The Cost of Fear

The Welfare Effect of the Risk of Violence in Northern Uganda

Marc Rockmore

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Abstract

Although the effects of insecurity are believed to be important, these have never been directly measured. Previous estimates of the costs of conflict have only captured the joint effect of violence and insecurity. The distinction is important for understanding the origins of the costs and for policy design. Spatially disaggregated measures

of insecurity are created based on the spatial-temporal variation in the placement of violence. These are used to generate the first estimates of the relative causal contributions of the risk and experience of violence. The article also provides the first micro-data based counterpart to the cross-country literature on the costs of conflict.

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Marc Rockmore

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The effects of conflict and, more broadly, of violence on the development process are among the most important and, unfortunately, understudied areas in development economics. One in four people live in fragile and conflict-affected countries, or in countries with very high levels of violence; many more live in countries that recently emerged from conflict. These conditions substantially affect the development process as low income fragile or conflict-affected countries have not achieved a single Millennium Development Goal (MDG) (World Bank 2011).

Despite these large and persistent costs, we have only a limited understanding of the origins of these costs, particularly the role of insecurity (i.e., the risk of violence) relative to that of direct exposure to violence. Since the majority of people in conflict and violence-prone countries do not experience violence directly, the near-exclusive focus of the literature on the experience of violence¹ ignores potentially significant losses due to the persistent insecurity and uncertainty. These potential effects of insecurity are largely obscured in current studies. The macroconflict literature finds substantial aggregate economic costs arising from conflict in terms of GDP per capita and GDP per capita growth but cannot explain the distribution or composition of these costs (Collier 1999; Collier and Hoeffler 2007). Consequently, while very useful in “costing” conflict, this literature is silent on the origins of these costs or on specific policy intervention to mitigate them.

The microconflict literature causally links conflict to a variety of lower post-conflict outcomes, such as education (Blattman and Annan 2010; Akresh and de Walque 2011;), or nutrition/health (Akresh et al. 2011; Minoiu and Shemyakina 2012). The particular pathways from conflict to these outcomes, however, remain unclear. Presumably, these derive from some

1. Throughout the article, the experience of violence refers to first-hand exposure to attacks. Being present at an attack without being directly attacked is not considered as “experiencing violence.”

combination of losses from violence and responses to insecurity, although this is not known. Moreover, by focusing on households or regions that experience violence, the literature implicitly attributes the costs of insecurity to the violence.

Initially, authors compared households in conflict-affected areas with those in non-conflict affected areas and interpreted the coefficient on the conflict-affected region as the impact of violence.² Since many of the households in conflict-affected regions never experience violence, the estimated coefficient captures the consequences for both violence-affected and nonaffected households and therefore combines the costs from violence and insecurity. To overcome this, recent studies focus on households directly affected by violence (Minoiu and Shemyakina 2012). Since violence-affected households almost certainly also experience some level of insecurity, these estimated coefficients reflect both the effects of violence and any *ex ante* risk mitigation. Moreover, the focus on households which directly experience violence ignores any costs arising from insecurity, therefore underestimating the full costs of conflict.

While both insecurity and exposure to violence surely contribute to the costs of conflict, disentangling their relative contributions has important implications for both research and policy. If the costs from conflict primarily arise from direct exposure, this implies that the costs are disproportionately borne by a narrow set of individuals and only materialize during attacks and in *ex post* household responses. In this case, policy interventions are necessarily reactive. This would justify the focus of the current microconflict literature on exposure to violence. In contrast, if the costs primarily arise from insecurity, then they are the result of *ex ante* risk mitigation strategies and are borne by a broader segment of the population. This would also suggest that a narrow focus

2. Some authors use the intensity of violence instead of a binary measure although the same concern remains (Voors et al. 2012).

on just exposure to violence would likely miss some of the important pathways (arising from insecurity) that lead from conflict to lower (post-conflict) development outcomes.

This research makes two unique contributions. Most importantly, I isolate the relative effects of exposure to violence and insecurity. This is accomplished by using the spatial-temporal variation in the placement of attacks to estimate spatially disaggregated measures of both the statistical and perceived risk of attack during a conflict. Methodologically, this approach is similar to Besley and Mueller (2012). I find that while exposure to violence is more costly (in terms of per capita household consumption) at the household level, the opposite is true at the aggregate level. Since considerably more individuals suffer from insecurity than are exposed to violence, the effects of aggregate of insecurity outweigh those of exposure. This finding suggests that the current focus on exposure to violence may miss the majority of conflict-related costs.

Second, despite the large literature on the aggregate costs of conflict, there are no corresponding micro-based estimates of the monetary costs. The existing microconflict literature primary focuses on the nonmonetary costs (such as physical or human capital) and on post-conflict environments thereby making it difficult to compare to the macroconflict literature. I estimate aggregate rural household costs (in terms of consumption) of close to one percent of GDP with insecurity accounting for more than half of these costs.

This is not the first study to examine household responses to insecurity. Studies have examined how households change behaviour during conflict along a variety of dimensions: labor allocation (Fernández et al. 2011; Menon and Rodgers 2011), cropping and livestock holding (McKay and Loveridge 2005; Bundervoet 2007; Bozzoli and Brück 2009; Rockmore 2012; Arias et al. 2014; Ibáñez et al. 2013) and investments into businesses (Deininger 2003). This study differs in two important ways. First, previous studies focus on specific responses to conflict. Insofar as

households engage in a variety of income generating strategies, each only captures part of the household response (such as labor market responses or crop portfolios). The aggregate cost, however, cannot be captured by looking at narrow responses. Second, and crucially, while these papers examine responses to insecurity, they do not directly measure insecurity.³ That is, the studies observe changing household behaviour in conflict areas and attribute this to insecurity. Insecurity is never measured and therefore the elasticity of responses to insecurity is unknown. Consequently, even within the literature on household behaviour during conflict, the exact effect of insecurity (relative to exposure to violence) has not been measured.

The remainder of the article is structured as follows. Section 1 briefly considers how conflict-related risk can affect household behaviour. Section 2 highlights the history of conflict in Northern Uganda before section 3 presents data. Section 4 discusses the estimation strategy and presents the results. Section 5 concludes and discusses policy implications.

I. RISK, SHOCKS, AND CONFLICT

The literature on choice under uncertainty provides a framework for understanding the potential effects of the risk of violence during conflicts. This literature views households as making decisions at two discrete points in time. First, households make choices before knowing which, if any, shocks will occur. This first choice takes into account the uncertainty by also considering the potential options after the uncertainty is resolved. *Ex ante* strategies, such as diversifying crops or delaying planting, are used to manage the risk,⁴ that is, to reduce the probability of the shock or the magnitude of its effects. A second choice takes place after any shocks have occurred, whether

3. The only exceptions of which I am aware are Arias et al. (2014) who use the duration of rebel activity in the areas as a proxy for insecurity and examine the impact on cropping patterns; and Rockmore (2012) who uses the same methodology as here and examines the impact on the composition of crop and livestock portfolios.

4. Risk refers to the possibility that a particular shock might occur.

positive or negative. At this time, households use *ex post* risk coping strategies (e.g., selling assets) to smooth incomes (Deaton 1992; Townsend 1994; Dercon 2002).

Conflicts may affect both *ex ante* and *ex post* decisions. For instance, assets that support peacetime livelihoods may become liabilities during conflicts (Lautze and Raven-Roberts 2006). Certain assets, such as livestock, are not only more likely to be looted, but they may also increase the risk of being attacked, especially if they are difficult to conceal. The composition of crops is also likely to change as crops whose harvest may be delayed at low cost, such as cassava, may be particularly advantageous in conflict zones (Finnström 2003; Rockmore 2012; Ibáñez et al. 2013). More broadly, conflict-related risk should lead households to avoid otherwise profitable activities with sunk costs, or assets that cannot be easily hidden, transported, or liquidated (Dercon 2008; Arias et al. 2013). This suggests that as perceived risk increases, income and consumption should decrease below their risk-free optimal levels. In certain cases, households might consume more in order to prevent looting although this strategy is unlikely in the poorest households, who save little.

