H i C N Households in Conflict Network

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Living Within Conflicts:

Risk of Violence and Livelihood Portfolios[1]

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HiCN Working Paper 121

September 2012

Abstract: This paper provides a comprehensive view of household responses to insecurity by examining chances along the extensive and intensive margins of livelihoods during a conflict. In particular, it examines how insecurity affects both the choice of activities and the composition of associated livestock and crop portfolios. Uniquely, I rely on a sample of over 690,000 rural households, accounting for 75 percent of all rural households in Northern Uganda. Overall, the analysis suggests that shifts in the composition and levels of assets are one of the primarily paths by which conflict-risk lowers welfare.

Key words: Welfare and Poverty, Economic Development, Conflict, Risk

[1] The author thanks Pius Bigirimana, the Office of the Permanent Secretary to the Prime Minister of Uganda, and the Ugandan Bureau of Statistics for generously making the Northern Uganda Survey and the Ugandan Census available. Chris Barrett, George Jakubson, David Just, Jordan Matsudaira, Kevin Morrison have provided excellent advice. Any remaining errors are solely attributable to the author. The research was partially funded by a travel grant from the Mario Einaudi Center.

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I. Introduction

The micro-conflict literature finds adverse conflict and post-conflict outcomes along a variety of outcomes (consumption: Ibáñez and Moya, 2010; Rockmore 2011; education: Akresh and de Walque 2011; Shemyakina 2011; and nutrition/health: Akresh *et al.* 2011, forthcoming; Minoiu and Shemyakina forthcoming). The origins of these outcomes, however, remain largely unknown. Insofar as only a fraction of household directly experience violence during conflicts, this suggests that violence may not be the only, or even primary, source of these costs. This possibility is underlined by Rockmore's (2011) finding that conflict-risk causes at least half of the aggregate household consumption losses in a study of rural Northern Uganda.

Ibáñez and Moya's (2010) study of populations displaced by violence in Columbia suggests that costly risk coping strategies may be an important factor. Moreover, recent research examining the effect of conflict on labor markets finds responses consistent with responses to insecurity (Dell 2011; Fernández *et al.* 2011; Menon and Rodgers 2011). Similarly, numerous authors have linked the increases of low-risk low-return crops during conflicts to insecurity (Finnström 2003; Bundervoet 2007; McKay and Loveridge 2005; Vlassenroot 2008).

While the studies highlight *ex ante* risk mitigation in response to insecurity, due to data quality and availability, they focus on specific responses, such as the labor market. Since households in developing countries typically engage in a range of activities, responses can occur along both the intensive and extensive margins of the entire portfolio. Consequently, a comprehensive examination of adjustment to the overall livelihood portfolio is needed to understand household responses to insecurity (i.e., the risk of violence) and to design appropriate policy responses.

By studying the behavior of rural household in Northern Uganda with respect to their livelihood portfolios, this paper extends the current literature in three important ways. First, whereas data constraints have resulted in fragmented view of household responses to insecurity, the data used allow the study of both the overall choice of activities (sources of incomes and labor market participation), and the composition of portfolios (i.e., the choice of crops and livestock) within the dominant activity, agriculture. Additionally, the impact of conflict risk on returns to assets is estimated and used to separate the effects of household responses to insecurity from those of broader general equilibrium effects.

Second, while the literature finds results consistent with responses to insecurity, empirical measures of insecurity have not been available. Consequently, the observed behavior could result from a variety of reasons and estimates necessarily combine the effects of both the risk and realization of violence (i.e, insecurity and exposure to violence, respectively). Following Rockmore (2011), the spatial-temporal placement of violence is used to estimate spatially disaggregated measures of conflict-risk and to separate the effects of insecurity from that of the experience of violence.

Lastly, since most of the variation in the "placement" of violence is across geographical regions, the risk of violence is necessarily correlated with a variety of other factors that influence the relevant outcomes. While this can be overcome with geographic fixed effects, the remaining variation in the risk of violence makes it difficult to accurately identify the impacts of (the risk of) violence in conventional samples. Unlike existing studies on the micro-consequences of conflict which rely on either qualitative evidence or small samples, many of the results in this paper are derived from a unique data set of over 690,000 rural households, accounting for 75 percent of all rural households in Northern Uganda.

Looking at overall livelihood portfolios, in the particular context of Northern Uganda, I find that conflict has only a limited effect on the principal sources of income of households. Rather, much of the effects of conflict occur with these livelihoods. Although there are labor market responses for men, many of the strongest changes occur within the livestock and crop portfolios. In particular, both the composition and size of livestock portfolios are substantially impacted. For instance, the livestock portfolios shift from large to small livestock, matching expectations as smaller livestock are less risky since they are less exposed than larger grazing livestock. On average, the value of livestock herds drop by two thirds. Moreover, the higher expected returns to larger livestock suggest that household forego income as a result of this shift in the livestock portfolio. While there are similarly strong responses in cropping patters, the pattern does not seem to match the shift the shift towards lower risk crops suggested by the literature.

In particular, these results contribute to our understanding of the important adverse health consequences associated with growing up during conflicts. While these emerge in a variety of studies, their origins have not been examined (Akresh *et al.* 2011, forthcoming; Minoiu and Shemyakina forthcoming). While a variety of pathways exist, these results suggest that these are

not only caused by a decrease in calories but also by shifts in nutrients. For instance, the shift in the cropping patterns suggest strong decreases in the variety of crops grown, and therefor also in the dietary diversity during conflicts.

