Risk Tolerance during Conflict: Evidence from Aleppo, Syria

Vera Mironova (Belfer Center, Harvard Kennedy School)

Sam Whitt (High Point University)

Abstract

We examine risk preferences among rebel combatants and civilians in Aleppo Syria using a variation of the Eckel-Grossman Risk Game. Field work in Syria was conducted in 2013 with a total 232 participants to include both Syrian civilians and active rebel fighters. Compared to Syrians in other locations, people in rebel-held territory of Aleppo are significantly more risk tolerant. We consider plausible explanations for elevated risk preferences in Aleppo based on self-selection, adaptive learning, future prospects, grievances, and social solidarity. We find that risk tolerance is most clearly mediated by optimist wishful thinking about the present and future. This suggests that a strong sense of self-efficacy may explain higher propensity for risk-taking. Overall, our results speak to plausible sorting mechanisms during conflict where risk averse individuals self-select out of conflict, while highly risk tolerant individuals are more prone to discount the inherent dangers of remaining in conflict zones.

Introduction

When war breaks out, what compels some people to remain in harm's way or engage in armed struggle given the likely dangers, uncertainties, and life-or-death costs? We consider the role that risk tolerance could play in explaining why some individuals flee conflict while others do not. We ask to what extent are people who participate in violent conflict and remain in conflict zones a group of extreme risk-takers? What drives them to engage in risky behavior? Is risk tolerance due to self-selection or is it shaped by the conflict environment? When facing conflict, what do risk averse people do? Finally, what are the long-term implications of risk-taking behavior for future violence?

Based on field research in the case of war-torn Syria, we examine risk preferences among civilians and combatants in the rebel held and contested areas of eastern Aleppo using a variation of the Eckel-Grossman (2002, 2008) risk game from behavioral economics. We find that risk tolerance is elevated among combatants and non-combatants in rebel-held territory of Aleppo compared to people in other locations in Syria and to Syrian refugees abroad in neighboring Turkey. Our results suggest a plausible sorting mechanism during conflict where risk averse individuals flee conflict, while risk tolerant individuals are more likely to stay (and fight). To explain risk tolerance, we turn to possible self-selection, adaptive learning, future prospects, grievance, and social solidarity based explanations for why some individuals embrace risk.

After reviewing the literature on risk tolerance, we offer hypotheses about the effects of conflict on risk-seeking behavior and risk aversion. We then provide a rationale for our case selection, discuss our experimental protocols and data collection, and present results. We

conclude with a discussion of the implications of our findings for understanding micro-level behavior during violence.

Literature

Individual decision-making under conditions of risk and uncertainty has been an ongoing concern for the social sciences (von Neuman and Morgenstern 1947, Arrow 1965). This is in part because conventional explanations of risk-seeking behavior based on expected utility models are often empirically violated (Starmer 2000). Risk-taking behavior appears to have important psychological, environmental, and possibly genetically transmitted components. Kahneman and Tversky (1979) illustrate from prospect theory that people are more sensitive to loss than gains and risk-propensities can be altered by framing effects. Dohmen et. al. (2010) find that risk aversion is associated with lower cognitive ability. Jaeger et. al. (2010) show that individuals who are more willing to take risks are more migratory. Binswanger (1980) and Holt and Laury (2002) find that people tend to have stronger preferences for risk aversion than risk-loving behavior. Harrison et. al. (2007) also observe heterogeneous risk preferences using field experiments in a representative sample of the Danish population. Eckel and Grossman (2008) show that women tend to be more risk averse than men in risk-taking experiments. Apicella et. al. (2008) also find that risk taking is positively associated with increased levels of testosterone, which has also been linked to overconfidence in one's self-efficacy and aggressive behavior (Johnson et. al. 2006). Furthermore, Dohmen et. al. (2012) find evidence of intergenerational transmission of risk preferences from parents and local environments where people live via positive assortative mating. Becker et. al. (2014) suggest that heterogeneity in risk preferences around the world can be traced to genetic diversity linked to ancient migration patterns.

Risk propensities have been increasingly examined cross-culturally using a range of behavioral and survey instruments. Andersen et. al. (2010) find good congruence between lab and field experiments on risk. Dohmen et. al. (2011) observe consistency between general attitudinal and behavioral measures of risk taking. Vieider et. al. (2015) also find strong evidence of generalizable risk preferences using survey and experimental risk instruments in a comparison of thirty countries, making cross-cultural comparison of risk possible.

Researchers are increasingly studying risk propensities under real world conditions of threat and uncertainty linked to natural disasters and conflict. Cameron and Shah (2015) find evidence of elevated risk taking in the aftermath of severe flooding and earthquakes. Eckel et. al (2009) observe heightened risk tolerance among evacuees following Hurricane Katrina flooding in New Orleans, which they link to negative emotions resulting from traumatic events. Kim and Lee (2014) find that children who were exposed to violence during the Korean War have long-tern risk aversion five decades after the Korean War. Callen et. al. (2014) offer evidence that exposure to violence and fearful recollections creates a premium on certainty (risk aversion) in Afghanistan. Jakiela and Ozier (2015) show that individuals in the aftermath of Kenyan electoral violence are also more risk averse. In contrast, Voors et. al. (2012) find that victims of violence in Burundi are more risk tolerant. Our study considers risk tolerance under conditions of ongoing conflict in Syria.

Theory and Hypotheses: Risk-Taking During Conflict

We explore whether risk tolerance during conflict could be an important factor in explaining mobilization for violence, conflict participation, and refugee flight. We consider

whether people who remain in conflict zones and willfully participate in violent conflict as combatants are a group of highly risk tolerant individuals. To understand risk preferences, we begin with the assumptions of the expected utility model of risk preferences, which predicts that risk-taking is a function of the expected value of plausible outcomes. Key to the model is the ability to calculate the relative costs and benefits of different choices and the probability that a choice will lead to a desired outcome. Of course, the costs of remaining in conflict zones could be quite high: psychological trauma, physical pain and suffering, and possibly death. It may also be difficult to assess relative risks and probabilities of adverse outcomes because it is unclear what tangible benefits one might receive or costs to be incurred from taking up arms or otherwise remaining in conflict zones. Furthermore, the decision to flee conflict could also carry considerable risk: abandoning one's home and community for a potentially perilous journey to an uncertain future. What compels some individuals to remain in conflict zones and take up arms while others take up flight?

Research on refugee flight during conflict generally shows that the intensity of violence and the threat of future violence is a strong predictor of when people leave conflict zones, while economic means and opportunity play a critical role in determining who leaves and who stays (Davenport, Moore, and Poe 2003; Moore and Shellman 2004, 2006, 2007; Adhikari 2013). In assessing risks during conflict, individuals may follow the logic of the expected utility model. They stay until the potential costs of remaining in conflict zones become untenable, at which point, they leave, provided they have the ability to do so. Assuming variation in individual risk tolerance, we would predict that more risk averse people leave first, while more risk-taking individuals will elect to stay in conflict zones for longer periods of time, though continually updating and re-evaluating relative risks of staying vs. leaving. We test the following hypothesis:

H1 (*Risk-Taking During Conflict*) People in conflict zones are highly risk tolerant. Risk averse people flee conflict whenever possible.

If individuals in conflict zones are in fact extreme risk-takers, what might account for their greater tolerance for risk? One possibility is that greater risk tolerance is due to self-selection. Research by Dohmen et. al. (2012) and Becker et. al. (2014) underscore important cultural and genetic contributions to risk preferences based on parental socialization and positive assortative mating. Eckel and Grossman (2008) and Apicella et. al. (2008) also point to important gender effects of risk-taking linked to testosterone, which Johnson et. al. (2006) also links to overconfidence and aggressive behavior.[1] Research from psychology also shows a strong link between emotional fear and risk aversion (Lerner and Keltner 2001). Self-selection offers one explanation for how people in conflict might sort based on risk tolerance. Individuals with low risk tolerance (linked to genetics, gender, and socialization) flee conflict whenever possible. Risk tolerance may also be part of an evolutionary mechanism for why some individuals altruistically self-sacrifice for the survival of the larger group (Choi and Bowles 2007).