Conflict also reduces the effectiveness of *ex post* risk coping strategies thereby increasing the importance of *ex ante* risk mitigation. Markets for asset sales⁵ or for labour may no longer function well, while migration may become restricted. Similarly, both community and informal insurance networks may weaken due to the death or migration of members, or the increase in shocks experienced by network members due to the conflict (Verpoorten and Berlage 2007). Additionally, the risk associated with travel, even over short distances may also weaken ties between members.

While conflict may adversely affect households through a variety of channels, the goal of this article is not to examine specific pathways. As noted above, studies have identified particular

5. Verpoorten (2009) reports that cattle prices in Rwanda decreased by 50 percent during the genocide. This may be caused by the widespread sale of cattle as well as by the difficulty in protecting livestock during times of conflict.

household responses during conflict, many of which are consistent with responses to risk. Rather, the purpose is to quantify the aggregate cost of these responses. That is, once households make adjustments over their entire portfolio, what is the cost of conflict? Additionally, within these costs, what are the relative contributions of the risk of and exposure to violence?⁶

II. CONFLICT IN NORTHERN UGANDA

Although conflict in Northern Uganda pre-dates the emergence of the Lord's Resistance Army (LRA) in 1986, the rise of the LRA from the remnants of Alice Lakwena's short-lived rebellion began a near-continuous cycle of violence in Northern Uganda.⁷ Initially, the LRA sought to capitalize on the tensions between the North and the newly installed government in the center of the country and claimed to represent the interests of the Acholi, one of the main Northern ethnic groups. The inability of the LRA to obtain support from the local population quickly led to the LRA targeting the local population for supplies and recruits. Throughout this period, attacks were fairly widespread. Representative data show that 16, 25, and 25 percent of Northern communities suffered attacks by the LRA in 1992, 1999, and 2004, respectively (Ssewanyana et al. 2007).

Unlike many other insurgencies, the LRA often did not seek to engage government forces, preferring instead to target the local population especially for forced recruitment through abductions. Youths were typically permanently abducted and forced into the LRA, while older individuals were often used as temporary porters or as guides. The length of the conflict and the absence of reliable data complicate estimates of the level of abductions. However, they are

6. Rockmore (2012) provides a comprehensive examination of household responses to conflict risk in Northern Uganda, the setting for this study. He finds no responses to sources of income and limited changes (on the extensive margin) in the allocation of labor. Rather, there appear to be strong shifts away from risk in the livestock and crop portfolios.

7. The analysis focuses on the LRA since they were the only insurgent group in Northern Uganda during this period. While the Ugandan military (UPDF) may have committed acts of violence or looting, this is not recorded in the data.

believed to range from 20,000 to 80,000 (Lomo and Hovil 2004; Pham et al. 2007; Blattman and Annan 2010).

The prolonged violence resulted in several types of migration. Wealthier households were able to flee toward urban areas. Poorer groups tended to move to internally displaced persons (IDP) camps located within Northern Uganda (Fiala 2009). Additionally, since the LRA often attacked at night, a large number of children commuted nightly to the relative safety of urban areas or to the centers of IDP camps. At its peak, there were an estimated 30,000 “night commuters” (Amnesty International 2005).

Beginning in 2002, the government displaced large numbers of individuals, primarily from conflict prone areas, to IDP camps. Between voluntary and involuntary movements, certain districts virtually emptied. For instance, by 2004, approximately 90 percent of the original populations of Gulu and Kitgum districts were no longer in their original districts (Pham et al. 2005).⁸ Although the reasons for the government’s choices of particular districts are not known, it is reasonable to assume that these areas were among those with the highest risk of future attacks. Consequently, *ex ante* losses from the risk of conflict may be underestimated as the individuals in the high risk communities were moved to lower risk communities.

III. DATA

The household and community data are drawn from the Northern Uganda Survey (NUS) that was administered by the Uganda Bureau of Statistics in 2004. It contains representative data for 386 georeferenced rural communities and 3,867 households.⁹

8. Although the most affected districts were almost completely displaced to IDP camps, the data is representative of a broader area (only 17 percent of the sample currently resides in an IDP camp).

9. While representative for the population in rural Northern Uganda, the sample cannot account for any migration to urban areas in Northern Uganda or to areas outside of Northern Uganda. Consequently, the analysis can only consider the current rural population. This might potentially lead to a negative relationship between consumption

As is subsequently discussed, the empirical strategy relies on the geographical coordinates of communities. Consequently, the data are restricted to the communities (and associated households) for whom these data are available and correct.¹⁰ Additionally, households without any consumption of food (purchased, free, or own production) or which had abnormally high holdings of land (>200 acres as compared to mean holdings of 3.7 acres with a standard deviation of 5.4) are not included.¹¹ The remaining analysis is based on 353 communities and 3,508 households for whom data were available.¹²

The NUS data are supplemented with data from the Armed Conflict Location and Event Data (ACLED) for Uganda (Raleigh and Hegre 2005). The NUS data only include data on community level attacks in 1992, 1999, and 2004. By providing additional georeferenced data for the location of LRA attacks from 1997 until 2003, ACLED allow both for a larger set of instruments and a more accurate “map” of violence. Additionally, insofar as the behaviour of households changes based on their distance from violence, ACLED should result in more precise estimates of the effects of the risk of violence.¹³ I use only events that are violent, involve the LRA, and occurred in 2003 or earlier. Additionally, since the precision of the geographical coordinates

and risk. There are, however, also strong reasons to believe that the inclusion of wealthier households would lead to a larger impact of insecurity. In particular, in times of conflict and insecurity, their income generating activities would likely also suffer, and they would have more room to reduce their consumption before reaching minimal subsistence levels. Unfortunately, since the sample only contains current households, this hypothesis cannot be investigated.

10. For 33 communities, the recorded coordinates fall outside of the boundaries of Uganda, and therefore these communities have been dropped. Since this is based solely on the recorded coordinates, there is no reason to believe that any systematic differences exist in these observations.

11. While possible for households to live an entire week without receiving any food aid or food gifts, purchasing food, or consuming their own production, this is highly unlikely. Since this appears to be a clear coding error, these households are dropped. Their inclusion does not change the analysis.

12. The variables for the distance to the nearest attack are an exception. These were created using all the data—rural or urban—for which correct geographical coordinates were available.

13. The ACLED data are drawn from a variety of sources including press accounts, books, and humanitarian worker accounts. The data are disaggregated by event type, year, participants, and geographical coordinates.

varies, I only include those that are precise to the village or subregion location and exclude those that are only recorded at the regional level.

LRA attacks are recorded using a binary variable for whether or not a particular community was attacked by rebels in 2004. Insecurity is a binary variable for whether “any section of the community found it difficult to cultivate their land in 2004 because of insecurity.”¹⁴

Variables for the distance from each community nearest to rebel attacks in each year are created from the NUS and the ACLED data sets. Specifically, these measure the distance (in arc degrees) from community *i* to the nearest attacked community (excluding community *i*). For the NUS data, these are created for the rebel attacks in 2004, 1999, and 1992. The ACLED data contain information on LRA attacks for each year from 1997 to 2003.

On average, communities were relatively close to attacks by the LRA as the average distance varied between 0.20 and 0.90 decimal degrees (approximately 22 and 100 kilometers, respectively). For the closest communities, this was as low as approximately 3.6 kilometers. Moreover, close to one third of the sample communities were attacked in 2004. A similar number of communities reported being insecure.

Consumption is measured as the natural log of per capita annual total household consumption.^{15,16} Livestock holding are aggregated into tropical livestock units¹⁷ (TLU). Household members are defined as all household members who have lived in the house 6 months

14. The full text of the questions as well as full descriptive statistics of the variables are provided the appendix (tables S.1–S.3).

15. The variable is calculated by summing the following consumption sections: food consumption (purchased, consumption of home production, and free), non-durable goods and frequently purchased services (including rent), semi-durable and durable goods and services, and nonconsumption expenditure (such as remittances and taxes).

