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ABSTRACT

Civil War, Natural Disaster and Risk Preferences: Evidence from Sri Lankan Twins*

We estimate whether risk preferences are affected by traumatic events by using a unique survey of Sri Lankan twins which contains information on individual's exposure to the 2004 Indian Ocean Tsunami, participation as a combatant in the civil war, validated measures of mental health and risk preferences, and a rich set of control variables. Our estimation strategy utilises variation in experiences within twin pairs and allows us to explore whether preference changes are driven by wealth shocks and/or changes in mental health. We find that both events lead to less risk aversion, a result that is not driven by mental health or wealth changes.

JEL Classification: D74, D81, D91, Q54

Keywords: risk preferences, natural disaster, civil war, twin study

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1. Introduction

A growing literature estimates how economic preferences, such as risk aversion, respond to traumatic events. If events that have a large collective impact on the population, such as natural disasters and wars, lead to a change in economic preferences among the affected individuals, they could potentially change the economic and social trajectory of the affected region, on top of the direct effects that these events have on infrastructure and wealth.

The primary goal of this paper is to estimate the effect of two large-scale traumatic events – a tsunami and civil war – on risk preferences in Sri Lanka, a lower-middle income country.[1] Our paper builds on previous work in two main ways. First, we utilise a large twin dataset and exploit variation in exposure to traumatic events within twin pairs. This allows us to construct a more credible counterfactual group than most previous studies. Second, we have access to detailed data on mental health that includes diagnostic criteria for depressive episodes, anxiety and post-traumatic stress disorders. We are thus able to use these data to test the hypothesis that trauma has an adverse effect on mental health which in turn affects risk preferences (Haushofer and Fehr, 2014).

There are several theoretical frameworks through which major traumatic events may influence risk preferences. However, the competing hypotheses often deliver conflicting predictions. For example, expected utility theory predicts that risk aversion increases after a disaster to the extent that the event constitutes a wealth shock and risk aversion decreases with wealth. On the other hand, using Prospect Theory framework (Kahneman and Tversky, 1979), Page et al., (2014) argue that a negative wealth shock may put decision makers in a loss frame where utility is convex therefore leading to a change from risk aversion to risk seeking. Other theories have emphasised the role of background risk which is generally, but not always, thought to increase risk aversion (Gollier and Pratt, 1996; although see also Quiggin [2003] for a counter view). For our purposes, the background risk theories are problematic, because it is often unclear whether background risk increases or decreases after a natural disaster; people could reasonably believe that the probability of such an event occurring again in the future is either higher or lower. Haushofer and Fehr (2014) provide a theory of poverty in which adverse shocks induce stress and worsen mental health, which in

[1] Those in developing nations are particularly vulnerable to the consequences of civil conflicts and natural disasters as these events occur frequently in many regions and less resources are available to mitigate their consequences. Between 2006-2016, there were around 3,700 natural disaster across the world, with around 65% occurring in Asia and Africa (ICFR, 2016). More than 400,000 people from low human development countries were killed, with 482 deaths on average per disaster (compared to 97 per disaster in other countries).

turn increases risk aversion precluding people from taking advantageous risks. Eckel et al. (2009) provide some empirical evidence that following a disaster people are more emotive decision makers, which they suggest may lead to lower risk aversion.

Existing empirical literature suggests that risk preferences are indeed influenced by natural disasters and civil conflict but has failed to find a consistent answer on the direction of these effects. Several studies find evidence of lower risk aversion following natural disasters such as hurricane (Eckel et al., 2009), lahars (Bchir and Willinger, 2013; Willinger et al., 2013), flood (Page et al., 2014) and earthquake (Hanaoka et al., 2018). On the other hand, others find the opposite effect following various natural disasters (Van den berg et al., 2009; Ashan, 2014; Reynaud and Aubert, 2014; Cameron and Shah, 2015; Cassar et al., 2017) while Said (2015) finds mixed effects depending on how exposure to the event (flood) is defined.

There is less research on civil conflict; however, results and the nature of violence under study are mixed, making comparisons difficult. Voors et al. (2012) study exposure to civil war related violence in Burundi and find evidence of lower risk aversion. Callen et al. (2014) find no change in risk aversion for those exposed to insurgency attacks in Afghanistan (although exposure is related to greater preference for certainty when primed to recall a fearful event). Jakiela and Ozier (2015) study election related violence in Kenya, while Nasir et al. (2016) and Brown et al. (2017) study violence related to the Mexican drug war; each finds evidence of increased risk aversion.

Why is there so much disagreement across studies? One reason could be that the context for each study varies. Studies relate to a variety of countries, regions and time periods. The time since the event also varies across studies, along with how exposure is defined. A different concern is that research designs may not fully account for biased selection into ‘exposed’ and ‘control’ groups. To date, almost all studies have relied on cross-sectional survey data collected from field samples after the event. The typical estimation strategy is to compare a group of people living in an area exposed to the event to a control group in a different area after adjusting for observable differences. This approach is subject to the standard concern that exposure may also be related to unobservable differences in the outcome (risk preferences), which could be due to, for example, selective migration out of the disaster region following the event. Only Hanaoka et al. (2018) are able to observe the same individuals before and after a natural disaster (earthquake in Japan). Nasir et al. (2016) and Brown et al. (2017) also exploit panel data to study the Mexican drug war, but as we will discuss shortly, this is quite different to the civil conflict we study. Page et al. (2014) use a regression discontinuity design by exploiting a flood level threshold for higher probability of property damage following floods in Australia. However, their risk preference measure is somewhat coarse– a choice between a lottery ticket and a fixed sum as payment for completing a short survey about the flood – which involves ambiguity and very low probability of a high payoff. They attribute the higher probability of flood victims to choose the lottery ticket to them being in the disaster-induced loss frame where according to Prospect Theory individuals are risk seeking.

Given the mixed theoretical predictions and empirical findings on the relationship between economic preferences and natural disasters and civil wars and the prevalence and the global consequences of the potential impact that they have on behavior, in this paper we seek to provide more credible evidence on this relationship by using a within-twins design. Moreover, we empirically test mechanisms through which traumatic events may influence preferences, in particular mental health. In addition, we can identify participants in the civil war, which allows us to answer a novel question: does participating in war (as opposed to living in war affected area that was studied previously) change risk preferences? Given the scale of conflict globally, combatants constitute a large and important group of the population in many countries and there is much interest in the effect of service on their behavior in civil life. We also consider the effect of non-combat exposure to the war (i.e. civilian injury, displacement or property damage). Our focus is on the effect of two significant events on risk preferences in Sri Lanka – the 2004 Indian Ocean Tsunami and the civil war fought between the Liberation Tigers of Tamil Eelam (the Tamil Tigers) and the Sri Lankan Government between 1983-2009. Both events had widespread devastating effects, characterised by significant loss of life, property damage and displacement.

We anticipate that our work can also help to identify the circumstances under which traumatic events might lower or increase risk aversion. As discussed above, empirical evidence to date is mixed and differences in studied populations, events, degrees of exposure, and empirical approaches make cross-study comparisons difficult. As the evidence base grows, so will the feasibility of meta-analytic methods to identify how aspects of the research environment predict the direction of effects. One advantage of our dataset is that we are able to study the effect of two very different and distinct traumatic events on the risk preferences of people drawn from the same population pool. To be clear, the twins in our sample who we use to identify the effects of the tsunami will generally differ from those identifying the effects of the civil war. However, both groups come from the same region within the same country, observed at the same point in time.

We find that both exposure to the tsunami and participation in the civil war lead to less risk aversion. We do not find any evidence that this is driven by mental health or financial circumstances. We find some evidence that the effect is partially attributable to disparate direct and indirect exposure effects – being directly exposed to a traumatic event makes a person less risk averse, while having a sibling who was exposed to a traumatic event may make a person more risk averse. However, this evidence is not robust and cannot fully account for the reduction in risk aversion we estimate.

The paper is organized as follows. In Section 2 we provide background information on the 2004 tsunami and civil war. In Section 3 we present our empirical methodology. In Section 4 we discuss our data. In Section 5 we discuss causal identification. In Section 6 we present and discuss our results. Section 7 concludes.

2. Background

Sri Lanka is an island in South Asia. It has a high life expectancy (75 years), low infant mortality rate (8/1000/year) and high literacy rates (92%) and is characterised as a lower-middle income country. It is a small, densely populated country and many people have family and links across the country. Participants in our study come from the Colombo district of Sri Lanka, which includes the financial capital Colombo and surrounding rural regions (population approximately 2.5 million).

Civil War

From 1983 Sri Lanka was affected by a prolonged civil war with hostilities predominantly in the North and East between government and Tamil separatist forces, with an estimated mortality of 1 in 200 of the population. Whilst the Colombo district was relatively spared from direct involvement in the civil war, a proportion of the residents had direct experience through violence in the capital, serving in the forces, or migrating from war torn areas. The Colombo district was the target for a number of indiscriminate suicidal bombings, killing many civilians. The war ended in 2009 with the defeat of the Tamil separatist forces.

Tsunami

On 26th December 2004 the South Asian Tsunami resulted in approximately 40,000 deaths in Sri Lanka, predominantly in the South and East of the island. Nearly 500,000 people were displaced and there was large scale resettlement across the island although exact figures are lacking (Vithanagama et al., 2015). The Colombo district was also affected, although less severely, with the loss of 56 lives and over 6,000 homes damaged.

