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Vertical and horizontal reciprocity in a theory of taxpayer compliance

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Abstract. This paper examines the interplay of horizontal and vertical reciprocity in determining the degree of tax compliance. Horizontal reciprocity is of the type that is frequently observed in public goods games, where reciprocally minded taxpayers may respond to non-contributing, strictly selfish taxpayers by mimicking their selfish behaviour. Vertical reciprocity is located in the relationship between the taxpayer and her government. Some recent empirical evidence is suggesting that initial cooperation of taxpayers with the fiscal authorities is not so much the result of positive reciprocity, but rather of a general tendency to obey authorities. Vertical reciprocity is therefore modeled as the propensity of taxpayers to retaliate against an uncooperative government by means of reducing the level of tax compliance. This allows us to identify feedback mechanisms between horizontal and vertical reciprocity.

JEL-Classification: H26, Z13.

Keywords: tax compliance; tax morale; tax evasion; reciprocity.

1. INTRODUCTION

Not too long ago, Cullis and Lewis (1997, p. 309) have stated with regard to the analysis of tax evasion that the “*economic approach has obvious analytic appeal but lacks realism and humanity.*” A lot has changed since then in theoretical research, while in empirical research contributions as early as Spicer and Becker (1980) have argued for the relevance of fairness considerations in explaining actual tax evading behaviour. In a similar spirit, Maital (1982) has argued that high levels of tax compliance can be explained with the wish of individuals to support policies that are in concurrence with their preferences. Later, Frey (1997) has extended such arguments to the hypothesis that individuals are endowed with civic virtues. These supposedly render cooperation with government, and in collective action in general, the default behaviour. If this is indeed the case, then not the surprisingly high levels of tax compliance are a theoretical puzzle, but it is defection that needs to be explained theoretically. Frey argues that civic virtues can be crowded out if the government violates norms of procedural fairness, or if conducts policies that are perceived as fundamentally unfair.

In this way, reciprocity in the form of *vertical reciprocity*, i.e. in the relationship between the individual and the public sector, enters the theoretical reasoning on tax compliance. Gouldner (1960) has argued that reciprocity is a ubiquitous characteristic of human interaction across cultural boundaries. The basic norm to which, according to Gouldner, individuals tend to adhere, is that we ought to cooperate with those who cooperate with us. In the economics literature, which we will discuss in detail below, there is widespread belief that there is also a complementary norm at work, which states that those who do not behave cooperatively, and who do so in a harmful way, ought to be punished.

Reciprocal behaviour may, however, not only occur in the relationship between taxpayers and their government; it may as well play a role as *horizontal reciprocity* among taxpayers. In this paper, we will attempt to show how both types of reciprocity enter the decision-making calculus of a rational taxpayer. Furthermore, we will probe into the interaction of both types of reciprocity, and in particular argue that the taxpayer's ability to retaliate against a non-cooperative government depends crucially on her being endowed with a feeling of guilt related to the activity of tax evasion. In Section 2, we will review the literature on reciprocity and hint at some connections to the tax compliance problem. In Section 3, both types of reciprocity in tax evasion will be discussed separately, and Section 4 discusses the interaction of both. Finally, Section 5 concludes.

2. RECIPROCITY AND TAX EVASION

2.1. How reciprocity is understood in this paper. Fueled in particular by experimental evidence, economics has in the recent years experienced a lively debate on whether the assumption of strictly self-interested behaviour reflects reality or not. The evidence indicates that frequently, individuals do appear to deviate from a narrowly defined, short-termed self-interested motivation, and one pattern of behaviour that stood out was that of reciprocal decision-making. Fehr and Gächter (2000a) offer a broad overview over the issues, and in particular over the empirical evidence.

Reciprocity can be defined as conditional kindness and conditional retaliation, depending on the observed behaviour of other individuals, and as Fehr and Gächter point out, it is in this sense different from self-interested cooperation or retaliation in repeated interactions, where costly cooperation or retaliation can be seen as an investment to secure benefits in the future. Reciprocity, on the other hand, is only of a responsive nature. It is also important to note that not all

individuals exhibit the same propensity to reciprocate; indeed, a substantial minority of individuals in experiments does not do so. The empirical evidence thus suggests that it is reasonable to assume different types of individuals in theoretical discussions. The plausibility of co-existing groups of reciprocally minded and strictly self-interested individuals has also been shown by Gintis (2000) in an evolutionary model incorporating group selection.

We will not in detail elaborate on the controversial discussion regarding the sources of reciprocity here, i.e. the question if intentions or results of observed behaviour are relevant in determining which reciprocal response is chosen by an individual (see e.g. Dufwenberg and Kirchsteiger 2004, Falk et al. 2007, Rabin 1993 and Sobel 2005). As Fehr and Schmidt (1999) point out, this dispute is in any event of limited relevance for many applications of reciprocity in economic theory. If intentions matter – i.e., if only pure kindness evokes a reciprocal reaction, as argued e.g. by Rabin (1993) – then this kindness will lead to the implementation of a distributional result that is considered fair and acceptable. Normally, a fair result that follows from the cooperative action of one individual will be attributed to a fairness-oriented mindset of this individual. Discriminating between different motivations for cooperative behaviour may become relevant if short-term cooperation can be attributed to some overarching strict self-interest, but this is unlikely to be the case for individuals who decide to pay taxes honestly. Thus, we will restrict ourselves here to an outcome-based notion of reciprocity: Reciprocally minded individuals have a propensity to positively (negatively) reciprocate if the observed actions of other individuals yield a result that is considered fair (unfair).

