Diskussionspapierreihe
Working Paper Series

Helmut Schmidt Universität
Universität der Bundeswehr Hamburg

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Nr./ No. 142
April 2014

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Fächergruppe Volkswirtschaftslehre

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Redaktion / Editors

Helmut Schmidt Universität Hamburg / Helmut Schmidt University Hamburg
Fächergruppe Volkswirtschaftslehre / Department of Economics

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Tax Evasion and Cognitive Dissonance

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Zusammenfassung/ Abstract

We introduce public signals and cognitive dissonance into the standard Allingham-Sandmo-Yitzhaki (ASY) model of tax evasion. It turns out that the pres- ence of cognitive dissonance attenuates tax evasion as individuals dislike allowing their true bevhaviour to diverge from their public statement of the "admissible" degree of tax evasion, which, in turn, they use to influence the probability of detection. Some potential policy conclusions and extensions are discussed.

JEL-Klassifikation / JEL-Classification: H26; H30; D03

Schlagworte / Keywords: tax evasion; cognitive dissonance; public signals

1. Introduction

Prominent cases of tax evasion often exhibit a marked discrepancy between the culprit's public statements and role before detection and his actual behaviour. Many public figures who appear to espouse ethical principles end up embroiled in tax evasion charges – in Germany, recent cases include former FC Bayern manager Uli Hoeneß and perennial suffragette Alice Schwarzer.

We build on Kuran's (1997; 1989) idea of a discrepancy between peoples' public point of view and their private (true) opinion to provide a theoretical explanation for this phenomenon. The idea is that individuals may use their public signal of a level of tax evasion they (allegedly) find "acceptable" to reduce their probability of detection. By itself, obviously, this signal would just be cheap talk. If people experience cognitive dissonance, i.e. a source of disutility increasing in the discrepancy between the "private truth" and the "public lie" (Kuran, 1997), however, an interior equilibrium may exist in which (a) taxpayers use the public signal in the manner described above, and (b) the signal is in fact positively correlated to the degree of tax evasion undertaken (which we define as the share of income hidden from the taxman).

The impact of psychological factors in general and as tax morale in particular on tax evasion has long been recognised in economic literature. Issues like perceived fairness of the tax code, people's public spirit, religiosity and the desire for conformity have all been analysed at length.[1] It is probably fair to say, however, that most recent contributions are empirical or experimental in nature.

The paper that is probably closest to ours in spirit is Fortin et al. (2007). They model social interactions between taxpayers explicitly and also use an additive utility formulation in which the standard expected utility of consumption is augmented by an additive term reflecting a "social component", which depends on compliance and exogenous social variables. They use an exogenous probability of detection and exogenous social variables, however, and their main argument is experimental.

Barth & Cappelen (2013) are also close to our paper in that they explicitly attempt to model cognitive dissonance and allow for an endogenous probability of detection. Their version of dissonance differs from ours in that it is a utility loss increasing in the discrepancy between individual morality (assumed fixed) and behaviour (Barth & Cappelen, 2013). We differ from this approach in that both the signal and the level of tax evasion are treated as endogenous. Regarding the probability of detection, Barth & Cappelen (2013) follow the standard practice of having this depend on evaded income; our approach is again different in that we explore the effect of an endogenous public signal.

The next section of this note (2) introduces the model and states the main results, with some of the proofs being relegated to an appendix. Section 3 concludes.

[1] See Beckmann (2003) and Cowell (1990) for book-length treatments and extended surveys. Social interactions in tax evasion have also been analysed using agent-based modelling (Pickhardt & Seibold, 2014).

2. Theory

2.1. **The model.** Our model is an extension of the seminal Allingham-Sandmo-Yitzhaki (ASY) application of the Beckerian economics of crime to tax evasion (Becker, 1974; Yitzhaki, 1974; Allingham & Sandmo, 1972). Consider an individual endowed with exogenous gross income y and facing a proportional tax rate t. The individual can choose to conceal an amount hy ($0 \leq h \leq 1$) out of his income – if he succeeds, this results in tax savings of hty; if the evasion attempt fails, the individual pays the full taxes plus a surcharge at a rate s on the evaded tax.[2] The net income with successful evasion is therefore $y_1 = y(1-t+ht)$, $y_2 = y(1-t-sht)$ otherwise.

In addition to the evasion decision, the individual proclaims his opinion o ($0 \leq o \leq 1$) on an "acceptable" level of average tax evasion. This signal may have an effect on the probability of detection $p = p(o)$ faced by the individual. However, the individual suffers cognitive dissonance when his public signal o diverges from his private action h, which reduces his level of well-being. Note that the existence of this cognitive dissonance is precisely what justifies the assumption that o is informative with respect to h, viz. that the fisc may rationally condition p on the observed statement o.

