The Indirect Effects of Auditing Taxpayers

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Abstract
Empirical studies suggest that the effects of tax audits are not only in terms of recovered unpaid tax (direct effect) but there are also indirect effects in terms of future better compliance that tend to outweigh the direct effect. However, current policy decisions on the allocation of investigation resources across different groups of taxpayers generally neglect the indirect effects, generating a potential resource misallocation issue. With the aim to clarify a possible mechanism through which the indirect effects work, the authors model tax compliance as a social norm and show that taxpayers’ interdependencies introduce a multiplier effect to an increase in the audit rate.

Keywords
tax evasion, social norm, indirect effects, tax audits

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This article focuses on the indirect effects of auditing taxpayers. When a tax audit takes place, two main effects can be expected: (1) a direct effect, consisting of the amount of recovered unpaid tax and any fines applied to the noncompliant taxpayers, and (2) indirect effects, consisting of changes to future compliance behavior. These indirect effects take two forms: (1) changed behavior by audited taxpayers and (2) spillover effects to nonaudited taxpayers.

According to the empirical evidence on the impact of audits on taxpayers’ compliance, the indirect effects substantially outweigh the direct effect. Dubin, Graetz, and Wilde (1990) estimate a ratio between indirect and direct effects of six to one, that is, the indirect effects of audits produce six of every seven dollars of additional revenue. In a recent extension of this study by Dubin (2007) includes factors that measure the criminal investigation activity of the Internal Revenue Service (IRS) and considers the period from 1988 to 2001. Results from a simulation on doubling the audit rate suggest a ratio between indirect and direct effects of fifteen to one. Plumley (1996) presents an econometric analysis on the determinants of voluntary compliance, using a very rich data set by state and year, from 1982 through 1991. Controlling for tax policy measures (e.g., filing threshold, allowed exemptions), burden/opportunity variables (e.g., hours needed to complete a tax return, type of income), IRS enforcement measures (audit rate at the start of the period, information return matching program, nonfiler notices, refund offsets, and criminal tax convictions), IRS responsiveness (telephone assistance, return preparation services), and taxpayers’ demographic and economic characteristics, the author obtains an estimate for the ratio between indirect effects and direct effects in a similar way to Dubin, Graetz, and Wilde (1990) and gets a value of eleven to one.

The fact that taxpayers may be affected by the audits even if not directly involved in the assessment seems to be confirmed by surveys and laboratory experiments on taxpayers’ attitudes toward noncompliance. Several studies show that individuals’ (self-reported) compliance is correlated with their estimate of other individuals’ compliance (e.g., Bosco and Mittone 1997; De Juan, Lasheras, and Rafaela 1994; Webley, Henry, and Morris 1988). Torgler (2002) reviews experimental findings on tax compliance, which suggest that there are some interdependencies in individuals’ decision of whether or not to evade and their perceptions of other taxpayers’ evasion.

However, current policy decisions on the allocation of investigation resources across different groups of taxpayers typically neglect the indirect
effects. Actual targets and resources for audits across different groups of taxpayers are set on the direct yield:cost ratio, at least in the United Kingdom and United States, as this is currently the only available measure of the effects of an audit. If the ratio between the indirect and direct effects were constant across different groups of taxpayers, then neglecting the indirect effects would not pose a problem of misallocation of resources. But, if the ratio were to vary, the resulting decision would be suboptimal, as it would not take into account the full marginal benefit of an increase in the audit rate. In order to assess the potential misallocation issue, we need a better understanding of the determinants of the indirect effects. Although the indirect effects have been estimated in empirical studies, the theoretical models on tax evasion do not seem to pay attention to the distinction between the direct and indirect effects of audits. In the standard portfolio models, the tax parameters are fixed, chosen independently from taxpayers’ behavior. Later contributions have analyzed, by the use of game theoretical models, the interaction between taxpayers and the tax authority. The assumption made in those models is that the choice of the tax parameters depends on the extent of evasion, in that taxpayers’ decisions have an impact on the tax revenues raised by the government. However, these models consider the overall response of taxpayers to the audit policy, without distinguishing between direct and indirect effects.

