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Guilt aversion in economics and psychology

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Abstract

We investigate whether the concept of guilt aversion in economics is related to the psychological characterization of the same phenomenon. For trust games and dictator games we report correlations between the guilt sensitivity measured within a framework of psychological games most common in economics and the guilt sensitivity measured using a questionnaire common in psychology (TOSCA-3). We find that the two measures correlate well and significantly in the two settings.

JEL Codes: A13, C91

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1 Introduction

In recent years there has been a growing interest among economists to better understand how emotions impact economic interactions. Many emotions in economics are modeled using psychological game theory and belief-dependent preferences (Geanakoplos, Pearce, and Stacchetti, 1989; Battigalli and Dufwenberg, 2009). One of the belief-dependent preferences is guilt aversion. Guilt averse individuals trade off their own well-being on the other hand and how much they let down others on the other hand, with the latter depending on their belief regarding others' expectations (Charness and Dufwenberg, 2006; Battigalli and Dufwenberg, 2007). Second-order beliefs – what individuals think others expect from them – thus play a central role in the economic analysis of guilt aversion.

Psychologists have a longer tradition in studying guilt and guilt aversion. Like economists, they have highlighted the interpersonal nature of guilt. E.g. Baumeister, Stillwell, and Heatherton (1994) refers to guilt as a feeling of distress that arises whenever one has caused harm on to somebody else or has violated a moral standard. Next to this, however, guilt might also arise in reaction to a situation in which one feels having received more than deserved or violated a moral standard even 'when no one is harmed or disappointed or knows about the incident' (Baumeister, Stillwell, and Heatherton, 1994, p. 246-247). Thus, notwithstanding its connection to the economic conceptualization, the psychological definition of guilt is broader as it more generally refers to an emotional state associated with the violation of an intrinsic moral standard. This moral standard may be related to the (expected) beliefs or outcomes of others, but not necessarily so. The psychological concept of guilt is often put in contrast to shame in that guilt may lead to the repair of the violation or a correction of future behavior whereas shame rather leads to withdrawal (see Tangney and Dearing, 2002, for a discussion).

Unsurprisingly, very distinct measures of guilt sensitivity have been developed in economics and psychology. Economists focus on studying how people respond to second-order beliefs in specific choice settings (see Charness and Dufwenberg, 2006). This research typically provides aggregate measures of guilt sensitivity for a given population.[2] The approach has re-

[2]Bellemare, Sebald, and Strobel (2011) present an analysis of the socio-economic determinants of guilt sensitivity measured at the aggregate level in a large-scale survey experiment conducted in the Netherlands. They find little

cently been extended to measure guilt sensitivity at the individual level (see Khalmetski, Ockenfels, and Werner, 2015; Attanasi, Battigalli, and Nagel, 2017; Bellemare, Sebald, and Suetens, 2017). Psychologists on the other hand have developed extensive questionnaires to measure guilt sensitivity at the individual level, including the Test of Self-Conscious Affect, hereafter TOSCA (Tangney, Dearing, Wagner, and Gramzow, 2000). TOSCA presents respondents with a series of scenarios including six possible emotional reactions on a five-points Likert scale. Feelings of guilt are one of these possible reactions, and the summation of the scale responses across all scenarios generates a measure of guilt sensitivity at the individual level. It remains an open question whether measures of guilt sensitivity developed in economics and psychology are at all related – the focus of our analysis.

Establishing a relationship between these two measures would lend wider credibility to the concept of guilt as defined in economics and provide new opportunities for the economic analysis of its socio-economic determinants. Measuring the economic concept of belief-dependent guilt sensitivity at the individual rather than the aggregate level offers direct information about its distribution in the population and thus more power to detect its correlates as compared to aggregate measurements. However, this approach is not always implementable because of the requirement to set up interactions between respondents as well as the need to measure the causal effect of higher-order beliefs. The psychological TOSCA measure on the other hand is simpler to implement in e.g. large representative samples because it does not involve interactions. If correlated, the latter can serve as a proxy for economic guilt sensitivity.

Our paper relates to Bracht and Regner (2013) (BR2013), in which choices by trustees in a Trust game are regressed on a set of explanatory variables including self-reported second-order beliefs and psychological measures of guilt aversion (TOSCA-3 and GASP). They find that these measures correlate significantly with choices in an intuitive way. Our study improves upon theirs in three respects. First, our dependent variable is economic guilt sensitivity at the individual level rather than the 'extent' of prosocial behavior (of trustees). The same extent of prosocial behavior can be hiding either a low guilt sensitivity combined with pro-social second-order beliefs or a high guilt sensitivity combined with less pro-social second-order be-

evidence that guilt sensitivity varies across the various socio-economic characteristics of relevant players.

liefs. Implicitly, the assumption in BR2013 is thus that economic guilt sensitivity is the same for all subjects. Neglected heterogeneity of economic guilt sensitivity (documented here) will likely be picked up by psychological measures of guilt aversion, exaggerating the effects of the latter. Second, in contrast to BR2013 our analysis does not suffer from possible endogeneity issues related to the self-reporting of second-order beliefs. Such a 'false consensus effect' is known to lead to an overestimation of the effect of second-order beliefs on choices in trust and related games (see Vanberg, 2008; Ellingsen, Johannesson, Tjötta, and Torsvik, 2010; Bellemare, Sebald, and Strobel, 2011; Bellemare, Sebald, and Suetens, 2017). Third, even absent the first two problems, joint significance of second-order beliefs and psychological measures of guilt sensitivity as variables that explain pro-social behavior does not necessarily imply that economic and psychological guilt sensitivities are correlated.

In this paper we use data that allow to identify economic guilt sensitivity at the individual level controlling for possible false consensus effects. We use these data to assess correlation with a psychological measure of guilt sensitivity (TOSCA-3). We explore correlation both when economic guilt sensitivity is measured in a binary Trust game or a binary Dictator game. We find that the two measures are significantly correlated: Spearman rank correlations are well above 0.2 in absolute value, and statistically significant in both sets of experimental games. We also find that economic measures of guilt sensitivity do not correlate with other emotional dispositions covered by TOSCA-3 (such as proneness to shame, externalization, detachment, and pride), a further indication that TOSCA-3 is able to capture fundamental elements of economic guilt which are conceptually different than alternative emotions. This paper thus complements recent efforts by economists to validate survey measures of preferences by establishing correlation with experimental decisions (see e.g. Falk, Becker, Dohmen, Huffman, and Sunde, 2016).

The organization of our paper is as follows. Section 2 presents our experimental design and procedures. Section 3 presents our experimental results. Section 4 concludes.

