TAX EVASION, CONSPICUOUS CONSUMPTION, AND SIGNAL AUDITING

by

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A B S T R A C T

The vast economic literature on income tax evasion has almost entirely ignored an important aspect of the audit decision. Very often, the tax authority initiates an audit on the basis of signals of prosperous living (e.g., villas, yachts, latest-model cars). Such signals, known in the literature as “conspicuous consumption”, are likely to draw the attention of the tax agency, which may suspect that the purchase of a highly priced asset has been the consequence of tax evasion. This requires the skillful evader to carefully consider his expenditures on observable consumption. In this paper, I develop a joint evasion-consumption decision model that allows for this consideration. Contrary to a recent contribution to the literature which assumes that the amount evaded by the conspicuous consumer is exogenously fixed, I allow the consumer to determine his desired level of evasion. Consequently, the amount evaded becomes dependent on the parameters of the model, and in particular, on the price of the conspicuous good which plays a crucial role in determining the optimal audit policy of the tax agency. While signal auditing has the advantage of focusing on the population that is more likely to evade taxes, it also has its weakness, as a sufficiently high price might induce evaders to shelter their evasion through avoiding signaling altogether. The paper analyzes the tax evader's and tax agency's optimal strategies under signal auditing, showing that the tax agency can prevent tax evaders from evading the signal by sufficiently lowering the audit intensity. Furthermore, taxing the conspicuous good is shown to always increase total tax revenue despite a possible fall in the revenue from income taxes.

Key words: Tax Evasion; Conspicuous Consumption; Signal Auditing

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I. Introduction

Governments collect taxes from the public to finance the activity of the public sector, and, in particular, to finance the provision of public services such as defense, health, education, housing, etc. The most important tax is the individual income tax, which is imposed on the incomes of individuals. The tax liability of the individual is dependent on the level of income obtained in a given period. However, in order to calculate the amount of taxes due, the tax agency must know the level of the individual’s income. How does the tax agency know this? Basically, it does not. Therefore, the tax agency requires that individuals report their incomes annually through filing an income tax return. Taxes due are determined, at first stage, by the individual’s declaration.

Because paying taxes reduces net income, and because the amount paid is dependent on the individual’s own declaration, an incentive may obviously arise to evade taxes through the underreporting of actual income. If the tax evader does not draw the attention of the tax agency, he will end up with a higher net income than he would in case of declaring honestly. However, if the taxpayer is investigated by the tax agency, his evasion is likely to be revealed. In this case, he will have to pay the evaded tax plus a penalty, consequently ending up with a lower net income than in case of honest declaration. The taxpayer thus faces two options: (a) declaring his true income; (b) declaring less than his true income and facing uncertainty regarding the consequence of his action. Which option will he choose?

The first attempt in the economic literature to answer this question was made by Allingham & Sandmo (1972), who constructed a simple model of the evasion decision. Allingham & Sandmo first derived an entry condition into tax evasion and, given that the entry condition holds, proceeded to examine the taxpayer's response to various parameter changes. In particular, Allingham & Sandmo were interested in finding out whether an increase in the income tax rate reduces declaration, as is intuitively expected. Surprisingly, they concluded that this must not necessarily be the case. Moreover, slightly adapting their penalty function to real-life schemes, Yitzhaki
(1974) showed that an increase in the income tax rate will unambiguously, and counter-intuitively, increase declaration. In the years that followed, several researchers [e.g., Weiss (1976), Pencavel (1979), Cowell (1985)] allowed the taxpayer to determine his actual income along with the level of underreporting, examining the interrelationships between evasion and the supply of labor. Others have incorporated concealment costs into the evasion decision, allowing the taxpayer to undertake costly effort to hide his evasion [e.g., Kaplow (1992), Yaniv (1999)]. Attempts have also been made to investigate the evasion decision of the firm and the way it affects the optimal production or employment level in the case of sales taxes [Marrelli (1984)], withholding taxes [Yaniv (1988)], or profit taxes [Wang (1990)].