In this article, we model a possible mechanism through which the indirect effects may work. We consider the role of social interactions in a community of taxpayers in explaining the existence of indirect effects. Similar to Myles and Naylor (1996), these social interactions work through a conformity payoff: in case of evasion an individual incurs a psychic cost, which (positively) depends on the proportion of honest taxpayers. However, in our model, this psychic cost is suffered only in case of detection, as a loss in reputation for being discovered cheating the tax authority. Unlike in Myles and Naylor (1996), it is not a personal moral cost incurred for hiding one’s income, irrespective of being subject to an audit. We not only show that an increase in the probability of audit has the expected deterrence effect, consisting of an increase in the expected fine, but we also identify a multiplier effect of audits which acts through the reputational cost.

The remainder of this article is organized as follows: The second section sets out our model. We first consider individual behavior and then extend the analysis to a community of taxpayers. In the third section, we consider the effects of an increase in the audit probability on a possible interior equilibrium and distinguish the normal deterrent effect of inquiries from a multiplier effect due to the existence of the reputational cost of being caught. The fourth section presents our conclusions.
The Role of a Social Psychic Cost of Being Investigated

Social interactions across taxpayers have been considered by some theoretical developments of the standard model of tax evasion. The assumption made in these models is that individuals attach a moral content to tax compliance and hence suffer a psychic cost when cheating the tax authority. Gordon (1989) considers the case of a social stigma attached to the act of evading taxes, which depends on the proportion of the population who are believed to consider tax evasion as morally wrong and is suffered irrespective of being detected. Myles and Naylor (1996) capture the influence of social interactions in the taxpayers’ decision whether or not to evade in the framework of the social custom and conformity approach. In their model, a social custom utility is derived when taxes are paid honestly. Individuals also get an extra utility from conforming with the standard pattern of social behavior. Hence, the utility from nonevasion includes two extra arguments neglected in the standard portfolio model: a fixed gain from following the social custom and an extra gain from conforming to the other honest taxpayers, which depends on the number of honest taxpayers. Like in Gordon (1989), Myles and Naylor assume that there is a moral dimension in the act of behaving honestly.

In our model, we adopt a different approach than Gordon (1989) and Myles and Naylor (1996). In line with the rather uncompelling results of empirical studies on how morals actually translate into taxpayers’ behavior, we adopt a less strong moral connotation attached to tax compliance. We assume that individuals suffer a psychic cost for evading only in case of detection, such as a loss in reputation. This loss in reputation is not linked to the act of evading, but rather to the fact of being audited and caught. There is not necessarily any personal conviction that paying taxes honestly is morally right, that is, there is no personal moral cost of evading. In line with the empirical evidence mentioned previously, we assume that this psychic cost is decreasing with the perceived number of tax cheaters in the community. Kim (2003) also considers a model where taxpayers suffer a stigma for being audited and exposed as cheaters. The author is interested in the analysis of the existence and characterization of the equilibria emerging when taxpayers’ behavior is affected by this social stigma and in the analysis on the impact of income distribution on the existence of multiple equilibria. The aim of our model is to analyze the taxpayers’ response to an increase in the audit probability when social interactions act through a reputational nonmonetary cost. The previous models on social interactions did not consider this issue, their main focus being the explanation of why
taxpayers tend to be more honest than expected by the standard portfolio model.

In the next section, we present our model. We first consider the decision of a single individual and then we extend the analysis to a group or community of taxpayers.

**Individual Behavior**

In the analysis that follows, we consider the taxpayer decision as a two-step decision: the taxpayer first decides whether or not to evade, by comparing the utility of nonevasion with the expected utility of evasion, and then chooses the optimal amount of evasion. We focus on the decision whether or not to engage in tax evasion. In order to keep notation simple and to concentrate on the effects of social interactions, we make the assumption of risk neutrality. Our results are not qualitatively affected by this assumption. In fact, the degree of risk aversion does not affect the decision whether or not to evade: tax evasion will be chosen whenever the probability of being detected is below a certain threshold, determined by the value of the fine and tax rate. The degree of risk aversion affects instead the decision how much to evade. Another assumption we make is that once an individual is investigated, tax evasion is fully detected, as in the standard portfolio model.

