Tax evasion and orders of risk aversion

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Abstract

The classic Allingham and Sandmo’s (Journal of Public Economics, 1 (1972) 323–338) portfolio choice approach to income tax evasion has been increasingly criticised because it requires an ‘excess’ degree of risk aversion to explain the observed rate of tax compliance. In this paper we argue that there may not necessarily be ‘excess risk aversion’; and that the evidence can be explained by the distinction between orders of risk aversion, as defined by Segal and Spivak (Journal of Economic Theory, 51 (1990) 111–125) and considered in regard to the same problem of anomalous ‘excess risk aversion’ in financial and insurance markets. © 1998 Elsevier Science S.A.

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1. Introduction

Evading tax is like gambling. This was the central intuition of Allingham and Sandmo (1972) in their seminal paper on income tax evasion. The idea has since been extended in various directions (Cowell (1990) has a comprehensive survey of the literature). Nonetheless, there are still some well-known facts about income tax evasion that the portfolio approach seems unable to explain.

Perhaps the main difficulty of the approach is its failure to come to terms with the rate of tax compliance documented in many countries, by surveys and
Consider a taxpayer who must decide how much income to report to the tax authorities. He knows that with some probability $p$ his declaration will be audited. If audited, then all his unreported income will be discovered and he will have to pay a penalty at rate $s$ on each dollar that he should have paid in tax but did not. Thus, for every dollar of tax evaded the taxpayer can expect, on the average, a return of $E(r) = 1 - p - ps$ dollars.

The fiscal systems of most countries imply values of $E(r)$ typically greater than zero — in the range of 0.99 to 0.75 (see e.g. Skinner and Slemrod (1985) and Section 3 below for a detailed discussion). But since Allingham and Sandmo (1972) we know that whenever the expected return per dollar of evaded tax is strictly positive, a risk-averse taxpayer, with a differentiable von Neumann-Morgenstern utility function, will always under-report his income. Thus, according to the model, it would seem that all taxpayers evade some of their taxes, a prediction clearly contradicted by intuition as well as by empirical evidence.

To explain the apparent paradox, researchers have often appealed to stigma, ethical norms, or moral sentiments (e.g. Gordon (1989), Bordignon (1993) and Erard and Feinstein (1994)). While we acknowledge the importance of most such non-pecuniary determinants for a comprehensive descriptive model of compliance decision, we would stress that the evidence is nevertheless consistent with an excessive tendency to play safe which affects behaviour in financial and insurance markets too.

One very famous example demonstrating such tendency is the so-called ‘equity premium puzzle’, pointed out by Mehra and Prescott (1985), who have shown that a representative agent, expected utility model, should have a coefficient of relative risk aversion around 30 to account for both the 0.8% average real return on treasury bills and the nearly 7% average real return on equity that the US data show for the period 1889–1978. Previous estimates and independent theoretical arguments, however, indicate that the actual value for the coefficient of relative risk aversion is between 1 and 2 (see e.g. Epstein (1992) and references cited therein). With a coefficient of 30, in particular, a person with a level of non-stochastic wealth of (say) $75,000, would be willing to pay the unbelievably large premium of $23,791 to avoid the gamble of winning or losing $25,000 with equal probability. More generally, Epstein (1992 p. 11), has shown that an expected utility model implies either enormous risk premiums for large gambles, when the coefficient of constant relative risk aversion is unrealistically high, or almost zero premiums for moderate risks, when the coefficient is within reasonable bounds. With a coefficient of 2, for example, a person with an initial wealth of $75,000 would pay only $0.85 to avoid the symmetric gamble $\pm$250.

As proved by Segal and Spivak (1990), the latter case can be explained by the restriction imposed by the assumption of differentiability of the expected utility

1Examples of such empirical research include Graetz and Wilde (1985), Skinner and Slemrod (1985), Alm et al. (1992) and several others among whom those cited in Cowell (1990).
functional, which implies that for small risk the utility function is approximately linear, hence neutral towards risk. On the other hand, Segal and Spivak (1990) show that if the preference functional is not differentiable near certainty, more risk averse behaviour can be accounted for, including that consistent with the observation that individuals sometimes prefer certainty to a gamble, even when the odds of the gamble are clearly better than fair.