At the same time, attention has been drawn to the evasion decision from the tax agency's perspective. The problem faced by the tax agency is how many resources to devote to the auditing of tax returns and how to select the returns that will be audited. The simplest way of selecting returns for audit is by drawing some random sample out of all returns. The size of the sample will then determine the probability of the tax evader to get caught, as well as the costs of auditing. Slemrod and Yitzhaki (1987), for example, investigated the optimal probability of audit for a tax agency which seeks to maximize social welfare, showing that because the risk of being audited reduces tax evaders' welfare, the agency should stop at a point where the marginal net revenue is still positive. Another way of selecting returns is based on the level of reported income. Reinganum & Wilde (1985) showed that it would pay the tax agency to announce some cut-off income, such that every taxpayer declaring an income lower than the cut-off level is audited and every taxpayer declaring an income higher than the cut-off level is not audited. Such an auditing scheme induces taxpayers whose income is lower than the cut-off level to declare their income truthfully and leads taxpayers whose income is higher than the cut-off level to declare at least the cut-off income. However, such a scheme might also induce taxpayers of the former group to avoid filing a return altogether rather than declaring the true income. The taxpayer will then become a "ghost" of whom the tax agency knows nothing about. This latter implication of the cut-off scheme has not been examined in the literature.
Recently, Yaniv (2003) has shed some light on an important aspect of the audit decision that has not been addressed before in the tax evasion literature. Very often, the tax authority initiates an audit on the basis of signals of prosperous living (e.g., villas, yachts, latest-model cars). Such signals, known in the literature as “conspicuous consumption” [e.g., Veblen (1899), Basmann, Molina & Slottje (1988), Bagwell & Bernheim (1996)], are likely to draw the attention of the tax agency which may suspect that the purchase of a highly-priced asset has been the consequence of tax evasion. This requires the skillful evader to carefully consider his expenditures on observable consumption. In this work, I follow Yaniv in developing a joint evasion-consumption decision model that allows for this consideration. However, contrary to Yaniv, who assumes that the amount evaded by the conspicuous consumer is exogenously fixed, I allow the consumer to determine his desired level of evasion. Consequently, the amount evaded becomes dependent on the parameters of the model, and in particular, on the price of the conspicuous good. The latter parameter, which is quite latent in Yaniv's model, plays a crucial role in determining the audit policy of the tax agency in my model.

While signal auditing has the advantage of focusing on the population that is more likely to evade taxes, it also has its weakness, as a sufficiently high price of the conspicuous good might induce evaders to shelter their evasion through avoiding signaling altogether. The present paper analyzes the tax evader's and tax agency's optimal strategies under signal auditing, showing that the tax agency can prevent tax evaders from evading the signal by sufficiently lowering the audit intensity. Contrary to intuition, the tax agency need not promote the removal of a luxury tax or the provision of a luxury subsidy in order to induce signaling. As shown in this paper, taxing the conspicuous good would always increase total tax revenue (i.e., from both income and luxury taxes) despite a possible fall in the revenue from income taxes.
II. The model

Consider an economy where individuals may evade taxes and spend their net income on conspicuous consumption, $S$, and non-conspicuous consumption, $C$. Suppose that conspicuous consumption takes the form of a single good (e.g., a villa, a yacht, a latest-model car), hence $S$ can only obtain the values of 1 or 0. Suppose further that individuals in the economy are divided between two groups: conspicuous consumers, who would purchase the conspicuous good if they find it worth their while, and non-conspicuous consumers who would never consider purchasing the conspicuous good. While consumers in the former group may also opt to evade their taxes, consumers in the latter group always pay their taxes truthfully.

Consider now a conspicuous consumer whose annual income, $Y$, is subject to a constant tax rate, $\theta$. Suppose that the consumer considers the possibility of declaring to the tax agency an income, $X$, which is less than his true income. Underreporting his true income exposes the consumer to two possible events (“states of the world”): he may either get caught (state $+$) or he may not (state $-$). If he is not caught, his net income, $I^+$, will be

$$I^+ = 1 - \theta X,$$  \hspace{1cm} (1)

where, for simplicity, $Y$ is normalized to unity. However, if the consumer is caught, he will be obliged to pay the entire taxes due on his actual income as well as a penalty in proportion $\lambda$ ($> 0$) to the evaded tax, $\theta(1-X)$. His net income, $I^-$, will therefore be

$$I^- = 1 - \theta \left[1 + \lambda \left(1 - X\right)\right] = 1 - \theta \left[X + f(1 - X)\right]$$  \hspace{1cm} (2)

where $f \equiv 1 + \lambda$.

Suppose now that the consumer’s utility function is defined on both types of consumption, so that $U = U(C, S)$, where $C$ represents expenditures on non-
conspicuous consumption. Suppose further that the utility function is continuous and twice differentiable in $C$, increasing with $C$ at decreasing marginal rates, hence $U_C(C, S) > 0$ and $U_{CC}(C, S) < 0$. Finally, suppose that all conspicuous consumers in the economy are identical (i.e., having the same utility function, the same level of income, and purchasing the same conspicuous good) and that the tax agency announces that rather than blindly auditing a fraction of all consumers in the economy, it will audit a fraction $\pi$ of conspicuous consumers only. Hence, if the consumer does not purchase the conspicuous good he is never audited, whereas if he purchases the conspicuous good he will face a probability $\pi$ of being audited.

The consumer must now decide whether and to what extent to underreport his true income [i.e., select $X^* (\leq 1)$] as well as whether or not to purchase the conspicuous good [i.e., select $S^* \in (1, 0)$]. Suppose that the consumer chooses $X^*$ and $S^*$ so as maximize the expected utility of his prospect. His problem can be formally stated as

\[
\begin{align*}
\text{Max } & EU(C, S) = (1-\lambda)U(C^+, S) + \lambda U(C^-, S) \\
\text{s.t.} & C^+ = I^+ - pS = 1 - \theta X - pS \\
& C^- = I^- - pS = 1 - \theta [X + f(1-X)] - pS ,
\end{align*}
\]

where $p$ is the price of the conspicuous good and $0 \leq X \leq 1$, $S \in (1, 0)$, $\lambda = \pi S$. Notice that if the consumer purchases the conspicuous good, underreports his true income and gets caught, the penalty is assumed to affect his non-conspicuous consumption only.