16. Total household consumption includes all the typical consumption categories, including the consumption of home produce and food aid. The recall periods vary across the components of consumption from the past week for food to the past year for semidurables and durable goods and services as well as for nonconsumption expenditure (such as taxes and remittances). The aggregate consumption annualizes components and assumes that behavior over the recall period is representative for the entire year.

17. Tropical livestock units are aggregated as follows: cattle=0.70, sheep and goats=0.10, pigs=0.20, poultry=0.01.

or more during the past 12 months. This also includes those who have come to stay in the household permanently even if they have lived in the household less than 12 months. Households typically contain only five members.¹⁸

IV. EMPIRICAL STRATEGY AND ESTIMATION RESULTS

Building on the earlier discussion, the effects of conflict on the household can be divided into two parts: the responses to risk (*Risk*: *ex ante* risk mitigation), and the effects of the shock including household responses (*Experience*: losses from both the exposure to violence and the subsequent *ex post* risk coping).

Formally, this can be estimated using the following equation:

$$(1) \text{Cost}_{ij} = a + b_1 \text{Risk}_{ij} + b_2 \text{Experience}_{ij} + b_3 X_{ij} + e_{ij}$$

where the subscripts refer to community i and household j . The vector X reflects other non-conflict (observed) factors that influence the economic performance of the household. While the questionnaire contains questions regarding the exposure of communities and households to violence (*Experience*), there is only limited information regarding risk (*Risk*). Consequently, the conflict-risk levels need to be estimated. e_{ij} is an independent and identically distributed error term.

Measuring Conflict Risk

Since violence is typically not random, regions or households may face different risks of exposure. Conceptually, violence can be thought of as occurring on two separate but related levels: geographic and within area. The former “placement effect” encompasses the reasons that

18. Regular members are defined by NUS as “close relatives and would have been usual members of the household but have been away more than six months during the last 12 months.” Regular members are not included in the household for the purposes of calculating per capita consumption.

determine which areas experience violence (see Jacoby [2000] for a discussion of placement effects). In the context of conflict, the characteristics of an area, such as the physical geography or its ethnic homogeneity, may influence both its likelihood of being attacked as well as the observed outcomes. The second effect is within community heterogeneity as households within the same community may face very different risks of experiencing violence. For instance, in ethnic or religious conflicts, such as genocide in Rwanda or intercommunal violence in India, this risk may vary greatly among households within a specific community and will therefore result in different household responses.

The estimation of conflict risk relies on the assumption that the risk of violence is heterogeneous at the community level but largely homogenous within it. While typically unrealistic, a variety of qualitative and quantitative evidence support this assumption in the specific context of Northern Uganda.

Although the LRA operated throughout Northern Uganda, the “placement” of its attacks was not random, as it primarily operated in the Acholi districts. While the tactics and motivations of the LRA are unclear, there are several plausible explanations for this targeting such the substantial linguistic differences throughout Northern Uganda. Since the original LRA members primarily came from the Acholi districts, it was easier for the LRA to operate in these areas and to communicate with abducted individuals from these districts. Moreover, although the main bases for the LRA were in Southern Sudan, they had a number of smaller bases in the area including in Pader district (Fiala 2009). Over time, especially after 2002, LRA attacks became more frequent in other parts of the country.

This evidence implies that attacks were generally not determined by particular village characteristics. Rather, LRA raiding parties happened to come across particular villages and then

target them.¹⁹ Insofar as this is true, then attacks are exogenous to village characteristics (including endogenous changes). As will be shown, the results are extremely robust to the inclusion of plausible village characteristics or responses that might influence the likelihood of attacks or the local consumption patterns, such as remoteness, local economic conditions (including markets, electricity, and credit), access to roads (if the rebels followed roads), or the presence of local security forces (table 4). Moreover, insofar as the locations of refugee camps are known and that these camps attract attacks, these effects are captured by the binary variable for refugee camps. Consequently, based on the particular context and the included controls, the residual heterogeneity is likely small and random and the placement of LRA attacks can be considered to be exogenous to village characteristics.

In contrast to the “placement” of attacks, the evidence suggests that attacks and abductions were random within the same village or at least uncorrelated with individual observed and unobserved characteristics. This was the result of the LRA’s goal to “purify” Northern Uganda of corruption and witchcraft through violence (Finnström 2003; Branch 2010; and Titeca 2010). During an attack, all non-LRA individuals were at potential risk of exposure to violence, abduction, or death. Interviews of former LRA officers indicate that the LRA would attack any households encountered and abduct all able-bodied civilians (Blattman and Annan 2010). In particular, the former officers noted that the targeting of homesteads was generally unplanned and random. These largely depended on chance encounters. Crucially, this suggests that concerns of reverse causality between consumption and conflict, such as villagers reducing wealth to lower the likelihood of attacks, are unfounded.

19. This does not rule out specific cases of the LRA attacking particular villages when abductees from that village escape from LRA captivity. This was known to happen. First, this was an exception to the rule. Second, even if this determined all attacks, this is still exogenous to particular village responses.

Once a village or homestead was attacked, the LRA's "strategy was to abduct first and sort out later" (Blattman and Annan 2010, 8–9). This is supported by Blattman and Annan's (2010) quantitative analysis of youth abductions using a pre-abduction representative data for one of the most affected districts in Northern Uganda. They find no statistically significant differences in the mean of pre-war characteristics that predict abductions in other conflicts, such as pre-war wealth or parental characteristics.²⁰ These findings suggest that variation of individual and household characteristics within village did not affect the likelihood of being abducted, which in turn is likely highly correlated with attacks.²¹

Relationship Between Statistical and Perceived Risk

Two different types of risk can be estimated with the available data: statistical (objective) and perceived (subjective). The former refers to the observed likelihood of a particular shock occurring while the latter to the a priori belief whether a specific shock will occur. While correlated, individuals make their decisions based on upon their perceptions as opposed to the "true" likelihood of shocks.

In general, these two types of risk may differ for a variety of reasons including incomplete information or behavioural biases such as the proximity or vividness of events. Lowenstein et al. (2001) highlight how "emotional reactions to risk situations often diverge from cognitive

20. The only exceptions were the year of birth and the size of the household. The former reflects the preference of the LRA for youths between the ages of 10 and 24 as forcible recruits; younger children were less useful while older youth were perceived as being difficult to indoctrinate. The significance of the size of household is driven by the sub-sample of household with 25 or more members. This is not only a rare occurrence in their data but also overall in Northern Uganda. The 2002 Uganda National Census shows that less 1 percent of households in Northern Uganda, rural or urban, have 15 or more members; in rural areas, this represents roughly 0.5 percent of the sample.

21. Unfortunately, it is not possible to directly test whether attacks were random within the data used (or within almost any other dataset). Post-attack data are potentially endogenous to the violence. Additionally, since certain households or individuals may disappear from the sample (through death, abduction or migration), the post-attack population is not representative of the pre-attack population. Consequently, any analysis requires both a pre-attack representative sample and pre-attack characteristics. As a result, the Blattman and Annan study is particularly unique as it is essentially representative of the pre-abduction population.

assessments of those risks . . . [and that] when such divergence occurs, emotional reactions often drive behaviour” (267).

In particular, numerous studies argue that perceived risk assessments are formed through interactions between analytical and experiential systems (see Slovic et al. [2002] for a review). That is, perceived risk assessments can be broadly considered as a combination of statistical risk and of individual feelings, memories and associations. Based on this relationship, statistical risk can be viewed as a measurement of perceived risk which contains measurement error (the perceived part of the expectations). Therefore, as with classical measurement error, the effects of statistical risk in the subsequent results should be lower than those the perceived risk (due to the attenuation bias toward zero).

Estimating Risk

Both statistical and perceived risk are estimated using questions in the community questionnaire. This questionnaire was administered through group interviews of community leaders.²² Specifically, the statistical risk measure is based on a binary question asking about “incidents of LRA Rebel attacks” within the community. Communities which reported an incident of LRA rebel attack currently (2004) were coded as having been attacked in 2004.

