

# Shaming Tax Delinquents

Theory and Evidence from a Field Experiment in the United States\*

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## Abstract

We study shaming as a policy to improve tax debt collection. First, we show that when the tax agency focuses on private welfare and revenues, the optimal policy may involve a mix of financial and shaming penalties. Second, we present evidence from a field experiment with 34,344 tax delinquents who owed half a billion dollars in three U.S. states. We find that increasing the salience of financial and shaming penalties reduces tax delinquency. We also provide suggestive evidence that the effectiveness of these penalties depends on the garnishability of the debtor's income as in the model.

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# 1 Introduction

Shaming penalties are on the rise in America (Kahan and Posner (1999)). Yet, little is known about the rationale for using shaming penalties or whether they work as intended. In this paper, we tackle this question in the context of tax delinquencies, which are the debts incurred by a citizen with the tax administration. A shaming penalty consists of publicly revealing the names of tax debtors. As of January of 2015, twenty-three U.S. states maintained shaming lists on the Internet with the names, addresses, and other information of individuals and businesses with delinquent taxes.<sup>1</sup> Local and national governments around the world use similar policies.<sup>2</sup> First, we present a model showing that, in theory, shaming penalties may be useful even if financial penalties are available. Second, we investigate whether shaming penalties work as intended in practice, exploiting a field experiment with 34,344 tax delinquents who owed about half a billion dollars in three U.S. states.

Tax delinquency is a significant problem. According to the U.S. Department of Treasury, delinquent taxes comprised more than 25 percent of the total U.S. gross tax gap in 2006.<sup>3</sup> These potential tax revenues are arguably the most readily available to tax enforcement agencies. Consequently, these agencies invest substantial resources in designing and implementing policies to reduce tax delinquency. In practice, tax debts are enforced through financial penalties (e.g., an above-market interest rate on the debt amount) and nonfinancial penalties. As a last resort, tax agencies may use other collection tools, such as garnishing wages (i.e., requiring employers to withhold a portion of the debtor's paycheck and send it to the tax agency).

We provide a model in which traditional collection tools can be used in combination with a shaming penalty. The tax agency maximizes social welfare, defined as a weighted average of the present value of tax revenues and private welfare. Taxpayers derive utility from social interactions with peers. Taxpayers are heterogeneous in their liquidity needs, and they must decide whether to pay their tax obligations on time or wait. If they wait, then the tax agency can try to enforce payment via a collection tool, such as wage garnishment. The collection tool is not always effective and may not be equally effective on all debtors (e.g., it is arguably easier to garnish wages than to garnish business income).<sup>4</sup> In addition to using a financial penalty to incentivize taxpayers to

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<sup>1</sup>All these states and their corresponding websites are listed in Table E.1.

<sup>2</sup>For example, online lists of tax delinquents are or have been published by local or national governments in Argentina, Bosnia and Herzegovina, Croatia, El Salvador, Greece, Macedonia, Mexico, Montenegro, Portugal, Serbia, Slovenia, Spain and the United Kingdom. Other countries, such as Canada, Ireland, Italy and New Zealand, published lists of tax evaders in newspapers or newsletters. A notable example is the city of Bangalore, India, which hires drummers as tax collectors to visit the homes of tax evaders and to bang the drum if they refuse to pay.

<sup>3</sup>The treasury reported \$46 billion in underpayment of declared taxes and \$65 billion in enforced and other late payments as of 2006. The tax gap amounts to \$450 billion dollars, which in addition to the previous items includes nonfiling and underreporting. Source: U.S. Department of the Treasury, Internal Revenue Service (2012), "Updated Estimates of the TY 2006 Individual Income Tax Underreporting Gap. Overview," Washington, D.C.: Office of Research, Analysis, and Statistics.

<sup>4</sup>This heterogeneity in income garnishability resembles the heterogeneity in the ability to hide assets in models of tax evasion (Kleven et al (2011)). Indeed, there is an overlap in the institutional factors that drive both heterogeneities: e.g., third-party reporting makes it more difficult to hide assets and easier to garnish them.

pay on time, the tax agency can use a shaming penalty. The shaming penalty makes delinquency less attractive, because it can signal moral and financial untrustworthiness, which can be costly for social interactions.<sup>5</sup>

We show that when individuals are homogeneous with regard to income garnishability, the shaming penalty is inferior to the financial penalty. Intuitively, even though both penalties increase the proportion of individuals who pay earlier, the financial penalty generates additional revenues from the individuals who wait and therefore must pay above-market interest later. Consequently, using the shaming penalty is not optimal.<sup>6</sup>

However, if income garnishability differs across individuals, the shaming penalty has a comparative advantage over the financial penalty. Intuitively, the tax agency would like to give an individual extra time to pay based on her liquidity needs only. However, given a liquidity need, the financial penalty is less effective on debtors with lower income garnishability, because they are less vulnerable to the collection tool. If the tax agency used the financial penalty alone, the decision to pay would depend on income garnishability and thus social welfare could not be at its maximum. Instead, the effectiveness of the shaming penalty does not vary with the income garnishability of the debtor, creating an advantage for the shaming penalty over the financial penalty. We show that, if the collector cares about private welfare in addition to revenues, then the optimal policy involves a combination of shaming and financial penalties.

In practice, whether increasing the salience of shaming penalties with neighbors reduces delinquency, as predicted by the social interactions model, is an empirical question. For example, shaming penalties may conflict with the intrinsic desire to honor tax debts, as suggested by the literature on the ability of extrinsic motivation to crowd-out intrinsic motivation (Bénabou and Tirole (2003)). The effect of shaming penalties on debtors' social interactions could alienate them from new sources of income generation and thus make them less likely to pay.<sup>7</sup> Similarly, the desirability of shaming penalties relies on their effectiveness not depending on the debtor's garnishability, which can be tested empirically. In the second part of the paper, we provide new evidence about these questions with a field experiment.

Our field experiment was based on a sample of 34,344 individuals from the online lists of tax delinquents published by the states of Kansas, Kentucky, and Wisconsin. All subjects were informed that their names had been listed online.<sup>8</sup> These subjects had been delinquents for years, despite numerous attempts and solicitations from the tax agency and high financial penalties. For

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<sup>5</sup>This value of reputation may be instrumental (e.g. a job/business opportunity, a romantic/friendly proposal) or purely affective (social esteem as an hedonic good).

<sup>6</sup>The U.S. regulations on collection of credit card debt explicitly prohibit credit card companies from using shaming penalties (Hunt (2007)). At first sight, this prohibition may seem at odds with the finding that a revenue-maximizing collector would not find it optimal to use shaming penalties. However, in practice, since usury laws limit the interest rates that they can charge, these revenue-maximizing collectors can still find optimal to use shaming penalties.

<sup>7</sup>For instance, Prescott and Rockoff (2011) shows that disclosing the identities of sex offenders may actually have increased recidivism among existing sex offenders.

<sup>8</sup>Tax agencies are required to notify delinquents before disclosing the identity of tax delinquents.

example, subjects in Kentucky, the only state listing when the debts were originated, had been delinquent for an average of 2.7 years and faced annual interest rates of up to 30 percent. The median amount owed by these subjects was \$5,500, and collectively they owed half a billion dollars. Our sample is notable in that tax delinquents were heterogeneous in their debt amounts, which ranged from \$250 to \$150,000.

We sent letters to all 34,344 delinquents. All of these letters were identical except for a few key pieces of information that were randomly assigned to vary the salience of financial and shaming penalties. We then estimated the effects of these random variations on the probability of paying the tax debt by using publicly available data to identify whether the subjects were still listed as delinquent after they received our letters.

The first treatment arm was designed to study a specific mechanism through which the shaming penalty could influence the decision to pay taxes: social interactions. We altered the visibility of recipients' delinquency status toward a subset of their social contacts of the delinquents: their neighbors. We randomized subjects into two treatment groups. In the first treatment group, the delinquent was the only individual in the area who was informed about the online list of delinquents. In the second treatment group, the delinquent's neighbors were also randomly informed of this information, thus making the delinquent feel more monitored by neighbors.

The second treatment arm was designed to create exogenous variation in the knowledge and salience of information about financial penalties. The letter contained either no message about financial penalties or a message summarizing the financial penalties incurred by the debt. It is documented in a variety of settings that subjects systematically underestimate the financial penalties (Stango and Zinman (2011); Frank (2011); Ausubel (1991)) and are inattentive about financial penalties (Karlan et al. (2014)). Under this scenario, the effect of the reminders can provide an estimate of the effect of the financial penalties. Indeed, in an extension of our model in the Appendix, we show that correcting biases about financial penalties can be desirable for the tax agency if it cares enough about private welfare relative to revenues.

We find that increasing the salience of financial and shaming penalties has a statistically and economically significant effect on the probability of leaving the list of delinquents. Ten weeks after mail delivery, our shaming intervention increased the probability of leaving the list by 2.1 percentage points (about 21 percent of the average probability) among delinquents in the first quartile of the debt distribution (\$250–\$2,273). The effect was close to zero and statistically insignificant among individuals in the other three quartiles (\$2,274–\$149,738). This finding illustrates that social incentives may sometimes be difficult to scale up.<sup>9</sup> The evidence suggests that social interaction with neighbors is indeed a channel through which shaming penalties increase tax compliance. We also find that over the same time period our financial reminder increased the probability of repayment by 0.7 percentage points (about 7 percent of the average probability).

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<sup>9</sup>Our intervention, however, exposed delinquents only to neighbors. If we had expose delinquents also to friends, relatives, co-workers, clients and bosses, the effects could have plausibly been larger.

We explore how the effectiveness of shaming and financial penalties varies with wage garnishability, as proxied by the fraction of reported income from wages in the ZIP code. The evidence is consistent with our model: we find that the effect of the financial penalty is stronger in zip codes where more of the reported income comes from wages, but the effect of the shaming penalty does not vary with the fraction of reported income from wages.

We also consider the possibility that the online list of delinquents could affect the behavior of delinquents through a separate channel: delinquents may use the list to compare their own debt amount with the amounts owed by other delinquents. Depending on the direction of the effects, this alternative channel could make the publication of online lists more or less attractive from a social welfare perspective. To address this concern, our experimental letters also included exogenous but non-deceptive information about the delinquent behavior of others. We find that delinquents do not change their behavior in response to information about the behavior of other delinquents. This finding suggests that peer comparison may not be a significant source of side effects from the publication of the list of delinquents.

This paper builds on and relates to the tax enforcement, shaming, and behavioral public finance literatures. A growing body of evidence shows that tax compliance can be increased by policies such as auditing (Slemrod et al. (2001); Almunia and Lopez-Rodriguez (2012)), third-party reporting (Kleven et al. (2011); Kumler, Verhoogen and Frías (2013)), paper trails (Pomeranz (2015)), cross-checking (Bø et al. (2015); Carrillo, Pomeranz, and Singhal (2012); Naritomi (2015)), and satellite detection of unregistered properties (Casaburi and Troiano (2015)). This paper is the first to study shaming as a policy to increase tax compliance.

The topic of the normative desirability of shaming as an enforcement tool has been mostly debated by legal scholars, and the literature is summarized in Posner (2002). For instance, scholars in favor of shaming penalties point out that they may be cost-effective (Kahan (1996)) and may have attractive retributive features (Kahan and Posner (1999)). Scholars who oppose these penalties point out that criminals may be insensitive to shaming (Massaro (1997)) and that shaming may be inconsistent with individual dignity (Nussbaum (2004)). We contribute to the normative debate on shaming penalties by showing that, in the context of tax delinquency, shaming penalties may be desirable because of the ability to better target individuals who are less vulnerable to financial penalties, such as individuals with low income garnishability.<sup>10</sup>

Leveraging social signaling can be a useful instrument to attain public policy goals (Chetty, Saez and Sandor, 2014). The existing evidence on social signaling, however, focuses on pro-social behavior (Gerber, Green and Larimer (2008); Della Vigna et al. (2012); Ali and Lin (2013); Perez-Truglia and Cruces (2013)). Instead, we study the role of social signaling in anti-social behavior, which is most relevant for shaming penalties. To the best of our knowledge, the only existing evidence on the effects of shaming on anti-social behavior is Prescott and Rockoff (2011),

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<sup>10</sup>Relatedly, Benabou and Tirole (2006) study the socially optimal mix of incentives in the context of a public good game. They show that the government should tax social rewards to avoid wasteful competition among charities.

who study sex offender disclosure laws. Using variation in state laws, they find that listing sex offenders does not affect their recidivism, but may have a deterrent effect on first-time offenders. We contribute to this area in two ways. First, we are the first to study the policy of shaming tax delinquents. Second, we provide experimental evidence about a precise channel through which shaming penalties operate (i.e., social interactions).

The paper proceeds as follows. Section 2 lays out the model of tax debt enforcement and discusses the main results. Section 3 introduces the institutional framework, the data sources and the experimental design. Section 4 presents the experimental results. The last section concludes.

## 2 A Model of Tax Delinquency with Financial and Shaming Penalties

### 2.1 Financial Penalty

There is a continuum of taxpayers indexed by subscript  $i$ , who each have a tax responsibility normalized to 1. There are two periods. In the first period, the individual can either pay the tax due ( $x_i = 1$ ) or not pay it ( $x_i = 0$ ) and as a result becoming a tax delinquent. Some individuals are liquidity constrained, so that paying taxes in the first period will not allow them to conduct their lives normally (e.g., eat, keep their businesses alive, pay medical bills). To represent this preference for paying later, we assume that paying in the first period has a cost of  $R_i > 1$ , which is uniformly distributed between  $\underline{R}$  and  $\bar{R}$ .<sup>11</sup> The government does not observe each  $R_i$ , although it knows how this variable is distributed in the population.

The government also prefers revenues in the first period to revenues in the second period. The government's value for receiving payment in the first period is  $R_g > 1$ . For individuals who did not pay in their first period, the effective debt at the second period will be  $F$ , where  $F > 1$  is the size of the financial penalty.<sup>12</sup>

### 2.2 Collection Tool

In this second period, if the individual refuses to pay then the government will try to force the payment using some collection tool. For example, the creditor can force payments of wage earners

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<sup>11</sup>This heterogeneity, of course, depends on a number of factors, such as number and type of credit lines that are still open, ability to borrow money from family and friends, credit history and possibly many other considerations.

<sup>12</sup>We implicitly assume that there is not an ex-ante limit to the size of financial penalties, which turns out to be consistent with a number of facts. For example, states typically exempt the Department of Revenues from complying with usury laws when setting up penalties for tax delinquencies (see for example Revised Code of Washington 19.52.140). Also, the financial penalties typically vary from year to year, with both increases and decreases, which is suggestive of the absence of restrictions.

through wage garnishment.<sup>13</sup> However, the collection tool is imperfect: an individual expects to be immune with probability  $1 - q_i \in [0, 1]$ . As a result, debtor  $i$  expects to pay  $F \cdot q_i$  in the second period. We allow for heterogeneity in  $q_i$ : a proportion  $\theta \in (0, 1)$  of the population expects its income to be “garnishable” with probability  $q_i = \underline{q}$ , and the remaining  $1 - \theta$  expects to be garnishable with probability  $q_i = \bar{q} \geq \underline{q}$ . One easy interpretation is that  $1 - \theta$  is the share of future wage earners, from whom it is easier to garnish income. The government knows the distribution of  $q_i$  but does not observe the  $q_i$  of each individual.<sup>14</sup> For the sake of simplicity, we assume that  $q_i$  is always observable to one’s peers (this assumption does not change the main results, but does make the model considerably more tractable).

## 2.3 Shaming Penalty

Whether the individual is a tax delinquent is observable to peers with probability  $p$ , which is a parameter under the control of the tax agency. The creation of an online list of tax delinquents can be seen as an increase from  $p = 0$  to some  $p > 0$ . Further steps, such as including a search tool or advertising the list of delinquents, can increase  $p$  even further. We assume that increasing  $p$  has no significant costs. This simplifying assumption is for the purposes of clarity: even though adding a cost would lead to a lower use of the policy, it would not change the main qualitative results that follows.

To model how the shaming penalty affects the decision to pay taxes, we take a signaling approach to social interactions (Cole, Mailath and Postlewaite (1992); Bernheim (1994); Bénabou and Tirole (2006, 2011)). According to this framework, individuals may avoid anti-social behavior because that may signal untrustworthiness.<sup>15</sup> In our model, taxpayers interact with peers after deciding whether to pay the tax or not. The individual’s utility from these interactions depends on her peers’ perception about her financial trustworthiness. This value of reputation may be instrumental (e.g., through a higher likelihood of obtaining an invitation, a job/business opportunity, a romantic/friendly proposal) or purely affective (e.g., social esteem as an hedonic good). To represent this, we assume that the utility of the individual is a linear function of her expected financial trustworthiness, from the perspective of her peers:  $-\eta \cdot E[R_i|I_i]$ , where  $I_i$  is the observable information about  $i$  and  $\eta$  is a parameter that scales the value of social interactions. With

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<sup>13</sup>In practice, there are a number of different technologies for enforcing collection so that, for a given individual, the government may want to use the one that is most cost-effective for that particular individual. We abstract from this aspect because it is not relevant for the results that follow.

<sup>14</sup>In practice, even if  $q_i$  was perfectly observable to the collector, the results would stay the same as long as the financial penalty cannot be made dependent on  $q_i$ : e.g., if the tax agency cannot charge a higher interest rate to wage earners than to the self-employed. In practice, fairness concerns may prevent government from discriminating even if they could (as in Mankiw and Weinzierl (2010)). Additionally, benevolent states may not want to give bureaucrats the power to discriminate because that power may be exploited for personal gain (i.e., corruption) or to harass individuals based on their race or political beliefs.

<sup>15</sup>There is a body of evidence consistent with this social signaling approach. For example, Tadelis (2011) provides evidence from a lab experiment that individuals not only exhibit concerns for how they are perceived by others, but they seem strategically rational by anticipating the change in behavior of their opponents.

probability  $p \in [0, 1]$ ,  $I_i$  includes whether the individual paid her taxes in the first period.

The expected utility from social interactions can be re-expressed as:

$$-\eta \left[ p \cdot (1 - x_i) \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1]) + (1 - p) \cdot \frac{R + \bar{R}}{2} \right]$$

The term  $p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])$  is the signaling cost from failing to pay taxes in the first period. That is, increasing the visibility of the decision to pay taxes makes paying on time more attractive, because failing to pay on time can serve as a bad signal of trustworthiness and thus result in worse outcomes in social interactions.<sup>16</sup>

Integrating over the population of individuals, we can obtain the average utility from social interactions:  $-\eta \frac{R + \bar{R}}{2}$ . This value does not depend on  $p$ , meaning that disseminating information about delinquents redistributes utility across taxpayers (i.e., from individuals who did not pay in the first period to individuals who did pay), but does not affect the aggregate utility from social interactions. This convenient property is a direct product of the linearity assumption on the value of social interactions:  $-\eta \cdot E[R_i|I_i]$ .<sup>17</sup>

This model of social interactions assumes that peers care about financial trustworthiness. The results, however, are similar when peers care instead about moral trustworthiness. Appendix C.2 provides an extension of the model where individuals have an additional source of utility from paying on time, related to the pride from doing what is right. Instead of signaling financial trustworthiness, being a delinquent can serve as a signal of moral trustworthiness. The Appendix shows that the main qualitative results that follow are the same under this alternative specification.<sup>18</sup>

## 2.4 The Taxpayer's Problem

Combining the financial and social incentives, the individual solves the following maximization problem:

$$\max_{x_i \in \{0,1\}} U(x_i; R_i), \text{ with}$$

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<sup>16</sup>Gerber et al. (2015) provides some suggestive linking tax compliance to social image. They conducted a survey experiment where respondents were shown information about a hypothetical individual and then were asked how favorably they view this person. They show that respondents view the hypothetical individual less favorably when the individual was described as someone who never votes in presidential elections relative to someone who always votes. Additionally, they show that never voting (vs. always voting) has an effect on social image of similar magnitude than paying taxes late (vs. paying taxes on time). They also show similar effects of other informational treatments, such as recycling (vs. not recycling) and returning books on time (vs. late).

