Tax Debt Enforcement:

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

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Abstract

We present theory and evidence about the enforcement of tax delinquencies, which are tax debts incurred with the government. In our model, the tax agency relies on a financial penalty and a social penalty that involves publishing the names of tax delinquents online, a policy that is becoming increasingly common. We show that, when the tax agency cares about social welfare as well as revenues, the optimal policy involves a mix of financial and social penalties. We conducted a field experiment with 35,000 tax delinquents who owed half a billion dollars in three U.S. states. We find that increasing the salience of both financial and social penalties reduces tax delinquencies. We also provide suggestive evidence that, as predicted by our model, the effectiveness of social and financial penalties depends on the debtor's income garnishability.

JEL Classification: tax debt, enforcement, interests, social, penalty.

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1 Introduction

An efficient system of tax collection is one of the key determinants of state capacity (Besley and Persson (2013)). The existing literature has focused on understanding tax evasion and tax avoidance (Slemrod (2007); Slemrod and Gillitzer (2013)). However, a more unexplored topic which is equally important to tax compliance is the reduction of tax delinquencies: i.e., the debts incurred by the citizen with the tax administration. These potential tax revenues are arguably the most readily available for the tax agencies. As a result, tax enforcement agencies invest substantial resources in designing and implementing policies to reduce tax delinquency. The problem of tax delinquency is significant in the developed world. For example, according to the U.S. Department of Treasury (2012), in 2006 delinquent taxes comprised more than 20 percent of the total U.S. gross tax gap.³ Tax delinquency plays an even more important role in the developing world (Gordon and Li (2009)).⁴ This paper develops a theoretical framework for this understudied aspect of tax compliance and provides empirical evidence from a field experiment on tax delinquency in three U.S. states.

In practice, tax debts are enforced through financial penalties (e.g., the interest rate on the debt amount) and non-financial penalties. When those remedies don't work, as a last resort, tax agencies may resort to garnishing wages, which is the process of deducting money from an employee's monetary compensation. We focus on one particular type of non-financial penalty - using websites to list the names and addresses of tax delinquents. This social penalty is becoming widespread in the United States and the rest of the world. For example, Table 1 lists twenty-three U.S. states which, as of December 31st, 2014, maintained websites listing the names and other identifying information of individuals and business with delinquent taxes. In spite of the widespread use of social penalties and the excitement expressed by tax agencies in their communications with the press, little is known about whether they are effective in reducing delinquency or whether they may be desirable from a social welfare perspective.⁵ Our research tackles these questions. First,

³The estimates that in 2006 there were \$46 billion in underpayment of declared taxes and \$65 billion in enforced and other late payments. In addition to the previous items, the tax gap includes nonfiling and underreporting, estimated to be near \$450 billion dollars.

⁴Official estimates indicate that tax delinquency is also a significant problem in other developed countries. For example, according to the Swedish Tax Agency, in 2014 in Sweden there were SEK 37.4 billion in outstanding unpaid tax arrears (about \$5 billion 2014 U.S. dollars). According to the French Public Finances Directorate, in 2012 there were €18.1 billion in total unpaid net taxes and penalties in France (about \$24 billion 2014 U.S. dollars). And according to Japan's National Tax Agency, in 2012 there were 1,270.2 billion yen in tax delinquencies in Japan (about \$11 billion 2014 U.S. dollars).

⁵Some examples of the practical effectiveness of the online list of delinquents are: Wisconsin (Department of Revenue press release, December 26, 2007), Illinois (Department of Revenue press release, November 3, 2009), California (Hines, Alice "Amex, Cantor Fitzgerald And Pamela Anderson Land On Cyber-Shame Lists Of Tax Delinquents," Huffington Post, April 17, 2012), Georgia, Wisconsin and Colorado (Jones, Ben "Latest tax tool: 'Internet shaming'" USA TODAY, December 22, 2005), Delaware ("State releases list of top 100 delinquent taxpayers in Delaware," Dover Post, November 28, 2011), Massachusetts (Mohl, Bruce "Mass. lists 1,481 as delinquent on taxes" Boston Globe, May 6, 2004). Not all the press releases were positive, though. For example, the spokesman for the Georgia Department of Revenue had doubts during the early implementation of this policy (Chu "Shame

we present a model which shows that social penalties can indeed be useful to increase revenues and social welfare. Second, we present evidence from a field experiment with 35,000 delinquents who owed about half a billion dollars in three U.S. states. We show that increasing the salience of both financial and social penalties reduces tax delinquencies, and that the effectiveness these penalties seems to depend with the debtor's income garnishability as predicted by the model.

In our model, a tax agency maximizes a weighted average of tax revenues and social welfare. This agency can use imperfect administrative remedies to enforce payments from debtors who refuse to pay, such as wage garnishment. Depending on the source of income of the debtor, the enforcement may be more or less effective: e.g., it is arguably easier to garnish wages than to garnish business income. Indeed, this heterogeneity in income garnishability resembles the heterogeneity in the ability to hide assets in models of tax evasion (Kleven et al (2011)).⁶ The agency can set a financial penalty (i.e., an interest rate) as well as a social penalty (i.e., advertise the identities of the tax delinquents). To model how the social penalty affects delinquency, we take a signaling approach to social interactions (Cole, Mailath and Postlewaite (1992); Bernheim (1994); Bénabou and Tirole (2003)). An individual has social interactions with peers, and her utility from these interactions depends on how financially (or morally) trustworthy the individual is perceived to be by her peers.⁷ By publishing the list of delinquents, the tax agency affects the visibility of the decision to pay back tax debts. A higher visibility makes not paying taxes less attractive, because it can serve as a bad signal of trustworthiness and thus result in worse outcomes from social interaction.

We show that, when individuals are homogeneous in the garnishability of income, the social penalty is clearly 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 don't pay sooner but have to pay interest later. As a result, the collector would never find it optimal to use the social penalty. However, when individuals differ in the garnishability of income, social penalties have an advantage over financial penalties. For a given financial penalty, some individuals don't pay even though they are financially sound, because they expect to escape income garnishment with a higher probability. Instead, the effect of the social penalty does not vary with income garnishability. We show that, if the collector cares about welfare, it is optimal to use a combination of the social penalty and the financial penalty, because the social penalty is more lenient towards individuals who are going through financial hardship.⁸

apparently not motivating delinquent Georgia taxpayers to pay up," Associated Press News, 2004).

⁶Indeed, 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.

⁷This 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).

⁸Another rationalization for the existence of social penalties would be that the debt collector cannot increase the financial penalty and thus imposes a social penalty instead. In other words, the social penalty could act as a mere substitute of the financial penalty. However, this is not a compelling explanation, because the tax agencies face little to no restrictions to set financial penalties.

If, on the other hand, the collector cares only about revenues, a social penalty is inferior to using a financial penalty, which generates additional revenues from individuals who repay late with high interest rates.⁹

In the second part of the paper, we provide evidence from a field experiment about the effectiveness of financial and social penalties and, additionally, about whether the effectiveness of these penalties varies with income garnishability as suggested by our model. There are a number of plausible conjectures as to why social penalties could be ineffective in reducing delinquency, and even backfire.¹⁰ For example, social penalties may conflict with the intrinsic desire for honoring tax debts, as suggested by the literature on how extrinsic motivation can crowd-out intrinsic motivation (Bénabou and Tirole (2003); Kleven et al. (2011)). The effect of social penalties on the debtor's social interactions could alienate her from new sources of income generation and thus make her less likely to pay.¹¹

Our field experiment was based on a sample of 34,344 individuals taken from the online lists of tax delinquents published by three U.S. states: Kansas, Kentucky and Wisconsin. At the time of the field experiment, the median amount owed by these subjects was \$5,500, and the total amount was about half a billion dollars. These subjects had been delinquents for years, despite numerous attempts and solicitations from the tax agency and high financial penalties. For example, in the case of Kentucky, our subjects had remained delinquent for an average of 2.7 years (median of 2 years), and faced an annual interest rate of up to 30 percent.¹² We sent letters to this sample of 34,344 individuals. These letters were identical in everything except a few key pieces of information that were randomly assigned to affect the salience of financial and social penalties. We then estimate the effect of these messages by using data on whether each of the subjects is no longer listed as a delinquent in each of the weeks after we mailed our letters.

The first treatment was designed to alter the visibility of the recipient's delinquency status in the eyes of the neighbors. We randomized whether the recipient was the only individual in the area receiving information about the online list of delinquents, or whether other individuals in the area were also randomly chosen to receive this information too.¹³ This information was prominently displayed in the letter. The difference between the two messages is that in the first type of

⁹The U.S. regulations on collection of credit card debt explicitly prohibit credit card companies from using social penalties (Hunt (2007)). At first sight, this prohibition may seem at odd with the finding that a revenue-maximizing collector would not find it optimal to use social 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 social penalties.

¹⁰Indeed, some states, such as Louisiana and Illinois, chose to discontinue the publication of the list of tax delinquents (Hines, Alice "Amex, Cantor Fitzgerald And Pamela Anderson Land On Cyber-Shame Lists Of Tax Delinquents," Huffington Post, April 17, 2012).

¹¹For instance, Prescott and Rockoff (2011) shows that disclosing the identities of sex offenders may actually have increased recidivism among existing sex offenders.

¹²Kentucky is the only one of the three states in our sample for which we observe the exact date when the lien was originated. The estimated average duration for the other two states is, if anything, even higher. The annual interest rates in Kansas and Wisconsin were 12% and 18%.

