Tax evasion and Altruism

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Abstract

This study builds on the Allingham and Sandmo (1972) model of income tax evasion but departs from the existing literature by assuming altruistic preferences. In this paper, we build a model that captures the relationship between tax evasion and altruism. We find that altruism may either control the evasive tendencies among tax payers or may instigate the same. The nature of the outcome depends on the interrelationship between altruism, the audit probability and the penalty rate. An attempt has been made to question the efficacy of an external punishment by bringing in the insights from behavioral economics. We also extend our study to address the trade-off between tax evasion and tax avoidance and show how the associated moral costs significantly influence an individual tax payer's decisions pertaining to both the tax evasion as well as avoidance.

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Introduction:

The question of why people evade taxes has drawn attention of both the academicians and policy makers alike. Since Allingham and Sandmo (1972) and Srinivasan (1973) most of the studies focused on analyzing the impact of 'economic' or 'pecuniary' factors on the tax compliance decision of the tax-payers. There is a plethora of studies that have investigated the relationship between tax compliance and audit probabilities (Spicer and Thomas, 1982; Friedland 1982), imposition of penalty or fines (Fischer et. al. 1992), incremental changes in tax rates (Pommerehne & Weck-Hannemann, 1996; Baldry ,1987), Subjective knowledge on taxation (Clotfelter, 1983), 'attitudes towards taxes' (Trivedi, Shehata, & Mestelman, 2004) etc. The need to depart from this kind of a framework in order to consider several 'non-pecuniary' factors while analyzing the facets of tax evasion behaviour arose due to a mismatch between the theoretical predictions of the traditional models and their empirical results. The predictions of Allingham and Sandmo (1972) and Yitzhaki (1974) were challenged by several studies (Alm, McClelland, & Schulze, 1992; Crane and Nourzad, 1986; Poterba 1987) when they found out that despite having low audit probability and small penalties the taxpayers' compliance was much higher in reality as compared to the predictions of these standard models. This seemingly puzzling observation, coupled with the emergence of behavioural economics, created new pathways to tread on. Most of the behavioural economics models not only introduced new concepts like 'hyperbolic discounting' (Chorvat, 2007), 'prospect theory' (Yaniv, 1999) to analyze compliance behaviour but also highlighted the importance of framing of tax (Copeland and Cuccia, 2002), tax ethics (Baldry 1987), social norms (Sigala, Burgoyne and webley, 1999) etc. to analyze the same.

In the similar veins, Alm and Torgler (2011) have stressed upon the ethical dimensions and postulated the fact that "…Individuals may have personal moral rules, they may incur psychic costs for not paying taxes and free-riding on the tax payments of others, or they may feel good about themselves for being virtuous and paying taxes."[4] The field experiments conducted by both Schwartz and Orleans (1967) and Blumenthal, Christian, and Slemrod (2001) found a strong relationship between moral appeals and the tax fillings of individuals, whereas the study by

[4] Gordon (1989) is one of the first economists who brought the 'reputation costs' into the theoretical model and showed that honesty has a major role to play in curbing the act of evasion.

McGraw and Scholz (1991) found no significant relation between the two. The discussion on the relationship between moral emotions like 'altruism' and the compliance behaviour surfaced in the literatures of Bergstrom, Blume, and Varian (1986) and Warr (1982), the results of which were later challenged by Andreoni (1990) who coined the term 'warm-glow' while analyzing the partial crowding out theory of private contributions. Despite this, the question of whether such moral emotions have any significant influence over the compliance decisions or upon any of its determinants has largely been unanswered.[5]

Our paper builds on the Allingham and Sandmo (1972) model but departs from it by assuming altruistic preferences. We show that an increase in the degree of altruism may conditionally reduce the need for penalty. However, external punishment can't reduce evasion unambiguously and will eventually crowd out the intrinsic motivation. Altruism might induce the tax payer to pay less tax. In order to address the evasion-avoidance trade-off, we extend our model further and show that the associated moral costs influence the compliance decisions of the tax payer.

The model

We build on the model developed by Allingham and Sadmo (1972) by incorporating two distinctive features namely (a) a unique parameter that captures altruistic preference and (b) segregation of benefits, derived from the government's welfare expenditure, which are accrued to the agent and others.

Let us assume N tax-payers each of whom contributes equal amount as tax payment. An individual tax-payer can report a part or all of the total income to authorities. The act of declaring less might be detected with exogenously determined probability[6], in which case a penalty rate[7] (higher than the existing tax rate) will be levied on the amount evaded.

The decision maker maximizes expected utility given by:

[5] The possible exception will be the study done by Christian and Alm (2014), where they tried to investigate the relationship between 'empathy',' sympathy' and tax compliance behaviour of taxpayers.

[6] This can also be termed as the 'Random audit rule.' But, the literature on tax evasion discusses several other rules such as 'Cutoff Rule', 'Conditional Future Audit Rule', 'Conditional Back Audit Rule' etc. where the audit probabilities were considered as endogenous. For a discussion on these rules refer to Alm et al. (1993).

[7] The main purpose of our model is to investigate the altruism-evasion nexus. As a result, we stick to the Random audit rule instead of considering the audit probability to be endogenous.

$$E(U) = (1-p)[U(W-(1-m).\theta \sum_{i=1}^{N} X_i) + \alpha.V((1-m).\theta \sum_{i=1}^{N} X_i)] + p\,[U(W - (1-m).(\theta \sum_{i=1}^{N} X_i + \pi.(W-X_i)) + \alpha.V((1-m).(\theta \sum_{i=1}^{N} X_i + \pi.(W-X_i))$$

Where $\alpha > 0$ $\quad Eq\ (1)$

Where, W, $\sum_{i=1}^{N} X_i$, p, $\theta, \pi, \alpha,$ and m refer to the total income of the individual, sum of the declared incomes, probability of getting caught, existing tax rate, penalty rate, altruistic parameter and proportion of the welfare expenditure[8] received by the individual respectively. We normalize the aggregate population to unity, i.e. N=1. In a symmetric Nash Equilibrium every tax payer declares the same amount i.e. X_i to the tax authorities and hence $\sum_{i=1}^{N} X_i = NX_i = X_i = X$.