3. Empirical approach

In this section we outline our estimation strategy using within-twin variation in exposure to the tsunami and civil war. We assume that a measure of risk preferences rp_{ij} for person i in family j is linearly related to a set of personal characteristics represented by $\boldsymbol{X_i}$ and a genetic and environmental intercept shifter α_j that is common across twin pairs.

Our model is set out formally in equation (1), where ε_{ij} is a stochastic error term that, conditional on $\boldsymbol{X_i}$ and α_j, is assumed to be independent of exposure to the war W_i and exposure to the tsunami T_i (where W_i and T_i are binary indicators).

$$rp_{ij} = c + \boldsymbol{X_i'\beta} + \alpha_j + \beta^W W_i + \beta^T T_i + \varepsilon_{ij} \qquad (1)$$

Equation (1) can be estimated by taking within-twin mean differences so that α_j drops out of the estimation equation. Controlling for α_j helps to capture variation in risk preferences that is due to genetic similarities across twins as well as shared environmental factors and age/cohort effects. It also means that causal identification comes from variation within twin pairs – essentially a twin not exposed to the war/tsunami becomes a control for their exposed twin. Twin pairs who have the same exposure (i.e. both exposed or both not exposed) do not help to directly identify β^W or β^T but do have an indirect effect by contributing to the estimation of $\boldsymbol{\beta}$.

In most previous studies, causal identification relies on exposure to the disaster being exogenous to underlying risk preferences, conditional on a set of observable characteristics. Typically, control groups come from villages or regions in areas unaffected by the disaster or conflict. In our set-up, because we condition on twin-fixed effects, our strategy essentially picks out from the potential control group individuals who are likely to be highly similar (i.e. twin pairs) both on observables and unobservables. All standard errors will take account of clustering at the twin level.

In the next section we test whether our estimation strategy is sound by comparing exposed and not exposed twins across observables. For both events, exposed and unexposed twins are statistically indistinguishable across a wide array of observable characteristics (see Table 1), lending support to our empirical approach.

4. Data

Overview

Our data are from the Colombo Twin and Singleton Study (CoTASS) conducted between 2006-2007 (around 2-3 years after the 26 December tsunami and during the last years of the civil war). The method is described in detail elsewhere (Siribaddana et al., 2008); here we discuss the key features. 13,681 adult twins were identified through multiple methods as potentially residing in the catchment area. Of these 6,600 were randomly selected to participate, of whom 833 were untraceable. During household visits, 1,389 were found ineligible to participate e.g. 910 had emigrated or moved from the Colombo district. This left 4,387 individuals who were potentially eligible. Of these, 363 (8.3%) refused consent, resulting in a sample of 4,024 twins (3,923 fully responding). Since our identification strategy exploits variation within twin pairs, our analysis focuses only on the twin sample. After restrictions for missing information on key variables (risk preference and tsunami/civil war exposure variables) and re-balancing across siblings we have 2,946 individuals in our baseline estimation sample.[2]

Risk preference measurement

The risk preference measure, rp_{ij}, is hypothetical willingness to pay for a lottery and versions of it have been used in numerous other studies (e.g. Cramer et al., 2002; Hartog et al., 2002; Guiso and Paella, 2008; Hanaoka et al., 2018). [3] Specifically, participants are asked the following:

"We would like to ask you a hypothetical question. Please, answer it as if the situation were a real one. You have the opportunity to buy a lottery ticket that has a 50% chance of earning

[2] This sample is comprised of 1,466 twin pairs. There are also 14 individuals who belong to sets of triplets where at least two siblings are in the sample.

[3] Questions were also included to measure time preferences and trust. However, there is not enough variation in these variables for our within-twins estimation strategy to be informative. Callen (2015) estimates the impact of the 2004 tsunami on time preferences in Sri Lanka and finds evidence that patience increases for those affected.

Rs. 1,000 and a 50% chance of earning Rs. 0. What is the highest price that you are prepared to pay for this ticket?"

The winning payoff of 1,000 Rupees (Rs) is equivalent to approximately $9 USD in 2006 and roughly 6.5% of average monthly wages in Sri Lanka in 2006 (Sri Lankan Department of Census and Statistics, 2018). For comparison, in 2006, 6.5% of the average monthly wage for U.S. workers was roughly $300 USD (OECD, 2018).

Our scenario has been shown to predict risk-taking behaviors such as owning risky assets, entrepreneurship, gambling and risky health behaviors (see e.g. Cramer et al., 2002; Guisso and Paiella, 2008; Hanaoka et al., 2018) suggesting that it indeed measures individual's risk taking propensity.[4] In Appendix Table A3 we regress willingness to pay for the lottery on gender, self-assessed financial circumstances and years of education and recover the well-established correlations that males and those with better finances are less risk averse.

Details on the distribution of the risk preference variable are in Appendix Table A2. As seen in other samples using this instrument (e.g. Cramer et al., 2002), there is a large number of people with very low willingness to pay to enter the lottery and bunching at particular thresholds (e.g. 25 Rs, 50 Rs, 100 Rs).[5] While our mean willingness to pay amounts suggest our study population is extremely risk averse (a risk neutral person should be willing to pay 500 Rs), they are similar in nominal terms to values derived from other population groups (see e.g. Hartog et al., 2000).

Tsunami exposure

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[4] While ideally, we would prefer to use an incentivised measure of risk preferences, such measures are typically not available in large-scale field surveys. In fact, the literature on risk preferences and natural disasters/conflict highlights a frequent trade-off between measurement and more credible research designs. To our knowledge, all previous studies that elicit incentivised risk preferences rely on cross-sectional data collected *after* the event with typically small sample sizes. Large-sample studies that track individuals *before* and *after* the event (i.e. Nadir et al., 2016; Brown et al., 2017, Hanaoka et al., 2018) all elicit risk preferences with hypothetical scenarios (we are not aware of any previous studies that use twins).

[5] The bunching at 10 Rs is likely to be due to the fact that when the data were collected, 10 Rs was the smallest note available as legal tender. While smaller value coins were in circulation at the time – even 1 Rs – the purchasing power of these coins was extremely low. It may also reflect an anchoring effect since in 2008 the standard scratch card lottery ticket price was 10 Rs. Due to concerns about the effect of bunching at certain thresholds for rp_{ij} on the normality of the error term, we estimated both conventional asymptotic standard errors and non-parametric bootstrap confidence intervals. The bootstrap confidence intervals are similar to those implied by the asymptotic standard errors and for brevity are reported in the Appendix (see Table A11).

The primary variable we use for exposure to the tsunami is whether the person states that they were in an affected area when the tsunami hit.[6] In addition, participants were asked about tsunami related injuries, displacement and property loss, enabling us to test whether the way a person experiences the tsunami matters.

We note that because we use a within-twins estimation strategy, only twins with conflicting tsunami experiences provide useful variation.[7] There are 75 twin pairs where only one twin was exposed to tsunami, captured by variable 'affected'. When we also include an indicator for severe tsunami consequences (injury, lost property or displacement) which we label 'victim'. There are 63 twin pairs that were not victims but only one twin was in the affected area, 14 twin pairs where both twins were in the exposed area but only one of them was a victim, and 12 twin pairs with variation in both indicator variables. These small cell sizes warrant caution in interpreting these interacted effects.

Civil war exposure

The primary variable we use for exposure to the war is whether the person reported participating in the conflict as a combatant (henceforth 'combatant'). Additionally, we capture the severity of war consequences using 'victim' variable that is equal to one for individuals (not necessarily combatants) who either sustained injuries, or were displaced, or lost property due to civil war. These are both worthwhile measures to focus on for two reasons. First, the effect of direct involvement in conflict on risk preferences has received little attention. While there have been some efforts to measure risk preferences of soldiers (e.g. Haerem et al., 2011; Lahav et al., 2011), little is known about how military service itself shapes preferences. Second, it allows us to contrast our results on the tsunami, an event outside people's control, with a different traumatic event in which people had at least some control over their involvement.

There are some important weaknesses of our combatant indicator. First, we have little information on the details of a respondent's combat experience – its length, combatant' role, and the side they fought for.[8] Second, participation in the war is self-determined. While we

[6] Participants were also asked questions about whether friends or family were affected by the war/tsunami. Because we exploit within-twin variation, we focus on direct exposure (twins share the same family (and often friends) and consequently, there is limited variation in indirect exposure to exploit).
[7] Other twins have an indirect effect on the estimates by helping to identify the coefficients on the control variables.
[8] In our sample combatants are likely to have fought on the side of the Sri Lankan Government. This is both because our sample is from Colombo – which is far from the main combat regions – and because all combatants in our sample identify as Sinhalese.

expect that twin fixed effects will absorb much of the variation in risk preferences, it is possible that within twin pairs, siblings who chose to participate in the conflict are systematically less risk averse. To counter this, as with the tsunami, we use an indicator for whether the person was injured, lost property or was displaced by the conflict, which we expect to be less self-determined.

There is generally less within-twin variation in civil war exposure to exploit than for the tsunami. For the main exposure variable ('combatant') there are effectively 27 exposed/control. When we also control for the 'victim' indicator and interact with 'combatant', there are 19 exposed/control for 'combatant', 31 exposed/control for 'victim only' and 8 treatment/control for 'combatant × victim' (i.e. both a combatant in the war and injured, property damage or displaced).