¹³The methodology of increasing the salience of the policy is based on Perez-Truglia and Cruces (2013), who study political campaign contributions.

message, other individuals in the area are also receiving the information about the delinquent list and the website, thus making the recipient feel monitored by neighbors. The second treatment was intended to create exogenous variation in the knowledge and/or salience of information about financial penalties. The letter could either contain no message about financial penalties, or contain a message with a summary of the financial penalties to which the debt was subject. Providing these reminders should provide an estimate of the financial penalties if, as documented in a variety of setting, subjects systematically under-estimate the financial penalties (Stango and Zinman (2011); Frank (2011); Ausubel (1991)) and/or are inattentive about them (Karlan et al. (2014)). Indeed, as in the case of the social penalty, our model shows that correcting misperceptions about financial penalties can be optimal for a tax agency that cares enough about social welfare. Last, the letter also included some information about the debts owed by other delinquents in the recipient’s area of residence. We generated some random but non-deceptive variation in this information, with the goal of testing whether delinquents care about the behavior of other delinquents, which could be a source of side-effects from the publication of the list of delinquents.

We find that increasing the salience of financial and social penalties has a statistically and economically significant effect on the speed of repayment. Our sample is unique in that tax delinquents are vastly heterogeneous in their debt amounts, ranging from \$250 to \$150,000. We find that the effect of the financial penalty does not change with the debt amount, but the effect of the social penalty is inversely proportional to the debt amount. This finding is informative about the underlying value of social interactions, and also suggests that social incentives may sometimes be difficult to scale-up. We also find that effect of the financial penalties is stronger in places where more of the reported income derives from wages, which we use as a proxy for income garnishability. Instead, the effect of social penalties does not vary with the fraction of reported income coming from wages. This evidence suggests that the social and financial penalties depend on the debtor’s income garnishability as predicted by our model and that the use of social penalties may increase not only the speed of repayment but also social welfare. Finally, we investigate whether varying delinquents’ information about the distribution of other delinquents’ debts changes their behavior. Last, we generated some random but non-deceptive variation in this list, with the goal of testing whether delinquents care about the behavior of other delinquents, which could be a source of side-effects from the publication of the list of delinquents. We find no evidence that informing delinquents about other large debts affects their repayment behavior. This evidence is broadly consistent with the finding that moral appeals seem ineffective in reducing tax avoidance (Blumenthal, Christian and Slemrod (2001)).¹⁴ This finding suggests that peer comparison of debt amounts are not a source of side-effects from the publication of the list of delinquents.

This paper relates to several strands of literature. Our study is related to a recent set of

¹⁴Fellner, Sausgruber and Traxler (2013) also find that moral appeals fail to reduce tax evasion. Kleven et al. (2014) also find that moral incentives have a net effect of zero and they argue their finding is explained by fact that intrinsic and extrinsic motives have opposite signs and offset each other. In contrast with this evidence, Hallsworth et al. (2014) find that moral appeals increase tax compliance.

studies focused on providing experimental and quasi-experimental evidence on the effects of tax evasion, tax enforcement and tax avoidance (Blumenthal, Christian and Slemrod (2001); Slemrod, Blumenthal and Christian (2001); Slemrod (2006); Kleven et al. (2011); Casaburi and Troiano (2013); Castro and Scartascini (2013); Slemrod, Thoresen and Bo (2013); Fellner et al. (2013); Hasegawa et al. (2013); Dwenger et al. (2014); Hallsworth et al. (2014)). We contribute to this literature in two different ways. First, this literature focuses almost entirely on tax evasion and avoidance. To the best of our knowledge, we are among the first to study administrative tax delinquencies, which are debts actually owed by citizens to local administrative agencies and that have not been collected despite numerous attempts and solicitations.¹⁵ Second, we are the first to study the disclosure of the identities of the tax delinquents as a social penalty, which is a widespread policy in the United States and the rest of the world.

Analyzing the optimality of financial and non-financial penalties is a central question in law and economics (Becker (1968); Shavell (1987); Polinsky and Shavell (2000); Linden and Rockoff (2008); Prescott and Rockoff (2011)), and the specific application to tax debt enforcement is novel, allowing us to contribute to this literature with new predictions. The standard legal and economic framework predicts that the first-best sanctions for crimes rely on the exclusive use of financial penalties, even when non-financial sanctions are available (Shavell (1987)). Consistent with the increasing trends in the United States and around the world, we show that non-financial penalties can be optimal in the context of tax delinquency, because it allows to target agents who are less responsive to financial penalties. In this respect, our insights may also be useful for the literature on consumer finance, debt collection and default (Wang and White (2000); Hynes and Posner (2001); Djankov et al. (2008); Lilienfeld-Toal, Mookherjee and Visaria (2012); Agarwal et al. (2015); Karlan et al. (2014)).

This paper is also related to the literature on social interactions and peer-pressure in contexts of pro-social behavior (Bénabou and Tirole (2003); Bénabou and Tirole (2006); Gerber, Green and Larimer (2008); Andreoni and Bernheim (2009); Bénabou and Tirole (2011); Alcott (2011); DellaVigna, List and Malmendier (2013); Ali and Lin (2013); Perez-Truglia and Cruces (2013)). We contribute to this literature in three different ways. First, we show that social pressure can be effective in a context of anti-social behavior like having an outstanding tax delinquency. Second, many of the social incentives studied in the literature, such as social pressure for charitable giving and voting, have been studied in isolation but, instead, we provide an analysis that considers social and financial penalties jointly. Third, and related to the previous point, we provide a theoretical and empirical analysis that not only measures the effect of social incentives on revenues but also examines under which conditions a combination of social and financial incentives may be welfare enhancing.

¹⁵Casaburi and Troiano (2013) study the electoral response to a program in Italy that involved the identification of buildings that were not registered in the tax base register. Although the main goal of the program was to reduce property tax evasion, one additional component of the program involved enforcing the payment of previous not paid taxes on those unregistered buildings.

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

2 A Model of Tax Delinquency with Financial and Social Penalties

2.1 Financial Penalty

There is a continuum of taxpayers indexed by subscript i , who 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 become a tax delinquent. Some individuals are liquidity constrained, so that paying off their tax responsibility in the first period will not allow them to conduct their lives normally (e.g., eat, keep their businesses alive, pay expensive medical bills). Paying off the tax due has a cost of R_i , where the interest rate $R_i > 1$ is uniformly distributed between $\underline{R}$ and $\bar{R}$. The government knows $\bar{R}$ but not the R_i of each individual. The heterogeneity in R_i represents a combination of liquidity needs and credit constraints.¹⁶ 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.¹⁷

2.2 Enforcement Technology

In this second period, if the individual refuses to pay then the creditor will try to force the payment using administrative remedies. For example, the creditor can force payments of wage earners through wage garnishment. However, this enforcement technology is imperfect: an individual expects to be immune to the administrative remedies 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 $q_i = \bar{q} \geq \underline{q}$. The easiest interpretation is that $1 - \theta$ is the share of future wage earners, from whom it is easier to garnish income. The

¹⁶This 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.

¹⁷We 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 an absence of any type of stickiness.

government knows the distribution of q_i but does not observe the q_i of each individual.¹⁸ For the sake of simplicity, we assume that q_i is always observable to the peers (this assumption does not change the main results but does make the model considerably more tractable).

2.3 Social 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 a higher p is costless. 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 understand how the social 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 (2003)). After deciding whether to pay the tax or not, the individuals interact with peers. The individual's utility from these interactions depends on the peer's perception about how financial trustworthy the individual seems. 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 the expectation about her financial health: $-\eta \cdot E[R_i|I_i]$, where I_i is the observable information about i and η is a parameter that scales the value of social interactions. With probability $p \in [0, 1]$, I_i includes whether the individual paid her taxes in the first period.

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

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

By publishing the list of delinquents, the tax agency affects the visibility of the decision to pay taxes. This visibility makes not paying taxes less attractive, because it can serve as a bad signal of trustworthiness and thus result in worse outcomes in social interactions.

Integrating over the population individuals, we can obtain the average utility from social interactions: $-\eta \frac{\underline{R} + \overline{R}}{2}$. This value does not depend on p , meaning that disseminating information about delinquents redistributes utility from delinquents to non-delinquents, but does not affect the aggregate utility from social interactions. This convenient property is a direct product of the linearity assumption made about the value of social interactions: $-\eta \cdot E[R_i|I_i]$. A non-linear spec-

¹⁸In practice, even if q_i was perfectly observable to the collector, the results would stay the same if 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.

ification could make the aggregate utility from social interactions depend on p either negatively or positively. Additionally, we are ignoring the utility that the peers obtain from the social interactions. A higher p is likely to increase the utility of the peers, because they expect better outcomes from their social interactions. Indeed, the peers could even increase the number of interactions that they choose to have. We will not include these positive byproducts from an increase in p in the social-welfare function, meaning that we will under-estimate the potential benefits from this policy.

This model of social interactions assumes that peers care about financial trustworthiness. This assumption, however, is not crucial for our results. Appendix E 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. We show that instead of signaling financial trustworthiness, being a delinquent may serve as a signal of moral trustworthiness. Furthermore, the Appendix shows that the main results that follow are qualitatively identical under this alternative specification. In the real world, it is likely that peers care about a combination of both financial and moral trustworthiness.