We rewrite equation (1) as follows:

$$E(U) = (1-p)\left[U(W-(1-m).\theta X) + \alpha.V\big((1-m).\theta X\big)\right] + p\,[U(W-(1-m)\{\theta X + \pi.(W-X)\}) + \alpha.V((1-m).\{\theta X + \pi.(W-X)\})\ where\ \alpha > 0 \qquad Eq\ (2)$$

The utility function U ( ) refers to the utility from the amount left after paying tax and V ( ) refers to the utility from the proportion of the tax payment that goes to others. We assume diminishing marginal utility. The first order condition[9] is given by:

$$0 = (1-p)\left[U'(W-(1-m).\theta X)\{-(1-m).\theta\} + \alpha.V'\big((1-m).\theta X\big)\{(1-m).\theta\}\right] + p.[U'(W-(1-m)\{\theta X + \pi.(W-X)\})\{-(1-m).(\theta-\pi)\} + \alpha.V'((1-m).\{\theta X + \pi.(W-X)\}.\{(1-m).(\theta-\pi)\}] \qquad Eq(3)$$

For an interior solution to exist, the marginal rate of change of expected utility will be positive at X=0 and negative at X=W. This implies the following equalities:

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[8] For example, we can think of a partially excludable public good, which gets financed by the total tax contributions of the tax payers i.e. $\sum_{i=1}^{N} X_i$,where m becomes the proportion of such a public good that is accrued to the individual tax payer and the rest goes to the society.

[9] The second order condition is satisfied by the concavity of the utility function (See Appendix.)

$$\frac{\partial E(U)}{\partial X} at\ (X = 0)$$

$$= -\theta.(1-m).(1-p).[U'(w) - \alpha.V'(0)]$$
$$+ p.\left[U'(W-(1-m).\pi W).\left(-(1-m).(\theta-\pi)\right)\right.$$
$$\left. + \quad \alpha.V'\left((1-m).\pi W\right).\{(1-m).(\theta-\pi)\}\right] > 0$$

Eq(4)

$$\frac{\partial E(U)}{\partial X} at\ (X = W)$$

$$= (1-p).[U'\left(W - \theta W.(1-m)\right).(-(1-m).\theta)$$
$$+ \alpha.V'\left(\theta W.(1-m).\left((1-m).\theta\right)\right]$$
$$+ p.\left[U'\left(W-\theta W.(1-m)\right).\{-(1-m).(\theta-\pi)\}\right.$$
$$\left. + \alpha.V'\left((1-m).\theta W\right).\{(1-m).(\theta-\pi)\}\right] < 0$$

Eq(5)

Rearranging equations (3) and (4) we get:

$$\pi > \theta.\left[1 + \frac{(1-p)}{p}.\frac{U'(W) - \alpha.V'(0)}{U'(W.(1-(1-m).\pi) - \alpha.V'\left((1-m).\pi W\right)}\right]^{10} \qquad Eq(4')$$

$$\pi < \frac{\theta}{p} \qquad Eq(5')$$

Comparing the above two inequalities with the similar set of inequalities from the Allingham-Sandmo (1972) [11] model, we find that a change in altruistic parameter changes the lower limit of the penalty rate.

[10] The Necessary condition to ensure the existence of an interior solution of π can be stated as follows:

$$\frac{\theta}{p} > \pi > \theta.[1 + (\frac{1}{p} - 1).\frac{U'(W) - \alpha.V'(0)}{U'(W.(1-(1-m).\pi) - \alpha.V'\left((1-m).\pi W\right)}]$$

[11] The similar set of inequalities from the actual AS model (1972) is as follows:

$$p\pi > \theta.\left[p + (1-p).\frac{U'(W)}{U'(W.(1-\theta))}\right] \qquad Eq(4")$$

$$p\pi < \theta \qquad Eq(5")$$

Figure 1 plots the LHS and RHS of equation $Eq(4')$ as a function of π.

