher level. These predictions from self-interested behavior are shown in Tables 1 and 2, where an asterisked parameter indicates that compliance with this parameter is predicted to be 100 percent. The existence of a social norm will alter these predictions, by leading to higher compliance in those sessions in which zero compliance is predicted.

There are also implications for individual voting behavior. If there is zero compliance in sessions 1 to 4, as implied by condition (2), then the individual should always vote against the 0.5 tax rate both in S1 and S2; however, if there is in fact some compliance, then the individual should vote for the higher 0.5 tax rate in S3 and S4 because the group surplus multiplier exceeds 1. Further, in S5 and S6 (or in S9 and S10), the higher rate of audit (or fine) does not cross the critical value, so that a rational individual should always vote against the higher audit (or fine) rate. However, in S7, S8, S11, and S12, the critical value of p or of f is surpassed with the higher value of the relevant parameter; with m>1 individuals should vote for the greater enforcement, and compliance after the vote should now be 100 percent in these sessions. These predictions are also indicated in Tables 1 and 2, where an underlined parameter indicates that this parameter is predicted to be chosen under majority rule. As noted earlier, it is not possible to make voting predictions based on social norms in the absence of information on the magnitude of γ_i.

IV. EXPERIMENTAL RESULTS

There are three general issues to be addressed in the results: the effects of tax, audit, and fine rates and the group surplus multiplier on pre-vote compliance; the outcomes of voting on tax, audit, and fine rates; and the effect of voting on subsequent compliance rates. We consider each in turn. The results are summarized in Tables 2 and 3 and in Figures 2 to 5.

A. The Effects of t, f, p, and m on Pre-vote Compliance

Table 2 presents the average compliance rate for each part of each session and also gives the outcome of the vote. The average compliance rate is calculated by dividing the total declared income of all group members by total group income in each round and then averaging across the rounds.

Any linear (or risk-neutral) objective function predicts that individuals will comply either fully or not at all. Figure 2 displays the frequency distribution of the individual compliance rates, for all 28 pre-vote rounds of all 14 sessions. Although there are some observations between the extremes of zero of full compliance, many individuals exhibit all-or-none behavior, as predicted. Overall, 54 percent of the individual decisions are at the extremes of all-or-none, and roughly two-thirds of all decisions are nearly all-or-none (e.g., less than 0.05 or greater than 0.95 compliance).

The theory of self-interested behavior made a number of predictions about pre-vote compliance under each combination of parameters, as summarized in Tables 1 and 2. For the 6 pre-vote sets of rounds for which compliance was predicted to be high (as indicated by an asterisk in Tables 1 and 2), the average compliance rate is 0.74, while for the 22 pre-vote sets of rounds for which compliance was predicted to be low, the average compliance rate is 0.32. Although full and zero compliance is not observed, average compliance is clearly much higher for those sets of rounds where compliance is predicted to be high than for the rounds where zero compliance is predicted.

A more powerful test of the theoretical predictions is obtained in Table 3 and Figure 3 by comparing the magnitude of the change in pre-vote compliance between parts I and II with the magnitude of the change of the aggregate incentive (pf+ms), theoretically derived from equation (2). The dependent variable ΔACRPREVOTE is the difference between the average compliance rates in parts I and II of each session. The independent variable ΔINCENTIVE is the difference in economic incentives in the evasion gamble over these rounds, as measured by the change in (pf+ms). Construction of the dependent variable uses the average compliance rate for the entire group rather than the individual compliance data because the individual decisions are not independent of one another; use of the entire group average compliance rate significantly reduces the number of observations.

As indicated in Table 3, the constant from an ordinary least-squares regression is -0.03, which, as expected, is not significantly different from zero ($t(14)=-1.32$). The coefficient on ΔINCENTIVE equals 0.15, which is significantly different from zero ($t(14)=7.61$, $R^2=0.83$, $p<0.001$) and which indicates that a 1 point increase in the incentive (pf+ms) produces on average a 15 percent increase in compliance. The strong linear relationship in Table 3 and Figure 3 is therefore largely in accord with the aggregate theoretical predictions.