The second relevant question asked: did “any section of the community find it hard to cultivate their land in the last 5 years because of insecurity?” The responses are limited to those who answer the current year (2004). While this question does not directly measure perceptions regarding risk, it does measure a direct response to perceived insecurity. Since agriculture is the

22. Enumerators were instructed to make certain that the respondents for the community questionnaire contained at least two men and two women leaders and which did not exceed 10 individuals. Moreover, the group was supposed to contain at least several individuals who have lived in the community for several years and who are knowledgeable about historical events. In general, this group was supposed to be organized with the help of the local community leader (chairperson of the LC1).

self-reported primary income source for the majority of respondents (~70 percent) in these rural communities, this question is a particularly good measure of household responses to insecurity.

The question on insecurity examines responses to perceptions of insecurity over the past year. That is, it is based on *past* perceptions of insecurity. However, this is not a problem for the estimation. First, current perceptions of insecurity likely strongly reflect the previous perceptions. (See Rockmore and Barrett [2012] for an analysis of the evolution of perceptions of insecurity using panel data in a different setting.) Second, the household measures of consumption include recall data with some of the recall periods being the past month or past year. Consequently, large portions of the consumptions are contemporaneous with the perceptions. Lastly, and most importantly, current income (and hence consumption) is a function of prior choices. Insofar as these choices are difficult or costly to reverse (such as cropping or livestock decisions), current consumption is heavily dependent on prior choices and hence prior perceptions of insecurity.

The previous discussion regarding LRA attacks makes clear that once villages are attacked, all households are equally at risk because the LRA was liable to attack and/or abduct anyone encountered. While this implies that statistical risk is homogeneous within villages, perceived risk need not be as homogeneous. There is relatively little empirical evidence on the heterogeneity of perceptions, particularly within developing countries. The only study of which I am aware suggests that across-community variation in beliefs is substantially higher than within-community variation (Doss et al. 2008). Moreover, the widespread attacks and abductions in the area—close to 40 percent of males and 20 percent of females aged between 14 and 30 were abducted in the most affected areas—implies that the indiscriminate strategies of the LRA were widely known (Beber and Blattman 2013).

While a variety of factors might lead to systematic differences in perceived risk levels, the data allow for controls for many of the most arguably important. In particular, controls are included for the demographic structure of the household as those with younger members might be at greater risk of suffering a prolonged abduction, or members working in multiple locations or attending school thereby increasing the risk of abduction. Additionally, since household perceptions might be systematically related by personal histories with violence, variables for household histories of prior attacks and of prior abductions over the previous 10 years are also included.²³

Similarly, the gender of the head of the household might influence perceptions of risk as the experience of abductees often varied based on their gender.²⁴ Consequently, a control for the female headed households is also included. Although it is not possible to fully control for everything that might lead to heterogeneity of perceptions within villages, based on the particular context and the included controls, the residual heterogeneity is likely small and random.

Empirically, risk is estimated at the community level using the following logistic regression:

$$(2) \ln[(\Pr(Y_i = 1))/(1 - \Pr(Y_i = 1))] = A + \sum_{t=1992}^{2003} \beta_{it} distance_{it} + E_i ,$$

where the dependent variable, Y , is measured at the community level. As noted, for statistical risk, Y is a binary variable for whether or not community i was attacked in 2004. In this case, the predicted value (or fitted value) from equation (2) is the estimated probability of the community experiencing an attack in 2004. For perceived risk, the dependent variable is a binary variable for

23. It is not possible to control for the experiences of friend, family and acquaintances of the households. Based on the widespread exposure to violence, it is high likely that all households know someone who has been abducted or others affected by the violence. It not possible, however, to control for heterogeneity due to spillovers via knowledge or indirect experiences.

24. Males often were indoctrinated and turned into fighters. Others primarily carried loads or performed domestic duties in the camps. Although some females also became fighters, they frequently were used as sex slaves or as cooks within the camps. Moreover, since these camps were located in Southern Sudan, it was typically more difficult for females to escape due to the added distance from their homes and the fewer opportunities to slip away from camps.

whether any section of the community found it hard to cultivate their land in 2004 because of insecurity. The predicted value represents the probability that the community would report being insecure in 2004 and therefore represents perceived risk.

The vector of independent variables, *distance*, represents the distance of community *i* from the closest LRA attacks in previous years. Separate distance measures are constructed from the NUS and ACLED data. The NUS data only contain information for attacks in 1992 and 1999. The ACLED data contain yearly data for 1997 until 2003. There are therefore nine independent variables (two from the NUS and seven from the ACLED data). The same independent variables are used for both the estimation of statistical and perceived risk. *E* is an error term.

The results from the estimation of equation (2) to construct the measures of statistical and perceived risk are presented in table 1.²⁵ The errors in the logistic regression are clustered at the community level. In the first column, the dependent variable is a binary variable for whether or not a community was attacked by the LRA in 2004. Consequently, as previously discussed, the predicted values represent the probability of the community being attacked in 2004, that is the statistical risk. Similarly, the second column uses a binary variable for the perceived insecurity within the community. As previously noted, the fitted values from column (2) are estimates of the likelihood that the community feels insecure and therefore of the perceived risk.

Overall, while the variables are strongly jointly statistically significant, only several of the variables are individually significant, likely reflecting the multicollinearity among measures of distance to the closest attacks in different years. This is not a problem as we are only interested in how well the model “predicts” attacks as opposed to the relevant contribution of any of the

25. This estimation only captures the part of insecurity which is correlated with the proximity of communities to historical violence. While this likely determines the statistical risk of violence, perceived insecurity could arise for a variety of reasons which are unrelated to proximity of violence. Consequently, the estimates only capture part of the overall effects of perceived insecurity and should be considered as conservative estimates.

independent variables. The fit of the model can be assessed by looking at what per cent of attacks in 2004 are correctly classified²⁶ in each specification. For statistical risk, this is a direct measure of accuracy since the fitted values represent the probability of being attacked in 2004. For perceived risk, it is suggestive as perceived risk is likely to be strongly and positively correlated with actual attacks. The predicted values for perceived risk match very closely with the actual distribution of attacks (90.1 percent). The predicted perceived risk also does well albeit to a lesser degree (79.9 percent). These strongly imply that attacks at the community level are clustered and, hence, nonrandom. In addition to the overall levels, the spatial distribution of statistical and perceived risk at the community level is similar to those of actual attacks. That is, the predicted data largely match the spatial distribution of attacks. The largest difference occurs in Karamoja where the higher perceived risk likely reflects the insecurity in the region associated with cattle raiders.

Economic Costs

In the second stage of the estimation, the predicted risk values from equation (2) are inserted into equation (1) resulting in equation (3):

$$(3) \text{ Cost}_{ij} = a + b_1 \widehat{\text{Risk}}_i + b_2 \text{Experience}_{ij} + b_3 X_{ij} + \text{district}_k + e_{ij} .$$

The economic costs, *Cost*, are proxied by the log of per capita household consumption for household *j* in community *i* in district *k*. While the broader household welfare can be measured using different measures, per capita consumption is arguably highly correlated with many of the

26. To calculate ‘correct classification’, the fitted values are compared with the actual values (here the binary variable for a community being attacked in 2004). Since actual attacks are binary while the estimates of the risk are continuous and bounded by 0 and 1, values of less than 0.5 for the estimated risk are counted as 0 and values greater than 0.5 as 1 for the purpose of checking the accuracy.

alternative choices and directly linked to poverty measures. To the extent that households value leisure, the economic costs may overestimate the welfare losses.

$\widehat{\text{Risk}}_i$ is a vector containing the fitted risk value and its square from the first stage (equation (2)). The choice of a quadratic reflects that the possibility that household responses to risk may not be constant. On the one hand, households may not respond strongly to low levels of risk but then have a much larger response once risk levels become very high. On the other hand, households may be able to adopt a variety of strategies to reduce *ex ante* risk but that also reduce income (and consumption). As risk increases, their ability to further adapt is limited both by the availability of strategies and by the minimum level of consumption required to survive. Since the exact nature of household responses is unknown, the quadratic allows for either possibility. Similarly, the choice of a quadratic also allows for a linear relationship and therefore is *less* restrictive than a linear specification. As we discuss below, we estimate equation (3) with statistical and perceived risk both individually and combined.