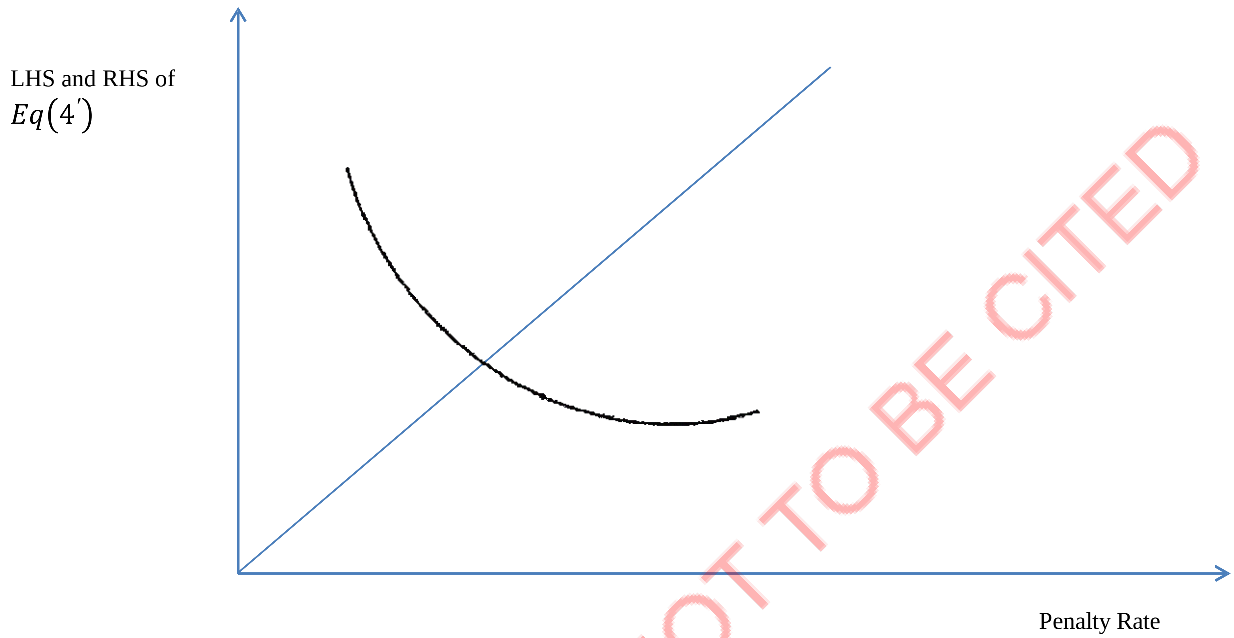

Figure 1: $Eq(4')$ as a function of π.

At α= 0, $Eq(4')$ is same as that in the AS model. It is also evident that an increase in the α will shift the R.H.S of $Eq(4')$ downwards widening the range of values of π for which the same equation is satisfied and thereby pushing the lower limit of π further down.

Proposition 1: *As alpha increases, the lower limit of π goes down unconditionally for the highly*[12] *hedonistic and conditionally*[13] *for the less hedonistic individual.*

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[12] If $\frac{U'(W)}{V'(0)} > \alpha$, that means if the lowest point of the marginal utility curve of U is always higher than the highest point on the marginal utility curve of V, being weighed by a positive constant α, then that person can be considered as a highly hedonistic person. In case of a highly altruistic individual, the inequality stated at the beginning of this footnote, can be rewritten as: $\frac{U'(W)}{V'(0)} > \alpha > 1$.

[13] The condition that needs to be satisfied is as follows:

$$\frac{(1-p)}{p}\,\theta\,\frac{\{\alpha V'(0) - U'(W)\}\,.\,[U''(W(1-(1-m)\pi)\,\{-(1-m)W\} - \alpha V''\big((1-m)\pi W\big)\{(1-m)W\}]}{\Big(U'(W.(1-(1-m).\pi) - \alpha.V'\big((1-m).\pi W\big)\Big)^2} < 1$$

Figure 2[14] gives a graphical representation of what has been stated in the above proposition. It can be shown that π^* shifts downwards to π^{**} when the value of the shift parameter α increases.

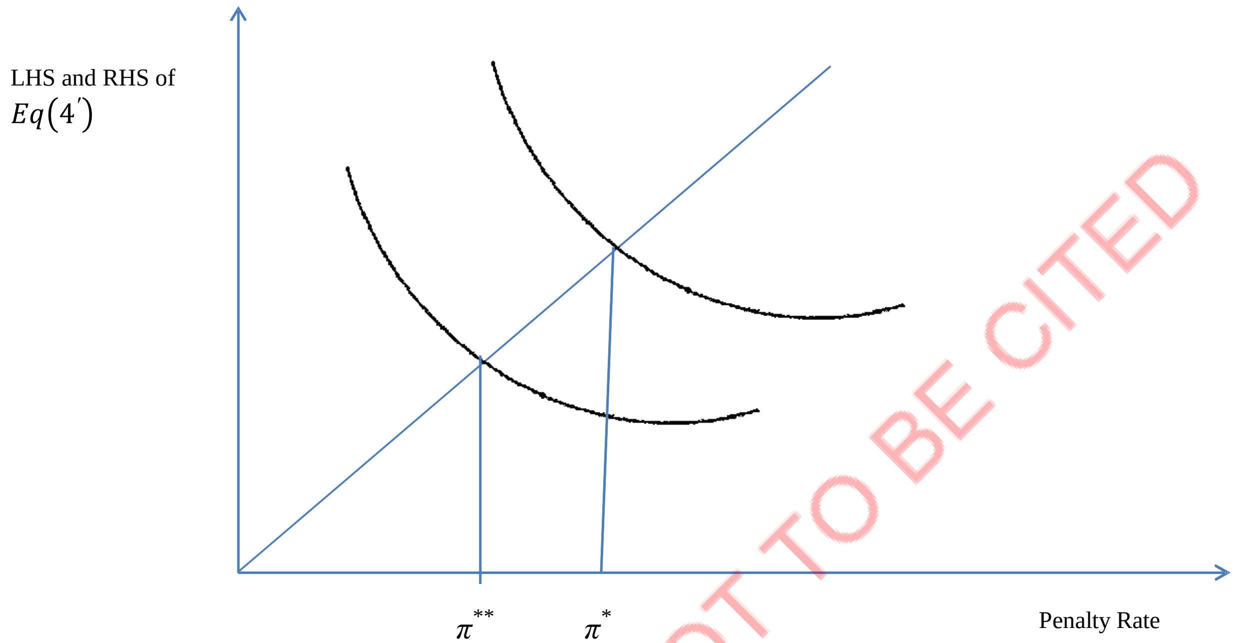


Figure 2: Change in Penalty Rate with Altruism

If the tax payer becomes more altruistic, the person would need lesser penalty to start paying a non-zero tax amount. It is also important to note that even though the lower limit of π falls, the upper limit stays intact. Thus, even though the altruistic component makes the tax payer start paying the taxes at an early stage but eventually that effect fades away and the complete disclosure of taxable amount takes place at same penalty rate as before.