2.2. Reciprocity and contributions to public goods. The literature on reciprocity in public good games is of some interest here. The reason is that evading fewer taxes than predicted by Allingham and Sandmo (1972) is to some degree akin to voluntarily contributing to the

financing of a public good under the condition of individual insignificance for the overall quantity supplied. Fehr and Gächter (2000b) conduct an experiment which allows them to compare behaviour in a public good game both with and without punishment opportunities. They show that a substantial fraction of individuals bears the costs of punishing free-riders, and that the threat of punishment secures on average a relatively high, positive contribution by the subjects in the experiments. The mechanism through which punishment occurs in experiments of this class is through a direct reduction of payoffs: Punishing individuals invest into “punishment points” which they can assign to a different individual whose payoffs are reduced, with the magnitude of payoff-reduction depending on the number of points assigned to her.

Fischbacher et al. (2001) make another interesting observation in a public good experiment that does not allow for punishment. Using the strategy method to extract information on individual preferences, they also find that a large fraction of individuals is conditionally cooperative: If the average contributions of the other individuals rise, then half of the subjects react to this by raising their own contribution to the public good. However, even a conditional cooperator will contribute less than the average contribution of the rest of the population. Thus, Fischbacher et al. predict that in a repeated game, conditional cooperation will eventually diminish – a downward spiral of conditional cooperation is to be expected. It appears to be the case that the availability of a mechanism for reciprocal punishment is indeed crucial to ensure positive cooperation levels that are stable in time.

At this point, we can hint at an important difference between public good games and tax evasion. Fehr and Schmidt (1999) assume a very precise mechanism of punishing uncooperative individuals: The actions of every single subject can be observed, and every single individual can be singled out for punishment by every other individual. They show that a full-cooperation equilibrium can be reached if a sufficiently large group of reciprocal punishers is present in the population. However,

this result can obviously not simply be carried over to a model of tax compliance. Here, it is hardly possible to single out uncooperative individuals for reciprocal punishment, since at best aggregate estimates of overall evasion activity become common knowledge, while information on the compliance levels of single individuals is not publicly disclosed. Reciprocal punishment is then directed at an uncooperative collective of individuals: If a taxpayer observes a large magnitude of overall evasion activity, she may feel inclined to punish the population of (on average) disingenuous other taxpayers by evading herself.

There is another point to be made regarding the suggestion of Fehr and Schmidt to model reciprocity as inequality aversion. Cox and Sadiraj (2007) confront the model with experimental data, and show that inequality aversion is ill-suited to account for several stylized facts of public good experiments. An alternative model with an egocentric, but mildly altruistic utility function that meets the standard criteria of strict convexity and strict monotonicity in payoffs is shown to perform much better in predicting these stylized facts. And on the empirical side, Charness and Rabin (2002) report evidence which indicates that individuals aim much more at increasing social welfare than being motivated by inequality aversion. However, Charness and Rabin also note that reciprocity matters, which strongly indicates that reciprocity and a concern for equality are to be treated separately. They also report from their experiments that negative reciprocity in the form of disregard for the welfare of other individuals appears to play a greater role than positive reciprocity.

Given these general considerations, some scepticism regarding the identification of a propensity to reciprocate with inequity aversion is in order. It is very premature to assume an egalitarian distribution of net incomes as the reference point by which individuals judge the fairness of an actual distribution. This may be warranted for laboratory experiments where the payoffs do not or only to a small extent depend on effort and labour, but it is by no means a natural starting point

for models of real-world economic activity. Thus, it is difficult to see how the now canonical models of fairness and reciprocity by Bolton and Ockenfels (2000), as well as Fehr and Schmidt (1999) with their focus on equity as distributional equality could be directly applied to the issue of tax compliance.

2.3. Reciprocity and tax compliance. On a very general level, reciprocity in tax morale implies that one's own evasion activity depends on the fiscal policy conducted, and on the evasion decisions of other individuals. As we have seen above, if this interdependence is indeed reciprocity-related, then some notion of fairness will be needed as benchmark, with deviations from the benchmark evoking negative reciprocity. There are already some contributions to the literature that suggest an interdependence of decisions, without explicitly recurring to reciprocity. For example, Alm and McKee (2004) investigate taxpayers' reactions to endogenous audit probabilities in an experiment where the likelihood of being audited increases for a taxpayer if her reported income differs from that of other taxpayers in the same cohort. They find that taxpayers have difficulties in coordinating on a zero-compliance equilibrium and that endogenous audit probabilities depending on individual peculiarities in reporting can indeed induce high compliance levels.