<sup>17</sup>A non-linear specification could make the aggregate utility from social interactions depend on  $p$  either negatively or positively. As a result, relaxing this assumption could make the shaming penalty either more or less desirable. Furthermore, we are ignoring the utility that the peers obtain from the social interactions with taxpayers. Including this utility into the social welfare function would make the shaming penalty more desirable. A higher  $p$  should increase the utility of the peers, because they have more information and thus should get better outcomes from their social interactions. Indeed, the peers could even increase the number of interactions that they choose to have.

<sup>18</sup>In the real world, it is likely that peers care about a combination of both financial and moral trustworthiness.



$$U(x_i; R_i) = -R_i \cdot x_i - (1 - x_i) \cdot [q_i \cdot F + p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])] + \eta \cdot (1 - p) \cdot \frac{\underline{R} + \overline{R}}{2}$$

Let the debtor's optimal response be denoted  $x^*(q, R) = \arg \max_{x \in \{0,1\}} U(x; q, R)$ . This optimal response can be characterized as a threshold decision:

$$x^*(q, R) = 1 \left[ R \leq \hat{R}(q) \right]$$

Assuming all taxpayers are responding like this, we can obtain the rational inference from the perspective of peers:

$$E[R_i|x_i = 1] = \frac{\underline{R} + \hat{R}}{2} \text{ and } E[R_i|x_i = 0] = \frac{\hat{R} + \overline{R}}{2}$$

Replacing that back into the objective function:

$$U(x_i; R_i) = -R_i \cdot x_i - (1 - x_i) \cdot \left[ q_i \cdot F + p \cdot \eta \cdot \frac{\overline{R} - \underline{R}}{2} \right] + (1 - p) \cdot \eta \cdot \frac{\underline{R} + \overline{R}}{2}$$

Thus, individual  $i$  chooses  $x_i = 1$  iff:

$$R_i \leq q_i \cdot F + p \cdot \eta \cdot \frac{\overline{R} - \underline{R}}{2}$$

Which confirms our guess that the optimal response consists of the cutoff decision  $\hat{R}(q) = \max \left\{ \underline{R}, \min \left\{ q \cdot F + p \cdot \eta \cdot \frac{\overline{R} - \underline{R}}{2}, \overline{R} \right\} \right\}$ . As expected, the proportion of individuals paying in the first period is decreasing in the financial penalty,  $F$ , and in the shaming penalty,  $p$ .

## 2.5 The Government's Problem

The government chooses two policies: the financial penalty,  $F$ , and the shaming penalty,  $p$ . Let  $T$  denote the present value of government revenues:

$$T(F, p) = \int \int [x^*(q, R) \cdot R_g + (1 - x^*(q, R)) \cdot q \cdot F] dF(R) dG(q)$$

Recall that  $R_g$  denotes the government's own discount rate. Let  $PW(F, p)$  denote the present value of private welfare of the taxpayers:

$$PW(F, p) = - \int \int [x^*(q, R) \cdot R + (1 - x^*(q, R)) \cdot q \cdot F] dF(R) dG(q)$$

Note that we omit the aggregate utility from social interactions, without loss of generality, because this aggregate utility does not depend on  $F$  or  $p$ . The government maximizes social

welfare, which is a weighted average of the tax revenues and private welfare:

$$\max_{F \geq 1, p \in [0,1]} SW(F, p) = \alpha \cdot T(F, p) + (1 - \alpha) \cdot PW(F, p)$$

Where  $\alpha \in \left[\frac{1}{2}, 1\right]$  measures how much the government values an additional dollar in its own pocket (in the second period) versus in the pockets of the taxpayers (in the second period). In one extreme case,  $\alpha = \frac{1}{2}$ , the government is indifferent between the two. This can be consistent with a government that maximizes social welfare and faces a marginal return from government expenditures that is equal to the marginal return faced by the individual taxpayers. An  $\alpha > \frac{1}{2}$  is a reduced-form representation of a benevolent government that values tax revenues more than private welfare because it uses those revenues to provide the efficient level of a public good, as in Samuelson (1954). The higher the returns to government spending, the higher  $\alpha$  should be. In the other extreme case,  $\alpha = 1$ , the government only cares about maximizing revenues, no matter the cost to the taxpayers. In reality, we expect tax agencies to have preferences somewhere in the middle of the two extreme cases.

## 2.6 Ranking Policies

The followings definitions are useful to rank sets of policies:

**Definition 1.** Given two sets of policies  $A$  and  $B$ , they are interchangeable if for every policy in  $B$  there is a policy in  $A$  such that the government attains the same social welfare and for every policy in  $A$  there is a policy in  $B$  such that the government attains the same social welfare.

**Definition 2.** Given two sets of policies  $A$  and  $B$ ,  $A$  dominates  $B$  if for each policy in  $B$  there is a policy in  $A$  such that the government attains higher social welfare.

For ranking policies, the possibility of corner solutions can introduce an extra layer of complexity. For example, consider an extreme case where  $R_g$  is arbitrarily larger than  $\bar{R}$ : i.e., the government is infinitely impatient. In that case, the shaming penalty could not help the government do better, because the government can attain the first best by simply setting a financial penalty that is arbitrarily large so that everyone pays in the first period. However, this negative results stems entirely from the (simplifying) assumption that  $R$  is bounded. To separate these extreme cases, we introduce the following assumption:

**Assumption 1.** Let  $F^*(\alpha)$  be the set of optimal financial penalties that maximize  $SW(F, p = 0)$  given a set of parameter values  $\left\{\underline{R}, \bar{R}, \underline{q}, \bar{q}, \theta, \eta, R_g\right\}$ . We assume that these parameter values are such as:  $\cup_{\alpha \in \left[\frac{1}{2}, 1\right]} F^*(\alpha) \in \left(\frac{\underline{R}}{\underline{q}}, \frac{\bar{R}}{\bar{q}}\right)$ .

This assumption implies that, if the government only had access to the financial penalty and regardless of the value of  $\alpha$ , the optimal financial penalty would always be an interior solution

(i.e., some individuals pay in the first period and some other individuals pay in the second period). This assumption excludes the possibility of extreme cases like the infinitely-impatient government discussed above.

The next two subsections presents the main results. We want to show that for the shaming penalty to be optimal we need both heterogeneity in  $q_i$  and a low enough  $\alpha$ . For ease of exposition, we present the results in two parts. First, we show that with a homogeneous  $q_i$ , there is no  $\alpha$  such as the shaming penalty is optimal. Second, we show that under a heterogeneous  $q_i$ , the shaming penalty is optimal as long as  $\alpha$  is low enough.

## 2.7 Optimal Penalties under Homogeneity in $q_i$

The following proposition ranks the policies under homogeneity in  $q_i$ :

**Proposition 1.** *If  $\bar{q} = q$ :*

- *If  $\alpha = \frac{1}{2}$ , then the sets of policies  $\{(F, p) : F \geq 0, p = 0\}$  is interchangeable with the set  $\{(F, p) : F \geq 0, p \in (0, 1]\}$ .*

- *If  $\alpha > \frac{1}{2}$ , then the set of policies  $\{(F, p) : F \geq 0, p = 0\}$  dominates  $\{(F, p) : F \geq 0, p \in (0, 1]\}$ .*

*Proof.* See Appendix A.1.

To see the intuition behind this result, it is easier to start with the case  $\alpha = 1$ , when the government wants to maximize revenues. Both the financial and the shaming penalties have the capability of increasing the proportion of individuals who pay in the first period. However, the financial penalty is superior to the shaming penalty because it generates additional revenues from the individuals who do not pay in the first period and therefore must pay above-market interest in the second period. As a result, a revenue-maximizing collector would not rely on shaming penalties if the use of financial penalties is unrestricted. In the other extreme case, when  $\alpha = \frac{1}{2}$ , the government simply wants the group with  $R < R_g$  to pay right away and the group with  $R > R_g$  to pay in the second period. For that, the government can simply choose  $F \cdot q = R_g$  and let the individuals maximize the utility of the government, attaining the first best. Even though combining  $F$  with  $p > 0$  would not harm the government, it could not make it better either. That is, the government is indifferent about whether using  $p > 0$  or  $p = 0$ . As a result, even if the government has an infinitesimal bias in favor of revenues,  $\alpha \in (\frac{1}{2}, 1]$ , the government is strictly better off by not using the shaming penalty.<sup>19</sup>

## 2.8 Optimal Penalties under Heterogeneity in $q_i$

The following proposition ranks the policies when  $q_i$  is heterogeneous:

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<sup>19</sup>It must be noted, however, that if the financial policy was restricted (e.g., because of political constrains or because of laws), then a  $p > 0$  could be optimal even if  $\alpha > \frac{1}{2}$ .

**Proposition 2.** *If  $\bar{q} > \underline{q}$ , there is a unique threshold  $\alpha^* \in (\frac{1}{2}, 1)$  such as:*

- *if  $\alpha \leq \alpha^*$ , then the set of policies  $\{(F, p) : F \geq 0, p \in (0, 1]\}$  dominates  $\{(F, p) : F \geq 0, p = 0\}$ .*
- *if  $\alpha > \alpha^*$ , then the set of policies  $\{(F, p) : F \geq 0, p = 0\}$  dominates  $\{(F, p) : F \geq 0, p \in (0, 1]\}$ .*

*Proof.* See Appendix A.2.

To see the intuition behind this result, it is easier to start with the case  $\alpha = \frac{1}{2}$ . As before, the government simply wants the group with  $R < R_g$  to pay right away and the group with  $R > R_g$  to pay in the second period. However, this is not attainable any more by using just the financial penalty. Intuitively, if the government is only using a financial penalty, there will be two different thresholds,  $\hat{R}_{\underline{q}}$  and  $\hat{R}_{\bar{q}}$ , for individuals with high and low income garnishability. This is because individuals with different garnishability expect to escape the financial penalty with different probabilities and thus face different probabilities of actually having to pay the financial penalties. As a result, the government cannot attain the first best.

Consider for example setting the financial penalty such as  $\hat{R}_{\underline{q}} > R_g > \hat{R}_{\bar{q}}$ . The government would prefer that the individuals with  $R_i \in (R_g, \hat{R}_{\bar{q}})$  pay in the second period, but those individuals are paying in the first period instead. The government would also prefer that the individuals with  $R_i \in (\hat{R}_{\underline{q}}, R_g)$  pay in the first period, but those individuals are paying in the second period instead. By decreasing or increasing  $F$ , the government cannot solve one of the problems without aggravating the other one. Instead, were the government using the shaming penalty alone, there would be a single threshold and the government could attain the first best solution  $\hat{R} = R_g$  (in practice, the value of social interactions is bounded so the optimal policy would still involve a combination of financial and shaming penalties).

The shaming penalty is still inferior in terms of producing tax revenues, as in the case of homogeneous  $q_i$ . Thus, when  $\alpha > \frac{1}{2}$  the government faces a trade-off between the advantages and disadvantages of the shaming penalty. As a result, the optimality of the shaming penalty depends on the value of  $\alpha$ : the shaming penalty will be desirable if and only if  $\alpha$  is low enough, that is, if the government cares enough about private welfare relative to tax revenues.

The comparative advantage of the shaming penalty is that its effectiveness does not depend on income garnishability ( $q_i$ ). This property would be violated if the value of social interactions ( $\eta_i$ ) were heterogeneous and correlated with income garnishability ( $q_i$ ). We believe that it is plausible that income garnishability is more related to the ability to escape the tax burden than to the value social interaction. Even assuming that garnishability were related to social interactions, this would not necessarily weaken our result. On the one hand, if the effectiveness of the shaming penalty were increasing in income garnishability (i.e.,  $\eta_i$  positively correlated to  $q_i$ ), that would diminish the comparative advantage of the shaming penalty relative to the financial penalty, possibly even to the point of making the shaming penalty no longer optimal. On the other hand, if the effectiveness of the shaming penalty were decreasing in income garnishability (i.e.,  $\eta_i$  negatively correlated to  $q_i$ ), the comparative advantage of the shaming penalty would be even greater. The latter case

is arguably more likely than the former. Consider the case of self-employed professions such as lawyers or doctors, with arguably lower income garnishability. Relative to wage earners, the self-employed may value their social image more because this social image is important for building relationships with clients and suppliers.

The above discussion implies that our main result would change only if higher garnishability were to reduce the effectiveness of the shaming penalties at a higher rate than reducing the effectiveness of the financial penalties. Consistent with our model, our conversations with professionals in this sector reveal that the ability to comparatively better target individuals with lower garnishability is perceived as a key advantage of the shaming penalty over the financial penalty. For example, in a press release from November 3, 2009, the Illinois Department of Revenue declared that: “The threat of disclosure and the negative publicity of being included in this list are particularly effective with self-employed professionals and cash businesses where some routine collection tools, such as the ability to garnish wages, may not work.” The field experiment presented below tries to provide some evidence about the relationship between the effectiveness of penalties and income garnishability.

## **3 Design of the Field Experiment**

### **3.1 Motivation**

The model postulates that shaming lists can reduce tax delinquency through social interaction (for instance, with neighbors). However, whether increasing the salience of shaming penalties with neighbors reduces delinquency, as in the social interactions model, is an empirical question. Additionally, although our model suggests that the shaming penalty reduces tax delinquency, we also discuss deviations from the model that could make the shaming penalty ineffective or even counterproductive (e.g., crowding out intrinsic motivation). Similarly, in our model, the desirability of shaming penalties relies on their independence from the debtor’s garnishability, which can be tested empirically. We designed a field experiment to study these questions empirically.

### **3.2 Institutional Context, Data Sources and Subject Pool**

At the time of our field experiment, twenty-three of the United States had published online lists of tax delinquents (see a full list in Table E.1). From these states, we selected our experimental states based on two criteria. First, the minimum debt amount had to be low enough to include a significant number of individuals, as opposed to states where only the very top delinquents were listed (e.g., the top 100 delinquents). Second, the online list had to include the full addresses of the delinquents, which we needed to contact them by mail.<sup>20</sup> The resulting experimental subjects

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<sup>20</sup>For example, in Georgia every delinquent is listed online, but their full addresses are not listed.

were individuals listed in the states of Kentucky, Kansas, and Wisconsin.

We downloaded the online lists of individuals for these three states on May 26, 2014. At that point, the online lists included 57,744 individual tax delinquents who owed \$968,764,474 to departments of revenue in the three states. We ex-ante excluded the following individuals from the subject pool: (i) individuals with unreliable address information; (ii) records with full names corresponding to multiple addresses in the same state, because we could not confirm whether they corresponded to the same or different individuals; (iii) individuals living in Wisconsin whose debts were not for state income tax; (iv) individuals who moved out of the state; and (v) individuals with debts exceeding \$150,000. We sent letters to a sample of 34,334 delinquents.<sup>21</sup>

The publication of tax delinquents' names and addresses is regulated by state legislation. In these three states, tax agencies are required by law to notify taxpayers and to allow time for payment before they are publicly listed.<sup>22</sup> It is thus reasonable to assume that most subjects knew that they would be included in these online lists of delinquents. The lists are updated daily to reflect revisions to the original debt, new debts, interest, penalties, and fees. Some differences exist in the way the program is implemented across the three states, as discussed in more detail in Appendix E. The main difference among the states is the debt threshold for listing the delinquent:<sup>23</sup> \$250 in Kentucky, \$2,500 in Kansas, and \$5,000 in Wisconsin.<sup>24</sup> In our subject pool, 52.7 percent of subjects are from Kentucky, 25.4 percent are from Kansas, and the remaining 21.9 percent are from Wisconsin.

Our subjects had been delinquents for years, despite numerous attempts and solicitations from the tax agency and high financial penalties. For example, subjects in Kentucky (the only state publishing the exact date when the debt was originated) had been delinquent for an average of 2.7 years (median of 2 years). In addition to other fees, the amounts owed by our subjects were subject to annual interest rates of around 30 percent, 12 percent, and 18 percent in Kentucky, Kansas, and Wisconsin, respectively. The mean initial debt amount (i.e., as of May 26, 2014) was

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<sup>21</sup>About 150 letters were returned to us because undeliverable. The results are virtually unchanged if we exclude ex-post these individuals.

<sup>22</sup>The consent of the taxpayers, however, is not needed before the publication. The websites contain an e-mail address and a phone number that exposed tax delinquents can contact to pay off their debts and be removed from the lists.

<sup>23</sup>The existence of these thresholds suggests that an alternative research design could exploit the exogenous variation generated by these discontinuities. A first limitation of such a design would be that delinquents right above the threshold receive an additional letter from the state, that not only informs them about the shaming policy, but also reminds them about their tax debt and other information unrelated to the shaming policy. Therefore, such a design would not be ideal to study the effect of the shaming policies. A second limitation of such a design would be that those results would not necessarily be externally valid to delinquents owing amounts that are farther away from the threshold. Indeed, our experimental results suggest that effects of shaming may vary sharply with the size of the debt.

<sup>24</sup>In Wisconsin, the public list at its inception in 2006 included delinquent taxpayers who owed more than more than \$25,000 while, on January 2008, the threshold was lowered at \$5,000. The Communications Officer of the Wisconsin Department of Revenue declared that the policy had been highly successful at increasing collected tax revenues, as one of the reasons to explain the lowering of the threshold (Communications Officer Press Release December 26, 2007, Wisconsin Department of Revenue).

\$13,000, and the median amount was \$5,500. Using auxiliary data on the distribution of gender and ethnicity by first and last names, we estimate that our sample of delinquents is 35 percent female and 71 percent white, although no demographic information was officially provided by the online lists. These figures imply an under-representation of women and whites, relative to the state averages.<sup>25</sup> We do not have data on the subjects' incomes, although the fact that tax debts originated primarily from state income tax<sup>26</sup> suggests that the income of these individuals is above the tax-exempted level. Thus, a small debt amount does not necessarily imply that the debtor is poor.

To the best of our knowledge, this is the first time that these administrative data on delinquents have been used. To provide more background information about this sample, Appendix D.1 presents ZIP code-level regression analysis of the correlates of the tax delinquency rate. For example, the delinquency rate increases with our proxy for income garnishability (i.e., the share of wage income), which is consistent with the idea that individuals with more garnishable income have more financial incentives to pay. The tax delinquent rate is also higher in places where individuals take advantage of tax evasion opportunities, as proxied by the bunching measure provided by Chetty et al. (2013). This correlation suggests that individuals who take advantage of opportunities to evade reporting income may also take advantage of opportunities to evade tax collection. The tax delinquency rate also decreases with social capital, which is consistent with the view that social responsibility may be important for tax compliance (Putnam (2001); Casaburi and Troiano (2014)).<sup>27</sup> Finally, the tax delinquency rate is uncorrelated to the mean income in the ZIP code, which underscores our previous point that our sample of delinquents is not limited to a particular income group.