Let us define the utility from nonevading for an individual $i$, with income normalized to 1 and facing a tax rate $t$, as follows:

$$U_i^{NE} = (1 - t) \quad (1)$$

Let $e_i, 0 \leq e_i \leq 1$, be the individual $i$'s opportunity to evade, that is, the proportion of income that can potentially be hidden and $\tilde{e}_i, 0 \leq \tilde{e}_i \leq e_i$, the actual proportion of income evaded. An individual is investigated with probability $p, 0 < p < 1$, and in case of evasion he or she will need to pay back the taxes due and a monetary fine $F > 0$ on the amount of evaded income, $\tilde{e}_i$ (as in Allingham and Sandmo 1972). Being audited also implies a loss in reputation. We make the assumption that this loss in reputation varies across individuals and is decreasing in the number of people in the community who are perceived to evade. So, the total loss in case of detection is as follows:

$$f_i = F + \lambda_i C(1 - \mu), \quad (2)$$

where $\lambda_i > 0$ is the importance attached by individual $i$ to the nonpecuniary loss of being caught, $C(1 - \mu)$ is the amount of the nonpecuniary cost of being caught and $\mu$ is the proportion of perceived evaders in the community.
We assume $C'(\cdot) > 0$, to reflect the fact that the larger the proportion of honest taxpayers in the community, the larger the psychic cost of being caught. The utility from evading is as follows:

$$U_i^E = p[(1 - p) - f_i \bar{e}_i] + (1 - p)[(1 - \bar{e}_i)(1 - t)] + \bar{e}_i$$

$= (1 - t) + \bar{e}_i[t(1 - p) - pf_i]$. \hspace{1cm} (3)

An individual $i$ is willing to evade if $U_i^E > U_i^{NE}$. Hence, tax evasion will occur whenever $\bar{e}_i[t(1 - p) - pf_i] > 0$, that is, whenever the expected financial gain from evading one extra unit of income is positive. In this case, the taxpayer will always evade to the maximum amount, so $\bar{e}_i = e_i$.\hspace{0.5cm} 6

We shall assume that from a monetary point of view, evasion is always worth it, that is, $F < \frac{t(1 - p)}{p}$, and that there is always an opportunity to evade, that is, $\bar{e}_i > 0$, so that an individual would evade the proportion of income equal to his or her opportunity of evasion. Given that the expected total gain from evading one extra unit of income is increasing in $\mu$, there will be a unique $\bar{\mu}$ such that the net expected marginal gain of tax evasion is zero; that is, $t(1 - p) - p(F + \lambda_i C(1 - \bar{\mu})) = 0$. For given tax parameters and a given value attached to the importance of the reputational loss of being audited, values of $\mu > \bar{\mu}$ will induce tax evasion, as for $\mu > \bar{\mu}$, the net expected marginal gain of tax evasion becomes positive.

**The Community of Taxpayers**

In our model, opportunities to evade are exogenous, in that they are not affected by the tax parameters and the psychic cost. Given that we assume $\bar{e}_i > 0$, opportunities to evade only affect the total amount of evasion and not the number of evaders.\hspace{0.5cm} 7 In what follows, we concentrate on the total number of evaders rather than on total evasion, so that we can simplify notation. Our results are not affected by the distribution of opportunities to evade across the population of taxpayers. We assume taxpayers differ in the importance attached to the nonpecuniary fine for being audited $\lambda_i$. The density function for $\lambda$ is $h(\lambda)$, and we assume it is continuous and that the support of $h(\lambda)$ is $[0, +\infty]$. For given tax parameters and a given proportion of evaders, some individuals will have $\lambda_i$ such that the expected marginal gain from evasion is negative and some will have $\lambda_i$ such that the expected marginal gain from evasion is positive. The distribution of $h(\lambda)$ will determine how many individuals evade. We denote the value of $\lambda_i$ such that the expected marginal
gain from evasion is zero as \( \bar{\lambda} = \frac{t(1 - p) - pF}{pC(1 - \mu)} \). Values of \( \lambda_i \) above \( \bar{\lambda} \) will imply a negative expected marginal gain from evasion.