Comparative statics

Let the optimal level of declared income be X*(α,π). Differentiating Eq (3) with respect to **α,** we get,

This is the slope of the R.H.S of $Eq(4')$with respect to π. Note, that even without invoking this assumption it can be seen that R.H.S of $Eq(4')$is a monotonically increasing function of π. But, in our case, this particular assumption has been invoked in order to ensure that, graphically, both the L.H.S and R.H.S of $Eq(4')$ intersect with each other.

[14] This diagram deals with the case of a highly hedonistic individual only.

$$\frac{\partial X}{\partial \alpha} = \frac{\begin{matrix}[p\,.\,U'(W-(1-m)\{\theta X+\ \pi.(W-X)\}).\{(1-m).(\pi-\theta)\} \\ -(1-p).(1-m).\theta.U'(W-(1-m).\theta X)]\end{matrix}}{\alpha.D} \qquad Eq(6)$$

Where the sign of D is determined by the second order condition of the model.[15]

It should be evident from the above equation that depending on the positive and the negative terms, the sign of the derivative will be determined[16]. To analyze the derivative further, let's consider the following two sub-cases:

Sub-case 1: When p tends to 0 and **π**>**θ**, $\frac{\partial X}{\partial \alpha} > 0$.

If we substitute p=0, in Eq (6) we get the following:

$$\frac{\partial X}{\partial \alpha} = \frac{-.(1-m).\theta.U'(W-(1-m).\theta X)]}{\alpha.[\,U"(W-(1-m).\theta X)\,\{(1-m).\theta\}^2+\alpha.V"((1-m).\theta X)\{(1-m).\theta\}^2]}$$

If the probability of getting caught or getting audited by the tax authority is almost 0, then the tax payment increases with altruism.

Sub-case 2: When p tends to 1 and **π**>**θ**, $\frac{\partial X}{\partial \alpha} < 0$.

Now, If we substitute p=1 in Eq (6) then assuming that penalty rate is higher than the existing tax rate, we get:

$$\frac{\partial X}{\partial \alpha} = \frac{U'(W-(1-m)\{\theta X+\pi.(W-X)\}).\{(1-m).(\pi-\theta)\}}{\alpha.[\,U"(W-(1-m).\theta X)\,\{(1-m).\theta\}^2+\alpha.V"((1-m).\theta X)\{(1-m).\theta\}^2]} < 0$$

This, undoubtedly, seems to be counter intuitive. In this case, when the probability of getting caught is high along with a high penalty rate, the tax- payer's internal motivation is crowded out.

Proposition 2: As the tax payer transits from a state with low probability of audit and a high penalty rate to a state with high probability of audit and a high penalty rate, evasion increases with an increase in the value of the parameter capturing altruism[17].

[15] See appendix.
[16] See appendix.
[17] A mathematical justification of proposition 2 is given in the appendix.

The first part of proposition 2 talks about how even at the level of low audit probability tax payment has actually increased being driven by altruism. Recent evidence from field experiment seems to corroborate this. In the experiment conducted by Dwenger, Kleven,Rasul and Rincke (2016) in Germany clearly found that a significant amount of the citizens of that country comply at the 'zero deterrence baseline' being driven solely by their intrinsic motivation.

In continuation to the same, the second part of proposition 2 shows how an external intervention in the form of higher penalty would eventually drive away the intrinsic motivation of the tax-payer and give rise to more evasion. The recent empirical literature has found evidence to support this claim. The studies conducted by Bowles and Polonia-Reyes (2012) as well as Frey (1997) postulate the fact that any kind of external intervention be it positive (Bowles and Polonia-Reyes, 2012) or negative (Frey, 1997) may actually crowd out such intrinsic motivation

An important observation that can be made at this juncture is that the probability of audit seems to influence the tax payer more rapidly as compared to the penalty rate.

By differentiating Eq(3) with respect to π, we get:

$$\frac{\partial X}{\partial \pi} = p.\left[\frac{\alpha.(1-m).V'((1-m).(\theta X+\pi.(W-X))}{D} - \frac{(1-m).U'(W-(1-m).\left(\theta X+\pi.(W-X)\right)}{D} - \frac{(1-m).(1-m).(W-X).(\theta-\pi).U"(W-(1-m).\left(\theta X+\pi.(W-X)\right)}{D} - \frac{(1-m).(1-m).\alpha.(W-X).(\theta-\pi).V"((1-m).\left(\theta X+\pi.(W-X)\right)}{D}\right] \quad Eq(7)$$

The sign of the derivative under consideration is ambiguous and requires some parametric restrictions to be imposed in order to drive the ambiguity away. Under the restriction that, $\alpha.(1-m).V'((1-m).\left(\theta X+\pi.(W-X)\right) < (1-m).U'(W-(1-m).\left(\theta X+\pi.(W-X)\right) + (1-m).(1-m).(W-X).(\theta-\pi).U"(W-(1-m).\left(\theta X+\pi.(W-X)\right) + (1-m).(1-$

$m).\alpha.(W-X).(\theta-\pi).V''((1-m).\big(\theta X+\pi.(W-X)\big)$, the sign of the derivative will be positive and vice-versa.