**III. The consumer's problem**

The consumer first finds $X^*$ that maximizes his expected utility for $S = 0$ and $S = 1$. Then he selects $S^*$ for which the maximum value of his expected utility is the highest.
(a) **Optimal declaration for \( S = 0 \)**

In this case, the consumer’s problem reduces to

\[
\max_x \quad EU(C, 0) = U(C^+, 0) \tag{6}
\]

s.t.: \[ C^+ = I^+ = 1 - \theta X \tag{7} \]

It is immediately clear that \( U(C^+, 0) \) is maximized when \( C^+ \) is maximized. This will happen when \( X \) is minimized. Hence \( X^* = 0 \) and \( EU = U(1, 0) \). The consumer evades his entire taxes due because not purchasing the conspicuous good protects him from being audited. We will hereafter refer to this solution as “sheltering”.

(b) **Optimal declaration for \( S = 1 \)**

In this case, the consumer’s problem becomes

\[
\max_x \quad EU(C, 1) = (1 - \pi)U(C^+, 1) + \pi U(C^-, 1) \tag{8}
\]

s.t.: \[ C^+ = I^+ - p = 1 - \theta X - p \tag{9} \]

\[ C^- = I^- - p = 1 - \theta [X + f(1 - X)] - p \tag{10} \]

The first-order condition for the maximization of expected utility is

\[
\frac{\partial}{\partial X} [EU(C, 1)] = \theta [-(1 - \pi)U_c(C^+, 1) + (f - 1)\pi U_c(C^-, 1)] = 0 \tag{11}
\]

whereas the second-order condition

\[
\frac{\partial^2}{\partial X^2} [EU(C, 1)] = \theta^2 [(1 - \pi)U_{cc}(C^+, 1) + (f - 1)^2 \pi U_{cc}(C^-, 1)] < 0 \tag{12}
\]

holds under the concavity assumption on the utility function \( U_{cc} < 0 \).

Notice now that a solution to equation (11) may obtain at either \( X^* < 1 \) or \( X^* = 1 \). In
the former case the consumer will evade taxes, taking into account that purchasing
the conspicuous good might attract the attention of the tax agency. We will hereafter
refer to this solution as “signaling”. A sufficient requirement for signaling is

\[
\frac{\partial \left[ EU(C, 1) \right]}{\partial X} \bigg|_{X=1} = \theta \left[ - (1 - \pi) + (f - 1)\pi \right] U_C(C, 1) < 0, \tag{13}
\]

which reduces to \( \pi < 1/ f \). This implies that the expected profit per evaded dollar
should be positive in order for signaling to take place. Notice that the expected return
per evaded dollar is \((1-\pi)\theta\), whereas the expected cost is \(\pi f - 1\). The expected
profit per evaded dollar is therefore \((1-\pi)\theta - \pi f = \theta (1-\pi f)\), which is positive
for \(\pi < 1/ f\). It immediately follows that the consumer will fully comply with the tax
law if \(\pi \geq 1/ f\). Expected utility would then reduce to \(EU = U(1 - \theta - p, 1)\). We will
hereafter refer to this solution as “complying”.

Figure 1 describes the consumer’s solution graphically. The opportunity boundary
reflects all possible combinations of \(C^+\) and \(C^-\) resulting from various levels of
underreporting. At point \(X=1\), the consumer declares his true income and
\(C^+ = C^- = 1 - \theta - p\). At point \(X=0\), the consumer declares zero income thus \(C^+ = 1 - p\)
and \(C^- = 1 - \theta f - p\). Underreporting an additional dollar increases \(C^+\) by \(\theta\) dollars and
decreases \(C^-\) by \(\theta (f - 1)\) dollars, hence the slope of the opportunity boundary is
\(1/(1 - f)\). The slope of an indifference curve, which holds expected utility constant, is
\(\pi U_C(C^+, 1) / (1-\pi) U_C(C^-, 1)\). At equilibrium, the slope of the opportunity boundary
equals that of an indifference curve, resulting in condition (11). An interior solution
\((X^* < 1)\) requires that the slope of the indifference curve passing through the point
\(X = 1\) be less than the slope of the opportunity boundary. Because \(C^+ = C^-\) at \(X = 1\),
the slope of the indifference curve at this point reduces to \(\pi / (1 - \pi)\). This should be
less than \(1 / (f - 1)\) in order for the consumer to engage in signaling, which yields the
entry condition \(\pi < 1/ f\).
(c) The choice of $S$

We have identified three possible solutions for the consumer’s problem:

1. Sheltering: $S = 0; X^* = 0; EU = U(1, 0)$.
2. Complying: $S = 1; X^* = 1; EU = U(1 - \theta - p, 1)$.
3. Signaling: $S = 1; X^* < 1; EU = (1 - \pi)(U(C^+, 1) + \pi U(C^-, 1))$.