Comparisons between and within sessions in parts I and II describe the more specific effects on pre-vote compliance of changes in tax, audit, and fine rates and in the group surplus multiplier. Consider first the impact of changes in the tax rate t. Self-interested theory predicts that the tax rate should have no effect on compliance (see equation (2)). In parts I and II of S1 to S4, or those four sessions in which the tax rate varies, the effect of the tax rate is in fact negligible: compliance averages 0.28 at the 20 percent tax rate and 0.29 at the 50 percent rate. In contrast, the group surplus multiplier m is predicted to have a positive effect on compliance. In those same sessions, compliance averages only 0.14 for m=1/2, and increases markedly to 0.44 for m=2. Compliance is also predicted to increase with the audit rate p. Across parts I and II of S5

to S14, for a constant tax rate (t=0.2), fine rate (f=5), and group surplus multiplier (m=2), the audit rate p equals 2 percent for 4 sets of rounds, 10 percent for 8 sets of rounds, and 50 percent for 4 sets of rounds. The average compliance rate as a function of the audit rate is displayed in Figure 4. The average compliance rate increases linearly across audit rates of 0.02, 0.1, and 0.5; the intercept, representing a default compliance rate, is 0.25, and the slope is 0.97. Consequently, within the range of audit rates in these sessions, the average compliance rate changes by approximately the same amount as the audit rate. In contrast, if decisions were made strictly according to expected value, then Figure 4 should have been a step function with audit rates 0.02 and 0.1 on the bottom step and 0.5 on the top step, as suggested by Figure 1; the average compliance rate for these two steps is actually 0.27 and 0.73, respectively. Compliance is also predicted to be greater with a larger fine rate f. For f=5 in S9 to S12 compliance is 0.39, while for f=25 in those four sessions it is 0.58, so that increases in the fine rate clearly increase compliance.

B. Voting on Tax, Audit, and Fine Rates

Consider now the voting behavior of the subjects in those sessions in which discussion is not allowed. Recall that an underlined parameter in Tables 1 and 2 indicates that this parameter is predicted under self-interest theory to be chosen by a simple majority vote with secret ballots before part III of the session.

In S1 to S4 individuals vote on the level of the tax rate they face (0.2 versus 0.5). In S1 and S2 the group surplus multiplier is 1/2, while in S3 and S4 the multiplier equals 2. The higher tax rate is voted down in S1 by a margin of 10 to 1, and in S2 by a margin of 7 to 4. If the probability of any individual vote is assumed to equal 0.5, then the probability of observing the S1 vote is 0.11, and the probability of the S2 vote is 0.55 (see Table 2). In contrast, subjects vote in favor of the higher tax rate in S3 and S4, where the group surplus multiplier is 2. The vote in S3 is 7 to 4, and in S4 is 9 to 2. The probabilities of observing these voting outcomes are 0.55 and 0.07, respectively.

In contrast to the results on the tax rate vote, individuals always vote against an increase in the levels of enforcement that they face. In S5 and S6 voters strongly reject a 10 percent audit rate in favor of a 2 percent audit rate (11 to 0 in S5 and 7 to 4 in S6), and in S7 and S8 they reject a 50 percent rule for a 10 percent rule by 8 to 3 and 7 to 4 votes, respectively. They also vote 8 to 3 against an increase in the fine rate from 5 to 25 in S9 and S10 (at p=0.02) and in S11 and S12 (at p=0.1); the votes in these latter two sessions are only 6 to 5.

Note that the predicted vote for the lower tax rate in S3 and S4 in Table 1 is based on the assumption that there will be zero individual compliance in these two sessions. However, given the positive levels of compliance actually observed in these sessions at the 50 percent tax rate (or 0.55 and 0.44), a positive vote for the higher tax rate is implied when the group surplus multiplier exceeds unity. Consequently, our discussion of the predictions of self-interested behavior assumes that individuals should in fact vote for the higher tax rate in these two sessions, and the predicted vote for these two sessions in Table 2 reflects this change. All other predictions are identical across Tables 1 and 2.