Now consider,

$$\alpha.(1-m).V'((1-m).\big(\theta X+\pi.(W-X)\big)<(1-m).U'(W-(1-m).\big(\theta X+\pi.(W-X)\big)+(1-m).(1-m).(W-X).(\theta-\pi).U''(W-(1-m).\big(\theta X+\pi.(W-X)\big)+(1-m).(1-m).\alpha.(W-X).(\theta-\pi).V''((1-m).\big(\theta X+\pi.(W-X)\big)$$

Rearranging the terms we get:

$$\alpha.V'((1-m).\big(\theta X+\pi.(W-X)\big)-U'(W-(1-m).\big(\theta X+\pi.(W-X)\big)<(1-m).(W-X).(\theta-\pi).U''(W-(1-m).\big(\theta X+\pi.(W-X)\big)+(1-m).\alpha.(W-X).(\theta-\pi).V''((1-m).\big(\theta X+\pi.(W-X)\big) \quad \text{Eq(8)}$$

For an altruistic agent, as long as the difference between the marginal utility derived from the proportion of the tax payment that goes to others, being weighed by the positive parameter α (i.e. $\alpha.V'((1-m).\big(\theta X+\pi.(W-X)\big)$ in L.H.S of Eq(4b)) , and the marginal utility derived from the amount left after paying tax (i.e. $U'(W-(1-m).\big(\theta X+\pi.(W-X)\big)$ in the L.H.S of Eq(4b)) is below a positive threshold (i.e. the R.H.S of Eq(4b)) penalty rate ensures tax compliance. But the moment it goes beyond the threshold, an increase in the penalty rate will eventually increase evasion.

In other words, in case of a highly altruistic individual (i.e. the one with a large α such that the product of $\alpha.V'(\,)$ is higher than $U'(\,)$ in the L.H.S of Eq(4b)) the penalty rate can no longer ensure compliance; rather it will induce more evasion.

It is now obvious that the tax payer might evade more or be honest, depending upon the above parametric restriction. Hence, we can say that an increasing penalty rate won’t necessarily ensure that the tax payer will always pay more taxes. At times, the tax payer may also be ‘misbehaving’ (i.e. evading more).

Proposition 3: If the representative tax payer is altruistic, then under the specific parametric restrictions stated above, the penalty rate can't unambiguously reduce evasion rather it may either act as a catalyst or as a deterrent in curbing the evasion.[18]

The seminal work by Allingham and Sandmo (1972) states that a higher penalty rate will unambiguously reduce evasion. We posit a different result here and claim that the impact of penalty rate on evasion may no longer remain unambiguous.

Recent experiments (Friedland, Maital, & Rutenberg, 1978) have found that an increase in the fines or penalty rates has significant positive impact upon the compliance rates, whereas some experiments ((Friedland, 1982; Webley, Robben, Elffers,& Hessing, 1991) failed to validate the existence of any such relationships. Hence, such ambiguity exists even on the empirical front as well.

Altruism, moral costs and the evasion-avoidance trade-off:

Till now, we have endeavoured to analyze the nuances and the intricacies of the behavior of a representative tax payer whose only concern was to decide whether he should evade or not; and if he evades then by how much should he evade. Even though tax evasion, undeniably, is one of the major concerns of any government in the world, what, more often than not, gets overshadowed under the towering presence of evasion as a cause of concern is the act of *tax avoidance*. Tax avoidance is not illegal rather depends upon how efficiently one can identify and capitalize over the loopholes of the existing law structure of a country. But, the most appealing aspect of this kind of an act that demands a genuine inspection is the presence of moral costs.[19]

In order to keep it consistent with the notations and the premise set so far, we would propose a static model where a tax payer not only decides upon how much he should reveal but also decides the amount that he would be avoiding. Unlike the traditional models that consider 'rational costs' or 'sheltering costs'[20] while addressing the problem of avoidance, we would introduce moral costs for both the act of evasion as well as that of avoidance. The basic premise of the model will be equivalent to the standard AS model. The representative tax payer will have

[18] In the appendix we have analyzed Eq (7) by assuming $\alpha<0$ i.e. by considering the agent to be **spiteful**. Even then, the ambiguity regarding the sign of the derivative under consideration can't be ruled out.
[19] For a detailed discussion on the same see Brian Erard & Jonathan Feinstein, 1994. "**The Role of Moral Sentiments and Audit Perceptions in Tax Compliance**,"
[20] See Mayshar (1991) for a detailed discussion on this type of costs.

to choose his revealed income X and a proportion **S** of the revealed income that he would actually reveal to the authorities and upon which tax rate θ' will be levied. In order to avoid the unnecessary clustering of mathematical notations, let us also assume that $(\mathbf{1-m}).\boldsymbol{\theta}' = \boldsymbol{\theta}$.

We have introduced per unit moral costs of avoidance and evasion namely $\mathbf{t_A}$ **and** $\mathbf{t_E}$. By construction, both of these costs are linear in nature. As it must have become evident that the problem of the tax payer is equivalent to the problem of *portfolio diversification* where the agent has to jointly decide upon the amount he should evade and how much should he avoid.[21]

The expected utility of the tax payer will be as follows:

$$E(U) = V = (1-p).\left[U\left(W-\theta SX-t_A(1-S).X-t_E(W-X)\right)+\alpha.V(\theta SX)\right]+p.\left[U\left(W-\theta SX-t_A(1-S).X-\pi(W-X)\right)+\alpha.V\left(\theta SX+\pi(W-X)\right)\right]$$

Eq (9)

An important thing to be noted at this point is that when the person gets caught he does not have to bear the burden of a moral cost as that gets crowded out when he pays a penalty amount equivalent to π. All the other assumptions, pertaining to the marginal utilities, that have already been invoked hold good in this particular set up as well. Following the same line of argument as discussed before, we will try to find out the conditions under which the interior solutions for both the evasion and avoidance would exist.

To this end, let us find out the two first order conditions with respect to the two choice variables namely X and S.

First order conditions:

$$\frac{\partial V}{\partial X}=(1-p).\left[U'(M).(-\theta S+t_A.S-t_A+t_E)+\alpha.V'(\theta SX).(\theta S)\right]+p.\left[U'(N).(-\theta S+t_A.S-t_A+\pi)+\alpha.V'\left(\theta SX+\pi(W-X)\right).(\theta S-\pi)\right]$$

Eq(10)

$$Where,\quad M = W-\theta SX-t_A(1-S).X-t_E(W-X)\ and\ N = W-\theta SX-t_A(1-S).X-\pi(W-X)$$

[21] For a similar type of a treatment see Im, James. (1988). Compliance Costs and the Tax Avoidance-Tax Evasion Decision. Public Finance Quarterly.