In this paper, we apply the Segal and Spivak (1990) analysis to resolve this puzzle of taxpayers complying more than conventional theory would suggest. In their study, they distinguish between risk aversion of the order 2, which exhibits conventional differentiability of the utility function everywhere, and risk aversion of the order 1, which is not differentiable with respect to introducing small risks.\(^2\)

The difference between the two attitudes hinges on the distinction between the expected utility model and the literature on non-expected utility theories (recent review in Karni and Schmeidler (1990)), supported by an ever-growing body of experimental evidence (see Camerer (1995)). That some criticisms of the classic expected utility theory could help to explain compliance behaviour has sometimes been anticipated (e.g. Cowell (1990), Alm et al. (1992) and Erard and Feinstein (1994)). Not all non-expected utility models quoted in the early studies, however, display first-order risk aversion. In fact, after having shown in Section 2 how the Segal and Spivak (1990) results easily extend to tax evasion, in Section 3 we make a clear distinction between generalisations of expected utility which can be used to solve the puzzle of tax compliance and those which cannot. A brief final section summarises and draws conclusions.

2. The general model

Following Allingham and Sandmo (1972), we consider a taxpayer with income \(W\), which is unknown to the tax collector. The taxpayer must decide how much income \(X\) to report, knowing that on the reported income he will have to pay tax at a flat rate \(\theta\) and also knowing that with some probability \(p\) his declaration will be audited. If audited, all his income will be known exactly by the authorities. The tax on any income \((W-X)\) found to have been concealed is subject to a higher rate \(\theta s\), with \(s\) strictly positive.

The taxpayer must decide whether and to what extent it is worth taking the chance of being caught and penalised. We now provide general conditions for full compliance, based on the new concept of orders of risk aversion as defined and considered in regard to anomalous risk aversion in financial and insurance markets by Segal and Spivak (1990).

\(^2\)Applications of risk aversion of the order 1 to resolve anomalies from the financial literature are discussed in Epstein and Zin (1990) (who have specifically analysed the equity premium puzzle), and in other studies quoted in Epstein (1992).
For this purpose, assume that individual preferences over random prospects are well-behaved. For a generic random variable $\varepsilon$ with $E(\varepsilon) = 0$, define $\pi(\varepsilon)$ as the risk premium a decision maker is willing to pay out of his non-stochastic wealth $W$, to avoid playing the lottery $W + \varepsilon$. By definition, the risk premium is positive whenever the decision maker is risk-averse. Consider now the risk premium $\pi(t\varepsilon)$ that the decision maker is willing to pay to avoid the risk $t\varepsilon$ with $t$ scalar. Clearly, $\pi(0\varepsilon) = 0$. We now assume that $\pi$ is continuously differentiable with respect to $t$, except perhaps at $t = 0$, where only side derivatives may exist. Following Segal and Spivak (1990) (see also Montesano (1991)), we define orders of risk aversion as the order of the first non-zero derivative of $\pi(\cdot)$ with respect to $t$ at $t = 0$.

**Definition.** The individual’s attitude towards risk is of the order 1 if for every non-trivial random variable $\varepsilon$ such that $E(\varepsilon) = 0$, $\partial \pi(t\varepsilon) / \partial t|_{t=0} \neq 0$. It is of order 2 if for every such $\varepsilon$, $\partial \pi(t\varepsilon) / \partial t|_{t=0} = 0$, but $\partial^2 \pi(t\varepsilon) / \partial t^2|_{t=0} \neq 0$.

Given the definition, we can now state the following result.

**Proposition.** Let the expected rate of return on a dollar of evaded tax $E(r) = (1 - p - ps)$ be strictly positive (or, $(1-p)/p > s$). If the taxpayer’s aversion is of the order 2, he will always evade some tax, that is $X < W$. If his aversion to risk is of the order 1, and if $E(r)$ is not too big, evasion may be zero, that is $X = W$.

Proof is omitted, since the more general original result is in Segal and Spivak (1990 p. 115). More interesting for our purpose is its diagrammatic interpretation. The region (O,A,B,C) in Fig. 1 shows the taxpayer’s budget set. The set

![Fig. 1. The tax compliance equilibrium and orders of risk aversion.](image-url)
consists of pairs of the form \((w', w'')\), representing the taxpayer’s income \(w' = W - 0X\) under the state ‘not caught’, which occurs with probability \((1 - p)\); and the income \(w'' = W(1 - 0) - (W - X)\delta\) under the state ‘caught’, occurring with probability \(p\). Point A along the certainty line is the case in which the taxpayer reports all income. Its coordinates are \((W(1 - 0), W(1 - 0))\). Point B is the case where the reported income \(X\) is 0. Its coordinates are \((W, (1 - 0 - 0)W)\). Thus, the slope of the boundary AB is \(-s\). This means that a taxpayer will make a positive evasion whenever the slope of his indifference curve at A (from right) is lower than \(-s\), but otherwise will report all his income.