Other papers aim directly at the relationship between the taxpayer and the government. Cowell (1992) presents some very counterintuitive results. If consumption c and a fairness measure ϕ both enter a standard utility function $U = u(c, \phi)$ that is strictly concave in both arguments, and if this is used in a standard Allingham-Sandmo-model of tax evasion, then individuals will actually adjust to a decline of the fairness measure by evading less. The reason is that the decline of utility that results from a *ceteris paribus* reduction of fairness leads to a reduced willingness to take the risk involved in tax evasion. A more intuitive result can in this framework only be obtained if increasing

evaded income e made the individually perceived situation more equitable for the taxpayer, i.e. if $\phi = \phi(e)$ with $\partial\phi/\partial e > 0$, and if the fairness effect was sufficiently large to overcompensate the risk-aversion effect. In this case, evasion increases with inequity. Falkinger (1995) extends this approach by incorporating public goods whose utility in consumption rises with income and shows that for this type of public goods, evasion increases with a declining quantity of goods provided, and vice versa. However, this again is a special case and it is not obvious at all that this condition should hold for all or even most publicly provided goods.

Here, an important distinction between mere individual equity concerns and reciprocity has to be made. The condition $\partial\phi/\partial e > 0$ can plausibly be fulfilled in very small groups, where the individual evasion activity matters directly and to a quantitatively relevant degree for the collective outcome. It is, however, also fulfilled in large societies if the individually perceived inequity is corrected by only increasing the individual evader's welfare, without reducing perceived inequity for society as a whole. This distinction is important: Both a purely self-interested individual in the Cowell (1992) model and a reciprocally minded individual will increase their evasion activity as a response to increased inequity if one of the two above conditions is fulfilled so that $\partial\phi/\partial e > 0$. If, however, a large society exists with $\partial\phi/\partial e = 0$, then Cowell (1992) cannot explain increasing tax evasion (tax morale) as a response to decreasing equity (inequity) – but a model based on reciprocity could.

A very important question is therefore what the true relationship between ϕ and e is, because this relationship indicates what kind of fairness benchmark individuals use in their decision-making. Individuals who are only concerned about being treated fairly themselves can, starting from a perceived unfair situation, increase fairness in their own relationship with the public sector and with other taxpayers by improving their own welfare, and only their own welfare, and even at the expense of other individuals. In contrast, those who care about a

societal measure of fairness and who decide behind a veil of insignificance in a large society cannot expect to improve the fairness measure by evading taxes. How self-centered is the fairness concept that is usually employed, then? Not too surprisingly, the empirical evidence suggests that both fairness measures matter, with the above cited work by Charness and Rabin (2002) being one contribution that emphasizes the relevance of motivations concerned with social welfare.

The intuition that taxpayers use tax evasion to restore equity if they perceive to be treated personally unfair is for example corroborated by experimental evidence reported by Fortin et al. (2004). They find that individuals who are themselves taxed at a higher rate than the mean tax rate for their reference group tend to increase evasion if the gap between their and the mean tax rate increases. On the other hand, Crane and Nourzad (1986) find for US data that inflation has a positive impact on tax evasion. Suppose that this does not only reflect an attempt to counterveil “cold progression”, but that there is an equity effect at work here, i.e. that taxpayers are disgruntled with a state that cannot supply stable money. Certainly, tax evasion can do nothing directly to put an end to this unfair state of affairs, i.e. $\partial\phi/\partial e = 0$ in this case. In contrast, a reciprocal motive, the wish to punish the government that is perceived to be responsible for inflation, may still be at work. In a similar vein, a very interesting finding by Weck-Hannemann and Pommerehne (1989) for Swiss cantonal data suggests that political participation rights of citizens (e.g. in the form of direct democracy) have a negative impact on tax evasion (see also Feld and Tyran 2002 for experimental as well as Kucher and Götte 1998 for field evidence in this regard). Related to this, Torgler (2003) reports evidence that tax morale increases with trust of individuals in the procedures of political decision-making in their polity.

Generally, it may therefore not only be reasonable to distinguish between reciprocally minded and purely self-interested individuals in

theoretical reasoning, but also to also distinguish between those reciprocally minded individuals who have a self-centered and those who have a society-centered fairness benchmark guiding their judgments on equity. In order to keep matters simple, we will however in the following discussion employ a modeling approach to tax evasion where only $\partial\phi/\partial e = 0$ matters. In contrast to models and experiments concerned with reciprocity in small groups of sometimes only two members, it should be warranted to make this simplifying assumption for an issue like tax compliance. If we observe a situation where few people honestly pay their taxes while many taxpayers cheat, then this unfair situation will not change substantially into the direction of fairness due to our decision to negatively reciprocate by cheating also. On the contrary, if we expected that some taxpayers still remain honest in the next round, we might even expect to increase the overall unfairness of the situation.