Returning to Rockmore's (2011) estimation of the cost of insecurity, I find that the impact of the risk of violence on consumption levels disappears once I control for the allocation of asset portfolios. Along with the other evidence, this suggests that the primary pathway from conflict-risk to lower consumption is in portfolio choice as opposed to either returns to capital or general equilibrium effects. More broadly, there is little evidence of conflict-risk affected assets returns outside of human capital.

The remainder of the paper is organized as follows. Section II describes how livelihoods may respond to violence, which underlies the conceptual framework in Section III. The background and data are described in Sections IV and V, respectively. Section VI presents the methodology and the results and Section VII concludes.

II. Household Responses to Conflict

The economics literature on non-labor (rural) household responses to the risk of violence can be divided into two strands.[3] The first strand attempts to isolate the effects of conflict, typically on investment decisions. These studies do not differentiate between the effects of the risk of violence from its realization nor do they address potential heterogeneity in the selection into violence (e.g Deininger 2003; Singh 2011). Grun's (2008) study of household investment and asset composition is notable for recognizing the potential non-random assignment of violence at the municipal level. While she attempts to control for the geographical placement of violence, she makes the strong assumption that exposure at the individual level is exogenous to individual asset holdings and composition.

A second strand of the literature documents and describes the effects of conflict (combining both the risk and realization of conflict risk) on crop, livestock and asset portfolios. This evidence suggests several consequences. Not only are there changes to overall production levels, but there is strong evidence to suggest shifts in the composition. In particular, a number of studies find

[3] I do not address the literature on migration as I focus on responses conditional on the risk of violence. Having migrated, households fit into two categories. Either they still experience the risk of violence and then may respond as discussed here. Alternately, they no longer experience any such risk and therefore are not the focus of this paper.

evidence consistent with households increasing the share of low-risk, low-return activities (Finnström 2003; Bundervoet 2007; McKay and Loveridge 2005; Vlassenroot 2008).

In particular, rural households may value crops whose harvest can be delayed during periods of insecurity (e.g., root crops), which require little attention (e.g., calabashes) or which are difficult to loot (e.g., rice) (Finnström 2003). In contrast, more lucrative crops, such as fruits or vegetables, need to be harvested with a short period of time (and are easily looted) and may force households to choose between venturing to exposed fields to harvest and remaining in the relative safety of their village.

Similar responses have been found in other conflict-affected countries in Sub-Saharan Africa. In the Democratic Republic of Congo (DRC), between 1996 and 2004, general food production decreased by 12% but vegetable and cereal production dropped by 42% and 33%, respectively (Vlassenroot and Raeymaekers 2008). Additionally, there are shifts from intensive cultivation and perennial crops to low-risk and seasonal crops such as green peas and bananas (Vlassenroot 2008). Vlassenroot notes that "agricultural production had become driven more by the push to minimize [conflict-related] risk than to maximize profit" (p. 210). Similarly, studies in Burundi (Bundervoet 2007) and Rwanda (McKay and Loveridge 2005) find crop production shifting away from "risky" crops and cash crops, such as maize, coffee and beer bananas, towards "safer" crops such as cassava and potatoes. Despite these responses, in areas where food markets still exist, household may not completely retreat to subsistence farming (OCHA 2005).[4]

The size and composition of livestock holdings may also respond to conflict risk. Large livestock, such as cattle, need to graze and may further expose household members. In contrast, smaller livestock, such as goats or swine, can be kept within villages or individual compounds and are also more easily hidden. Within the DRC, Vlassenroot and Raeymaekers (2008) find that livestock activity shifted from cattle-raising to small livestock activity with cattle decreasing by more than half with other studies reporting similar shift towards small livestock (Raeymakers 2008). The risk associated with important peacetime assets, such as cattle, is illustrated by the experience of Northern Uganda. Between 1985 and 1997, the cattle of population of the two of the most affected districts decreased by 98.2 percent (from 285,000 to 5,000), primarily due to

[4] OCHA's study of the Beni and Lubero areas in the DRC finds that while close to 54 percent of food production is auto-consumed and another 11 percent is used as seeds, a large portion, 27 percent, is sold.

raiding by rebels or neighboring cattle raiding communities (Gersony 1997). More broadly, during the genocide, cattle prices in Rwanda decreased by 50 percent (Verpooten 2009). This reflects both distress sales of cattle and the difficulty in protecting (large) livestock during conflicts.

Within Northern Uganda, Stites *et al.* (2006) report a shift towards pigs in Acholi districts for a variety of reasons: (1) pigs can be kept inside villages thereby avoiding the need to send boys to herd them outside of villages; (2) rarely targeted during raids since the nearby cattle raiders did not raid pigs while the insurgent group were banned from eating it; (3) changes in the availability of fodder; (4) reducing the concentration of wealth in a single asset (cattle).

Beyond changing the composition of crops and livestock, conflict can also reduce the returns associated with particular activities or portfolio allocations. For instance, returns to labor may decline as more remunerative permanent employment opportunities may give way to casual labor. Within agriculture, yields may decrease for a variety of reasons such as premature harvesting to reduce the risk of pillage, decreased fertilizer use resulting lower soil quality, and the inability to fallow fields (Vlassenroot 2008). In Northern Uganda, Stites *et al.* (2006) note that as (perceived) insecurity increased, villages might be temporarily abandoned as some/all villagers spent the night in the bush or, if possible, in nearby hills. Other villages were only inhabited during planting and harvesting times although this was risky as attacks increased during this period due to the availability of supplies to loot and individuals to abduct. These responses also suggest decreased production efficiency due to perceived risk.