There is almost no overlap between our tsunami and civil war exposure groups; only one twin pair having both conflicting tsunami and combat experiences.

Mental health and Psychiatric diagnoses

All mental health measurements were administered by trained research staff. The Mental Health Index from the SF-36 (see Ware et al., 2000), is scaled from 0 to 100, with higher scores indicating better mental health. In addition, the WHO-Composite International Diagnostic Interview provides diagnoses for major depression, generalised anxiety and posttraumatic stress disorder. As the prevalence of major depression is low in our sample, we also use the screening questions "D-probe" to ascertain a broader phenotype of people with affective symptoms (Ball et al., 2010). This captures people who have experienced a two-week period of either of the two cardinal features of major depression (i) feeling sad, empty or depressed or (ii) loss of interest in most things.

Other controls

CoTASS interviews also collected information on basic demographics (e.g. gender, marital status, household size), education, financial circumstances, physical health (also from SF-36), employment and life experiences, which are used as controls. Detailed definitions for all variables used in this paper are available in Appendix Table A1.

5. Identification

Our identification strategy relies on the assumption that within-twin pairs, exposure to the war and tsunami is unrelated to pre-existing differences in risk preferences. Essentially, twins not exposed to the event act as a control for their pair who was exposed.

Exposed and not-exposed twins do not differ on most of the covariates (see Table 1 and Table 2) validating our econometric approach.

Table 1: Descriptive statistics for twin pairs with different tsunami exposure

	Affected N=75	Not affected N=75	Difference	p-value
Risk	63.91	30.92	32.99	0.05
Male	0.49	0.49	0.00	1.00
Age	33.73	33.75	-0.01	0.76
Married	0.61	0.67	-0.05	0.37
Widowed	0.05	0.01	0.04	0.18
Separated	0.00	0.00	0.00	.
Divorced	0.03	0.00	0.03	0.16
Never married	0.31	0.32	-0.01	0.78
Interview date	246.81	230.85	15.96	0.04
SF-36 general	64.27	62.80	1.47	0.60
SF-36 mental	73.23	72.20	1.03	0.74
D-probe	0.21	0.13	0.08	0.18
Depression life	0.16	0.11	0.05	0.32
Depression cur.	0.01	0.01	0.00	1.00
GAD	0.03	0.07	-0.04	0.25
PTSD	0.07	0.03	0.04	0.26
Poor finances	2.56	2.41	0.15	0.26
House quality	-0.31	-0.05	-0.26	0.03
Assets	0.13	0.18	-0.04	0.75
Debt	0.56	0.53	0.03	0.70
Education years	9.89	10.08	-0.19	0.60
HH no. persons	4.85	4.75	0.11	0.62
Employed	0.60	0.51	0.09	0.18
Ethnic minority	0.13	0.13	0.00	.
Life events	1.48	1.41	0.07	0.71
Urban	0.69	0.69	0.00	1.00

Note: P-values are calculated using paired t-tests on the difference in means for each variable. See Table A1 for variable definitions.

Table 2: Descriptive statistics for twin pairs with different civil war participation

	Combat N=27	No combat N=27	Difference	p-value
Risk	74.26	38.81	35.44	0.03
Male	0.89	0.67	0.22	0.03
Age	34.48	34.56	-0.07	0.42
Married	0.59	0.52	0.07	0.42

Widowed	0.04	0.07	-0.04	0.57
Separated	0.00	0.00	0.00	.
Divorced	0.00	0.00	0.00	.
Never married	0.37	0.41	-0.04	0.57
Interview date	218.59	235.56	-16.96	0.43
SF-36 general	67.22	61.11	6.11	0.15
SF-36 mental	82.07	76.74	5.33	0.30
D-probe	0.22	0.37	-0.15	0.21
Depression life	0.19	0.15	0.04	0.74
Depression cur.	0.00	0.00	0.00	.
GAD	0.11	0.11	0.00	1.00
PTSD	0.00	0.07	-0.07	0.16
Poor finances	2.15	2.26	-0.11	0.54
House quality	-0.14	-0.14	0.00	1.00
Assets	-0.31	-0.47	0.16	0.46
Debt	0.37	0.59	-0.22	0.05
Education years	11.81	11.44	0.08	0.88
HH no. persons	4.81	4.70	0.11	0.78
Employed	0.85	0.85	0.00	1.00
Ethnic minority	0.00	0.00	0.00	.
Life events	1.30	1.26	0.04	0.91
Urban	0.19	0.11	0.07	0.32

Note: P-values are calculated using paired t-tests on the difference in means for each variable. See Table A1 for variable definitions.

Looking first at the tsunami sample (Table 1), exposed and control twins are similar on a wide range of characteristics such as marital status, household size, education, gender, employment, physical health and region. Somewhat surprisingly, there is also no statistically significant difference in the mental health indicators. There is however a large difference in risk preferences — those affected by the tsunami are willing to pay over twice as much for the lottery compared to the control twins (64 Rs compared to 31 Rs).

Across one measure of socioeconomic status – a house quality scale – exposed twins are 0.27 standard deviation units worse off (there is no statistically significant difference for self-assessed financial circumstances, assets ownership or debt). Given the relatively short time between the tsunami and the CoTASS interviews, this may be a direct result of the disaster. The exposed twins are interviewed on average 16 days after their control pair. We do not expect this small difference to be related to risk preferences but nevertheless control for interview date in our formal analysis.

Exposed and control twins have similar characteristics in the case of civil war (Table 2) with an exception of gender — combatant twins are more likely to be male (89% versus 67%). Males often make riskier choices in risk elicitation experiments (Croson and Gneezy, 2009), so we will control for gender in our analysis. Further, we will consider carefully the sensitivity of our results to focusing only on monozygotic twins (who have twice the genetic similarity of dizygotic twins). As with exposure to the tsunami, combatants display less risk-averse behaviour, with willingness to pay for the lottery on average 74 Rs compared to 39 Rs for the control group.

The descriptive evidence points to both natural disaster and exposure to civil conflict leading to lower risk aversion. The lack of differences in mental health or wealth between exposed and control twins suggests that neither mental health nor wealth are likely to be the mechanism that leads to preference change.

6. Results

6.1 Main regression results

We begin by estimating equation (1) without conditioning on $\boldsymbol{X_i}$ (column 1 of Table 3) and then progressively add potential confounders to assess the sensitivity of our baseline estimates. For brevity, only the coefficients on the exposure variables are reported in Table 3. Full regression results are available in Appendix Table A4.[9]

Table 3: Twin fixed effects regression results on willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	32.530*	33.186*	33.883**	32.803*	15.375
	(16.841)	(17.077)	(16.707)	(16.786)	(12.909)
War combat	34.240**	34.294**	34.379**	34.522**	39.374**
	(15.450)	(15.975)	(16.437)	(16.345)	(19.109)
Tsunami victim					-35.102
					(42.239)
War victim					43.223
					(32.294)
T. Affected × victim					117.798*
					(61.156)
War combat × victim					-51.631
					(40.125)
Twin Fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics	No	Yes	Yes	Yes	Yes
Finances	No	No	Yes	Yes	Yes
Mental health	No	No	No	Yes	Yes
N	2946	2910	2908	2880	2880
R^2	0.005	0.028	0.030	0.042	0.050
ρ	0.370	0.379	0.383	0.395	0.397

Note: The dependent variable is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected

[9] We observe the common result that males are less risk averse than females. Most other controls have no statistically significant effect.

area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). Demographics controls also include survey interview date. ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01. Full results are in Table A4.

The results across columns 1-4 are notably stable and consistently indicate that those in an affected area during the tsunami or who fought in the civil war are less risk averse. All marginal effects are significant at either the 5% or 10% levels and the bootstrap confidence intervals do not include zero (see Table A11). Although magnitude is difficult to assess with risk elicitation tasks, the effect sizes seem economically large. The estimates in column 1 are equivalent to 0.31 and 0.27 standard deviation units for the tsunami and civil war respectively (based on the distributions of rp_{ij} for twins included in Table 1 and Table 2).

When we include the alternative exposure indicators in column 5, the effect of being in an affected area during the tsunami is smaller in magnitude and no longer statistically significant. Those injured, who lost property or were displaced are actually more risk averse but the estimate is not statistically significant. The group who are most sensitive to the disaster are those who were in an affected area and were also injured, lost property or were displaced. The marginal effect for these individuals is 98.1 Rs (SE = 55.8). This suggests effects are be strongest for those with a greater intensity of exposure; the combination of both experiencing the disaster first hand and suffering some kind of damages elicit the greatest response in risk preferences. This is consistent with other studies that use more intensive exposure as the treatment variable (e.g. Hanaoka et al., 2018). However, we are cautious not to overemphasise this result given the small sample sizes identifying the effects (as discussed in Section 4).

In contrast to the tsunami, the marginal effects for the different definitions of exposure to the civil war are more consistent. The point estimates for combatants and those who were injured, lost property or displaced but were not combatants are 39.4 Rs and 43.2 Rs respectively (although the latter is not precisely estimated), while the marginal effect for those who were both combatants and injured, lost property or displaced is 31.0 Rs (SE = 18.0).