As noted earlier, based on the particular context of Northern Uganda, there is substantial evidence to suggest that both statistical and perceived risk are arguably homogenous within community. The vector of control variables (described below), including the demographic structure of the household, prior abductions histories, and migration due to insecurity, along with the controls for individual and community level exposure to violence, arguably address the primarily remaining sources of within community variation. Consequently, despite being measured at the community level, the fitted values from equation (2) are treated as measures of household risk for the remainder of the article.

The *Experience* vector measures the experience of violence in community i and household j . Community and household experiences of violence may differ for a variety of reasons including

migration, the spatial distribution of household or even the nature of the specific attacks. Additionally, the effects of the two experiences are likely to be different. Whereas community level attacks may affect the broader economy and public goods, household attacks may lead to the destruction or theft of personal assets, the abduction or death of household members or psychological trauma.

For community level attacks, I am able to construct binary variables for whether there was a rebel attack in 2004 and whether there were any rebel attacks since 1992. Unfortunately, the data on household level attacks are not as detailed. Consequently, I am only able to construct a binary variable for the household experiencing at least one attack since 1992. There are, however, questions regarding abductions within the household and these are used to create binary variables similar to those for community level attacks. The abduction variables are included in the control vector, X_{ij} .

Equation (3) therefore separates the effect of *ex ante* risk exposure (b_1) from the experience of being attacked (b_2). When statistical risk is used, equation (3) contains both the dependent variable and the fitted value for equation (2). Mechanically, the predicted value of risk used in equation (3) represents the part of the experience that is correlated with the proxies used in equation (2). Therefore, although the experience variable and the fitted values are highly correlated, they have distinct interpretations. The former reflects the effect of risk on consumption while controlling for the experience of households and communities. Similarly, the latter reflects the effect of the experience of violence after controlling for risk.

The control vector, X_{ij} , contains a variety of household and community-level controls. The controls for the demographic structure of the household reflect both the differences in productivity and required consumption levels of different age groups but also their varying risk for abduction.

As noted earlier, the LRA systematically targeted youth between the ages of 10 and 24. Consequently, households with members in this age group might experience greater (perceived) risk.

The data allow me to largely control for migration within rural communities or IDP camps in Northern Uganda. In particular, the migration of individual members is controlled for using a variable for the number of absent working age household members (14–60). I also control for the motivation for any migration by including binary variables for migration due to insecurity by the head of the household in 2004 or ever. While there are no data on forced migration, this is likely included in the category for migration due to insecurity.

It is not possible to link migrants with their former communities. Consequently, the variables regarding their community's experience with violence relate to their current community. Therefore, certain households may have experienced an attack but currently reside in a community that has not experienced an attack. This is part of the variation that allows for the separate estimation of household and community experiences of violence.

Households that either migrated to urban areas in Northern Uganda or which left Northern Uganda are not included in the sample. The sample is therefore only representative of nonurban households (including IDP households) in 2004. Since the conflict has been ongoing since 1986, it is likely that most households that could leave Northern Uganda (or even move to cities) would have left before 2004.

Lastly, the vector of control variables includes a binary variable for female headed households, the highest education level in the household, residence in an IDP camp, the presence of a major source of employment within 10 kilometers of the community. Since asset holdings may be endogenous, equation (3) is estimated both with and without productive assets. The

variables for productive assets are ownership of at least one unit of the following: a plough, a hoe, a boat, a motor vehicle, a motorbike, a bicycle, and a generator. Additionally, there are variables for the total amount of land owned, and a variable for total livestock holdings in tropical livestock units (TLU). The estimation also includes district level fixed effects

As discussed above, the risk measures are predicted regressors and are therefore estimated with error (Pagan 1984). The standard errors are corrected using a modified bootstrap with 2000 replications. Typically, since the same sample is used in both stages, sampling with replacement alters the composition of the sample in both stages. In the estimation presented below, different levels of data are used in each stage; the first stage uses community level data while second stage uses household data. Consequently, only the first stage is bootstrapped and the resulting 2000 estimates of risk are used in the second stage (whose sample composition does not change).

Table 2 presents the key coefficients from the estimation of equation (3). Columns (1) and (2) present the result for statistical risk using the base control variables and then including the potentially endogenous productive assets. The coefficients for the statistical risk measures are always significant although sometimes only weakly (i.e., at the 10 percent level). Columns (3) and (4) have the same specifications for perceived risk. Consistent with the idea that statistical risk measures perceived risk with classical measurement error, the significance and magnitude of the perceived risk coefficients are larger. More broadly, the estimated coefficients for perceived risk are significant and indicate household level losses of over 5 per cent at the sample mean.

Column (5) examines the relationship between the two different sets of measures of risk by including both sets within the same regression along with productive assets. Despite the high correlation between both measures of risk, perceived risk maintains its high significance while its effect increases (at the sample mean). In contrast, the significance and effect of statistical risk

decreases. This suggests that the effect of statistical risk in columns (1) and (2) largely reflects the underlying relationship between statistical and perceived risk. Once perceived risk is included, the measures of statistical risk offer little explanatory power. For these reasons as well as the theoretical superiority of perceived risk, the remainder of the article focuses on specification in column (4).²⁷

The effects of exposure to violence are mixed. Community level exposure to violence, whether in the current year or historical, is never significant. Moreover, the coefficients for historical exposure are positive. The insignificance of the coefficient and its magnitude may reflect a variety of offsetting effects. On the one hand, attacks on communities may be destructive and have negative lasting consequences for household income and consumption. On the other hand, prior attacks may lead to higher consumption as NGOs may focus their activities in previously exposed areas.²⁸

Historical exposure to violence at the household level is consistently highly significant with relatively stable coefficients across specifications. As expected, direct exposure to violence causes higher losses in per capita consumption than exposure to risk (-10.0 vs -5.9 at the sample mean). While the effects of exposure to violence are larger at the household level, perceived risk still accounts for roughly 37 percent of the overall consumption per capita in exposed households. This implies that conflict reduces household income by 16 percent in violence-affected households and 6 percent in households that are not exposed. These magnitudes are similar to the estimated

27. The curvature of the quadratic function for perceived risk implies that consumption per capita increases at very high levels of risk. Earlier versions of this research show that food aid was targeted towards the areas of high risk, particularly IDP camps. As a result, this leads to a positive relationship between per capita consumption and risk at very high levels of risk. This discussion has been omitted over concerns of manuscript length. Irrespective, it is not possible to completely remove these effects. Consequently, I estimate the effect of conflict risk after the mitigating effects of food aid.

28. In results not presented here, I estimate that food aid reduces the effects of conflict risk by roughly 18–26 percent. These results are available upon request.

economic effects of terrorism in the Basque country, approximately 10 per cent decrease in GDP per capita (Abadie and Gardeazabal 2003).

Robustness

In this section, I examine four sources of potential concern. First, equation (3) assumes that the effect of insecurity does not systematically vary across communities based on whether or not they experience (current or historical) violence. I investigate this possibility by introducing interaction terms between each of the three measures of exposure and the linear and quadratic perceived risk terms.²⁹ Due to the high collinearity between all these variables, none of the coefficients are significant. Since the linear and quadratic perceived risk measures are significant when the interactions terms are omitted, I next examine whether the reverse is true. Only two of the interaction terms (community attacked in present year X perceived risk) are (weakly) significant. Due to the aforementioned high collinearity between the interaction terms and the risk measures, it is difficult to make any definitive statements regarding the possibility of the effect of risk varying by exposure levels. Rather, there is limited evidence suggesting the possibility.

A second concern relates to the timing of the survey. Since households are interviewed at different times of the year, households interviewed earlier in the year are less likely to have been attacked in the calendar year than those interviewed subsequently. Table 3 demonstrates the robustness of the results to this concern. Columns (1) reproduces the preferred specification while column (2) introduces control variables for the month of survey. While this somewhat reduces the magnitude of the estimated effects of perceived risk, they remain qualitatively similar.