III. Framework for Identifying Behavioral Responses to Conflict Risk

The observed behavior suggests a framework for identifying responses which aims to disaggregate responses as changes at the extensive and intensive margins (e.g., levels and composition of assets versus the returns to these assets) or by broader general equilibrium effects. Conceptually, the changes in consumption levels induced by can be thought of as resulting from (1) $\Delta Assets$: changes in the levels or composition of assets due to risk, which includes changes in savings rates; (2) $\Delta Activity$: changes in the choice or intensity of activities due to risk; (3) $\Delta Returns\ to\ Assets\ or\ Activities$: changes in the returns due to risk; and (4) $\Delta Other\ Effects\ of\ Risk$: this includes other non-measured pathways from risk to consumption

including general equilibrium effects such as changes in overall demand and supply of goods.[5]

The remainder of the paper uses this framework to examine the impact of risk on household behavior and, ultimately, on household consumption. Insofar as possible, each aspect is examined separately before estimating a model similar to (1) to understand the effects of the risk of violence in rural Northern Uganda.

IV. Conflict in Northern Uganda

While Uganda has experienced a variety of internal conflicts since independence, the conflict in Northern Uganda lasted from 1986 until 2008 with only briefs respites. The Lord's Resistance Army (LRA) was formed by Joseph Kony from the remnants of Alice Lakwena's Holy Spirit Movement which had sought to replace the national government in Kampala along with elements of other insurgent groups. While the LRA initially sought support from the Acholi, one of the main ethnic groups in Northern Uganda, the local population did not support them. As a result, the LRA raided local communities for supplies and forced recruits. These raids were widespread during the conflict as representative data suggests that 19, 25 and 25 percent of Northern Uganda communities were attacked in 1992, 1999, and 2004 respectively (Ssewanyana *et al.* 2007).

The prolonged conflict resulted in a variety of responses by Northern Ugandans. While the conflict led to voluntary migration, the number of internally displaced persons (IDP) increased substantially beginning in 1996 when the government forced the populations of the most affected regions into IDP camps (Fiala 2009). At their peak, approximately 1.8 million persons lived in IDP camps and many districts were virtually emptied (IDMC 2010).

The evidence suggests that while the risk of violence is heterogeneous at the community level, it is largely homogenous within communities. As a result, an identifying assumption in the paper is that this risk need only be estimated at the geographic level although I also control for factors which might lead to within-village heterogeneity. Consequently, insofar as the (perceived) risk of violence is not largely homogenous within communities, the measure of risk estimates village-level average effects of risk.

The indiscriminate nature of the violence emerges in interviews with rebel commanders who note that their strategy was to attack and capture as many people and then to sort them out later

[5] The general equilibrium effects (GE) in the other pathways exclude those GE effects captured in the changing returns.

(Blattman and Annan 2010). This reflects the ideology of the LRA to "purify" Northern Uganda of corruption and witchcraft through violence (Allen and Schomerus 2006; Branch 2010; Titeca 2010; and Finnström 2003). An analysis of representative[6] data from two of the most affected districts finds quantitative support for this view. Using recall data on household and community characteristics, Blattman and Annan find no significant differences in the means of abducted and non-abducted youths with the exceptions of the age of the individual and the size of the household. The former reflect the preference of the LRA for children old enough to be militarily useful but also sufficiently young to be controlled. The importance of the size of the household is due to households with 25 or members, a rare occurrence in Northern Uganda. For instance, in the 2002 Census, only 0.1% of rural households in Northern Uganda reported having 25 of more members. This suggests, that conditional of being with a village during an attack, abductions (and presumably exposure to violence) by the LRA were largely exogenous of individual and household characteristics.

In contrast, the "geographic placement" of attacks by the LRA was not random. Although the LRA operated throughout Northern Uganda, 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 as 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 (Ssewanyana *et al.* 2007). This is partially due to the forced displacement within the Acholi districts by the government which deprived the LRA of potential targets for supplies and abductees, thereby forcing them to follow the migration.

V. Data

Several datasets are used in the analysis presented here. The Northern Uganda Survey (NUS)

[6] Blattman and Annan (2010) use World Food Programme (WFP) food distribution lists from 2002 and a retrospective household roster to create household rosters for 1996, a time which predated 85 percent of local abductions. The roster was used to create a representative sample of young men from eight sub-counties within Kitgum and Pader districts.

2004 are geo-referenced community and household data representative for Northern Uganda. These contain detailed information on a variety of topics including individual and community exposure to violence and household consumption. After omitting communities and associated households with recorded coordinates outside of Uganda and household without food consumption or abnormally high holdings of land[7], the final NUS sample contains 230 communities and 2,300 associated households.

While the NUS contains information on livestock holdings, there is no information on cropping decisions. The 2002 Census for Uganda contains an agricultural module on livestock holdings at the time of question and on crops grown during the January-June, 2002, period (the last growing season prior to the Census). In addition to being the most recent census, it was also collected during the conflict and provides a variety of information on the 24.2 million individuals in Uganda. Consequently, rather than relying on representative data (such as the NUS), it is possible to directly observe crop and livestock portfolios for the full population.

The Census contains data on 920,958 households in rural areas of Northern Uganda. The final sample used in the analysis contains only 690,836 households (75.0% of the overall rural population). This difference arises for three reasons. First, the empirical strategy relies on linking the census data with a geo-referenced map. The only parish level map of Northern Uganda is from 2006 but a variety of new parishes were established between 2002 and 2006. One of these new parishes could not be matched, resulting in the loss of its 41,002 households (5.2 percent). Second, while the agricultural module was administered to each household, 139,299 households (15.1 percent) could not be matched with the agricultural module. The pattern associated with the matching does not suggest that this is systematically related to exposure to conflict or to cropping or livestock patterns. Rather, this primarily occurs due to incorrect coding of identifiers such as parishes with districts. Although households that cannot be matched have a slightly higher incidence of exposure to conflict at the parish level (45.6 versus 41.0 percent), their mean conflict risk is slightly lower (38.0 versus 38.8 percent). Third, a further 49,891 households are omitted due to missing information from the community survey (5.4 percent).