Similarly,

$$\frac{\partial V}{\partial S} = (1-p).\left[U'(M).(-\theta X + t_A.X) + \alpha.V'(\theta SX).(\theta X)\right] + p.\left[U'(N).(-\theta X + t_A.X) + \alpha.V'\left(\theta SX + \pi(W-X)\right).(\theta X)\right] \quad \text{Eq(11)}$$

Second order conditions:

$$Dx = (1-p).\left[U''(M).(-\theta S + t_A.S - t_A + t_E)^2 + \alpha.V''(\theta SX).(\theta S)^2\right] + p.\left[U''(N).(-\theta S + t_A.S - t_A + \pi)^2 + \alpha.V''\left(\theta SX + \pi(W-X)\right).(\theta S - \pi)^2\right] \quad \text{Eq(12)}$$

Similarly,

$$Ds = (1-p).\left[U''(M).(-\theta X + t_A.X)^2 + \alpha.V''(\theta SX).(\theta X)^2\right] + p.\left[U''(N).(-\theta X + t_A.X)^2 + \alpha.V''\left(\theta SX + \pi(W-X)\right).(\theta X)^2\right] \quad \text{Eq(13)}$$

Both the second order conditions are satisfied as the assumption of concavity has already been invoked.

Following the same methodology as before, we first evaluate Eq(11) at S=0 and S=1(as the maximum that S can go is till 1) and rearrange the terms to arrive at the following two inequalities:

$$t_A > \theta.\frac{(1-p).U'\left(W-t_A.X-t_E(W-X)\right) + p.U'\left(W-t_A.X-\pi(W-X)\right) - (1-p).\alpha.\theta.V'(0) - p.\alpha.\theta.V'\left(\pi(W-X)\right)}{(1-p).U'\left(W-t_A.X-t_E(W-X)\right) + p.U''\left(W-t_A.X-\pi(W-X)\right)} \quad \text{Eq(14)}$$

$$t_A < \theta.\left[\frac{(1-p).U'\left(W-\theta.X-t_E(W-X)\right) + p.U'\left(W-\pi.X-\pi(W-X)\right) - (1-p).\alpha.\theta.V'(\theta X) - p.\alpha.\theta.V'\left(\pi(W-X)+\theta X\right)}{(1-p).U'\left(W-t_A.X-t_E(W-X)\right) + p.U'\left(W-t_A.X-\pi(W-X)\right)}\right] \quad \text{Eq(15)}$$

If we assume that the agent is completely rational i.e. α = 0, then the upper limit becomes $t_A > \theta$ and the lower limit becomes $t_A < \theta$, which are contradictory to each other. As a result the only feasible solution that can exist is $t_A = \theta$. This means that for a completely rational tax payer there exists no interior solution (rather a corner solution) and the moral cost of avoidance gets equated to the tax rate.

Now, it will be interesting to introduce α into the inequalities and analyze them further. Appling the same method as we did before in order to find the interior solution of my basic model, we can see that the L.H.S of both Eq(14) and Eq(15) are upward sloping curves of t_A and the R.H.S of Eq(14) has a positive but decreasing slope with respect to the moral cost of avoidance whereas the R.H.S of Eq(15) is independent of t_A.

Now, considering **α** to be the shift parameter in both the equations we see that both the lower as well as the upper limits of the cost of avoidance comes down with an increase in the value of α, which leads us to the next proposition:

Proposition 4: Keeping all other parameters constant, an increase in the value of the altruistic parameter α induces the tax payer to start refraining himself from the act of avoidance at an early stage and eventually reach the last stage early where the avoidance is zero.

In case of both the evasion in the initial setup and avoidance in the current setup, the altruistic component seems to have a significant influence in making sure that at a comparatively lower moral cost (in case of avoidance) or the lower cost associated with external punishment (in case of evasion), the tax payer starts conforming to the rules of the law being prodded by his internal motivation.

Now, we will evaluate the Eq(10) at X =0 and X= W to find out the conditions required to ensure that the interior solutions of X exist. Let's consider the following two inequalities:

$$p.\pi < \frac{(1-p).\left[U'(W-t_E.W)\left(-\theta S+t_A.S+t_E-t_A\right)+\alpha.V'(0).(\theta S)\right]+ p.\left[U'(W-\pi.W).(-\theta S+t_A.S-t_A)++\alpha.V'(\pi.W).(\theta S)\right]}{-U'(W-\pi.W)+\alpha.V'(\pi.W)} \qquad \text{Eq(16)}$$

$$p.\pi > \frac{U'(W-SW\theta-t_A.(1-S).W).(-\theta S+t_A.S-t_A)+\alpha.V'(\theta SW).(\theta S)+ (1-p).U'(W-SW\theta-t_A.(1-S).W).t_E}{\alpha.V'(\theta SW)-U'(W-SW\theta-t_A.(1-S).W)} \qquad \text{Eq(17)}$$

It is quite evident that both the L.H.S of the two equations are an increasing function of π. The R.H.S of the Eq(16) too seems to be an increasing function of π under the assumption that $t_E > (-\theta S + t_A.S - t_A)$,whereas the R.H.S of the Eq(17) is independent of π and hence can be thought of as a horizontal line parallel to the x axis where π is measured.