2.4 The Taxpayer's Problem

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

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

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

The term $p \cdot \eta \cdot (E[R_i|x_i = 0] - E[R_i|x_i = 1])$ is the individual's loss in signaling from not paying the debt in the first period. 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:

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

Replacing that back into the objective function:

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

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

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

Which confirms our guess that the optimal response consist of the cutoff-decision $\hat{R}(q) = q \cdot F + p \cdot \eta \cdot \frac{\bar{R} - R}{2}$. As expected, the proportion of individuals paying in the first period is decreasing in the financial penalty, F , and in the social penalty, p . Also, note that we have not explicitly dealt with the possibility of corner solutions (i.e., that either everyone or nobody pays in the first period), which we address properly in the proofs of the propositions.

2.5 The Government's Problem

The government chooses two policies: the financial penalty, F , the the intensity of the social penalty, p . Let T denote the 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. And let $SW(F, p)$ denote the utilitarian social welfare of the taxpayers:

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

Note that we used the property that the aggregate utility from social interactions does not depend on F or p . The government maximizes a weighted average of the tax revenues and social welfare:

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

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 extreme case $\alpha = \frac{1}{2}$, the government is indifferent between the two. In the 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 these two extreme cases.

The followings definitions are useful to rank sets of policies:

Definition 1. Given a set of feasible 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 utility and for every policy in A there is a policy in B such that the government attains the same utility.

Definition 2. Given a set of feasible policies A and B , A dominates B if for each policy in B there is a policy in A such that the government attains at least the same utility and - for at least some parameters - strictly higher utility.

The next two subsections presents the main results. We want to show that heterogeneity in q_i and a low enough α are two necessary and sufficient conditions for the social penalty to be optimal. To make this clear, we present the results in two parts. First, we show that under the homogeneous q_i , there is no α such as the social penalty is optimal. Second, we show that under heterogeneous q_i , the social penalty is optimal as long as α is low enough.

2.6 Optimal Penalties under Homogeneity in q_i

The following proposition ranks the policies under homogeneity in q_i :

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

- *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 government wants to maximize revenues. Both the financial and the social penalties have the capability of increasing the proportion of individuals who pay in the first period. However, the financial penalty is superior to the social penalty because it generates additional revenues from the individuals who don't pay in the first period and thus have to pay more in interest later. As a result, a revenue-maximizing collector would never use the social penalty. 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 on behalf 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 between using $p > 0$ or $p = 0$. As a result, even if the government has the slightest bias in favor of revenues, $\alpha \in (\frac{1}{2}, 1)$, the government is strictly better off by not using the social penalty.¹⁹

2.7 Optimal Penalties under Heterogeneity in q_i

The following proposition ranks the policies under heterogeneity in q_i :

¹⁹It must be noted, however, that a $p > 0$ could be optimal even if $\alpha > \frac{1}{2}$ as long as the financial policy is restricted (e.g., because of political constraints or because of laws).

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, $\hat{R}_{\bar{q}}$ and $\hat{R}_{\underline{q}}$, 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 have different incentives to pay in the first period. In other words, some individuals don't pay because they are having a harder time but some other individuals don't pay because they expect to escape wage garnishment. Instead, individuals with different income garnishability do not react differently to the social penalty. As a result, if the government was using the social penalty only, there would be a single $\hat{R}_{\bar{q}} = \hat{R}_{\underline{q}}$. Then, the collector strictly prefers to use as much of the social penalty as possible. The social penalty is helpful because it can help the government discriminate between individuals who don't pay because they are having a hard time and individuals who don't pay because they expect to escape the wage garnishment. Even though for $\alpha = \frac{1}{2}$ the social penalty is desirable, for $\alpha = 1$ the government strictly prefers not to use the social penalty, for the same reason as in the case of homogeneous q_i . Whether the social penalty is desirable or not will then boil down to the value of α : the social penalty will be desirable if and only if α is low enough, that is, if the government cares enough about social welfare.

According to our conversation with professionals in this sector, this differential effect is perceived as a key advantage of the social 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." We could think of variations of the model in which, although unlikely, the social penalty could vary with the income garnishability. For example, income garnishability might be correlated to some other individual characteristic that affects the value of social interactions. However, the results above would only change if higher garnishability were to reduce the effectiveness of social penalties at a higher rate than reducing the effectiveness of financial penalties. In the second part of the paper, we provide some empirical evidence about this hypothesis.

2.8 Misperceptions 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)). In this subsection we consider the theoretical possibility that a fraction of tax delinquents underestimates financial penalties and we consider whether it is optimal to correct those biases. Indeed, in the field experiment we implement this same intervention to study the effects of financial penalties.

2.8.1 The Debtor's Problem

We focus on the case of homogeneous q_i . Suppose now that a fraction s of individuals incorrectly perceive that the financial penalty are lower than reality, $F = \underline{F} < F$, 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.

2.8.2 The Government's Problem

In addition to the financial and social penalties, the government can decrease the fraction s of debtors who misperceive the financial penalty of failing to repay at no 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 utilitarian social welfare are now:

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

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

The government solves:

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

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. See Appendix A.3.

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.

3 Experimental Design, Subject Pool and Data Sources

3.1 Experimental Design

The field experiment consists of sending a letter to a sample of delinquents listed in the online lists of tax delinquents published by the Department of Revenues of three U.S. states: Kansas, Kentucky and Wisconsin. These letters are identical except for a few key pieces of information that were randomly assigned, designed to vary the salience of social and financial penalties. We then measure how each piece of information affects the subsequent behavior of the delinquents.²⁰ The outcome variable of interest is whether the recipients of the letters are still delinquents in each of the weeks after the letters were sent, which we can verify using the publicly-available information from the online lists.

Appendix B contains 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 of the letter indicated that the letter was part of a research study about tax delinquency. The letter also contained a table with ten tax delinquents in the area of the recipient, including the recipient. In this table, the delinquents are identified by full name and debt amount, and appear in ascending order by debt amount, with the row corresponding to the recipient highlighted. One of the goals of having this table is to grab the recipient’s attention, whose name always appear in the highlighted row. The second paragraph of the letter identified the corresponding state’s Department of Revenue 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 zipcode, by visiting the following web-page (...)” The second page of the letter contained, for illustration purposes, a screenshot of this online search tool, the contact information of the researchers, the link to the project’s website and a link to an online survey where individuals could share any comments about the study.²¹

The two main tests, about the effects of social and financial penalties, consist in randomizing two key pieces of information in this letter. 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 the message prominently displayed in a box

²⁰We did not base the experiment in the comparison between individuals who received a letter and those who did not receive a letter, because it would be very difficult to disentangle the mechanisms through which receiving a letter like this may affect behavior: e.g., being reminded that one is a delinquent, being told that one is being part of an academic study.

²¹This 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%), but these results are available upon request.

located right below the list of contributors among one of two possible cases:

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.”

Note that households were explicitly told that the selection process was random, so that they would not feel special about being in one treatment group or the other. Both of these messages were non-deceptive: we divided the U.S. territory in small areas and then, consistent with the message, we randomized whether just one or more than one individual in the area would get a letter.²² The difference between the two messages is that in the higher visibility group other individuals in the area are also receiving the information about how to access the list of tax delinquents, thus making the recipient feel monitored by her neighbors.

It must be noted that the above treatment increases the visibility of an individual’s delinquency status only to the eyes of a limited set of individuals: her neighbors. In practice, it is likely that individuals care about the opinion of neighbors to a limited extent, which can generate differential responses to the social penalty depending on the debt amount. For example, if all delinquents value their neighbor’s esteem at most \$100, being exposed to neighbors as being a delinquent may be an effective deterrent for an individual who owes \$1,000, for which the social penalty could amount to 10% of the amount owed, but not effective at all for an individual who owes \$1,000,000, for which the social penalty could amount to no more than 0.01% of the amount owed. Indeed, one reason why some researchers are not compelled about the power of social incentives is that they may only work when stakes are very low (Levitt and List, 2007). In the context of lab experiments, for example, there is evidence that stakes matter a lot. For instance, even though respondents in the ultimatum game often reject unfair offers, that is almost never the case when stakes are very high (Andersen et al., 2011). A remarkable advantage of our empirical setting is that the size of the debts of our experimental subjects varies extensively, from \$250 to about \$150,000, so we can plausibly measure how social incentives scale up.

To measure the effect of financial penalties, the ideal experiment would consist of randomizing the interest rate that the individuals must pay. Since randomizing the financial penalties was not feasible for us, we opted for creating exogenous variation in the knowledge and/or salience of this information. The recipient could either receive no message, or receive a message, the text in boldface that is located below the snapshot of the search tool, with a brief summary of the interest rates being charged on the delinquent amount. For example, in Wisconsin the message was: “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 specific penalties were adapted in the letters

²²Note 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. Also, we chose the share of areas to be assigned to each group as to generate roughly the same number of letters in each of the two treatment groups.

to recipients living in the other two states: 12% in Kansas and 30% in Kentucky.²³

We can compare these interest rates with the ones faced by different sources of credit that a liquidity-constrained individual may try to use. First, the U.S. average for the annual interest rate on a credit card is 14% (Source: CreditCards.com, accessed on January 5th, 2015). For individuals with bad credit score, it can be substantially higher than that. Second, individuals using less conventional sources of credit, which presumably may be the individuals with the most urging liquidity constraints, can pay several times this rate: e.g., the average annual interest rate for payday loans is estimated to be in the three-digits (Stegman (2007)). If, on average, delinquents under-estimated the size of the financial penalties, then our message about financial penalties would be expected to increase the speed with which the delinquents pay. Indeed, as discussed above, there is evidence that people underestimate interest rates in many markets (Ausubel (1991); Stango and Zinman (2011); Frank (2011)) and, because of that, that reminding individuals about interest rates significantly increases savings (Karlan et al. (2014)).