The critical difference between second order and first order risk aversion in explaining tax compliance and models of first-order risk aversion is that under second order risk aversion the indifference curves are everywhere differentiable with slope along the certainty line equal to the slope of the actuarially fair market line \(- (1 - p)/p\); under first order risk aversion, on the other hand, the indifference curves have a kink at certainty, with \(-(1 - p)/p\) as the only supporting slope. Thus, if the taxpayer’s attitude is of the order 2 and \(-s > -(1 - p)/p\), the optimal decision is strictly between A and B, implying positive evasion; but if risk aversion is of the order 1, A may be the optimal point.

Second order risk aversion is consistent with a differentiable expected utility (EU, below) functional. To see this, note that for a typical gamble \((w'; 1 - p, w'', p)\) an EU maximiser with a von Neumann-Morgenstern utility index \(u\), has preferences given by \((1 - p)u(w') + pu(w'')\). Then, if \(u\) is everywhere differentiable, the slope of a generic indifference curve is given by \(-(1 - p)u'(w')/pu''(w'')\) (where \(u'(\cdot)\) indicates first derivative), which reduces to \(-(1 - p)/p\) along the certainty line where \(w' = w''\).

### 3. The puzzle of tax compliance and models of first-order risk aversion

In Table 1 we report some computations illustrating the importance of the distinction between second order and first order risk aversion for explaining compliance behaviour. The first column shows values for the audit probability in force in many countries, normally between 0.01 and 0.03; the probability 0.05 is an exceptional upper limit, whereas 0.09 is an average of USA taxpayers'
Table 1
Orders of risk aversion and the puzzle of tax compliance

<table>
<thead>
<tr>
<th>Audit</th>
<th>EU (second order risk averse)</th>
<th>EURDP (first order risk averse)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>Slope of indifference curves at certainty $a$</td>
<td>Slope of indifference curves at certainty $a$</td>
</tr>
<tr>
<td></td>
<td>$\left(-\frac{1-p}{p}\right)$</td>
<td>$\left[-\frac{1-f(p)}{f(p)}\right]$</td>
</tr>
<tr>
<td>0.01</td>
<td>99.0</td>
<td>7.4</td>
</tr>
<tr>
<td>0.02</td>
<td>49.0</td>
<td>5.0</td>
</tr>
<tr>
<td>0.03</td>
<td>32.3</td>
<td>3.9</td>
</tr>
<tr>
<td>0.05</td>
<td>19.0</td>
<td>2.9</td>
</tr>
<tr>
<td>0.09</td>
<td>10.1</td>
<td>2.1</td>
</tr>
</tbody>
</table>

$^a$Under each model, the absolute value of the slope of the indifference curves at certainty gives the minimum value of the penalty surcharge $s$ necessary to induce full compliance. In case of EURDP, $f(p)=1-(1-p)^{\gamma}/[p^{\gamma}+(1-p)^{\gamma}]$, with $\gamma=0.56$.

$^b$Under each model, $X$ is the optimal amount of reported income in case of a benchmark system with tax rate $\theta=0.3$ and penalty surcharge $s=3$, computed with an isoelastic utility function $u(w)=w^{1-\gamma}/(1-\gamma)$, where $\gamma=1.8$. ($X/W$ is its ratio to full income $W$).

$^c$Under each model, $C$ is the dollar amount which must be added to a fully compliant taxpayer’s income to make him as well off as if he cheated the optimal amount $X$. ($C/W$ is its ratio to full income $W$).

assessments of $p$, reported in a survey by Harris (1987), on which we comment below.

Under EU, full compliance arises only when the slope $-(1-p)/p$ calculated for the different audit probabilities is lower (in absolute value) than the penalty surcharge $s$. For example, with $p=0.01$, compliance requires a value of $s$ as big as 99; $p=0.03$ requires $s \geq 32.3$ and $p=0.05$ demands $s \geq 19$. In the USA, $s$ is around 0.5; in Italy it is 2. Higher values of $s$ sometimes arise because when a fraud is discovered some tax authorities extend their investigations several years into the past. The foregoing calculations, however, show that for values of $s$ well below two digits, EU predicts massive evasion, with all taxpayers under-reporting their income.