These data are supplemented by the Armed Conflict Location and Event Data (ACLED) for

[7] Households who report more than 200 acres of land are omitted. The overall sample for all of rural Northern Uganda has mean holdings of 3.7 acres with a standard deviation of 5.4 acres.

Uganda (Raleigh and Hegre 2005). 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. This paper only uses the events that are violent, include the LRA, and occurred in 2004 or earlier. Additionally, since the precision of the geographical coordinates varies, I only include those that are precise to the village or sub-region location and exclude those which are only recorded at the regional level. The ACLED data are used to supplement the data on the geo-spatial variation of LRA attacks from 1997 until 2003.

The geo-spatial environmental data has been generously shared by Lang *et al.* (2010). Further information can be found in that paper. These include parish level measures of the percent of the parish land in different land types and agro-ecological zones. Tables 1 and 2 presents descriptive statistics for the data used.

VI. Methodology and Results

A. Estimating Risk

Since risk is not directly measured, measures of risk need to be estimated. Two different measures of risk are estimated: statistical (objective) and perceived (subjective) risk. Objective risk refers to the estimated probability of a community being attacked based on the observed geo-spatial variation of attacks across time. Subjective risk refers to the population's perceived risk of being attack. While related to objective risk, subjective risk may differ for a variety of reasons such as emotions, the information available, local conditions that cannot be observed in the data, or as the placement of violence evolves from its historical patterns (Lowenstein *et al.* 2001). For instance, the LRA might target particular areas or communities as revenge for perceived cooperation with the government or due to the defection of abductees from these regions. Slovic *et al*. (2002) suggest that subjective risk assessments are formed through interactions between analytical and experiential systems. Consequently, subjective risk is combination of objective risk and of individual feelings, memories and associations.

Since individuals make decisions based on their subjective risk assessments, these are conceptually superior to statistical measures of risk, Subjective risk measures, however, are rarely available. While it is possible to construct these with NUS data, this is not possible with the Census data. Rockmore (2011) demonstrates that while subjective risk measures are better,

objective risk measures can lead to qualitatively similar results.

While it would be preferred to estimate risk at the individual or household level, there is not sufficient data to do so. Consequently, similar to the Rockmore (2011), risk is estimated at a more aggregate level. As noted previously, the ideology of the LRA to "purify" Northern Uganda resulted in an in-group (LRA members) and out-group (everyone) mentality which resulted in largely homogeneous risk within villages. For the NUS data, risk is estimated at the community level. Due to the limited availability of geographical coordinates in the Census data, risk in these data is only estimated at the parish level. Parishes are the next level of aggregation above communities and group several communities together.

Equation (1) creates measures of risk using the spatial and temporal variation of LRA attacks:

(1) $Indicator_i = f(\alpha + \beta Z_i + \varepsilon_i)$

Where f(·) is the logistic cumulative density function. For objective risk, the dependent variable, $Indicator_i$, is a binary measure of exposure to risk. For the NUS data, this variable is based on a question in the community questionnaire on whether community i was attacked by the LRA in 2004. This questionnaire was administered to a group of community leaders representing different segments of the community, including women. Insofar as LRA attacks were important events, it is unlikely that the leaders would be unaware of prior attacks. Additionally, since the questionnaire was administered by a statistical agency unconnected with relief work, there is little incentive to falsely report attacks.

For the Census data, the dependent variable is also drawn from the community questionnaire and refers to a question on where there were any incidents of rebel activity the community. As previously noted, due to the impossibility to identify the coordinates of the individual communities, these answers are aggregated to the parish level. Consequently, the dependent variable measures whether or not there were any incidents of rebel activity within any of the enumeration areas within parish i. The community questionnaire was administered to a group of local leaders including the local chairperson, the Secretary for Youth and the Secretary for Women Affairs. As with the NUS data, there is little reason to believe that the data are systematically incorrect.

While the "incidents of rebel activity" is potentially less precise than attacks by the LRA (as

recorded in the NUS), this is the only information within the Census questionnaire. However, since the entire country is surveyed, the Census data on attacks provides a more precise view of the movement and placement of LRA than do the NUS data. The predicted value from equation (2) therefore represent the probability that the community (parish) is attacked (has rebel activity).

As noted earlier, subjective risk measures can be constructed from the NUS data. As with the statistical risk measure, the binary dependent variable is drawn from the community questionnaire. It refers to a question as to whether or not any section of the community found it hard to cultivate land due to insecurity in 2004. Therefore, the predicted value is the likelihood that any section of the community found it hard to cultivate land during the year. Since this refers to a subjective belief, it is possible that the community leaders may have been unaware of the activities of others within communities. However, since most respondents are directly involved with agriculture, it is likely that difficulties related to farming are shared and communicated within communities. Moreover, while there are certainly differences in beliefs within communities, I arguably control for many of the most important factors which might determine the heterogeneity – previous exposure to violence, demographic structure of the household, female head of household – so that any remaining heterogeneity is likely small and random. Importantly, this is not a direct measure of the perception of subjective risk. Rather, finding it hard to cultivate the land is a result of this perception and thus represents an indirect measure of subjective conflict risk.