There was a third and final piece of information which was randomized in the letter, with the goal of testing the possibility of side effects from the publication of the list of tax delinquents. It is possible that publishing the list of tax delinquents affects the delinquent’s perception about the behavior of other delinquents, which may end up affecting the decision of when to pay the tax debt. For instance, it has been documented that individuals behave more pro-socially when they perceive that others are behaving pro-socially too. The evidence includes diverse behavior such as charitable contributions (Frey and Meier, 2004) and political contributions (Perez-Truglia and Cruces, 2013). It is unclear, however, whether the same mechanism could play a role in the case of anti-social behavior, such as being a tax delinquent.

To test whether delinquents care about the behavior of other delinquents, we created some exogenous variation in the recipient’s perception about 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 in the area, we created some exogenous variation in the distribution of delinquent amounts by randomly selecting a group of nine neighbors in the area with higher or lower debt amounts, depending on the value of a randomly-assigned weighting parameter that determines which individuals to include in the list.²⁴ The independent variable of interest will not be the actual mean amount shown in the list, but the difference between that amount and the amount that would have resulted if we used some baseline parameter. As a result,

²³The 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.

²⁴For 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 a amount-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 can generate exogenous variation in the mean debt amount for the delinquents in the table.

this independent variable consists purely of exogenous variation created by random assignment of the weighting parameter.²⁵

3.2 Institutional Context and Subject Pool

Even though twenty-three U.S. states publish online lists of tax delinquents (Table 1), we focused on Kentucky, Kansas and Wisconsin because they were the only three that satisfied two important properties. First, in these states the minimum debt amount needed to be included in the online list was low enough that a significant number of individuals were listed, as opposed to other states where only the very top delinquents are included (typically the top100 delinquents). Second, the delinquent lists in these three states included the addresses of the delinquents listed, which we needed to contact those individuals by mail.²⁶ Our sample includes individual delinquents but not business delinquents, although it would be straightforward to extend our analysis to the case of businesses.

The publication of tax delinquents names and addresses is regulated by state legislation. In these three states, even though the consent of the tax delinquents is not required, the administrative agency still needs to try to notify the taxpayer before publishing the name online, to give time to pay the balance and avoid being listed.²⁷ As a result, a vast majority of delinquents likely know that they are included in the lists. The lists are updated on a daily basis, and the updates typically include the addition or removal of names, and updating the debt amounts. Amounts are updated to reflect revisions to the original debt, additions of new debts, and the interest, penalties and fees. In spite of these similarities, there are some differences in the way the program is implemented across the three states that we study, which are discussed in more detail in Appendix D. The main difference among the states is the amount of debt above which the delinquent is listed:²⁸ \$250 in Kentucky, \$2,500 in Kansas and \$5,000 in Wisconsin.²⁹

The debts are originated primarily due to state income taxes. In Kansas only individuals who

²⁵For more methodological details, see Perez-Truglia and Cruces (2013).

²⁶For example, in Georgia every delinquent is listed online, but their addresses are not listed.

²⁷Once listed, the websites contain an e-mail address and a phone number that exposes tax delinquents can contact to pay off their debt and be removed from the lists.

²⁸The existence of these thresholds suggests that an alternative research design could have been a Regression Discontinuity one, exploiting the exogenous variation generated by those discontinuities. The main 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. An additional 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. Our experimental results suggest that the size of the debt is an important determinant of those treatment effects, and social penalties seem to be more effective for small debts rather than big ones.

²⁹In 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).

owe state income tax debts are listed. In Kentucky the type of tax generating the debt includes non-income taxes, but is not specified in the list. Even though there are no public statistics, private communications between our research team and the Kentucky Department of Revenue suggest that the vast majority of people in the list had debts originated by state income tax. In Wisconsin, the list includes delinquents for both income and a variety of other taxes (e.g., estate tax). In order to improve the similarity across states, we included in the subject pool only delinquents with at least part of the debt originating from state income tax.

We downloaded the online lists of individuals for the three states on May 26, 2014. At that point in time the online lists included 57,744 individual tax delinquents, who owed \$968,764,474 to their states' Department of Revenue. We excluded some individuals from the subject pool: (i) individuals with unreliable address information; (ii) records with full names corresponding to multiple addresses in the same state, due to the uncertainty as to whether they correspond to the same or different individuals; (iii) individuals living in Wisconsin whose debts were not due to state income tax; (iv) individuals who moved out of state; (v) individuals with debt amounts over \$150,000. From the resulting subject pool of 38,299 delinquents, 34,334 of them were chosen to receive a letter. A 52.7% of these subjects were from Kentucky, 25.4% from Kansas and the remaining 21.9% from Wisconsin.

Some of the information contained in the letter was randomly assigned. The random assignment was conducted at the household level³⁰ and it was stratified at the 3-digit ZIP code (ZIP-3) level. In Table 2 we present some descriptive statistics as well as balance checks for the randomization. The two main characteristics are the (pre-treatment) initial debt amount and its logarithm. The mean (median) debt amount was \$13,000 (\$5,500). We also included other variables that we do not observe directly but we imputed using secondary data sources: the gender and ethnicity of the individual.³¹ About 65% of subjects are coded as male, 71% as white and 14% as black. Table 2 presents the p-value of a test of the null hypothesis that the average characteristics are the same across all seven treatment groups. As expected, the individuals are balanced on these observable characteristics.³² As an additional robustness check, in the results section we present falsification tests by estimating the “effects” of the treatments on a key pre-treatment outcome: the initial debt amount.

³⁰That is, all household members were assigned to the same treatment group.

³¹Data 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).

³²The 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.

3.3 Outcome of Interest and Econometric Specification

Once an individual has been listed, the main way to get off the list is either to pay up front the entire amount or to enter a payment plan for the full amount and pay the first installment. According to conversations with the tax agencies, it is not possible to pay the difference between the debt and the threshold to get off the list.³³ In Appendix C we provide some direct evidence confirming this claim. In any case, even if paying below the threshold was allowed, 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 above the threshold again. Because of this feature, our main dependent variable is a dummy variable for whether a delinquent is off the list at a given point in time. We interpret changes in this variable as a combination of paying back the debt in full or agreeing to a repayment plan for the full amount, but we do not have data on the relative composition of these two.³⁴

Figure 1 shows the evolution over time of the probability that our experimental subjects leave the online list of delinquents as a function of the number of weeks since the start of the sample (May 26). Figure 1.a applies to the entire sample, while Figures 1.b-1.d apply to each of the three states on a separate basis. 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 reflects some points in time where, for arbitrary reasons, a higher number of updates are made.

The baseline econometric specification is given by:

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

The outcome variable (Y_i^t) takes the value 100 if the individual has left the list t weeks after the letters were sent. The dummy for social penalty (M_i) takes the value 0 if the recipient was the only one chosen to receive a letter and 1 if others 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 social 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, such as the gender of the delinquent and the initial debt amount.

³³It is possible, however, to pay new debts on time in order to avoid them from being accumulated with the amount listed from previous debts.

³⁴There are some alternative ways to get off the list, such as due to death, bankruptcy or surpassing the 10-year limit of the lien. 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 D discusses in more detail the specific laws and requirements.

4 Results

4.1 Effects of Financial and Social Penalties

Figure 2 presents the effects of the social and the 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. Both financial and social penalties increased the probability of leaving the list, although there were marked differences in the distribution of these effects with respect to the debt amounts. As a falsification test, in Figure 3 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 mailed. As expected, none of the “fake” treatments effects were statistically significant for any quartile of the debt distribution. For reference, all these estimates are included as regression estimates in Table 3, along with the corresponding baseline rates for reference.

First consider the effects of the social penalty, shown in Figure 2.a. For the lowest quartile (\$250–\$2,273), the social penalty increased the share of individuals leaving the list by 2.1 percentage points. This effect is statistically significant at the 1% level and, when compared to the baseline rate of 10 percentage points, suggest an economically significant effect of nearly 21% of the baseline rate. The effect of the social penalty, however, is estimated to be very close to zero and statistically insignificant for the other three quartiles of the initial debt amount. This finding that the effect of the social penalty is inversely proportional to the debt amount is consistent with the possibility of an upper bound on the underlying value of social interactions with neighbors, as discussed in the previous section.³⁵ This evidence also suggests that it may be difficult to scale-up social incentives. However, this evidence does not exclude the possibility that, if we were increasing the visibility of the list in the eyes of a broader group, including for example relatives and coworkers, the social penalty would have a significant effect for individuals of all debt amounts.

There are three reasons why it seems plausible to think our estimates provide a very conservative lower bound to the effectiveness of the social penalty. First, a significant share of the individuals may not have read the letter: indeed, the U.S. Environmental Protection Agency (EPA) estimates that only half of the unsolicited correspondence is opened. As a result, the average effect on those who actually read the letter could be twice the magnitude of our estimates. Also, our treatment increases the visibility of one’s delinquency status among neighbors. For most people, however, the most valuable social interactions are instead with relatives, friends and coworkers, a majority of which are not neighbors. If instead we had increased the visibility in the eyes of those other peers, the effects of the social penalty would have been much greater. Additionally, as mentioned before, the tax agencies in all of our three experimental estates are required to send letters to

³⁵We 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 social penalties. However, we find it reassuring that the effect of social penalties changes with the debt amount but not the effect of financial penalties.