2 Methods and design

We use data from two experiments, namely a Trust game and a Dictator game, as well as data from a TOSCA-3 questionnaire that participants answered after completion of the games. The experimental data have been reported in our companion papers Bellemare, Sebald, and Suetens (2017) and Bellemare, Sebald, and Suetens (2018). Bellemare, Sebald, and Suetens (2017) use data from the Trust and Dictator games and focus on comparing different methods of studying the effect of second-order beliefs on behavior. Bellemare, Sebald, and Suetens (2018) use data from the Dictator game with the purpose of studying the effect of stakes on guilt sensitivity. We explain the decision-making part of the games in Section 2.1 and the elicitation of TOSCA-3 guilt proneness in Section 2.2.[3]

2.1 Economic approach to measure guilt sensitivity

Participants in the Trust game played a binary Trust game. They were randomly allocated to the roles of player A and player B at the start of the experiment. Participants in the role of A were asked to choose between playing *In* or *Out*. Participants in the role of B were asked to choose between playing *Left* or *Right*, conditional on the matched A choosing *In* and without knowing A's actual choice (strategy method). If player A chose *Out*, both players earned 20 points. If A chose *In* and B chose *Left*, A and B earned 30 and 32 points respectively. If A chose *In* and B chose *Right*, A and B earned 14 and 42 points respectively.[4]

Participants in the Dictator game played three consecutive binary dictator games. They were randomly allocated to the roles of player A and player B at the start of the experiment. We refer to the dictator as B and to the passive player as A. Participants in the role of B were asked to choose between playing *Left* and *Right*. In the first game, A and B earned respectively 48 and 50 points when B chose *Left*. A and B earned respectively 22 and 54 points when B chose *Right*. In the two other games, all payoffs were multiplied by 2 and 4 respectively.[5]

[3]Notice that the experimental data we use in the current paper are from what we have referred to as the *Menu* treatments in Bellemare, Sebald, and Suetens (2017).

[4]The conversion rate was as follows: 10 points = 40 DKK (about five Euros).

[5]Participants played the three dictator games in a random order and did not receive any feedback in between these decision situations. The instructions made clear that total payoff in experimental points would be equal to

The economic approach we used to measure guilt sensitivity in both games was the following. Participants in the role of A were asked to report their belief about B's choice; they were asked to indicate how many out of 10 B-players they believe will choose *Left*. In the case of the Trust game they were asked for the conditional first-order belief. Participants in the role of B were asked whether they would choose *Left* or *Right* for each of the 11 possible levels of belief of the matched A (see Figure A3 in the appendix). In the Trust game B was free to switch back and forth between both options for different levels of A's beliefs. In the Dictator game B was not allowed to switch back and forth but instead could switch at most once from *Right* to *Left* as beliefs of the matched A increased.[6] The choices of B were subsequently matched to the (first-order) belief of the matched A-players to determine the payoffs of both players.[7]

We illustrate the identification of guilt sensitivity using the model of 'simple' guilt introduced by Charness and Dufwenberg (2006) and Battigalli and Dufwenberg (2007). In this model, a guilt-averse B-player chooses *Left* if she believes sufficiently strongly that A would be let down by her choosing *Right* instead. More formally, let $\theta \geq 0$ denote the guilt sensitivity of player B, and $0 \leq \beta \leq 1$ the (mean) probability with which player B expects player A to expect her to choose *Left* (B's second-order belief).[8] Define π_j^i as the payoff of player i if player B chooses j with $i = \text{A, B}$ and $j = L, R$. A guilt averse B chooses *Left* if $\pi_L^B \geq \pi_R^B - \theta \cdot \beta \cdot (\pi_L^A - \pi_R^A)$, i.e. if $\beta \geq \frac{\pi_R^B - \pi_L^B}{\theta(\pi_L^A - \pi_R^A)}$. This condition implies that conditional on B's sensitivity to guilt θ, the second-order belief β plays a key role in determining whether B chooses *Left* or *Right*. Specifically, in case player B believes that A believes that no B-player chooses *Left*, there is neither guilt in choosing *Left* nor *Right*. As a consequence, given that $\pi_L^B < \pi_R^B$ in our experiment, a guilt averse player B chooses *Right* irrespective of her guilt sensitivity θ. On the other hand, at a second- order belief $\beta > 0$, whether a guilt averse player B switches from *Right* to *Left*

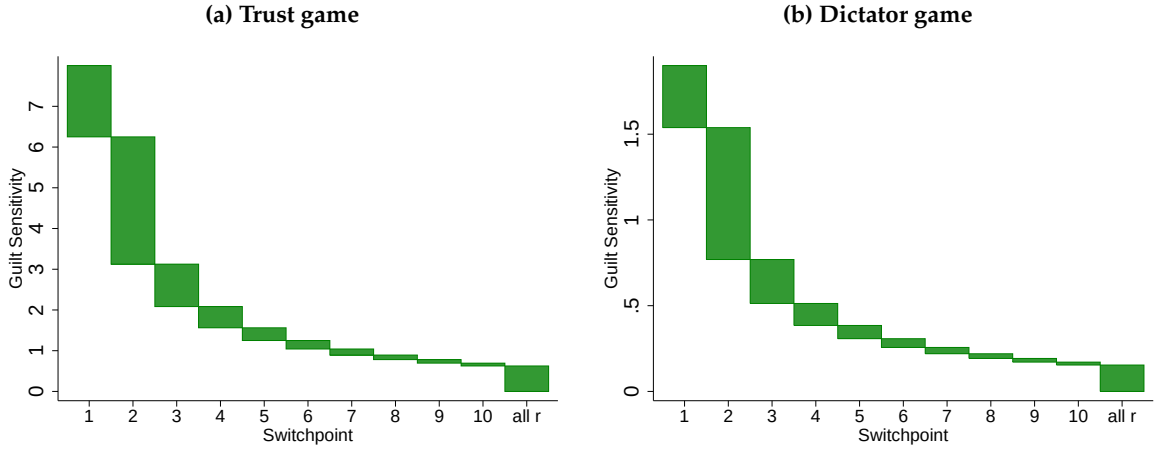
the sum of payoffs obtained across all games. The conversion rate was as follows: 10 points = 4 DKK (about half a Euro). Average earnings per hour were very similar to those in the Trust game.

[6]The motivation to allow for just one switch in the Dictator game was that this experiment was designed to structurally estimate how guilt sensitivity depends on stakes in the context of the model of simple guilt of Charness and Dufwenberg (2006) and Battigalli and Dufwenberg (2007) (see our companion paper Bellemare, Sebald, and Suetens, 2018).

[7]As we show in Bellemare, Sebald, and Suetens (2017), this elicitation method does not lead to significant differences in choices relative to a baseline treatment where second-order beliefs are self-reported.

[8]In the Trust game β represents player B's conditional second-order belief, since B was asked to choose $Left$ or *Right* conditional on player A choosing In.

Figure 1: Identification regions of guilt sensitivity θ



Notes: The figure shows for both games the identification regions of guilt sensitivity θ corresponding to each switch-point. The switch-point is defined as the second-order belief β at which player B switches from *Right* to *Left*. It is equal to k if the dictator chooses *Right* for $\beta \leq \frac{k}{10}$ and chooses *Left* for $\beta > \frac{k}{10}$.

depends on θ. Whenever $\theta \geq \frac{\pi_R^B - \pi_L^B}{\beta(\pi_L^A - \pi_R^A)}$, player B switches from *Right* to *Left*. Notice that the switch-point is decreasing in β. Finally, if player B's sensitivity to guilt $\theta < \frac{\pi_R^B - \pi_L^B}{(\pi_L^A - \pi_R^A)}$, player B will always choose *Right* independent of the second-order belief β. In this case, player B's sensitivity to guilt is not strong enough to induce a switch from *Right* to *Left* in our game. Figure 1 presents for both games the identification regions of θ corresponding to the belief at which B switches from *Right* to *Left*. Note that identifications regions are insensitive to the three payoff scales used in the Dictator game experiment (see Bellemare, Sebald, and Suetens (2018) for more details).