### 3.3 Experimental Design

The experimental design consists of sending letters that were identical except for a few key pieces of information that were randomly assigned with the goal of varying the salience of the shaming and financial penalties. After the letters were sent, we measured how each piece of information affected the probability that the name of the delinquent appeared in the online public lists. Our experimental design compares individuals who received a given type of treatment letter with those who received the control letter for that specific treatment. Our experimental design does not

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<sup>25</sup>In comparison, the frequency of females and whites in these three states are respectively 50 percent and 85 percent.

<sup>26</sup>In Kansas, only individuals who owe state income tax debts are listed. In Kentucky, the debts can be originated with non-income taxes, but it is not specified in the list. Even though there are no public statistics, private communications suggest that most delinquents from Kansas on the list had debts originating from state income tax. In Wisconsin, the list includes delinquents for both income and a variety of other taxes (e.g., estate tax). To improve the similarity across states, we ex ante excluded from the subject pool delinquents with debts not originated from state income tax.

<sup>27</sup>On the relationship between cultural norms and tax compliance see also: Torgler (2003); Spicer and Becker (1980) and Alm, Jackson, and McKee (1992).

compare individuals who did receive a letter with those who did not, because of the difficulties to determine the exact mechanism through which the letter can affect behavior.<sup>28</sup> Additionally, as mentioned previously, the respective revenue departments had already notified all our subjects that they were going to be included in the list of delinquents, so it is plausible to assume that informing them about the existence of the list would not affect their behavior.

We provide in Appendix B a sample letter and its envelope. Both the envelope and the letter included a logo of the Department of Economics at the University of Michigan to increase the legitimacy of the communication, as perceived by the recipient. The first paragraph explained that the letter was part of a research study about tax delinquency. The letter also included a table, which was designed to get the recipient’s attention. The table listed ten tax delinquents in the recipient’s geographic area, including the recipient. All delinquents were identified by full name and in ascending order by debt amount, with the recipient’s row highlighted. The second paragraph identified the corresponding state’s revenue department as the data source, with an explanation that “Names, addresses and other details about tax delinquents are freely available to see for anyone with access to the Internet. You can search for individual debtors by first and last name, or by ZIP code, by visiting the following web-page (...).” The second page of the letter contained a screenshot of this online search tool (for illustration purposes) and some information (i.e., the researchers’ contact information, a link to the project’s website, and a link to an online survey) to convey the legitimacy of the letter.<sup>29</sup>

The effects of shaming and financial penalties were measured by cross-randomizing two key pieces of information. The first treatment was designed to alter the visibility of the recipient’s delinquency status with respect to the neighbors. We followed the design in Perez-Truglia and Cruces (2013) by randomizing a lower visibility message and a higher visibility message, which was prominently displayed in a box located right below the list of contributors:

**Lower Visibility:** “Your household was the only household randomly chosen from your area to receive a letter of this type.”

**Higher Visibility:** “Your household and other households in your area were randomly chosen to receive a letter of this type.”

The effects of shaming are identified by comparing the behavior of individuals receiving the Higher Visibility statement to those receiving the Lower Visibility statement. Households were told explicitly that the selection process was random. Neither of these messages was deceptive;

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<sup>28</sup>For instance, a letter can both act as a reminder and make the recipient feel observed or monitored, and a design that relied on such a comparison would not allow to keep those confounding effects constant.

<sup>29</sup>The website provided basic information about the research project, and contact information to reach the research team. The main purpose of the website was to provide contextual information about our study to interested subjects, and to dissipate any doubts about its legitimacy, emphasizing its academic and non-partisan nature. Although the website provided some general information about the main research objective, to avoid the contamination of the experimental results, it did not provide any details about the precise hypotheses to be tested, nor about the existence of several different treatment types. We don’t report the survey results because of its extremely low response rate (0.2 percent), but these results are available upon request.



we divided the U.S. territory into small areas by 9-digit ZIP codes and then, consistent with the message, we randomized whether one or more individuals in the area received a letter.<sup>30</sup> The only difference between the Higher Visibility and Lower Visibility groups was that recipients in the latter group were informed that their neighbors also received information about how to access the online list of tax delinquents. The purpose of this notification was to make the recipients feel more monitored by their neighbors.

It must be noted that our shaming intervention increases the visibility of an individual's delinquency status only among a limited group of individuals with whom the delinquent may interact; namely, the delinquent's neighbors. In practice, individuals probably care about their neighbors' opinions to a limited extent, which can limit the potential effects of our shaming intervention, especially among individuals owing higher debt amounts. For example, if delinquents value their neighbors' esteem at \$100 maximum, then we expect our shaming intervention to be an effective deterrent for an individual who owes \$1,000, for which the dollar value of the shaming penalty would be 10% of the amount owed. However, we expect our shaming intervention to be largely ineffective for an individual who owes \$1,000,000, because the shaming penalty would comprise just 0.01% of the amount owed.

Indeed, some researchers seem unpersuaded by the evidence on social signaling. They believe that social incentives are effective only when stakes are low (Levitt and List, 2007). The existing experimental studies on social pressure usually involve low stakes. For instance, DellaVigna et al. (2015) estimate that the social signaling value of voting is between \$5 and \$15. DellaVigna et al. (2012) estimate that the social signaling value of charitable giving to a door-to-door solicitor is between \$1.40 and \$3.80. As a proportion of the average cost of voting and giving, these values of social signaling are significant. However, it is unclear how these social signaling values would scale up with higher stakes. Evidence from lab experiments suggests that stakes do matter for social preferences. For example, although respondents in the ultimatum game often reject unfair offers, they rarely reject them when the stakes are very high (Andersen et al., 2011). Our simple signaling model predicts that stakes should matter: the effectiveness of the shaming penalty should be inversely proportional to the size of the debt amount (for details see Appendix C.3). However, this property may change under a different specification of the value of social interactions. Thus, how the effects of shaming scale up with the debt amount is ultimately an empirical question. A remarkable advantage of our empirical setting is that amounts owed by our subjects vary extensively, from \$250 to about \$150,000, allowing us to measure how social incentives scale up.

To measure the effect of financial penalties, the ideal experiment would consist of randomizing the individual's interest rate. Because randomizing the financial penalties was not feasible, we

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<sup>30</sup>Note that the probability of assignment to the message is conditional on the number of delinquents in the area, which we always include as a control variable in the regressions. Also, we chose the number of areas to be assigned to each group as to generate roughly the same number of letters in each of the two treatment groups.

instead created exogenous variation in the knowledge and salience of this information by altering the letter as follows. The letter included or excluded a message with a brief summary of the interest rates applied to the recipient’s debt amounts. To make this information more salient, the message was printed in boldface, below the snapshot of the search tool. The effects of this financial summary was identified by comparing the behavior of individuals who received a letter with this reminder to those who received a letter without this summary. For example, Wisconsin recipients received the following message: “This website also includes information about penalties. For instance, your tax debt is subject to, among other penalties, an annual interest rate of 18%.” The corresponding interest rates were 12% in Kansas and 30% in Kentucky.<sup>31</sup> In comparison, the U.S. average for the annual interest rate on a credit card was 14% (Source: CreditCards.com, accessed on January 5, 2015).<sup>32</sup> If, on average, delinquents underestimated or ignored the size of the financial penalties, then our message about financial penalties could make the recipients pay sooner. Indeed, there is evidence that people underestimate interest rates in many markets (Ausubel (1991); Stango and Zinman (2011); Frank (2011)) and that they are inattentive about interest rates (Karlan et al. (2014)).

Last, we anticipated that publishing the list of tax delinquents might affect a delinquent’s decision to pay tax debt through a separate channel: the information contained in the list might change the delinquent’s perception about the delinquent behavior of others. For instance, individuals have been documented to behave more pro-socially when they perceive that others behave pro-socially (e.g., Frey and Meier, 2004). To test this hypothesis, we created some exogenous variation in the recipient’s perception of the delinquent amounts owed by others. To attain that goal without being deceptive, we followed the methodology from Perez-Truglia and Cruces (2013). In the table of delinquents from the recipient’s area of residence, we included nine delinquents that were randomly chosen from the twenty delinquents that were geographically closest to the recipient. This random selection used a parameter that gave higher or lower priority to delinquents, depending on their debt amounts,<sup>33</sup> thus generating exogenous variation in the mean amount owed by the individuals as shown in the table.<sup>34</sup>

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<sup>31</sup>More precisely, the messages were “This website also includes information about penalties. For instance, your tax debt is subject to, among other penalties, an annual interest rate of 12%” in Kansas and “This website also includes information about penalties. For instance, your tax debt is subject to, among other penalties, an annual interest rate of 4% and a monthly late payment fee of 2%” in Kentucky.

<sup>32</sup>Individuals using less conventional sources of credit, which presumably would be the most liquidity-constrained individuals, can pay several times this rate; for example, the average annual interest rate for payday loans is estimated to be over 100% (Stegman (2007)).

<sup>33</sup>For each recipient, we identified the twenty closest delinquents. The nine neighbors to be shown in the table were selected by first ordering the list of twenty closest delinquents according to a composite index, and then selecting the top nine delinquents from the ordered list. This composite index was the sum of a random term plus the debt amount of the individual, weighted by the weighting parameter. Choosing higher values of that parameter would result in a table with nine delinquents with higher debt amount. Thus, by randomly assigning the weighting parameter we generated exogenous variation in the distribution of amounts owed by the delinquents included in the table.

<sup>34</sup>The independent variable of interest will not be the actual mean amount shown in the list, but rather the difference between that amount and the amount that would have resulted from using some baseline parameter.

### 3.4 Outcome of Interest and Econometric Specification

Once an individual is listed, the main way to get off the list is to pay upfront the entire amount or enter a payment plan for the full amount and pay the first installment. According to the instructions for the delinquents shown on the websites of tax delinquents, and consistent with the statutory evidence discussed in Appendix E, paying the difference between the debt and the threshold to get off the list is not possible.<sup>35</sup>

Our main dependent variable is a dummy variable for whether a delinquent is off the list at a given point in time.<sup>36</sup> We interpret changes in this variable as a indication of either paying back the debt in full or agreeing to a repayment plan for the full amount, although we do not have data on the relative composition of these two.<sup>37</sup> The baseline econometric specification is given by:

$$Y_i^t = \alpha + \sum_{j=1}^4 \beta_j Q_i^j M_i + \sum_{j=1}^4 \gamma_j Q_i^j F_i + \sum_{j=1}^4 \phi_j Q_i^j + \delta X_i + \epsilon_i \quad (1)$$

The outcome variable ( $Y_i^t$ ) is a dummy variable that takes the value 100 if the individual has left the list  $t$  weeks after the letters were sent. The dummy for shaming penalty ( $M_i$ ) takes the value 0 if the recipient was the only one in the area chosen to receive a letter and 1 if others in the area were chosen to receive a letter too. The dummy for financial penalty ( $F_i$ ) takes the value 1 if the letter included information about the financial penalties and 0 if not. Note that, to accommodate the fact that the shaming penalty may be less effective for higher delinquent amounts, we allow the treatment effects to differ with each quartile of the initial debt amount ( $\{Q_i^j\}_{j=1}^4$ ). Finally,  $X_i$  is a vector of controls, including variables such as state dummies and the initial debt amount.

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As a result, the independent variable consists purely of exogenous variation created by random assignment of the weighting parameter. For methodological details, see Perez-Truglia and Cruces (2013).

<sup>35</sup>In conversations with them, the tax agencies confirmed this claim. Furthermore, Appendix D.2 provides some related empirical evidence. It should also be noted that, even if there was a way of paying to be taken below the threshold, that would only result in being taken off the list for a short time period, because the financial penalties would accumulate and take the total amount back above the threshold. It is possible, however, to pay new debts on time in order to avoid them from being accumulated with the amount listed from previous debts.

<sup>36</sup>We must note that it is not uncommon for delinquents to leave the list to then re-enter a few months later, after contracting new tax debt with the government. For example, 9.3 percent of our subjects leave the list temporarily during the 37 weeks after the sample began (May 26).

<sup>37</sup>There are some alternative ways to get off the list, such as due to death, bankruptcy or surpassing the 10-year limit since the debt was originated. Even though we do not have direct data on the share of individuals leaving the list due to these reasons, conversations with officials of the tax agency indicate that a very small minority leaves the list through these mechanisms. Appendix E discusses in more detail the specific laws and requirements. Additionally, this appendix provides graphs with the week-by-week evolution of this outcome variable in the subject pool.

## 4 Results

### 4.1 Effects of Financial and Shaming Penalties

As discussed in the previous section, some of the information in the letter was randomly assigned. Randomization was conducted so that all members of the same household were assigned to the same treatment group. We randomized the financial reminder at the household level and the shaming sub-treatments at the 9-digit ZIP code (ZIP-9) level, in both cases stratifying at the ZIP-3 level (see the previous section for additional details). In Table 1, we present some descriptive statistics across treatment groups to check that the treatment assignment was balanced in observable (pre-treatment) characteristics. The main outcomes from this table are the initial debt amount and its logarithm. Additionally, we included other variables that we did not observe directly but could impute from secondary data sources (e.g., gender and ethnicity).<sup>38</sup> This table includes the p-value of a test of the null hypothesis that the average characteristics are the same across all seven treatment groups. As expected from random assignment, the individuals were balanced on pre-treatment characteristics, with the exception of a small difference in the percentage of African-Americans.<sup>39</sup> As an additional robustness check, we present falsification tests by estimating the “effects” of the treatments on the main pre-treatment outcome: the initial debt amount.

Figure 1 presents the effects of the shaming and financial penalties on the probability of leaving the list ten weeks after the letters were sent, broken down by quartiles of the initial debt amount, estimated as in equation (1).<sup>40</sup> Both financial and shaming penalties increased the probability of leaving the list, although they differed in how their effects varied with the debt amounts. As a falsification test, in Figure 2, we plot the same average treatment effects of the previous figure, but on the logarithm of the initial debt amount, three weeks before the experimental letters were delivered. As expected, none of the “fake” treatment effects were statistically significant for any quartile of the debt distribution.<sup>41</sup>

We first considered the effects of the shaming penalty, shown in Figure 1.a. For the lowest quartile (\$250–\$2,273), the shaming penalty was associated with a 2.1 percentage point increase in the share of individuals leaving the list. This effect is statistically significant at the 1% level, and compared to the baseline rate of 10 percentage points, suggests an economically significant effect of nearly 21 percent of the baseline rate. The effect of the shaming penalty, however, was estimated

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<sup>38</sup>Data for these characteristics is imputed using data on the joint distribution of first names and gender (several sources, including data from the U.S. Census Bureau), and the joint distribution of last names and ethnicities (data from U.S. Census Bureau).

<sup>39</sup>The null hypothesis of equality is rejected statistically for one of the seven individual characteristics, the percentage of African-Americans, albeit the size of the difference is small and one rejection may be due to chance given the the large number of combinations between treatment groups and individual characteristics. In any case, we always control for the percent of African-Americans in the analysis, but the results are similar if we do not control for this variable.

<sup>40</sup>The results choosing other time periods close to 10 weeks are qualitatively similar and available upon request.

<sup>41</sup>For reference, Appendix D shows these estimates along with the corresponding baseline rates.

to be very close to zero and statistically insignificant for the other three quartiles of the initial debt amount. The finding that the effect of the shaming penalty declines with the debt amount is consistent with the possibility of an upper bound on the underlying value of social interactions with neighbors. In the previous section we discussed an extension of our model that predicts that stakes should matter: the effectiveness of the shaming penalty is predicted to be inversely proportional to the size of the debt amount (for details see Appendix C.3).<sup>42</sup> This evidence suggests that scaling up social incentives may be difficult. However, if instead of increasing visibility among a few neighbors, we had increased visibility among a larger group of individuals (including relatives, friends, etc.), then the shaming penalty might have also had a significant effect on individuals owing larger amounts. Additionally, the fact that shaming penalties seem more effective for smaller debts is consistent with the perception of tax practitioners, for example as mentioned in press releases.<sup>43</sup>

Our estimates intend to measure the mechanisms through which the publication of the list of tax delinquents may affect tax compliance. Thus, one should not interpret that the magnitude of the effects of our shaming intervention is intended to proxy for the effects of the publication of tax delinquents. Furthermore, we do not recommend that tax agencies send letters like the ones we sent (publishing lists of tax delinquents is probably much more cost-effective). There are many reasons why the effects of our shaming intervention provide a very conservative lower bound to potential effectiveness of publishing lists of tax delinquents. First, our treatment increased the visibility of the recipient's delinquency status among neighbors. For most individuals, however, the most valuable social interactions are not with neighbors but with relatives, friends, coworkers, bosses, and clients, a majority of whom are not neighbors. If our shaming intervention had instead increased the visibility to these peers, then the estimated effects would probably have been much greater. Second, as previously mentioned, the tax agencies in all three experimental states must send letters to allow individuals and businesses the opportunity to resolve their debt prior to the posting. Both press releases from the tax agencies and private communications between our research team and these agencies suggest that a significant fraction of the response to the shaming penalty happens when the warning letter is received.<sup>44</sup> Our subject pool comprised only those individuals who received such notification and did not respond, which by construction is a subset of individuals who are selected against caring about social interactions. Thus, our estimates

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<sup>42</sup>We are aware that there may be other explanations for this finding. For instance, it's possible that people who owe larger amounts have unobservable characteristics, such as dishonesty or selfishness, that are associated both with having big debts and being less responsive to shaming penalties. However, we find it reassuring that the effect of shaming penalties changes with the debt amount but not the effect of financial penalties.

<sup>43</sup>For instance, the Vermont deputy tax commissioner has declared: "When you are talking about large debts, you do tend to get some people who just don't care. It's just not worth playing off their \$450,000 or \$1.2 million debt. Down on the lower levels, you get more of the Average Joe who is concerned" (Source: "To Collect Revenue, Some States Put Tax Scofflaws in Virtual 'Stocks'," Stateline, May 28, 2015).

<sup>44</sup>For instance, the chairman of the California Board of Equalization declared that when the list was introduced in California 41 percent of those who were about to appear on the list made payment arrangements before their names were published (Source: Stateline, May 28, 2015). Additionally the spokeswoman for the Illinois Department of Revenue declared that "The real success of the program is before the postings are made" (Source: CNN Money, December 23, 2005).

arguably provide a lower bound on the response to shaming incentives. Last, a significant share of the individuals may not have read the letter, so the average effect of our shaming intervention on those who actually read the letter could be a multiple of the estimates reported in this paper.<sup>45</sup>

Figure 1.b shows the effects of the financial penalty. Consistent with financial penalties being proportional to the amount owed, the effects of financial penalties were roughly similar for individuals who owed different amounts. For the first three income quartiles, the financial penalty increased the probability of leaving the list by about 1 percentage point (or 10 percent of the baseline rate). Although individually these three coefficients are statistically insignificant, their average is significant: an average effect of 0.98, with a p-value of 0.034. The effect of the financial penalty seems to be close to zero and statistically insignificant for the top quartile (\$13,347–\$150,000). The effect across all quartiles pooled together is statistically significant. Below we show that this pattern plausibly arises because of differences among states rather than because of differences in the debt amount.

The finding that individuals reacted significantly to reminders about financial penalties implies that they subsequently made more informed choices. To illustrate the potential applications of our theoretical framework, in Appendix C.1 we provide an extension of our model that gives the government an extra policy, consisting of disseminating unbiased information about financial penalties. The model shows that this policy can be optimal for the government when the agency cares about private welfare rather than just tax revenues. Intuitively, a revenue-maximizer agency could actually benefit from uninformed delinquents by being able to “surprise” them with financial penalties above their expectations. Instead, a tax agency that cares about private welfare would like delinquents to be fully informed and make optimal choices.