This is the puzzle of tax compliance. Although incontrovertible evidence on the extent of tax evasion is hard to obtain, it is clear that not everybody cheats: estimates from different countries and sources indicate that between 30% and 60% of taxpayers report (or attempt to report) their incomes correctly.

For the various audit probabilities, we have also calculated the percentage of the reported income as a fraction of the total (i.e. $X/W$) predicted by the EU model. We considered a benchmark tax system with tax rate $\theta=0.3$ and penalty surcharge $s=3$, and an isoelastic utility function $u(w)=w^{1-\gamma}/(1-\gamma)$ with the parameter of constant relative risk aversion $\gamma$ set equal to a value of 1.8, as a representative estimate from various sources (references in Karni and Schmeidler (1990) and Epstein (1992)). Then, we computed the value $X^*/W$ which maximises $1-$
Field evidence indicates that among the taxpayers who under-report their income, $X/W$ is between 60% and 80% (e.g. estimates quoted in Skinner and Slemrod (1985) and Cowell (1990)). The proportions predicted by the EU model are substantially lower (see Table 1): only 36.4% of true income reported when $p = 0.01$, 43.3% when $p = 0.02$, 47.6% when $p = 0.03$ and 55.4% when $p$ is as big as 0.05.

A further measure of the extent of the puzzle of tax compliance is provided by the dollar amount $C$ one must add to fully compliant taxpayers’ income to make them as well off as if they cheated the optimal amount. $C$ can then be considered the lower limit of the value which a taxpayer must place on non-pecuniary factors (like moral sentiments or stigma) for him to report all his income. For example (see Table 1), when $p = 0.01$ full compliance requires a value of moral sentiments equal to 21.6% of full income, 17.3% when $p = 0.02$, 14.3% when $p = 0.03$ and 10.3% when $p = 0.05$. These percentages appear extremely high if compared with those which might be expected as well as with estimates derivable from other sources.

It should be emphasized that these inconsistencies apply not only to EU, but to all preference functionals which, being second order risk averse, predict positive evasion whenever $E(r) = 1 - p - sp > 0$.

This is important for determining which theories on generalised expected utility might resolve the puzzle of tax compliance. These do not include, for example, the Machina (1982) famous generalised utility model nor the Chew (1983) weighted utility theory, which (see Segal and Spivak (1990)) display second order risk aversion under quite general conditions. Some theories, however, entail a first-order attitude.

One such model that may be relevant to tax evasion is expected utility with rank dependent probabilities (EURDP). Proposed by Quiggin (1982) and Yaari (1987), and then extensively analyzed by various authors (see Karni and Schmeidler (1990)), EURDP orders the outcomes of a lottery from the smallest to the largest; then a representation distorts probabilities according to the rank ordering of outcomes.

For gambles of the form $(w', 1-p; w'', p)$, EURDP gives values $\left[1 - f(p)\right]u(w') + f(p)u(w'')$ when $w' \geq w''$ and $f(1-p)u(w') + \left[1 - f(1-p)\right]u(w'')$ when $w'' > w'$, where $u$ is a standard von Neumann-Morgenstern utility index and $f: [0,1] \rightarrow [0,1]$ is a continuous, strictly increasing and onto probability transformation function. Thus, in terms of the diagram in Fig. 1, the slope of an indifference curve along the certainty line is $-f'(1-p)/[1-f(1-p)]$ from the left (i.e. for more specific, C solves for $(1-p)u(W-\theta X^*) + pu(W(1-\theta) - (W-X^*)\theta) = u(W(1-\theta) + C)$, with $u$ being the isoelastic utility function of the text.

For example, evidence on donations to charity and to other public goods documents levels of personal gifts normally in the range of 0.5% to 2% per year of the income of the donors (Jones and Posnett, 1993, p. 133).
and $w'' > w'$) and $-\left[1-f(p)\right]/f(p)$ from the right (for $w' \geq w''$). This latter, which is that relevant for analysing tax evasion, is flatter than $-\left(1-p\right)/p$, implying first-order risk aversion, whenever $f(p)$ is bigger than $p$ (or, alternatively, whenever $f(\cdot)$ overweights $p$).