2.2 Psychological approach to measure guilt sensitivity

Participants were asked to go through a questionnaire consisting of a slightly adjusted version of the TOSCA-3 questionnaire printed in Tangney and Dearing (2002). The complete questionnaire used is presented in Section A.3 of the appendix.[9] The TOSCA-3 is standard in psychology and was developed to assess individuals' sensitivity to social emotions. It contains 16 com-

[9]We slightly changed the choice of words in 5 out of the 16 scenarios in order to make the scenario appropriate for a student-based subject pool. For example, we replaced words like 'co-worker' and 'work' by 'other student' and 'student job' without changing the nature of the emotional experience. The modified questionnaire is available upon request.

mon day-to-day scenarios drawn from written accounts of relevant experiences provided by a sample of college students and non-college adults (e.g., 'While out with a group of friends, you make fun of a friend who's not there.'). Each scenario is followed with item responses referring to separate emotions. Emotions considered include guilt, shame, detachment, externalization, and pride (see appendix A.3 for examples of item responses). For each item response, participants are asked to indicate on a 5-point scale the likelihood of responding in the indicated way, ranging from 0 (not sensitive) to 4 (highly sensitive). Measures of guilt sensitivity, shame proneness, externalization, pride, and detachment are respectively computed by summing together reported scales across all item responses specific to the emotion. All of the 16 scenarios have item responses that qualify for guilt-proneness, shame-proneness, and externalization. Other responses qualify for detachment (in 11 out of the 16 scenarios), and pride (in the remaining 5). Our psychological measures of guilt sensitivity, shame sensitivity, and externalization thus range from 0 to 64. The measure of detachment ranges from 0 to 44, while the measure of pride ranges from 0 to 20. Our analysis will correlate each of the emotions measured using the TOSCA questionnaire with the economic measure of guilt sensitivity.

In the introduction we mentioned that the psychological definition of guilt is somewhat broader than the economic definition. It not only refers to feelings of distress that arise in interpersonal relations whenever one feels that one has caused harm on to somebody else or is in the wrong but can also arise in reaction to e.g. positive inequity or when one feels to have violated some moral standard even 'when no one is harmed or disappointed and no one knows about the incident'. This might broadly suggest that a division of the TOSCA scenarios could be relevant depending on whether somebody else is harmed or let down as a consequence of one's action. Roughly speaking it seems that scenarios 1, 3, 5, 7, 9, 12, 13, 15 and 16 involve a possible harm inflicted on somebody else or a potential let down of somebody else. All other scenarios seem to relate more to issues concerning positive inequity or the violation of an internal moral standard.

2.3 Experimental procedures

The Trust game was run in May 2011 while the Dictator game was run in February and September 2012. Both experiments were conducted in the Laboratory of the Center of Experimental Economics at the University of Copenhagen. The experiments were programmed in z-Tree (Fischbacher, 2007) and participants were recruited through ORSEE (Greiner, 2015). The Trust and Dictator games had 42 and 142 participants respectively in the role of player B.[10] At the beginning of a session participants were randomly allocated to a computer terminal. Once seated, they received instructions explaining they were matched in pairs and that they were randomly allocated to one of the roles. Instructions can be found in Sections A.1 and A.2 of the appendix. Upon completing the experiment and the TOSCA-3 questionnaire, participants were informed of their payoffs, completed a short post-experimental questionnaire, were paid and dismissed.

Finally, we note that one may argue that having subjects complete the TOSCA-3 questionnaire right after the elicitation of the choices in the experiment may raise concerns of possible spurious correlations between the two measures due to subjects' wish to be consistent (see e.g. Podsakoff, MacKenzie, Lee, and Podsakoff, 2003). However, given that the two tasks are of a very different nature it not obvious at all for laymen what it means to be consistent.[11]

3 Results

3.1 Descriptive statistics

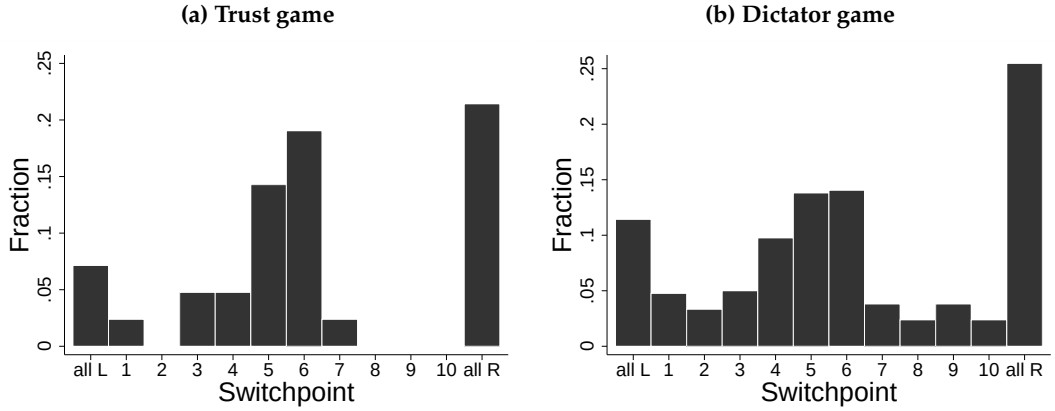
The economic approach allows to bound guilt sensitivity for B-players who switch at most once from playing *Right* to playing *Left* as second-order beliefs increased. 32 out of 42 B-players in the Trust game and, by design, all B-players in the Dictator game satisfy this requirement.[12] Our economic measure of guilt sensitivity is given by the switch-point defined as the belief at

[10] Due to an error in the computer program, the data from 2 B-players in the Dictator game were not usable, leaving us with 140 B-players in this experiment. We had an excess of dictators relative to passive players in the Dictator game as their decisions was the central focus of the analysis (see Bellemare, Sebald, and Suetens, 2018).

[11] Our procedures are similar to Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner (2011) who validate a survey measure of risk by administrating a questionnaire immediately before subjects took part in an incentived economic experiment.

[12] In order to avoid arbitrarily choosing one of multiple switch points, we excluded from the analysis the 10 participants in the Trust game experiment who switched more than once.

Figure 2: Distributions of switch points



Notes: Distribution of switch points for the Trust game (panel (a), $N = 32$) and the Dictator game (panel (b), $N = 140x3$). The data from the Dictator game are pooled across the three stake levels.