Another possibility we consider is that risk taking is an adaptive learning behavior, conditioned by the environment (March 1996; Denrell 2007). Research in psychology on protection motivation theory would suggest that risk taking could be an adaptive (or maladaptive) coping mechanism for dealing with perceived threats and vulnerabilities (Rogers 1975; Floyd et. al. 2000). People in conflict zones adapt to the conditions at hand. As individuals

[1] See also research on aggression and the expression of the Monoamine Oxidase A gene (MAOA) by McDermott et. al. (2009).

become more exposed to dangers and uncertainty, they grow accustomed to living with extreme risk. Danger becomes normalized and risk tolerance is a necessity for survival. Rather than selecting for risk tolerant individuals, conflict simply compels individuals to adjust upward their tolerance for risk.

Yet another possibility is that people in conflict zones assume risks because they are committed to the cause of violence. We consider this a grievance-based explanation for risk tolerance. A number of studies suggest that grievances may function to mobilize individuals for violence (Krueger and Maleckova 2003; Arjona and Kalyvas 2008; Costalli and Ruggeri 2015; Souleimanov and Aliyev 2015). Psychologists have also found strong linkages between anger and risk tolerance (Lerner and Keltner 2001). People in conflict zones may take calculated risks to advance the goal of defeating a perceived adversary.

Risk taking could also be mediated by the prospects of one's side winning or losing. A number of scholars have applied prospect theory to understanding individual decision-making behavior during conflict (Levy 1997, McDermott 2004; Mercer 2005, Tezcur 2015). Prospect theory would predict that risk tolerance is reference dependent - people treat gains and losses differently, and are more willing to take risks to preserve the status quo or prevent future losses (Kahneman and Tversky 1979). However, whether or not people take risks to avoid losses may be mediated by one's sense of self-efficacy to affect future outcomes (Krueger and Dickson 1994; Tezcur 2015). Research on optimism bias suggest that individuals are often susceptible to wishful thinking and will take risks when they overestimate their chances of winning and discount the possibility of losing (Weinstein 1980; Bracha and Brown 2012). In particular, males with elevated testosterone levels appear prone to overconfidence and risk taking when engaging in aggressive behavior (Apicella 2008; Johnson et. al. 2006). We examine how peoples' beliefs

about their present and future prospects might impact risk tolerance in the context of an ongoing conflict.

Finally, we consider whether increased risk tolerance could be motivated by a desire to protect kinship and friendship networks. Individuals take risks out of a sense of social solidarity with those who share their experiences in the conflict zone. A number of scholars have emphasized the blurring of lines between civilians and combatants, who represent different parts of a broader holistic fighting community with different roles and functions to play (Wood 2003, Kalyvas 2006; Parkinson 2013). There is also enduring evidence in the military literature that individual bonds between combatants are more important to understanding fighting motives than the actual cause of war (Shils and Janowitz 1948; Whitehouse et. al. 2014). Risk taking may also be linked to evolutionary mechanisms for group survival (Bowles 2006). We explore whether risk-taking is borne out of sense of in-group solidarity.

Of course, our hypothesis may be incorrect. One counter-argument to our hypothesis is that under some circumstances, the potential risks of refugee flight might outweigh the risks of remaining in a conflict zone. For example, the path to safety could be perilous. Civilians might have to pass through front lines or territory controlled by opposition forces where they could be highly vulnerable to opportunism. Leaving a conflict zone also may entail the potential loss of personal property as well as separation from family, friends, and disruption of social networks they might rely on for resources and survival. International efforts to provide refugee shelter and assistance may be lacking, in which case the decision to leave a conflict zone is both potentially costly and a risky endeavor. This counter-argument would predict the *null hypothesis* that risk tolerance is uncorrelated with decisions to remain or flee conflict-affected areas. Both carry risks.

Another counter-argument can be found in the "certainty premium" hypothesis advanced by Callen et. al. (2014). They find in Afghanistan that exposure to violence may have long-term traumatic effects on individuals that make them highly risk averse. A growing experimental literature also underscores a mix of positive and negative effects of exposure to violence on social preferences (Bauer et. al. 2016, Mironova and Whitt 2016). The certainty premium hypothesis would predict that individuals with greater conflict exposure become more risk averse, in which case, individuals who stay in highly volatile conflict zones are potentially more risk averse than those who flee – the opposite of what is predicted by H1.

Yet another counter-argument might emphasize the heterogeneity of different actors in conflict zones. Not everyone is there voluntarily, and it may be necessary to draw distinctions between active combatants and non-combatants who may not support the cause (Weinstein 2006; Humphreys and Weinstein 2008). To understand the behavior of those who willfully participate in conflict as combatants or combatant supporters, the expected utility model is more problematic. Active participation in combat carries potentially high risks of trauma, injury and death. Individuals may also face incentives to free ride rather than join combatant groups (though see Kalyvas and Kocher 2007). This could imply that combatants have higher risk tolerance than non-combatants who might remain in conflict zones but not necessarily support combatant causes for fighting. This argument would predict heterogeneous risk preferences in conflict zones depending on one's role and level of engagement in the conflict.

In summary, we will test our hypothesis of elevated risk tolerance in conflict zones against alternative hypotheses of null, reverse, and mixed effects regarding risk tolerance and then explore plausible explanations for risk tolerance based on self-selection, adaptive learning, future prospects, grievances, and social solidarity.

Background on Conflict

In the wake of the Arab Spring, protests calling for the ouster of Syrian President Bashar al-Assad began in early 2011 and were countered with violent repressive measures by the Assad regime.[2] By the end of 2011, Syrian opposition groups had militarized under the umbrella organization of the Free Syrian Army and the armed insurgency was underway. Since 2011, the Syrian opposition has splintered into a range of factions to include both moderate secular resistance groups as well as religious sectarian armies affiliated with Al Qaeda and the Islamic State (ISIS). The city of Aleppo played a strategic role for opposition forces linked to the Free Syrian Army, which occupied the eastern part of the city, while the Assad government controlled the western part and subjected the opposition to relentless air and artillery bombardments. It was under these conditions that our study began in August 2013.

One of our main rationales for conducting this study in Aleppo was to understand how conflict affects risk preferences during high intensity, ongoing conflict. Citizens of eastern Aleppo faced a number of agonizing choices: whether to stay in the city or flee abroad leaving family, friends, and property behind, whether to remain sheltered or venture out for provisions in the face of air strikes, shelling, and snipers, how to ration savings, food, and medical supplies

[2] The origins of the conflict are complex and go beyond mere sectarian divisions. See Seale (1986) and Heydemann (1999) for historical background and Pierret (2013); Hashemi and Postel (2013) for the current conflict.

when the duration of the conflict is uncertain, whether to support the opposition insurgents or oppose them? A key question for our study is whether such conditions make individuals more risk averse or risk tolerant. The few studies which have been conducted on risk and conflict exposure appear to find mixed results (Voors et. al. 2012; Callen et. al. 2014). One possibility is that risk preferences are highly sensitive to timing of conflict exposure, and most work so far has been retrospective. Our study attempts to assess risk preferences when conflict is intense and ongoing and outcomes are highly uncertain.

Experimental Protocols

To measure risk tolerance, we use a variation on the Eckel-Grossman Risk Game (here after EG Risk Game) as well as standard survey questions about risk attitudes. In general, researchers have found good consistency among different survey and behavioral measures of risk (Dohmen et. al. 2011). We chose the EG risk game for its simplicity, which we believe will help reduce confusion in the field and noise in the data (Dave et. al. 2010). We use two versions of the EG risk game. In each game, the subject is presented with five choices. Option 5 has the highest potential payoff of 500 Syrian Pounds (about $5). Option 1 is a sure pay-off of 100 Syrian Pounds (see Table 1). However, in one game, the expected value of risk taking is linearly increasing while in the second game, expected values are a non-linear, inverted U-shape (see Figure 1). We use the non-linear game to measure whether subject risk preferences correspond to expected utility models of risk. In the second game, the expected value for the highest payoff (500 Syrian Pounds) is no greater than the sure pay-off (100), so extreme risk-taking is not a

logical decision given the expected value calculation. The non-linear game assesses whether risk-takers are rational utility maximizers.