3. MODELING TAX EVASION WITH VERTICAL OR HORIZONTAL RECIPROCITY

3.1. Vertical reciprocity. By the term vertical reciprocity, we denote the tendency of individuals to make evasion decisions conditional on the fiscal policy parameters set by the government. This, however, is not trivial, since standard modeling techniques yield results that are not in line with empirical evidence. For example, it is a well-known result of the Allingham-Sandmo model that with declining absolute risk aversion, the effect of an increase in the tax rate on evasion is ambiguous, due to counterveiling income- and substitution effects. Yitzhaki (1974) has even shown that an increased tax rate leads to unambiguously less tax evasion if the penalty tax of detected evaders depends on evaded taxes (and not on income concealed) – in this case, the substitution effect vanishes. Cowell and Gordon (1988) investigate if incorporating public good supply in a standard model of tax evasion leads to more intuitive, and more empirically reasonable results. However, they show that raising the tax rate to increase the quantity of supplied public

goods will still lead to lower evasion if public goods are oversupplied in the *status quo ante* and to higher evasion if they are initially under-supplied. In other words, moving towards the preferred level of public goods increases tax evasion, and moving away from it decreases it. The rationale is again that individuals become more willing to take the risk of evasion if fiscal policy provides them with a higher utility.

In an extension of the Cowell-Gordon framework, Bordignon (1993) even argues that taxpayers will never evade if the supply of public goods is below the pareto-efficient level. Despite all the theoretical coherence and elegance, these propositions are still at odds with the vast number of empirical and experimental studies that indicate rising evasion with rising tax rates and declining public good levels (Andreoni et al. 1998). Furthermore, experimental evidence suggests that it is not a pure feeling of guilt, stemming from the perception that evasion is wrong, that deters honest individuals from evading taxes. Rather, it appears that indeed the connection of paying taxes with receiving public goods in return is relevant for inducing compliance (Alm et al. 1992).

3.1.1. *The basic approach.* Following the fairness model of Falkinger (1995), let the utility of a taxpayer be represented by a function

$$U = u(c - v(\phi)) \tag{1}$$

with $u' > 0$ and $u'' < 0$. Here, c is the disposable income, which is determined through a tax evasion lottery with

$$\begin{aligned} c_1 &= y \cdot (1 - \tau) + e \cdot \tau \\ c_2 &= y \cdot (1 - \tau) - e \cdot \tau \cdot s \end{aligned}$$

where y is the taxpayer's gross pecuniary income, p is the probability of detection, τ is the uniform rate of a flat income tax, s is a penalty tax to be paid by detected evaders and e denotes, as above, some amount $0 \leq e \leq y$ of income concealed from the tax administration. With the function $v(\phi)$ for which $dv/d\phi > 0$ always holds, the willingness

to cooperate enters the taxpayer’s calculus. In accordance with the empirical evidence on reciprocity discussed above, we can interpret v as an individual guilt function: With increasing perceived fairness, tax evasion becomes less attractive to a reciprocally minded individual; evading would be ad odds with her general motivation to honour her obligations as long as these obligations are perceived as legitimate. The taxpayer thus solves

$$\max_{0 \leq e \leq y} (1 - p) \cdot u(c_1 - v(\phi)) + p \cdot u(c_2 - v(\phi)) \quad (2)$$

for an optimal level of tax evasion $e^* = e^*(y, p, \tau, s, \phi)$. As Falkinger (1995) shows, for such a model specification we will always have $\partial e^*/\partial \phi < 0$. Note that ϕ matters only to the taxpayer if he evades – in this case, his utility is diminished by $v(\phi)$, and his decision-making shifts into an area of his utility function with higher absolute risk aversion. Straightforwardly, he evades less. The simple, but important difference to the Cowell framework is thus the assumption that here, equity enters the utility function not as a good, but as a “bad”, because equity in combination with cheating evokes guilt.

Of course, it could be argued that guilt as a result of non-cooperation does not accurately capture reciprocity, or that a correct notion of reciprocity should rest on a taste for fairness. Such a dispute would, in essence, be about the correct reference point for reciprocal decision-making. In the above depicted case, cooperation evoked by guilt in case of defection is the default choice, and the non-cooperation of others reduces guilt. In a different approach, pure self-interest could be default option, and due to a preference for fairness, positive reciprocity would lead away from self-interest. From a behavioral perspective, both approaches ought to be more or less equivalent. From a modeling point of view, the former approach can more easily be integrated into a tax compliance model.

3.1.2. *Two stylized facts: Perfect compliance and the impact of the tax rate.* But how does this approach fare with regard to the other stylized

facts of the empirical literature on tax compliance? Given that guilt matters only for cheaters, not only the marginal calculus is relevant, but also a comparison of different states of the world. Let c_i^* with $i = 1, 2$ denote the disposable incomes in case of optimal evasion e^* according to (2). Then the taxpayer also has to make the choice whether to evade or not, and if

$$u(y \cdot (1 - \tau)) > (1 - p) \cdot u(c_1^* - v(\phi)) + p \cdot u(c_2^* - v(\phi)) \quad (3)$$

holds, she has an unambiguous preference not to evade. Since the value of the right hand side of the inequality decreases unambiguously with $v(\phi)$, there must exist some level of guilt \hat{v} where complete non-evasion is the strictly preferred action for any $v(\phi) > \hat{v}$. In other words, the empirical observation that some individuals never evade is consistent with the approach if individuals in a population are heterogenous in their propensity to feel guilt in case of tax evasion. One class of v -functions consistent with the evidence is of the form