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 sizable fraction of the response to the social penalty happens at the first stage of the policy, when the warning letter is received.³⁶ Our subject pool is comprised of only individuals who received such notification and did not react to it, which by construction is a subset of individuals who care less about social interactions and thus provide a lower bound on the average response to the social penalty in a more representative sample of delinquents.

Figure 2.b shows the effects of the financial penalty. Consistent with the fact that financial penalties are proportional to the amount owed, the effects of financial penalties was roughly similar on 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% of the baseline rate). Even though these three coefficients are individually statistically insignificant, jointly they are statistically significant. The effect of the financial penalty seems to be close to zero and statistically insignificant for the top quartile (\$13,347-\$150,000). However, as discussed below, this difference actually arises from heterogeneity in effects across states, not across debt amounts.

As aforementioned, it would be possible that the treatment effects vary across states. To separate heterogeneity arising from different initial amounts from heterogeneity by state, we split the Kentucky sample in two: initial amounts between \$250 and \$2,500, and initial amounts above \$2,500. The resulting sample size in each of the four groups is similar, resulting in similar precision of the estimates. Figure 4.a presents the results for the social penalty. In theory, given that these lists are implemented in different states and subject to different rules,³⁷ it could be possible that the effects differ by state. The graph shows that, even though in Kentucky debtors below \$2,500 react to the social penalty, for debts above \$2,500 debtors in the three states do not react to the social penalty. The results suggest that, even within Kentucky, the effects of the social penalty are inversely proportional to the debt amount. Also, the results suggest that, once we control for the debt amount, there are no significant differences in the effects of social penalties across states.

Figure 4.b shows the effects of the financial penalty by state. Given that the annual interest rate is significantly different across the three states (30% in Kentucky, 12% in Kansas and 18% in Wisconsin), it would be natural that reminders about these interest rates would have different effects by state. For all debtors in Kentucky, both below and above \$2,500, the financial penalty has a significant and similar effect. That is, within Kentucky, there is no evidence that the effect of the financial penalty changes with the initial debt amount. However, for debts above \$2,500,

³⁶For example, during one of those interviews, the spokeswoman for the Illinois Department of Revenue declared that “The real success of the program is before the postings are made.”

³⁷For 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.

even though the effect is significant for Kentucky it is close to zero and statistically insignificant for Kansas and Wisconsin. This evidence suggests that the effect of the reminders was different between Kentucky and the other states. This is not very surprising, given that the interest rate in Kentucky was twice that of the other two states. As a result, individuals in Kentucky may be more likely to under-estimate the actual financial penalties and thus more likely to react to information about the actual penalties.³⁸ However, it should be noted that, due to the precision of the point estimates, even though the difference in effects between Kentucky and the two other states is large, it is statistically insignificant at conventional levels.

In order to illustrate the timing of the effects, Figure 5 shows the week-by-week estimates of the effects of social incentives (for the first quartile) and financial incentives (for the full sample). Figure 5.a shows that individuals reacting to the social penalty want to get off the list as soon as possible: the vast majority of the reaction builds up during the first to fifth week after mailing of the letters. After week ten, the effects of the social penalty start to gradually decline. Intuitively, this means that some of the individuals who paid by week 10 because of the social treatment were individuals who were going to pay anyway during the following weeks. But 29 weeks after mailing the letters, the probability of leaving the list is still 1.6 percent higher, which compared to the 2.1 effect at week 10, meaning that nearly 75% of the individuals who reacted to the social penalty were individuals who were originally not planning to pay during the subsequent 19 weeks.³⁹

Figure 5.b shows that individuals reacting to the financial penalty do not react nearly as promptly as the individuals reacting to the social penalty. This may be because these are individuals that owe higher amounts on average, and thus may need more time to gather the resources to pay up front the full amount or the first installment. The effects of the financial penalty seem to build up during the first four months, and then start a slow decline.⁴⁰ Just in the case of the social penalty, this decline is so slow that it implies that a majority of individuals who reacted to the financial penalty were not planning to leave the list in the following months.

4.2 Wage Garnishment and the Effectiveness of Social and Financial Penalties

In this section we provide evidence related to the interactions between income garnishment and the effectiveness of social and financial penalties. According to our model, the effect of financial penalties should increase in the income garnishability of the debtor, but the effect of the social

³⁸There may be other characteristics that vary between Kentucky and the other two states that may explain the difference in effects. For instance, it is possible that Kentucky disseminated less information about the financial penalties. Also, delinquents in Kentucky may be more responsive to financial penalties because this state may be better at threatening with administrative remedies to force payments.

³⁹Due to the precision of the estimates, however, we can't reject that our effects are statistically different than zero, or that they are statistically different from the effect from earlier weeks.

⁴⁰There is a jump around the tenth week, corresponding to one of the major updates to the databases made in Kentucky, which, as discussed above, is the state for which the financial penalties had the highest effect.

penalty should not depend on the income garnishability. If possible, we would like to interact a measure of expected income garnishability of each debtor with both of our penalty dummies. Unfortunately, we do not observe this information directly. As a proxy, we use the IRS Statistics of Income database to measure the average share of wage income in the ZIP-5 code of each delinquent. 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). “Importance of Wages” 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.⁴¹

The results in the previous section suggests that the effect of social penalties can be modeled as inversely proportional to the quantity of debt owed by the delinquent. To incorporate this, for the rest of the section, we normalize the social penalty dummy by dividing by the initial debt amount (in \$1,000s).⁴² Thus, the coefficient on “Social Penalty” should be interpreted as the predicted effect for a delinquent with an initial debt of \$1,000.⁴³ Results are shown in Table 4. 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 social penalty increases this probability by 1.1 percentage points (again, for an individual with a \$1,000 initial debt). Both of these effects are about 5 percent of the baseline mean.

Column (2) adds the variable “Importance of Wages” along with its interaction with the social and financial penalties. As predicted by the 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 the importance of wages doubles the effectiveness of the financial penalty. Also as predicted by our model, the effectiveness of social 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 the importance of wages could be due to heterogeneity with respect to unobservable place characteristics that are correlated with the importance of wages: e.g., income, tax sophistication, tax morale, and so on. 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 social and financial penalties. First, we control for income by using a measure of mean gross income in the ZIP code from the same IRS-SOI data. Second, we control for tax sophistication using a measure known as EITC bunching provided in Chetty, Friedman and Saez (2013), which measures the awareness

⁴¹The 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.

⁴²The regression also includes the inverse of the initial debt amount as a control variable.

⁴³The results are similar if, instead, we interact the Social Penalty dummy with a dummy for the first quartile of initial amount. We used this specification because it seemed to provide the most efficient use of the data.

of opportunities for tax evasion. Last, given that political views may lead to different tax morale (see Cullen, Turner and Washington, 2014), we control for the share of Republican votes in the 2012 U.S. presidential election.⁴⁴ Column (3) through (5) control for each one of these variables individually, while column (6) controls for all these variables simultaneously. The interactions of the social and financial penalties with the importance of wages 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 about the behavior of other delinquents, which may end up affecting the decision to stay a delinquent or not. For instance, it has been documented that individuals behave more pro-socially when they perceive that others are behaving pro-socially too. If such externalities existed 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, by measuring whether the information about the delinquent behavior of others included in the letter affected the recipient’s subsequent behavior.

Results for this test are shown in Table 5. We follow the same econometric specification used for the previous subsection. Column (1) shows the baseline specification with the effects of financial and social penalties. Column (2) adds a new variable, which is 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 individuals do not care about the delinquent behavior of others.

One potential concern, which we anticipated while designing the experiment, is that the mean amount may have effects through multiple channels, which may cancel each other out. On the one hand, if the tax debtor is led to believe that others have even higher debts, she could potentially feel less guilty about her own tax debt and thus be less likely to pay.⁴⁵ On the other hand, the same information could also lead the 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 in 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 social penalty itself. In order to

⁴⁴On the link between politics and tax enforcement see also Casaburi and Troiano (2014) and Besley, Jensen and Persson (2014).

⁴⁵The dependency between one’s behavior and the perceived behavior of others has been documented in a variety of contexts such as charitable giving (Frey and Meier 2004), campaign contributions (Perez-Truglia and Cruces, 2013) and energy conservation (Alcott, 2011).

disentangle between these two channels, we can exploit the exogenous variation in visibility used to measure the effects of the social penalty. Column (3) adds the mean amount in the list along with its interaction with the social 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 social 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 \$10,000,⁴⁶ would only decrease the probability of leaving the list by 0.02 percentage points.⁴⁷ This finding may suggest that social norm considerations do not play a significant role in state tax compliance, and as a result there is no reason to worry about the side-effects from publishing lists of tax delinquents. As a robustness check, columns (4) and (5) replicate the results from (2) and (3) except that they use the median amount shown in the table instead of the mean amount. The results are similar under this alternative specification.⁴⁸ This evidence is consistent with related field experiments showing that messages of moral appeal are ineffective at reducing tax evasion (Blumenthal et al. (2004); Fellner et al. (2013)).⁴⁹

5 Conclusions

Increasing the efficiency of tax compliance is a key issue for fostering economic development. In this paper we explored an important topic that was arguably understudied compared to other aspects of tax compliance: tax debt collection. We presented novel theoretical and empirical evidence about the interaction among the enforcement technology, financial and non-financial penalties. In the first part of the paper, we provided a simple and tractable framework for analyzing tax debt enforcement when the government can use both financial and social penalties. We showed that, under plausible conditions, the optimal policy involves the use of social penalties. In the second part of the paper, we provided evidence from a field experiment suggesting that financial and

⁴⁶This is a significant increase compared to the median delinquent amount among the subjects of \$5,500.