We have also found that signaling would be preferable to complying if $\pi < 1/f$, whereas complying would be preferable to signaling if $\pi \geq 1/f$. How does sheltering compare with each one of these two solutions?

Compare first sheltering with complying. Suppose that if $p = 0$ the consumer will purchase the conspicuous good, hence $U(1 - \theta, 1) > U(1, 0)$. Suppose also that if $p = 1 - \theta$, so that purchasing the conspicuous good would leave him nothing to spend on regular consumption, the consumer would avoid purchasing, hence $U(0, 1) < U(1, 0)$. It thus follows that there exists $\hat{p}$ such that $U(1 - \theta - \hat{p}, 1) = U(1, 0)$. Consequently, if $p < \hat{p}$, complying will be preferable to sheltering, whereas if $p > \hat{p}$, sheltering will be preferable to complying.

Compare now sheltering with signaling, and define

$$\hat{\pi} = \frac{U(C^+, 1) - U(1, 0)}{U(C^+, 1) - U(C^-, 1)}$$

(14)

as the probability of audit that equates the expected utility in case of signaling (evaluated at $X^*$) with the certain utility in case of sheltering. It is easily seen that if $\pi < \hat{\pi}$, signaling will be preferable to sheltering, whereas if $\pi > \hat{\pi}$, sheltering will be preferable to signaling. Notice, however, that $\hat{\pi}$ varies with $p$. 
Figure 1

\[ p - q = (C - X) \]

\[ p - q + (C_0 - X_1) = (X = 0) \]

\[ p(1 - X^*) - q(1 - f - 1) = \frac{1}{f - 1} \]

\[ (X = 1) \]
Totally differentiating $\hat{\pi}$ with respect to $p$ (using the Envelope Theorem) yields

$$
\frac{\partial \hat{\pi}}{\partial p} = -\frac{EU_C(C, 1)}{U(C^+, 1) - U(C^-, 1)} < 0, \quad (15)
$$

hence $\hat{\pi}$ falls as $p$ increases.

Figure 2 provides a graphical illustration of the solutions to the consumer’s problem under alternative values of $\pi$ and $p$. Notice that $\hat{\pi} = 1/f$ when $p = \hat{p}$ (point A): because $\hat{p}$ is the price of the conspicuous good that equates the utility of sheltering with the utility of complying, and $1/f$ is the probability of audit that equates the utility of complying with the expected utility of signaling, it follows that at $p = \hat{p}$ and $\hat{\pi} = 1/f$, the utility of sheltering also equates the expected utility of signaling. Consequently, at point A the consumer is indifferent between complying, signaling, and, sheltering. Notice further that the negatively sloped $\hat{\pi}$ curve, which defines the borderline between signaling and sheltering, emerges from point A, but must not necessarily end exactly at $p = 1 - \theta f$, which is the ceiling that must be imposed on the price of the conspicuous good. This ceiling emerges from the assumption that in case of detection the consumer preserves the conspicuous good, therefore must pay the fine out of his remaining resources. Since the greatest possible fine is $\theta f$ (imposed in case that the consumer has evaded his entire income), it follows that the price of the conspicuous good cannot exceed $1 - \theta f$.

Figure 2 reveals that when the price of the conspicuous good is sufficiently low ($p < \hat{p}$), the consumer will always purchase it. The decision whether or not to evade taxes will then depend on the magnitude of the probability of audit alone. However, when the price of the conspicuous good is sufficiently high ($p > \hat{p}$), the consumer will purchase it only if the probability of audit is sufficiently low ($\pi < \hat{\pi}$). A sufficiently low probability will enable him to increase his net income through evasion, without taking too much risk, so as to meet the high price of the conspicuous good.
Figure 2

\[ p \leq X \]

\[ \hat{p} \]

Signaling
\( (S = 1 ; X < 1) \)

Sheltering
\( (S = 0 ; X = 0) \)

Complying
\( (S = 1 ; X = 1) \)
The higher the price of the conspicuous good, the lower the probability of audit required by the consumer in order to purchase the good. If the probability of audit is too high (\(\pi > \pi^*\)), the consumer will avoid purchasing the conspicuous good. As a compensation for his grief, he would be able to evade his entire tax liability, knowing that the tax agency has no interest in him.

IV. The tax agency’s problem

Having carefully studied the solution to the consumer's problem as illustrated in Figure 2, the tax agency must now determine its audit intensity, taking into account that the consumer responds optimally to its choice. Suppose that the tax agency cannot influence the income tax rate, \(\theta\), nor the penalty rate for tax evasion, \(\lambda\), which are set in the law. Suppose also, at this stage, that the tax agency cannot influence in any way the price of the conspicuous good, \(p\) (an assumption I relax in section V). Its sole objective is to select an audit intensity, \(\pi^*\), which maximizes the collection of tax revenue net of audit costs.