The spatial and temporal variation in LRA attacks in the NUS and ACLED data are used to create the independent variables, Z_i, for the NUS estimation. Specifically, I use the distance of community i from LRA attacks (excluding attack on community i) in each of the previous years for which there are data. Consequently, to estimate risk for 2004, the independent variables include the distance to the nearest LRA attack in 2003, the distance to the nearest attack in 2002, and so forth. The vector β represents the partial correlation between the dependent variable and the distances from historical attacks. α represents the level of risk for community i if its distance to attacks in previous years is uniformly 0. ε_i is an error term that is assumed to have mean 0. The resultant estimation is presented in table 3. Since only the predicted value of risk is used, the best indicator of the fit is the percent of observations correctly predicted. For both the measure of objective and subjective risk, over 80% of the data is correctly predicted.

Some of the analysis relies on the change of (objective) risk levels between 1999 and 2004. Since available information on the prior placement of violence differs for the two periods, I re-estimate the risk levels for 2004 using the same number of lags on the distance to violence in previous years. The results are presented in table 4. Again, the relative fit of the risk measures is close to 80%.

For the Census data, instead of using lagged values, I use distance from current rebel activity in the past 12 months. In contrast to the NUS and ACLED data, the Census allows for a full map of rebel activity for the region. However, since the Census occurs over a period of time, when the current activity is used, the timing of attacks is unclear. Specifically, the specific question in the Census asks whether there was any rebel activity within the past 12 months. Since the Census occurred over a period of time, rebel activity in certain areas may have occurred after data was collected in other regions. Consequently, the spatially disaggregated risk parameters creating from the Census data cannot be interpreted in the same casual manner as those from the NUS data.

α denotes the level of conflict risk within a parish if the distance to attacks in each year is 0, that is the amount of risk in a community which is attacked in each year. β is the correlation between this distance and rebel activity within the community. ε_i is an error term that is assumed to have mean 0. The results are presented in table 5. Despite the low number of explanatory variables, there is a relatively strong fit as 69% of the data is predicted correctly.

The change in the placement of violence and in the estimated level of risk in 1999 and 2004 can be seen in table 6. Even at the regional level, there is substantial variation in the incidence of violence. Overall, there are increases in the incidence in 4 of 5 regions. This reflects the response of the LRA to Ugandan government's Operation "Iron Fist", which attacked the LRA's bases in South Sudan. The LRA responded by increasing both the intensity of attacks as well as the regional scope of their attacks. In the data, this is reflected by the increase of violence in the Acholi districts and the shift of attacks east and south (and away from the West Nile region in the North West). The estimated risk levels evolve in similar fashion with the exception of the Teso region which shows declining risk between the two points in time due to the initial high estimated risk in 1999.

Since the Census data is comprehensive for Northern Uganda, it is possible to examine the

distribution of the statistical risk of attacks. In particular, a decomposition of the estimated statistical risk shows that roughly 75 percent of the variation is across the 198 sub-counties as opposed to within them. This strongly supports the assertion that LRA attacks are not random at the geographical level.

B. Estimating Livelihood Responses

As noted earlier, the observed changes to consumption in response to changing levels of risk can either come from behavioral responses from households or from broader general equilibrium effects. I first examine behavioral responses, starting with changes to the extensive margins, specifically the correlation between change in risk levels and the reported principle sources of income across time.

Extensive Margin: Sources of Income and Labor Force Status

One potentially important response to conflict risk is a shift in household income sources. That is a change in livelihoods. This shift may be voluntary as households seek to minimize exposure or forced as assets or infrastructure which underpin certain income sources become unavailable or less effective. The effect of conflict risk on the principle reported sources of income is identified by comparing changes in the main sources of income between household in the communities which experience the greatest changes in estimated objective risk levels between 1999 and 2004. By comparing changes in income sources across time with locations, it is possible to eliminate the effects of any time invariant location-specific effects. Moreover, since the households are in communities which have essentially identical levels of estimated risk in 1999[8], their livelihoods should have responded in a similar fashion the conflict risk at the baseline. By comparing changes in levels of an outcome (the percent of households reporting a particular principle source of income[9]) across periods in similar communities, this approach resembles a difference-in-difference methodology.

Specifically, comparisons are made between the households with the greatest increase and decrease in risk. These households are grouped according to the distribution in the change of estimated risk between 1999 and 2004. Table 7 presents the results for the 1st and 5th quintile

[8] As shown in table 7, the risk levels of the groups differ at the 25% level and the levels of risk are within 0.014 points of each other.

[9] The data does not record the amount of income from each source. Rather, it notes the principle self-reported source of income so it is not possible to examine change in the relative contributions of differences sources.

where the households in 1st quintile have the greatest decrease in risk between 1999 and 2004.[10] Since the choice of groups is arbitrary, the results for the 1st and 4th quartile are presented in Appendix 1. These results are qualitatively similar.

This analysis relies only on the non-IDP NUS sample due to the substantial difference in income sources in IDP camps and the great increase of IDP camps during this period. Moreover, the strong expenditure effects in the second chapter persist (and even increase) in the non-IDP population. The number of internally displaced individuals greatly increased during this period, particularly in late 2002 after Operation "Iron Fist" with reported increases of 100,000 internally displaced individuals in 7 months in 2002 (NRC 2004). Within IDP camps, since there was limited access to land and income generating opportunities, the population became increasingly dependent on food aid (Allen and Schomerus 2006). The percent of households that report that "other transfer (food aid, other aid)" was the main sources of income increased from 4.3 to 19.8% for households who were in IDP camps in 2004 as compared to a constant 0.3% in non-IDP households. Consequently, when the IDP camp population is included, there appears to be a strong change in income sources due to risk.