The financial and shaming penalties differ across states: the interest rates differ markedly, and the online lists of delinquents are implemented differently.<sup>46</sup> Thus, the effects of these penalties may vary by state. Figure 3 presents the results on state-level heterogeneity. Given that the distribution of the debt amounts is so different in Kentucky compared with the other two states, we separated the heterogeneity by state from the heterogeneity by debt amount. We did this by splitting the Kentucky sample in two: initial amounts between \$250 and \$2,500 and initial amounts above \$2,500. The resulting four groups each contain about one quarter of the sample. We use \$2,500 to split the Kentucky sample, because it corresponds to the disclosure threshold for Kansas, but the results are very similar if we instead split the sample using the first quartile, as before (i.e., \$2,273).

Figure 3.a presents the state-level heterogeneity for the shaming penalty. Although debtors

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<sup>45</sup>For instance, the U.S. Environmental Protection Agency estimates that only about half of unsolicited correspondence is opened.

<sup>46</sup>For instance, the Kentucky website features a search tool to search individuals by name, lien balance and/or location (e.g., street, city, state, ZIP code, county), while the Wisconsin website does not feature a search tool, but it provides the opportunity to sort the list of delinquents alphabetically by name or by city. The Kansas website allows for a name search, and it also provides the full list that can be sorted by name, county and amount due, among others.

in Kentucky with debts below \$2,500 reacted to the shaming penalty, debtors in Kentucky with debts above \$2,500 did not react to the shaming penalty, and neither did debtors with debts above \$2,500 in Kansas and Wisconsin. These results suggest that, even within Kentucky, the effects of the shaming penalty decline significantly with the debt amount. These results also suggest that, once we control for heterogeneity by debt amount, no significant differences remain in the effects of shaming penalties across states.

Figure 3.b explores state-level heterogeneity for the financial penalty. For all debtors in Kentucky with debts below and above \$2,500, the financial penalty had a significant and similar effect. In other words, the effect of the financial penalty did not appear to change with the debt amount in Kentucky. On the other hand, the effect of the financial penalty was close to zero and statistically insignificant for Kansas and Wisconsin. This evidence suggests that the effect of the reminders about financial penalties differed between Kentucky and the other two states.<sup>47</sup> One simple explanation for this finding is that the financial penalty in Kentucky (30 percent) may be higher compared to the financial penalties in the other two states (14 percent in Kansas and 18 percent in Wisconsin).<sup>48</sup> An alternative explanation is that individuals in Kentucky are more likely to underestimate the true financial penalty. For instance, it is possible that Kentucky disseminated less information about the financial penalties.

To illustrate the timing of the effects, Figure 4 shows the week-by-week estimates of the effects of social incentives (for the first quartile) and financial incentives (for the full sample). Figure 4.a shows that individuals reacting to the shaming penalty leave the list as soon as possible: the vast majority of the reaction occurs during the second to fifth week after mail delivery. After week ten, the effects of the shaming penalty gradually decline. Intuitively, this means that some of the individuals who paid by week ten because of the shaming penalty were likely to pay anyway during the following weeks. However, even twenty-nine weeks after the letters were delivered, the probability of leaving the list was still 1.6 percentage points higher, compared to the 2.1 percentage points effect at week ten. This suggests that nearly 75 percent of the individuals who reacted to the shaming penalty did not intend to pay during the subsequent nineteen weeks.<sup>49</sup>

Figure 4.b shows that the effects of the financial penalty seem to build during the first four months and then slowly decline.<sup>50</sup> Individuals reacting to the financial penalty react more slowly

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<sup>47</sup>We can reject the hypothesis that the average effect in Kentucky (for all debt amounts) is equal to the average effect in Kansas and Kentucky (pooled together).

<sup>48</sup>Recall that the average individual in the United States is estimated to face a 14 percent annual interest rate for credit card borrowing. If this average individual was living in Kentucky and found out about the 30% annual interest rate on her tax debt, she should save a significant amount of money by paying off the tax debt with her credit card. On the contrary, if this average individual was living in Kansas (where her tax debt is subject to an 14% interest rate) or Wisconsin (18%), she should gain nothing or very little from paying off the her tax debt with her credit card

<sup>49</sup>However, note that the effects are less precisely estimated for longer time horizons. As a result, we cannot reject that our effects are statistically different than zero, or that they are statistically different from the effect from earlier weeks.

<sup>50</sup>There is a jump around the tenth week, corresponding to one of the major updates to the databases made in

than those reacting to the shaming penalty. This may be because they owe higher amounts on average and thus may need more time to pay the full amount or the first installment. Just as in the case of the shaming penalty, the slow decline implies that a majority of individuals who paid because of the reminder about the financial penalty were individuals who, in absence of this reminder, would not have paid in the subsequent nineteen weeks.

## 4.2 Wage Garnishment and the Effectiveness of Shaming and Financial Penalties

In this subsection we provide evidence related to the interactions between income garnishment and the effectiveness of shaming and financial penalties. According to our model, the effect of financial penalties should increase with the income garnishability of the debtor, but the effect of the shaming penalty should not depend on the income garnishability. If feasible, we would like to interact a measure of expected income garnishability at the individual level with the variables on financial and shaming penalties. Unfortunately, we did not observe this information directly. As a proxy, we constructed the variable *Share of Wage Income*, which is the fraction of gross income from wages in the 5-digit ZIP code as reported by the Internal Revenue Service Statistics of Income database for 2012. A higher share indicates higher income garnishability, given that wages are one of the sources of income that are easiest to garnish (as opposed, for example, to business income). This variable was normalized to have a mean of zero and a standard deviation of one within each of the three states.<sup>51</sup>

The results from the previous subsection suggest that the effect of shaming penalties are inversely proportional to debt amount owed by the delinquent. To incorporate this, for the rest of the section, we normalize the shaming penalty dummy by dividing it by the initial debt amount (in \$1,000s).<sup>52</sup> Thus, the coefficient on *Shaming Penalty* should be interpreted as the predicted effect for a delinquent with an initial debt of \$1,000.<sup>53</sup> Results are shown in Table 2. Column (1) presents the baseline results. The financial penalty increases the probability of leaving the list four months after the treatment by 1.15 percentage points, whereas the shaming penalty increases this probability by 1.1 percentage points (again, for an individual with a \$1,000 initial debt).

Column (2) adds the variable *Share of Wage Income* along with its interaction with the shaming and financial penalties. As in our model, the effect of financial penalties is stronger in places characterized by a higher fraction of wage income. The coefficients imply that a one standard deviation increase in *Share of Wage Income* doubles the effectiveness of the financial penalty. Also

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Kentucky, that, as discussed above, is the state for which the financial penalties reminder had the highest effect.

<sup>51</sup>The goal of normalizing within each state is that the variable does not pick up cross-state heterogeneity in the effectiveness of the penalty. In practice, the results are similar if applying the same normalization over the entire population instead of within each state.

<sup>52</sup>The regression also includes the inverse of the initial debt amount as a control variable.

<sup>53</sup>The results are similar if, instead, we interact the shaming penalty dummy with a dummy for the first quartile of initial amount.



as predicted by our model, the effectiveness of shaming penalties does not vary with the share of wage income. The corresponding point estimate is very close to zero and statistically insignificant.

Of course, it should be noted that the heterogeneity with respect to *Share of Wage Income* could be due to heterogeneity with respect to unobservable place characteristics correlated with the this variable (e.g., income, tax sophistication, tax morale). We alleviate those concerns by assessing how sensitive the results are when we control for other place characteristics, including the interactions between these characteristics and the shaming and financial penalties. First, we control for income by using a measure of mean gross income in the 5-digit ZIP code, obtained from the same database than *Share of Wage Income*. Second, we control for tax sophistication using a measure known as *EITC Bunching* provided in Chetty, Friedman, and Saez (2013). In a nutshell, this variable is supposed to measure how reactive individuals are to opportunities for evading taxes. Last, given that political views may lead to different tax morale (see Cullen, Turner, and Washington, 2015), we control for the share of Republican votes in county during the 2012 U.S. presidential election.<sup>54</sup> Columns (3) through (5) control for each one of these variables individually, while column (6) controls for all these variables simultaneously. The interactions of the shaming and financial penalties with the *Share of Wage Income* are very robust under all of these specifications, both in terms of magnitude and statistical significance.

### 4.3 Estimating Potential Side Effects from the List of Delinquents

It is possible that publishing the list of tax delinquents affects the delinquent’s perception of the behavior of other delinquents, which may affect the decision to remain delinquent. For instance, individuals have been documented to behave more pro-socially when they perceive that others are behaving prosocially too (e.g., Frey and Meier, (2004); Perez-Truglia and Cruces (2013)). If such externalities exist in the case of tax compliance, it could change, for better or worse, the welfare implications from publishing the lists of tax delinquents. In this subsection, we present suggestive evidence about the possibility of side effects.

Results for this test are shown in Table 3. We follow the same econometric specification used for the previous subsection. Column (1) shows the baseline specification with the effects of financial and shaming penalties. Column (2) adds a new variable, the mean tax debt amount (in \$1,000s) in the table included in the letter. As explained in section 3, this right hand side variable only includes the variation that was exogenously generated by the random selection of nine individuals out of the twenty closest delinquents from the recipient. The coefficient is virtually zero and statistically insignificant, indicating that the mean amount shown in the list has no effect on the subsequent probability of leaving the list. This result suggests that delinquents may not be affected by the delinquent behavior of others and, as a result, social comparisons may not generate significant side-effects from publishing lists of delinquents.

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<sup>54</sup>On the link between politics and tax enforcement see for example Casaburi and Troiano (2014).

One potential concern is that the mean amount of tax debts may have effects through multiple channels, which may cancel each other out. On the one hand, if a tax debtor believes that others have even higher debts, she could potentially feel less guilty about her own tax debt and thus be less likely to pay. On the other hand, the same information could also lead an individual to perceive that tax debtors as a group have a worse reputation, making it more costly to be associated with other debtors by appearing on the list and thus making the debtor more likely to pay. Only the first channel could be considered a side effect, because the second channel would be part of the shaming penalty itself. To disentangle the effects from these two channels, we can exploit the exogenous variation in visibility used to measure the effects of the shaming penalty. Column (3) adds the mean amount in the list along with its interaction with the shaming penalty (i.e., with the higher-visibility dummy) and (for the sake of completeness) with the financial penalty. The coefficient on the mean amount corresponds to the effect of this variable in the lower-visibility treatment, which is closest to the notion of a side effect. The coefficient on the interaction between the mean amount and the shaming penalty, instead, measures the second channel.

The coefficient on mean amount has the expected negative sign. However, the magnitude of the effect is very small and statistically insignificant. Increasing the mean amount in the list by \$10,000,<sup>55</sup> would only decrease the probability of leaving the list by 0.02 percentage points.<sup>56</sup> This finding may suggest that social norm considerations do not play a significant role in state tax compliance, and there is consequently no reason to worry about the side effects from publishing lists of tax delinquents. As an additional robustness check, columns (4) and (5) replicate the results from (2) and (3) except they use the median amount shown in the table instead of the mean amount. The results are similar under this alternative specification.<sup>57</sup> This evidence is broadly consistent with related field experiments showing that messages of moral appeal are ineffective at reducing tax evasion (Blumenthal et al. (2001)).<sup>58</sup> Given that our sample is probably comprised of individuals with lower tax morale, it is somewhat unsurprising that social comparisons are ineffective in shaping their behavior. This evidence suggests that the same moral interventions that are effective with pro-social individuals (e.g., individuals who give to charity) may not be

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<sup>55</sup>This is a significant increase compared to the median delinquent amount among the subjects of \$5,500.

<sup>56</sup>Column (3) also reports the coefficient on the interaction between the shaming penalty and the mean amount in the list. This coefficient has the expected positive sign: increasing the mean delinquent amount by \$10,000 increases the effect of the shaming penalty by 0.39 percentage points, or roughly 35 percent of the mean effect of the shaming penalty. This might suggest that individuals may be even more averse to being recognized as a tax delinquent when tax delinquents have a worse reputation as a group. However, this coefficient is not statistically significant. Column (3) also reports the interaction between the mean amount in the list and the financial penalty. As expected, the coefficient is close to zero and statistically insignificant, indicating that the perception about the delinquent behavior of others does not affect the effectiveness of the financial penalty.

<sup>57</sup>In other words, individuals may be less sensitive to very large amounts owed by a minority of delinquents.

<sup>58</sup>Fellner, Sausgruber and Traxler (2013) also find that moral appeals fail to reduce tax evasion. Dwenger et al. (2014) find that moral appeals fail to reduce tax evasion (although there are significant effects on different subgroups with opposite signs). In the context of tax collection, the evidence on the effect of moral appeals is mixed: while Hallsworth et al. (2014) find significant effects, Castro and Scartascini (2013) do not. For a more general discussion about tax morale, see Luttmer and Singhal (2014).

equally effective with anti-social individuals (tax delinquents).<sup>59</sup>

## 5 Conclusion

Increasing the efficiency of tax compliance is a key issue for fostering economic development. Even though there is little empirical and theoretical evidence on the effects of shaming, shaming is being increasingly used in America and the world, for tax delinquents and for other purposes. We provide a theoretical and empirical framework for thinking rigorously about shaming. First, we introduced a simple and tractable framework for analyzing tax debt enforcement when the government can use both financial and shaming penalties. We showed that, under plausible conditions, the optimal policy is a mix between financial and shaming penalties. Second, we provided evidence from a field experiment. We showed that financial and shaming penalties seem to increase the speed of payment. Last, we showed that the effectiveness of these penalties may depend on the garnishability of the debtor's income as in our model.

Our results raise several questions for future research. First, our framework could be used to examine, from a theoretical and empirical perspective, the optimality of disclosure policies for other aspects of tax compliance, such as tax evasion and tax avoidance. Consistent with this observation, some tax agencies outside the United States have started to publish lists of tax evaders, although this policy is much less widespread compared with the one disclosing tax delinquents.<sup>60</sup> Second, we focused on a specific form of nonfinancial penalty consisting of the online publication of lists of debtors. In practice, tax agencies use other nonfinancial penalties, such as direct pressure through home visits and revocation of driving licenses and passports (Blank, 2014). Our theoretical and empirical framework could be extended to shed light on the effectiveness and optimality of these other types of nonfinancial policies.

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<sup>59</sup>Our evidence, however, does not rule out the possibility that social comparisons may play a more significant role in tax compliance among individuals who paid their taxes on time.

<sup>60</sup>For example, the U.K. publishes a list of top tax evaders ([link](#)). Also, even though it was not part of a regular policy, Chetty, Mobarak and Singhal (2014) present results from an intervention in Bangladesh that peer pressure may be effective in reducing tax evasion.

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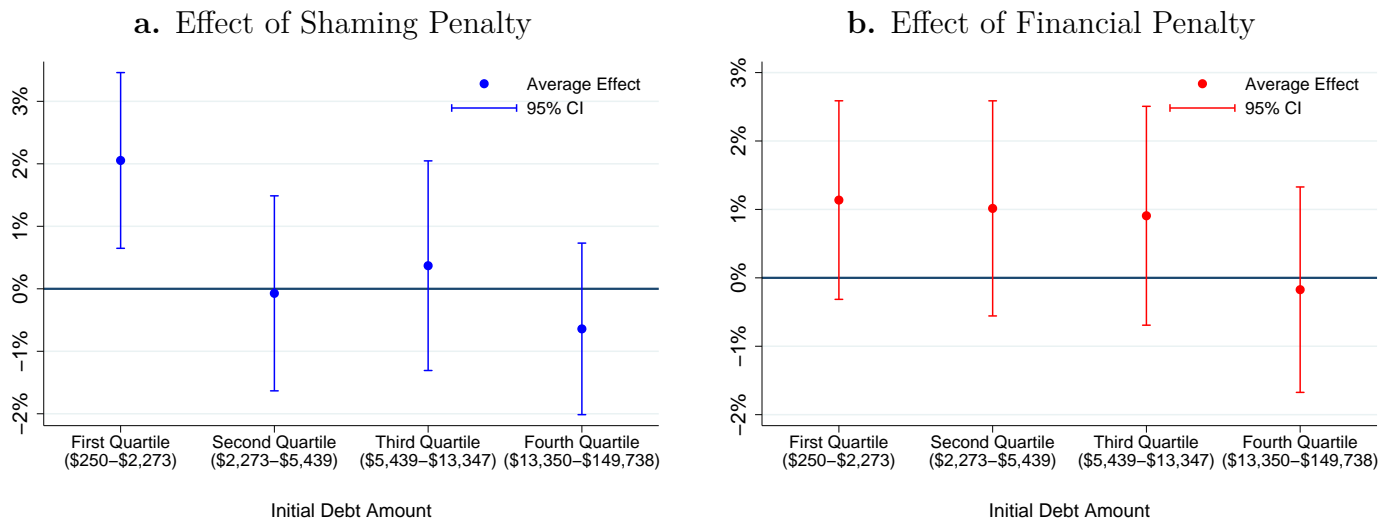
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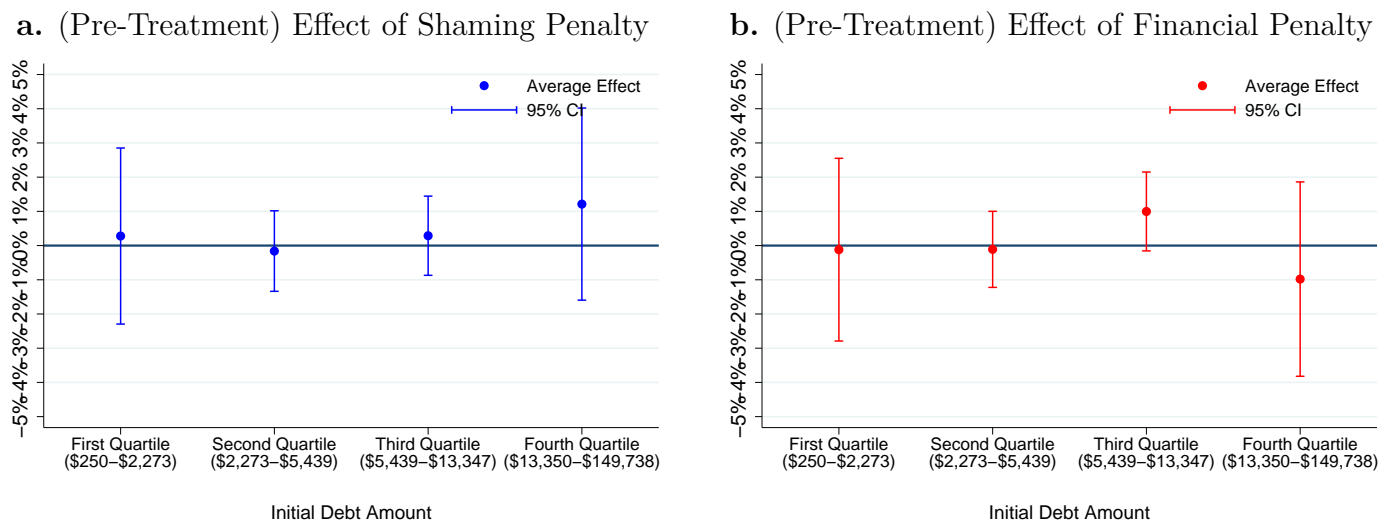
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Figure 1: Effects of Shaming and Financial Penalties 10 Weeks after Mail Delivery, by Quartile of Debt Amount



Notes: N=34,334. The debt amount in the x-axis corresponds to the amount owed when the subject pool was formed (May 26, 2014). The effects were estimated from OLS regressions (one for each group in the x-axis) where the dependent variable is a dummy for whether the subject is listed as a delinquent 10 weeks after the letters were delivered, and the right hand side variables are the treatment dummies plus a set of control variables: gender, ethnicity and state dummies, initial debt amount and its logarithm (with state-specific coefficients) and the number of delinquents in the ZIP code. *Average Effect* is defined as the comparison between treated and control groups as defined in Section 3. *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. Confidence intervals computed with heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level.