⁴⁷Column (3) also reports the coefficient on the interaction between the social 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 social penalty by 0.39 percentage points, or roughly 35% of the mean effect of the social 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 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.

⁴⁸In other words, individuals may be less sensitive to very large amounts owed by a minority of delinquents.

⁴⁹Nevertheless, it should be noted that even though some of our subjects are regular individuals facing financial hardship, some of the delinquents may be a self-selection of individuals with lower tax morale. As a result, our evidence cannot really rule out the possibility that, among individuals who paid their taxes on time, social comparisons may play a more significant role.

social penalties can indeed increase the speed of payment. Additionally, our evidence suggests that financial and social penalties can target different type of tax payers. This is suggestive evidence that combining financial and social penalties can be welfare-enhancing. In sum, our research provides a positive theory and supporting experimental evidence about the use of social penalties by tax agencies in the United States and the rest of the world.

Our results raise a number of 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 less widespread compared to the one disclosing tax delinquents.⁵⁰ Second, we focused on a specific form of non-financial penalty, which involved the publication of online lists of debtors: this form of social penalty is arguably the most diffuse in the United States and around the world. In practice, tax agencies use other non-financial penalties, such direct pressure through home visits and revoking driving licenses and passports (Blank, 2014). Our theoretical and empirical framework can be extended to shed light on the effectiveness and optimality of these other non-financial policies.

⁵⁰For example, the U.K. publishes a list of top tax evaders ([link](#)). And even though it was not part of a regular policy, Chetty, Mobarak and Singhal (2014) present results from a policy intervention consistent with a relationship between tax avoidance and social recognition when studying firms in Bangladesh.

References

- [1] Agarwal, S.; S. Chomsisengphet; N. Mahoney and J. Stroebel (2015), “Regulating Consumer Financial Products: Evidence from Credit Cards,” *Quarterly Journal of Economics*, forthcoming.
- [2] Ali, S.N. and Lin, C. (2013), “Why People Vote: Ethical Motives and Social Incentives,” *American Economic Journal: Microeconomics*, Vol. 5 (2), pp. 73–98.
- [3] Andersen, S.; S. Ertac; U. Gneezy; M. Hoffman and J. A. List (2011), “Stakes Matter in Ultimatum Games,” *American Economic Review*, Vol. 101, pp. 3427–3439.
- [4] Ausubel, L. (1991), “The Failure of Competition in the Credit Card Market,” *American Economic Review*, Vol. 81, pp. 50–81.
- [5] Andreoni, J.; D. Bernheim (2009), “Social Image and the 50-50 Norm: A Theoretical and Experimental Analysis of Audience Effects,” *Econometrica*, Vol. 77 (5), 1607–1636.
- [6] Becker, G.S. (1968), “Crime and Punishment: An Economic Approach,” *Journal of Political Economy*, Vol. 76, pp. 169–217.
- [7] Bénabou, R.J.M. and Tirole, J. (2011), “Laws and Norms,” NBER Working Paper No. 17579.
- [8] Bénabou, R.J.M. and Tirole, J. (2003), “Intrinsic and Extrinsic Motivation,” *Review of Economic Studies*, Vol. 70, pp. 489–520.
- [9] Bénabou, R.J.M. and Tirole, J. (2006), “Incentives and Prosocial Behavior,” *American Economic Review*, Vol. 96 (5), pp. 1652–1678.
- [10] Bernheim, B.D. (1994), “A Theory of Conformity,” *Journal of Political Economy*, Vol. 102 (5), pp. 841–77.
- [11] Besley T.; A. Jensen and T. Persson (2014), “Norms, Enforcement, and Tax Evasion,” Mimeo.
- [12] Besely, T. and T. Persson (2013), “Taxation and Development”, prepared for A. Auerbach, R. Chetty, M. Feldstein, E. Saez *Handbook of Public Economics*.
- [13] Blank, J.D. (2014), “Collateral Compliance,” *University of Pennsylvania Law Review*, Vol. 162, pp. 719–800.
- [14] Blumenthal, M.; Christian, C. and Slemrod, J. (2001), “Do Normative Appeals Affect Tax Compliance? Evidence From a Controlled Experiment in Minnesota,” *National Tax Journal*, Vol. 54, pp. 125–38.

- [15] Cadena, X. and Schoar, A. (2011), “Remembering to pay? Reminders vs. financial incentives for loan payments,” NBER Working Paper No. 17020.
- [16] Casaburi, L. and U. Troiano (2013), “Ghost-house busters: The electoral response to a large anti-tax evasion program,” Mimeo.
- [17] Castro, L. and C. Scartascini (2013), “Tax Compliance and Enforcement in the Pampas. Evidence from a Field Experiment,” working paper.
- [18] Chetty, R.; J. N. Friedman and E. Saez (2013), “Using Differences in Knowledge across Neighborhoods to Uncover the Impacts of the EITC on Earnings.” *American Economic Review*, Vol. 103 (7), pp. 2683–2721.
- [19] Chetty R.; M. Mobarak and M. Singhal (2014), “Increasing Tax Compliance Through Social Recognition.” Policy Brief.
- [20] Cole, H.L.; Mailath, G.J. and Postlewaite, A. (1992), “Social norms, savings behavior, and growth,” *Journal of Political Economy*, Vol. 100, pp. 1092–1125.
- [21] Cullen, J.; N. Turner and E. Washington (2013), “Heterogeneity in behavioral responses to taxation: the role of partisanship and perceived net benefits,” Mimeo.
- [22] DellaVigna, S.; List, J. and Malmendier, U. (2012), “Testing for Altruism and Social Pressure in Charitable Giving,” *Quarterly Journal of Economics*, Vol. 127 (1), pp. 1-56.
- [23] Djankov, S.; Hart, O.; McLiesh, C. and Shleifer, A. (2008), “Debt Enforcement Around the World.” *Journal of Political Economy*, Vol. 116 (6), pp. 1105-1149.
- [24] Dwenger, N.; H. Kleven; I. Rasul and J. Rincke (2014), “Extrinsic and Intrinsic Motivations for Tax Compliance: Evidence from a Field Experiment in Germany,” Mimeo.
- [25] Fellner, G.; Sausgruber, R. and Traxler, C. (2013), “Testing Enforcement Strategies in the Field: Threat, Moral Appeal and Social Information,” Vol. 11 (3), pp. 634–660.
- [26] Frank, J.M. (2011), “Do Credit Card Users Systematically Underestimate Their Interest Rates? Evidence from the Survey of Consumer Finances,” *Journal of Public Policy & Marketing*, Vol. 30 (1), pp. 133-139.
- [27] Frey, B. and Meier, S. (2004), “Pro-social behavior in a natural setting,” *Journal of Economic Behavior & Organization*, Vol. 54, pp. 65–88.
- [28] Gordon, R. and W. Li, (2009). “Tax Structure in Developing Countries: Many Puzzles and a Possible Explanation.” *Journal of Public Economics*, 93, 855-866.

- [29] Hasegawa, M.; Hoopes, J.L.; Ishida, R. and Slemrod, J. B. (2013), “The Effect of Public Disclosure on Reported Taxable Income: Evidence from Individuals and Corporations in Japan,” *National Tax Journal*, Vol. 66 (3), pp. 571-608.
- [30] Hallsworth, M.; List, J.A.; Metcalfe, R.D. and Vlaev, I. (2014), “The Behavioralist As Tax Collector: Using Natural Field Experiments to Enhance Tax Compliance,” NBER Working Paper No. 20007.
- [31] Hynes, Richard and Posner, Eric A. (2002), “The Law and Economics of Consumer Finance,” *American Law and Economics Review*, Vol. 4 (1), pp. 168-207.
- [32] Karlan, D.; McConnell, M.; Mullainathan, S.; Zinman, J. (2014), “Getting to the Top of Mind: How Reminders Increase Saving,” *Management Science*, forthcoming
- [33] Kleven, H. J.; M. B. Knudsen; T. Kreiner; S. Pedersen, and E. Saez (2011), “Unwilling or Unable to Cheat? Evidence from a Randomized Tax Audit Experiment in Denmark,” *Econometrica*, Vol. 79 (3), pp. 651-692.
- [34] Levitt, S.D. and List, J.A. (2007), “What Do Laboratory Experiments Measuring Social Preferences Reveal about the Real World?” *Journal of Economic Perspectives*, Vol. 21 (2), pp. 153-174.
- [35] Lilienfeld-Toal, U. v., D. Mookherjee and S. Visaria (2011), ‘The Distributive Impact of Reform in Credit Enforcement: Evidence from Indian Debt Recovery Tribunals,’ *Econometrica*, Vol. 80 (2), pp. 497–558.
- [36] Linden, L. and J. E. Rockoff (2008), “Estimates of the Impact of Crime Risk on Property Values from Megan’s Laws,” *American Economic Review*, Vol. 98, pp. 1103-1127.
- [37] Perez-Truglia, R. and G. Cruces (2013), “Social Incentives in Contributions: Field Experiment Evidence from the 2012 U.S. Presidential Campaigns,” Mimeo.
- [38] Polinsky, M. and S. Shavell (2000), “The economic theory of public enforcement of law,” *Journal of Economic Literature*, Vol. 38, pp. 45-76.
- [39] Prescott, J. J. and J. E. Rockoff (2011), “Do Sex Offender Registration and Notification Laws Affect Criminal Behavior?” *Journal of Law and Economics*, Vol. 54 (1), pp. 161-206.
- [40] Shavell, S. (1987), “The optimal use of nonmonetary sanctions as a deterrent.” *American Economic Review*, Vol. 77, pp. 584-592.
- [41] Shavell, S. (2004), “Foundations of economic analysis of law.” The Belknap Press of Harvard University Press.