The two risk games are conducted at the beginning of the study along with a series of dictator games with various in-group and out-group treatments. Subjects are told that they will be paid for one of the tasks they complete, but they are not told for which task they are paid.[3] After the risk games, subjects completed a survey on wide-ranging themes. The survey also included several attitudinal measures of risk as a robustness check on experimental risk preferences.

Table 1 and Figure 1 About Here

Data Collection

Data were collected in month long waves between August 2013 until May 2014. Subjects in Aleppo were recruited in August-September 2013, subjects in a neighboring province of Idlib were recruited in November-December 2013, and Syrian refugees were recruited inside and around an UNHCR refugee camp in Kilis Turkey in April-May 2014. Idlib region was selected as a more peaceful point of comparison to Aleppo inside Syria and under rebel-controlled

[3] Our initial plan was to randomize payments to one experiment. However, we were concerned about cultural and religious sensitivities to gambling, and so we decided to select a dictator game, rather than a risk game for payment. Subjects did not know in advance for which game they would be paid, but there is no deception because we did pay them for one of the tasks they completed.

territory. Idlib was far less dangerous than Aleppo at the time of our study.[4] Refugees were sampled in Kilis, Turkey because the Kilis refugee camp is one of the closest to Aleppo and Idlib and a primary initial destination for refugee seekers from those regions.

A total of 232 participants completed the risk games. Subjects were recruited using cluster sampling techniques by a local enumerator. We oversample males in the non-combatant and refugee groups to be comparable to the combatant sample, though we have enough female participants to control for gender effects. The local enumerator conducted the risk games face-to-face in a public location, but without interference from others.[5] Due to the challenges of conducting field research during an active conflict, we are not able to make population inferences from our data. Our research is highly exploratory, but we attempt to go beyond convenience samples which are commonly used in lab and lab-in-the-field experiments. This research design received IRB approval, and we took very seriously the safety and well-being of our enumerator and subjects in designing and conducting this study.[6] Appendix Table 1 provides summary statistics of key demographics for our sample.

---

[4] Objectively, Idlib region was under firmer rebel control and less subjected to ground and areal assaults by the Assad regime. Subjectively, subjects in Idlib region report that they feel much safer than those in Aleppo (see analysis for further details).

[5] For the safety of our enumerator, we refrained from random route sampling door-to-door, given the uncertainty of the environment. Our enumerator identified public locations where individuals would gather and then randomly select five people (no more than 5 per cluster and 1 per household) to conduct the study.

[6] In 2013, conditions on the ground in Syria more permissible to field research. Numerous journalist organizations and aid groups were working in Aleppo and travel in and out of Aleppo

Results

Figure 2 presents kernel density plots of risk-taking in the linear EG risk game for Syrians outside Aleppo compared to Syrians in Aleppo.[7] Ordering decisions in the risk game from 1 = most risk averse to 5 = most risk tolerant, the mean risk preference for Aleppo is 3.14 (SD = 1.13, N = 81) compared to 2.71 outside Aleppo (SD = 1.33, N = 147). The difference in means is significant using parametric tests ($t = 2.578$, $p = 0.0054$) and non-parametric Mann-Whitney tests ($z = 2.637$, $p = 0.0084$). It appears that our initial hypotheses has merit. People in Aleppo much more risk tolerant than other Syrians. Syrians in Aleppo are also more risk tolerant than other Syrians in the more peaceful province (at the time of our study) of Idlib and in refugee camps in Turkey. In general, our findings run contrary to the certainty premium hypothesis that conflict exposure encourages risk aversion. People in one of the most conflict affected areas of Syria are the most risk tolerant among Syrians in our study.

Figure 2 About Here

To further assess heterogeneity in risk tolerance in our sample, we run OLS regression models where the dependent variable ranges from 1 (most risk averse) to 5 (most risk tolerant)

---

to Turkey was common. What we did in 2013 would not have been possible at later stages of the conflict.

[7] See SI Appendix Figures 1-4 for additional graphical representations of the data using means and 95% confidence intervals by location as well as frequency distributions.

using the linear EG Risk Game. Table 2 below shows that people in Aleppo are more risk tolerant than Syrians outside Aleppo (Model 1), more risk tolerant than other comparison groups (Model 2), and that rebel fighters in Aleppo are more risk tolerant than civilians in Aleppo, though both tend to be more risk tolerant than other comparison groups (Model 3). The findings are robust using extended demographic controls. Finally, we use the second EG risk game with non-linear expected values to assess whether the risk taking preferences we observe in Aleppo function according to predictions of expected utility. In Models 4-6, we find that risk taking in Aleppo violates the expected utility model. People in Aleppo are as risk-loving as in the linear EG Risk Game. They do not appear to be taking expected value of risk into consideration when making their decisions.

Finally, to address whether risk-seeking behavior is the result of conditioning to violence or a function of self-selection, we develop indices of conflict exposure based on time spent in Aleppo, displacement into Aleppo from other regions, and self-reported exposure to violence (saw violent acts, personally injured or nearly injured, family members injured, killed or missing, close friends injured killed or missing) and property destruction (home or business damaged or destroyed). These controls are either not correlated with risk tolerance or do not clearly mediate the effects of being in Aleppo on risk tolerance in Table 2.[8] This would suggest people in conflict zones are more likely a self-selected group of extreme risk takers rather than simply individuals who have learned to adapt their risk preferences to living in a conflict environment, but we will explore this question in more detail in subsequent analysis.

Table 2 About Here

[8] See Appendix Table 1 for further description of control variables in the models.

Perhaps our experimental games are a poor measure of risk preferences. As a robustness check, we turn to attitudinal measures of risk in our survey. In the survey, subjects are asked whether they agree with the following: "I am not afraid to take risks" and "I avoid risks whenever possible. Responses are order from 1 = strongly disagree to 4 = strongly agree. Table 3 reports OLS regression results for risk tolerance from survey attitudes.[9] As with our risk games, we find that subjects from Aleppo are more risk tolerant than those outside Aleppo in their attitudes, especially rebel fighters. Overall, attitudinal measures of risk correspond to behavioral measures in predicting risk tolerance.[10]

Table 3 About Here

Explaining Greater Risk Tolerance in Aleppo

What might make people in Aleppo more risk tolerant than other Syrians? Here we

[9] More subjects completed the survey risk questions (N = 256) than risk games (N = 232) because the risk games were added after the first week of sampling began to better calibrate risk tolerance in the field.

[10] Our two behavioral measures of risk are highly inter-correlated (pearson r = 0.28, $p < 0.0000$) and our two attitudinal measures of risk are also highly inter-correlated (pearson r = 0.17, $p<0.0001$). Cross correlation between attitudes and behavior are weaker (pearson $r < 0.12$), but all independently predict greater risk tolerance in Aleppo than elsewhere. Civilians in Aleppo are more risk tolerant behaviorally than they acknowledge in their attitudes.

explore four possible explanations based on 1) self-selection vs. adaptive conditioning to the environment 2) views of one's present conditions and future prospects 3) conflict related grievances, and 4) in-group solidarity using survey measures from our data. In Table 4 below we report a number of mediator models using observations about people in Aleppo that might explain elevated risk. Figure 3 also indicates the predictive marginal effect (expected value) of living in Aleppo on dependent variables in Table 4. First, people in Aleppo are aware of the fact that they are living under extremely hazardous conditions. People in Aleppo feel much less safe in their current location, feel they have no help to leave, and lack access to basic resources such as food, water, and medical supplies compared to Syrians in other areas (Models 1-3). Given those realities, people in Aleppo are also surprisingly more optimistic the present and future than people in other locations (Models 4-5). We also find some support for a grievance based explanation for risk tolerance. People in Aleppo are more committed to the fight against the Assad regime, refuse to negotiate, and more wanting of US military intervention in the conflict than people in other areas (Models 6-8). Finally, there is also evidence of social solidarity; people in Aleppo feel much closer to one another than people in other areas (Model 9). See Appendix Table 1 for description of mediator variables.