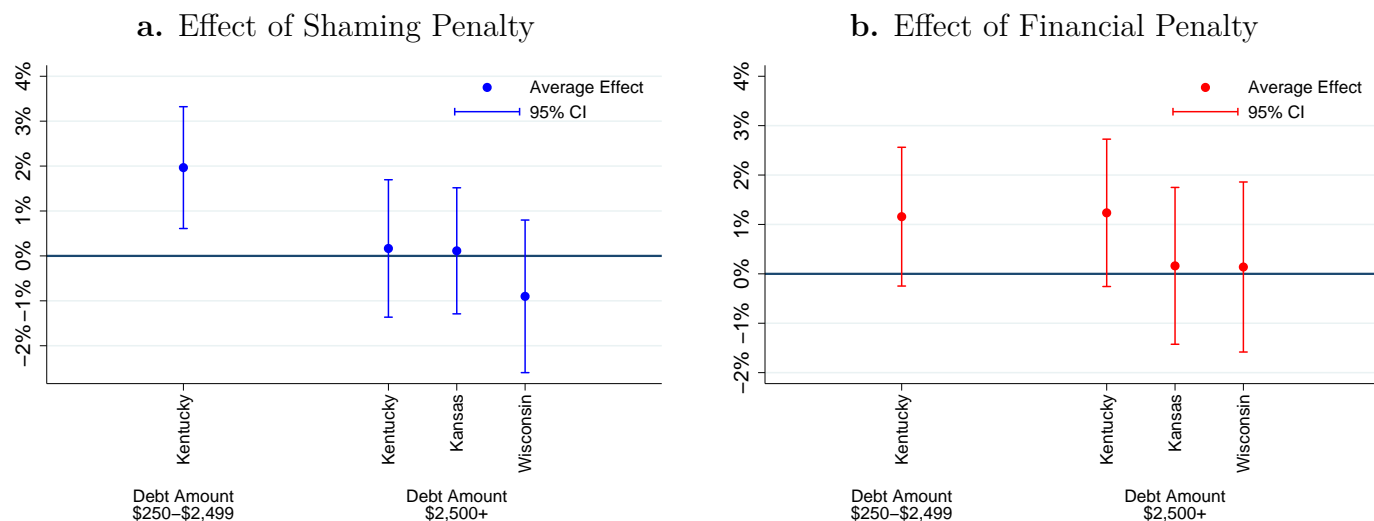
Figure 2: Falsification Test: Placebo Effects of Shaming and Financial Penalties on the Pre-Treatment (Log) Debt Amount



Notes:  $N=34,334$ . The debt amount in the x-axis corresponds to the amount owed when the subject pool was formed (May 26, 2014). The effects were estimated from OLS regressions (one for each group in the x-axis) where the dependent variable is the logarithm of the initial debt amount, and the right hand side variables are the treatment dummies. *Average Effect* is defined as the comparison between treated and control groups as defined in Section 3. *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. Confidence intervals computed with heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level.



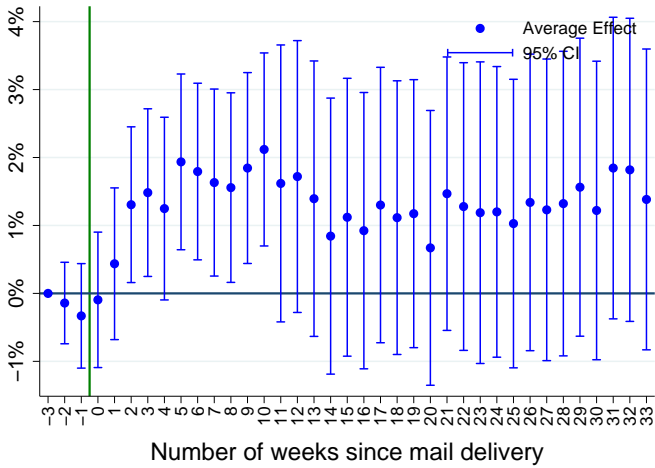
Figure 3: Effects of Shaming and Financial Penalties 10 Weeks after Mail Delivery, by State and Debt Amount



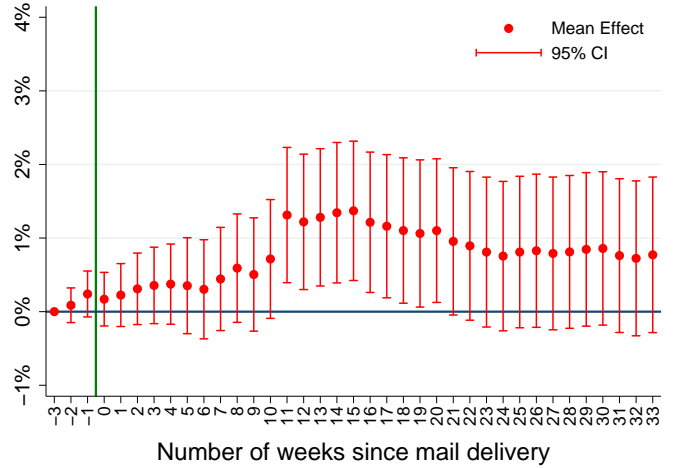
Notes:  $N=34,334$  (9,029 from Kentucky \$250-\$2,499, 9,072 from Kentucky \$2,500+, 8,710 from Kansas and 7,523 from Wisconsin). The debt amount in the x-axis corresponds to the amount owed when the subject pool was formed (May 26, 2014). The effects were estimated from OLS regressions (one for each group in the x-axis) where the dependent variable is a dummy for whether the subject is listed as a delinquent 10 weeks after the letters were delivered, and the right hand side variables are the treatment dummies plus a set of control variables: gender, ethnicity and state dummies, initial debt amount and its logarithm (with state-specific coefficients) and the number of delinquents in the ZIP code. *Average Effect* is defined as the comparison between treated and control groups as defined in Section 3. *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. Confidence intervals computed with heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level.

Figure 4: Week-by-week Evolution of Effects of Shaming and Financial Penalties

a. Effect of shaming penalty (Lowest Quartile)



b. Effect of Financial Penalty (All Sample)



Notes:  $N = 8,584$  (a.) and  $34,334$  (b.). In the x-axis, Week -3 corresponds to the date when the subject pool was formed (May 26, 2014). The green vertical line shows the approximate date when the letters were delivered. The effects were estimated from OLS regressions (one for each graph) where the dependent variable is a dummy for whether the subject is listed as a delinquent 10 weeks after the letters were delivered, and the right hand side variables are the treatment dummies plus a set of control variables: gender, ethnicity, and state dummies, initial debt amount and its logarithm (with state-specific coefficients) and the number of delinquents in the ZIP code. *Average Effect* is defined as the comparison between treated and control groups as defined in Section 3. *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. Confidence intervals computed with heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level.

Table 1: Descriptive Statistics and Randomization Balance Test

	Shaming Penalty		Financial Penalty		Amount Listed			Difference
	(1) No	(2) Yes	(3) No	(4) Yes	(5) Low	(6) Medium	(7) High	(8) P-value
Initial Debt Amount (\$1,000s)	12.86 (0.16)	12.90 (0.16)	12.85 (0.16)	12.91 (0.15)	12.86 (0.19)	13.16 (0.20)	12.63 (0.19)	0.43
Log(Initial Debt Amount)	8.58 (0.01)	8.58 (0.01)	8.57 (0.01)	8.59 (0.01)	8.57 (0.01)	8.60 (0.01)	8.57 (0.01)	0.28
Percent Male	64.32 (0.37)	64.56 (0.36)	64.81 (0.38)	64.11 (0.36)	64.26 (0.45)	64.10 (0.45)	64.95 (0.44)	0.40
Percent White	70.87 (0.22)	70.85 (0.22)	70.50 (0.22)	71.17 (0.21)	70.95 (0.27)	70.98 (0.27)	70.64 (0.27)	0.23
Percent Black	13.94 (0.11)	13.73 (0.11)	14.13 (0.12)	13.57 (0.11)	13.75 (0.14)	13.87 (0.14)	13.88 (0.14)	0.01
Percent Hispanic	5.86 (0.15)	5.83 (0.15)	6.02 (0.15)	5.69 (0.14)	5.75 (0.18)	5.82 (0.18)	5.97 (0.18)	0.48
Percent Other	3.33 (0.05)	3.37 (0.06)	3.36 (0.06)	3.35 (0.05)	3.34 (0.07)	3.37 (0.07)	3.35 (0.07)	0.98
Observations	17,155	17,179	16,125	18,209	11,431	11,384	11,519	1

Notes: N=34,334. Pre-treatment mean individual characteristics by treatment group (standard errors in parenthesis). *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. *Amount List* corresponds to the value of the weighting parameter used to select the delinquents to be listed in the table shown to the recipient, which was randomly-chosen from three possible values: low, medium and high. The p-value corresponds to the test of the null hypothesis that the average characteristics are the same in both pairs of treatment groups. The initial debt amount corresponds to the amount owed when the subject pool was formed (May 26, 2014). Gender and ethnicity are not observed directly. Data for these characteristics is imputed using data on the joint distribution of first names and gender (several sources, including data from the U.S. Census Bureau), and the joint distribution of last names and ethnicities (data from U.S. Census Bureau). The omitted category for gender is male, and the omitted category for ethnicity corresponds to unmatched last names.

Table 2: Evidence about the Interaction between Income Garnishability and Shaming and Financial Penalties

	Probability of Leaving the List, 16 weeks After Treatment					
	(1)	(2)	(3)	(4)	(5)	(6)
Shaming Penalty	1.095** (0.527)	1.127** (0.530)	1.150** (0.527)	1.150** (0.532)	1.115** (0.528)	1.154** (0.527)
Financial Penalty	1.146** (0.486)	1.111** (0.474)	1.130** (0.475)	1.052** (0.474)	1.091** (0.475)	1.069** (0.475)
Share of Wage Income		-1.575*** (0.480)	-1.080* (0.607)	-1.028** (0.490)	-1.482*** (0.474)	-0.683 (0.610)
Interaction with Shaming Penalty		0.035 (0.539)	0.193 (0.657)	-0.146 (0.526)	0.004 (0.533)	0.042 (0.635)
Interaction with Financial Penalty		1.205*** (0.456)	1.055* (0.567)	1.207** (0.469)	1.188*** (0.458)	1.061* (0.570)
Extra Controls (with interactions)	None	None	Mean Income	EITC Bunching	Share Republican	All

Notes: N=34,334. \* significant at the 10% level, \*\* at the 5% level, \*\*\* at the 1% level. Heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level. The coefficients were estimated from OLS regressions (one per column) where the dependent variable is a dummy for whether the subject is listed as a *delinquent* 16 weeks after the letters were delivered and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state, inverse of the initial debt amount). *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter and 1 if others in the area were chosen to receive a letter too, and then it is divided by the initial debt amount. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. *Share of Wage Income* is the share of gross income from wages in the 5-digit ZIP code, as reported by the Internal Revenue Service Statistics of Income (IRS-SOI) database for 2012. This variable was normalized to have mean zero and standard deviation 1 within each of the three states. The extra controls correspond to other ZIP code level variables, including the interaction with the two treatment variables. Mean Income corresponds to the average gross income in 2012 at the 5-digit ZIP code, also from IRS-SOI. EITC Bunching corresponds to the share of self-employed individuals in the 3-digit ZIP code estimated to be mis-reporting income to take advantage of EITC benefits (data source: Chetty et al., (2013)). Share republican is the county-level share of votes for the Republican candidate in the 2012 U.S. Presidential Election. The last columns includes these three control variables (plus the interactions). All these control variables were normalized to have mean zero and standard deviation 1 within each of the three states.

Table 3: Evidence about the Effect of Perceptions about the Delinquent Behavior of Others

	Probability of Leaving the List, 16 weeks After Treatment				
	(1)	(2)	(3)	(4)	(5)
Shaming Penalty	1.095** (0.527)	1.095** (0.527)	1.100** (0.529)	1.095** (0.527)	0.945* (0.538)
Financial Penalty	1.146** (0.486)	1.146** (0.486)	1.151** (0.486)	1.146** (0.486)	1.273*** (0.492)
Mean Amount in List		-0.000 (0.007)	-0.002 (0.011)		
Interaction with Shaming Penalty			0.039 (0.036)		
Interaction with Financial Penalty			-0.004 (0.014)		
Median Amount in List				0.004 (0.020)	0.030 (0.033)
Interaction with Shaming Penalty					0.115 (0.079)
Interaction with Financial Penalty					-0.064 (0.040)

Notes: N=34,334. \* significant at the 10% level, \*\* at the 5% level, \*\*\* at the 1% level. Heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level. The coefficients were estimated from OLS regressions (one per column) where the dependent variable is a dummy for whether the subject is listed as a delinquent 16 weeks after the letters were received and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state, inverse of the initial debt amount). *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter and 1 if others in the area were chosen to receive a letter too, and then it is divided by the initial debt amount. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not. *Mean Amount in List* is the mean debt amount among the nine individuals listed in the table from the letter sent to the recipient (not including the recipient). This variable is the difference between the actual mean amount shown in the list and the counter-factual mean amount that would have resulted from using the baseline parameters to choose the nine individuals included in the letter. *Median Amount in List* was constructed in the same way, except that using the median instead of the mean.

# Online Appendix: For Online Publication Only

## A Proofs of Propositions

### A.1 Proof of Proposition 1

Let's start with the case  $\alpha = \frac{1}{2}$ . The objective function of the government can be written as a function of the threshold  $\hat{R}$ :

$$\frac{1}{2} \frac{(\hat{R} - \underline{R})}{\bar{R} - \underline{R}} \cdot \left( R_g - \frac{\underline{R} + \hat{R}}{2} \right)$$

Given  $\{F, p\}$  if we find a  $\{F', p'\}$  such as the same threshold arises in equilibrium, then the value of the objective function of the government will be the same. When  $\{F, p > 0\}$ , we can use the alternative policy  $\left\{ F' = F + \frac{p\eta}{q} \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$ . And when  $\{F, p = 0\}$ , we can use the alternative policy  $\left\{ F' = F - \frac{p'}{q} \cdot \eta \cdot \frac{\bar{R} - \underline{R}}{2}, p' \right\}$ . Thus, the set of policies with and without shaming penalties are interchangeable.

When  $\alpha > \frac{1}{2}$ , the government's objective function is:

$$\frac{\hat{R} - \underline{R}}{\bar{R} - \underline{R}} \cdot \left( \alpha R_g - (1 - \alpha) \frac{\underline{R} + \hat{R}}{2} \right) + \frac{\bar{R} - \hat{R}}{\bar{R} - \underline{R}} \cdot q \cdot F \cdot (2\alpha - 1)$$

Given  $\{F, p > 0\}$ , consider the alternative policy  $\left\{ F' = F + \frac{p\eta}{q} \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$  that attains the same  $\hat{R}$  but reduces  $p$  to zero. The first term of the objective function will be the same. The second term, provided  $\hat{R} < \bar{R}$ , will be even higher because the  $F$  increases. Thus, the utility of the government under  $\{F', p' = 0\}$  is higher than under  $\{F, p > 0\}$ . The other possible case is if  $\{F, p > 0\}$  was such as we are in the corner solution  $\hat{R} = \bar{R}$ . In that case, the second term would always be zero and thus the utility of the government would be the same under  $\{F, p > 0\}$  and  $\{F', p' = 0\}$ . However, given Assumption 1, it follows that since the candidate  $\{F', p' = 0\}$  is a corner solution it cannot be optimal, and thus there must be at least another  $\{F'', p'' = 0\}$  that attains strictly more utility than  $\{F', p' = 0\}$ . By transitivity, this  $\{F'', p'' = 0\}$  must attain strictly more utility than the original  $\{F, p > 0\}$ . That is, we proved that even when  $\{F, p > 0\}$  is a corner solution there is an alternative  $\{F'', p'' = 0\}$  that attains strictly higher utility. This completes the proof that the set of policies with  $p = 0$  dominates the set of policies with  $p > 0$ .

### A.2 Proof of Proposition 2

The proof is organized as follows. First, we prove that using the shaming penalty makes the government strictly better off if  $\alpha = \frac{1}{2}$ . Second, we prove that using the shaming penalty makes

the government strictly worse off if  $\alpha = 1$ . Third, we will prove that these two results imply that there must be a unique  $\alpha^* \in \left(\frac{1}{2}, 1\right)$  such as the set of policies with  $p > 0$  dominates  $p = 0$  if  $\alpha < \alpha^*$ , the two are interchangeable if  $\alpha = \alpha^*$ , and the set of policies with  $p = 0$  dominates  $p > 0$  if  $\alpha > \alpha^*$ .

First, consider the case  $\alpha = \frac{1}{2}$ . The government's objective function can be written as:

$$\frac{1}{2} \frac{1}{\bar{R} - \underline{R}} \cdot \left( -\frac{1}{2} \left( \theta \hat{R}_{\bar{q}}^2 + (1 - \theta) \hat{R}_{\underline{q}}^2 \right) + R_g \left( \theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}} \right) + \frac{\underline{R}^2}{2} - \underline{R} \cdot R_g \right)$$

Given a policy  $\{F, p = 0\}$ , consider the alternative policy  $\left\{ F' = F - \frac{\epsilon}{\theta \bar{q} + (1 - \theta) \underline{q}} \cdot \eta \cdot \frac{\bar{R} - \underline{R}}{2}, p' = \epsilon \right\}$  with  $\epsilon$  positive but arbitrarily close to zero. If  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  were originally not a corner solution, this transformation leaves  $\left( \theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}} \right)$  unchanged while reducing the gap between  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  (and, additionally, reduces  $F$ ). As a result, the only term of the objective function that changes is  $-\frac{1}{2} \left( \theta \hat{R}_{\bar{q}}^2 + (1 - \theta) \hat{R}_{\underline{q}}^2 \right)$ . Given that the gap between  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  is reduced, by Jensen's inequality we know that the average  $\theta \hat{R}_{\bar{q}}^2 + (1 - \theta) \hat{R}_{\underline{q}}^2$  must decrease, so that the entire term  $-\frac{1}{2} \left( \theta \hat{R}_{\bar{q}}^2 + (1 - \theta) \hat{R}_{\underline{q}}^2 \right)$  increases. That is, the new policy makes the government strictly better off. If, on the other hand,  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  were originally not a corner solution, due to Assumption 1 that implies that there must be another policy  $\{F'', p'' = 0\}$  that is not a corner solution and it is strictly better than  $\{F, p = 0\}$ . Using the above method, it follows that we can find a  $\{F', p' = 0\}$  that is strictly better than  $\{F, p = 0\}$ , completing the proof that the government is better off by using the shaming penalty than by not using it.