Tax revenue per consumer, \(R\), has two components: a certain component, \(\theta X^*\), which constitutes the amount of tax collected from the consumer at the time of declaration, and an expected component, \(\pi \theta f(1 - X^*)\), reflecting the amount of tax and penalties that will be collected from the consumer if he is caught evading taxes. That is

\[
R = \theta [X^* + \pi f(1 - X^*)]. \tag{16}
\]

Because the probability of getting caught, \(\pi\), is also the proportion of conspicuous consumers audited by the tax agency, the expected individual yield, \(R\), is also the average yield per consumer. This is the gross yield, however, since audits incur a cost. Suppose that audit costs depend on the audit intensity, \(\pi\), being, on average, \(c(\pi)\) per consumer, where \(c'(\pi) > 0\) and \(c''(\pi) = 0\).
The tax agency now seeks $\pi^*$ which maximizes the net tax revenue per consumer

$$NR = \theta \{ X(\pi, p) + \pi f [(1 - X(\pi, p))] - c(\pi) \}, \quad (17)$$

taking into account that its choice of $\pi$ affects the consumer's optimal level of declaration, $X^*$, which I henceforth denote by $X(\pi, p)$. While $X^*$ also depends on two additional parameters, $\theta$ and $\lambda$, they will be omitted, for simplicity, from the $X$-function, because, unlike $\pi$ and $p$, they do not play an active role in the present model.

Differentiating now (17) with respect to $\pi$ and equating to zero, the first-order condition for net revenue maximization is

$$\frac{\partial (NR)}{\partial \pi} = \theta [1 - \pi f] X_\pi + f (1 - X) - c'(\pi) = 0, \quad (18)$$

where $X_\pi$ denotes the partial derivative of $X(\pi, p)$ with respect to $\pi$. The second-order condition for the maximization of net revenue is

$$\frac{\partial^2 (NR)}{\partial \pi^2} = \theta [1 - \pi f] X_{\pi\pi} - 2 f X_\pi - c''(\pi) < 0, \quad (19)$$

where $X_{\pi\pi}$ denotes the second partial derivative of $X(\pi, p)$ with respect to $\pi$. Assuming that $X_{\pi\pi} \leq 0$, the second-order condition will hold.

Attempting to interpret the optimum condition (18), we first explore the sign of $X_\pi$. Totally differentiating the consumer's optimum condition (11) with respect to $X^*$ and $\pi$ reveals that

$$X_\pi = -\frac{\theta [U_c(C^+, l) + (f - 1)U_c(C^-, l)]}{\Delta} > 0, \quad (20)$$
where $\Delta < 0$ is the second-order condition for the maximization of expected utility (8). Hence, as intuitively expected, an increase in the audit intensity, which makes evasion less profitable at the margin, will unambiguously increase declaration. Consequently, as implied by the optimum condition (18), the tax agency will gain additional revenue of $\theta(1–\pi f)X\pi$ dollars (recall that $1–\pi f > 0$ if evasion takes place), where $\theta(1–\pi f)$, the expected profit to the consumer of evading a dollar, now reflects the expected yield to the tax agency of raising declaration by one dollar. In addition, the tax agency will gain $\theta/(1–X)$ dollars more on the previous level of undeclared income, due to the increase in the probability of getting caught. On the other hand, the tax agency will incur additional costs of $c'(\pi \pi)$. The optimal audit intensity for the tax agency is the one which equates the additional revenue with the additional cost.

Does the optimal audit intensity ensure that consumers of the conspicuous good fully comply with the tax law ($\pi^* = 1/f$) or does it allow for tax evasion ($\pi^* < 1/f$)? Inquiring into this question, suppose, for a moment, that the solution to (18) is obtained at $\pi^* = 1/f$. Substituting $1/f$ for $\pi$ in (18), as well as $X = 1$, the optimum condition reduces to $– \theta c'(1/f) = 0$, which contradicts the assumption of $c'(\pi) > 0$. Hence, as long as the audit cost increases in $\pi$, a solution to (18) can only be obtained at $\pi^* < 1/f$. In other words, it is optimal for the tax agency to halt its detection efforts at the point where evasion is still desirable for the consumer, rather than increasing its efforts so as to totally eliminate tax evasion. The rational for this result is quite simple: at the neighborhood of full-compliance, the marginal revenue from devoting more resources to auditing approaches zero, whereas the marginal cost continues to rise (Figure 3). Hence, the net marginal revenue at the vicinity of $\pi = 1/f$ is negative. However, the optimum solution for the tax agency is not unique, but varies with the price of the conspicuous good. A change in $p$ is likely to affect the optimal level of declaration for the consumer, $X(\pi, p)$, thus requiring an adjustment in the optimal audit intensity. Furthermore, sufficiently high values of $p$ might induce the consumer to prefer sheltering to signaling, hence an audit intensity which is optimal for a low value of $p$ might end up yielding zero return if the value of $p$ is higher.
Figure 3
Consider the former effect first. Totally differentiating the optimum condition (18) with respect to $\pi$ and $p$ yields