Given this revision, consider the accuracy of the predictions. At the individual level, 84 of the 132 votes (or 64 percent) are in the predicted direction, and at the session level 8 of the 12 predictions (or 67 percent) are in the predicted direction. When voting on the tax rate, individuals reject a tax increase when they receive less from government than they pay in taxes (S1 and S2), while they support a tax increase when they receive some consumers' surplus from public good provision (S3 and S4). Both decisions are consistent with the theoretical predictions. When voting on the audit or fine rate, individuals always vote against stricter enforcement. In S5, S6, S9, and S10, voting against increased audit or fine rates is rational because the low levels of enforcement generate low levels of compliance.

The 4 session votes opposite to prediction are all in the direction of less strict enforcement, or lower audit and fine rates in S7, S8, S11, and S12; these 4 sessions account for 27 of the 48 opposite-direction

individual votes. In these 4 sessions the higher levels of the audit or fine rate should tip an individual who maximizes the expected value of the evasion gamble toward full compliance. The individual who responds in this way might well conclude that others will react in the same manner, and thereby vote for the stricter enforcement regime in order to enjoy the benefits of greater public good provisions. Nevertheless, individuals do not vote in this way. Actual compliance rates increase in some rounds of the sessions in which the audit or fine rate is at its higher level, but the average compliance rate does not come close to 100 percent. Based on this observation, individuals may well recognize that the higher audit or fine rate has relatively little impact on group compliance (and so on public good provision), and they vote against the higher level because they do not want to face the potentially larger loss of individual income that may occur with the greater enforcement.

In short, participants are willing to vote for higher taxes as long as they believe that at least some others will comply and as long as the group surplus multiplier is greater than one. However, participants are in no instance willing to vote for stricter enforcement of compliance, even though it is sometimes in their best interests to do so.

It is important to note that cheap talk is able to reverse the voting outcome. All fiscal parameters are identical in S7 and S8 (with no group communication) and in S13 and S14 (with cheap talk). Communication in these latter sessions about the costs and benefits of increased enforcement is able to convince subjects that greater enforcement is in their self-interest, and they respond by voting in favor of higher audit rates. At the individual level, only 7 of the 22 participants in S7 and S8 vote for stricter enforcement, but 16 of the 22 participants so voted in S13 and S14.[16]

[16] The types of comments made by the subjects included statements like "We should vote for the higher number of red chips to make sure that everyone pays," "It's not right if some pay and others don't," and "If everyone pays, we are all better off." Recall that the subjects received no direction from the experimenter in these sessions.

C. The Effect of Voting on Post-vote Compliance: The Role of Social Norms

A notable feature of the results is the effect of voting on the pre-vote versus the post-vote levels of compliance, especially in those sessions in which voting occurs without cheap talk on the enforcement regime (or S5 to S12). It must be emphasized that these comparisons within sessions are made under the same fiscal regime, (e.g., parts I and III of S5, as indicated by italicized average compliance rates in Table 2), so that the only thing that has changed is the subjects' knowledge of the vote. In all cases stricter enforcement is rejected by the subjects, and this rejection generally leads to substantial post-vote declines in compliance, relative to the earlier rounds with identical audit or fine rates. In S5 and S9 in particular, the average compliance rate for part III of each session falls to less than 10 percent, and the compliance rate for the last five rounds in both sessions is virtually zero. The results for the other sessions are not as striking, but there is still a strong general tendency for post-vote compliance to decline relative to pre-vote compliance with the same incentive structure.

Our interpretation of this behavior is that voting seems likely to affect the social norm for tax compliance. The rejection by the group of stricter sanctions sends a signal to each individual that others do not wish to enforce the tax laws. The group vote essentially says to each individual that it is now socially acceptable to evade one's taxes because others will do the same, and post-vote individual noncompliance becomes in some sense justified by the actions of others. Put differently, the vote destroys any social norm for tax compliance that may have existed prior to the vote. Of course, other interpretations of the results are possible, and we discuss these alternative views later.