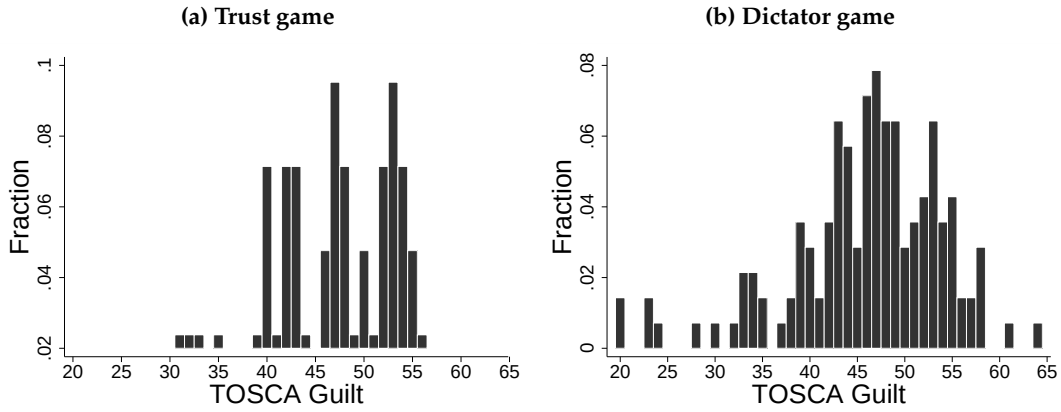
which B chose to switch from playing *Left* to playing *Right*. The value of the switch-point ranges from 11 (not sensitive – corresponding to choosing *Right* irrespective of second-order beliefs) to 0 (highly sensitive – corresponding to choosing *Left* irrespective of second-order beliefs).

B-players switch on average at a belief of 6.22 in the Trust game and of 6.03 across the three Dictator games. The median switch-point is 6 in both types of games. Figure 2 displays the distributions of switch points in both games. We find that more than 20% of B players in the Trust game and slightly more than 25% of B players in the Dictator game chose *Right* irrespective of the belief of the other player. These players are thus (close to) selfish; their guilt sensitivity lies within the lowest possible interval (see Figure 1). About 33% of players in the Trust game have a switch-point of 5 or 6, corresponding to a guilt sensitivity θ between 1.04 and 1.56. In the Dictator game, about 27% of players have a switch-point of 5 or 6, corresponding to a guilt sensitivity θ between 0.26 and 0.38.[13]

Regarding TOSCA-3 guilt proneness, we find a Cronbach's alpha of 0.645 for the Trust game and 0.749 for the Dictator game, and of 0.725 for the merged sample. The internal consistency of the answers related to guilt proneness in the Trust game is lower than in the Dictator game. However, the bootstrapped 95% confidence interval for alpha is $(0.565, 0.767)$ for the Trust

[13]Bellemare, Sebald, and Suetens (2018) provide a detailed analysis of the distribution of switch-points in the Dictator game experiment for all three stake levels. Distributions are not significantly different between the first two payoff scales, while distributions for the lowest and highest payoff scales are significantly different, consistent with diminishing guilt sensitivity.

Figure 3: Distributions of TOSCA-3 guilt sensitivity



Notes: The figure shows distributions of guilt sensitivity of B-players computed using the TOSCA-3. Panel (a) is based on players in the Trust game ($N = 42$), while panel (b) is based on players in the Dictator game ($N = 140$).

game and $(0.696, 0.838)$ for the Dictator game, so that the null that alpha is equal to 0.7 is rejected for neither of the two settings (see Padilla, Divers, and Newton, 2012, for details on the bootstrap procedure). This leads us to conclude that internal consistency is sufficiently strong in both settings. The observation that the confidence interval for the Trust game is wider than for the Dictator game reflects the relatively lower sample size.

Figure 3 shows the distributions of psychological guilt sensitivity in both experiments. There are no clear differences between the two distributions. We find that average guilt sensitivity of B-players is 46.4 in the Trust game and 45.9 in the Dictator game ($p = 0.845$ in a Mann-Whitney-U test). This suggest that TOSCA-3 guilt sensitivity is robust to the nature of economic decision-making that took place beforehand. These results combined with the overlap on confidence intervals for Cronbach's alpha support pooling data from both games.

3.2 Correlations

Table 1 reports for both experiments Spearman rank correlations between guilt sensitivities measured using the two approaches as well as associated p-values (in parentheses). Correlation between measures is -0.33 and -0.25 in the Trust game and Dictator game respectively and statistically significant ($p = 0.067$ and $p = 0.003$ respectively). The interpretation is that a higher economic guilt sensitivity in the experiment – a lower switch-point – is associated with

a higher score on the TOSCA-3 guilt sensitivity scale. Note that the rank correlations for the three stake levels separately are -0.148 ($p = 0.081$), -0.213 ($p = 0.011$) and -0.219 ($p = 0.009$) for low, middle and high stakes respectively. The games with higher stakes thus correlate best with the TOSCA-3 score.

One might be tempted to see the correlations relative to a perfect correlation of 1 or -1. However, such a perfect correlation can only be obtained if there would not be any measurement error, which is obviously not realistic (see Falk et al., 2016, for a discussion in the context of other preferences). Thus, due to measurement error, the maximum possible correlation between our measure for economic guilt sensitivity and the TOSCA-3 guilt aversion score would be lower than one even if the latter would measure guilt sensitivity equally well as the economic measure. In order to have a benchmark for comparison, we calculate the correlations between the three subsequent choices within the Dictator experiment. Subjects in the Dictator experiment were elicited their switch-point in three subsequent games that varied only in the level of stakes. The correlations between the three switch-points are 0.347 between the first and the second, 0.395 between the first and the third and 0.624 between the second and the third, which is in the same ball park as the 'test-retest' correlations reported by Falk et al. (2016) for other preference measures (risk preferences, time discounting, altruism and reciprocity). This leads us to conclude that the level of between economic and psychological guilt sensitivity is substantial.

A further result is that correlations between our economic measure of guilt sensitivity and other emotional dispositions identified in the TOSCA-3 are much smaller in absolute value, not robust across the two experiments, and not statistically significant (see Table A1 in the appendix). This squares well with the result of Bracht and Regner (2013) that trustworthiness in a Trust game correlates significantly with guilt proneness but not shame proneness, both of which were elicited in a separate questionnaire. The results overall suggest that the TOSCA-3 measure of guilt aversion may serve as a valid proxy for economic guilt sensitivity.

We next analyze whether a smaller subset of TOSCA-3 scenarios better correlates with economic guilt sensitivity. This exercise is useful if searching for a proxy for economic guilt sensitivity in settings where TOSCA-3 is available and economic measures are not. We measure

Table 1: Rank correlations between economic guilt sensitivity and TOSCA-3 emotional dispositions

	Trust game	Dictator game
Guilt proneness	-0.328 ($p = .067$)	-0.246 ($p = .003$)
Shame proneness	0.074 ($p = .688$)	-0.094 ($p = .271$)
Detachment	0.028 ($p = .878$)	0.049 ($p = .564$)
Externalization	-0.040 ($p = .827$)	0.000 ($p = .999$)
Pride (a)	0.012 ($p = .950$)	0.061 ($p = .476$)
Pride (b)	0.115 ($p = .532$)	0.106 ($p = .215$)
N	32	140

Notes: The table reports Spearman rank correlations (and p-values) between switch points and the six emotional dispositions elicited in the TOSCA-3 questionnaire.