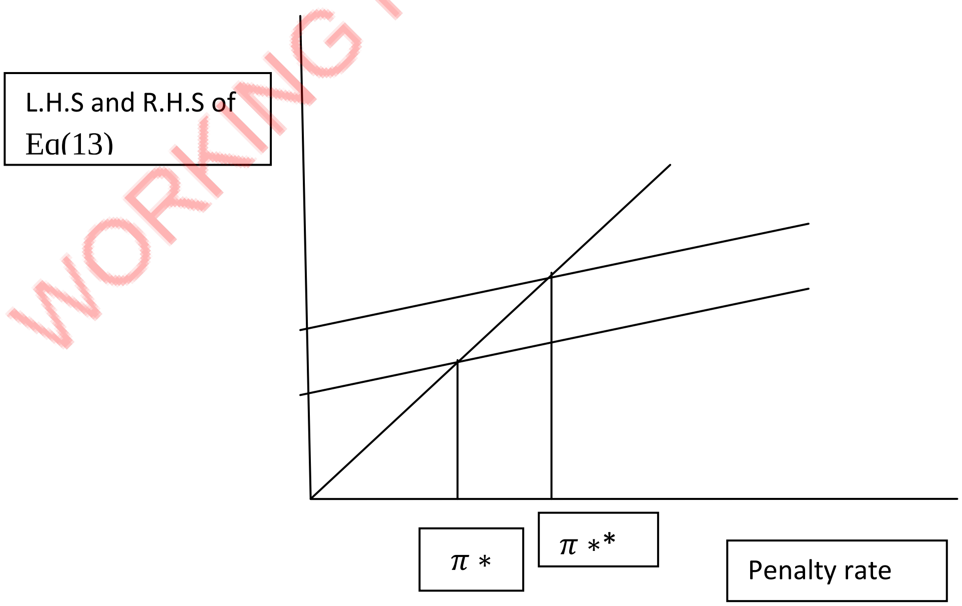
As we have already analyzed the relationship between the altruistic parameter and π, we would now choose the moral cost of evasion i.e. t_E as the shift parameter and see how the penalty rate changes with respect to the same. It can be clearly seen that with an increase in the value of the moral cost of evasion both the lower as well as the upper limit shifts upwards.

This brings us to the last proposition of this model:

Proposition 5: Keeping all other parameters constant, an increase in the value of the moral cost of evasion increases the corresponding penalty rate π.

The following diagram explains the relationship with the help of Eq(16).

Figure 3



From the above figure it is quite evident that as the shift parameter t_E increases, the upper limit of π *goes up* as the R.H.S of Eq(16) shifts upwards.

This is quite Intuitive and can well be considered as a policy suggestion for the government. If we consider a situation where the moral cost is higher than the monetary cost of evasion i.e. π, then the tax payer will not refrain from evading taxes as the monetary cost is lower; rather he will ensure that he evades and gets caught in the process as that would put a less burden upon his shoulders. As a result, if the moral cost is high, it is a suggestive fact that the concerned authority should also increase the monetary cost so that the tax payer gets discouraged to take advantage of the arbitrage opportunities and thereby adhere to the regulations of the law by paying the right amount of tax.

Conclusion

The propositions in the paper highlight the importance of altruism in decision making process of a representative tax payer and also show how the amount of evasion as well as the monetary cost of punishment change with respect to altruism. It also gives us a counter intuitive result of higher evasion coupled with higher levels of altruism. This could be termed as the crowding out phenomenon of the intrinsic motivation by external penalty. The last 2 propositions address the evasion-avoidance trade-off and its relationship with the moral costs. It would still be more interesting to consider a dynamic framework to see if the results of this static model remain consistent or whether it brings about new and valuable changes in the model.

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Appendix- A:

The second order condition is as follows:

$$D = (1-p).\left[\, U''(W-(1-m).\theta X)\,\{(1-m).\theta\}^2 + \alpha.V''\big((1-m).\theta X\big)\{(1-m).\theta\}^2\right] + p\,.\left[\, U''(W-(1-m)\{\theta X + \pi.(W-X)\})\{(1-m).(\theta-\pi)\}^2 + \alpha.V''(\,(1-m).\ \{\theta X + \pi.(W-X)\}).\{(1-m).(\theta-\pi)\}^2\right]$$

Eq (1a)

Derivation of $Eq(6)$:

Suppose, the optimal level of declared income be X*(α,π). Differentiating eq(3) with respect to α, we get,

$$D.\frac{\partial X}{\partial \alpha} + p.V'\big((1-m).\ \{\theta X + \pi.(W-X)\}\big).\{\,(1-m).(\theta-\pi)\} + (1-m).\theta.(1-p).V'\big((1-m).\theta X\big) = 0$$

Eq(2a)

$$where\ D\ refers\ to\ eq(1a)$$

$$\frac{\partial X}{\partial \alpha} = \frac{-\left[\, p.V'\big((1-m).\ \{\theta X + \pi.(W-X)\}\big).\{\,(1-m).(\theta-\pi)\} + (1-m).\theta.(1-p).V'\big((1-m).\theta X\big)\right]}{D}$$

Eq(3a)

Rewriting the Eq(3) we get:

$$(1-p)U'(W-(1-m).\theta X)\,\{-(1-m).\theta\} + p\,.U'(W-(1-m)\{\theta X + \pi.(W-X)\})\{(1-m).(\pi-\theta)\}\{-(1-m).(\theta-\pi)\} = -[\alpha.(1-p).V'\big((1-m).\theta X\big)\{(1-m).\theta\} + \alpha.p.V'(\,(1-m).\ \{\theta X + \pi.(W-X)\}.\{(1-m).(\theta-\pi)\}]$$

Eq(4a)

Now, by using the *envelope theorem* i.e. by substituting eq(4a) in eq(3a) we get:

$$\frac{\partial X}{\partial \alpha} = \frac{[p\,.U'(W-(1-m)\{\theta X + \pi.(W-X)\}).\{(1-m).(\pi-\theta)\} - (1-p).(1-m).\theta.U'(W-(1-m).\theta X)]}{\alpha.D}$$

For any p ∈ (0,1), $\frac{\partial X}{\partial \alpha} > 0$ when $p\,.U'(W-(1-m)\{\theta X+\ \pi.(W-X)\}).\{(1-m).(\pi-\theta)\} < (1-p).(1-m).\theta.U'(W-(1-m).\theta X)]$ and vice-versa.