Overweighting of small probabilities is consistent with well-known arguments from cognitive psychology (see e.g. Kahneman and Tversky (1979) and Karni and Safra (1990)), which suggest that a small change in probability has typically a bigger impact when it changes the state of an event from impossible to possible or from possible to certain, than when it occurs in mid-interval $(0,1)$. It is also consistent with a large body of experimental evidence based on pairwise choices between risky prospects (i.e. monetary lotteries with objectively given probabilities). Fig. 2 presents a weighting function obtained by Camerer and Ho (1994) fitting the parametric form $f(z) = 1 - (1-z)^\gamma / [z^\gamma + (1-z)^\gamma]^{\gamma/\gamma}$. On the basis of a very large set of experimental data from studies conducted by different people in various parts of the world, these authors estimated a 'representative agent best-fitting model' and found a cross-over point $f(z) = z$ near 0.7, with $\gamma$ centred around a value of 0.56.

Using their estimate, we computed the slope of the indifference curves along

\[ \text{Fig. 2. The weighting function obtained by Camerer and Ho (1994) fitting the parametric form} \]
\[ f(p) = 1 - (1-p)^\gamma / [p^\gamma + (1-p)^\gamma]^{\gamma/\gamma}; \gamma = 0.56. \]

\footnote{Other authors, including Hey and Orme (1994) and many of those cited in Tversky and Wakker (1995), have estimated similar parametric forms with similar fits. In comparing the various studies, however, note that the results are sometimes expressed in terms of a probability transformation function specified as $w(1-z) = 1 - f(z)$.}
the certainty line, as well as the ratios \( X/W \) and \( C/W \), predicted by the EURDP model. We believe that the figures obtained are very suggestive of the part which the model might play in solving the puzzle. Firstly, for full compliance to arise in this model are sufficient values of the penalty surcharge \( s \) much lower and much more consistent than those requested by EU: for example (see Table 1), when \( p = 0.03 \), a penalty surcharge of 3.9 suffices to generate full compliance here whereas 32.2 was necessary under EU; secondly, for our benchmark tax system (that with \( \theta = 0.3 \) and \( s = 3 \), but other parameters give similar qualitative results) the ratios of reported over full income, ranging from 74.5% (when \( p = 0.01 \)) to 100% (when \( p = 0.05 \)), also seem consistent with estimates from various countries; thirdly, and as an obvious consequence, within this model the importance of moral values (i.e., values of the ratio \( C/W \)) for explaining compliance behaviour is substantially reduced (only 3.3% when \( p = 0.01 \), 0.4% when \( p = 0.03 \) and 0 when \( p = 0.05 \) or above).

That the overweighting of small probabilities could help to solve the puzzle of tax compliance has sometimes been anticipated in the literature and also confirmed by independent experimental findings (Alm et al., 1992).

A second non-expected utility argument perhaps relevant to tax compliance decision notes that a taxpayer may have no objective knowledge of the actual audit probability. Erard and Feinstein (1994) have stressed the importance of the difference between the actual audit probabilities and the taxpayer’s estimates, and in particular of the latter being typically bigger than the former, in solving the puzzle of tax compliance. Even considering overestimation, however, EU seems generally unable to predict full compliance: with an overestimate of \( p = 0.09 \) (an average value reported in the survey by Harris (1987)), compliance requires a penalty surcharge as big as 10.1 (see Table 1); under EURDP, on the other hand, with a subjective assessment of \( p = 0.09 \), a penalty surcharge as low as 2.1 is sufficient to generate full compliance.

The application of the weighting function to subjective probabilities is not in contrast with the intuition of the model. In fact, when probabilities are not objectively known, there is an additional argument which may push in the direction of departures from EU. That is the aversion to the situation of ‘genuine’ uncertainty (of not knowing the actual audit probability), which, starting with Knight (1921), several authors have considered much more harmful for a decision

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7 We simply performed the same calculations computed for the EU model, with \( p \) transformed according to \( f(p) \).

