Income Tax: Enforcement and Compliance

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Lecture 1

Basics I

Let

- y denote the income level of an individual
- e denote the income evaded/hidden from tax authority
- $y - e$ denote the income reported for tax purpose
- $\hat{e} = e/y$ be the proportion of income evaded;
- π_0 be the probability of the tax department taking up an individual's file for auditing/inspection, at $t = 1$.
- Conditional on the fact that the file is audited, there is a probability of the individual being caught for evasion and fined.
- Let this probability be $\pi_c(a, \hat{e})$.

Basics II

- $\pi_c(a, \hat{e})$ to be increasing in $\hat{e}$. Consider, e.g.,

$$\pi_c(a, \hat{e}) = \frac{a\hat{e}}{1 + \hat{e}}$$

- So overall probability of getting caught and fined is given by

$$\pi(\pi_0, a, \hat{e}) = \pi_0 \pi_c(a, \hat{e}) = \pi_0 \frac{a\hat{e}}{1 + \hat{e}}$$

where,

- a is professional Dis-advantage of the taxpayer, lying between 0 and 1 (higher a means lower advantage).

Exogeneous π_0 I

- Assume that π_0 is exogenous, and $f(e) = t\hat{e}$
- The Tax department randomly choses files for auditing.

Given the probabilistic structure, the taxpayer's expected payoff is given as:

$$y - t(y-e) - \frac{\pi_0 a\hat{e}}{1+\hat{e}}(t + f(e))e$$

$$= y - t(y - \hat{e}y) - \frac{\pi_0 a\hat{e}(t + t\hat{e})\hat{e}y}{1+\hat{e}}$$

So, OP is

$$\max_{\hat{e}}\{y - t(y - \hat{e}y) - \pi_0 a\hat{e}^2 yt\}$$

FOC:

$$ty - 2\pi_0 a\hat{e}ty = 0$$

Exogeneous π_0 II

SOC:

$$-2\pi_0 aty < 0$$

The second order condition is satisfied, so we have a maxima.

$$\hat{e}^* = \frac{1}{2(\pi_0 a)}$$

$$e^* = \frac{1}{2(\pi_0 a)} y$$

Equilibrium level of e^*

- Decreases in a, so people with lower a and hence greater advantage evade more.
- decreases in π_0, exogenous probability of audit.
- Increases in income y, high income individuals evade more.

Exogeneous π_0 III

Equilibrium probability of getting caught:

$$\pi^*(a,t,y,\pi_0) = \pi_0 \frac{a\hat{e}^*}{1+\hat{e}^*} = \pi_0 a \frac{\frac{1}{2(\pi_0 a)}}{1+\frac{1}{2(\pi_0 a)}} == \frac{\pi_0 a}{2\pi_0 a + 1}$$

- $\pi^*(a,t,y,\pi_0)$ does not vary with t or y
- Increases in a and π_0, lower advantage individuals are more likely to be caught.

The Government's revenue is given by: TR=

$$\begin{aligned} t(y-e^*) + \pi^*[t+f(e^*)]e^* &= ty(1-\hat{e}^*) + \pi^*(1+\hat{e}^*)ty\hat{e}^* \\ &= ty[(1-\hat{e}^*) + \pi^*(1+\hat{e}^*)\hat{e}^*] \end{aligned}$$

Government's revenue increases in t and y.

Exogeneous π_0 with cost of evasion I

Now, we assume that

- Evasion activity requires efforts.
- So, there is an effort cost of evading income, in addition to the expected fine.
- Let this cost be

$$C(a, \hat{e}) = aC(\hat{e}^2)$$

Now, the taxpayer‘s problem is to maximize:

$$y - t(y - e) - \frac{\pi_0 a\hat{e}}{1+\hat{e}}(t + f(e))e - C(a, \hat{e})$$

$$= y - t(y - \hat{e}y) - \frac{\pi_0 a\hat{e}(t + t\hat{e})\hat{e}y}{1+\hat{e}} - ac\hat{e}^2$$

$$\max_{\hat{e}}\{y - t(y - \hat{e}y) - \pi_0 a\hat{e}^2 ty - ac\hat{e}^2\}$$

Exogeneous π_0 with cost of evasion II

The FOC is given by

$$ty - 2\pi_0 a\hat{e}ty - 2ac\hat{e} = 0$$

SOC: $-2\pi_0 aty - 2ac < 0$.