Similarly, related to timing, the bulk of consumption may have occurred prior to attacks, particularly if attacks occurred late in the year. This is examined in column (3) which replicates

29. These results are available upon request.

the preferred specification while limiting consumption to food consumption, the portion of consumption with the shortest recall period (1 week). Since the probability of experiencing violence in the past week is quite low, column (3) arguably captures the only consumption after attacks.³⁰ The results for perceived risk remain largely unchanged.

A third concern is that the specification of the first stage imposes artificial structure on the data. In supplemental appendix table S.4, I investigate the choice of a logistic regression in the first stage using respectively a probit, a linear probability model, and a linear probability model where predicted values below 0 are recoded to 0 and values above 1 are similarly recoded to 1. The resultant estimated effects are broadly similar with the exception of the linear probability model in the first stage which produces a more lower estimated effect of risk (−1.7 percent at the sample mean versus −5.9 percent in the preferred specification). In the subsequent analysis, it is used as a conservative estimate of aggregate effect of perceived insecurity.

The last concern relates to the possibility of community characteristics being correlated with both the *ex-ante* risk of violence and household expenditure. In particular, remoteness might affect both the likelihood of attacks and economic opportunities or returns to assets. For instance, Fafchamps and Moser (2003) find higher levels of crime and insecurity in isolated areas. Alternately, proximity to previous attacks could affect current consumption by limiting current consumption through such channels as lower access to input or output markets. This is investigated in table 4. Column (1) presents the preferred specification for ease of comparison. Column (2) adds binary variables for the presence of a paved trunk road, murram trunk road (gravel), feeder, or community roads within the community (LC1) as proxies for the remoteness of a community.

30. Since this limits the consumption measure to only one category, it is possible that the results only capture changes specific to food consumption.

I next address the potential effect of the economic infrastructure, including the availability of markets. Markets are especially important since they could represent an alternate pathway from insecurity to decreased local consumption. Additionally, proximity to historical violence might also directly affect markets and therefore the estimated effect might be a combination of perceived risk and market mechanisms. Column (3) adds a variety of measure of economic infrastructure to the specification in column (2).³¹ In particular, the following binary variables for the presence of markets are included: the presence of a market selling agricultural inputs, market selling agricultural produce, market selling nonagricultural output, or a market selling nonagricultural output within the community. The estimated effects are essentially identical to the earlier results. Consequently, the proximity of communities to historical violence is capturing a distinct effect than the presence of markets or of broader measures of economic infrastructure.³²

Column (4) adds binary variables for the presence of a police station/post or an army detachment/barrack within the community. Despite the inclusion of wide-ranging set of measures of remoteness or of local economic structure/opportunities, the general qualitative story remains unchanged while the implied losses increase.

31. The following binary variables for economic structure are included: the availability of publically generated electricity within 5 km of the village centre, availability of privately generated electricity within 5 km of the village centre, the presence of source of credit not requiring collateral within 10 km of the village center, the presence of a World Food Programme office or other NGO food distribution centre within 5 km from the village center, or an IDP camp within 5 km of the village center. Also, as a reminder, the preferred specification already included a binary variable for the “existence of a major factory/other source of employment (e.g., town) within 10 km” of the village center.

32. Unfortunately, it is not possible to control for how well these markets function, so it is not possible to rule out the effect of market mechanisms. The available evidence suggests important household responses to risk which are consistent with ex ante risk mitigation. In related work in the same setting (Rockmore 2012), households both decrease the size of their livestock portfolio and shift the composition toward low-risk and low-return animals. At mean risk levels, a rough calculation suggests that the value of the average livestock portfolio decrease by 65 percent of the value of the average livestock holdings or roughly 25.5 percent of mean annual consumption. There are similar strong patterns in cropping behavior which do not seem to reflect responses to market signals. This suggests that changes in household production likely explain a large portion of the observed losses.

Aggregate Effects

Although the estimated effect of the risk of violence is smaller than that of its experience, only a modest fraction of the overall population experience violence. In contrast, the risk of exposure affects virtually the entire population. Consequently, the aggregate effects of risk are considerably higher than implied by cursory comparisons of their estimated coefficients. Table 5 provides a rough estimate of the relative contributions of the risk of violence and its realization to the aggregate costs of conflict in rural areas.

The table divides the aggregate losses into those in households who were never attacked (since 1992) (top third) and those households who have been attacked (middle third). Within each third, the losses are divided into those from risk and exposure to violence. These are calculated using the coefficients estimated in table 2 for risk, the mean household levels of risk, exposure to violence, and the aggregate income by exposure status. Since the estimated coefficients on community attacks are positive, this can result in negative losses (i.e., gains). This effect is particularly visible among households that are never attacked. Since some of the households reside in communities which have been attacked, the positive coefficients result in negative losses for this entire row.

The first column uses the preferred specification. The second column uses a specification with controls for remoteness, economic activity and security (column 4 from table 4). The third column uses the coefficients from the most conservative estimate of the effects of risk (linear probability model in the first stage). Irrespective of the specification, losses from risk account more than half of the overall losses. This is likely a conservative estimate since the measures of insecurity only capture the part of perceived insecurity which is related to the proximity of communities to historical violence. Since perceptions of insecurity could arise for other reasons (even in the absence of violence; Kalyvas 2006), the costs of insecurity are underestimated.

Moreover, there is evidence of strong spillovers of risk into households which never directly experience violence (but may reside in communities which are attacked).

The aggregate household losses attributable to conflict are substantial with estimates ranging from 0.7 to 1.0 percent of GDP for 2004. This suggests that risk lowered aggregate consumption by 60 to 90 million 2004 dollars.^{33, 34}

V. CONCLUSION

While the potential effects of insecurity have been widely recognized, they have never been directly measured. Using the spatial-temporal variation in the placement of violence to estimate disaggregated measures of insecurity, I find that insecurity causally reduces household per capita consumption in Northern Uganda. Although the effects of direct exposure to violence are larger than those arising from insecurity, only a minority of households are ever attacked. Consequently, on aggregate, losses from insecurity are larger than those from violence. This suggests that prior studies that focus solely on exposure to violence both substantially underestimate the costs of conflict as well as ignore one of the more important pathways from conflict to the outcomes observed during and post-conflict.

More broadly, the results suggest that perceptions of risk may be just as important as actual violence. This implies that losses from conflict may occur even without the presence of violence. Consequently, violence-related losses may occur in fragile countries or in uncertain times, such as

33. I am only aware of one other study on the aggregate costs of conflict in Northern Uganda (Dorsey and Opeitum 2002). Since much of the needed data are missing, the study uses experts to establish losses and counterfactual growth rates. Despite the differences in methodology, our estimates are broadly similar; they estimate annual losses of roughly \$77 million per year once country wide losses for tourism and increased military expenditure are excluded.

34. To put these totals into perspective, in 2004, disbursed ODA aid from DAC countries to Uganda amounted to roughly 684 million US dollars. Although it is not possible to solely isolate aid directed to Northern Uganda or resulting from conflict, the stated purpose of individual grants allow for an upper bound of 126 million US dollars to be calculated. The bulk of the disbursed aid, 102 million US dollars, is categorized as emergency food aid or as food security programs/food aid and is likely partially used in areas outside of Northern Uganda.

elections or other transitions of power. Careful monitoring of perceptions may allow for proactive responses as opposed to waiting for losses to accumulate. The importance of risk and the limited ability of households and communities to address this risk suggest an important role for government policy. Moreover, since perceptions of the risk of violence are more important than the actual risk of violence, this suggests that conflict-related losses may persist even after the end of violence. These perceptions may also impact responses to post-conflict program which seek to introduce new livelihoods and assets.

