Informal Sector and Taxation

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Abstract: In this paper, we present a model of tax evasion in the presence of imperfect auditing. We show that there is a clear link between the degree of observability associated with a given taxpayer or activity and that taxpayer's optimal declaration strategy with respect to fiscal agency. We also show that the degree of observability is critical in determining the optimal policies to be followed by the fiscal authorities. Our imperfect monitoring approach provides a new strategy for understanding the informal sector in LDCs, which can be interpreted as that group of economic activities characterized by low observability.

JEL Classification : D26,O17

1. Introduction

The seminal paper on tax evasion is due to Allingham and Sandmo (1972), who examine comparative statics of tax evasion with respect to change in the tax rate, the penalties for evasion and the frequency of audit. The idea that a taxpayer may be tempted to report taxable income below its true value was later extended by Kolm (1973), Srinivasan (1973) and Cowell (1985) among others[1].One limitation of the approach of these authors was that the tax rate, as well as the penalty for evasion and the frequency of audit, were taken to be exogenous.

More recently , the strategic interaction between fiscal authorities and the economic agents being taxed have been the focus of analysis , and game theoretic arguments or Principal Agent models have bee invoked in order to characterize the optimal taxation mechanisms available to government authorities (see Townsend, 1979, Border and Sobel, 1987,Greenberg, 1984, Reinganum and Wilde,1985).Even more recently, the theory of hierarchic collusion developed by Tirole (1986, 1992) has been used in an effort to better capture complex relationships between governments, fiscal agencies and taxpayers. Chander and Wilde (1990) for example , show that potential corruption of fiscal agencies by taxpayers leads to higher audit rate than when such a issue is absent . Flatters and McLeod (1995) find that a certain degree of tolerance for collusion can be an efficient scheme given the resources constraint faced by the government . Finally, Besley and McLaren (1993) consider wage incentives designed to thwart bureaucratic collusion, and show that the efficiency wage may not be an appropriate choice.

One limitation remains in these studies of this strand of literature on tax evasion is that they all assume that auditing is perfect, that is that once the audit is carried out, there is perfect certainty regarding the income of audited taxpayers , and this despite the fact that the structure of taxation is largely a function of the information obtained regarding non-observable variables (see,e.g. Cowell (1990, p.38).

The main aim of this paper is to provide an explanation of differences in taxation structures by stressing the role of the observability in the context of a simple model of tax

[1] For a comprehensive survey on tax evasion and implications for policy analysis ,see Slemrod and Yitzhaki (2001).

evasion. Mainly, one corollary of our approach is a new approach to modelling the informal sector, especially in LDCs: in our information theoretic construct the informal sector may be construed to be those activities for which the degree of observability is very low.

The paper is organized as follows: in section 2 we present a simple model of tax evasion with imperfect auditing and the optimal fiscal policy; in section 3 we offer concluding comments.

2. The Model

Consider a population of taxpayers characterized by their revenue y. Fiscal authorities can not costlessly observe his revenue, but they know the cumulative density of revenue $G(y)$, and the associated probability density $G'(y) = g(y)$, where $y \in Y = [y_o, \bar{y}]$. Upon learning her type, the gent declares a revenue x to the fiscal authorities. If $x \leq y$, then $(y - x)$ is the magnitude of this individual's tax evasion. Imperfect auditing by the fiscal authorities is modelled in the following manner. Assume that agency spends $c > 0$ in order to audit a given individual once. Then the agency will observe $y \in Y = [y_o, \bar{y}]$ with a probability : $p(\zeta) = \zeta q$, where $q \in [0,1]$ is the frequency of auditing and $\zeta \in [0,1]$ parametrizes the efficiency of the audit. In other words , $\zeta \in [0,1]$ parametrizes the degree of observability of the individual's type in question once the audit is undertaken. This parameter can be though of as being a function of the sector or type of activity to which the individual undergoing auditing belongs. In particular, it can be interpreted as a measure of the formality of the sector in which the individual works, particularly in the case of LDCs, where informal sector activity , widely defined, is pervasive.

Suppose that individuals are risk neutral and that there is no advantage to overestimating one's revenue. Then an individual's expected after tax revenue is given by :

$$U(y,x) = (1-q)(y - \tau x) + q(1-\zeta)(y - \tau x) + q\zeta(y - \tau x - f(y - x)) \qquad (1)$$

where τx is the amount of taxes paid when no audit obtains or when the audit fails, whrere :

$0 \leq \tau \leq 1$ because taxation is proportional to declared revenue , and where $f(y-x)$ is the fine paid in the case of a successful audit. We assume that the penalty rate f i s such that : $0 \leq f \leq 1$.

Given the fiscal policy $\langle \tau, q, f \rangle$, the taxpayer chooses an optimal declaration. Given informational constraint, the fiscal authority chooses its policy $\langle \tau, q, f \rangle$ so as to maximize its expected net fiscal revenue. Its maximization program is therefore:

$$\underset{\tau,q,f}{Max} \quad R = \int_Y [(1-q)(\tau x) + q(1-\zeta)\tau x + q\zeta(\tau x + f(y-x))] dG(y) - cq$$

st: i) $0 \leq \tau \leq 1$

ii) $0 \leq q \leq 1$

iii) $\tau \leq f \leq F$

iv) $x = Arg \underset{d \leq y}{Max} U(y,d)$

Where constraint (iii) involves the lower and upper bounds on the penalty rate : $\tau \leq f \leq F$, and where $F \leq 1$. Constraint (iv), on the other hand, represents the incentives compatibility constraint which takes into account optimal behavior on the part of the taxpayer; We are now ready to state our first result.