5.2 Sensitivity

Our results so far relate to all twins, both monozygotic and dizygotic. This means that in some cases we are comparing twins of different gender, and fraternal twins who share on average only 50% of their DNA with their sibling. Arguably, monozygotic twins will serve as a more credible control group since they share the same genetic structure and gender. The trade-off is that focusing on monozygotic twins only reduces our sample size by around 55%. Nevertheless, this serves as a useful robustness check to the main results.

Monozygotic twins are identified using a validated questionnaire that has been found to accurately categorise twins in around 90% of cases (Ooki et al., 1990; Jarrar et al., 2018). We restrict the sample to these twins and re-estimate each model in Table 3. The results are reported in Table 4. Despite the reduction in sample size, we continue to estimate a statistically significant effect of the tsunami and civil war on risk aversion. For the tsunami, estimates are around twice as large as the main results, significant at the 10% level and invariant to the inclusion of controls. The estimates are also larger in magnitude for the civil war, significant at 5% and again largely invariant to the inclusion of controls. The results in column 5 are qualitatively similar to the main results. We conclude that our results are robust to restricting the sample to monozygotic twins only. For the remaining sensitivity analyses we therefore use our full sample of twins.

Table 4: Monozygotic twin fixed effects regression results on willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	57.813	60.089*	60.781*	62.692*	25.603
	(35.369)	(36.019)	(35.373)	(33.532)	(22.784)
War combat	49.333**	48.058**	49.981**	40.684*	41.328
	(22.178)	(22.112)	(22.932)	(22.083)	(28.538)
Tsunami victim					85.439
					(70.173)
War victim					60.247
					(36.755)
T. Affected × victim					118.140
					(100.298)
War combat × victim					-47.918
					(59.209)
Twin Fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics	No	Yes	Yes	Yes	Yes
Finances	No	No	Yes	Yes	Yes
Mental health	No	No	No	Yes	Yes
N	1280	1265	1265	1258	1258
R^2	0.014	0.026	0.030	0.053	0.085
ρ	0.387	0.389	0.393	0.407	0.429

Note: * p < 0.10, ** p < 0.05, *** p < 0.01. See Table 3 for further details. Full results are in Table A5.

Next, we consider transformations of the risk preference measure. The first transformation we consider is to replace rp_{ij} with $\log(rp_{ij})$, which given the skewed nature of willingness to pay for the lottery ticket may be helpful. This transformation will reduce the influence of outliers (i.e. very high bids for the lottery) and result in marginal effects with an arguably simpler interpretation. Again, we estimate the same five regressions by progressively adding controls. The results are in Table 5. For the tsunami exposure, estimates across columns 1-4 imply an approximately 30% reduction in willingness to pay for the lottery ticket. These estimates are all significant at the 10% level. For the civil war, the magnitudes are notably larger – between 80-90% – and with the full set of controls included are significant at the 1% level. Inspection of the data indicates that this difference across events is partly driven by more outlying willingness to pay values for twins exposed to the tsunami (see Appendix Table A2). The results for the other exposure variables are qualitatively similar to the main estimates.

Table 5: Twin fixed effects regression results on log willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	0.299*	0.313*	0.318*	0.288*	0.090
	(0.167)	(0.170)	(0.169)	(0.170)	(0.170)
War combat	0.814***	0.876***	0.857***	0.881***	0.819***
	(0.277)	(0.268)	(0.270)	(0.269)	(0.271)
Tsunami victim					-0.494
					(0.542)
War victim					0.560*
					(0.286)
T. Affected × victim					1.414*
					(0.732)
War combat × victim					-0.244
					(0.542)
Twin Fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics	No	Yes	Yes	Yes	Yes
Finances	No	No	Yes	Yes	Yes
Mental health	No	No	No	Yes	Yes
N	2946	2910	2908	2880	2880
R^2	0.008	0.030	0.031	0.039	0.048
ρ	0.412	0.427	0.426	0.433	0.437

Note: the dependent variable is the natural logarithm of willingness to pay for the lottery described in Section 4. See Table 3 for additional details. Full results are in Table A6.

Finally, we present results using the unit interval transformation suggested by Cramer et al., (2002). They recast the willingness to pay values as $\widetilde{rp}_{ij} = 1 - rp_{ij}/(0.5 \times 1000)$ where 1000 is the payoff for a win and 0.5 is the probability. This results in an index of values from 0 to 1 for bids that are risk averse (i.e. $rp_{ij} < 500$), with higher values indicating greater risk aversion.[10] Since $\widetilde{rp}_{ij}$ and rp_{ij} are linearly related to each other, this preserves the structure of the raw data and has no qualitative effect on the results but is useful if one wants to compare our results to others who have transformed the outcome variable in this way. The estimates are reported in Appendix Table A7.

5.3 Who are the exposed?

Because we use a within-twins estimation strategy, identification comes from the group of twins where one twin was exposed to the tsunami/civil war while the other twin was not. This group may differ from the general population of twins in Colombo. For example, older twins will have had more opportunities for divergent behavior and may therefore be disproportionately represented. This does not threaten the causal validity of our estimation strategy but can have implications for external validity. It is therefore useful to explore whether the likelihood of the within twin pair variation in exposure is related to any of our observables.

To this end, in Table 6 and Table 7, we compare the covariates of twins with conflicting exposure (i.e. one twin only was in tsunami-affected area or participated in the civil war) with the rest of the CoTASS twin sample. Among twin pairs with non-conflicting exposure, the vast majority were not exposed (in only 33 pairs were both twins in a tsunami-affected area and in only 12 pairs were both twins civil war combatants).

Table 6: Comparison of mixed tsunami exposure twins to all other twins

	Same exposure N=2784		Mixed exposure N=150		Difference
	Mean	SD	Mean	SD	p-value
Risk	42.85	(88.35)	47.41	(103.37)	0.54
Male	0.48	(0.50)	0.49	(0.50)	0.67
Age	33.56	(13.26)	33.74	(11.10)	0.87
Married	0.54	(0.50)	0.64	(0.48)	0.02
Widowed	0.03	(0.17)	0.03	(0.18)	0.81

[10] An arguably more useful transformation would be to convert $\widetilde{rp}_{ij}$ into values of absolute risk aversion (i.e. $-U''/U'$). Cramer et al., (2002) have derived such a formula for the current measure of risk preferences by taking Taylor series expansion around the expected utilities for the favourable and unfavourable outcomes; however, as Guiso and Paella (2008) point out, this approach has undesirable limiting behavior as willingness to pay approaches zero (rather than $-U''/U'$ converging to infinity it converges to a constant). The transformation formula in this application is $(0.5 \times 1000 - rp_{ij})/(0.5 \times (0.5 \times 1000^2 - 2 \times 0.5 \times 1000 \times rp_{ij} + rp_{ij}^2))$. Given the undesirable limiting behaviour of this transformation, coupled with the fact that we have considerable bunching in the left tail, we are sceptical of using this approach in our setting. Unfortunately, any alternative approach would require us to specify the reference wealth for the agent's utility function and we do not have this information in our data. We report estimates using the Cramer et al., (2002) transformation in the Appendix (Table A8) for the interested reader.

Separated	0.01	(0.09)	0.00	(0.00)	0.26
Divorced	0.00	(0.06)	0.01	(0.12)	0.07
Never married	0.42	(0.49)	0.31	(0.47)	0.01
Interview date	220.67	(113.85)	238.83	(119.07)	0.06
SF-36 general	63.59	(18.03)	63.53	(20.53)	0.97
SF-36 mental	74.89	(16.95)	72.71	(20.44)	0.13
D-probe	0.16	(0.36)	0.17	(0.38)	0.62
Depression life	0.11	(0.31)	0.13	(0.34)	0.35
Depression cur.	0.01	(0.11)	0.01	(0.12)	0.94
GAD	0.04	(0.19)	0.05	(0.21)	0.63
PTSD	0.02	(0.13)	0.05	(0.21)	0.01
Poor finances	2.31	(0.89)	2.49	(1.03)	0.02
House quality	-0.01	(1.00)	-0.18	(1.10)	0.05
Assets	-0.06	(1.01)	0.15	(0.99)	0.01
Debt	0.43	(0.50)	0.55	(0.50)	0.01
Education years	10.84	(3.13)	9.99	(3.00)	0.00
HH no. persons	4.92	(1.97)	4.80	(1.90)	0.48
Employed	0.54	(0.50)	0.55	(0.50)	0.68
Ethnic minority	0.09	(0.29)	0.13	(0.34)	0.07
Life events	0.98	(1.12)	1.45	(1.38)	0.00
Urban	0.37	(0.48)	0.69	(0.46)	0.00

Note: The same exposure group consists of twin-pairs where both twins were either not in an affected area during the tsunami, or both twins were in an affected area. Sample sizes for the same exposure group vary between 2,757 and 2,784 depending on the variable. The mixed exposure group are the twin pairs with conflicting tsunami exposure (N=150 except for GAD where N=149). P-values on differences are based on two-tailed t-tests.

There are differences between our mixed tsunami exposure twin sample and the rest of the CoTASS twin sample. Mixed exposure twins are more likely to be married, more likely to live in an urban area and have had more adverse life experiences. They are also less educated, more likely to have debt, live in lower quality housing and have worse self-rated financial wellbeing but own more assets. On other covariates, such as mental and physical health, employment, household size and age, both groups are broadly similar. Perhaps the most prominent difference is urbanicity, with 69% of mixed exposure twins living in urban areas compared to only 37% of other twins. Overall, our tsunami exposure estimates seem to be based on a more urban and, on several dimensions, less advantaged, subset of the Columbo twin population.