While these results underline the importance of perceptions of risk, these data are rarely available even in nonconflict contexts. In contrast, there has been a strong increase in the availability of spatially and temporally disaggregated data on acts of violence. This article has introduced a simple methodology to obtain disaggregated measures of statistical risk using this newly available data. While the measures of statistical risk are not as strong as those of perceived risk, their results are qualitatively similar suggesting that this methodology can be used to examine responses to conflict risk in other settings.

Although this research causally links conflict-risk with lower economic outcomes, the precise pathways are unclear. The existing literature on livelihoods during conflicts suggests important endogenous responses to conflict risk, but these are obscured by the lack of measures of risk. Consequently, an important avenue for future research will be to precisely measure these responses and to understand whether these occur at the intensive and/or extensive margins. Similarly, this raises questions about the origins of the large and lasting micro-economic post-conflict costs found in the literature. Are these the result of exposure to violence, as suggested by many articles, or the responses of households to the risk of violence? While the answers are beyond

the scope of this article, they suggest that many important questions remain in understanding the origins of the cost of conflict.

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Table 1. Logit Estimating Statistical and Perceived Risk of Community Attacks

	Statistical	Perceived
Distance to nearest attack 1992, NUS	3.14 [3.14]	-0.20 [1.91]
Distance to nearest attack 1999, NUS	-5.19 [5.13]	1.33 [2.28]
Distance to nearest attack 1997, ACLED	2.78 [2.11]	8.31*** [1.88]
Distance to nearest attack 1998, ACLED	-2.94* [1.79]	-2.54* [1.48]
Distance to nearest attack 1999, ACLED	-0.50 [2.20]	-8.30 [2.27]
Distance to nearest attack 2000, ACLED	-1.08 [1.59]	0.94 [1.58]
Distance to nearest attack 2001, ACLED	-2.45 [2.51]	0.87 [1.97]
Distance to nearest attack 2002, ACLED	-0.27 [3.08]	-5.25** [1.91]
Distance to nearest attack 2003, ACLED	-16.2*** [5.08]	-1.48 [1.97]
Constant	3.18*** [1.16]	0.36 [0.49]
Observations	353	353
Pseudo R^2	0.58	0.35
Percent of LRA attacks in 2004 correctly classified	90.1	79.9

Community weights used. Errors are clustered at the community level.

*, **, *** statistically significant at the 10 percent, 5 percent, 1 percent levels respectively

Source: Author's calculations based on data sources described in text.

Table 2. The Effects of the Risk and Realization of Violence on the Log of Household per Capita Consumption

	<u>Consumption</u>	<u>Consumption</u>	<u>Consumption</u>	<u>Consumption</u>	<u>Consumption</u>
	(1)	(2)	(3)	(4)	(5)
Statistical risk	-0.45*	-0.38*			-0.37
	[0.23]	[0.23]			[0.24]
Statistical risk ²	0.49**	0.42*			0.42*
	[0.22]	[0.22]			[0.21]
Perceived risk			-0.64**	-0.68***	-0.69**
			[0.26]	[0.26]	[0.29]
Perceived risk ²			0.80***	0.84***	0.84***
			[0.28]	[0.28]	[0.29]
Community attacked in 2004	0.02	-0.01	0.00	-0.02	-0.02
	[0.05]	[0.04]	[0.05]	[0.04]	[0.04]
Community attacked, since 1992	0.04	0.06	0.03	0.04	0.05
	[0.04]	[0.04]	[0.04]	[0.03]	[0.04]
HH attacked since 1992	-0.09***	-0.10***	-0.09***	-0.10***	-0.10***
	[0.04]	[0.03]	[0.03]	[0.03]	[0.03]
Productive assets		X		X	X
Cost of statistical risk (at mean)	-2.4%	-1.9%			-1.7%
Cost of perceived risk (at mean)			-5.4%	-5.9%	-6.1%
R ²	0.35	0.37	0.35	0.37	0.37
N	3,508	3,508	3,508	3,508	3,508

The regressions included controls for household composition, migration, highest education, IDP camp residence

The regressions also control for the presence of a major source of employment within 5 km

Standard errors in brackets are bootstrapped with 2,000 replications. Household weights used. Models include district fixed effects, and clusters errors by district.

*, **, *** statistically significant at the 10 percent, 5 percent, 1 percent levels respectively

Source: Author's calculations based on data sources described in text.

Table 3. Robustness Check for Time of Interview

	<u>Consumption</u>	<u>Consumption</u>	<u>Recall 7 days</u>
	(1)	(2)	(3)
Perceived risk	-0.68*** [0.26]	-0.56** [0.26]	-0.71** [0.30]
Perceived risk ²	0.84*** [0.28]	0.72*** [0.28]	0.95*** [0.31]
Community attacked in 2004	-0.02 [0.04]	-0.02 [0.04]	-0.06 [0.05]
Community attacked, since 1992	0.04 [0.03]	0.05 [0.04]	0.06 [0.04]
HH attacked since 1992	-0.10*** [0.03]	-0.10*** [0.03]	-0.06 [0.04]
Productive assets	X	X	X
Control for month of interview		X	
Cost of perceived risk (at mean)	-5.9%	-4.5%	-5.2%
R^2	0.37	0.38	0.23
N	3,508	3,508	3,508

The regressions included controls for household composition, migration, highest education, IDP camp residence. The regressions also control for the presence of a major source of employment within 5 km. Standard errors in brackets are bootstrapped with 2,000 replications. Household weights used. Models include district fixed effects, and clusters errors by district.

*, **, *** statistically significant at the 10 percent, 5 percent, 1 percent levels respectively

Source: Author's calculations based on data sources described in text.

Table 4. Investigating the Impact of Remoteness and Economic Opportunity

	<u>Consumption</u>	<u>Consumption</u>	<u>Consumption</u>	<u>Consumption</u>
	(1)	(2)	(3)	(4)
Perceived risk	-0.68*** [0.26]	-0.67** [0.27]	-0.61** [0.25]	-0.68*** [0.26]
Perceived risk ²	0.84*** [0.28]	0.82*** [0.28]	0.70*** [0.26]	0.80*** [0.28]
Community attacked in 2004	-0.02 [0.04]	-0.03 [0.04]	-0.01 [0.04]	0.00 [0.04]
Community attacked, since 1992	0.04 [0.03]	0.04 [0.04]	0.03 [0.04]	0.03 [0.03]
HH attacked since 1992	-0.10*** [0.03]	-0.10*** [0.03]	-0.09*** [0.03]	-0.09*** [0.03]
Productive assets	X	X	X	X
Access to roads		X	X	X
Economic infrastructure			X	X
Security				X
Cost of perceived risk (at mean)	-5.9%	-6.1%	-6.0%	-6.5%
R^2	0.37	0.37	0.38	0.39
N	3,508	3,478	3,468	3,448

The regressions included controls for household composition, migration, highest education, IDP camp residence. The regressions also control for the presence of a major source of employment within 5 km. Standard errors in brackets are bootstrapped with 2,000 replications. Household weights used. Models include district fixed effects, and clusters errors by district.

*, **, *** statistically significant at the 10 percent, 5 percent, 1 percent levels respectively

Source: Author's calculations based on data sources described in text.

Table 5. Aggregate Rural Costs of Conflict in Northern Uganda for 2004

	<u>Base</u>	<u>Full Controls</u>	<u>Conservative</u>
HH never attacked (percent of total losses)	<i>30.0</i>	<i>35.4</i>	<i>17.5</i>
From attacks	-2.1	-9.1	-2.7
From risk	32.1	44.5	20.2
HH attacked	<i>70.0</i>	<i>64.6</i>	<i>82.5</i>
From attacks	39.2	37.4%	46.4
From risk	30.8	27.1%	36.1
Total	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>
From attacks	37.1	28.3	43.7
From risk	62.9	71.7	56.3
Percent of GDP Lost	0.9	0.7	1.0
Lost due to Risk	0.5	0.5	0.6

Source: Author's calculations based on data sources described in text.

S.1: Survey Questions Used to Estimate Risk

A. To estimate statistical risk:

Community leaders were asked to whether there were “Incidents of LRA Rebel Attacks” within the community. Answers were given separately for “Currently (2004),” “1999” and “1992”). Communities which reported an incident of LRA rebel attack currently (2004) were coded as having been attacked in 2004. This binary variable is used as the dependent variable.