$$v(\phi) = \alpha \cdot \nu(\phi) \quad (4)$$

where $\nu(\phi)$ is an arbitrary, strictly increasing function with $\nu(0) = 0$ that is identical for all taxpayers, and α is an individual multiplier distributed over an interval $[\underline{\alpha}, \bar{\alpha}]$ with $\underline{\alpha} > 0$. Using α as a multiplier ensures that for sufficiently low values of ϕ , even the most honest taxpayer with a very high value of α will begin evading taxes. Furthermore, the individual levels of α in this initial distribution ought to be understood as “natural” propensities to feel guilty that may for example result from an individual’s upbringing. As we will see later in Section 4, these individual propensities can change if the individual observes decisions of other taxpayers. In other words, the initial value of α should be interpreted as the propensity to feel guilt if all other taxpayers are honest. If the taxpayer discovers dishonesty among other taxpayers, he will adjust his own tendency to feel guilt accordingly.

With regard to the empirical observation that usually $\partial e^*/\partial \tau > 0$, the model has *prima facie* the same problems as the Allingham-Sandmo-Yitzhaki model – the effect of a change of τ seems to be ambiguous due to an interaction of an income and a substitution effect. However, it is very unlikely that ϕ is independent of the tax rate. Since ϕ characterizes the perceived fairness of the relationship between taxpayer and government, it must depend on the policy parameters chosen by the government, with the quantities of public goods and the tax rate being the most prominent political choices to be made. Whenever $\partial \phi/\partial \tau < 0$, the income effect that is responsible for the counterintuitive results of the ASY-model is directly countered by a fairness effect. If the reduction of a taxpayer’s guilt as a response to an increase of the tax rate is sufficiently strong, it will (possibly together with the substitution effect) overcompensate the income effect. Once again, the value of the parameter α of a single taxpayer is important: If α assumes a relatively high value, the condition for an intuitive response to increased tax rates is likely to be met.

The interpretation of this result may be somewhat surprising, because it implies that a reasonably strong feeling of guilt entering the taxpayer’s utility function is necessary to unequivocally explain a result that a reader not familiar with the issues would probably associate with simple self-interested behaviour. It also implies that if for some reason the tendency of taxpayers to associate guilt with tax evasion was diminished, we would converge towards the counterintuitive results of the ASY-model. We will return to this issue in greater detail below in Section 4.

3.1.3. *Fairness.* A likely criticism regarding this approach to modeling vertical reciprocity is that a model involving reciprocity should involve an explicit taste for fairness in the taxpayer’s utility function. Let (1) be modified such that

$$U = u(c - v(\phi), \phi) \tag{5}$$

with the assumption that $u(\cdot, \cdot)$ is strictly concave in both arguments. Furthermore, let the utility function be defined such that the direct effect of an increase in ϕ (without accounting for its effect on guilt) would *ceteris paribus* increase the willingness to take risks in the tax evasion gamble. In determining the net effect of a fairness increase on tax compliance, the value of α would again be crucial, since it determines the magnitude of the guilt effect vis-à-vis the effect on risk aversion. Taxpayers with a high value of α overcompensate the decreased risk-aversion with increased guilt and evade less; for taxpayers with a low value of α the opposite is true. With α being sufficiently large, the qualitative statements regarding the stylized facts do still hold, while individuals with a small enough propensity to feel guilt make decisions that are qualitatively akin to those predicted by the ASY-model. Incorporating an explicit positive utility from fairness is thus not at odds in principle with the approach pursued here.

Finally, some comments on the concept of fairness used here are also in order. For analytical reasons, it is convenient to restrict heterogeneity in the population of taxpayers to the guilt-parameter α . We therefore assume a Rawlsian concept of fairness, i.e., we propose that in thinking about policy, individuals are able to evaluate the policy parameters set by their government from an impartial point of view. In such a process of evaluation, not only policy outcomes, but also procedural criteria may matter. For example, I may consider a tax rate that I do not prefer personally nevertheless as fair if it is the result of transparent democratic decision-making, while I would not consider it fair if it was imposed through a dictatorial process. This leads to the assumption that there is some compact set of different policy parameters that are all considered as acceptable (as fair) under given, formal political institutions (see Schnellenbach 2006). The further the government deviates from this set, the more ϕ is deteriorated.

3.2. Horizontal reciprocity. Gordon (1989) assumes a psychological disutility stemming from being dishonest as a taxpayer, which is added to an Allingham-Sandmo model. In contrast to the “flat” guilt disutility used in our approach, Gordon’s disutility is assumed to rise proportionally with the concealed income. Gordon shows that his model can explain some of the stylized facts found in the empirical literature, in particular the fact that some people do not evade at all. Also, for individuals who are initially small evaders a positive relation between the tax rate and evasion is shown to exist – but only for small evaders. In a further step towards incorporating also horizontal reciprocity, Gordon adds a social custom component as an additional disutility from evading taxes; this component is assumed to rise with the fraction of other taxpayers who are known to be honest. For plausible parameter values, an interior equilibrium in which evaders and non-evaders co-exist is shown to exist.