As can be seen at the top of table 7, despite almost identical levels of estimated risk in 1999, the groups (1st and 5th quintiles) have significantly different levels of risk by 2004. In 1999, there are some differences in terms of principle sources of income. Wage employment is higher in the 5th quintile, primarily driven by higher permanent employment levels. There is also evidence of lower self-employment within these same groups.

Comparing changes in the shares of employment between 1999 and 2004, only permanent employment is consistently (weakly) significant. With the quartiles (in appendix 1), there is also some evidence that the share of temporary employment increases faster in the groups whose risk increases the most. While these results are not causal, they suggest that the principle sources of income are only weakly linked with significant changes in estimated risk levels. Moreover, unlike Fernández *et al.* (2011), there is a little evidence of a shift from the agricultural to the non-agricultural sectors. The inability to measure the relative contributions of sections may mask this shift, however. Additionally, differences in the violence associated with the different conflicts

[10] As the groups grow smaller, there are tradeoffs as the absolute difference in risk levels between the first and last group grows but sample sizes decrease. Due to these reasons, significant results in the quintiles are perhaps more indicative than in the quartiles.

might explain the lack of shift in Northern Uganda. Since abductions were highly prevalent, working in the non-agricultural sector would not lessen the likelihood. In fact, it may have the opposite effect as areas with large groups of people of people may be more attractive targets.

These changes in employment are examined in table 8 which shows the employment status of non-disabled adults (aged 14-64).[11] The results for both the full and non-IDP camp population are displayed in table 8 while those for quartiles are included in appendix 2. Increases in risk are correlated with increased work as employees and a slightly larger decrease in unpaid family labor. The inclusion of the IDP population does not qualitatively change the results apart from the statistical significance of unemployed individuals. Similarly, limiting the sample to individuals aged 21-64 (not shown) lowers the portion of individuals in school and slightly increases the magnitude of the differences.

The discussions in the literature on the effects of conflict suggest the possibility of strong gender differences. This is examined in table 9, which restricts the sample to those aged 18-64 to limit the potential effects of schooling. The labor force participation of women does not appear strongly respond to the risk of violence. The magnitude of significant differences is quite small. When the quartile groups are used, there is a significant decrease in family workers. In the non-IDP quartile sample, there is a significant increase in the women who work in the high risk sample which almost matches the significant decrease in female students. In contrast, the effects of risk are pronounced for men. These results largely match the pattern in table 8 (the combined sample) with larger observed effects.

Interestingly, the share of employers in table 8 and 9 is extremely low and apparently does not noticeably shift with increases in risk. Since the share of employees increased, particularly for men, this implies that either the size of businesses increases with conflict or that other businesses, such as NGOs, are more prevalent in high-risk areas and that these absorb/hire away labor. In general, the shift away from unpaid family labor to becoming employees might be expected to result in higher income and therefore higher consumption levels. This contrasts with the observed lower consumption per capita in the second chapter as conflict risk rises. One possibility is that the increased number of non-family labor decreased wages. Additionally, the

[11] Since risk is estimated at the community level and since the number of households per community varies, the groups (quartiles and quintiles) are slightly imbalanced.

departure of unpaid family labor should decrease the productivity of assets, particularly land since is an integral part of the Northern Ugandan economy.

Extensive Margin: Livestock and Crop Holdings

In both 1999 and 2004, agriculture was the primary source of income for at least 75% of the sample. Consequently, it is the main sectors in which responses to conflict-risk might occur. While households face certain geographical and agro-meteorological constraints, these changes are likely to occur within their livestock and crop portfolios. As noted earlier, the limited available literature is consistent with shifts in the portfolio composition. The detailed agricultural module in the Census contains information on both livestock holdings and crop choices.

First, the number of each major livestock type is estimated using a series of tobit models

$$(2)\ Livestock_{ijk} = \alpha + \beta_1 \widehat{Risk}_j + \beta_2 \widehat{Risk}_j^2 + \theta Violence_j + \delta X_{ij} + \gamma_k + \varepsilon_{ijk}$$

where the livestock holding of household i, in parish j and sub-county k are presumed to be correlated with: (1) α: an intercept; (2) Risk: as estimated earlier using equation (2) and which enters with both linear and quadratic terms; (3) Violence: any LRA activity within the parish; (4) X: a vector of controls for household characteristics (demographic profile[12], proportion of literate adults, and the gender, age, literacy, marital status and education of the head of the household), whether or not the household also produces crops, household assets[13], community characteristics[14], and parish level agro-ecological measures[15]; and (5) γ_k: sub-county fixed effects. The sub-county is the geographical level immediately above the parish and adds 198 additional fixed effects that control for a variety of unobserved sub-county invariant factors.

Importantly, IDP camps tended to be concentrated in the Acholi districts. While IDP camp status is not observed within the Census data, the sub-county fixed effects reduce the potential impact of this potentially important omitted variable. Additionally, the fixed effects also address any regional differences in livestock holding patterns and preferences (such as between Karamoja

[12] Household demographics are disaggregated by gender and by the total number of individuals aged 0-5, 6-16, 17-50 and 51 and older in each household.

[13] The binary asset variables measure ownership of land, house, motor vehicle, motorcycle, bicycle, and mobile phone.

[14] Binary variables include those for a human disease epidemic, the presence of micro-finance institutions and for the presence of all-weather road, and for the presence of seasonal roads in the enumeration areas.