8 Erard and Feinstein (1994 p. 78), discuss the psychological factors which may lie behind such overestimates. They suggest that ‘scenarios in which an audit occurs may come into a taxpayer’s mind disproportionately often as compared with scenarios in which an audit does not occur’ — causing the overestimation — due to the combination of strong emotions typically associated with being audited. ‘Overestimating’, however, is not the same as ‘overweighting’, as is demonstrated by much experimental evidence (including that on tax evasion, e.g. Alm et al. (1992)), which shows that people typically overweight probabilities even when these are objectively given.
maker than a condition of pure risk (where probabilities are objectively given). For example, Ellsberg (1961) has convincingly argued, and several experiments have confirmed (see Camerer (1995)), that people prefer to bet on an urn containing an equal number of red and black balls than on one which contains red and black balls in some unknown proportion.

In that respect, we emphasise that various models of behaviour under ‘uncertainty’ (able to solve the Ellsberg paradox) have been proposed in the literature, which are known to have important affinities with first order risk averse preferences, in general, and with EURDP theories, in particular. In addition, there is also some experimental evidence indicating that the overweighting of small subjective assessments for uncertainty is significantly more pronounced than the overweighting of small objective probabilities for risk (see Tversky and Wakker (1995) and references cited therein). So that, definitively, recognising that $p = 0.09$ refers to an estimate rather than an objective value, if anything, could require even more pronounced overweighting and make still clearer the solution of the puzzle of compliance behaviour.

4. Summary and conclusion

We started from Allingham and Sandmo (1972), who stressed that the risk of detection and punishment induces tax compliance. The problem with this approach, however, is that for plausible values of the fiscal parameters in most countries, the standard expected utility model cannot explain the rate of tax compliance, unless individuals’ aversion to risk far exceeds conventional hypotheses. Similar ‘excess risk-aversion’ has been reported in insurance markets, financial markets and in experimental studies.

In explanation, Segal and Spivak (1990) (see also Epstein and Zin (1990) and Montesano (1991)) apply a new definition of attitude towards risk — called risk aversion of the order 1 — which extends that implied by the expected utility model — called risk aversion of the order 2. The present paper has established how the same definition of risk aversion is also useful in the context of tax evasion. More specifically, calibrating first order risk averse preferences on parameters from empirical and experimental studies, and considering a ‘repre-

9Specifically, under genuine uncertainty, the tax evasion gamble takes the form $(w', S-E ; w, E)$, where $E$ represent the event ‘being audit’ and $S-E$ the event ‘not being audit’ ($S$ is the set of all states of the word). Various authors quoted in Karni and Schmeidler (1990) describe slightly different models of uncertainty aversion, which are however equivalent in valuing the above gamble as $(1 - \pi(E))\mu(w') + \pi(E)\mu(w)$ for $w' \geq w$ and $\pi(S-E)\mu(w') + [1 - \pi(S-E)]\mu(w)$ for $w' > w$, where $\pi$ is a non-additive probability measure on $S$ (i.e. $\pi(E) + \pi(S-E) \neq 1$). Under technical conditions (see, e.g. Karni and Schmeidler (1990, p. 1810)) there is a subjective additive probability measure $p$ on $S$, such that for any event $E$ in $S$, $\pi(E) = W(p(E))$, where $p(E)$ is the subjective additive probability of $E$ and $W$: $[0,1] \rightarrow [0,1]$ is a probability transformation function of the kind entailed in EURDP.
sentative’ set of fiscal parameters, we have shown that there is not an ‘excess’ rate of tax compliance; the latter appears instead quite consistent with individual behaviour towards risk as evidenced by the pricing of risk in financial and insurance markets (e.g. Epstein (1992)).

Our results shed doubt on the importance of social factors, like ethical norms or moral sentiments, in explaining observed rates of tax compliance. This does not mean that a taxpayer necessarily attaches no moral value to compliance. But it means that one need not appeal to moral sentiments or ethics to obtain compliance. The converse is not true, however: in particular, our computations show that one would need unrealistically high values of moral sentiments to generate tax compliance.

The first order risk averse preferences considered in our analysis are of the rank-dependent category and belong to the more general class of non-expected utility preferences (references in Karni and Schmeidler (1990)). But we have also shown that not all non-expected utility models display first order risk aversion and, therefore, not all can be used to explain the observed compliance behaviour. In this perspective, we finally note the lack of general consensus about how to model alternatives to the traditional EU theory. Recent experimental studies offer no firm conclusions, sometimes almost leaving the reader in doubt whether EU generalisations serve any purpose (e.g. Hey and Orme (1994)). We believe that applications along the lines developed in this paper can help researchers to select those models deserving of more serious attention.

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