B. To estimate perceived risk:

Community leaders were asked “Has any section of your community ever found it hard to cultivate their land in the last five years because of insecurity?” If the answer was yes, the community leaders were asked: “If yes, in which years did this happen and what proportion of the community was affected? (Percentage of households)”. The dependent variable takes a value of 1 if the leaders responded that yes to the first question and then listed 2004 as one of the years during which this occurred.

S.2: Descriptive Statistics for Variables in Equation 2

Variable	Mean	Median	SD	Min	Max	Source
LRA attack in 2004 (1=yes)	0.30	0.00	0.46	0.00	1.00	NUS
Hard to cultivate land due to insecurity in 2004 (1=yes)	0.28	0.00	0.45	0.00	1.00	NUS
Fitted value using LRA attack in 2004	0.30	0.06	0.37	0.00	0.98	-
Fitted value using hard to cultivate land	0.28	0.16	0.29	0.00	0.98	-
Distance to nearest attack 2004 (decimal degrees), NUS	0.34	0.26	0.28	0.00	1.09	NUS
Distance to nearest attack 1999 (decimal degrees), NUS	0.28	0.20	0.25	0.00	1.25	NUS
Distance to nearest attack 1992 (decimal degrees), NUS	0.31	0.24	0.26	0.00	1.37	NUS
Distance to nearest attack 1997 (decimal degrees), ACLED	0.83	0.79	0.51	0.02	2.43	ACLED
Distance to nearest attack 1998 (decimal degrees), ACLED	0.44	0.33	0.34	0.00	1.36	ACLED
Distance to nearest attack 1999 (decimal degrees), ACLED	0.86	0.90	0.49	0.01	2.22	ACLED
Distance to nearest attack 2000 (decimal degrees), ACLED	0.92	0.78	0.58	0.00	2.49	ACLED
Distance to nearest attack 2001 (decimal degrees), ACLED	0.69	0.68	0.47	0.01	2.11	ACLED
Distance to nearest attack 2002 (decimal degrees), ACLED	0.37	0.26	0.34	0.00	1.60	ACLED
Distance to nearest attack 2003 (decimal degrees), ACLED	0.21	0.14	0.20	0.00	0.95	ACLED

Author's calculations using the 2004 Northern Uganda Survey. Weighted using community level weights.

S.3: Descriptive Statistics for Variables in Equation 3

Variable	Mean	Median	SD	Min	Max	Source
Consumption, ln(per capita annual HH exp)	12.10	12.07	0.66	8.66	15.61	NUS
Statistical Risk	0.29	0.06	0.37	0.00	0.98	-
Perceived risk	0.26	0.16	0.29	0.00	0.98	-
Community, LRA attack in 2004 (1=yes)	0.29	0.00	0.45	0.00	1.00	NUS
Community, LRA attack since 1992 (1=yes)	0.45	0.00	0.50	0.00	1.00	NUS
HH attacked since 1992	0.43	0.00	0.49	0.00	1.00	NUS
Any abduction in 2004 (1=yes)	0.00	0.00	0.05	0.00	1.00	NUS
Any abduction since 1992 (1=yes)	0.06	0.00	0.23	0.00	1.00	NUS
Number of disabled in HH	0.31	0.00	0.57	0.00	6.00	NUS
Female head of HH	0.31	0.00	0.46	0.00	1.00	NUS
Total number in HH younger than 14	2.61	3.00	1.95	0.00	12.00	NUS
Total number in HH between 14-60	2.28	2.00	1.33	0.00	9.00	NUS
Total number in HH older than 60	0.20	0.00	0.47	0.00	3.00	NUS
Total number in HH older than 60	0.06	0.00	0.28	0.00	3.00	NUS
Number of non-HH members residing in HH	0.02	0.00	0.16	0.00	4.00	NUS
Some schooling but did not finish primary (1=yes)	0.53	1.00	0.50	0.00	1.00	NUS
Finished primary (1=yes)	0.14	0.00	0.35	0.00	1.00	NUS
Some secondary schooling (1=yes)	0.17	0.00	0.37	0.00	1.00	NUS
Finished secondary (1=yes)	0.01	0.00	0.09	0.00	1.00	NUS
Specialized degree or diploma (1=yes)	0.05	0.00	0.22	0.00	1.00	NUS
Finished tertiary (1=yes)	0.00	0.00	0.05	0.00	1.00	NUS
No answer for schooling (1=yes)	0.00	0.00	0.06	0.00	1.00	NUS
Head of HH migrated due to insecurity, 2004 (1=yes)	0.02	0.00	0.15	0.00	1.00	NUS
Head of HH migrate due to insecurity, ever (1=yes)	0.22	0.00	0.41	0.00	1.00	NUS
Currently reside in an IDP camp (1=yes)	0.17	0.00	0.37	0.00	1.00	NUS
Community <10 km of major employment source (1=yes)	0.14	0.00	0.35	0.00	1.00	NUS
Converted livestock units into TLU	1.33	0.20	4.80	0.00	141.15	NUS
Own at least one plough (1=yes)	0.12	0.00	0.32	0.00	1.00	NUS
Own at least one hoe (1=yes)	0.23	0.00	0.42	0.00	1.00	NUS
Own at least one boat (1=yes)	0.00	0.00	0.07	0.00	1.00	NUS
Own at least one vehicle (1=yes)	0.00	0.00	0.03	0.00	1.00	NUS
Own at least one motorbike (1=yes)	0.01	0.00	0.08	0.00	1.00	NUS
Own at least one bicycle (1=yes)	0.39	0.00	0.49	0.00	1.00	NUS
Own at least one generator (1=yes)	0.00	0.00	0.03	0.00	1.00	NUS
Sum of acres of land in 3 largest plots	3.70	2.00	5.37	0.00	88.00	NUS

Author's calculations using the 2004 Northern Uganda Survey. Weighted using household weights

S.4: Robustness of Results to Structural Forms

	<u>Consumption</u> (1)	<u>Consumption</u> (2)	<u>Consumption</u> (3)	<u>Consumption</u> (4)	<u>Consumption</u> (5)
Perceived risk (logit)	-0.68*** [0.26]				
Perceived risk ² (logit)	0.84*** [0.28]				
Perceived risk (probit)		-0.66*** [0.25]			
Perceived risk ² (probit)		0.84*** [0.27]			
Perceived risk (linear)			-0.31** [0.13]		
Perceived risk ² (linear)			0.45*** [0.16]		
Perceived risk (linear with trim)				-0.56** [0.22]	
Perceived risk ² (linear with trim)				0.72*** [0.24]	
Perceived risk (logit, quadratic stage 1)					-0.47* [0.26]
Perceived risk ² (logit, quadratic stage 1)					0.59** [0.28]
Community attacked in 2004	-0.02 [0.04]	-0.02 [0.04]	-0.01 [0.05]	-0.02 [0.05]	-0.02 [0.04]
Community attacked, since 1992	0.04 [0.03]	0.04 [0.03]	0.04 [0.03]	0.05 [0.03]	0.05 [0.03]
HH attacked since 1992	-0.10*** [0.03]	-0.10*** [0.03]	-0.10*** [0.03]	-0.10*** [0.03]	-0.10*** [0.03]
Productive assets	X	X	X	X	X
Cost of perceived risk (at mean)	-5.9%	-5.6%	-1.7%	-5.7%	-3.2%
R ²	0.37	0.37	0.37	0.37	0.37
N	3,508	3,508	3,508	3,508	3,508

The regressions included controls for household composition, migration, highest education, IDP camp residence. The regressions also control for the presence of a major source of employment within 5 km. Standard errors in brackets are bootstrapped with 2,000 replications. Household weights used. Models include district fixed effects, and clusters errors by district. *, **, *** statistically significant at the 10 per cent, 5 per cent, 1 per cent levels respectively. *Source:* Author's calculations based on data sources described in text.