A different model, by Bordignon (1993), assumes that taxpayers have an ethical disposition and determine a fair tax payment by asking themselves the question: What contribution would I wish all the others to make? This so-called Kantian tax burden is then corrected in reciprocal terms: The more the other taxpayers evade, the lower becomes the fair tax burden that a taxpayer assigns to herself, which generates an upper bound in his evasion decision. However, it is the Kantian rule that guarantees unambiguous results. In a pure reciprocity variant of the model, there are either multiple equilibria, or the unique equilibrium guaranteed by restrictions on the parameters has empirically doubtful implications: The rich never evade taxes, while the poor behave according to the Allingham-Sandmo model.

Myles and Naylor (1996) analyze a model that has social customs and a taste for conformity at its centre. Individuals either evade not at all, if they enjoy sufficient utility from adhering to the social custom of being honest taxpayers, or they behave like the ruthless evaders of the Allingham-Sandmo world. Myles and Naylor show that for each

individual, there exists a threshold fraction of evaders in the population where they begin to evade themselves, as the utility from being a conformist decreases with this fraction. They then go on to analyze the social dynamics of tax evasion, and show that depending on parameter values, there may be equilibria with full evasion, no evasion at all, or some interior fraction of individuals who behave as unscrupulous tax evaders.

These contributions illustrate some of the difficulties that are associated with modeling horizontal reciprocity in tax evasion; in particular the difficulty of finding empirically relevant conditions for the different equilibria to be reached. If we define horizontal reciprocity in a very narrow sense, it predicts only that the evasion decision of one taxpayer will be conditional on those of all other taxpayers. It then becomes immediately clear that employing the solution concept of a Nash equilibrium, as Bordignon (1993) does, is somewhat problematic. Suppose that for any individual taxpayer i in a population of N taxpayers with (to simplify) identical pre-tax incomes we have $\partial e_i^*/\partial \bar{e} \geq 0$ where $\bar{e} = \sum_{j \neq i} e_j^*/(N - 1)$. Obviously, any symmetric state of affairs with $e_i^* = e^*(\bar{e}) \forall i$ would be an equilibrium – but it is doubtful that N taxpayers could coordinate on any e_i^* , especially since tax evasion will usually be a rather clandestine activity. While it is quite likely that a taxpayer can receive some information *ex post*, e.g. on the approximated overall evasion activity in his jurisdiction in the past fiscal year, coordination on one of multiple Nash equilibria *ex ante* is an entirely different issue.

Suppose, then, that instead of coordinating on some Nash equilibrium *ex ante*, individuals adapt at any time t to the information on \bar{e}_{t-1} that they by assumption receive at no cost, such that $e_{it}^* = e^*(\bar{e}_{t-1})$. Clearly, the system is potentially unstable. The necessary condition for an equilibrium for each single individual is that $e_{it}^*(\bar{e}_{t-1}) = e_{it-1}^*(\bar{e}_{t-2})$. In other words, as long as the functional relationship $e_i^*(\cdot)$ is constant in time, only a stable evasion activity of all other individuals would

secure an equilibrium for a single taxpayer, and of course for the model economy as a whole: There is no stable individual equilibrium level of tax evasion without a stable societal level of tax evasion. But how could the functional relationship between an individual's own evasion activity and that of the rest of the population reasonably look like? There are three economic conditions that are straightforward:

- (1) $e_{it}^*(0) \geq 0$. A single taxpayer who has a reasonably low guilt parameter α would decide to evade some arbitrarily small amount, even if all others would not evade at all. In other words, the horizontal fairness considerations for him do not dominate the entire decision-making on tax compliance. This assumption is consistent with the empirical and experimental evidence discussed in Section 2, which indicates that reciprocal cooperation is not perfect cooperation, but that self-interested and reciprocal motives interact. However, individuals with very high levels of guilt are known not to evade at all. For these individuals, we have $e_{it}^*(0) = 0$. For them, a positive number of other taxpayers has to evade in order to reduce their value of α , and to induce them to evade taxes themselves.
- (2) $e_{it}^*(e^{max}) < e^{max}$. A single taxpayer who observes that all other taxpayers evade the maximum amount (where e^{max} is reasonably determined as the evasion activity in a completely amoral ASY-model) will conceal strictly less than this maximum amount. There is some autonomous, and maybe very small, degree of morality that does not depend on the behaviour of fellow taxpayers.
- (3) $e_{it}^*(\bar{e}_{t-1})$ is strictly increasing in the average amount of income concealed by all other taxpayers if the first condition hold with strict inequality. If it holds with equality, there is some positive interval of evasion levels of other taxpayers where i does not yet evade and $\partial e_{it}^*/\partial \bar{e}_{t-1} = 0$. But some reciprocal punishment of a cheating population of other taxpayers is always taking place.

These simple conditions suffice to broadly characterize horizontal reciprocity in the relationship between taxpayers. In the following section of the paper, we will discuss how both types of reciprocity interact.