To explore our interpretation further, we estimate a simple linear regression in which the change in the pre- and post-vote average compliance rate in each session is assumed to depend upon the margin of the vote in favor of greater enforcement. The dependent variable ΔACRVOTE is the difference between the post-vote average compliance rate and pre-vote average compliance rate with the identical incentive

structure. The independent variable PLURALITY is the margin of the vote difference in favor of greater enforcement. As with the earlier estimation, construction of the dependent variable uses the average compliance rate for the entire group rather than the individual compliance data because the individual decisions are not independent of one another. Only the ten sessions S5 to S14 are included in the regression because it is only in these sessions that subjects vote on the enforcement regime. The results are reported in Table 3 and Figure 5.[17]

The results indicate that more votes in favor of stronger enforcement leads to a greater positive change in the average compliance rate, with the estimated slope coefficient on PLURALITY positive (0.02) and highly significant ($t(10)=3.20$, $R^2=0.56$, $p<0.01$) despite the small number of observations. Recall that ΔACRVOTE is the change in pre- and post-vote compliance in a session, holding constant the underlying incentive structure; that is, the fundamentals of the evasion gamble are unchanged in the calculation of ΔACRVOTE, and the only factor that could affect the compliance decisions of individuals is the vote on the enforcement regime. The estimation results show that a stronger group statement in favor of enforcement of the tax laws sends a clear message that compliance is now the social norm, and individuals respond accordingly. An explicit vote for lax enforcement may therefore free some individuals from a social obligation to comply, while a vote for stricter enforcement may establish a norm for compliance.

V. CONCLUSIONS

Why do people pay taxes? Our experimental results suggest the crucial role that social norms play in individual compliance behavior, and show the ways in which these norms can be affected by voting on the fiscal system. In particular, individual behavior appears to be affected by the outcome of the vote when the

[17] For example, for S5 ΔACRVOTE equals -0.23 (or 0.01-0.24), and PLURALITY equals -11 (or 0-11).

vote is on the enforcement regime. Rejection by the group of greater enforcement sends a signal to the individual that noncompliance will be tolerated, and compliance decreases drastically relative to the identical pre-vote fiscal regime. Similarly, compliance increases significantly relative to the same pre-vote parameters when the group votes for greater enforcement.

Our results also suggest that individuals generally, though not always, vote in accordance with their individual payoffs. Individuals vote in favor of a tax increase when the public good provided by their taxes generates some consumer surplus, and vote against an identical tax increase when they receive as a group less from the government than they pay in taxes. Further, in the absence of public discussion, individuals always vote against an increase in the levels of audit rates and penalties imposed on tax evaders, since they apparently believe that noncompliance by others will still be sufficiently high that the individual benefits from greater provision of the public good will not outweigh the larger expected costs of higher sanctions. Cheap talk is able to reverse this result if compliance is in the public interest.

We have attributed our results to the presence of a social norm of tax compliance. However, we must acknowledge that alternative explanations may well be possible, explanations that draw upon recent work in public good provision and that assume self-interested individual behavior. One explanation is based on the work of Palfrey and Rosenthal (1988), who argue that altruism may explain observed levels of contributions in public good experiments.[18] In the context of our framework, their suggestion implies that each individual i maximizes EV_i', defined as

$$\begin{aligned} EV_i' &= I_i - tD_i + mst(\Sigma_j D_j) - pft(I_i - D_i) + \alpha_i(\Sigma_{j \neq i} EV_j) \\ &= EV_i + \alpha_i(\Sigma_{j \neq i} EV_j), \end{aligned} \tag{9}$$

where EV_i is defined by equation (1) and where the parameter α_i incorporates some fraction of everyone else's

[18] See also Margolis (1982), Sugden (1984), and Andreoni (1989) for similar arguments.

expected earnings in the individual's payoff. Non-paternalistic altruism is plausible because both the private and public goods are paid out in cash and so are not in the form of specific commodities for which individuals may have paternalistic preferences. Condition (2) for individual compliance is now modified to

$$pf + ms > 1- \alpha_i(1-s)m, \tag{10}$$

which must hold for individual i to report all income. Obviously, this condition can be satisfied more easily than condition (2) because $\alpha_i(1-s)m$ is greater than zero if altruism is present.

However, despite the importance of altruism in many settings, we do not believe that altruism is a convincing explanation for our results. Although altruism can explain excess compliance, it is difficult to argue that the outcome of a vote on enforcement changes the amount of altruism present among subjects in an experiment. In other words, we think it unlikely that a greater vote plurality increases α_i.