Table 7: Comparison of mixed civil war exposure twins to all other twins

	Same exposure N=2880		Mixed exposure N=54		Difference
	Mean	SD	Mean	SD	p-value
Risk	42.83	(88.36)	56.54	(125.07)	0.26
Male	0.47	(0.50)	0.78	(0.42)	0.00
Age	33.56	(13.19)	34.52	(11.54)	0.59
Married	0.55	(0.50)	0.56	(0.50)	0.88

Widowed	0.03	(0.17)	0.06	(0.23)	0.27
Separated	0.01	(0.09)	0.00	(0.00)	0.51
Divorced	0.00	(0.06)	0.00	(0.00)	0.63
Never married	0.41	(0.49)	0.39	(0.49)	0.72
Interview date	221.50	(113.91)	227.07	(128.73)	0.72
SF-36 general	63.58	(18.14)	64.17	(19.54)	0.81
SF-36 mental	74.69	(17.11)	79.41	(18.86)	0.05
D-probe	0.16	(0.36)	0.30	(0.46)	0.01
Depression life	0.11	(0.31)	0.17	(0.38)	0.18
Depression cur.	0.01	(0.11)	0.00	(0.00)	0.41
GAD	0.04	(0.19)	0.11	(0.32)	0.01
PTSD	0.02	(0.13)	0.04	(0.19)	0.30
Poor finances	2.33	(0.90)	2.20	(0.76)	0.32
House quality	-0.02	(1.00)	-0.14	(1.08)	0.38
Assets	-0.04	(1.01)	-0.39	(1.07)	0.01
Debt	0.44	(0.50)	0.48	(0.50)	0.53
Education years	10.78	(3.13)	11.63	(2.94)	0.05
HH no. persons	4.91	(1.97)	4.76	(1.65)	0.57
Employed	0.53	(0.50)	0.85	(0.36)	0.00
Ethnic minority	0.09	(0.29)	0.00	(0.00)	0.02
Life events	1.00	(1.13)	1.28	(1.34)	0.08
Urban	0.39	(0.49)	0.15	(0.36)	0.00

Note: The same exposure group consists of twin-pairs where both twins were either not combatants in the civil war, or both twins were combatants. Sample sizes for the same exposure group vary between 2,855 and 2,880 depending on the variable. The mixed exposure group are the twin pairs with conflicting combat experience (N=54). P-values on differences are based on two-tailed t-tests.

There is a stark difference in the number of male-male twin pairs in our mixed exposure group for the civil war – 78% of twins are male compared to only 47% for the rest of the CoTASS twin sample. The mixed exposure sample appears to have worse mental health on some indicators (GAD, D-probe) but also performs slightly better on the SF-36. They also have less assets but are similar on other financial indicators, have more years of education and are significantly more likely to be employed (85% compared to 53%), which is likely driven by the gender differences. There is no representation of ethnic minorities in our mixed exposure sample and in contrast to the tsunami sample, they are much more likely to reside in rural areas. Overall, our mixed exposure sample for the civil war seems to be largely drawn from males living in rural parts of the Columbo district.

5.4 Mechanisms

Throughout the analysis we have sequentially added controls for financial circumstances and mental health. At all stages, these controls have minimal impact on our estimates. Looking at the results in Table 1 and Table 2 as well as the full regression results in Appendix Table A4, this is both because there is little effect of the tsunami and war on these indicators and because they are insignificant predictors of our risk preference measure. We therefore conclude that financial circumstances and mental health are unlikely to be channels for the effects we estimate.[11]

One issue that is seldom acknowledged in the disaster/conflict and risk preferences literature is that using people from the same broad region as control units means that marginal effects are actually contrasting some level of indirect exposure to direct exposure. The reason is that controls are likely to be aware of the disaster occurring or may know people who were affected by it, and this might affect their preferences. This is true even in studies that use a differences-in-differences methodology.[12] In our case, there is a potentially stronger possibility of such effects since the control twin necessarily has a sibling who was exposed to the tsunami or civil war. It could dramatically change how we interpret our findings if indirect exposure is influential. At the extreme end, it is possible that direct exposure has no effect but that indirect exposure makes people more risk averse. The implications in terms of the average level of risk aversion in the wider economy would then be opposite to if the effects we estimate are driven by direct exposure. On the other hand, if the effects of direct and indirect exposure go in the same direction, we may be understating the macroeconomic effects.

To test whether indirect exposure effects are driving our results, we first restrict the twin-sample to only those who were not in an affected area during the tsunami. We then create an indicator for the 75 people in our restricted sample who have a twin who was in an affected area (Twin affected). The idea is that those who have a twin who was in the affected area (i.e. our control group in the main analysis) will have experienced a greater level of indirect exposure on average than those who do not. To test this, we simply regress our risk preference measure rp_{ij} on this indicator as well as our set of controls. We have already seen in Table 6 that twins with mixed exposure differ on several dimensions from those where neither was in an affected area, so it will be important to adjust for observable differences. We conduct analogous exercises for exposure to the civil war. The results are reported in Table 8.

[11] We do not control for PTSD in any of our regressions because the screening for this diagnosis requires that a traumatic event has occurred, so exposed twins are necessarily more likely to be screened. The results in Table 1 and Table 2 indicate that PTSD rates are low in our sample and are not statistically different between exposed/control twins.
[12] Jakiela and Ozier (2015) discuss this issue and address it by comparing a group surveyed before the event (election related violence) to a group surveyed after the event.

Table 8: Regression results risk preferences on having a twin exposed to event

	(1) rp_{ij}	(2) rp_{ij}	(3) $\log(rp_{ij})$	(4) $\log(rp_{ij})$
		Tsunami group		
Twin affected	-11.957**	-10.111*	-0.054	-0.026
	(5.237)	(5.724)	(0.113)	(0.119)
Controls	No	Yes	No	Yes
N	2793	2733	2793	2733
R^2	0.000	0.017	0.000	0.019
		Civil war group		
Twin combat	-4.050	-8.004	-0.314	-0.386*
	(18.336)	(19.104)	(0.232)	(0.229)
Controls	No	Yes	No	Yes
N	2883	2818	2883	2818
R^2	0.000	0.016	0.001	0.018

Note: The estimation sample for all estimates are those in the CoTASS twin sample who were not exposed (i.e. not in an affected area for the tsunami group panel; did not participate in the civil war as a combatant for the civil war group panel). In columns 1-2 the dependent variable is the willingness to pay for the lottery described in Section 4. In columns 3-4 the dependent variable is the natural logarithm of this value. Twin affected is an indicator for if the person's twin was in an affected area during the tsunami; twin combat is an indicator for if the person's twin was a combatant in the civil war. Other controls are detailed in Table A1. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05. Full results are in Table A9 and Table A10.

Beginning with results for the tsunami, the coefficient for having a twin in an affected area is negative and marginally significant when we condition on controls. We see the same pattern for the civil war. This suggests that indirect exposure effects might partly explain our results – specifically, having a sibling who was affected by the disaster (fought in the civil war) may cause an individual to become more risk averse. This result is somewhat sensitive to functional form – when we log-transform our risk preference measure, the statistical significance disappears for the tsunami group, while we only get marginal significance after log-transformation for the civil war group. We are also wary of the fact that our model does not adjust for unobservable heterogeneity, and the descriptive statistics in Table 6, which show disparities between twin sets, imply we should interpret these results with caution. Further, the marginal effects in Table 8 are much smaller than those in Table 3, so even if we accept these estimates as truth, our main conclusion that people become less risk averse after the tsunami remains (although our effect sizes might be overstated). Nevertheless, these results may help to shed light on the underlying mechanisms between traumatic events and risk preferences. For example, it is possible that living through a traumatic experience leads to a sense of optimism and strengthens resilience (e.g. 'come out the other side stronger'), while having indirect exposure leaves people feeling weary and cautious. It is beyond the scope of this paper to explore this further, but it would be an interesting avenue for future work.

6. Conclusion

There is much interest in how economic preferences are formed and whether they are influenced by changes in circumstances. Significant events such as natural disasters and civil war are particularly interesting because they typically reach of large part of the population and if preferences change, this may alter the social and economic trajectory of the affected region.

Our results suggest that people become less risk averse after traumatic events. One unique aspect of our project is that we are able to study the effect of two distinct and different events within the same context. Exploiting differences in exposure within twin pairs, we find that being in an affected area during the 2004 tsunami or participating in the Sri Lankan Civil War are both associated with less risk averse choices in a preference elicitation task. Our results are robust to different transformations of the dependent variable, sets of controls and restricting our sample to monozygotic twins. There is some evidence that more intensive exposure to the tsunami – namely being both in an affected area when it struck and being injured, losing property or displaced – leads to a larger response.

A unique feature of our data is the extensive information on individual mental health, which allow us to test whether mental health is a mechanism through which risk preferences change following a traumatic event. We find no evidence that variation in mental health is a mechanism, consistent with recent findings regarding the Mexican drug war (Nasir et al., 2016). Material deprivation also does not seem to explain our results. We find some evidence that indirect exposure effects (i.e. the effect of having a sibling affected by the tsunami/civil war) may go in the opposite direction of direct exposure effects. However, this does not fully explain the decrease in risk aversion for those directly affected.