$$\hat{e}^* = \frac{ty}{2(\pi_0 aty + ac)}$$

The equilibrium level of $\hat{e}$

- increases in t and y, i.e., high income individuals evade more.
- decreases in a, so people with lower a and hence greater advantage evade more.
- decreases in π_0, exogenous probability of audit.
- decreases in C, which is the cost parameter in the cost of evasion function.

Exogeneous π_0 with cost of evasion III

Equilibrium level of probability:

$$\pi^* = \pi_0 a \frac{\frac{ty}{2(\pi_0 aty + ac)}}{1 + \frac{ty}{2(\pi_0 aty + ac)}} = \frac{\pi_0 aty}{2\pi_0 aty + 2ac + ty} = \frac{\pi_0 aty}{(2\pi_0 a + 1)ty + 2ac}$$

- increases in t and y, i.e., high income individuals have a higher overall probability of being caught ex-post.
- Increases in a, lower advantage individuals are more likely to be caught.

Government's Revenue

$$ty[(1 - \hat{e}^*) + \pi^*(1 + \hat{e}^*)\hat{e}^*]$$

Edogeneous π_0 without cost of evasion I

Assume

- π_0 is the probability of the tax department taking up an individual‘s file for audit which is a function of reported income.
- The tax authority on the other hand observes only $y - e$.

Let,

$$\pi_0 = \frac{y - e}{K}$$

where, K is a large enough constant. The conditional probability is,

$$\pi_c(a, \hat{e}) = \frac{a\hat{e}}{1 - \hat{e}}; \text{ for } \hat{e} < \hat{e}_u = \frac{1}{1 + a}$$

$$\pi_c(a, \hat{e}) = 1; \hat{e} \geq \hat{e}_u$$

$$1 = \frac{a\hat{e}_u}{1 - \hat{e}_u} \ i.e., \ \hat{e}_u = \frac{1}{1 + a}$$

Edogeneous π_0 without cost of evasion II

Thus the overall probability of being caught is,

$$\pi(a,e,y) = (\frac{y-e}{K})(\frac{a\hat{e}}{1-\hat{e}}) = \frac{ay\hat{e}}{K} = \frac{ae}{K}; \hat{e} < \hat{e}_u$$

$$\pi(a,e,y) = \frac{y-e}{K}; \hat{e}_u \leq \hat{e} < 1$$

$$\pi(a,e,y) = 0; \hat{e} = 1$$

When $\hat{e}$ is less than $\hat{e}_u$
In this case, the taxpayer?s Expected payoff can be given as :

$$y - t(y-e) - \frac{ae(t+f)e}{K} = y - t(y-e) - \frac{ae^2(t+f)}{K}$$

Taxpayer maximises his expected income with respect to his evasion choice e.

Edogeneous π_0 without cost of evasion III

FOC:

$$t - \frac{2(t+f)ae}{K} = 0$$

SOC: $-\frac{2(t+f)a}{K} < 0$. This gives us equilibrium level of evasion as,

$$e^* = \frac{Kt}{2a(t+f)}, i.e., \ \hat{e}^* = \frac{Kt}{2a(t+f)}y$$

Clearly, $\hat{e}^*$ should be less than $\hat{e}_u$, i.e.,

$$\frac{Kt}{2a(t+f)} < \frac{1}{1+a}$$

This means, we need

$$a > \frac{Kt}{2y(t+f) - Kt}$$

Edogeneous π_0 without cost of evasion IV

RHS is clearly less than 0, because K is assumed large enough to make the denominator negative. Hence, our parametric condition is trivially satisfied.

The equilibrium level of *e*

- increases in t.
- decreases in f due to expected enhanced compliance
- decreases in a (That is, it is greater for people with greater natural advantage)
- constant across individuals