Another possible explanation for higher post-vote levels of compliance relies on the notion that each individual has a positive conjecture about the effect of his or her own contribution on the contributions of others. Cornes and Sandler (1983) construct a model of public good provision in which this exogenous assumption is made by self-interested individuals, and show that this assumption results in a higher level of public good provision than that obtained under a Nash equilibrium.[19] In our context, their reasoning suggests that a vote in favor of greater enforcement reinforces each individual's conjectural variation, and thereby leads to higher post-vote compliance. More precisely, if an individual believes that

$$\partial(\sum_{j \neq i} D_j)/\partial D_i \equiv \upsilon_i > 0 \tag{11}$$

in his or her calculation of the effect of a policy change on EV_i, then a plurality for enforcement may increase the conjectural variation υ_i. If such an exogenous conjecture is present, then the condition for individual

[19] See also Sugden (1985), Bergstrom, Blume, and Varian (1986), and Bagnoli and Lipman (1989).

compliance is modified to

$$pf + ms > 1 - ms\upsilon_i, \tag{12}$$

which is more easily satisfied the greater is υ_i.

Again, however, we do not believe that this explanation is a convincing one for our results. Cornes and Sandler (1983) argue that such an exogenous conjecture ultimately cannot be consistent with actual experience; in fact, they show that υ_i must become negative over time to be consistent with experience. Given the low levels of compliance typically achieved in the initial rounds of each session of our experiments, it is difficult to believe that subjects could maintain a positive conjecture.

We are left with the existence of a social norm (and the related notions of psychic cost, tax morale, moral sentiments, group conformity, social customs, and intrinsic motivation) as the most convincing explanation for our results. Still, our data do not necessarily reject either of these alternative hypotheses, and so our experiments cannot distinguish between social norms, altruism, and conjectural variations as a possible explanation. However, it is not clear that any clear distinction is actually warranted. As emphasized by Elster (1989a, 1989b), to argue for an important role for social norms in individual behavior is not to argue against the importance of individual optimization. Altruism and conjectural variations may be viewed as either generating or reinforcing a social norm, especially when the norm is in the private or public interest. Conversely, it might also be that self-interest, defined either on an individual or a collective basis, underlies the selection of a social norm. In short, individual behavior is likely to be motivated by a variety of factors, including adherence to a social norm and individual optimization, and these factors need to be considered in explaining behavior.

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Table 1
Experimental Design[a] and Theoretical Predictions[b]

	Parameter Value			
Session	Tax Rate t	Audit Rate p	Fine Rate f	Group Surplus Multiplier m
Voting on the Tax Rate				
S1	0.2/0.5	0.02	5	1/2
S2	0.5/0.2	0.02	5	1/2
S3	0.2/0.5	0.02	5	2
S4	0.5/0.2	0.02	5	2
Voting on the Audit Rate				
S5	0.2	0.02/0.1	5	2
S6	0.2	0.1/0.02	5	2
S7	0.2	0.1/0.5*	5	2
S8	0.2	0.5*/0.1	5	2
Voting on the Fine Rate				
S9	0.2	0.02	5/25	2
S10	0.2	0.02	25/5	2
S11	0.2	0.1	5/25*	2
S12	0.2	0.1	25*/5	2
Voting on the Audit Rate with Cheap Talk				
S13	0.2	0.1/0.5*	5	2
S14	0.2	0.5*/0.1	5	2

[a] All sessions consist of 30 rounds divided into three equal parts. In part I of each session, the value of the parameter to be voted upon takes the first of the listed values; in part II the parameter takes the second value; and in part III the parameter has the value chosen by a simple majority vote with secret ballots. The values of the other parameters are not changed during the session.

[b] An underlined parameter indicates that this parameter is predicted under self-interest theory to be chosen by a simple majority vote with secret ballots under part III of the session. Also, an asterisked parameter indicates that the compliance rate with this parameter is predicted by self-interest theory to be 100 percent; all other compliance rates are predicted to be 0 percent.