Let

\[
\int_0^{\bar{\lambda}(t, p, F, \Pi)} h(\lambda) d\lambda = H(\bar{\lambda}(\cdot))
\]

be the proportion of taxpayers in the community that are willing to evade. Notice that

\[
\frac{\partial H(\bar{\lambda}(\cdot))}{\partial \mu} = \left[ \frac{\partial \bar{\lambda}}{\partial \mu} h(\bar{\lambda}) \right] \geq 0
\]

since

\[
\frac{\partial \bar{\lambda}}{\partial \mu} = -[t(1 - p) - pF][pC(1 - \mu)]^{-2}[pC'(1 - \mu)(-1)] > 0.
\]

The equilibrium value of \( \mu, \hat{\mu} \), is given by

\[
\hat{\mu} = H(\bar{\lambda}(\hat{\mu})).
\]

It occurs when the distribution of the importance attached to the psychic cost is such that, if every individual faces the same proportion of evaders \( \hat{\mu} \), the actual proportion of evaders in the whole economy, \( H(\bar{\lambda}(\hat{\mu})) \), will be just \( \hat{\mu} \); that is, \( \hat{\mu} \) is a fixed point for \( H(\bar{\lambda}(\hat{\mu})) \).

We now check what types of equilibria there might exist:

a. Zero evasion equilibrium: It can be easily seen that an equilibrium with zero-evasion will not be possible as follows: if \( \hat{\mu} = 0 \), then \( \bar{\lambda}(0) = \frac{t(1 - p) - pF}{pC(1)} > 0 \). Hence, \( H(\bar{\lambda}(0)) > 0 \). This implies that \( \hat{\mu} = 0 \) cannot be an equilibrium.

b. Full evasion equilibrium: if \( \hat{\mu} = 1 \), then \( \bar{\lambda}(1) = \frac{t(1 - p) - pF}{pC(1)} \). Unless \( C(0) = 0 \), \( \bar{\lambda}(1) \neq +\infty \). Hence, \( H(\bar{\lambda}(1)) < 1 \). This implies that \( \hat{\mu} = 1 \) cannot be an equilibrium, unless \( C(0) = 0 \).

c. Interior equilibria: As \( H(\bar{\lambda}(\mu)) \) is a continuous function of \( \mu \), the existence of at least one interior equilibrium is guaranteed. A sufficient condition for the interior equilibrium to be unique is that \( \frac{\partial H(\bar{\lambda}(\mu))}{\partial \mu} \) is monotonic. Note that
\[ \frac{\partial^2 H(\tilde{\lambda}(\mu))}{\partial \mu^2} \approx h'(\tilde{\lambda}(\mu)) \frac{C^2K^2}{C^4} + h(\tilde{\lambda}(\mu)) \frac{2CC'^2 - C''C^2}{C^4} K \]  

(7)

with \( C' = \frac{\partial C(.)}{\partial \mu} \), \( C'' = \frac{\partial^2 C(.)}{\partial \mu^2} \), and \( K = \frac{t(1-p) - pF}{p} \).

All we can say about the sign of equation (7) is that if \( C'' < 0 \), and \( h'(\tilde{\lambda}(\mu)) \geq 0 \) (or not too negative), then \( \frac{\partial^2 H(\tilde{\lambda}(\mu))}{\partial \mu^2} > 0 \). The same is valid if \( C'' > 0 \), but not too much. We obtain \( \frac{\partial^2 H(\tilde{\lambda}(\mu))}{\partial \mu^2} \leq 0 \) if \( C'' \geq 0 \) and \( h'(\tilde{\lambda}(\mu)) \leq 0 \) and \( K \) is big enough.

In conclusion, the existence of multiple equilibria depends on the shape of the psychic cost function and on the distribution of the importance attached to the psychological cost of being audited.

In what follows, we shall assume the existence of a unique interior equilibrium and consider the comparative statics for a change in the audit rate. We make the assumption that \( C(0) \neq 0 \) and that \( C'' \geq 0 \) and \( h'(\tilde{\lambda}(\mu)) \leq 0 \) and \( K \) is big enough so that \( \frac{\partial^2 m}{\partial \mu^2} \leq 0 \). Results are however valid for any locally stable interior equilibrium and for small changes in the audit probability.