Table 4 and Figure 3 About Here

To explore causal mechanisms for why residents of Aleppo are more risk tolerant, we

turn to mediation analysis (Baron and Kenny 1986; Imai et. al. 2010).[11] In Table 5, we report the average causal mediation effects of variables proxying for adaptive learning, present and future prospects, grievances, and social solidarity. We generally find the mediating effects of social solidarity, grievances, and adaptive learning proxies to be weak or inconsistent with a few noteworthy exceptions. The effects of living in Aleppo on risk are partially mediated by a lack of basic resources. As individuals run out of basic resources (food, water, shelter, medicine), risk tolerance appears to decline, which runs contrary to the adaptive learning hypothesis. We found the mediating effects to be similar in both the linear and non-linear versions of the risk game. Sensitivity analysis, however, suggests that the mediating effect is somewhat weak and could be potentially explained away by unobservable confounders. In contrast, there is a stronger positive mediating effect of optimism about the present and future, but only in the non-linear version of the risk game. Sensitivity analysis also suggests that the mediating effect would be less easily confounded than the mediating effect of lacking basic resources. It seems that self-efficacy in the form of optimism bias (i.e. wishful thinking) encourages irrational risk-taking.

Table 5 About Here

Discussion and Conclusion

[11] We acknowledge the challenges of establishing causal mechanisms given violations of the sequential ignorability assumptions of mediation analysis when using observational data. Our mediation analysis is highly exploratory.

What motivates people to remain in conflict zones and willfully mobilize for violent causes? We find that people in a conflict may be a self-selected group of risk-takers based on behavior in risk games and attitudes toward risk from a survey. In the case of Aleppo Syria, rebel combatants and civilians display stronger risk tolerance than people in other areas of Syria or Syrian refugees abroad, supporting our hypothesis that people who engage in conflict are highly risk tolerant. Such risk taking is not clearly rational. Subjects in the risk game engage in risky behavior even when expected value from risk taking should preclude it. In contrast, refugees appear more risk averse and flee conflict when possible. We also consider possible explanations for greater risk tolerance and explore whether people in Aleppo are more risk-taking as a function of self-selection vs. adaptive conditioning to a dangerous, uncertain environment, optimistic wishful thinking about the present and future, grievances related to the conflict, and social solidarity with others in their community. We find some plausible evidence that people in Aleppo are more likely to self-select rather than adapt to living in a dangerous environment, nurse grievances against the Assad regime, have a strong sense of social solidarity, and are surprisingly optimistic about their present and future prospects. Mediation analysis suggests that a sense of self-efficacy, as reflected by optimistic wishful thinking, appears to be an important mediator of irrational risk-taking. As such, our results provide further micro-level validation of prospect theory based accounts for participation in violence (Tezcur 2015). Even when facing past and present losses, individuals with a strong sense of self-efficacy (optimism about present and future prospects) are highly risk tolerant, as we observe in Aleppo.

To explain this heightened sense of self-efficacy, it is important to underscore the timing of our study the context of the Syrian civil war. In 2013, many Syrians in Aleppo were still hopeful that the Free Syrian Army, which occupied most of Eastern Aleppo, could prevail in the

conflict. Many also still believed that NATO and/or the United States might intervene militarily against the Assad regime as they had done against the Gaddafi regime in Libya. In retrospect, of course, this was clearly wishful thinking. However, it could explain why so many people were willing to discount the real risks of remaining under siege in eastern Aleppo. They overestimated the prospects of the rebellion's success and paid a heavy price. In the end, the Free Syrian Army disintegrated, the U.S. never intervened, eastern Aleppo was destroyed by Assad's military, and the Syrian revolution that began with the 2011 Arab Spring uprisings ultimately failed.

Beyond Syria, our research speaks to research on risk tolerance in the face of danger, uncertainty, conflict and unrest (Eckel et. al. 2009; Voors et. al. 2012; Cameron and Shah 2015). The risk preferences of Syrians in Aleppo partially mirror Hurricane Katrina victims who withstood the hurricane rather than heed calls to evacuate their homes (Appendix Figure 1).[12] In contrast, we do not find evidence to support a certainty premium in the face of violence (Callen et. al. 2014, Jakiela and Ozier 2015). One possibility for the discrepancy in findings might be that elevated risk tolerance is a short-term response to violence and dangerous situations (perhaps linked to self-preservation instincts), while risk aversion is a more long-term effect of severe conflict exposure (perhaps linked to post-traumatic stress). As we have said, however, our research is exploratory and more work should be conducted on the nature, timing, and degree of conflict exposure to arrive at more definitive conclusions about risk preferences during conflict.

Finally, if people in conflict zones represent a self-selected group of extreme risk-takers, we pause to consider the long-term consequences of such a selection process. If there are cultural, environmental, and genetic components to risk preferences, then the sorting of individuals into and out of conflict on the basis of risk could have long-term effects on

[12] Data on risk preferences of Hurricane Katrina evacuees were provided by Eckel et. al. 2009.

socialization and assortative mating, as has been identified in the broader literature (Dohmen et. al. 2012). Because risk tolerance has been linked to overconfidence and aggressive behavior, especially in males (Johnson et. al. 2006; Apicella 2008), the purging of risk averse people from conflict zones creates an environment where individuals may feed off one another's risk-loving tendencies, providing another micro-level explanation for why some societies become mired in conflict traps.

Table 1a. EG Risk Game (Linear EVs)

Which of the following options would you prefer?

Option		
5	50% chance of receiving 500	50% chance of receiving 60
4	50% chance of receiving 400	50% chance of receiving 70
3	50% chance of receiving 300	50% chance of receiving 80
2	50% change of receiving 200	50% chance of receiving 90
1	100% chance of receiving 100	

Table 1b. EG Risk GAME (Non-Linear EVs)

Which of the following options would you prefer?

Option		
5	20% chance of receiving 500	80% chance of receiving 0
4	40% chance of receiving 400	60% chance of receiving 0
3	60% chance of receiving 300	40% chance of receiving 0
2	80% change of receiving 200	20% chance of receiving 0
1	100% chance of receiving 100	0% chance of receiving 0