Table 2
Voting Outcomes and Average Compliance Rates

Session	Outcome[b]	Vote	Voting Probability[c]	Average Compliance Rate[a] Part/Round I/1-10	II/11-20	III/21-30
Voting on the Tax Rate						
S1	t=<u>0.2</u> over 0.5	10 to 1	0.01	*0.11*	0.05	*0.10*
S2	t=<u>0.2</u> over 0.5	7 to 4	0.55	0.14	*0.23*	*0.19*
S3	t=<u>0.5</u> over 0.2	7 to 4	0.55	0.58	*0.55*	*0.43*
S4	t=<u>0.5</u> over 0.2	9 to 2	0.07	*0.41*	0.20	*0.17*
Voting on the Audit Rate						
S5	p=<u>0.02</u> over 0.1	11 to 0	0.001	*0.24*	0.19	*0.01*
S6	p=<u>0.02</u> over 0.1	7 to 4	0.55	0.27	*0.14*	*0.21*
S7	p=0.1 over <u>0.5</u>	8 to 3	0.23	*0.36*	0.64*	*0.36*
S8	p=0.1 over <u>0.5</u>	7 to 4	0.55	0.77*	*0.37*	*0.34*
Voting on the Fine Rate						
S9	f=<u>5</u> over 25	8 to 3	0.23	*0.30*	0.29	*0.10*
S10	f=<u>5</u> over 25	8 to 3	0.23	0.45	*0.25*	*0.17*
S11	f=5 over <u>25</u>	6 to 5	1.0	*0.39*	0.78*	*0.39*
S12	f=5 over <u>25</u>	6 to 5	1.0	0.77*	*0.59*	*0.45*
Voting on the Audit Rate with Cheap Talk						
S13	p=<u>0.5</u> over 0.1	9 to 2	0.07	0.55	*0.84**	*0.94**
S14	p=<u>0.5</u> over 0.1	7 to 4	0.55	*0.66**	0.40	*0.90**

[a] Italicized compliance rates indicate identical parameter values of (t, p, f) for these rounds within the session. Also, an asterisked compliance rate indicates that the compliance rate is predicted by self-interest theory to be 100 percent; all other compliance rates are predicted to be 0 percent. See Table 1.

[b] An underlined parameter indicates that this parameter is predicted under self-interest theory to be chosen by a simple majority vote with secret ballots under part III of the session. See Table 1. Note that the predictions given here for S3 and S4 are conditional on the actual compliance rate, and reflect the fact that actual compliance is substantially higher than zero in parts I and II of the sessions.

[c] The Voting Probability is the probability of observing n or more winning votes in 11 Bernoulli trials, where the probability of any individual vote equals 0.5.

Table 3
Regression Results[a]
(t-statistics in parentheses)

	Dependent Variable	
Independent Variable	ΔACRPREVOTE	ΔACRVOTE
Constant	-0.03 (-1.32)	0.03 (0.70)
ΔINCENTIVE	0.15 (7.61)	-----
PLURALITY	-----	0.02 (3.19)
R^2	0.83	0.56
n	14	10

[a] ΔACRPREVOTE is the difference between the average compliance rates in parts I and II of each session S1 to S14, and ΔINCENTIVE is the difference in economic incentives in the evasion gamble over these rounds, as measured by the change in (pf+ms). ΔACRVOTE is the difference between the post-vote average compliance rate and pre-vote average compliance rate with the identical incentive structure in sessions S5 to S14, and PLURALITY is the margin of the vote difference in favor of greater enforcement in these sessions. See the discussion in the text for further details.

APPENDIX:
SAMPLE INSTRUCTIONS

INSTRUCTIONS

This is an experiment in the economics of decision making under uncertainty. You will have an opportunity to earn a considerable amount of cash through your participation in this experiment. Please follow these instructions carefully, and do no hesitate to raise your hand if you have a question.

You are a member of a group of eleven individuals who will participate in a group decision making experiment. However, you will not be permitted to speak with the other members of the group. In each round of the experiment you, as well as each of the group members, will be given an amount of money that you will use as indicated in the instructions below. At the end of the experiment, you will keep one third of the money that you have accumulated. For example, if at the conclusion of the experiment your balance on the computer is $60.00, then you will receive $20.00. If you withdraw, then you will receive no money other than the $5.00 originally promised you for showing up. If you do remain in the experiment, then you should feel free to try to make as much money as you can.