**Effects of an Increase in the Probability of Detection on the Proportion of Evaders**

We now consider the effect of an increase in the probability of being audited on the number of evaders. In equilibrium, equation (6) holds and

\[ \tilde{\lambda} = \frac{t(1-p) - pF}{pC[1 - H(\tilde{\lambda})]} \]  

(8)

represents the equilibrium upper limit of the distribution of evaders. In order to assess the impact of an increase in the audit probability on the equilibrium proportion of evaders, we can totally differentiate equation (8) with respect to \( p \), and we get

\[ \frac{\partial \tilde{\lambda}}{\partial p} [C(1 - H(\tilde{\lambda})) - \tilde{\lambda}h(\tilde{\lambda})C'(1 - H(\tilde{\lambda}))] = \frac{\partial K}{\partial p}, \text{ with } K = \frac{t(1-p) - pF}{p}. \]  

(9)
The first term on the left-hand side of equation (9) represents the normal deterrence effect of audits: an increase in the probability of detection makes the entry condition for evasion more restrictive and hence lowers the critical level of importance of the psychic cost ($\lambda$), that is, those on the margin will stop evading. The second term on the left-hand side of equation (9) represents the additional effect arising because of taxpayers’ interdependencies. As the number of those on the margin stops evading, the magnitude of the psychic cost increases and this discourages even more people to continue evading. The greater $C'(\cdot)$, the greater the additional effect due to social interactions.

In order to assess the magnitude of this additional effect due to taxpayers’ interactions relative to the normal deterrence effect, we run a simulation. We assume $H(\lambda) = 1 - e^{-\lambda}$ and $C = 1 + c(1 - \mu)$ and set $t = 0.5$ and $F = 1.5$. We calculate the equilibrium proportion of evaders, $H(\lambda(\hat{\mu}))$, as defined in equation (6), for different values of the probability of being detected ($p$) and for different values of the marginal psychic cost of being detected, $c$. We consider $c = 0$, which corresponds to the case of the absence of social interactions across taxpayers, as in the standard model, and $c = 1$, $c = 2.5$, and $c = 5$. For these values of the marginal psychic cost and tax parameters and for the assumed distribution function of the importance attached to the psychic cost, we obtain a unique equilibrium, which is also an interior equilibrium for $0.07 < p < 0.25$. We show the results in figure 1. For a given value of the probability of being detected, a greater marginal nonpecuniary cost of being caught implies a lower equilibrium proportion of evaders.

We then consider how a change in the probability of being detected affects taxpayers’ behavior at the margin. In figure 2, we show how the equilibrium upper limit of the distribution of evaders, as defined in equation (8), changes with the probability of detection, for different values of the marginal psychic cost of being caught.

The standard deterrence effect of an increase in the probability of detection is illustrated on the curve for $c = 0$. The additional effect due to taxpayers’ interactions is represented by the difference in the slope of the curve for $c = 0$ and the slope of any curve for $c > 0$, for each value of $p$.

Figure 2 shows that, for low values of the probability of detection, the slope of the curve for $c = 5$ is greater than the slope of the other curves. This implies that for low values of the probability of detection, the greater the marginal cost of losing one’s reputation in case of detection, the greater the additional effect on the equilibrium proportion of evaders relative to the
normal deterrence effect. As the probability of being detected increases, the additional effect of taxpayers’ interactions becomes less and less important relative to the normal deterrence effect. With the chosen parameters, for values of $p > .11$, the curve for $c = 5$ becomes flatter than the other curves. As we approach $p = .25$ hardly anybody evades and the slope of any of the curves for $c > 0$ is less than the slope of the curve for $c = 0$. The intuition is that the greater the number of compliant taxpayers, the more negligible the additional effect of social interactions, driven by a switch from evasion to non evasion. Hence, an increase in the probability of an audit is most effective when the probability of detection is very low and the marginal psychic cost is very high.