Second, consider the case  $\alpha = 1$ . The government's objective function can be written as:

$$\frac{1}{\bar{R} - \underline{R}} \left[ \left( \theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}} \right) R_g - R_g \cdot \underline{R} + \left( \bar{R} - \left( \theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}} \right) \right) \cdot \left( \theta \bar{q} + (1 - \theta) \underline{q} \right) \cdot F \right]$$

We can show that the optimal cannot involve  $p > 0$ . Take any candidate  $\{F, p > 0\}$ . Consider the alternative  $\left\{ F' = F + \frac{p \cdot \eta}{\theta \bar{q} + (1 - \theta) \underline{q}} \cdot \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$ . There are number of possible cases. The first case is that  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  were originally not a corner solution and still are not a corner solution under the alternative policy. In this case, the transformation leaves  $\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}$  unchanged while increasing  $F$  (and, additionally, increases the gap between  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$ ). Note that, since we are not in a corner solution:  $\bar{R} - \left( \theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}} \right) > 0$ . Thus, since  $F' > F$  then the last term of the objective function is higher under  $\{F', p' = 0\}$ , meaning that the government is better off by not using the shaming penalty. A second case is that  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  were both a corner solution. In that case, the alternative  $\left\{ F' = F + \frac{p \cdot \eta}{\theta \bar{q} + (1 - \theta) \underline{q}} \cdot \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$  must involve  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  both as corner solutions as well. This transformation still leaves  $\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}$  unchanged while increasing  $F$ , so that it is still true that the government is better off by not using the shaming penalty. Using the same logic, it is straightforward to prove

that the government is better off by not using the shaming penalty in the remaining cases.<sup>61</sup>

Third, we will prove that these two results imply that there must be a unique  $\alpha^* \in (\frac{1}{2}, 1)$  such as the set of policies with  $p > 0$  dominates  $p = 0$  if  $\alpha < \alpha^*$ , the two are interchangeable if  $\alpha = \alpha^*$ , and the set of policies with  $p = 0$  dominates  $p > 0$  if  $\alpha > \alpha^*$ . The trick for this step is that the objective function of any intermediate case,  $\alpha \in (\frac{1}{2}, 1)$ , can be written as a weighted average between the objective functions evaluated at  $\alpha = \frac{1}{2}$  and  $\alpha = 1$ . Let  $\beta$  ( $1 - \beta$ ) be weight on the objective function with  $\alpha = 1$  ( $\alpha = \frac{1}{2}$ ), with  $\beta \in [0, 1]$  and with  $\beta = 0$  and  $\beta = 1$  corresponding to the extreme cases  $\alpha = \frac{1}{2}$  and  $\alpha = 1$ . Given a policy  $\{F, p > 0\}$ , the alternative policy  $\left\{F' = F + \frac{p\eta}{\theta\hat{R}_{\bar{q}} + (1-\theta)\hat{R}_{\underline{q}}} \cdot \frac{\bar{R}-R}{2}, p' = 0\right\}$  leaves  $(\theta\hat{R}_{\bar{q}} + (1-\theta)\hat{R}_{\underline{q}})$  unchanged while increasing  $F$  and the gap between  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$ . In the previous step we showed that this policy increases the objective function when  $\alpha = 1$  but decreases the objective function when  $\alpha = \frac{1}{2}$ . By the mean value theorem, there must be a critical and unique  $\alpha^* \in (\frac{1}{2}, 1)$  such as the objective function increases under the alternative policy (i.e., the shaming penalty makes the government worse off) if  $\alpha > \alpha^*$  and leaves it the same if  $\alpha = \alpha^*$ . Finally, we can use the same logic to show that the shaming penalty makes the government better off if  $\alpha < \alpha^*$ .

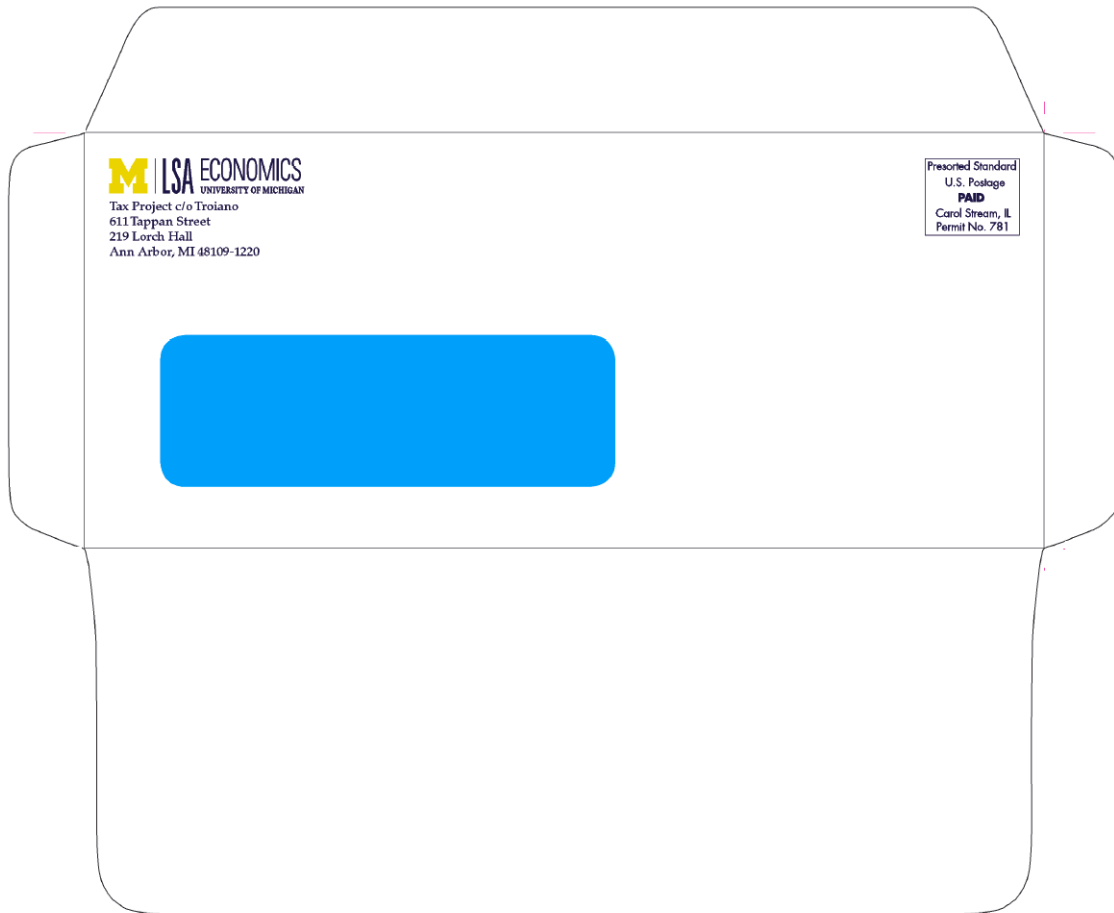
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<sup>61</sup>For instance, when the original  $\hat{R}_{\bar{q}}$  and  $\hat{R}_{\underline{q}}$  were not corner solutions but at least one would be a corner solution under the proposed alternative, what we can do is to propose a different alternative with  $p = 0$  but where  $F$  increases such as  $\theta\hat{R}_{\bar{q}} + (1-\theta)\hat{R}_{\underline{q}}$  remains the same even though now  $\hat{R}_{\bar{q}}$  and/or  $\hat{R}_{\underline{q}}$  is a corner solution.



## B Sample of the Envelope and the Letter

### Sample Envelope



Ann Arbor, May 26<sup>th</sup> 2014

Dear [REDACTED]

This letter is part of a research study about tax delinquency conducted by researchers at University of Michigan. We would like to share with you a sample of the public records from the Kentucky Department of Revenue. **The following is a sample of tax delinquents living close to your household as of today:**

First and Last name	Debt Amount
[REDACTED]	\$68,509
[REDACTED]	\$12,051
[REDACTED]	\$2,648
[REDACTED]	\$2,638
[REDACTED]	\$2,024
[REDACTED]	\$1,944
[REDACTED]	\$1,505
[REDACTED]	\$1,158
[REDACTED]	\$873
[REDACTED]	\$269

**YOUR HOUSEHOLD AND OTHER HOUSEHOLDS IN YOUR AREA WERE RANDOMLY CHOSEN TO RECEIVE A LETTER OF THIS TYPE**

Names, addresses and other details about tax delinquents are freely available to see for anyone with access to the Internet. You can search for individual debtors by first and last name, or by zipcode, by visiting the following web-page from the website of the Kentucky Department of Revenue:

<http://ilp.ky.gov/ILPInterNet.aspx?dt=I>

You can find a screenshot of this search tool on the reverse of the page.

For illustration purposes, the following is a screenshot of the search tool:



**This website also includes information about penalties. For instance, your tax debt is subject to, among other penalties, an annual interest rate of 4% and a monthly late payment fee of 2%.**

We kindly ask you to visit our website and fill out an anonymous questionnaire:

<http://www.umich.edu/~taxproj/survey.html>

Additionally, on our website you will also be able to find more information about this project, including our contact information.

**Ugo Troiano and Ricardo Perez-Truglia**

Contact email: [taxproject@umich.edu](mailto:taxproject@umich.edu)

Program website: <http://www.umich.edu/~taxproj/tax.html>

## C Extensions to the Model

### C.1 Informing Delinquents about Financial Penalties

There is a rapidly growing body of evidence about a systematic under-estimation of financial penalties in a variety of settings, such as consumer loan market (Stango and Zinman (2011)) and credit card debt (Ausubel (1991); Frank (2011)). Indeed, our experimental design exploits this tendency to identify the effects from financial penalties, by introducing an intervention that increases the salience of financial penalties and (possibly) corrects systematic biases. In this extension of our model we study whether a general policy consisting of correcting misperceptions about the interest rate would be desirable from the perspective of the tax agency.

#### C.1.1 The Debtor's Problem

We focus on the case of homogeneous garnishability:  $q_i = q \forall i$ . In reality, some individuals may under-estimate the financial penalties while some others may over-estimate it, but the evidence suggests that, on average, individuals under-estimate. For the sake of simplicity, we assume that a fraction  $s$  of individuals incorrectly perceive that the financial penalty are lower than it actually is,  $F = \underline{F} < F$ , while the remaining  $(1 - s)$  correctly perceive the financial penalty  $F$ . Let membership in  $s$  be independent of  $R_i$ . The optimal response to the perceived penalty is characterized by one threshold for individuals who correctly perceive the financial penalty and a different threshold for individuals who incorrectly perceive the financial penalty. Peers are correctly informed about the fraction  $s$ , and both groups of debtors correctly perceive peers expectations about  $R_i$  for those who do and do not repay their debts.

Debtors who correctly perceive the financial penalty maximize:

$$U(x_i; R_i) = -R_i \cdot x_i - (1 - x_i) \cdot [q \cdot F + p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])] \\ + \eta \cdot (1 - p) \cdot \frac{R + \bar{R}}{2}$$

Debtors who misperceive the financial penalty maximize:

$$U(x_i; R_i) = -R_i \cdot x_i - (1 - x_i) \cdot [q \cdot \underline{F} + p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])] \\ + \eta \cdot (1 - p) \cdot \frac{R + \bar{R}}{2}$$

Define the cutoff  $\tilde{R}$  for debtors who misperceive the financial penalty and the cutoff  $\hat{R}$  for debtors who correctly perceive the financial penalty. The cutoff rules are then:

$$x^*(R) = 1[R \leq \hat{R}]; \quad \tilde{x}(R) = 1[R \leq \tilde{R}]$$

It is easy to show that, as in the model without misperception,  $\hat{R} = q \cdot F + p \cdot \eta \cdot \frac{\bar{R}-R}{2}$  defines the cutoff below which the debtors who correctly infer the penalties repay their debt, and  $\tilde{R} = q \cdot \underline{F} + p \cdot \eta \cdot \frac{\bar{R}-R}{2}$  defines the cutoff for the biased debtors. Note that since  $\underline{F} \leq F$ ,  $\tilde{R} \leq \hat{R}$ , and types in between the two thresholds would have higher utility if they repaid their debt, but do not repay their debt due to their misperception of the financial consequences.

### C.1.2 The Government's Problem

In addition to the financial and shaming penalties, the government can decrease the fraction  $s$  of debtors who misperceive the financial penalty of failing to repay at no resource cost: i.e., it chooses  $s^* \in [0, s]$ . The government collects greater revenues in the second period by not correcting the misperception, as the misperception leads to more failure to repay in the first period. However, the debtors who misperceive the penalty lose actual (as opposed to perceived) utility by behaving incorrectly.

The government revenues and private welfare are now:

$$T(F, p, s^*) = \int [s^* \cdot \tilde{x}(R) \cdot R_g + (1 - s^*) \cdot x^*(R) \cdot R_g + s^* \cdot (1 - \tilde{x}(R)) \cdot q \cdot F + (1 - s^*) \cdot (1 - x^*(R)) \cdot q \cdot F] dF(R)$$

$$PW(F, p, s^*) = - \int [s^* \cdot \tilde{x}(R) \cdot R + (1 - s^*) \cdot x^*(R) \cdot R + s^* \cdot (1 - \tilde{x}(R)) \cdot q \cdot F + (1 - s^*) \cdot (1 - x^*(R)) \cdot q \cdot F] dF(R)$$

The government solves:

$$\max_{F \geq 1, p \in [0, 1], s^* \in [0, s]} \alpha \cdot T(F, p, s^*) + (1 - \alpha) \cdot PWD(F, p, s^*)$$

The following proposition ranks the policies when the government can also decide whether to correct debtors' misperceptions about the financial penalties:

**Proposition 3.** *There is a threshold  $\alpha^* \in (\frac{1}{2}, 1)$  such as:*

- if  $\alpha \leq \alpha^*$ , then the set of policies  $\{(F, p, s) : F \geq 0, p \in [0, 1], s^* = 0\}$  dominates  $\{(F, p, s) : F \geq 0, p \in [0, 1], s \in (0, 1]\}$ .

- if  $\alpha > \alpha^*$ , then the set of policies  $\{(F, p, s) : F \geq 0, p \in [0, 1], s \in (0, 1]\}$  dominates  $\{(F, p, s) : F \geq 0, p \in [0, 1], s = 0\}$ .

*Proof.* In the case where  $\alpha = 1/2$ , the government's objective function is now

$$\frac{1}{2} \int x^*(R)(R_g - R)dF(R) - s^* \cdot \frac{1}{2} \int [x^*(R) - \tilde{x}(R)](R_g - R)dF(R)$$

The government wants to collect if and only if  $R_g \geq R_i$ , which it can accomplish by setting  $x^*(R)$  to the appropriate threshold. The second term indicates that the fraction  $s^*$  of debtors behave in a way that costs the government utility conditional on it setting the threshold correctly, since  $x^*(R) - \tilde{x}(R)$  is either zero or one, and is only one in a range when  $R_g - R_i$  is positive (as the debtors who do not pay are people who would have paid had they correctly perceived the financial penalty). Thus the government's first-best behavior sets  $s^* = 0$  - it completely corrects the misperception.

The second term is:

$$-\frac{s^*}{2} \frac{\hat{R} - \tilde{R}}{\bar{R} - \underline{R}} \left[ R_g - \frac{\hat{R} + \tilde{R}}{2} \right]$$

Note that  $\hat{R} \geq \tilde{R}$  from above. Then setting  $s^* > 0$  is not optimal so long as the average of  $\hat{R}$  and  $\tilde{R}$  is not greater than  $R_g$ , which is true so long as the government has not set  $F$  and  $p$  too much higher than optimal.

Since setting  $s^* > 0$  strictly leads debtors to behave in a way that does not maximize their utility, if the government does not choose  $s^* > 0$  when  $\alpha = 1/2$ , the government will not choose  $s^* > 0$  for any  $\alpha < 1/2$ , as lowering  $\alpha$  only increases the weight the government puts on debtor's welfare.

$$\begin{aligned} U(F, p, s^*) &= \int x^*(R)[\alpha R_g - (1 - \alpha)R] + (1 - x^*(R)) \cdot (2\alpha - 1) \cdot q \cdot F dF(R) \\ &\quad + s^* \int [x^*(R) - \tilde{x}(R)] \cdot [(2\alpha - 1) \cdot q \cdot F - \alpha \cdot R_g + (1 - \alpha) \cdot R] dF(R) \end{aligned}$$

Consider now the case where  $\alpha = 1$ , and the government maximizes total revenues, which are

$$\begin{aligned} &\int x^*(R) \cdot R_g + (1 - x^*(R)) \cdot q \cdot F dF(R) + s^* \cdot (q \cdot F - R_g) \int [x^*(R) - \tilde{x}(R)] dF(R) \\ &= \frac{1}{\bar{R} - \underline{R}} \left[ R_g \cdot (\hat{R} - \underline{R}) + q \cdot F \cdot (\bar{R} - \hat{R}) + s^* \cdot (q \cdot F - R_g) \cdot (\hat{R} - \tilde{R}) \right] \end{aligned}$$

As one could see from the previous equation, the elasticity of the government's objective function with respect to the tax debtors misinformation depends on the sign of  $(qF - R_g)$ , which is endogenous. However, we can make the problem simpler by considering what happens

from a small deviation from the optimal policy without tax debtors misinformation. Because there is no heterogeneity in  $q$ , any optimal policy will have  $p^* = 0$ , following the results of the previous propositions. For simplicity, let's start from the policy  $\{F, p, s\} : F \geq 0, p = 0, s = 0\}$  and show that this policy is dominated by a policy with  $\{F, p, s\} : F \geq 0, p = 0, s = \varepsilon\}$ . Given this assumptions, the objective function of the government simplifies to:

$$\frac{1}{\bar{R} - \underline{R}} \left[ R_g \cdot (\hat{R} - \underline{R}) + q \cdot F \cdot (\bar{R} - \hat{R}) \right]$$

which is maximized when  $F^* = \frac{R_g + \bar{R}}{2q}$ . This trivially implies that moving to a situation where setting  $\{F, p, s\} : F \geq 0, p = 0, s = \varepsilon\}$  increases the objective function of the government, because  $\hat{R} > \tilde{R}$ , and  $q \cdot F^* > R_g$ .

Last, as in the proofs to the previous propositions, we can use the same argument with the mean value theorem to prove that there must be a critical and unique  $\alpha^* \in (\frac{1}{2}, 1)$  such as the objective function increases with  $s > 0$  if  $\alpha < \alpha^*$  and decreases with  $s > 0$  if  $\alpha > \alpha^*$ .

The main intuition is the following. When the government cares about both welfare of tax debtors and tax revenues, the first-best can be achieved by correcting the misperceptions of everyone and setting the first-best policy. This would be true also when the government cares more about the welfare of tax debtors than raising tax revenues. However, if the government cares comparatively more about raising tax revenues, it is optimal not to correct the debtors who underestimate the financial penalties, letting them act as if the financial penalty is low and surprising them with high penalties in the second period.

## C.2 Signaling Moral Type

This baseline model of social interactions assumes that peers care about financial trustworthiness. In this section, we provide an extension of the model that shows that the main results are robust if, instead, peers care about moral trustworthiness.