Figure 1. Expected Value Calculations in Two Variants of the EG Risk Game

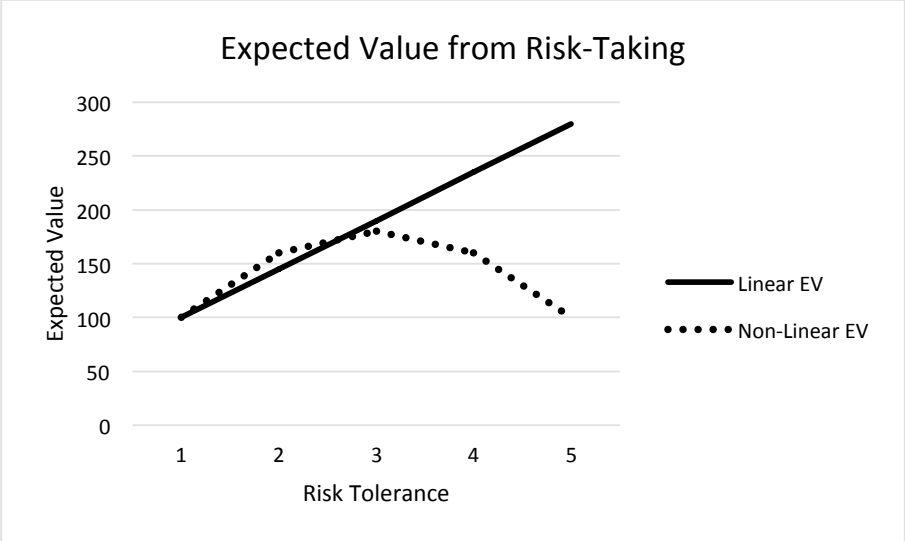

Figure 2. Risk Preferences in the Linear EG Risk Game

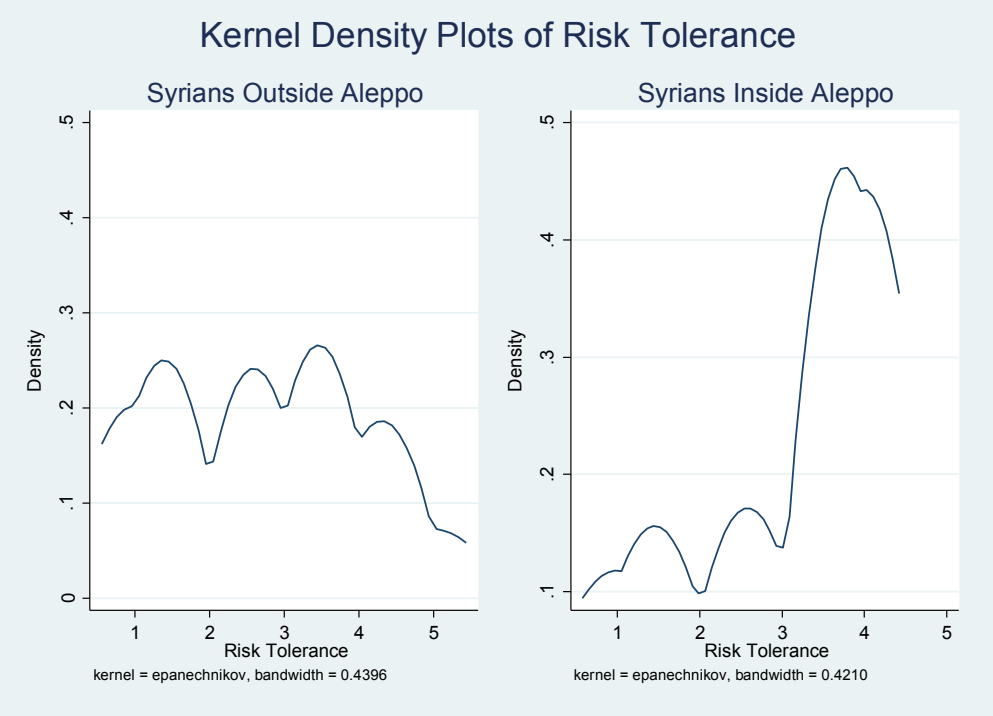

Table 2. Risk Tolerance in Experimental Behavior (OLS Regression)

DV = Risk Game	(1) Linear EV	(2) Linear EV	(3) Linear EV	(4) Non-Linear EV	(2) Non-Linear EV	(4) Non-Linear EV
Aleppo, Syria	0.428**	1.249***		1.132***	1.604**	
	(0.166)	(0.0973)		(0.176)	(0.280)	
Idlib, Syria		0.688*			0.266	
		(0.172)			(0.261)	
Rebel Fighter			1.328***			1.699**
in Aleppo			(0.0435)			(0.287)
Civilian			1.149**			1.478**
in Aleppo			(0.148)			(0.324)
Rebel Fighter			0.289*			0.473***
Idlib			(0.0811)			(0.0406)
Civilian			0.494			-0.233
Idlib			(0.206)			(0.422)
Refugee		0.937**	0.914**		0.174	0.265
camp, Turkey		(0.145)	(0.160)		(0.125)	(0.338)
female		-0.464*	-0.476*		-0.469	-0.491
		(0.124)	(0.126)		(0.322)	(0.317)
age		-0.00466	-0.00462		-0.00142	-0.00152
		(0.00453)	(0.00452)		(0.00448)	(0.00468)
education		-0.0343	-0.0384		-0.119	-0.124
		(0.0809)	(0.0836)		(0.0495)	(0.0544)
employed		0.150	0.173		0.159	0.190
before war		(0.191)	(0.195)		(0.509)	(0.531)
Time in curr.		-0.0772	-0.0635		-0.113**	-0.0919*
location		(0.0705)	(0.0814)		(0.0127)	(0.0303)
internally		0.186	0.178		0.105	0.0981
displaced		(0.148)	(0.158)		(0.183)	(0.185)
victimization		0.0111	-0.0238		-0.230	-0.275
		(0.407)	(0.411)		(0.491)	(0.478)
Property		0.0542	0.0638		0.692	0.717
damage		(0.566)	(0.572)		(0.618)	(0.608)
Constant	2.707***	2.463**	2.432**	2.939***	3.371**	3.314***
	(0.109)	(0.515)	(0.522)	(0.112)	(0.344)	(0.254)
Comparison Group	Not in Aleppo	Turkey, not in refugee camp	Turkey, not in refugee camp	Turkey, not in refugee camp	Turkey, not in refugee camp	Turkey, not in refugee camp
Observations	228	214	214	232	218	218
adj. r2	0.022	0.038	0.033	0.143	0.157	0.157

Robust standard errors clustered by location in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Results robust to tobit, ordered probit specifications.

Table 3. Risk Tolerance in Survey Attitudes (OLS Regression)

VARIABLES	(1) I am not afraid to take risks	(2) I am not afraid to take risks	(3) I avoid risks whenever possible	(4) I avoid risks whenever possible
Aleppo, Syria	0.372***	0.270***	-0.275*	-0.506**
	(0.132)	(0.0157)	(0.145)	(0.0817)
Idlib		0.125		-0.247*
		(0.188)		(0.0822)
Refugee Camp, Turkey		-0.105		-0.386*
		(0.0672)		(0.0954)
female		0.000828		-0.166
		(0.518)		(0.117)
age		-0.00350		0.00675
		(0.00941)		(0.0105)
education		0.252***		-0.0475
		(0.0236)		(0.0415)
employed before war		0.216***		-0.261
		(0.0165)		(0.125)
time in curr. location		-0.0342		0.0537
		(0.0597)		(0.0522)
internally displaced		0.0721		-0.193
		(0.108)		(0.132)
victimization		0.0400		0.316
		(0.142)		(0.409)
property damage		-0.107		0.355
		(0.230)		(0.139)
Constant	2.435***	1.881***	2.938***	2.857**
	(0.0881)	(0.0117)	(0.0969)	(0.500)
Comparison Group	Not in Aleppo	Turkey, not In refugee camp	Not in Aleppo	Turkey, not In refugee camp
Observations	254	236	256	238
adj. r2	0.028	0.024	0.009	0.003

Robust standard errors clustered by location in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: Results robust to tobit, ordered probit specifications.

Table 4. Probing for Explanations for Greater Risk Tolerance in Aleppo (OLS Regression)

VARIABLES	(1) Feel unsafe in current location	(2) Lack help needed to leave	(3) Lack basic resources	(4) Optimistic about the present	(5) Optimistic about the future	(6) Oppose negotiating with Assad gov.	(7) Oppose making concessions for peace with Assad gov.	(8) For US military intervention	(9) Feel Close to Others here
Aleppo	0.385**	0.526***	0.352***	1.336***	0.764***	0.665***	0.896***	0.648***	0.525***
	(0.160)	(0.184)	(0.0849)	(0.187)	(0.233)	(0.195)	(0.179)	(0.216)	(0.131)
refugees	-0.551***	N/A	-1.147***	0.590***	0.837***	0.478**	0.116	0.173	0.0573
	(0.165)		(0.0754)	(0.186)	(0.219)	(0.202)	(0.179)	(0.212)	(0.131)
female	-0.111	0.402*	0.319***	-0.850***	-0.245	0.152	0.469*	-0.608**	-0.415**
	(0.140)	(0.207)	(0.0974)	(0.221)	(0.267)	(0.214)	(0.255)	(0.270)	(0.182)
age	-0.00514	0.000972	-0.00215	-0.00503	0.00991	-0.0207**	-0.00792	-0.0106	0.00356
	(0.00612)	(0.00947)	(0.00307)	(0.00757)	(0.00930)	(0.00832)	(0.00682)	(0.00868)	(0.00442)
education	0.238***	-0.121	0.00353	-0.0220	-0.0134	0.115	0.197*	0.0256	-0.152
	(0.0840)	(0.142)	(0.0446)	(0.102)	(0.128)	(0.103)	(0.106)	(0.116)	(0.0981)
working	0.154	0.358	0.0865	0.231	0.198	-0.575***	-0.261	-0.244	0.279
	(0.165)	(0.259)	(0.0839)	(0.205)	(0.252)	(0.219)	(0.206)	(0.246)	(0.179)
Constant	1.750***	1.927***	2.449***	2.015***	1.856***	3.156***	2.003***	3.015***	3.394***
	(0.309)	(0.432)	(0.153)	(0.353)	(0.424)	(0.403)	(0.340)	(0.428)	(0.313)
Observations	220	127	188	236	237	218	216	233	195
R-squared	0.200	0.133	0.739	0.208	0.084	0.131	0.212	0.055	0.139
adj. r2	0.177	0.0974	0.730	0.187	0.0596	0.106	0.189	0.0294	0.112