Part I

The experiment asks you to decide how much to pay into a group fund from money that you receive. Each person will start the experiment with a balance of $0.00. Before each round of the experiment, each of the group members will be given an amount of money between $.25 and $2.75 in $.25 increments, which is randomly chosen by the computer. You will then decide how much of this money to disclose by typing the amount of money you choose to disclose on your computer terminal. You must pay 20 percent of the money you disclose. For example, if you received $2.00 on a round but only disclosed $1.00, then you would pay $.20 to the group fund. After you disclose your money, the computer will calculate your payment and automatically subtract it from your balance. You do not pay on money that you do not disclose, and only you know the true amount of money that you receive at the start of each round. You may disclose any amount of money between zero and the amount of money that you actually receive.

However, after you make your disclosure, you may be randomly chosen for a check on the amount of money that disclosed on that round. We will determine when a check occurs by drawing a chip from a bag on each round. Two red chips and 98 white chips will be placed in a bag. If a red chip is drawn, then everyone is checked by the computer. If a white chip is drawn, then no one is checked. The drawn chip is always returned to the bag before the next round.

Only you will know the result of your own check. If you are checked, then any money that you received but did not disclose on the round will be discovered, and you will pay the 20% of what you received but did not disclose plus an additional four times that amount. In the above example, where you only disclosed $1.00 and not the $2.00 that you received, you must pay $.20 on the $1.00 not disclosed plus $.80, so the total additional payment is $1.00. The computer will calculate your additional payment and subtract it from your balance.

After all payments are made, the total amount originally paid by all eleven group members will be added up. Note that this amount does not include additional payments resulting from shortfalls if you are checked. The original amount will be multiplied by two to form a group fund that will be divided equally among the group. Your share of the group fund will be added to your balance on each round. The computer will keep track of your net balance (the amount of money you are paid less your payments plus your 1/11th share of the group fund). Note that the group fund returns more than the sum of original payments made by members of the group.

We will then proceed to a new round where you will receive a new amount of money. Your will again have to decide how much of the money you receive to disclose. The rate of payment, payment on shortfall if a check occurs, number of chips, and distribution process for the group fund will be the same as in the initial round.

At the end of each part of the experiment, the computer will display the total amount that you have as your net balance. Again, you should feel free to try to make as much money as you can. We will then go on to Part II of the experiment. Your net balance at the end of each part will be carried over to the next part. You will not be told how many rounds there are in each part.

Part II

In Part II of the experiment, the instructions are the same as in Part I except for the following: there will be 10 red chips and 90 white chips in the bag. As in Part I, if a red chip is drawn from the bag, then you must pay the amount that you underpaid the group fund plus four times that amount. In the example, where you only disclosed $1.00 and not the $2.00 that you received, the fund would be underpaid by $.20 and your total additional payment would equal $1.00. Again, at the end of each round the total amount originally paid to the group fund by all eleven members will be added up, multiplied by two, and redistributed back to the members equally.

Part III

In Part III of the experiment you will vote on the number of red chips that will be placed in the bag (2 as in Part I or 10 as in part II). If a majority of the eleven individuals (six or more) votes for 2 red chips, then 2 red chips will be placed in the bag and Part III of the experiment will be subject to all of the instructions as given in Part I above. Alternatively, if a majority of individuals votes for 10 red chips, then 10 red chips will be placed in the bag and Part III will be identical to Part II above.

Before Part I begins, we will begin with four practice trials to familiarize you with the payment, check, and distribution process from the group fund. In these practice trials the process will be carried out as previously described. However, at the end of the four practice trials, your net balance will be set equal to $0.00 and the experiment will begin. The results of the process will then be binding; that is, payments will be made, payments on shortfalls will be assessed, and the group fund will be distributed to the group members, with each member's net balance adjusted accordingly after each round. After all three parts of the experiment are concluded, you will be paid one third of your final net balance.

When you have finished reading these instructions, please place them face down on your desk.