### C.2.1 The Debtor's Problem

Suppose that all debtors have  $q_i = q$ , and debtors have types  $\{R_i, m_i\}$ , where  $m_i | R_i \sim U[\underline{m}, \bar{m}]$ . The new type  $m_i$  is the moral cost the debtor bears if she has unpaid debt. Peers do not care directly about the credit-constraint measure  $R_i$ , and observe  $R_i$ , while the government does not observe  $R_i$ . Neither peers nor the government observe  $m_i$ . The type  $m_i$  is correlated with likelihood that a debtor will repay social favors, so peers wish to extend more social favors to higher- $m$  types. Debtors then receive expected social utility equal to:

$$\eta \left[ pE[m_i|R_i, x_i] + (1-p) \cdot \frac{m + \bar{m}}{2} \right]$$

Where  $\eta > 0$  is the relative value of social favors. Note that low- $m$  types are now punished and high- $m$  types are now rewarded; previously low- $R$  types were rewarded and high- $R$  types were punished (hence the absence of the minus sign in front of  $\eta$ ).

Debtors' utility functions are:

$$U(x_i; R_i, m_i) = -R_i \cdot x_i - (1-x_i) \cdot [q \cdot F + m_i - p \cdot \eta \cdot (E[m_i|R_i, x_i = 0] - E[m_i|R_i, x_i = 1])] + \eta \cdot (1-p) \cdot \frac{m + \bar{m}}{2}$$

The debtor's optimal response  $x^*(R_i, m_i) = \arg \max_{x \in \{0,1\}} U(x_i; R_i, m_i)$  is characterized by a threshold for each  $R_i$ ,  $\hat{m}(R_i)$ :

$$x^*(R_i, m_i) = 1[m_i \geq \hat{m}(R_i)]$$

Peers rationally infer that:

$$E[m_i|R_i, x_i = 1] = \frac{\hat{m}(R_i) + \bar{m}}{2} \text{ and } E[m_i|R_i, x_i = 0] = \frac{m + \hat{m}(R_i)}{2}$$

Substituting into the objective function:

$$U(x_i; R_i, m_i) = -R_i \cdot x_i - (1-x_i) \cdot \left[ q \cdot F + m_i + p \cdot \eta \cdot \frac{\bar{m} - m}{2} \right] + \eta \cdot (1-p) \cdot \frac{m + \bar{m}}{2}$$

Each debtor then chooses  $x_i = 1$  when

$$m_i \geq -q \cdot F + R_i - p \cdot \eta \cdot \frac{\bar{m} - m}{2}$$

This confirms our guess that the optimal response is characterized by the thresholds:

$$\hat{m}(R_i) = \min \left\{ \bar{m}, \max \left\{ -q \cdot F + R_i - p \cdot \eta \cdot \frac{\bar{m} - m}{2}, m \right\} \right\}$$

As expected, the proportion of debtors paying in the first period is increasing in the financial penalty  $F$  and the shaming penalty  $p$ , and for a given moral cost debtors pay in the first period provided  $R_i$  is low enough.



### C.2.2 The Government's Problem

Government revenues and private welfare of the taxpayers are:

$$T(F, p) = \int \int [x^*(R, m) \cdot R_g + (1 - x^*(R, m)) \cdot q \cdot F] dF(m|R) dF(R)$$

$$PWD(F, p) = - \int \int [x^*(R, m) \cdot R + (1 - x^*(R, m)) \cdot q \cdot F] dF(m|R) dF(R)$$

Which uses the fact that the aggregate utility from social interactions is fixed. The government again maximizes a weighted sum of tax revenue and the private welfare of debtors:

$$\max_{F \geq 1, p \in [0,1]} \alpha T(F, p) + (1 - \alpha) PWD(F, p)$$

### C.2.3 Optimal Penalties under Homogeneous $q_i$

The following is parallel to Proposition 1:

**Proposition 4.** *In the case that  $\alpha = 1/2$  ( $\alpha > 1/2$ ), for any policy  $\{F, p\}$  there exists an alternative policy  $\{F', p'\}$  with  $p' = 0$  that attains the same (or higher) utility for the government.*

*Proof.* In the case where  $\alpha = 1/2$ , the government's objective function becomes

$$\frac{1}{2} \int [R_g - R] \frac{\bar{m} - \hat{m}(R)}{\bar{m} - \underline{m}} dF(R)$$

Then for any  $\{F, p\}$ , the alternative  $\left\{ F' = F + \frac{p \cdot \eta}{q} \frac{\bar{m} - \underline{m}}{2}, p' = 0 \right\}$  produces the same thresholds  $\hat{m}(R_i)$  for all  $R_i$  and thus produces the same utility for the government.

For  $\alpha > 1/2$  the government's objective function is:

$$\int \frac{\hat{m}(R) - \underline{m}}{\bar{m} - \underline{m}} [\alpha R_g - (1 - \alpha)R] + \frac{\bar{m} - \hat{m}(R)}{\bar{m} - \underline{m}} (2\alpha - 1) \cdot q \cdot F dF(R)$$

Again, for any  $\{F, p\}$ , the alternative  $\left\{ F' = F + \frac{p \cdot \eta}{q} \frac{\bar{m} - \underline{m}}{2}, p' = 0 \right\}$  produces the same thresholds  $\hat{m}(R_i)$  for all  $R_i$ . The first term is the same under both policies, but the second term is larger under  $\{F', p'\}$  since  $F' \geq F$  and  $2\alpha - 1 > 0$ . Thus the alternative policy produces at least as much utility for the government.

### C.2.4 Optimal Penalties under Heterogeneous $q_i$

The following is parallel to Proposition 2:

**Proposition 5.** *If  $\underline{q} < \bar{q}$ , for some values of  $\alpha$ , and some policies  $\{F, p\}$ , the government can obtain strictly greater utility by choosing  $\{F' < F, p' > p\}$ .*

*Proof.* Let  $\alpha = 1/2$ . The government's utility function is:

$$\frac{1}{2} \int [R_g - R] \frac{\bar{m} - \hat{m}(R, \bar{q}) - \theta \cdot [\hat{m}(R, \underline{q}) - \hat{m}(R, \bar{q})]}{\bar{m} - \underline{m}} dF(R)$$

The wedge introduced by the types' difference on ability to collect is:

$$\frac{-\theta}{2(\bar{m} - \underline{m})} \int [R_g - R] [\hat{m}(R, \underline{q}) - \hat{m}(R, \bar{q})] dF(R)$$

Note that:

$$\begin{aligned} \hat{m}(R, \underline{q}) - \hat{m}(R, \bar{q}) &= \min \left\{ \bar{m}, \max \left\{ -\underline{q} \cdot F + R_i - p \cdot \eta \cdot \frac{\bar{m} - \underline{m}}{2}, \underline{m} \right\} \right\} \\ &\quad - \min \left\{ \bar{m}, \max \left\{ -\bar{q} \cdot F + R_i - p \cdot \eta \cdot \frac{\bar{m} - \underline{m}}{2}, \underline{m} \right\} \right\} \\ &\geq 0 \end{aligned}$$

If, for example, the range of  $m_i$  is sufficiently spread out that the boundaries of the  $\hat{m}(\cdot)$  function do not bind, then this term is simply  $F \cdot (\bar{q} - \underline{q})$ . In general, the wedge will be proportional to  $F$  and  $\bar{q} - \underline{q}$ . Assuming that  $\int [R_g - R] dF(R) \geq 0$  (which is a sufficient condition for the government wishing to raise positive revenue in the first period), then the wedge will be weakly positive. The wedge is strictly positive when both  $\int [R_g - R] dF(R) > 0$  and the range of  $m_i$  is large enough relative to the policy choices  $\{F, p\}$  that some types choose to pay while others do not. Using  $F$  as a policy instrument incurs this wedge, while using  $p$  as a policy instrument does not, so the government will prefer  $p$  as its first-choice policy instrument and only use  $F$  when it has set  $p$  as large as possible. Suppose, for example, that  $\{F > 0, p < 1\}$ . Then setting  $F = 0$ ,  $p' = p + \bar{q} \cdot F \frac{2}{\eta(\bar{m} - \underline{m})}$  maintains the same  $\hat{m}(R, \bar{q})$  for all  $R$  (provided that  $p' \leq 1$ ). This policy change also removes the wedge, and thus generates strictly greater utility for the government whenever the wedge is greater than zero.

### C.3 Varying Debt Amounts

This baseline model assumed that individuals were homogeneous with respect to the debt amount. This assumption was made to simplify the notation, and does not change the main intuitions and results. In this subsection, we relax this assumption to examine whether the effectiveness of the shaming penalty should depend on the debt amount.

Let  $d_i$  denote the debt amount. The simplest case is when debt amounts are common

knowledge, and each taxpayer can choose whether to pay the full amount in the first period ( $x_i = 1$ ) or pay nothing in the first period ( $x_i = 0$ ). The utility of the taxpayer is given by:

$$-R_i \cdot d_i \cdot x_i - (1 - x_i) \cdot [q_i \cdot F \cdot d_i + p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])] + \eta \cdot (1 - p) \cdot \frac{R + \bar{R}}{2}$$

Note that the key assumption is that peers only care about the individual's financial health ( $R_i$ ), in which case the value of the non-market good,  $\eta$ , does not vary with the debt amount. Solving for the debtor's problem as before, debtor  $i$  pays in the first period if and only if  $R_i$  is below the following threshold:

$$\hat{R}(d_i, q_i) = q_i \cdot F + p \cdot \frac{\eta}{d_i} \cdot \frac{\bar{R} - R}{2}$$

Note that the effect of the financial penalty on the threshold does not change with the debt amount: i.e.,  $\frac{\partial^2 \hat{R}(d)}{\partial F \partial d} = 0$ . This property arises directly from the fact that the financial penalty is proportional to the debt amount. The social penalty, on the other hand, is decreasing in the debt amount: i.e.,  $\frac{\partial^2 \hat{R}(d)}{\partial p \partial d} = -\frac{\eta}{d^2} \cdot \frac{\bar{R} - R}{2} < 0$ . Intuitively, the cost of obtaining the non-market good (i.e., paying off the debt) is increasing in the debt amount but the benefit of obtaining the non-market good ( $\eta$ ) is constant. As mentioned previously, this property arises directly from the assumption that peers only care about the individual's financial health ( $R_i$ ). In a more general model, peers may care about some combination of  $R_i$  and  $d_i$ , in which case this property may or may not be maintained.

## D More Details about the Experimental Sample

### D.1 Descriptive Statistics about the Place Characteristics Associated with the Number of Delinquents

In this subsection, we present some basic regression analysis aimed at identifying place characteristics that are associated with the number of delinquents in an area.

For that, we compiled a ZIP-5 level database with the number of delinquents living in each ZIP code of the three experimental states: Kentucky, Kansas and Wisconsin. As a measure of delinquency, we consider the number of delinquents listed online as of May 26th 2014, which is when we first downloaded our experimental sample. The sample includes individuals who are still living in the same state where the debt originated. Given that the three states have different thresholds, the distribution of the number of delinquents would be different across states. To keep the delinquency rates comparable, we only include individuals with debts of \$5,000 or above, which coincides with the highest of the three thresholds.<sup>62</sup> To properly account for the fact that the number of delinquents may be roughly proportional to the number of inhabitants, we include as independent variable the logarithm of population in the ZIP-5. We include a number of other independent variables, which were normalized to have mean zero and standard deviation 1. The coefficient on each of these variables can be interpreted as the effect of a one standard deviation increase in the covariate on the log of expected number of delinquents.

Table D.1 shows the regression results from a Negative Binomial regression of the number of delinquents in a ZIP-5 on the logarithm of population and a few additional place characteristics. *Mean Income* corresponds to the mean gross income at the ZIP-5 level. *Share of Wage Income* is the same proxy for income garnishability used in the analysis of the field experiment, defined as the share of income originating from wage income in the ZIP-5. *EITC Bunching* is a proxy for sophisticated tax avoidance, as proxied by the share of self-employed individuals in the 3-digit ZIP code estimated to be mis-reporting income to take advantage of EITC benefits (see Chetty et al., (2013)). *Share Republican* is the county-level share of votes for the Republican candidate in the 2012 U.S. Presidential Election. *Civic Life Index* is a county-level measure of social capital based on a number of indicators such as the density of civic and non-profit organizations.

The results from column (1) pool the data for the three states. The coefficient on  $\text{Log}(\text{Population})$  is close to one and significant (p-value<0.01), indicating that, as expected, the number of delinquents is roughly proportional to the population in the ZIP code. The coefficient on mean in-

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<sup>62</sup>As a result, the mean number of delinquents per 1,000 inhabitants are very similar across states: 2.27 in Kentucky, 2.31 in Kansas and 2.54 in Wisconsin.

come is close to zero and statistically insignificant. This suggest that high-amount delinquents (i.e., delinquents owing over \$5,000) don't seem to be overly concentrated in poorer or richer areas. The coefficient on *Share of Wage Income* is negative and significant (p-value<0.01). This is consistent with the prediction from the model that areas with higher income garnishability should have a lower number of delinquents: when income garnishability is lower, people will be less likely to have to pay back the debt in the last period, and, hence, can accumulate more delinquencies, ceteris paribus. The magnitude of the correlation is economically significant: a one standard deviation increase in *Share of Wage Income* decreases the expected number of delinquents in the area by about 8%. The coefficient on *EITC Bunching* is positive and significant (p-value<0.01). This finding suggests that sophisticated individuals who take advantage of opportunities to evade taxes may also take advantage of opportunities to avoid tax collection. The magnitude of this correlation is large: a one standard deviation increase in *EITC Bunching* reduces the expected number of delinquents in the area by about 17%. The coefficient on *Share Republican* is negative and significant (p-value<0.01) suggesting that partisanship and tax compliance may be related (Cullen, Turner and Washington (2015)). The coefficient on *Civic Life Index* is negative and significant (p-value<0.01), suggesting that tax delinquents are more rare in areas with higher social capital, which may be suggestive of the relevance of intrinsic motivation for paying taxes.

In principle, the institutional context and regulation for tax collection may vary so much across states that there could be significant differences in the relationship between tax delinquency and the covariates across states. Columns (2) through (4) shows the results for each state on a separate basis. The results indicate that, except for a few differences, the majority of the correlations are qualitatively similar across states.

## **D.2 Descriptive Evidence about How Delinquents can Get Off the List**

In this subsection we discuss the observational evidence supporting the statutory claim that, once included in the list, a delinquent can be taken off the list if and only if she commits to pay the full amount of the debt (rather than the minimum amount necessary to take the debt amount just below the threshold).

The evidence for Kentucky, Kansas and Wisconsin is shown in Figures D.1.a, D.1.b and D.1.c. The data corresponds to the subject pool. For each state, the figure shows the distribution of debt amounts. If individuals could pay a small amount of money to get below the threshold and get off the list, this would imply that there would be some “missing density” just above the threshold (i.e., those individuals could “aim” at having unpaid debts below the threshold). However, we do not find evidence of such missing density in any of the states. The

graph also shows the mean probability of leaving the list in the next 6 months, for each of the bins of the initial debt. If individuals could pay epsilon below the threshold to get off the list, we should observe a spike in the probability of leaving the list just above the threshold (in the extreme case, the individual that is \$1 to the right of the threshold could pay \$1.01 and get off the list). Again, we find no evidence consistent with that conjecture. Last, it should also be noted that, even if there was a way of paying to be taken below the threshold, that would only result in being taken off the list for a short time period, because the financial penalties would accumulate and take the total amount back above the threshold.

In sum, all the evidence supports the statutory claim that, once listed, individuals must pay the entire debt amount or enter a payment plan for the entire debt amount.

### D.3 Further Results and Descriptive Statistics

In this subsection, we present some complementary figures and tables.

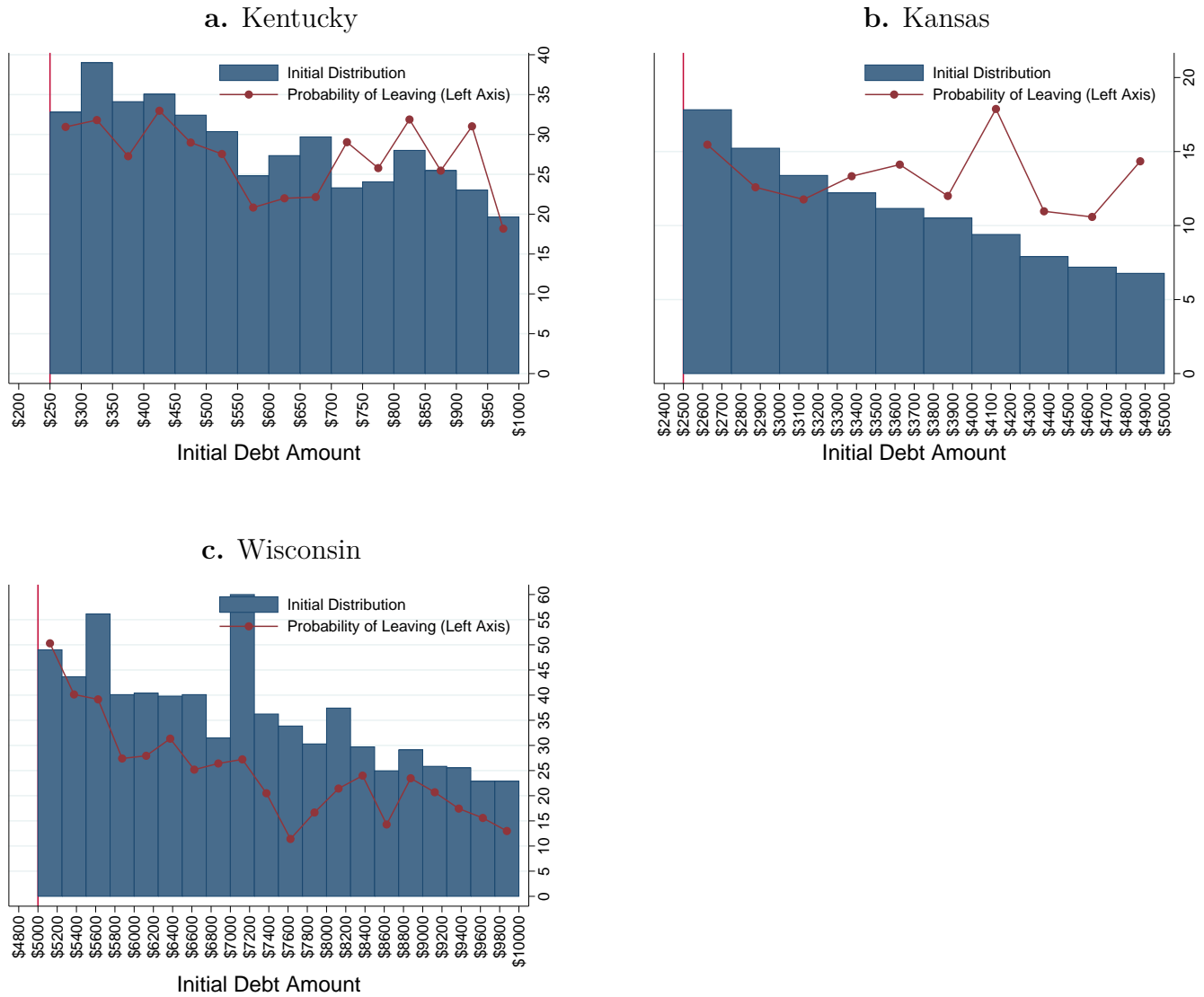
First, Figure D.2 shows the evolution of this outcome variable for each week from the beginning of the sample (Monday, May 26, 2014). Figure D.2.a shows the evolution over the entire sample, while Figures D.2.b-D.2.d show the evolution in each of the three states separately. These figures show that the probability that a given delinquent is off the list increases quite smoothly over time, although in Kentucky and Wisconsin there are some specific points in time when a larger-than-usual fraction of individuals leave the list (e.g., fifth week in Wisconsin and eleventh week in Kentucky). According to our conversations with the tax agencies, those discontinuities reflect time points when, for administrative reasons, the tax authority makes a higher number of updates to the list.<sup>63</sup>

Second, Table ??