$$\frac{\partial \pi^*}{\partial p} = -\frac{\theta}{\Omega} \left[ (1-\pi f) X_{\pi p} - f X_p \right], \quad (21)$$

where $\Omega < 0$ denotes the second-order condition for the maximization of net revenue (19), $X_p$ denotes the derivative of $X(\pi, p)$ with respect to $p$, and $X_{\pi p}$ denotes the cross derivative of $X(\pi, p)$ with respect to $\pi$ and $p$.

How would the optimal audit intensity, $\pi^*$, change if the price of the conspicuous good changes? To answer this question we must first explore the signs of $X_\pi$ and $X_{\pi p}$. Totally differentiating the consumer's optimum condition (11) with respect to $X^*$ and $p$ yields (substituting the optimum condition)

$$X_p = -\frac{(1-\pi) U_x (C^+, 1) [h(C^-, 1) - h(C^+, 1)]}{\Delta}, \quad (22)$$

where $h(C, 1) \equiv -U_{CC}(C, 1) / U_C(C, 1) > 0$. It can easily be verified that $h(C^-, 1) > h(C^+, 1)$ if $r_A(I^-, 1) > r_A(I^+, 1)$, where $r_A(I, 1) \equiv -U_{II}(I, 1) / U_I(I, 1) > 0$ is the Arrow-Pratt absolute risk aversion measure. Hence, applying the common assumption of decreasing absolute risk aversion ensures that the sign of (22) is positive: an increase in $p$, which reduces both $C^+$ and $C^-$, would make the consumer less inclined to take risks, consequently increasing declaration.

Unfortunately, the sign of $X_{\pi p}$ is unclear. Still, if $X_{\pi p} \leq 0$, the sign of (21) will be unambiguously negative, implying that the marginal tax revenue falls with $p$ (Figure 3). Examining, for example, the sign of $X_{\pi p}$ for the logarithmic utility function, $U(C, S) = \ln C + S$, reveals that the optimal declaration level is $X^* = [(1-\pi)\theta f - (1-p)(1-\pi f)] / \theta(f-1)$. Consequently, $X_\pi = f(1-p-\theta) / \theta(f-1) > 0$. 

16
and indeed $X_{\pi p} = -f / \theta(f - 1) < 0$. However, one cannot exclude the possibility that for different utility functions $X_{\pi p}$ is positive. In this case, we may rewrite (21) as

$$\frac{\partial \pi^*}{\partial p} = -\frac{\theta(1 - \pi f) X_p}{\Omega \pi} \left[ \varepsilon_{X p, \pi} - \frac{\pi f}{1 - \pi f} \right], \quad (21')$$

where $\varepsilon_{X p, \pi} > 0$ is the cross elasticity of $X_p$ with respect to $\pi$. It thus follows that $\partial \pi^*/\partial p$ will be negative, positive, or zero, if $\varepsilon_{X p, \pi}$ is less than, greater than, or equal to $\pi f / (1 - \pi f)$, respectively.

Figure 4 illustrates the relationship between the optimal audit intensity, $\pi^*$, and the price of the conspicuous good, $p$, by the curve $\pi^*(p)$. Assuming henceforth that $\partial \pi^*/\partial p < 0$ (which is most likely the case), the curve $\pi^*(p)$ is negatively sloped. Notice that the $\pi^*(p)$ curve does not intersect the vertical axis, because given that $c'(0)$ is very small (i.e., approaches zero), the optimum condition (18) cannot be solved at $\pi^* = 0$, for which $X^* = 0$. Still, the $\pi^*(p)$ curve may or may not cross the $\pi$ boundary. In the latter case, the $\pi^*(p)$ curve will lie below the $\pi$ boundary for all values of $p$. The optimum audit intensity, for any value of $p$, would then be read from the $\pi^*(p)$ curve. However, given that the two curves do intersect, the segment of $\pi^*(p)$ which lies above the $\pi$ boundary will no longer be relevant for audit policy, as it penetrates the sheltering region where the tax revenue is zero. Denoting the intersection point by $\tilde{p}$, the tax agency would now find its optimum along the $\pi^*(p)$ curve only if $p \leq \tilde{p}$. For $p > \tilde{p}$, the best it can do is move along the $\pi$ boundary. The curve depicting the chosen audit intensity as a function of $p$ would now become the broken line CBD.