the subset of TOSCA-3 questions which has the highest power of predicting economic guilt sensitivity based on the leaps and bounds approach proposed by Furnival and Wilson (1974). In our context, the leaps and bounds approach covers the space of all possible combinations of TOSCA-3 scenarios (predictors), while avoiding obvious inferior subsets and thus the need to compute the predictive power of all possible combinations of scenarios. The implementation of the leaps and bounds algorithm is based on the linear regression of the economic guilt sensitivity measure (the switch-point) on each scenario's guilt-proneness item response scale (0 to 4). For a given number of k predictors, the algorithm can be shown to select the best k scenarios from those available in order to minimize the residual sum of squares of the regression (see Lindsey and Sheather, 2010, for further references). Our analysis pools data from both dictator and trust games, controlling for differences across games using a binary variable separating data from each game of which the effect is kept constant throughout the algorithm.[14]

Table 2 gives an overview of the three best-predicting scenarios (numbered) and corresponding guilt proneness item responses (lettered) across the Dictator game and Trust game experiment. We find that 11e – corresponding to scenario 11 and item response e – is the best individual predictor of economic guilt sensitivity. The best set of two predictors contains 11e and 9d, while the best set of three predictors contains 11e, 9d and 5d. Table A2 in the appendix presents the full range of best subsets of TOSCA-3 scenarios retrieved from the algorithm along with model selection statistics, including Akaike, the Bayesian Information Criteria, and ad-

[14]The algorithm is implemented using the `vselect` command in Stata (see Lindsey and Sheather, 2010).

Table 2: Best-fitting TOSCA-3 scenarios

Scenario	Description and corresponding guilt item response
11	'You and a group of college students worked very hard on a project. Your professor singles you out for a better grade than anyone else.' item e 'You would feel you should not accept it.'
9	'You are driving down the road, and you hit a small animal.' item d 'You'd feel bad you hadn't been more alert driving down the road.
5	'You make a mistake at your student job and find out a coworker is blamed for the error.' item d 'You would feel unhappy and eager to correct the situation.'

Notes: TOSCA-3 scenarios (numbered) and corresponding guilt proneness item responses (lettered) derived using the leaps and bounds algorithm. See Section A.3 of the appendix for the full TOSCA-3 including all items.

justed R^2. Model selection statistics provide guidance on the predictive power of each subset of scenarios. AIC, AICC, and BIC model selection statistics prefer subsets with either 2 or 3 scenarios. Model selection based on adjusted R^2 points towards a larger subset of 7 scenarios. However, the change in adjusted R^2 from 2 scenarios to 7 scenarios is rather small.

Finally, Table 3 presents rank correlations between the economic measure of guilt sensitivity (the switch-points) and guilt sensitivity computed using the three smallest subsets of scenarios presented in Table A2. The latter are computed by summing the guilt proneness item response scale of each scenario (ranging from 0 to 4) in a given subset, similar to the way the overall TOSCA-3 measure is computed. We find that correlations between guilt sensitivities based on the best subset of three scenarios and switch- points are -0.398 in the Trust game, and -0.323 in the Dictator game. Both correlations are higher in absolute value than the corresponding correlations computed using all 16 TOSCA-3 scenarios (the latter were -0.328 and -0.233 respectively, see Table 1). Moreover, the best or two best scenarios also correlate well with the economic measure of guilt sensitivity.

4 Conclusion

Economists and psychologists have developed separate measures of guilt sensitivity based on fundamentally different approaches to model and capture guilt aversion. Economists ap-

Table 3: Rank correlations between economic and psychological measures of guilt sensitivity computed from subsets of TOSCA-3 scenarios

	Trust game	Dictator game
11e	-0.293 ($p = .104$)	-0.193 ($p = .022$)
11e + 9d	-0.294 ($p = .103$)	-0.284 ($p < .001$)
11e + 9d + 5d	-0.398 ($p = .024$)	-0.323 ($p < .001$)
N	32	140

Notes: Spearman rank correlations (and p-values) between switch points and guilt sensitivity measured using subsets of TOSCA-3 scenarios. TOSCA-3 scenarios (numbered) and corresponding guilt proneness item responses (lettered) derived using the leaps and bounds algorithm.

proach guilt aversion using mathematical models firmly grounded in psychological game theory where higher-order beliefs are central to determine the extent to which individuals are averse to letting down others. The TOSCA questionnaire used in psychology, on the other hand, is not grounded in a specific behavioral model anchored on beliefs, yet is able to capture guilt aversion using self-reported feelings of guilt in the context of a range of day-to-day scenarios.

Our results show that guilt sensitivity elicited in the context of the model of simple guilt by Battigalli and Dufwenberg (2007) is fundamentally related to the TOSCA-3 measure of guilt sensitivity, and unrelated to other emotional dispositions measured using TOSCA-3. The correlation with TOSCA-3 guilt sensitivity is in absolute value equal to 0.33 in the Trust game and to 0.25 in the Dictator games (statistically significant at the 10% and 1% level respectively). These correlations are not just statistically significant but also substantial in size, in particular if compared to the correlations between three measures for economic guilt sensitivity elicited in three subsequent Dictator games that are the same in terms of the incentive to avoid guilt. The result is good news for economists because it gives credit to a rigorous approach to guilt and guilt aversion.

This paper further identifies a small subset of TOSCA-3 which can be used to construct a simpler and better predictor of economic measures of guilt sensitivity, which fits well with recent efforts to validate simple and short survey measures of preferences by establishing correlation with experimental decisions (see e.g. Falk et al., 2016, 2018). As we are the first to

document such a finding in the context of guilt aversion further research in this direction is warranted.

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A Appendix (For Online Publication)

A.1 Instructions Experiment 1

A.1.1 General part

You are participating in an experiment on economic decision making and will be asked to make a number of decisions. Please follow the instructions carefully. At the end of the experiment, you will be paid your earnings in private and in cash.

You are not allowed to communicate with other participants. If you have a question, raise your hand and one of us will help you.

The experiment is strictly anonymous: that is, your identity will not be revealed to others and the identity of others will not be revealed to you.

Payoffs in the experiment are specified in points. At the end of the experiment the points will be exchanged into DKK at the following exchange rate: **10 points = 40 DKK**

A.1.2 Instructions player A

In the experiment, participants are divided into pairs. In each pair, one participant is randomly assigned to the role of "player A", and the other participant to the role of "player B". Your role will be player A.

The experiment is connected to the following decision situation:

Choice of player A: In relation to the decision situation above, you will be asked the following two questions:

- What do you choose, IN or OUT?
- Suppose that you choose IN, out of 10 B-players, how many do you think will choose LEFT? We call the answer to the first question player A's choice and the answer to the second question player A's belief.

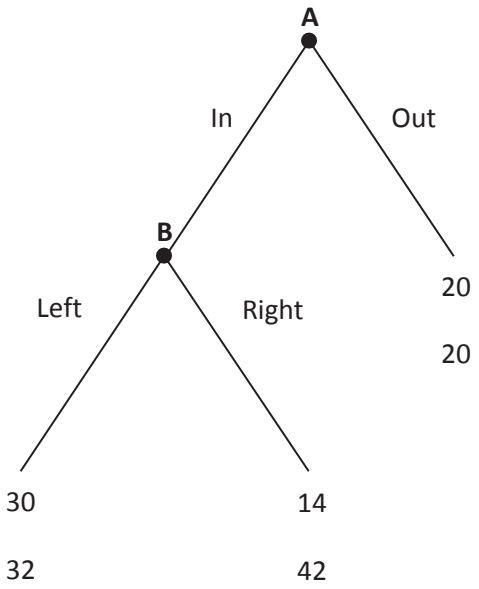


Figure A1

We call the answer to the first question your choice and the answer to the second question your belief.