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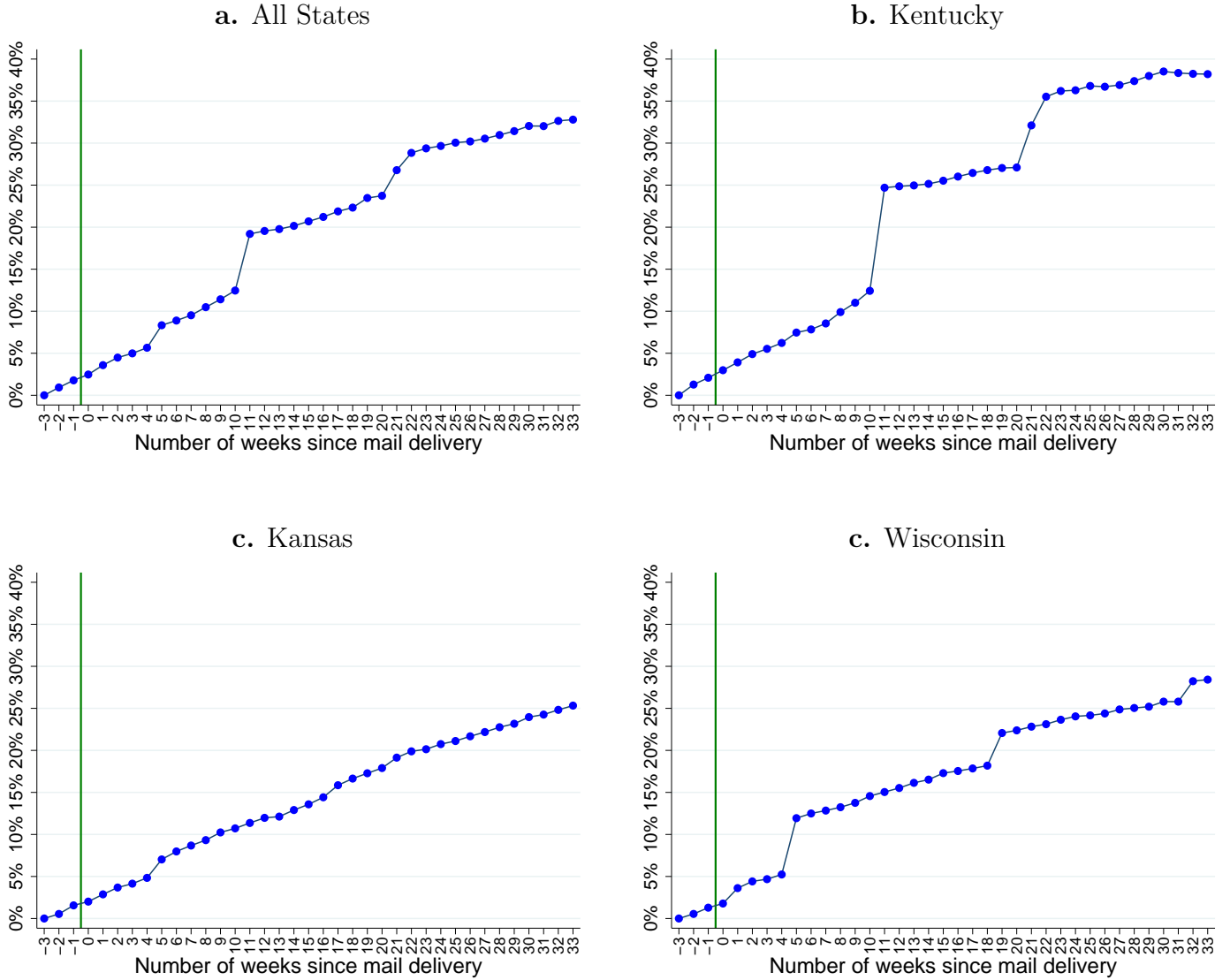
<sup>63</sup>For example, given that many individuals submit their tax forms close to the same deadline, that tends to create spikes in the rate with which new individuals enter the list.

Figure D.1: Descriptive Evidence about the Behavior of Tax Delinquents



Notes: N=18,101 in Kentucky (a.), 8,710 in Kansas (b.) and 7,523 in Wisconsin (c.). The blue bars show the histogram with the distribution of amounts owed by the subjects who appeared on the online lists of delinquents as of May 26th 2014. The red dots indicates, for the group of individuals in a given bin of amount owed as of May 26th 2014, the share of those individuals who are not listed as delinquents in exactly 6 months after May 26th 2014.

Figure D.2: The Evolution of the Probability of Leaving the List



Notes:  $N=34,334$  (18,101 from Kentucky, 8,710 from Kansas and 7,523 from Wisconsin). In the x-axis, week -3 corresponds to the date when the subject pool was formed (May 26, 2014). The green vertical line shows the approximate date when the letters were delivered. The y-axis corresponds to the share of the subjects who were no longer listed online.



Table D.1: Place Characteristics Associated to the Rate of Tax Delinquency

	Number of Delinquents in 5-digit ZIP code			
	(1)	(2)	(3)	(4)
	All	Kentucky	Kansas	Wisconsin
Mean Income (STD)	-0.001 (0.015)	-0.162*** (0.061)	0.064*** (0.023)	-0.056** (0.022)
Share of Wage Income (STD)	-0.079*** (0.030)	-0.123* (0.073)	0.057 (0.051)	-0.115*** (0.035)
EITC Bunching (STD)	0.177*** (0.023)	0.392*** (0.054)	0.178*** (0.067)	0.225*** (0.025)
Share Republican (STD)	-0.086*** (0.029)	-0.104* (0.061)	-0.063 (0.047)	0.106*** (0.032)
Civic Life Index (STD)	-0.140*** (0.031)	0.089 (0.074)	-0.237*** (0.041)	0.017 (0.052)
Log(Population)	1.030*** (0.018)	1.088*** (0.036)	1.000*** (0.026)	0.950*** (0.021)
Observations	1,972	657	603	712

Notes: \* significant at the 10% level, \*\* at the 5% level, \*\*\* at the 1% level. Heteroskedastic-robust standard errors in parenthesis. The coefficients correspond to a Negative Binomial Regression of the number of delinquents in the ZIP-5 on a number of place characteristics. All the independent variables (except Log(Population)) were normalized to have mean zero and standard deviation 1. *Number of Delinquents in ZIP-5* counts the number of unique individuals on the online lists of delinquents as of May 26th 2014 who owed \$5,000 or more. The sample includes individuals with debts originating from Kentucky, Kansas and Wisconsin who are still living in the same state where the debt originated. *Log(population)* is constructed at the ZIP-5 level and comes from the 2012 U.S. Census data. *Mean Income* corresponds to the mean gross income at the ZIP-5 level, based on data from 2012 IRS SOI. *Share of Wage Income* is the share of gross income originating from wage income, also constructed at the ZIP-5 level and using data from the 2012 IRS SOI. *EITC Bunching* is the share of self-employed individuals in the 3-digit ZIP code estimated to be mis-reporting income to take advantage of EITC benefits (data source: Chetty et al., (2013)). *Share Republican* is the county-level share of votes for the Republican candidate in the 2012 U.S. Presidential Election. *Civic Life Index* is a county-level measure of social capital based on density of civic and non-profit organizations, voting turnout and census completion rates as of 2005 (Rupasingha, A.; Goetz, S. and Freshwater, D. (2006), “The Production of Social Capital in US Counties,” Journal of Socio-Economics, Vol. 35, pp. 83–101). The regression in column (1) includes state fixed effects.

Table D.2: Effects of Shaming and Financial Penalties

	Probability of Leaving the List		Log(Amount)
	(1) Week 5	(2) Week 10	(3) Week -3
Effect of Social Penalty:			
First Quartile (250–2,273)	1.914*** (0.661)	2.080*** (0.725)	0.004 (0.013)
Second Quartile (2, 273–5,439)	-0.285 (0.630)	0.026 (0.796)	-0.001 (0.006)
Third Quartile (5, 439–13,347)	0.402 (0.694)	0.282 (0.858)	0.003 (0.006)
Fourth Quartile (13, 350–149,738)	-0.419 (0.637)	-0.669 (0.706)	0.012 (0.014)
Effect of Financial Penalty:			
First Quartile (250–2,273)	0.940 (0.652)	1.065 (0.741)	-0.002 (0.014)
Second Quartile (2, 273–5,439)	0.573 (0.619)	1.019 (0.803)	-0.001 (0.006)
Third Quartile (5, 439–13,347)	-0.014 (0.666)	0.856 (0.820)	0.010* (0.006)
Fourth Quartile (13, 350–149,738)	-0.124 (0.636)	-0.127 (0.765)	-0.009 (0.015)
Mean Outcomes:			
First Quartile (\$250-\$2,273)	8.551*** (0.420)	11.067*** (0.514)	6.783*** (0.007)
Second Quartile (\$2,273-\$5,439)	7.398*** (0.386)	12.933*** (0.575)	8.181*** (0.003)
Third Quartile (\$5,439-\$13,347)	9.366*** (0.475)	14.504*** (0.589)	9.010*** (0.003)
Fourth Quartile (\$13,350-\$149,738)	8.016*** (0.370)	11.348*** (0.470)	10.344*** (0.008)

Notes: N=34,334. \* significant at the 10% level, \*\* at the 5% level, \*\*\* at the 1% level. Heteroskedastic-robust standard errors clustered at the 5-digit ZIP code level. The coefficients were estimated from OLS regressions (one per column) where the right hand side variables are the treatment dummies, interacted with the quartile amount dummies, plus a set of control variables: gender dummy, ethnicity, state dummies, initial debt amount and its logarithm (with state-specific coefficients) and the number of delinquents in the ZIP code. *Shaming Penalty* is a dummy that takes the value 0 if the recipient was the only one in the area chosen to receive a letter, and 1 if others in the area were chosen to receive a letter too. *Financial Penalty* is a dummy that takes the value 1 if the letter included information about the financial penalties and 0 if not.

## **E Regulations of Lists of Tax Delinquents**

Table E.1 lists all the twenty-three U.S. that, as of January of 2015, maintained shaming lists on the Internet with the names, addresses and other information of individuals and businesses with delinquent taxes. This table includes some characteristics of the lists maintained by each state, such as the start year and whether they include individuals and businesses.

In the following subsections we presents further details about the legal aspects of tax delinquencies for the three states included in the experiment: Kansas, Kentucky and Wisconsin.

### **E.1 Kentucky**

A snapshot of the webpage with the list of tax delinquents from Kentucky is shown in Figure E.1. In Kentucky the publication of delinquents owing taxes or other fees is regulated by KRS 131.650. According to it, “a taxpayer may be included on a list if: (a) The taxes or fees owed remain unpaid at least forty-five (45) days after the dates they became due and payable; and (b) A tax lien or judgment lien has been filed of public record against the taxpayer before notice is given under KRS 131.654.” The provision related to the privacy of taxpayers are regulated by KRS 131.190. The notification to tax debtors is regulated by KRS 131.654. The requirements to qualify as tax delinquent are regulated by KRS 131.652.

### **E.2 Kansas**

A snapshot of the webpage with the list of tax delinquents from Kansas is shown in Figure E.2. In Kansas taxation matters are regulated by chapter 79 of the state Statute. Article 79-3235 regulates the collection of debts arising from state income tax. A warrant is issued if taxes are not paid within 60 days after they become due. The warrant comprises the delinquent taxes, with the added penalties, interest and the costs associated with the warrant itself. The process of state income taxation is regulated by article 32 in chapter 79 of the Kansas Statute. Article 79-3228 regulates the process of administering interests and penalties.

### **E.3 Wisconsin**

A snapshot of the webpage with the list of tax delinquents from Wisconsin is shown in Figure E.3. In Wisconsin the publication of tax delinquents is regulated by section 73.03(62) of the Wisconsin statute. A requirement for publication is that the amount is unpaid more than 90 days after all appeal rights have expired. The Wisconsin department will not post the accounts of taxpayers who have: entered into a valid installment agreement, submitted a complete Petition for Compromise, or filed for bankruptcy. The process of reaching a repay-

ment plan agreement with the Wisconsin Department of Revenue is regulated by section 71.92. The process of updating the online lists is regulated by s. 562.01 (3m). The process of taxing individuals is regulated by section 71.01. The interests and penalties are regulated by sections 71.82, 71.83, 71.84 and 71.85. The expression “liable for delinquent taxes” means that a person has exhausted all legal remedies to challenge the assertion that the person owes taxes, including penalties, interest, fees and costs, under ch. 71, 72, 76, 77, 78, 125 or 139 and sufficient time has elapsed so that the person is delinquent in the payment of those taxes.

Figure E.1: Snapshot of Online Search Tool, Kentucky Department of Revenue

Department of Revenue

Home | Site Map | Calendar | Finance & Administration Cabinet  
 Revenue > Listing of Delinquent Debtors > Individual Debtors

### Individual Debtors

Pay your delinquent debt or contact the Division of Collections by [email](#) or phone **502-564-4921, ext. 5367**.

Download Listing of Delinquent Debtors [View Listing of Delinquent Debtors Disclaimer](#)

Hide Search  
 You may search on any of the fields below.

Name Like RICARDO  
 Lien Balance >>  
 Address Like  
 City Like  
 State =  
 Zip =  
 County of Record =

Show 15 records at a time  
 15 result(s) 1 - 5 of 15 Total Records

View Detail / Name	Lien Balance	Address	City	State	Zip	County
RICARDO [REDACTED]	\$24,460.91	[REDACTED]	NEW BRAUNFELS	TX	[REDACTED]	JEFFER
RICARDO [REDACTED]	\$10,408.71	[REDACTED]	LOUISVILLE	KY	[REDACTED]	JEFFER
RICARDO [REDACTED]	\$10,119.18	[REDACTED]	WESTLAND	MI	[REDACTED]	JEFFER
RICARDO [REDACTED]	\$9,850.80	[REDACTED]	LEXINGTON	KY	[REDACTED]	FAYET
RICARDO T	\$8,777.13	[REDACTED]	CRESTWOOD	KY	[REDACTED]	OLDHA

1 2 3

Figure E.2: Snapshot of Online Search Tool, Kansas Department of Revenue

ANIMATA PER ASPERA  
**Kansas**  
 Department of Revenue

Home Personal Tax Business Tax Vehicles E-services Forms Contact Us Divisions Media Miscellaneous

Home > [Tax Delinquencies](#)

Tax Delinquencies

Click on the header below to sort by Name, County or Amount Due.  
 Note: This tax delinquency list does not include all types of warrants filed by the Kansas Department of Revenue.  
 Not Included Here: Warrants filed by the Division of Motor Vehicles, or the Division of Property Valuation (Property Tax).

ricardo Search Clear Search

Rows per page 10

Name and Address	County	Tax Type(s)	Total Amount Due	District Court Case Number
RICARDO [REDACTED] KANSAS CITY, KS [REDACTED]	WYANDOTTE	INCOME TAX	\$98,168.65	[REDACTED]
RICARDO [REDACTED] OVERLAND PARK, KS [REDACTED]	JOHNSON	INCOME TAX	\$52,669.65	[REDACTED]
RICARDO [REDACTED] KANSAS CITY, KS [REDACTED]	WYANDOTTE	INCOME TAX	\$18,717.43	[REDACTED]

Search Website

FILE YOUR TAXES ONLINE

Related items...

- ★ Check on your refund
- ★ Personal tax forms
- ★ Resolve tax issues
- ★ Frequently asked questions
- ★ Business topics
- ★ Policy library

Figure E.3: Snapshot of Online Search Tool, Wisconsin Department of Revenue

The screenshot shows the Wisconsin Department of Revenue website. The header includes the state seal and the text "Wisconsin Department of Revenue". Below the header is a navigation menu with buttons for "Home", "Businesses", "Individuals", "Tax Professionals", "Governments", and "Unclaimed Property". A search bar is located to the right of the menu. The breadcrumb trail reads: "Home > Wisconsin Delinquent Taxpayers > Delinquent Taxpayers by Name > Delinquent Taxpayers by Name". The main heading is "Delinquent Taxpayers by Name", followed by a list of letters from A to Z and a hash symbol. Below this are two links: "Go to Revoked Sellers Page" and "Back to Delinquent Page". The main content is a table with four columns: "Name/Doing Business As Name", "Last Known Mailing Address", "Tax Type", and "Amount". The table contains six rows of data, with names and addresses redacted with black boxes.

Name/Doing Business As Name	Last Known Mailing Address	Tax Type	Amount
[REDACTED]	[REDACTED]	W,S	\$14,890.88
[REDACTED]	[REDACTED]	W,Y,S,C,B	\$27,112.93
[REDACTED]	[REDACTED]	W,S	\$34,238.60
[REDACTED]	[REDACTED]	W,S	\$91,355.08
[REDACTED]	[REDACTED]	W	\$72,727.43
[REDACTED]	[REDACTED]	W,S,C	\$37,721.52

Table E.1: States with Online Lists of Tax Delinquents (as of December 31, 2014)

State	Start Year	Current Threshold	Type	Website
California	2007	Top-500	I, B	<a href="#">Link</a>
Colorado	2003	\$20,000	I, B	<a href="#">Link</a>
Connecticut	1995	Top-50	I, B	<a href="#">Link</a>
Delaware	2007	Top-100	I, B	<a href="#">Link</a>
Florida	2014	\$100,000	I, B	<a href="#">Link</a>
Georgia	2004	\$0	I, B	<a href="#">Link</a>
Indiana	2010	\$0	B	<a href="#">Link</a>
Kansas	2004	\$2,500	I, B	<a href="#">Link</a>
Kentucky	2007	\$250	I, B	<a href="#">Link</a>
Maryland	2000	Top-25	I, B	<a href="#">Link</a>
Massachusetts	2004	\$25,000	I, B	<a href="#">Link</a>
Montana	2010	\$10,000	I, B	<a href="#">Link</a>
Nebraska	2010	\$20,000	I, B	<a href="#">Link</a>
New Jersey	2010	Unknown	I, B	<a href="#">Link</a>
New York	2010	Top-250	I, B	<a href="#">Link</a>
North Carolina	2001	Unknown	I, B	<a href="#">Link</a>
Oklahoma	2009	\$25,000	I, B	<a href="#">Link</a>
Pennsylvania	2010	Unknown	I, B	<a href="#">Link</a>
Rhode Island	2003	Top-100	I, B	<a href="#">Link</a>
South Dakota	2012	Top-200	B	<a href="#">Link</a>
Vermont	2014	Top-100	I, B	<a href="#">Link</a>
Washington	1997	\$10,000	I, B	<a href="#">Link</a>
Wisconsin	2006	\$5,000	I, B	<a href="#">Link</a>

Notes: Tax type indicates whether the lists includes Individuals (I) and/or Businesses (B). While some states maintain separate lists for Individuals and Businesses, some states have these combined in the same list. States that maintain lists for very specific taxes are not included in this table: e.g., Alabama for property tax and Minnesota for liquor tax. This table does not include other states which had lists of delinquents in the past but discontinued the policy (e.g., Hawaii, Illinois, Louisiana, South Carolina, Virginia).