In conclusion, in the presence of a nonpecuniary cost of being investigated which depends on the proportion of evaders, an increase in the probability of detection will cause the fraction of the population who evades to fall, and this will give an extra reason for people to stop evading over and above the normal deterrence effect. Moreover, for sufficiently low values of the probability of detection, the greater the marginal psychic cost, the greater will be the fall in the proportion of evaders. Note that these results

![Figure 1. Equilibrium proportion of evaders for different values of the probability of being detected.](image)
rely on the assumption that the psychic cost of being audited increases with the number of other honest taxpayers. Similar results could be obtained in Myles and Naylor (1996). Although the authors do not consider this issue, it can be shown that an increase in the probability of detection causes the marginal individuals to stop evading; this lowers the proportion who evades, which in turns reduces evasion, as the extra gain from conforming with the honest taxpayers increases—and so on. However, in their model, results may not be so clear-cut. In fact, their approach is based on the assumption that tax compliance has a moral connotation. According to some authors,\textsuperscript{10} the intrinsic motivation to comply with the tax duties, based on morals, may be crowded out by an external intervention of the tax authority, such as an increase in the audit rate. In their view, an increase in the audit rate would be perceived by taxpayers as a controlling activity—that is, not giving any recognition to civic virtue. This would change their utility function, by making the extra utility gain from conforming with the honest taxpayers less important. Hence, there would be two opposing effects of an increase in the audit rate: an increase in the payoff from conforming to the honest taxpayers—due to a decrease in the proportion of evaders—and a decrease...
in the importance attached to that same payoff—due to the crowding-out effect—possibly leaving the final effect undetermined.

**Conclusion**

In this article, we consider how taxpayers’ interdependencies may amplify the normal deterrence effect of audits. We extend the standard portfolio model by introducing a nonmonetary cost of being audited, which increases with the number of honest taxpayers in the community. We show that an increase in the probability of audit causes the marginal individuals to stop evading. This is the normal deterrent effect of investigations pointed out in the standard portfolio model. However, there is an additional effect. Given that less people than before are evading, the magnitude of the psychic cost increases and this discourages even more people to continue evading and so on, giving rise to a multiplier effect. This prediction gives some support to the results of empirical studies suggesting the overwhelming role of indirect effects of investigations over the direct effects. Although we cannot claim the multiplier effect to be greater than the direct deterrence effect as a general result, our simulation shows that for sufficiently low values of the probability of detection, the multiplier effect can be greater than the direct deterrence effect. We should also note that in our analysis, we only considered one group of taxpayers (subject to the same tax parameters). In the presence of different groups of taxpayers, there will be spillover effects across different groups, which will make the indirect effects even more important and hence more likely to be greater than the direct effects.

Our results also make it clear that the indirect effects depend on the magnitude of the reputational cost of being audited and on the importance attached to this cost, which are very likely to vary across taxpayers. Hence, we should not expect the ratio indirect/direct effect to be constant, even across taxpayers belonging to the same group (subject to the same tax parameters). This implies that if audit resources are allocated by only considering the direct effects, there are important misallocations issues. A better understanding of how interdependencies across taxpayers actually occur is then crucial for any policy intervention. This calls for the identification of a possible reference group, which may differ across different taxpayers and could be based, for example, on occupation, or on neighborhoods or on the use of the same tax agent.

An important policy implication of our results is that the announcement of the investigation results can have a substantial role in reenforcing the multiplier effect of audits if reputational effects are at work. This raises the
question of what kind of announcements the tax authority could make to
deter noncompliant behavior. However, the answer to this question hinges
on the type of social interactions that may be at work. As pointed out by
Manski (2000), in order to analyze social interactions, it is crucial to distin-
guish between preference interactions—one person may imitate another
because the former prefers to act like the latter—from the expectation inter-
actions, generated by observational learning—one person may imitate
another because he or she believes that the other person has superior infor-
mation. These different explanations of social interactions have different
policy implications in that “Interventions that provide new information
may alter the nature of expectations interactions or even cause them to dis-
appear, but should have no effect on preference interactions.”