For analytical tractability, we consider additively separable preferences. The sub-utility function on consumption is assumed to be of the standard type, while we model cognitive dissonance as a quadratic loss function. Expected utility is given by[3]

$$\mathrm{E}\tilde{u} = p(o)u_2 + (1-p(o))u_1 - \alpha(h-o)^2 \tag{1}$$

where the parameter α captures the relative importance of cognitive dissonance.

The first-order conditions for an interior maximum are:

$$-stypu_2' + (1-p)tyu_1' - 2\alpha(h-o) = 0 \tag{2}$$

$$p'(u_2 - u_1) + 2\alpha(h-o) = 0 \tag{3}$$

2.2. **Results.** We begin by stating a couple of preliminary results.

Lemma 1. *(Characteristics of an interior solution.)*

(a) *For an interior solution with $h^* > 0$, it is necessary for tax evasion to yield a positive expected return in monetary terms, i.e. $1-p > ps$.*

(b) *Conversely, if the expected monetary return on tax evasion were negative ($1-p < ps$), an interior solution would require $p' < 0$.*

[2]For book-length treatments of the standard theory, see Beckmann (2003) or the earlier Cowell (1990).

[3]For notational simplicity, we write u_i for the sub-utility function u evaluated at income level $i \in \{1,2\}$. The same convention is applied to derivatives; for example, u_2'' is the second partial of u with respect to y at the point $y_2 = y(1-t-sht)$, i.e. if tax evasion fails.

(c) Our model includes the ASY model as a special case, where p is constant.

Proof. Begin by evaluating (2) at $h = 0$, which gives us $(1-p-ps)tyu'(y(1-t)) + 2\alpha o$. It is obvious that if $o = 0$, $(1-p) > ps$ is sufficient for this term to be positive, viz. for the taxpayer to prefer some small degree of tax evasion to complete honesty (Allingham & Sandmo, 1972).

Solve the first-order equations for $2\alpha(h^* - o^*)$ and combine the solutions to find

$$p'(u_2 - u_1) = pstyu_2' - (1-p)tyu_1' \tag{4}$$

Note that as $y_1 > y_2$, we must have $u_1 > u_2$ and $u_1' < u_2'$. If $ps > 1-p$, the RHS of (4) is unambiguously positive, which implies that $p' < 0$.

In the ASY model, p is exogenous, and therefore $p' = 0$. This implies that the LHS of the equation is zero for all h and o, such that (4) becomes the first-order condition in Yitzhaki (1974). □

Remark 1. *(Corner solution for o.) Evaluating (3) at $o = 0$, we obtain $p'(0)(u_2 - u_1) + 2\alpha h$, which is zero for $h = 0$ and ambiguous for positive h if we assume $p'(0) > 0$. Hence, it is possible for the signal o to remain in a corner solution even if we have an interior solution for the tax evasion decision. Intuitively, this is less likely the larger the gap between signal and action.*

Lemma 2. *(Restrictions on the form of $p(o)$.) $p'' > 0$ is necessary for the second-order condition for an interior solution to hold.*

Proof. See the appendix. □

We are now in a position to state our main results.

Proposition 1. *(Attenuating effect of cognitive dissonance on tax evasion.) If the probability of detection increases in the signal o, then the solution of our model will entail less tax evasion than in the ASY model, all other things being equal.*

Proof. Consider again equation (4). $p' > 0$ implies that the LHS is negative, while lemma 1 establishes that it would be equal to zero in the ASY case. Therefore, the RHS needs to shrink relatively to the ASY baseline. For given values of the exogenous parameters, that requires y_2 to increase and/or y_1 to decrease. The only way for this to happen is for h to decrease.

Note that we do not need the assumption that the expected monetary return on tax evasion be positive for our proof of proposition 1. □

Intuitively, tax evaders use their public signal to reduce the probability of detection. For any given level of evasion, reducing the signal entails a marginal benefit in terms of a higher expected utility of consumption – the first two terms in (2) – while generating marginal psychic cost in terms of cognitive dissonance (the third term). With $p'' > 0$, the first effect will be the smaller, the smaller o, while the marginal psychic cost is linear in both h and o.

Proposition 2. *("Hoeneß effect".) In an interior optimum, taxpayers evade more tax than they publicly claim to be admissible,* $h^* > o^*$.

Proof. To show this, one can work from either first-order condition. Rearrange (3) to obtain

$$h^* - o^* = \frac{p'(u_1 - u_2)}{2\alpha} > 0$$

Proposition 2 follows immediately. □

2.3. **Comparative statics.** The following proposition 3 summarises the comparative statics in our model, which we calculate in the appendix.