There are some shortcomings of our research and areas of further work that are worth highlighting. Many issues relate broadly to the literature on natural disasters/conflict and risk preferences. For example, exposure to any event is inherently difficult to define. In our paper, our primary exposure variables are being in an affected area during the tsunami and participating in the civil war as a combatant. The experience of two people in the disaster zone, or who fought in the civil war, may be quite different. We are also constrained in our ability to speak to the longevity of any effects on risk preferences. In particular, we do not know how recently combat service occurred. Our results suggest that effects of the tsunami last at least 2-3 years. Finally, while we provide new evidence on the role of mental health and indirect exposure, we are ultimately unable to identify the causal pathway between traumatic events and risk preferences. This is an important area for future work and finding good evidence on mechanisms will be critical to resolving conflicting evidence regarding traumatic events and risk preferences.

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Table A1: Variable definitions

Variable	Definition
Risk	Willingness to pay for 50/50 lottery; 1000 Rs or 0Rs
Male	=1 if male
Age	Age in years at the time of interview
Married	=1 if married
Widowed	=1 if widowed
Separated	=1 if separated
Divorced	=1 if divorced
Never married	=1 if never married
Interview date	Day of interview (first interview =0)
SF-36 general	SF-36 general health score [0-100]
SF-36 mental	SF-36 mental health subscale score [0-100]
D-probe	Scoring positively on at least one 'probe' question (a two-week period of either (i) feeling sad, empty or depressed; or (ii) loss of interest in most things)
Depression life	DSM-IV criteria for a depressive episode (World Health Organisation, 1990) excluding the requirement for reported functional impairment
Depression cur.	Conventional DSM-IV with exceptions as above currently
GAD	Conventional DSM-IV criteria for generalized anxiety disorder excluding if the diagnosis is attributable entirely to drugs, alcohol or a physical disorder e.g. thyroid disease.
PTSD	DSM-IV criteria for post traumatic stress disorder (only applicable to those who indicate having experienced a traumatic event in the past)
Poor finances	Self-assessed financial wellbeing [1=living comfortably, 2=doing alright, 3=just about getting by, 4=finding it difficult to make ends meet, 5=finding it very difficult to make ends meet]
House quality	Z-score based on index of house quality. This index is constructed by adding up the following indicators for house quality: lives in a single house; house has a living room; house has at least one bedroom; walls are constructed by brock/cement; cement, terrazzo, tile or granite floor; tile, asbestos or concrete roof; access to exclusive toilet; access to push flush toilet; drinking tap within premises; electricity used for lighting. We then use the standardized value of this score
Assets	Z-score based on index of assets owned. This index is constructed by adding up how many of the following asset the individual owns (no additional points for owning more than one of each type): radio; television; refrigerator; phone; bicycle; motorbike/scooter; car/bus/van. One point is given for each type of asset except motorbike/scooter and car/bus/van, which are given two points. We use the standardized value of this score.
Debt	=1 if currently has a debt
Education years	Number of years of schooling
HH no. persons	Number of persons living in households
Employed	=1 if employed
Ethnic minority	=1 if belongs to an ethnic minority (e.g. Tamil)
Life events	Sum of adverse life experiences in the last 12 months (suffered from a serious illness, injury or an assault; serious illness, injury or an assault happened to a close relative; parent, spouse (or partner), child, brother

	or sister of yours died; close family friend or another relative died (such as an aunt, cousin or grandparent) died; had a separation due to marital difficulties or broken off a steady relationship; had a serious problem with a close friend, neighbor or relative; made redundant or sacked from your job; become unemployed or seeking work unsuccessfully for more than one month; have a major financial crisis; have problems with the police involving a court appearance; something you valued lost or stolen.)
Urban	=1 if lives in an urban area

Table A2: Frequency distributions for risk preferences

	Whole twin sample			Tsunami affected			Tsunami control			Combat			No combat		
WTP	No.	Pct	Cumpct	No.	Pct	Cumpct	No.	Pct	Cumpct	No.	Pct	Cumpct	No.	Pct	Cumpct
0.1	1	0.03	0.03	.	.	.	.	.	.	.	.	.	.	.	.
1	17	0.58	0.61	1	1.33	1.33	.	.	.	.	.	.	1	3.70	3.70
2	21	0.71	1.32	1	1.33	2.67	2	2.67	2.67	.	.	.	1	3.70	7.41
2.5	2	0.07	1.39	.	.	.	.	.	.	.	.	.	.	.	.
3	2	0.07	1.46	.	.	.	.	.	.	.	.	.	.	.	.
4	1	0.03	1.49	.	.	.	.	.	.	.	.	.	.	.	.
5	79	2.68	4.18	.	.	.	1	1.33	4.00	.	.	.	1	3.70	11.11
6	1	0.03	4.21	.	.	.	.	.	.	.	.	.	.	.	.
8	1	0.03	4.24	.	.	.	.	.	.	.	.	.	.	.	.
10	1660	56.35	60.59	37	49.33	52.00	41	54.67	58.67	10	37.04	37.04	17	62.96	74.07
10.1	1	0.03	60.62	.	.	.	.	.	.	.	.	.	.	.	.
12	2	0.07	60.69	.	.	.	.	.	.	.	.	.	.	.	.
15	18	0.61	61.30	.	.	.	1	1.33	60.00	.	.	.	.	.	.
20	313	10.62	71.93	6	8.00	60.00	8	10.67	70.67	4	14.81	51.85	2	7.41	81.48
25	29	0.98	72.91	.	.	.	1	1.33	72.00	1	3.70	55.56	.	.	.
30	19	0.64	73.56	.	.	.	.	.	.	.	.	.	1	3.70	85.19
35	1	0.03	73.59	.	.	.	.	.	.	.	.	.	.	.	.
40	1	0.03	73.63	.	.	.	.	.	.	.	.	.	.	.	.
50	316	10.73	84.35	14	18.67	78.67	15	20.00	92.00	5	18.52	74.07	.	.	.
100	318	10.79	95.15	12	16.00	94.67	2	2.67	94.67	5	18.52	92.59	3	11.11	96.30
110	3	0.10	95.25	.	.	.	.	.	.	.	.	.	.	.	.
150	3	0.10	95.35	.	.	.	1	1.33	96.00	.	.	.	.	.	.
200	43	1.46	96.81	.	.	.	3	4.00	100.00	.	.	.	.	.	.
250	10	0.34	97.15	.	.	.	.	.	.	.	.	.	.	.	.
300	6	0.20	97.35	.	.	.	.	.	.	1	3.70	96.30	.	.	.
350	1	0.03	97.39	.	.	.	.	.	.	.	.	.	.	.	.
400	1	0.03	97.42	.	.	.	.	.	.	.	.	.	.	.	.
500	69	2.34	99.76	3	4.00	98.67	.	.	.	.	.	.	1	3.70	100.00
600	2	0.07	99.83	.	.	.	.	.	.	.	.	.	.	.	.
700	1	0.03	99.86	.	.	.	.	.	.	.	.	.	.	.	.
750	2	0.07	99.93	.	.	.	.	.	.	1	3.70	100.00	.	.	.
900	2	0.07	100.00	1	1.33	100.00	.	.	.	.	.	.	.	.	.
Total	2946	100.00		75	100.00		75	100.00		27	100.00		27	100.00	

Note: Frequency distributions for willingness to pay for the lottery described in Section 4. A small number of bids (none in the tsunami or combat groups) were ≥ 1000 Rs. Since such values are irrational (in the sense they guarantee no positive return and are stochastically dominated), we treat them as missing values.

Table A3: OLS regression result risk on gender, education and finances

	(1)
Male	13.396***
	(3.457)
Education years	-0.657
	(0.663)
Poor finances	-4.544**
	(1.875)
Constant	54.347***
	(10.224)
N	2917
R^2	0.008

Note: The dependent variable is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A4: Twin fixed effects regression results on willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	32.530*	33.186*	33.883**	32.803*	15.375
	(16.841)	(17.077)	(16.707)	(16.786)	(12.909)
War combat	34.240**	34.294**	34.379**	34.522**	39.374**
	(15.450)	(15.975)	(16.437)	(16.345)	(19.109)
Male		20.328***	20.158***	19.932***	19.237***
		(6.496)	(6.532)	(6.574)	(6.640)
Married		-5.586	-5.086	-6.805	-6.543
		(8.595)	(8.781)	(8.894)	(9.026)
Widowed		-6.233	-5.614	2.300	2.676
		(13.819)	(14.067)	(14.635)	(14.722)
Separated		-34.621	-33.704	-23.818	-21.580
		(31.027)	(30.833)	(30.814)	(30.946)
Divorced		-20.896	-20.810	-10.677	-6.797
		(16.067)	(16.320)	(13.747)	(12.741)
Interview date		-0.089*	-0.086	-0.095*	-0.102*
		(0.054)	(0.054)	(0.056)	(0.056)
SF-36 general		-0.016	-0.012	-0.101	-0.087
		(0.138)	(0.136)	(0.146)	(0.145)
Education years		0.251	0.125	-0.050	-0.159
		(1.195)	(1.204)	(1.207)	(1.200)
HH no. persons		-1.124	-1.512	-1.510	-1.536
		(1.895)	(1.999)	(2.038)	(2.010)
Employed		15.650**	16.274**	15.163**	15.155**
		(6.585)	(6.694)	(6.668)	(6.682)
Urban		-6.972	-7.204	-8.246	-7.511
		(11.957)	(11.977)	(12.207)	(12.220)
Poor finances			2.481	3.921	3.121
			(3.115)	(3.448)	(3.209)
House quality			4.600	5.092	5.751
			(3.620)	(3.743)	(3.554)
Assets			-2.837	-3.492	-3.893
			(4.043)	(4.022)	(4.044)
Debt			-2.510	-3.081	-3.212
			(5.586)	(5.687)	(5.590)
SF-36 mental				0.042	0.023
				(0.198)	(0.196)
D-probe				-10.127	-11.041
				(13.069)	(13.139)
Depression life				1.519	1.714
				(14.603)	(14.621)
Depression cur.				-45.487	-45.313
				(27.955)	(27.973)
GAD				-30.907**	-29.224**
				(14.890)	(14.641)
War combat					-35.102
					(42.239)
Tsunami victim					43.223