In this article, we consider preference interactions, and indeed the policy
implication is that the greater the publicity of the number of people con-
victed and stopping to evade, the greater the impact of the social psychic
cost. However, social interactions among taxpayers could also be explained
as expectation interactions. For example, if taxpayers do not know the
actual probability of being detected, they could use the information about
the proportion of detected cheaters to update their perceptions of the audit
rule. But, in line with what suggested by Manski (2000), in this case, an
announcement by the tax authority about the audit results may have detri-
mental effects, especially if individuals tend to overestimate the probability
of detection. Hence, more research needs to be undertaken on the updating
process of audit perceptions in order to have more conclusive policy impli-
cations of the tax authority’s announcements about the results of an audit.

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Notes
1. The methodology used to calculate the indirect and direct effects is as follows. Using US state-level data for the period 1977–86, when there was a sharp decline in the audit rate, the authors estimate reported tax liability per return and total returns filed per capita as functions of state income tax rate, the audit rate, per-capita income, and various other socioeconomic variables. They then calculate the predicted value of total reported tax from individual returns that would have been realized if the audit rate had remained constant at its 1977 level over the period 1977–86. They find that, maintaining the audit rate at its 1977 value, by 1986 total reported tax would have increased by 15.6 billion dollars. This value is the indirect effect or spillover effect of investigations. The predicted value for the increase in total assessed liability for 1986 from holding the audit rate to its 1977 value is 18.2 billion dollars. The difference between this figure and the predicted value of total reported tax (15.6 billion dollars) gives a direct revenue effect of 2.6 billion.

2. Allingham and Sandmo (1972) and Yitzhaki (1974).

3. See Reinganum and Wilde (1985, 1991) Graetz, Reinganum, and Wilde (1986) Cremer, Maurice, and Pestieau (1990) and Greenberg (1984).

4. Frey and Torgler (2007), using data from the European Values Survey, show a positive correlation between people’s tax morale (measured by a question whether cheating on tax is justified if one has the chance) and people’s perceptions of how many others cheat on taxes. This result is confirmed by Gächter (2006), who presents evidence from four laboratory experiments suggesting that people are less likely to cheat on their taxes or to commit benefit fraud if they have the impression that others behave honestly. The underlying idea of these studies is that taxpayers are intrinsically motivated to comply with the tax system by feelings of guilt or shame and are deterred from cheating by both formal and informal sanctions. However, Blumenthal, Christian, and Slemrod (2001) conduct a field experiment on the effects of normative appeals on tax compliance, but do not find any compelling effects of morals, their results suggesting instead the role of opportunities and costs of evasion in determining tax compliance. This seems to be confirmed by other studies using individual-level data from tax returns, like Slemrod, Blumenthal, and Christian (2001); Crane and Nourzad (1994); and Erard and Ho (2001).
5. This condition ensures that the expected utility from evasion is greater than the utility from nonevasion. In an income-state dependent diagram, this condition implies that the slope of the indifference curve at a point along the 45° line, 
\[ \frac{(1 - p)}{p} \]
, is more negative than the slope of the budget constraint \( \frac{(1-f)}{f} \) as in Allingham and Sandmo (1972) or \( (1-f) \) as in Yitzhaki (1974)—so that the point of tangency between the indifference curve and the budget constraint must lie below the 45° degree line, thus implying a positive amount of evasion.

6. We should note that here both the probability of detection \( p \) and the fine rate \( F \) are fixed and do not depend on the amount of evasion. In reality, both the frequency of an audit and the fine rate are positively related to the amount of concealed income. This may imply that tax evaders do not evade to the maximum extent of their possibilities.

7. In fact, if \( \hat{e}_i > 0 \), the entry condition for tax evasion is not affected by opportunities to evade.

8. With the chosen tax parameters, the maximum value of the probability of being detected is 0.25. Above this value, the expected monetary gain from tax evasion, defined as \( K \) in equation (7), becomes negative.

9. We should note that this analysis applies when there is a unique, locally stable equilibrium. In the presence of multiple equilibria, we would not be able to use our comparative statics as an increase in the probability of detection would shift the density function down and some initial equilibria might disappear, causing a jump to a different equilibrium.

10. See Frey (2003) and Frey and Jegen (2001).

11. See Manski (2000), 131.

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