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3. Expected Value of Living in Aleppo on Possible Mediators of Risk Tolerance (with 95% Confidence Intervals)

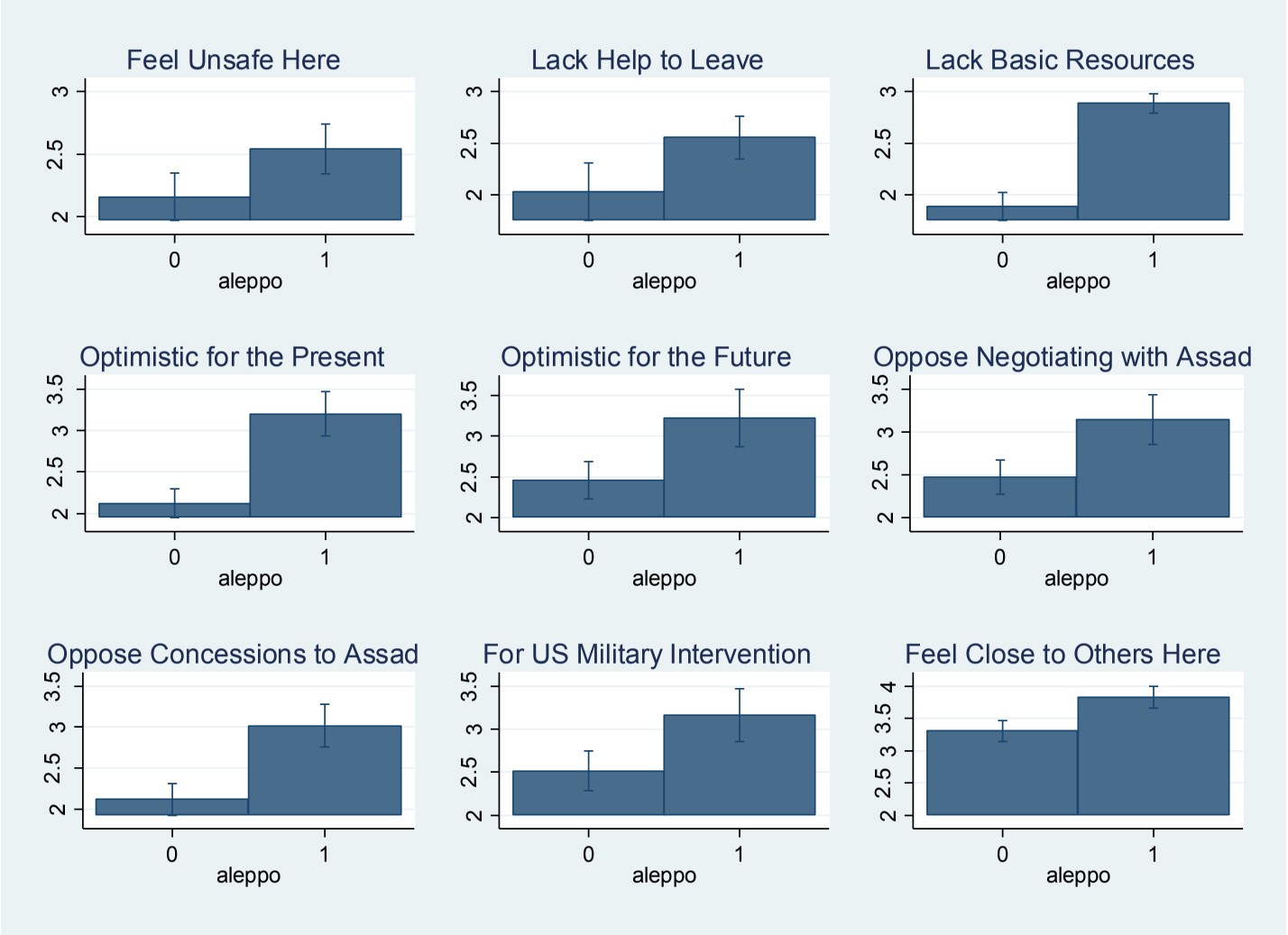

Table 5. Mediation Analysis (95% Confidence Intervals in brackets)

VARIABLES	(1) Lack Basic Resources	(2) Lack Basic Resources	(3) Optimistic for the present	(4) Optimistic for future
Risk Game	Linear EV	Non-linear EV	Non-linear EV	Non-linear EV
Average Causal Mediating Effect	-0.10 [-0.38, 0.16]	-0.11 [-0.37, 0.15]	0.23 [0.03, 0.48]	0.10 [-0.00, 0.24]
Direct Effect	0.59 [0.07, 1.05]	1.54 [1.02, 2.00]	1.13 [0.63, 1.57]	1.26 [0.83, 1.65]
Total Effect	0.49 [0.06, 0.85]	1.43 [1.02, 1.79]	1.37 [0.96, 1.72]	1.37 [0.96, 1.74]
Percentage of the total effect that is mediated	0.21	0.07	0.17	0.08
Rho at which AMCE = 0	-0.08	-0.07	0.15	0.13
R2M*R2Y at which AMCE = 0	0.005	0.005	0.02	0.02

References

Adhikari, Prakash. 2013. "Conflict-Induced Displacement, Understanding the Causes of Flight." *American Journal of Political Science* 57(1): 82-89.

Andersen, Steffen, Glenn W. Harrison, Morten Igel Lau, and E. Elisabet Rutström. 2010. "Preference Heterogeneity in Experiments: Comparing the Field and Laboratory." *Journal of Economic Behavior & Organization* 73(2): 209-224.

Apicella, Coren L., Anna Dreber, Benjamin Campbell, Peter B. Gray, Moshe Hoffman, and Anthony C. Little. 2008. "Testosterone and Financial Risk Preferences." *Evolution and Human Behavior* 29(6): 384-390.

Arjona, Ana M., and Stathis N. Kalyvas. 2011. *Recruitment Into Armed Groups in Colombia: A Survey of Demobilized Fighters*. London: Palgrave Macmillan.

Arrow, Kenneth J. 1965. *Aspects of the Theory of Risk-Bearing.* Helsinki: Yrjö Jahnssonin Säätiö.

Baron, Reuben M., and David A. Kenny. 1986. "The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations." *Journal of Personality and Social Psychology* 51(6): 1173.

Bauer, Michal, Christopher Blattman, Julie Chytilová, Joseph Henrich, Edward Miguel, and Tamar Mitts. 2016. *Can War Foster Cooperation?*. No. w22312. National Bureau of Economic Research.

Becker, Anke, Thomas Dohmen, Benjamin Enke, and Armin Falk. 2014. "The Ancient Origins of the Cross-country Heterogeneity in Risk Preferences.". Available at https://site.stanford.edu/sites/default/files/site_enke.pdf

Binswanger, Hans P. 1980. "Attitudes Toward Risk: Experimental Measurement in Rural India." *American Journal of Agricultural Economics* 62(3): 395-407.

Bowles, Samuel. 2006. "Group Competition, Reproductive Leveling, and the Evolution of Human Altruism." *science* 314(5805): 1569-1572.

Bracha, Anat, and Donald J. Brown. 2012. "Affective Decision Making: A Theory of Optimism Bias." *Games and Economic Behavior* 75(1): 67-80.

Callen, Michael, Mohammad Isaqzadeh, James D Long, and Charles Sprenger. 2014. "Violence and Risk Preference: Experimental Evidence from Afghanistan," *American Economic Review*, 104 (1), 123–148.