Proposition 1:

Given the policy $\langle \tau, q, f \rangle$, the optimal declaration by the taxpayer is given by :

i) $x = 0$ if $\zeta < \dfrac{\tau}{qf}$

ii) $x = y$ if $\zeta \geq \dfrac{\tau}{qf}$

Proof:

The optimization problem faced by the agent is given by the choice of a tax declaration which solves:

$$\underset{d}{Max} U(y,d) = (1-q)(y - \tau d) + q(1-\zeta)(y - \tau d) + q\zeta(y - \tau d - f(y-d))$$

whence the first order condition is:

$$\frac{\partial U(y,d)}{\partial d} = -\tau + q\zeta f \Rightarrow$$
$$x = 0 \Leftrightarrow \zeta qf < \tau, x = y \Leftrightarrow \zeta qf \geq \tau$$

(Q.E.D)

Proposition 1 reveals that there exists a threshold level of observabiility parametrized by $\zeta \in [0,1]$above which taxpayers are induced to reveal their true revenue. Consequently, there will exist individuals or sectors of the economy, for which observability is low , that will not declare any revenue. One possible interpretation of sectors which corresponds to proposition 1 ,is that they constitute the informal sector, which is typically large in LDCs[21]. The following proposition , gives the optimal fiscal policy of the government.

Proposition 2:

$\exists \zeta^o \in [0,1]$ such that the optimal fiscal policy is given by :

$$\forall \zeta < \zeta^o, q^* = 0$$
$$\forall \zeta = \zeta^o, 0 < q^* < 1, f^* = F, and\ \tau^* = q^* \zeta F$$
$$\forall \zeta > \zeta^o, q^* = 1, f^* = F, and \quad \tau^* = \zeta F$$

Proof:

Proposition 1 derives the optimal behavior of the taxpayer , leads us to reformulate the optimization problem faced by the fiscal agency i the following manner:

$$\underset{\tau,q,f}{Max}\, R^+ = q\zeta f E(y) - cq$$

[2] On the informal sector in LDCs, see Rauch (1991) and the references cited therein.

$$(PA^{+}):\ \text{st:}\ \begin{array}{l} \tau > q\zeta f \\ 0 \le \tau \le 1 \\ 0 \le q \le 1 \\ \tau \le f \le F \end{array}$$

where $E(y) = \int_{Y} y dG(y)$

$$\underset{\tau,q,f}{Max}\, R^{-} = \tau E(y) - cq$$

$$(PA^{-}):\ \begin{array}{l} \tau \le q\zeta f \\ 0 \le \tau \le 1 \\ 0 \le q \le 1 \\ \tau \le f \le F \end{array}$$

First, note that $f = F$ is optimal since it induces a truthful report . In (PA^{-}):

$\frac{\partial R^{-}}{\partial \tau} = E(y) > 0 \Rightarrow \tau = q\zeta f$, whence

$\underset{q}{Max}\, R^{-}(q) = (q\zeta F)E(y) - cq$. Moreover, if :

$\zeta > \zeta^{o} = \frac{c}{E(y)F}$, then $q^{*} = 1$, which implies that : $\tau = \zeta F \ \ \forall \zeta < \zeta^{o}$, on other hand , $q^{*} = 0$. Finally, for $\zeta = \zeta^{o} = \frac{c}{E(y)F} \Rightarrow q^{*} \in]0,1[$ and $\tau = q^{*}\zeta F$.

(Q.E.D).

Proposition 2 states that the optimal policy depends not only on average revenue and on the cost of auditing, but also on the type of economic activity under consideration, parametrized by its degree of observability $\zeta \in [0,1]$. The first part of the proposition implies that it will never be in the interest of the fiscal authorities to audit individuals in the informal sector, where ζ is relatively low. Moreover, the last two parts of the proposition show that, in case of audit, the level of taxation depends upon the degree of observability associated with the sector in question. This provides a potential explanation for the heterogeneous taxation

rates observed across countries (Dudley and Montmarquette, 1987), or across sectors within a given country (Virmani,1988). Thus, the imperfect monitoring issue and observability may lie at the base of the differential choice between direct and indirect taxes (Cowell,1990).

3. Conclusion

In this paper, we have presented a simple model of tax evasion in the presence of imperfect auditing. Our results have shown that there is clear link between the degree of observability associated with a given taxpayer or activity and that taxpayer's optimal declaration strategy with respect to fiscal authorities. We have also shown that the degree of observability is critical in determining the optimal policies to be followed by the fiscal agency.

Our information theoretic approach based on imperfect auditing potentially provides a new approach to modelling the informal sector in LDCs. In the model of the informal sector developed by Rauch (1991), an argument based on Lucas's (1978) model of the equilibrium size-distribution of firms is used in order to establish a cutoff value in the distribution of entrepreneurial talent below which individual choose to operate in the informal sector, often defined to be that sector of the economy where firms engage in tax evasion. While it may be the case that in some LDCs informal sector entrepreneurs are of lower productivity than those operating in the formal sector, this does not appear to us to be an empirical regularity which is true at all times and in all places. Indeed, in many LDCs , it is widely believed that it is informal sector entrepreneurs who are more productive. Moreover, it i soften the case that in the formal sector in LDCs is dominated by state owned entreprises (SOEs) where managers are chosen not because of their high productivity but rather as the outcome of rent seeking activities. Our approach, based as it is upon the observability to fiscal agency of the sector in question, this provides an additional explanation of informal sector activity in LDCs.

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