					(32.294)
War victim					117.798*
					(61.156)
T. Affected × victim					-51.631
					(40.125)
N	2946	2910	2908	2880	2880
R^2	0.005	0.028	0.030	0.042	0.050
ρ	0.370	0.379	0.383	0.395	0.397

Note: The dependent variable is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A5: Monozygotic twins fixed effects regression results on willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	57.813	60.089*	60.781*	62.692*	25.603
	(35.369)	(36.019)	(35.373)	(33.532)	(22.784)
War combat	49.333**	48.058**	49.981**	40.684*	41.328
	(22.178)	(22.112)	(22.932)	(22.083)	(28.538)
Married		-13.862	-13.549	-15.579	-19.193
		(14.848)	(14.878)	(14.634)	(15.149)
Widowed		-28.816	-26.589	-19.474	-27.111
		(26.727)	(27.003)	(27.030)	(27.603)
Separated		-85.069	-83.118	-66.793	-72.618
		(68.533)	(68.406)	(67.892)	(68.079)
Divorced		-50.260	-51.106	-59.252*	-46.781*
		(34.656)	(35.132)	(32.617)	(23.885)
Interview date		-0.030	-0.026	-0.044	-0.041
		(0.099)	(0.097)	(0.096)	(0.097)
SF-36 general		0.010	0.005	-0.051	-0.036
		(0.204)	(0.203)	(0.208)	(0.202)
Education years		-1.394	-1.292	-1.241	-1.113
		(2.894)	(2.880)	(2.885)	(2.861)
HH no. persons		-2.769	-3.622	-3.747	-3.239
		(3.186)	(3.429)	(3.430)	(3.242)
Employed		5.547	5.956	6.712	7.111
		(11.570)	(11.520)	(11.250)	(10.916)
Urban		-0.483	-0.886	-4.045	0.748
		(22.312)	(23.093)	(22.891)	(24.093)
Poor finances			3.859	5.064	4.318
			(6.189)	(6.880)	(5.825)
House quality			4.830	5.728	7.567
			(6.529)	(6.507)	(5.631)
Assets			-5.746	-6.756	-7.825
			(7.125)	(7.063)	(6.900)
Debt			-1.534	1.566	-2.149
			(10.106)	(10.516)	(10.199)
SF-36 mental				0.009	-0.054
				(0.264)	(0.241)
D-probe				-27.342	-27.134
				(27.400)	(27.767)
Depression life				34.800	33.546
				(28.363)	(28.338)
Depression cur.				5.923	2.909
				(21.987)	(20.273)
GAD				-69.568***	-63.652***
				(25.391)	(24.508)
War combat					85.439
					(70.173)
Tsunami victim					60.247
					(36.755)
War victim					118.140

					(100.298)
T. Affected × victim					-47.918
					(59.209)
N	1280	1265	1265	1258	1258
R^2	0.014	0.026	0.030	0.053	0.085
ρ	0.387	0.389	0.393	0.407	0.429

Note: The dependent variable is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Standard errors in parentheses are clustered at the twin level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Twin fixed effects regression results on log willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	0.299*	0.313*	0.318*	0.288*	0.090
	(0.167)	(0.170)	(0.169)	(0.170)	(0.170)
War combat	0.814***	0.876***	0.857***	0.881***	0.819***
	(0.277)	(0.268)	(0.270)	(0.269)	(0.271)
Male		0.253***	0.252***	0.255***	0.247***
		(0.079)	(0.079)	(0.080)	(0.081)
Married		-0.013	-0.001	-0.010	-0.008
		(0.092)	(0.093)	(0.094)	(0.095)
Widowed		-0.164	-0.148	-0.081	-0.073
		(0.171)	(0.173)	(0.177)	(0.177)
Separated		0.068	0.085	0.180	0.209
		(0.364)	(0.366)	(0.374)	(0.372)
Divorced		-0.036	-0.007	0.067	0.110
		(0.204)	(0.206)	(0.175)	(0.182)
Interview date		-0.001**	-0.001**	-0.001**	-0.001**
		(0.001)	(0.001)	(0.001)	(0.001)
SF-36 general		0.000	0.000	-0.001	-0.001
		(0.002)	(0.002)	(0.002)	(0.002)
Education years		-0.008	-0.009	-0.009	-0.010
		(0.014)	(0.014)	(0.014)	(0.014)
HH no. persons		-0.017	-0.016	-0.016	-0.016
		(0.019)	(0.020)	(0.020)	(0.020)
Employed		0.126	0.128*	0.114	0.110
		(0.077)	(0.077)	(0.078)	(0.077)
Urban		-0.047	-0.042	-0.055	-0.043
		(0.147)	(0.146)	(0.150)	(0.148)
Poor finances			-0.007	0.009	-0.001
			(0.036)	(0.037)	(0.036)
House quality			0.013	0.018	0.023
			(0.040)	(0.041)	(0.040)
Assets			-0.002	-0.008	-0.013
			(0.046)	(0.046)	(0.046)
Debt			-0.065	-0.076	-0.078
			(0.064)	(0.065)	(0.065)
SF-36 mental				0.002	0.001
				(0.002)	(0.002)
D-probe				0.004	-0.005
				(0.132)	(0.132)
Depression life				0.011	0.019
				(0.155)	(0.155)
Depression cur.				-0.324	-0.328
				(0.236)	(0.235)
GAD				-0.337**	-0.316**
				(0.158)	(0.157)
War combat					-0.494
					(0.542)
Tsunami victim					0.560*

					(0.286)
War victim					1.414*
					(0.732)
T. Affected × victim					-0.244
					(0.542)
N	2946	2910	2908	2880	2880
R^2	0.008	0.030	0.031	0.039	0.048
ρ	0.412	0.427	0.426	0.433	0.437

Note: The dependent variable is the natural logarithm of willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A7: Twin fixed effects regression results on index transformed willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	-0.065*	-0.066*	-0.068**	-0.066*	-0.031
	(0.034)	(0.034)	(0.033)	(0.034)	(0.026)
War combat	-0.068**	-0.069**	-0.069**	-0.069**	-0.079**
	(0.031)	(0.032)	(0.033)	(0.033)	(0.038)
Male		-0.041***	-0.040***	-0.040***	-0.038***
		(0.013)	(0.013)	(0.013)	(0.013)
Married		0.011	0.010	0.014	0.013
		(0.017)	(0.018)	(0.018)	(0.018)
Widowed		0.012	0.011	-0.005	-0.005
		(0.028)	(0.028)	(0.029)	(0.029)
Separated		0.069	0.067	0.048	0.043
		(0.062)	(0.062)	(0.062)	(0.062)
Divorced		0.042	0.042	0.021	0.014
		(0.032)	(0.033)	(0.027)	(0.025)
Interview date		0.000*	0.000	0.000*	0.000*
		(0.000)	(0.000)	(0.000)	(0.000)
SF-36 general		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Education years		-0.001	-0.000	0.000	0.000
		(0.002)	(0.002)	(0.002)	(0.002)
HH no. persons		0.002	0.003	0.003	0.003
		(0.004)	(0.004)	(0.004)	(0.004)
Employed		-0.031**	-0.033**	-0.030**	-0.030**
		(0.013)	(0.013)	(0.013)	(0.013)
Urban		0.014	0.014	0.016	0.015
		(0.024)	(0.024)	(0.024)	(0.024)
Poor finances			-0.005	-0.008	-0.006
			(0.006)	(0.007)	(0.006)
House quality			-0.009	-0.010	-0.012
			(0.007)	(0.007)	(0.007)
Assets			0.006	0.007	0.008
			(0.008)	(0.008)	(0.008)
Debt			0.005	0.006	0.006
			(0.011)	(0.011)	(0.011)
SF-36 mental				-0.000	-0.000
				(0.000)	(0.000)
D-probe				0.020	0.022
				(0.026)	(0.026)
Depression life				-0.003	-0.003
				(0.029)	(0.029)
Depression cur.				0.091	0.091
				(0.056)	(0.056)
GAD				0.062**	0.058**
				(0.030)	(0.029)
War combat					0.070
					(0.084)