- [42] Slemrod, J.B. (2006), “Taxation and Big Brother: Information, Personalization, and Privacy in 21st Century Tax Policy.” *Fiscal Studies*, Vol. 27 (1), pp. 1–15.
- [43] Slemrod, J.B. (2007), “Cheating ourselves: The economics of tax evasion,” *Journal of Economic Perspectives*, Vol. 21 (1), pp. 25-48.
- [44] Slemrod, J.; M. Blumenthal, and C. Christian (2001), “Taxpayer Response to an Increased Probability of Audit: Evidence from a Controlled Experiment in Minnesota,” *Journal of Public Economics*, Vol. 79 (3), pp. 455-483.
- [45] Slemrod, J.B.; Thoresen, T.O. and Bo, E. (2013), “Taxes on the Internet: Deterrence Effects of Public Disclosure,” CESifo Working Paper No. 4107.
- [46] Slemrod J.B. and C. Gillitzer (2013), “Tax Systems,” The MIT Press.
- [47] Stango, V. and Zinman, D. J. (2011), “Fuzzy Math, Disclosure Regulation, and Market Outcomes: Evidence from Truth-in-Lending Reform,” *Review of Financial Studies*, Vol. 24 (2), pp. 506-534.
- [48] Stegman, Michael A. (2007), “Payday Lending,” *The Journal of Economic Perspectives*, Vol. 21 (1), pp. 169-190.
- [49] 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.
- [50] Wang, Hung-jen and White, Michelle J. (2000), “An optimal personal bankruptcy procedure and proposed reforms,” *Journal of Legal Studies*, Vol. 29, pp. 255-286.

Figure 1: 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 mailed. The y-axis corresponds to the share of the subjects who were not longer listed online.

Figure 2: Effects of Social and Financial Penalties 10 Weeks after Mailing, 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 quartile of initial amount) where the dependent variable is a dummy for whether the subject is listed as a delinquent 10 weeks after the letters were sent, and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state dummies). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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: Falsification Test: Placebo Effects of Social 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 quartile of initial amount) where the dependent variable is the logarithm of the initial debt amount, and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state dummies). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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: Effects of Social and Financial Penalties 10 Weeks after Mailing, 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 sent, and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state dummies). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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 5: Week-by-week Evolution of Effects of Social and Financial Penalties

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 mailed. 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 sent, and the right hand side variables are the treatment dummies plus a set of control variables (e.g., gender, state dummies). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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: 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	Link
Colorado	2003	\$20,000	I, B	Link
Connecticut	1995	Top-50	I, B	Link
Delaware	2007	Top-100	I, B	Link
Florida	2014	\$100,000	I, B	Link
Georgia	2004	\$0	I, B	Link
Indiana	2010	\$0	B	Link
Kansas	2004	\$2,500	I, B	Link
Kentucky	2007	\$250	I, B	Link
Maryland	2000	Top-25	I, B	Link
Massachusetts	2004	\$25,000	I, B	Link
Montana	2010	\$10,000	I, B	Link
Nebraska	2010	\$20,000	I, B	Link
New Jersey	2010	Unknown	I, B	Link
New York	2010	Top-250	I, B	Link
North Carolina	2001	Unknown	I, B	Link
Oklahoma	2009	\$25,000	I, B	Link
Pennsylvania	2010	Unknown	I, B	Link
Rhode Island	2003	Top-100	I, B	Link
South Dakota	2012	Top-200	B	Link
Vermont	2014	Top-100	I, B	Link
Washington	1997	\$10,000	I, B	Link
Wisconsin	2006	\$5,000	I, B	Link

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).

Table 2: Descriptive Statistics and Randomization Balance Test

	Social Penalty		Financial Penalty		Mean Amount Listed			Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	No	Yes	No	Yes	Low	Medium	High	P-value
Initial Debt Amount (\$1,000s)	12.86 (0.16)	12.90 (0.16)	12.84 (0.16)	12.87 (0.15)	12.74 (0.19)	13.15 (0.20)	12.82 (0.19)	0.43
Log(Initial Debt Amount)	8.58 (0.01)	8.58 (0.01)	8.56 (0.01)	8.58 (0.01)	8.57 (0.01)	8.60 (0.01)	8.60 (0.01)	0.28
Percent Male (%)	64.32 (0.37)	64.56 (0.36)	68.22 (0.37)	67.60 (0.35)	60.64 (0.46)	61.11 (0.46)	61.21 (0.45)	0.40
Percent White (%)	70.87 (0.22)	70.85 (0.22)	70.48 (0.23)	71.01 (0.21)	70.70 (0.27)	71.13 (0.26)	71.03 (0.26)	0.23
Percent Black (%)	13.94 (0.11)	13.73 (0.11)	13.98 (0.12)	13.38 (0.11)	14.01 (0.14)	14.10 (0.14)	13.90 (0.14)	0.01
Percent Hispanic (%)	5.86 (0.15)	5.83 (0.15)	6.44 (0.16)	6.13 (0.14)	5.18 (0.17)	5.44 (0.17)	5.61 (0.17)	0.48
Percent Other (%)	3.33 (0.05)	3.37 (0.06)	3.23 (0.05)	3.30 (0.05)	3.40 (0.07)	3.47 (0.07)	3.46 (0.07)	0.98
Observations	17,155	17,179	16,042	18,292	11,422	11,418	11,494	

Notes: N=34,334. Pre-treatment mean individual characteristics by treatment group (standard errors in parenthesis). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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. Mean 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 3: Effects of Social and Financial Penalties

	Probability of Leaving the List			Log(Amount)
	(1)	(2)	(3)	(4)
	Week 5	Week 10	Week 15	Week -3
Effect of Social Penalty:				
First Quartile (250–2,273)	1.921*** (0.664)	2.075*** (0.730)	0.990 (1.043)	0.004 (0.013)
Second Quartile (2,273–5,439)	-0.171 (0.645)	0.125 (0.809)	-0.333 (0.958)	-0.001 (0.006)
Third Quartile (5,439–13,347)	0.330 (0.719)	0.239 (0.869)	0.019 (0.998)	0.003 (0.006)
Fourth Quartile (13,350–149,738)	-0.389 (0.632)	-0.615 (0.702)	-0.558 (0.793)	0.012 (0.014)
Effect of Financial Penalty:				
First Quartile (250–2,273)	0.937 (0.650)	1.070 (0.738)	1.969* (1.004)	-0.002 (0.014)
Second Quartile (2,273–5,439)	0.572 (0.631)	0.946 (0.811)	2.053** (0.903)	-0.001 (0.006)
Third Quartile (5,439–13,347)	0.203 (0.672)	0.944 (0.823)	0.601 (0.925)	0.010* (0.006)
Fourth Quartile (13,350–149,738)	-0.244 (0.636)	-0.312 (0.767)	0.301 (0.837)	-0.009 (0.015)
Baseline Rate:				
First Quartile (250–2,273)	7.503*** (0.661)	10.072*** (0.737)	24.808*** (1.124)	6.783*** (0.012)
Second Quartile (2,273–5,439)	7.459*** (0.569)	12.783*** (0.786)	20.071*** (0.908)	8.183*** (0.006)
Third Quartile (5,439–13,347)	9.347*** (0.656)	14.261*** (0.828)	20.615*** (0.913)	9.004*** (0.005)
Fourth Quartile (13,350–149,738)	8.549*** (0.602)	12.135*** (0.733)	16.529*** (0.771)	10.343*** (0.014)

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 (e.g., quartile dummies, gender, state). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter, and 1 if others 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.

Table 4: Evidence about the Interaction between Income Garnishability and Social and Financial Penalties

	Probability of Leaving the List, 16 weeks After Treatment					
	(1)	(2)	(3)	(4)	(5)	(6)
Social 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)
Importance of Wages		-1.575*** (0.480)	-1.080* (0.607)	-1.028** (0.490)	-1.482*** (0.474)	-0.683 (0.610)
Interaction with Soc. Penalty		0.035 (0.539)	0.193 (0.657)	-0.146 (0.526)	0.004 (0.533)	0.042 (0.635)
Interaction with Fin. 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 sending the letters 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). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter and 1 if others 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. Importance of Wages 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 5: 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)
Social 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 Social 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 Social 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 sending the letters 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). Social Penalty is a dummy that takes the value 0 if the recipient was the only one chosen to receive a letter and 1 if others 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.