Choice of player B: player B will be asked the following questions, supposing that you chooses IN:

- What do you choose, LEFT or RIGHT?
- Out of 10 B-players, how many do you think player A believes choose LEFT in your situation? *[only included in treatment* Baseline*]*

We call the answer to the first question player B's choice and the answer to the second question player B's belief. *[only included in treatment* Baseline*]*

How are payoffs calculated?

As can be seen in the figure on the previous page, if you choose OUT, you and B both earn 20 points independent of player B's choice.

If you choose IN, the earnings of you and player B depend on player B's choice. If player B chooses LEFT, you earn 30 points and player B earns 32 points. If player B chooses RIGHT, you earn 14 points and B earns 42 points.

At the end of the experiment you and player B will be paid according to what you both answered to the questions.

A.1.3 Instructions player B

In the experiment, participants are divided into pairs. In each pair, one participant is randomly assigned to the role of "player A", and the other participant to the role of "player B". Your role will be player B.

The experiment is connected to the following decision situation:

[Figure A1 is shown]

Choice of player A: In relation to the decision situation above, player A will be asked the following two questions:

- What do you choose, IN or OUT?
- Suppose that you choose IN, out of 10 B-players, how many do you think will choose LEFT? We call the answer to the first question player A's choice and the answer to the second question player A's belief.

Choice of player B: You will be asked to choose LEFT or RIGHT supposing that player A chooses IN. More specifically, you will be asked the following questions:

- Suppose player A chooses IN and believes that 0 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- Suppose player A chooses IN and believes that 1 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- Suppose player A chooses IN and believes that 2 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?

- Suppose player A chooses IN and believes that 3 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- ...
- ...
- ...
- Suppose player A chooses IN and believes that 10 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?

How are payoffs calculated?

As can be seen in the figure on the previous page, if player A chooses OUT, player A and you both earn 20 points independent of player A's belief or your choice.

If player A chooses IN, the earnings of player A and you depend on player A's belief and your choice. If player A's belief and your choice are such that you choose LEFT, A earns 30 points and you earn 32 points. If player A's belief and your choice are such that you choose RIGHT, A earns 14 points and you earn 42 points.

Example: Suppose that A chooses IN and believes that 8 out of 10 B-players will choose LEFT, following his/her choice IN. Suppose further that you choose LEFT if A believes that more than 4 B-players choose LEFT following A's choice IN, and that you choose RIGHT if A believes that 4 or less B-players choose LEFT following A's choice IN. In this case, the outcome will be (IN, LEFT) which implies that A earns 30 and you earn 32.

At the end of the experiment player A and you will be paid according to what you both answered to the questions.

A.2 Instructions Experiment 2

A.2.1 General part

You are participating in an experiment on economic decision making and will be asked to make a number of decisions. Please follow the instructions carefully. At the end of the experiment, you will be paid your earnings in private and in cash. You are not allowed to communicate with other participants. If you have a question, raise your hand and one of us will help you.

The experiment is strictly anonymous: that is, your identity will not be revealed to others and the identity of others will not be revealed to you.

Payoffs in the experiment are specified in points. At the end of the experiment the points will be exchanged into DKK at the following exchange rate: **10 points = 4 DKK**.

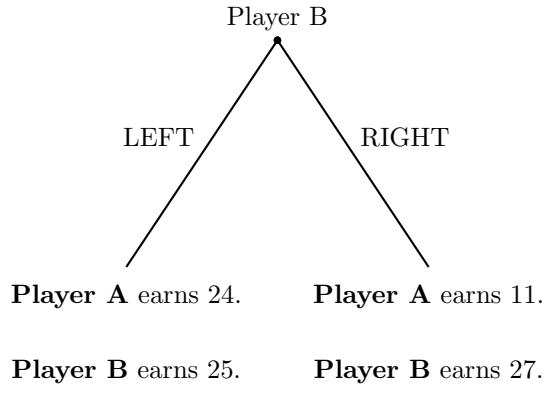
In the experiment, participants are divided into pairs. In each pair, one participant is randomly assigned to the role of "player A", and the other participant to the role of "player B".

A.2.2 Instructions player A

Your role will be player A.

In the experiment you will be confronted with a number of decision situations like the following:

Figure A2: Example of a decision situation



That is, player B will get the chance to decide between LEFT and RIGHT. The only difference between the decision situation depicted above (in Figure 1) and the situations you will be confronted with during the experiment are the payoffs connected to player B's choices LEFT and RIGHT.

What are the decisions that have to be taken during the experiment?

Choice of player A: In each decision situation that you will be confronted with, you will be asked the following question:

- Out of 10 B-players, how many do you believe will choose LEFT?

We call the answer to this question your belief.

Choice of player B: player B will be asked to choose LEFT or RIGHT.

How are payoffs calculated?

Assume that you are confronted with the decision situation as shown in Figure 1.

The earnings of you and player B in this decision situation depend on player B's choice. If player B chooses LEFT, you earn 24 points and player B earns 25 points. If player B chooses RIGHT, you earn 11 points and B earns 27 points.

At the end of the experiment the payoffs from the different decision situations will be summed and you and player B will be paid accordingly.

Following these decisions there will be a questionnaire.

A.2.3 Instructions player B

Your role will be player B.

In the experiment you will be confronted with a number of decision situations like the following:

[Figure A2 is shown]

That is, you will get the chance to decide between LEFT and RIGHT. The only difference between the decision situation depicted above (in Figure 1) and the situations you will be confronted with during the experiment are the payoffs connected to your choices LEFT and RIGHT.

What are the decisions that have to be taken during the experiment?

Choice of player A: In each decision situation, player A is informed that you can choose LEFT or RIGHT, and about the payoffs connected to these choices. player A will be asked the following question: Out of 10 B-players, how many do you believe will choose LEFT?

We call the answer to this question player A's belief.

Choice of player B: You will be asked to choose LEFT or RIGHT. More specifically, you will be asked the following questions:

- Suppose player A believes that 0 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- Suppose player A believes that 1 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- Suppose player A believes that 2 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- Suppose player A believes that 3 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?
- ...
- ...
- ...
- Suppose player A believes that 10 out of 10 B-players choose LEFT, what do you choose LEFT or RIGHT?

How are payoffs calculated?

Assume that you are confronted with the decision situation as shown in Figure 1.

The earnings of player A and you in this decision situation depend on player A's belief and your choice. If player A's belief and your choice are such that you choose LEFT, A earns 24 points and you earn 25 points. If player A's belief and your choice are such that you choose RIGHT, A earns 11 points and you earn 27 points.

Example: Suppose that A believes that 8 out of 10 B-players will choose LEFT. Suppose further that you choose LEFT, if A believes that more than 4 B-players choose LEFT and that you choose RIGHT, if A believes that 4 or less B-players choose LEFT. In this case, the outcome will be (IN, LEFT) which implies that A earns 24 and you earn 25.