Proposition 3. *(Summary of comparative statics results.)*

(a) The effect of the weight of cognitive dissonance α *on the choice variables is ambiguous. However, for sufficiently small values of* α*, an increase in that weight reduces tax evasion and increases the "acceptable" value of tax evasion that an individual avows to.*

(b) Unambiguous comparative statics signs from the ASY model tend to disappear. In particular, neither the fine s *nor the tax rate* t *have an unambiguous effect on the individual's choice in an interior optimum.*

(c) Consider a positive affine transformation $ep(o)$ *of the probability of detection schedule. For sufficiently small values of the weight* α *on the psychic costs, an increase in the factor* e *(a steeper schedule) will lead to less tax evasion* h^* *as well as a higher signal* o^*.

3. Discussion and conclusion

This short note provides a theoretical account of the divergence between tax evader's public statements of their attitude towards tax fraud and their actual behaviour. We introduce cognitive dissonance additively into the ASY model (with a general sub-utility function of consumption) and provide the necessary conditions for an interior solution. Under mild assumptions, intuitively plausible comparative statics are obtained; however, it does not come as a surprise that fewer clear-cut comparative statics results emerge than in the standard model.

An obvious extension of this work would be to consider a game between the tax evader and the fisc in which the latter commits to an optimal design of the probability of detection schedule $p(o)$. This, however, cannot be done at the level of generality of the present note as it presupposes assuming a special utility function (such as maximising expected net income, i.e. risk neutrality with respect to consumption). We leave this for future work.

Appendix

Second-order conditions. The Hessian for our maximisation problem is

$$\mathcal{H} = \begin{pmatrix} A & C \\ C & B \end{pmatrix}$$

where

$$A = p(sty)^2 u_2'' + (1-p)(ty)^2 u_1'' - 2\alpha < 0$$

$$B = p''(u_2 - u_1) - 2\alpha \lesseqgtr 0$$

$$C = -p'yt\left(su_2' + u_1'\right) + 2\alpha \lesseqgtr 0$$

We now proceed to prove lemma 2.

Proof. The second order conditions for an interior local maximum of our problem are $A < 0$ and $|\mathcal{H}| = AB - C^2 > 0$. It is obvious that the first condition holds. For the second one to be fulfilled, it is necessary that $AB > 0$, which requires $B < 0$ and, consequently, $p'' > 0$. □

Proof of comparative statics results. Finally, let us demonstrate the comparative statics results in proposition 3.

Proof. The effect of the parameter α on the optimal choice of h is:

$$\frac{\partial h^*}{\partial \alpha} = -\frac{\begin{vmatrix} -2(h^* - o^*) & C \\ 2(h^* - o^*) & B \end{vmatrix}}{|\mathcal{H}|}$$

with B and C as defined previously. The effect cannot be signed unambiguously over the entire domain as the sign of C is indeterminate. However, for sufficiently small α, we have $C < 0$ and, therefore, $\frac{\partial h^*}{\partial \alpha} < 0$. Analogously, we find

$$\frac{\partial o^*}{\partial \alpha} = -\frac{\begin{vmatrix} A & -2(h^* - o^*) \\ C & 2(h^* - o^*) \end{vmatrix}}{|\mathcal{H}|}$$

which exhibits a positive sign if α is close to zero, and cannot be signed unambigously in general.

We refrain from listing all the computations for the proof of the second part of proposition 3, which are straightforward. As an example for the procedure, consider the effect of the fine s on optimal evasion h^*, which is clearly negative in the standard ASY model:

$$\frac{\partial h^*}{\partial s} = -\frac{\begin{vmatrix} -ptyu_2' + phs(ty)^2 u_2'' & C \\ -htyp'u_2' & B \end{vmatrix}}{|\mathcal{H}|}$$

All the terms in the numerator are unambiguously negative – recall that it is necessary condition for an interior maximum that $B < 0$. The sign is therefore ambiguous.

Turning to the third part of the proposition, consider the impact of a small increase in e at the point where $e = 1$. This yields:

$$\frac{\partial h^*}{\partial e} = -\frac{\begin{vmatrix} -typ\,(su_2' + u_1') & C \\ p'\,(u_2' - u_1') & B \end{vmatrix}}{|\mathcal{H}|}$$

which is positive if $C < 0$, and

$$\frac{\partial o^*}{\partial e} = -\frac{\begin{vmatrix} A & -typ\,(su_2' + u_1') \\ C & p'\,(u_2' - u_1') \end{vmatrix}}{|\mathcal{H}|}$$

which is negative for $C < 0$. □

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