V. Taxing the conspicuous good

So far I have assumed that the tax agency cannot influence the price of the
Figure 4

$\pi^*(P)$

$\hat{\pi}$

$\hat{\pi}$

$\bar{p}$

$p$

$1 - \theta$

$\pi$

$\pi^*$

$\tilde{P}$

$\tilde{p}$

$1/f$

$C$

$D$

$A$

$B$

$S h e l t e r i n g$

$(S = 0; X = 0)$

$S i g n a l i n g$

$(S = 1; X < 1)$

$C o m p l y i n g$

$(S = 1; X = 1)$
conspicuous good. But what if the tax agency is in a position to initiate legislation that affects the price of the conspicuous good? Would it opt to raise the price (e.g., impose a luxury tax on the purchase of the good) or to reduce it (e.g., provide a luxury subsidy to the purchase of the good)? In other words, if the tax agency is indeed able to control the level of $p$, which level would best serve its interests?

Clearly, the answer to the latter question is “the level of $p$ for which net revenue is the highest along the CBD curve”. To find out how net revenue changes along the lower segment of the CBD curve, we may use the Envelope Theorem to partly differentiate the net revenue function (17) with respect to $p$, obtaining

$$
\frac{\partial (NR)}{\partial p} = \theta (1 - \pi f) X_p > 0, \quad (23)
$$

as $1 - \pi f > 0$ in the signaling region and $X_p > 0$. Notice that condition (23) would also emerge as a first-order condition for the maximization of net revenue if, alternatively, one treats $p$ as a second decision variable for the tax agency. It now follows that the higher the price of the conspicuous good (along the lower segment of the CBD curve), the greater the net revenue. This is so because a higher price increases the amount declared, and an additional dollar of declaration increases revenue by $1 - \pi f$ dollars. Consequently, if the market price of the conspicuous good is less than $\tilde{p}$, the tax agency’s best policy is to promote the imposition of a luxury tax, sufficient to boost the price of the conspicuous good up to $\tilde{p}$. Not only would this policy help collect more income taxes, it would also provide an additional source of revenue for the tax agency.

What happens to net revenue along the upper segment of the CBD curve, where the tax agency is halted by the $\tilde{\pi}$ boundary? As the price of the conspicuous good rises above $\tilde{p}$, the audit intensity falls by more than optimal. While the former effect acts to increase net revenue (for a given level of $\pi$), the latter effect acts to reduce it. Consequently, it is not possible to determine whether a given price above $\tilde{p}$ is inferior
or superior to \( \tilde{p} \). I thus conclude that if the tax agency is able to influence the price of the conspicuous good, its audit intensity should not exceed \( \pi^*(\tilde{p}) \), which is the point of intersection between the \( \pi^*(p) \) curve and the \( \pi^* \) boundary. Whether or not it pays the tax agency to further reduce the audit intensity below \( \pi^*(\tilde{p}) \) depends on the specific forms of the audit cost function and the individual’s utility function.

Consider a parametric example. Suppose that the utility function is linear in \( C \) and \( S \), given by \( U(C, S) = \alpha C + \beta S \), where \( \alpha > 0, \beta > 0 \). Suppose further that the penalty function is \( F = \theta(1-X)^2 \). The consumer’s problem is stated as

\[
\begin{align*}
\text{Max } & EU(C,1) = (1-\pi)\alpha C^* + \pi \alpha C^- + \beta \\
\text{s.t: } & C^* = 1 - \theta X - p \\
& C^- = 1 - \theta [1+(1-X)^2] - p .
\end{align*}
\]

(24)

The first- and second order conditions for the maximization of (24) are given by

\[
\begin{align*}
\frac{\partial}{\partial X}[EU(C,1)] &= \alpha \theta [- (1-\pi) + 2\pi (1-X)] = 0 \\
\frac{\partial^2}{\partial X^2}[EU(C,1)] &= -2\alpha \theta \pi < 0 .
\end{align*}
\]

(27)

(28)

The entry condition into tax evasion is

\[
\frac{\partial}{\partial X}[EU(C,1)] \bigg|_{X=1} = \alpha \theta [- (1-\pi)] < 0 ,
\]

(29)

which reduces to \( \pi < 1 \). Hence, tax evasion is always desirable. Rearranging (27) yields the optimum level of declaration

\[
X^* = \frac{3\pi -1}{2\pi} ,
\]

(30)

which is independent of \( p \) due to the linearity of the utility function. Clearly, \( X^* = 1 \) (honest declaration) only if \( \pi =1 \). Substituting (30) in (24) yields the maximum value
of the consumer’s expected utility in case of signaling. Equating this result with the utility derived from sheltering, \( E(1, 0) = \alpha \), the line separating between signaling and sheltering is given by

\[
\hat{p} = \frac{\beta}{\alpha} - \theta + \theta \frac{(1-\pi)^2}{4\pi}.
\]