A mathematical justification of proposition 2:

Consider Eq(3) when P tends to 1:

$$U'(W-(1-m)\{\theta X+\ \pi.(W-X)\})\{-(1-m).(\theta-\pi)\}+\ \alpha.V'(\ (1-m).\ \{\theta X+\pi.(W-X)\}.\{(1-m).(\theta-\pi)\}=0 \qquad \text{Eq(5a)}$$

For the sake of simplicity let's assume that $(1-m)\{\theta X+\ \pi.(W-X)\}=A$ and rewrite the above equation to get:

$$U'(W-A).\{-(1-m).(\theta-\pi)\}+\alpha.V'(\ A).\{(1-m).(\theta-\pi)\}=0 \qquad \text{Eq(6a)}$$

By rearranging the terms we can get:

$$\alpha=\frac{U'(W-A)}{V'(A)} \qquad Eq(7a)$$

It is quite clear that with an increase in X, A goes down and vice-versa. Now, if α increases, A should go up for the R.H.S of the above equality to go up, but that can only happen if X goes down. Hence, whenever α goes up, the value of X has to fall.

Appendix B:

Derivation of Eq(7):

Consider eq(3):

$$0 = (1-p)[\, U'(W-(1-m).\theta X)\, \{-(1-m).\theta\} + \alpha.V'\big((1-m).\theta X\big)\{(1-m).\theta\}\,] + p\,.[\, U'(W-(1-m)\{\theta X + \pi.(W-X)\})\{-(1-m).(\theta-\pi)\} + \alpha.V'(\,(1-m).\,\{\theta X + \pi.(W-X)\}.\{(1-m).(\theta-\pi)\}]$$

Suppose, $(1-p)[\, U'(W-(1-m).\theta X)\{-(1-m).\theta\} + \alpha.V'\big((1-m).\theta X\big)\{(1-m).\theta\}] = Q$

$$and$$

$p\,.[\, U'(W-(1-m)\{\theta X + \pi.(W-X)\})\{-(1-m).(\theta-\pi)\} + \alpha.V'(\,(1-m).\,\{\theta X + \pi.(W-X)\}.\{(1-m).(\theta-\pi)\}] = \mathrm{R}$

Differentiating Q with respect to π *we get*:

$$\frac{\partial X}{\partial \pi}[U''(W-(1-m).\theta X).\{(1-m).\theta\}^2.(1-p) + \alpha.V''\big((1-m).\theta X\big).\{(1-m).\theta\}^2.(1-p)] \qquad \text{Eq(1b)}$$

Differentiating R with respect to π *we get*:

$$p.\big[(1-m).U'(W-(1-m)\{\theta X + \pi.(W-X)\}) - \alpha.(1-m).V'\big((1-m)\{\theta X + \pi.(W-X)\}\big)\big] + p.[(1-m)^2.(W-X).(\theta-\pi).U"(W-(1-m).\big(\theta X + \pi.(W-X)\big) + \alpha.(1-m)^2.(W-X).(\theta-\pi).V"((1-m).\big(\theta X + \pi.(W-X)\big) + \frac{\partial X}{\partial \pi}[p.\{(1-m)(\theta-\pi)\}^2.U"(W-(1-m).\big(\theta X + \pi.(W-X)\big) + \alpha.\{(1-m)(\theta-\pi)\}^2.p.V"((1-m).\big(\theta X + \pi.(W-X)\big)] \qquad \text{Eq(2b)}$$

Adding Eq(1b) with Eq(2b) and rearranging the terms we get:

$$\frac{\partial X}{\partial \pi} = p.\Bigg[\frac{\alpha.(1-m).V'((1-m).(\theta X + \pi.(W-X))}{D} - \frac{(1-m).U'(W-(1-m).\big(\theta X + \pi.(W-X)\big)}{D} - \frac{(1-m).(1-m).(W-X).(\theta-\pi).U"(W-(1-m).\big(\theta X + \pi.(W-X)\big)}{D} - \frac{(1-m).(1-m).\alpha.(W-X).(\theta-\pi).V"((1-m).\big(\theta X + \pi.(W-X)\big)}{D}\Bigg]$$

Where D refers to Eq(1a).

When α>0, $\frac{\partial X}{\partial \pi} > 0\ if\ and\ only\ if\ \alpha.(1-m).V'((1-m).\big(\theta X + \pi.(W-X)\big) < (1-m).U'(W-(1-m).\big(\theta X + \pi.(W-X)\big) + (1-m).(1-m).(W-X).(\theta - \pi).U"(W-(1-m).\big(\theta X + \pi.(W-X)\big) + (1-m).(1-m).\alpha.(W-X).(\theta-\pi).V"((1-m).\big(\theta X + \pi.(W-X)\big)$ and vice-versa.

When α<0, $\frac{\partial X}{\partial \pi} > 0$ if and only if $(1-m).(1-m).\alpha.(W-X).(\theta-\pi).V"((1-m).\big(\theta X + \pi.(W-X)\big) < \alpha.(1-m).V'((1-m).\big(\theta X + \pi.(W-X)\big) < (1-m).U'(W-(1-m).\big(\theta X + \pi.(W-X)\big) + (1-m).(1-m).(W-X).(\theta-\pi).U"(W-(1-m).\big(\theta X + \pi.(W-X)\big)$ and vice-versa.

Even in case of a spiteful person the sign of the derivative remains ambiguous.