4. THE INTERACTION OF VERTICAL AND HORIZONTAL RECIPROCITY

A possible interaction of horizontal and vertical reciprocity in taxpayers' decision-making on tax evasion has already been discussed in a simulation model by Pommerehne et al. (1994). They analyze a rather complex structural model in order to compare evasion behaviour under direct and under representative democracy. They assume a heterogeneous population with individuals who are motivated by civic duty and are therefore (at first) honest taxpayers, while a minority of purely self-interested individuals always evades. Individuals who are initially honest can react to observed evasion of the minority and to a resulting divergence from optimal public good supplies by refusing to cooperate themselves. A downward spiral of tax compliance can be prevented by choosing appropriate deterrence and enforcement policies, and it is assumed that this process is more reliable under direct than under representative democracy. Accordingly, Pommerehne et al. predict that direct democracies will be characterized by lower levels of tax evasion.

Since Pommerehne et al. analyze a very special case, with a focus on the choice of tax enforcement policies under different institutions of collective decision-making, the somewhat higher degree of generality of the present paper hopefully offers some added value. The three conditions for the existence of a stable, interior equilibrium with horizontal reciprocity are a good starting point for bringing the two types of reciprocity in tax compliance together. The third condition states that a taxpayer wants to evade more, once the other taxpayers reduce their tax compliance. For psychologists who consider themselves with guilt, it is obvious that guilt is typically caused by "*infliction of harm, loss, or distress on a relationship partner*" (Baumeister et al. 1994, p. 245).

In our case, the relationship partners are the other taxpayers, whom, if they were honest, we would cheat if we decided to evade taxes. In this sense, it appears to be natural to assume that the guilt function $v(\phi)$ not only depends on the perceived fairness of the government's fiscal policy, but also on the evasion activity of fellow taxpayers. We can therefore modify (4) to

$$v(\phi, \bar{e}) = \alpha(\bar{e}) \cdot \nu(\phi) \quad (6)$$

with $\partial\alpha/\partial\bar{e} < 0$ and $\alpha > 0\forall\bar{e}$. The solution of the maximization problem (2) now becomes

$$e^* = e^*(y, p, \tau, s, \phi, \bar{e}) \quad (7)$$

and what we have simply postulated in Section 3.2 is now shown to be consistent with individual utility maximization. An increased intensity of tax evasion in the population reduces the impact of the vertical reciprocal relationship (i.e., the impact of the fairness measure). With a lower fixed cost of tax evasion in terms of guilt, the resulting income effect renders the taxpayer less risk averse and increases her propensity to evade taxes.

For those individuals whose “natural” initial value of α was already low enough for inequality (3) not to hold, we accordingly have $\partial e_{it}^*/\partial \bar{e}_{t-1} > 0$ over the entire range of feasible values of \bar{e}_{t-1} . By definition, the first condition of Section 3.2 is also fulfilled by these individuals – after all, they have already evaded taxes even before their feeling of guilt was reduced through receiving information on the evasion behaviour of other taxpayers. Finally, the second condition is met by the (relatively innocent) assumption that $\alpha > 0$ always holds. This implies that the individual susceptibility for guilt may become arbitrarily close to zero, but never vanishes completely.

Matters are a bit more complicated for those individuals, whose “natural” level of α is so high that inequality (3) holds for them, implying that they do not evade taxes initially. For them, the first and third conditions do not necessarily hold, because there might exist a

range of tax evasion activities in the population where for these individuals, $\partial e_{it}^*/\partial \bar{e}_{t-1} = 0$ simply because the costs imposed by guilt are still sufficiently high to deter them from tax evasion altogether. For these individuals, we might find a situation that even when they start to evade, they evade consistently less than the average evasion activity of the rest of the population.

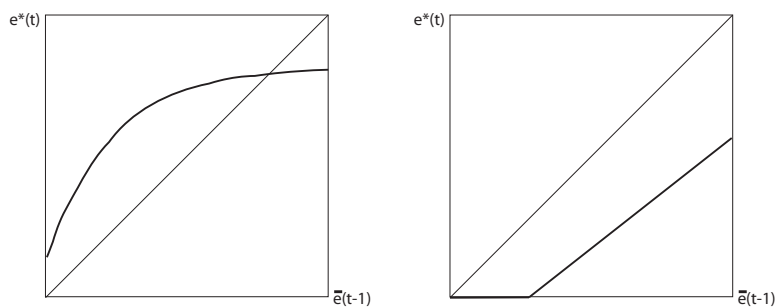


Figure 1: *Examples of horizontal reciprocity for taxpayers with normal (left) and extremely high (right) initial levels of α*

In Figure 1, two examples are shown to illustrate the discussion of different types of tax evaders. On the left the reaction function to levels of \bar{e}_{t-1} for a typical tax evader is shown, who always evades some of his income. On the right, a possible reaction function of a taxpayer with a very high “natural” level of α is shown. With increasing evading activities in the population as a whole, the guilt-factor α is diminished for both individuals and they increase their evasion activities, but the right taxpayer starts evading only when α is lower than a threshold value. It may be the case that, as we see here, the resulting reaction function of such an individual never intersects with the the 45-degree-line, which illustrates that this taxpayer does always want to evade less than the average taxpayer.