Tsunami victim					-0.086
					(0.065)
War victim					-0.236*
					(0.122)
T. Affected × victim					0.103
					(0.080)
N	2946	2910	2908	2880	2880
R^2	0.005	0.028	0.030	0.042	0.050
ρ	0.370	0.379	0.383	0.395	0.397

Note: The dependent variable is $\widetilde{rp}_{ij} = 1 - rp_{ij}/(0.5 \times 1000)$ where rp_{ij} is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Standard errors in parentheses are clustered at the twin level.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Table A8: Twin fixed effects regression results on CARA transformed willingness to pay for lottery

	(1)	(2)	(3)	(4)	(5)
Tsunami Affected	-0.127*	-0.128*	-0.131*	-0.129*	-0.063
	(0.069)	(0.070)	(0.068)	(0.069)	(0.048)
War combat	-0.083	-0.074	-0.078	-0.077	-0.127
	(0.062)	(0.069)	(0.070)	(0.071)	(0.088)
Male		-0.061**	-0.061**	-0.059**	-0.057**
		(0.026)	(0.026)	(0.026)	(0.027)
Married		0.018	0.018	0.025	0.024
		(0.036)	(0.037)	(0.037)	(0.038)
Widowed		0.010	0.011	-0.019	-0.020
		(0.052)	(0.053)	(0.055)	(0.055)
Separated		0.182	0.182	0.145	0.140
		(0.121)	(0.119)	(0.118)	(0.119)
Divorced		0.066	0.071	0.031	0.017
		(0.051)	(0.053)	(0.058)	(0.054)
Interview date		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
SF-36 general		0.000	0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)	(0.001)
Education years		-0.003	-0.002	-0.002	-0.001
		(0.005)	(0.005)	(0.005)	(0.005)
HH no. persons		0.001	0.003	0.003	0.003
		(0.008)	(0.008)	(0.008)	(0.008)
Employed		-0.057**	-0.060**	-0.057**	-0.058**
		(0.027)	(0.027)	(0.027)	(0.027)
Urban		0.021	0.024	0.026	0.024
		(0.047)	(0.047)	(0.048)	(0.048)
Poor finances			-0.015	-0.019	-0.017
			(0.012)	(0.014)	(0.013)
House quality			-0.023	-0.025*	-0.028**
			(0.015)	(0.015)	(0.014)
Assets			0.011	0.014	0.015
			(0.016)	(0.016)	(0.016)
Debt			-0.000	0.002	0.002
			(0.022)	(0.023)	(0.023)
SF-36 mental				0.000	0.000
				(0.001)	(0.001)
D-probe				0.043	0.047
				(0.053)	(0.053)
Depression life				0.001	0.002
				(0.059)	(0.059)
Depression cur.				0.201	0.199
				(0.123)	(0.124)
GAD				0.112*	0.106*
				(0.060)	(0.059)
War combat					0.110
					(0.167)

Tsunami victim					-0.107
					(0.134)
War victim					-0.430
					(0.262)
T. Affected × victim					0.252
					(0.163)
N	2946	2910	2908	2880	2880
R^2	0.004	0.020	0.024	0.036	0.043
ρ	0.365	0.369	0.374	0.388	0.389

Note: The dependent variable is $(0.5 \times 1000 - rp_{ij})/(0.5 \times (0.5 \times 1000^2 - 2 \times 0.5 \times 1000 \times rp_{ij} + rp_{ij}^2))$ where rp_{ij} is willingness to pay for the lottery described in Section 4. Estimates obtained by OLS regression using within-twin mean difference model. 'Tsunami affected' are those who were in an affected area when the tsunami struck, 'War combat' are those who participated in the civil war as a combatant, 'Tsunami victim' are those who were injured, suffered property loss or were displaced as a result of the tsunami (analogous for 'War victim'). ρ is the amount of variation in the outcome variable explained by twin fixed-effects. Coefficients have been multiplied by 1000 for readability. Standard errors in parentheses are clustered at the twin level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Regression results tsunami control twins vs non-affected twins

	(1) Risk	(2) Risk	(3) Log Risk	(4) Log Risk
Not affected	-11.957**	-10.111*	-0.054	-0.026
	(5.237)	(5.724)	(0.113)	(0.119)
Male		9.073**		0.125**
		(3.965)		(0.049)
Married		1.417		0.009
		(3.858)		(0.047)
Widowed		-9.236		-0.164
		(5.858)		(0.102)
Separated		3.501		0.282
		(9.509)		(0.221)
Divorced		29.151		0.074
		(46.540)		(0.362)
Interview date		-0.031**		-0.000
		(0.014)		(0.000)
SF-36 general		-0.190*		-0.001
		(0.106)		(0.001)
Education years		-0.453		-0.014*
		(0.668)		(0.008)
HH no. persons		0.712		0.008
		(0.960)		(0.011)
Employed		7.238*		0.045
		(3.850)		(0.048)
Ethnic minority		-5.465		0.016
		(5.580)		(0.082)
Urban		-0.554		-0.063
		(3.863)		(0.049)
Poor finances		-4.231**		-0.081***
		(1.907)		(0.026)
House quality		-1.566		-0.042
		(2.136)		(0.026)
Assets		-0.795		0.016
		(2.002)		(0.026)
Debt		-6.752*		-0.085*
		(3.444)		(0.044)
SF-36 mental		0.117		0.002
		(0.119)		(0.001)
D-probe		0.260		-0.051
		(9.270)		(0.101)
Depression life		-0.100		0.088
		(10.370)		(0.116)
Depression cur.		-6.323		0.024
		(8.818)		(0.161)
GAD		-12.166*		-0.228**
		(6.452)		(0.091)
Constant	42.877***	59.822***	2.935***	3.222***
	(1.771)	(15.731)	(0.023)	(0.193)

N	2793	2733	2793	2733
R^2	0.000	0.017	0.000	0.020

Note: The estimation sample for all estimates are those in the CoTASS twin sample who were not 'treated' (i.e. not in an affected area for the tsunami). In columns 1-2 the dependent variable is the willingness to pay for the lottery described in Section 4. In columns 3-4 the dependent variable is the natural logarithm of this value. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A10: Regression results civil war control twins vs non-treated twins

	(1) Risk	(2) Risk	(3) Log Risk	(4) Log Risk
No combat	-4.050	-8.004	-0.314	-0.386*
	(18.336)	(19.104)	(0.232)	(0.229)
Male		9.061**		0.126***
		(3.914)		(0.048)
Married		1.935		0.002
		(3.787)		(0.047)
Widowed		-4.597		-0.133
		(7.432)		(0.104)
Separated		3.824		0.303
		(9.519)		(0.217)
Divorced		30.092		0.264
		(39.192)		(0.342)
Interview date		-0.032**		-0.000
		(0.015)		(0.000)
SF-36 general		-0.225**		-0.002
		(0.108)		(0.001)
Education years		-0.475		-0.012
		(0.681)		(0.008)
HH no. persons		0.361		0.008
		(0.961)		(0.012)
Employed		6.197		0.037
		(3.812)		(0.048)
Ethnic minority		-8.678		-0.032
		(5.402)		(0.081)
Urban		1.248		-0.048
		(3.882)		(0.048)
Poor finances		-3.981*		-0.077***
		(2.238)		(0.027)
House quality		-3.176		-0.051**
		(2.298)		(0.025)
Assets		-1.353		0.005
		(2.043)		(0.026)
Debt		-4.981		-0.063
		(3.446)		(0.043)
SF-36 mental		0.114		0.002
		(0.131)		(0.001)
D-probe		-0.612		-0.048
		(8.833)		(0.098)
Depression life		2.253		0.118
		(10.056)		(0.113)
Depression cur.		-9.432		0.006
		(8.840)		(0.160)
GAD		-12.851**		-0.215**
		(6.531)		(0.091)
Constant	42.865***	62.909***	2.938***	3.216***
	(1.699)	(17.435)	(0.022)	(0.196)

N	2883	2818	2883	2818
R^2	0.000	0.016	0.001	0.019

Note: The estimation sample for all estimates are those in the CoTASS twin sample who were not ‘treated’ (i.e. did not participate in the civil war as a combatant). In columns 1-2 the dependent variable is the willingness to pay for the lottery described in Section 4. In columns 3-4 the dependent variable is the natural logarithm of this value. Standard errors in parentheses are clustered at the twin level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A11: Bootstrap confidence intervals for main regression results (estimates from Table 3)

	(1) Lower limit	Upper limit	(2) Lower limit	Upper limit	(3) Lower limit	Upper limit	(4) Lower limit	Upper limit	(5) Lower limit	Upper limit
Tsunami Affected	2.933	69.790	2.400	67.374	4.164	68.413	4.161	67.869	-8.663	43.245
War combat	5.280	68.255	4.098	69.164	2.601	68.387	2.332	70.368	4.969	84.057
Tsunami victim									-134.437	36.531
War victim									-20.871	111.024
T. Affected × victim									8.108	271.387
War combat × victim									-135.351	26.135
Twin Fixed effects	Yes		Yes		Yes		Yes		Yes	
Demographics	No		Yes		Yes		Yes		Yes	
Finances	No		No		Yes		Yes		Yes	
Mental health	No		No		No		Yes		Yes	
N	2946		2910		2908		2880		2880	

Note: Estimates are non-parametric bootstrap percentile confidence intervals (95% level) for the estimates in Table 3. The confidence intervals were constructed using 2000 replications clustered at the twin level.