Equation (31) is drawn in Figure 5. Notice that for \( \pi = 1 \), \( \hat{p} = \frac{\beta}{\alpha} - \theta \), and for \( \pi = 0 \), \( \hat{p} = \infty \). Consider now the tax agency’s problem. Suppose that audit costs are linear in \( \pi \), given by \( c\pi \), where \( c > 0 \). The tax agency’s net revenue per consumer will be

\[
NR = (1-\pi)\theta X + \pi \theta [1 + (1-X)^2] - c\pi,
\]

which, after substituting for \( X^* \), becomes

\[
NR = \theta \frac{6\pi - (1-\pi)^2}{4\pi} - c\pi.
\]

The first- and second-order condition for the maximization of (33) are given by

\[
\frac{\partial (NR)}{\partial \pi} = \theta \frac{1-\pi^2}{4\pi} - c = 0
\]

\[
\frac{\partial^2 (NR)}{\partial \pi^2} = -\frac{\theta}{2\pi^3} < 0.
\]

Rearranging (35) yields the optimal audit intensity

\[
\pi^* = \left( \frac{\theta}{\theta + 4c} \right)^{1/2}.
\]
which is independent of the price of the conspicuous good, \( p \). This is so because \( p \) may only appear in the net revenue function indirectly, through its influence on \( X^* \). Because \( X^* \) is independent of \( p \), so must also be the optimal audit intensity. Figure 5 depicts the \( \pi^*(p) \) curve as a vertical line which cuts the \( \hat{p} \) curve at \( \tilde{p} \). The broken curve CBD depicts the chosen audit intensity as a function of \( p \).

It is quite clear now that as the price of the conspicuous good increases along the \( \pi^*(p) \) line, the net revenue of the tax agency remains intact. Imposing a luxury tax at this segment of the CBD curve would thus yield additional revenue at no cost. But what about the upper segment of the CBD curve? Substituting (31) into (33) we have

\[
NR = \frac{\beta}{\alpha} - \hat{p} - c\pi(\hat{p}), \quad (37)
\]

which expresses the net revenue as a function of \( p \) along the upper segment of the CBD curve. Differentiating (37) with respect to \( p \) yields (using (31) to calculate \( p'(\pi) \))

\[
\frac{\partial (NR)}{\partial p} = -1 + c\pi'(p) = -1 + \frac{c}{p'(\pi)} = -1 + \frac{4c\pi^2}{\theta (1-\pi^2)} \quad (38)
\]

which is negative when \( \pi < \pi^* \), where \( \pi^* \) is given by (36). Hence, as \( p \) increases along the upper segment of the CBD curve, net revenue decreases. However, because the second term of (38) is positive, an increase of one dollar in the price of the conspicuous good would reduce net revenue by less than one dollar. It thus follows that imposing a luxury tax which increases the price of the good by one dollar (and usually requires a tax greater than one dollar) would raise the tax agency's total revenue (from both income and luxury taxes) at this segment as well, despite reducing the revenue from income taxes. We thus conclude that if the tax agency is able to control the price of the conspicuous good, it should raise it up to the highest price possible \((1-2\theta)\), and lower its audit intensity accordingly to the level determined by equation (31).
\[
\begin{align*}
\pi^*_s &= \left( \frac{\theta}{\theta + 4c} \right)^{1/2} \\
\hat{p} &= \frac{\beta}{\alpha} - \theta
\end{align*}
\]
VI. Conclusions

The present paper has examined several implications of tax auditing by signals of conspicuous consumption. Allowing the consumer to determine not only his desired level of tax evasion but also whether or not to purchase a conspicuous good, the paper first identifies three possible regions of choice for the consumer, depending on the levels of the audit intensity (which is the probability of getting caught) and the price of the conspicuous good: evading and purchasing ("signaling"), not evading and purchasing ("complying"), and evading and not purchasing ("sheltering"). The analysis reveals that when the price of the conspicuous good is sufficiently low, the consumer will always purchase it. The decision of whether or not to evade taxes will then depend on the magnitude of the audit intensity alone. However, when the price of the conspicuous good (which signals his spending capacity) is sufficiently high, the consumer will purchase it only if the audit intensity is sufficiently low. This will enable him to increase his net income through evasion, without taking too much risk, so as to meet the high price of the good. The higher the price, the lower the audit intensity required by the consumer in order to purchase it. If the audit intensity is too high, the consumer will avoid purchasing the conspicuous good, consequently evading his entire tax liability.

Being aware of the consumer's choices, the tax agency is assumed to select an audit intensity which maximizes its tax revenue (net of audit costs). The optimal audit intensity always allows for signaling, and, at relatively low prices of the conspicuous good, decreases as the price increases. Despite the fall in audit intensity, tax revenue rises with price, implying that the imposition of a luxury tax would unambiguously help raising more revenue. At sufficiently high prices, the consumer will face the temptation of not purchasing the conspicuous good, thereby evading the signal and sheltering the evasion of his entire taxes. To neutralize this urge, the tax agency must lower the audit intensity by more than would otherwise be optimal. Consequently, tax revenue may fall as the price rises. However, an example reveals that even if it does,
it falls by less than the increase in price. Consequently, the imposition of a luxury tax would still help raising more revenue.
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