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 becomes 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 $\left\{ F' = F + \frac{p \cdot \eta}{q} \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$. 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 social 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 $\{F, p\}$, consider like before the alternative policy $\left\{ F' = F + \frac{p \cdot \eta}{q} \frac{\bar{R} - \underline{R}}{2}, p' = 0 \right\}$ that attains the same $\hat{R}$. The first term of the objective function will be the same. The second term will be even higher, because $(\bar{R} - \hat{R})$ is the same but F is higher - or at least the same, in the corner solution $\hat{R} = \bar{R}$. Thus, the utility of the government under $\{F', p'\}$ is equal or higher than under $\{F, p\}$. This means that the set of policies with $p = 0$ dominates the set of policies with $p > 0$.

A.2 Proof of Proposition 2

Let's start with the extreme case $\alpha = \frac{1}{2}$. The government's objective function can be written as the function of two thresholds, $\hat{R}_{\bar{q}}$ and $\hat{R}_{\underline{q}}$:

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

Define the function $\Psi(R) = \frac{1}{2} \frac{1}{\bar{R} - \underline{R}} \left(-\frac{R^2}{2} + R \cdot R_g + \frac{\underline{R}^2}{2} - \underline{R} \cdot R_g \right)$, which attains its maximum at $\Psi(R_g)$. The objective function can be re-written as $\theta \Psi(\hat{R}_{\bar{q}}) + (1 - \theta) \Psi(\hat{R}_{\underline{q}})$. Thus, the first best must have $\hat{R}_{\bar{q}} = \hat{R}_{\underline{q}} = R_g$. Since a $F > 0$ introduces a wedge between $\hat{R}_{\bar{q}}$ and $\hat{R}_{\underline{q}}$,

then the first best could not be attained with $p = 0$ and $F > 0$. Instead, the first best can be attained with $\left\{F^{FB} = 0, p^{FB} = \frac{R_q}{\eta} \cdot \frac{2}{\bar{R} - \underline{R}}\right\}$, provided that η is large enough so that $p^{FB} \leq 1$.

If η is not large enough, then the optimal policy will be a corner solution involving a $p = 1$ and $F > 0$. To prove this last part, rewrite the objective function in the following way:

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

We need to show that if we have a policy with $p < 1$, we can make the government strictly better by increasing p up to 1. Take any candidate $\{F, p\}$ with $p < 1$. Consider the alternative $\left\{F' = F - \frac{1-p}{\theta\bar{q}+(1-\theta)\underline{q}} \cdot \eta \cdot \frac{\bar{R}-\underline{R}}{2}, p' = 1\right\}$. This leaves $\left(\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}\right)$ unchanged, but since this intervention decreases the distance between $\hat{R}_{\bar{q}}$ and $\hat{R}_{\underline{q}}$ (for this step, we are using that η is not large enough so that any $p \leq 1$ does not eliminate entirely the gap between these two) it follows that $\left(\theta \hat{R}_{\bar{q}}^2 + (1 - \theta) \hat{R}_{\underline{q}}^2\right)$ will be lower. Thus, the objective function is higher under this alternative policy, which is what we wanted to prove.

In the other extreme case, $\alpha = 1$, the objective function can be expressed as:

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

We can show that the optimal cannot involve $p > 0$. Take any candidate $\{F, p\}$ with $p > 0$. Consider the alternative $\left\{F' = F + \frac{p \cdot \eta}{\theta\bar{q}+(1-\theta)\underline{q}} \cdot \frac{\bar{R}-\underline{R}}{2}, p' = 0\right\}$. As a result, $\left(\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}\right)$ will stay the same, so that the first term of the objective function also stays the same. Note that, by construction, $\bar{R} - \left(\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}\right) \geq 0$. Thus, since $F' > F$ then the last term of the objective function is higher under the alternative policy - or the same, in the corner solution $\hat{R}_{\bar{q}} = \hat{R}_{\underline{q}} = \bar{R}$. Thus, the utility of the government under $\{F', p'\}$ is equal or higher than under $\{F, p\}$.

Last, we can extend the results for the intermediate cases with $\alpha \in \left(\frac{1}{2}, 1\right)$. We want to prove that there is a critical $\alpha^* \in \left(\frac{1}{2}, 1\right)$ such as the set of policies with $p > 0$ dominates if $\alpha \leq \alpha^*$ and is dominated if $\alpha \geq \alpha^*$ (and thus is equivalent if $\alpha = \alpha^*$). We start by proving that the set of policies with $p > 0$ is dominated for $\alpha \geq \alpha^*$. Given a policy $\{F, p > 0\}$, consider the alternative policy $\left\{F' = F + \frac{p \cdot \eta}{\theta\bar{q}+(1-\theta)\underline{q}} \cdot \frac{\bar{R}-\underline{R}}{2}, p' = 0\right\}$. This leaves $\left(\theta \hat{R}_{\bar{q}} + (1 - \theta) \hat{R}_{\underline{q}}\right)$ 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 $\alpha = 1$. It is straightforward to verify that this alternative policy decreases the objective function when $\alpha = \frac{1}{2}$. Note that the objective function of the intermediate case can be written as a weighted average between the objective functions evaluated at $\alpha = \frac{1}{2}$ and $\alpha = 1$. Let β ($1 - \beta$) 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 $\alpha = 1$. 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 if $\alpha > \alpha^*$ and leaves it the same if $\alpha = \alpha^*$, which is what we wanted to prove.

Now we must prove that the set of policies with $p > 0$ dominates for $\alpha \leq \alpha^*$. 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 ϵ positive but arbitrarily close to zero. This leaves $(\theta\hat{R}_{\bar{q}} + (1-\theta)\hat{R}_{\underline{q}})$ unchanged but reduces the gap between $\hat{R}_{\bar{q}}$ and $\hat{R}_{\underline{q}}$. It is straightforward to verify that, for an ϵ low enough, this alternative policy increases the objective function when $\alpha = \frac{1}{2}$ but decreases the objective function when $\alpha = 1$. Again, 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 if $\alpha \leq \alpha^*$ and leaves it the same if $\alpha = \alpha^*$, which is what we wanted to prove.

A.3 Proof of Proposition 3

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 α 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 $\alpha > \alpha^*$.

B Sample of the Envelope and the Letter

Sample Envelope

Ann Arbor, May 26th 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

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

Online Appendix: Not For Publication

C More Details about the Experimental Sample

In this section we discuss the observational evidence supporting the claim from the tax agencies 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 be below the threshold).

The evidence for Kentucky, Kansas and Wisconsin is shown in Figures C.1.a, C.1.b and C.1.c. The data corresponds to the subject pool. For each state, the figure shows the distribution of debt amounts. If individuals could pay epsilon below the threshold to get off the list, that would mean that there should be some “missing density” just to the right of the threshold (i.e., those individuals could “aim” at having unpaid debts below the threshold). However, there is no 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 dramatic increase in the probability of leaving the list just right of 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 of such behavior.

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

Notes: Write.

D Regulations of Lists of Tax Delinquents

In this section we presents further details about the legal aspects of tax delinquencies in Kansas, Kentucky and Wisconsin.

A snapshot of the webpage with the list of tax delinquents from Kentucky is shown in Figure D.1. In Kentucky the publication of delinquents owning 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.

A snapshot of the webpage with the list of tax delinquents from Kansas is shown in Figure D.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.

A snapshot of the webpage with the list of tax delinquents from Wisconsin is shown in Figure D.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 repayment 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 D.1: Snapshot of Online Search Tool, Kentucky Department of Revenue

The screenshot shows the Kentucky Department of Revenue website. The main navigation bar includes links for Home, Site Map, Calendar, Finance & Administration Cabinet, and Revenue > Listing of Delinquent Debtors > Individual Debtors. The left sidebar contains links for Home, Listing of Delinquent Debtors, Individual Debtors, Business Debtors, and Child Support Debtors. The main content area is titled "Individual Debtors" and includes a search form with fields for Name, Lien Balance, Address, City, State, Zip, and County of Record. Below the search form, there is a table of results showing 15 results, with 1-5 of 15 total records displayed. The table has columns for Name, Lien Balance, Address, City, State, Zip, and County. The results show four entries for "RICARDO" with various lien balances and addresses.

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

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

The screenshot shows the Kansas Department of Revenue website. The main navigation bar includes links for Home, Personal Tax, Business Tax, Vehicles, E-services, Forms, Contact Us, Divisions, Media, and Miscellaneous. The main content area is titled "Tax Delinquencies" and includes a search form with a text input field and "Search" and "Clear Search" buttons. Below the search form, there is a table of results showing tax delinquencies. The table has columns for Name and Address, County, Tax Type(s), Total Amount Due, and District Court Case Number. The results show four entries for "RICARDO" with various tax amounts and addresses.

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]

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

Home > Wisconsin Delinquent Taxpayers > Delinquent Taxpayers by Name > Delinquent Taxpayers by Name

Delinquent Taxpayers by Name

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

[Go to Revoked Sellers Page](#)

[Back to Delinquent Page](#)

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

E Extensions to the Model

E.1 Signaling Moral Type

E.1.1 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:

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

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 η).

Debtors' utility functions are:

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

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:

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

Substituting into the objective function:

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

Each debtor then chooses $x_i = 1$ when

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

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

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

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

E.1.2 The Government's Problem

Government revenues and social welfare of the taxpayers are:

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

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

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 welfare of debtors:

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

E.1.3 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.

E.1.4 Optimal Penalties under Heterogeneous q_i

The following is parallel to Proposition 2:

Proposition 5. *If $\underline{q} < \bar{q}$, for some values of α , 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.