[15] The agro-ecological controls include measures for the percent of the parish area with shrub or tree leaf, herbaceous, coniferous plantation, woodland, bushland, grassland, or wetland cover. These also include the percent of land in humid, sub-humid, semi-humid or transition agro-ecological zones.

and the rest of Northern Uganda). Atypically large holdings of livestock are also omitted[16]. The error term, ε_{ijk}, is assumed to be mean zero and normally distributed.

The model does not permit the estimated effect of risk, β, to be interpreted as having a causal effect on livestock holdings. As noted earlier, this is because the risk estimates from the Census data are estimated using data from current attacks and therefore the timing surveys relative to attacks is uncertain. Despite this, the literature review on the effects of conflict risk along with the literature on the placement of attacks in Northern Uganda suggests that these results may be stronger than mere correlation. In particular, since the LRA tended to attack whichever village they encountered, shifts in household livestock holdings should not have impacted risk levels (especially at the parish level).

The results for the primary livestock in Northern Uganda are presented in table 10. As can be seen, livestock holdings are relatively prevalent with roughly one in two households owning goats and poultry. Ownership of sheep or cattle is less prevalent (10 and 20 percent ownership, respectively) while pigs are the least widely owned type of livestock. In each of the tobit estimations, there is a strong quadratic relationship between risk and the amount of livestock owned suggesting that the intensity of responses to risk decreases as risk increases.

Interestingly, livestock that need to be grazed showed the largest implied[17] declines due to conflict risk. Moreover, poultry, which can be exclusively raised within a compound or village showed the lowest relative decline. These results strongly match the non-quantitative literature on how household livestock portfolios respond to conflict risk. The large implied increases in pig holdings are also consistent with the particular context in Northern Uganda as both the LRA and the Karamajong, a neighboring ethnic group which frequently raided livestock, are not interested in pigs. The overall effect, however, may be limited due to the relatively low amount of

[16] A conservative measure of outliers is used; an outlier is any observation that is more than 6 standard deviations away from the mean of individuals who have positive holdings. If the sample were normally distributed, there should not be a single household that is 6 standard deviations from the mean (even in a sample with over 500,000 observations), much less than the mean of positive holdings.

[17] The average effect of risk is created by multiplying the coefficients for the risk terms, β_j, with the averages for linear and squared risk within the sample. The implied effect is the average effect of risk divided by the average non-zero holdings. That is, the implied effect of livestock j = $\frac{\beta_j * mean\ Risk}{mean\ holdings\ for\ households\ with\ level\ of\ livestock\ j>0}$ This is a more conservative estimate than when the mean holdings of livestock j are used. Since certain livestock, such as pigs, are kept by a relatively small amount of households, the mean holdings are substantially smaller than the mean positive holdings. The implied effect is the average effect divided by the average positive holdings.

households reporting any pig holdings.

Overall, the results suggest that the conflict risk is correlated with a strong decrease in the wealth held in livestock. While the census does not contain information on the prices of livestock nor on household income/consumption, this information is available in the NUS data. Using the median 2004 prices[18], at the mean risk levels, the changes in livestock decreased the average value of livestock by roughly 260,746 shillings ($150), which represents roughly 65% of the average value of livestock holdings and 25.5% of the mean annual consumption. Within the livestock portfolio, there is a shift from large grazing animals, such as cattle, towards smaller livestock which can be maintained with villages or compounds. In particular, the relative importance of pigs in the livestock portfolio increases greatly.

These estimates may somewhat overestimate direct household responses to the risk of violence for two reasons. First, the Census data does not contain information on prior attacks on households or communities. Insofar as previous attacks are correlated with the current placement of violence, the estimated parameter may reflect both factors. This potential concern, however, is mitigated by the fact that most communities and, especially, households never directly experience. Consequently, this concern only affects a fraction of the sample. Second, as previous mentioned, the government forced households in certain areas to relocate to IDP camps. Presumably, the forced relocations were located in areas which were likely to be attacked. In order to avoid panic sales, households in these areas might anticipate the relocation and decrease their livestock herds and shift towards livestock that fit better in an IDP camp context. Again, this potential effect is largely mitigated as these forced relocations were primarily in the Acholi districts and should be reflected in the sub-country fixed effects.

Since these potential effects of these confounding factors are largely mitigated, the magnitude of the results strongly suggests that households decreased livestock holdings. The data are not sufficiently detailed to examine what happens to the proceeds from the livestock sales. Since Rockmore (2011) finds that increased conflict-risk leads to lower consumption levels, these proceeds do not appear to be consumed. While it cannot be verified, households presumably use the proceeds to either self-insure against destruction from attacks or to assist in voluntary

[18] Since the price data are imprecise and contain clear outliers, the price data were purged of prices which were more than six standard deviations above the non-zero prices mean for that particular livestock. The median value of this adjusted price distribution is then used.

migration following such attacks.

While livestock are important, it is not the primarily source of income for most households as many own little or no livestock. Consequently, the choice of crops provides another way to mitigate conflict risk within agriculture. For households with livestock, the size or the composition of livestock portfolios might also influence cropping decisions due to the need for draught power, manure or means to sell crop output. In contrast to the information on livestock, the total production of crops is not in the Census data. Therefore, cropping patterns are estimated using a series of probit models.[19] These models largely match model (3) except that the control variable for the household producing crops is switched with a variable for the household owning any livestock.