At this point, a cautioning remark regarding the equilibrium of the economy appears to be in order. Note again that the 45-degree-line in the two diagrams above is *not* an equilibrium condition, but is only there to illustrate whether an individual taxpayer reciprocates by evading more or less than the average of the other taxpayers. The existence of a stable equilibrium for society as a whole that is actually reached by the adaptive process described here can, unfortunately, not be guaranteed. To illustrate this point, suppose that at $t = 1$, all individual decisions on tax evasion determine a value for \bar{e}_1 . In a population that is heterogenous with regard to α , the responses to \bar{e}_1 may differ between individuals; for example, their respective local attractors might induce individuals 1 and 2 to choose $e_{12}^*(\bar{e}_1) > \bar{e}_1$ and $e_{22}^*(\bar{e}_1) < \bar{e}_1$. The relative magnitude of the adjustments of 1 and 2 might, however, be reversed in the next period – and the result would be an oscillating overall intensity of tax evasion for society as whole.

Even without having secured existence of a societal equilibrium, we can make some unambiguous, but also some ambiguous predictions regarding the effect of government policies on tax compliance.

- (1) An increase of the probability of the deterrence parameters p and s will always lead to a decrease of aggregate tax evasion, since those who do evade taxes will always react by shifting their reaction function to \bar{e}_{t-1} downward: They want to evade less themselves for any intensity of tax evasion in the rest of the population.
- (2) An increase of taxpayers' incomes y will always increase tax evasion on aggregate. Taxpayers become more willing to take risks, so that those who already evade now prefer higher levels of evasion for and \bar{e}_{t-1} and some of those individuals who have been perfectly compliant before may now find it worthwhile to take part in the evasion lottery.

- (3) If $\partial\phi/\partial\tau = 0$, the effect of a change of the tax rate is ambiguous or even counterintuitive as in the ASY-model. Only if individually felt guilt deteriorates with an increasing tax rate, and if this effect is sufficiently large, do individual taxpayers react with an increase of tax evasion to a heavier *de jure*-tax burden. Another important relationship in this regard is that between α and $\nu(\phi)$. Obviously, the higher the individual guilt-factor, the larger is the impact of a change of perceived vertical fairness. In fact, the more the deterioration of horizontal fairness has already diminished the individual levels of α , the more likely we will observe counterintuitive effects of tax rate changes. This leads to a more general point
- (4) The taxpayers' ability (or willingness) to negatively reciprocate against the government if it imposes unfair policies rises with the value of their guilt factor, i.e. with horizontal fairness.

The fourth statement might appear as very counterintuitive at first sight. It stems from the fact that individuals never employ an irrational reciprocal reaction. There is an upper bound to the evasion activity of individuals, and it is given by the rational magnitude of evasion in the ASY-model. The feeling of guilt induces what is commonly called tax morale, it leads individuals to evade less than they would evade in the morale-free world of the ASY-model, and this can be used as a reserve from which a taxpayer can reciprocate against other taxpayers, or against the public sector. This rules out costly punishment, as it is often reported in the experimental evidence e.g. from ultimatum games, as discussed in Section 2. And the reason is that costly retaliation against the public sector beyond the amount evaded in the ASY-model is not possible. If a taxpayer evaded more than the morale-free rational amount, he decreases his own expected income, and he increases the expected income of the public sector, in particular from expected penalty taxes. In other words, evading more would not evoke punishment, but gratification. Only a taxpayer influenced by guilt and morality, who

initially evades less than an ASY-taxpayer, can retaliate against the public sector at all.

This leads to another, interesting implication of the model. Suppose that the initial, “natural” distribution of α shifts to the left due to some exogenous shock, which would depict a sudden reduction of the propensity to feel guilty in the entire population of taxpayers. This would lead both to an increase of tax evasion for the population as a whole, and it would decrease the ability of taxpayers to reciprocate against the public sector in the future. If something crowds out the initial goodwill of the taxpayers, this has therefore not only straightforward fiscal implications, but it has also implications for the relationship between the taxpayers and the government – it reduces the possibility to discipline the government in the future. Several possible influences on this initial goodwill come to mind, such as social capital and trust, which are both magnitudes that become increasingly researched by economists. Having a detailed look at such possible relationships will, however, be a matter of future research.

5. CONCLUSIONS

In this paper, we have sketched the interaction of two types of reciprocity in the decision-making tax evasion. Having criticized the application of a Nash equilibrium to a multiple equilibrium setting with massive coordination problems such as tax evasion, we have instead proposed a simple, adaptive rule according to which individual taxpayers reciprocate vis-à-vis an evading population of fellow taxpayers. We have argued that, even without having a formal equilibrium, the signs of the impacts of political measures on the magnitude of tax evasion can be identified.

Furthermore, we have argued that the feeling of guilt by taxpayers is crucial as a precondition for vertical reciprocity. Taxpayers who do not behave morally when they are treated fairly (which could also be

catagorized as positive reciprocity) have no means to retaliate against the public sector when they become treated unfairly. Obviously, the present paper can only be seen as a first step towards incorporating results from the vast literature on reciprocity into theoretical reasoning about tax compliance. Further steps could, for example, be the modeling of endogenous decision-making in the public sector under conditions of reciprocal tax evasion, or further research into the sources and determinants of the individual propensity to feel guilt when evading taxes.

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