At the end of the experiment the payoffs from the different decision situations will be summed and player A and you will be paid accordingly.

Following these decisions there will be a questionnaire.

A.3 The Test of Self-Conscious Affect (TOSCA-3)

Instructions

Below are situations that people are likely to encounter in day-to-day life, followed by several common reactions to those situations.

As you read each scenario, try to imagine yourself in that situation. Then indicate how likely you would be to react in each of the ways described. We ask you to rate all responses because people may feel or react more than one way to the same situation, or they may react different ways at different times.

For example:

You wake up early one Saturday morning. It is cold and rainy outside.

a) You would telephone a friend to catch up on news.
① - - 2 - - 3 - - 4 - -5
not likely very likely

b) You would take the extra time to read the paper.
1 - - 2 - - 3 - - 4 - - ⑤
not likely very likely

c) You would feel disappointed that it's raining.
1 - - 2 - - ③ - - 4 - -5
not likely very likely

d) You would wonder why you woke up so early
1 - - 2 - - 3 - - ④ - -5
not likely very likely

In the above example, I've rated *all* of the answers by circling a number. I circled a "1" for answer (a) because I wouldn't want to wake up a friend very early on a Saturday morning — so it's not at all likely that I would do that. I circled a "5" for answer (b) because I almost always read the paper if I have time in the morning (very likely). I circled a "3" for answer (c) because for me it's about half and half. Sometimes I wouldn't — it would depend on what I had planned. And I circled a "4" for answer (d) because I would probably wonder why I had awakened so early.

Please do not skip any items — rate all responses.

Questionnaire

1. *You make plans to meet a friend for lunch. At 5 o'clock, you realize you stood your friend up.*

   a) You would think: "I'm inconsiderate — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   b) You would think: "Well, my friend will understand." — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   c) You'd think you should make it up to your friend as soon as possible. — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   d) You would think: "My boss distracted me just before lunch." — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

2. *You break something at work and then hide it.*

   a) You would think: "This is making me anxious. I need to either fix it or get someone else to." — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   b) You would think about quitting. — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   b) You would think: "A lot of things aren't made very well these days." — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

   d) You would think: "It was only an accident." — 1 - - 2 - - 3 - - 4 - -5 (not likely / very likely)

3. *You are out with friends one evening, and you're feeling especially witty and attractive. Your best friend's spouse seems to particularly enjoy your company.*

   a) You would think: "I should have been aware of what my best friend was feeling." — 1 - - 2 - - 3 - - 4 - - 5 (not likely / very likely)

   b) You would feel happy with you appearance and personality. — 1 - - 2 - - 3 - - 4 - - 5 (not likely / very likely)

   c) You would feel pleased to have made such a good impression. — 1 - - 2 - - 3 - - 4 - - 5 (not likely / very likely)

   d) You would think your best friend should pay attention to his/her spouse — 1 - - 2 - - 3 - - 4 - - 5 (not likely / very likely)

   e) You would probably avoid eye contact for a long time. — 1 - - 2 - - 3 - - 4 - - 5 (not likely / very likely)

4. *At university or work, you wait until the last minute to plan a project, and it turns out badly.*

a)	You would feel incompetent.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would think: "There are never enough hours in the day."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would feel: "I deserve to be reprimanded for mismanaging the project."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would think: "What's done is done."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

5. *You make a mistake at your student and find out a coworker is blamed for the error.*

a)	You would think the company did not like the coworker.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would think: "Life is not fair."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would keep quiet and avoid the coworker.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would feel unhappy and eager to correct the situation.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

6. *For several days you put off making a difficult phone call. At the last minute you make the call and are able to manipulate the conversation so that all goes well.*

a)	You would think: "I guess I'm more persuasive than I thought."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would regret that you put it off.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would feel like a coward.	1 - - 2 - - 3 - - 4 - -5 not likely very likely
d)	You would think: "I did a good job."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
e)	You would think you shouldn't have to make calls you feel pressured into.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

7. While playing around, you throw a ball and it hits your friend in the face.

a)	You would feel inadequate that you can't even throw a ball.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would think maybe your friends needs more practice at catching.	1 - - 2 - - 3 - - 4 - -5 not likely very likely
c)	You would think: "It was just an accident."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would apologize and make sure your friend feels better.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

8. You have recently moved away from your family, and everyone has been very helpful. A few times you needed to borrow money, but you paid it back as soon as you could.

a)	You would feel immature.	1 - - 2 - - 3 - - 4 - -5 not likely very likely
b)	You would think: "I sure ran into some bad luck."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would return the favor as quickly as you could.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would think: "I am a trustworthy person."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
e)	You would be proud that you repaid your debts.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

9. You are driving down the road, and you hit a small animal.

a)	You would think the animal shouldn't have been on the road.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would think: "I'm terrible."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would feel: "Well, it was an accident."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You'd feel bad you hadn't been more alert driving down the road	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

10. *You walk out of an exam thinking you did extremely well. Then you find out you did poorly.*

a) You would think: "Well, it's just a test." 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

b) You would think: "The instructor doesn't like me." 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

c) You would think: "I should have studied studied harder." 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

d) You would feel stupid. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

11. *You and a group of college students worked very hard on a project. Your professor singles you out for a better grade than anyone else.*

a) You would feel the professor is rather short-sighted. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

b) You would feel alone and apart from your colleague-students. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

c) You would feel your hard work had paid off. 1 - - 2 - - 3 - - 4 - -5
not likely very likely

d) You would feel competent and proud of yourself. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

e) You would feel you should not accept it. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

12. *While out with a group of friends, you make fun of a friend who's not there.*

a) You would think: "It was all in fun; it's harmless." 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

b) You would feel small . . . like a rat. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

c) You would think that perhaps that friend should have been there to defend him/herself. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

d) You would apologize and talk about that person's good points. 1 - - 2 - - 3 - - 4 - - 5
not likely very likely

13. *You make a big mistake on an important project at work. People were depending on you, and your boss criticizes you.*

a)	You would think your boss should have been more clear about what was expected of you.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would feel like you wanted to hide.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would think: "I should have recognized the problem and done a better job."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would think: "Well, nobody's perfect."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

14. *You volunteer to help with the local Special Olympics for handicapped children. It turns out to be frustrating and time-consuming work. You think seriously about quitting, but then you see how happy the kids are.*

a)	You would feel selfish, and you'd think you are basically lazy.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would feel you were forced into doing something you did not want to do.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would think: "I should be more concerned about people who are less fortunate."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would feel great that you had helped others.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
e)	You would feel very satisfied with yourself.	1 - - 2 - - 3 - - 4 - -5 not likely very likely

15. *You are taking care of your friend's dog while your friend is on vacation, and the dog runs away.*

a)	You would think, "I am irresponsible and incompetent."	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would think your friend must not take very good care of the dog or it wouldn't have run away.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would vow to be more careful next time.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would think your friend could just get a new dog.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