Cameron, Lisa and Manisha Shah. 2015. "Risk-Taking Behavior in the Wake of Natural Disasters." *Journal of Human Resources***.** 50(2): 484-515.

Choi, Jung-Kyoo, and Samuel Bowles. 2007. "The Coevolution of Parochial Altruism and War." *Science* 318(5850): 636-640.

Costalli, Stefano and Andrea Ruggeri. 2015. "Indignation, Ideologies, and Armed Mobilization: Civil War in Italy, 1943–45." *International Security* 40(2): 119-157.

Davenport, Christina, Will Moore, and Steven Poe. 2003. "Sometimes You Just Have to Leave: Domestic Threats and Forced Migration, 1964-1989." *International Interactions* 29 (1): 27-55

Dohmen, Thomas, Armin Falk, David Huffman, and Uwe Sunde. 2010. "Are Risk Aversion and Impatience Related to Cognitive Ability?." *The American Economic Review* 100 (3): 1238-1260.

Dohmen, Thomas, Armin Falk, David Huffman, and Uwe Sunde. 2012. "The Intergenerational Transmission of Risk and Trust Attitudes." *The Review of Economic Studies* 79(2): 645-677.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G. Wagner. 2011. "Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences." *Journal of the European Economic Association* 9(3): 522-550.

Denrell, Jerker. 2007. "Adaptive Learning and Risk Taking." *Psychological review* 114(1): 177.

Eckel, Catherine C., and Philip J. Grossman. 2002. "Sex Differences and Statistical Stereotyping in Attitudes Toward Financial Risk." *Evolution and human behavior* 23(4): 281-295.

Eckel, Catherine C., and Philip J. Grossman. 2008. "Men, Women and Risk Aversion: Experimental Evidence." *Handbook of experimental economics results* 1(1): 1061-1073.

Eckel, Catherine C., Mahmoud A. El-Gamal, and Rick K. Wilson. 2009. "Risk Loving After the Storm: A Bayesian-Network Study of Hurricane Katrina evacuees." *Journal of Economic Behavior & Organization* 69.2 (2009): 110-124.

Floyd, Donna L., Steven Prentice-Dunn, and Ronald W. Rogers. 2000. "A Meta-analysis of Research on Protection Motivation Theory." *Journal of applied social psychology* 30(2): 407-429.

Harrison, Glenn W., Morten I. Lau, and E. Elisabet Rutström. 2007. "Estimating Risk Attitudes in Denmark: A Field Experiment." *The Scandinavian Journal of Economics* 109(2): 341-368.

Hashemi, Nader, and Danny Postel, eds. 2013. *The Syria Dilemma*. MIT Press.

Heydemann, Steven. 1999. *Authoritarianism in Syria: Institutions and social conflict, 1946-1970*. Ithaca: Cornell University Press.

Holt, Charles A., and Susan K. Laury. 2005. "Risk Aversion and Incentive Effects." *American economic review* 92(2): 1644-1655.

Humphreys, Macartan, and Jeremy M. Weinstein. 2008. "Who fights? The Determinants of Participation in Civil War." *American Journal of Political Science* 52 (2): 436-455.

Imai, Kosuke, Luke Keele, and Dustin Tingley. 2010. "A general approach to causal mediation analysis." *Psychological methods* 15(4): 309.

Jaeger, David A., Thomas Dohmen, Armin Falk, David Huffman, Uwe Sunde, and Holger Bonin. 2010. "Direct Evidence on Risk Attitudes and Migration." *The Review of Economics and Statistics* 92 (3): 684-689.

Jakiela, Pamela, and Owen W. Ozier. 2015. "The impact of violence on individual risk preferences: evidence from a natural experiment." *World Bank Policy Research Working Paper* 7440.

Johnson, Dominic DP, Rose McDermott, Emily S. Barrett, Jonathan Cowden, Richard Wrangham, Matthew H. McIntyre, and Stephen Peter Rosen. 2006 "Overconfidence in wargames: experimental evidence on expectations, aggression, gender and testosterone." *Proceedings of the Royal Society of London B: Biological Sciences* 273(1600): 2513-2520.

Kalyvas, Stathis. 2006. *The Logic of Violence in Civil War*. Cambridge: Cambridge University Press.

Kalyvas, Stathis and Matthew Adam Kocher. 2007. "How "Free" is Free Riding in civil wars?: Violence, insurgency, and the collective action problem." *World Politics* 59(2): 177-216.

Kim, Young-Il, and Jungmin Lee. 2014. "The long-run impact of a traumatic experience on risk aversion." *Journal of Economic Behavior & Organization* 108(2): 174-186.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk."*Econometrica*, 47(2): 263–91.

Krueger, Alan B., and Jitka Maleckova. 2003. "Education, Poverty and Terrorism: Is There a Causal Connection?" *The Journal of Economic Perspectives* 17 (4): 119-144.

Krueger, Norris, and Peter R. Dickson. 1994. "How Believing in Ourselves Increases Risk Taking: Perceived Self-efficacy and Opportunity recognition." *Decision Sciences* 25(3): 385-400.

Lerner, Jennifer S., and Dacher Keltner. 2001. "Fear, anger, and risk." *Journal of personality and social psychology* 81(1): 146.

Levy, Jack S. 1997. "Prospect Theory, Rational Choice, and International Relations." *International Studies Quarterly* 41(1): 87-112.

March, James G. 1996. "Learning to be Risk Averse." *Psychological review* 103(2): 309.

McDermott, Rose. 2004. "Prospect Theory in Political Science: Gains and Losses from the First Decade." *Political Psychology* 25(2): 289-312.

McDermott, Rose, Dustin Tingley, Jonathan Cowden, Giovanni Frazzetto, and Dominic DP Johnson. 2009. "Monoamine Oxidase A gene (MAOA) Predicts Behavioral Aggression Following Provocation." *Proceedings of the National Academy of Sciences* 106(7): 2118-2123.

Mercer, Jonathan. 2005. "Prospect Theory and Political Science." *Annual Review of Political Science.* 8 (1): 1-21.

Mironova, Vera, and Sam Whitt. 2016 "Social Norms after Conflict Exposure and Victimization by Violence: Experimental Evidence from Kosovo." *British Journal of Political Science forthcoming*.

Moore, Will H., and Stephen M. Shellman. 2004. "Fear of Persecution Forced Migration, 1952-1995." *Journal of Conflict Resolution* 48 (5): 723-745.

Moore, Will H., and Stephen M. Shellman. 2006. "Refugee or Internally Displaced Person? To Where Should One Flee?" *Comparative Political Studies* 39 (5): 599-622.

Moore, Will H., and Stephen M. Shellman. 2007. "Whither Will They Go? A Global Study of Refugees' Destinations, 1965–1995." *International Studies Quarterly* 51(4): 811-834.

Parkinson, Sarah Elizabeth. 2013. "Organizing Rebellion: Rethinking High-risk Mobilization and Social Networks in War." *American Political Science Review* 107(3): 418-432.

Pierret, Thomas. 2013. *Religion and State in Syria: The Sunni Ulama from Coup to Revolution*. Vol. 41. Cambridge University Press.

Rogers, Ronald W. 1975. "A Protection Motivation Theory of Fear Appeals and Attitude Change." *The Journal of Psychology* 91(1): 93-114.

Seale, Patrick. 1986. "The Struggle for Syria: A Study of Post-war Arab Politics, 1945–1958, new edition." *London: IB Tauris*.

Shils, Edward A., and Morris Janowitz. 1948. "Cohesion and Disintegration in the Wehrmacht in World War II." *Public Opinion Quarterly* 12(2): 280-315.

Souleimanov, Emil Aslan, and Huseyn Aliyev. 2015. "Blood Revenge and Violent Mobilization: Evidence from the Chechen Wars." *International Security* 40(2): 158-180.

Starmer, Chris. 2000. "Developments in Non-expected Utility Theory: The Hunt for a Descriptive Theory of Choice under Risk." *Journal of Economic Literature* 38(2): 332-382.