16. *You attend you're a student's housewarming party and you spill red wine on a new cream-colored carpet, but you think no one notices.*

a)	You think the student should have expected some accidents at such a big party.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
b)	You would stay late to help clean up the stain after the party.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
c)	You would wish you were anywhere but at the party.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely
d)	You would wonder why the student chose to serve red wine with the new light carpet.	1 - - 2 - - 3 - - 4 - - 5 not likely very likely

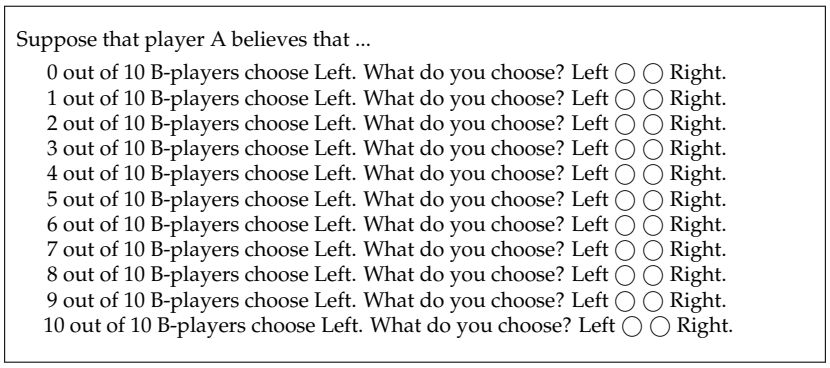
Interpretation

The TOSCA-3 is composed of 11 negative and 5 positive scenarios yielding indices of Shame-Proneness, Guilt-Proneness, Externalization, Detachment/Unconcern. Alpha Pride, and Beta Pride. The scale scores are the sum of responses to relevant items (e.g., the score for the Shame scale equals the respondent's answer to 1a, plus the answer to 2b, etc.). The scoring for the TOSCA-3 is as follows:

1. (Negative Scenario)
   a) Shame
   b) Detached
   c) Guilt
   d) Externalization
2. (Negative Scenario)
   a) Guilt
   b) Shame
   c) Externalization
   d) Detached
3. (Positive Scenario)
   a) Guilt
   b) Alpha Pride
   c) Beta Pride
   d) Externalization
   e) Shame
4. (Negative Scenario)
   a) Shame
   b) Externalization
   c) Guilt
   d) Detached
5. (Negative Scenario)
   a) Externalization
   b) Detached
   c) Shame
   d) Guilt
6. (Positive Scenario)
   a) Alpha Pride
   b) Guilt
   c) Shame
   d) Beta Pride
   e) Externalization
7. (Negative Scenario)
   a) Shame
   b) Externalization
   c) Detached
   d) Guilt
8. (Positive Scenario)
   a) Shame
   b) Externalization
   c) Guilt
   d) Alpha Pride
   e) Beta Pride
9. (Negative Scenario)
   a) Externalization
   b) Shame
   c) Detached
   d) Guilt
10. (Negative Scenario)
    a) Detached
    b) Externalization
    c) Guilt
    d) Shame
11. (Positive Scenario)
    a) Externalization
    b) Shame
    c) Beta Pride
    d) Alpha Pride
    e) Guilt
12. (Negative Scenario)
    a) Detached
    b) Shame
    c) Externalization
    d) Guilt
13. (Negative Scenario)
    a) Externalization
    b) Shame
    c) Guilt
    d) Detached
14. (Positive Scenario)
    a) Shame
    b) Externalization
    c) Guilt
    d) Beta Pride
    e) Alpha Pride
15. (Negative Scenario)
    a) Shame
    b) Externalization
    c) Guilt
    d) Detached
16. (Negative Scenario)
    a) Detached
    b) Guilt
    c) Shame
    d) Externalization

A.4 Supplementary figures

Figure A3: Elicitation of player B's choice in both experiments



A.5 Supplementary tables

Table A1: Rank correlations between economic guilt sensitivity and TOSCA-3 emotional dispositions in Dictator game

	Low Stakes	Mid Stakes	High Stakes
Guilt proneness	-0.148 ($p = .081$)	-0.213 ($p = .011$)	-0.219 ($p = .009$)
Shame proneness	-0.022 ($p = .796$)	-0.055 ($p = .519$)	-0.080 ($p = .345$)
Detachment	0.013 ($p = .880$)	0.071 ($p = .398$)	0.065 ($p = .448$)
Externalization	0.061 ($p = .476$)	0.069 ($p = .420$)	-0.045 ($p = .598$)
Pride (a)	0.124 ($p = .146$)	0.040 ($p = .643$)	0.046 ($p = .592$)
Pride (b)	0.129 ($p = .128$)	0.101 ($p = .235$)	0.070 ($p = .411$)

Notes: The table reports Spearman rank correlations (and p-values) between switch points and the six emotional dispositions elicited in the TOSCA-3 questionnaire for each of the stake levels in the Dictator game. Low stakes correspond to a distribution of $(48, 50)$ under *Left* and a distribution of $(22, 54)$ under *Right*. Mid and High stakes correspond to the double and quadruple of these stakes, respectively.

Table A2: Full set of best-fitting TOSCA-3 guilt scenarios and model selection criteria

# Scenarios k	TOSCA-3 scenarios and corresponding guilt items															
1	11e															
2	11e	9d														
3	11e	9d	5d													
4	11e	9d	13c	5d												
5	11e	9d	13c	16b	5d											
6	11e	9d	13c	16b	12d	5d										
7	11e	9d	13c	16b	2a	5d	6b									
8	11e	9d	13c	16b	2a	5d	6b	10c								
9	11e	9d	13c	16b	2a	5d	6b	10c	4c							
10	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c						
11	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d					
12	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d	14c				
13	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d	14c	3a			
14	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d	14c	3a	8c		
15	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d	14c	3a	8c	15c	
16	11e	9d	13c	16b	2a	12d	5d	6b	10c	4c	7d	14c	3a	8c	15c	1c

# Scenarios k	$\overline{R}^2$	AIC	$AICC$	BIC
1	0.0462704	869.244	869.4835	878.6865
2	0.0761112	864.7556	865.117	877.3456
3	0.0853834	863.9938	864.5029	879.7313
4	0.0900175	864.0871	864.77	882.972
5	0.0940376	864.2862	865.1697	886.3187
6	0.0946392	865.1264	866.2375	890.3064
7	0.0962636	865.7655	867.132	894.093
8	0.0951526	866.9184	868.5684	898.3933
9	0.0941883	868.0366	869.9988	902.659
10	0.0927618	869.2356	871.5394	907.0055
11	0.0906431	870.5584	873.2336	911.4758
12	0.0879513	871.9816	875.0585	916.0465
13	0.0840024	873.6326	877.1423	920.8451
14	0.0781703	875.6252	879.5993	925.9852
15	0.0722545	877.6194	882.09	931.1268
16	0.0662402	879.6176	884.6176	936.2725

Notes: The upper part reports subsets of TOSCA-3 scenarios (numbered) and corresponding items capturing emotions of guilt (lettered) derived using the leaps and bounds algorithm. The bottom part presents for each subset the corresponding adjusted R^2, the Akaike information criterion AIC, the corrected Akaike Information Criterion $AICC$, and the Bayesian Information Criterion BIC.