Tezcur, Gunes Murat. 2015. "Ordinary People, Extraordinary Risks: Participation in an Ethnic Rebellion." *Forthcoming in American Political Science Review*.

Vieider, Ferdinand M., Mathieu Lefebvre, Ranoua Bouchouicha, Thorsten Chmura, Rustamdjan Hakimov, Michal Krawczyk, and Peter Martinsson. 2015. "Common Components of Risk and Uncertainty Attitudes across Contexts and Domains: Evidence from 30 countries." *Journal of the European Economic Association* 13(3): 421-452.

von Neumann, John, and Oskar Morgenstern. 1947. *Theories of Games and Economic Behavior.* 2nd ed. Princeton, NJ: Princeton University Press.

Voors, Maarten J., Eleonora EM Nillesen, Philip Verwimp, Erwin H. Bulte, Robert Lensink, and Daan P. Van Soest. 2012. "Violent Conflict and Behavior: A Field Experiment in Burundi." *The American Economic Review* 102(2): 941-964.

Weinstein, Jeremy M. 2006. *Inside Rebellion: The Politics of Insurgent Violence*. Cambridge University Press.

Weinstein, Neil D. 1980. "Unrealistic Optimism about Future Life Events." *Journal of personality and social psychology* 39(5): 806.

Whitehouse, Harvey, Brian McQuinn, Michael Buhrmester, and William B. Swann. 2014. "Brothers in Arms: Libyan Revolutionaries Bond like Family." *Proceedings of the National Academy of Sciences* 111(50): 17783-17785.

Wood, Elizabeth J. 2003. *Insurgent Collective Action and Civil War in El Salvador*. Cambridge: Cambridge University Press.

Appendix

Figure 1. Risk Preferences of Syrians in Aleppo vs. Hurricane Katrina Evacuees (standardized)

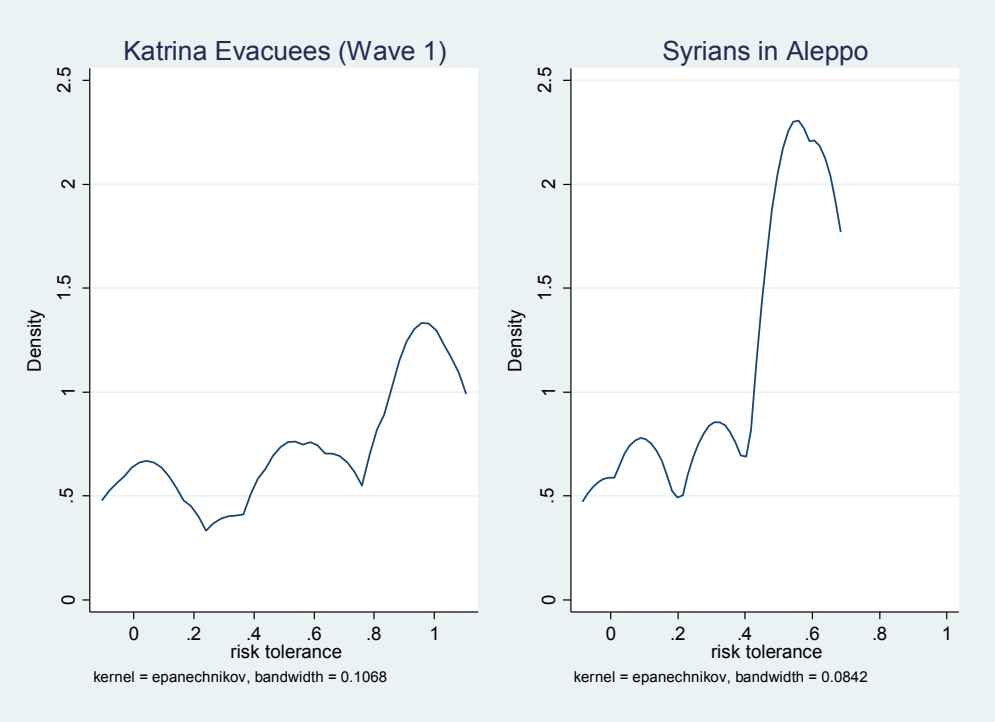

Table 1. Descriptive Statistics, Variable Description and Coding

Variable	Description	Mean	SD	N
Risk Game Linear EV	Ranges from 1 (low risk) to 5 (high risk)	2.86	1.27	228
Risk Game Nonlinear EV	Ranges from 1 (low risk) to 5 (high risk)	3.35	1.42	232
Not afraid to take risk	Survey question: "I am not afraid to take risks" Responses are order from 1 = strongly disagree to 4 = strongly agree.	2.57	1.07	254
Avoid risk	Survey question: "I avoid risks whenever possible." Responses are order from 1 = strongly disagree to 4 = strongly agree.	2.84	1.17	256
Aleppo, Syria	1 = subject in Aleppo, 0 = not in Aleppo	0.37	0.48	256
Idlib, Syria	1 = subject in Idlib, 0 = not in Idlib	0.20	0.40	256
Turkey	1 = subject in Turkey, 0 = not in Turkey	0.43	0.50	256
FSA fighters	1 = FSA fighter, 0 = not FSA fighter	0.24	0.43	256
Civilians inside Syria	1 = civilian inside Syria, 0 = not civilian inside Syria	0.33	0.47	256
Refugees in camp in Turkey	1 = refugee in camp in Turkey, 0 = not refugee in camp	0.23	0.42	256
Refugees outside camp in Turkey	1 = refugee outside camp in Turkey, 0 = not refugee outside camp	0.20	0.40	256
Female	1 = female subject, 0 = male subject	0.14	0.35	256
Age	Subject age in years from 18 to 60	29.7	9.58	249
Education	Subject education from 1 = no formal education to 4 = post-secondary education	2.48	0.74	249
Employed	1 = working before the war, 0 = unemployed, not working	0.85	0.36	249
Time in current location	"How long have you been in the location where you are currently living?" 1 = less than a week, 7 = more than 2 years	4.69	1.50	256
Internally displaced	"Were you forced to flee your home to another location in Syria?" 0 = no, 1 = yes	0.44	0.50	256
Victimization	Additive index of victimization based on self-reported exposure to violence, personal injury, injury, death or disappearance of close friends and family members (ranges from 0 to 1 with increasing victimization)	0.59	0.23	256
Property damage	Additive index of property damage based on self-reported damage or destruction of home or business property (ranges from 0 to 1 with increasing damage)	0.29	0.27	256
Feel unsafe in	"How safe do you feel in your current location?" 1 =	2.32	0.97	238

current location	very safe to 4 = not safe at all			
Lack help needed to leave[13]	"I would go somewhere safer if I had family or friends to help" 1 = strongly disagree to 4 = strongly agree	2.33	0.97	144
Lack access to resources	Additive index of access to resources based on self-reported access to food, water, housing, fuel, medical supplies, electricity, tv, internet, phone, radio. 1 = good access to 4 = none at all	2.37	0.80	206
Optimism for the present	"Compared to 12 month age, do you think conditions here have become: 1 = much worse to 5 = much better?"	2.50	1.23	252
Optimism for the future	"And over the next 12 months, do you expect conditions here to become: 1 = much worse to 5 = much better?"	2.70	1.31	255
Oppose negotiating with Assad gov.	"Support or Oppose: negotiate with the Assad government if it becomes too difficult to win militarily" 1 = strongly support to 4 = strongly oppose	2.75	1.17	235
Oppose concessions to Assad gov.	"Support or Oppose: continue to negotiate with the Assad government and make concessions in the interests of peace" 1 = strongly support to 4 = strongly oppose	2.45	1.18	232
Support US military intervention	"There is often discussion about the role of what other countries could do to bring an end to the Syrian conflict. To what extent do you strongly support, somewhat support, somewhat oppose, or strongly oppose the following: US military intervention" 1 = strongly oppose to 4 = strongly support	2.73	1.30	250
Feel close to others here	"How close do you feel to people in your current location?" 1 = not close at all, 4 = very close	3.53	0.76	213

[13] This question was not asked of refugees in Turkey since they left Syria.