Table 11 shows the effects of the estimation. As compared to the previous examination of livestock, this estimation will "underestimate" the effects of risk. Since the probit examines the probability that a household grows a particular crop, it does not capture shifts in the intensive margins of production which leave crop choice unchanged. Despite this, there appear to be strong effects of risk on the two most prevalent crops, cassava and beans. The decrease in cassava cropping likely reflects several factors. For instance, cassava cropping typically relies on draught oxen (FAO 2005). Not only have these generally decreased in Northern Uganda due to looting, but the earlier analysis suggests further decreases in the available oxen due to conflict-risk. Additionally, despite its ability to well in marginal and stressed environment, its yields crucially depend on weeding with delays leading to yield reductions of over 90 percent (FAO 2005). Insecurity may reduce the ability of households to weed their cassava plots. Insecurity has also hindered the ability of households to sell their production and to receive crucial farm extension services since it is vulnerable to pests.

Similarly, conflict has likely also made bean production less attractive. Bean production is very labor intensive due to the need to clear the bushes and tall grasses endemic to Northern Uganda as well as labor intensive to harvest and to winnow (Fit Uganda Ltd. 2007). Additionally, the conflict may have limited the availability high yielding grains.

Since the production data in unavailable for crops, the results are difficult to interpret. In general,

[19] The probits are not estimated using a system of equations due to the size of the data. With over 670,000 households, the system would have over 4 million observations and over 200 independent variables. Computationally, this would require considerable time and computing power for limited gains in standard errors.

there appears to be a strong response in cropping patterns due to conflict. These do not appear to match the low-risk, low-return strategy suggested by the literature. Rather, the changes appear to be driven by the particular characteristics of crops, as opposed to their inherent riskiness. For the two crops with the greatest decreases, I hypothesize that this more reflective of the considerable manpower and oxen needed to farm these. More detailed data, including on household composition, however, are needed to verify this. Similarly, groundnuts, the crop with the third largest decline, are an important cash crop whose value to households substantially declines as markets become inaccessible due to insecurity.

In contrast to the primary sources of income and the labor force status, the livestock and crop portfolios appear to strongly respond to conflict risk. The evidence from the analysis of livestock strongly match prior expectations as overall holdings decreased and as the composition of livestock shifted from large grazing animals to smaller animals that can be kept within villages. Additionally, pigs were the only category of livestock whose holdings increased in response to conflict risk thereby underlining the importance of the varying risk associated with specific livestock types. In contrast, while the crop choice also responded greatly to conflict risk, the pattern did not match prior expectations of a shift towards to low-risk low-return crops. Rather, households appear to choose crops based on their characteristics, particularly the requirement labor and oxen for production.

Intensive Margin: Returns and Risk

One factor that could explain these shifts in portfolios would be if returns to assets depended on the levels of conflict risk. These changes may reflect general equilibrium effects, such as changing prices, or other factors such as the intensity of use. Changes in returns would also explain the lower consumption per capita observed in the second chapter as risk levels increased. The earlier review of literature suggests that this could occur during conflicts for a variety of reasons. Yields of crops could decrease due to premature harvesting or decreased fertilizer use, while livestock may be culled prematurely. Additionally, prices for assets may change dramatically as evidence by Verpooten's (2009) finding that the price of livestock declined by 50 percent during the genocide in Rwanda. More broadly, shifting employment patterns might also impact the returns to assets such as labor or human capital.

A modified quadratic function is used to investigate the relationship between assets, conflict risk

and consumption per capita in the NUS sample.

(3) $\widetilde{Consumption}_{lm} = \alpha + \sum_{i=1}^{N} \beta_i \tilde{a}_i + \sum_{i=1}^{N} \sum_{j=1}^{N} \beta_{ij} \tilde{a}_{il} \tilde{a}_{jl} + \widetilde{\widetilde{Risk}}_m (\gamma_m + \sum_{i=1}^{N} \pi_i \tilde{a}_i +$
$i=1Nj=1N\theta ijaiaj + \tau imXlm + \varepsilon lm$

where the data is centered at the data mean so that this specification represents an exact second-order approximation at the sample mean. So $\tilde{a_i} = a_i - (\sum_{i=1}^{N} a_i)/N$. Consumption is the log of per capita household consumption for household l in district m. α is the intercept term. a is a vector of productive assets. Assets are measured along several dimensions: livestock (number of oxen and cattle, of sheep and goats, of chicken, and of pigs), land (acres of land owned), and human capital (proportion of literate household member aged 10 or older).

The coefficient on the 2nd term, β_i, represents the correlation between assets and consumption at the sample mean and can be interpreted as the mean returns to asset i at the sample mean. The 3rd term contains the square and cross term which allow both for non-linear returns to asset i but also for its returns to depend both on its level and that of asset j.

The interaction terms between the estimated conflict risk (linear and squared terms) and the assets allow the returns to assets to change in response to the level of estimated risk. Moreover, by estimating the effect of risk through assets, π and θ, as well as by itself, γ, it is possible to separate some of the channels in which risk affects consumption. In particular, by controlling for many of the assets, γ, may be interpreted as reflecting many of the broader general equilibrium effects (although some of these may also be reflected in the prices of assets which results in changes in wealth levels). Specifically, γ, represents the marginal effect of estimated risk (from mean risk levels) while π captures the joint effect of marginal changes in estimated risk and in asset levels as these change from their sample means.

The vector of control variables, X, reflects other factors that might influence consumption levels. Two different specifications are used. The first uses the same list of control variables as the second chapter.[20] The second specification supplements this list with several additional variables that might influence the returns to particular assets. The base specification contains controls for prior abductions, the demographic composition of the household, the gender of the head of

[20] The list is not exactly the same as the Rockmore (2011) as he aggregates livestock into tropical livestock units (TLU) and uses this measure as a control variable. Livestock are included individually in the vector of assets and therefore do not enter as TLU.

household, whether the household had migrated due to insecurity (in 2004 or since 1992), the education of the head of the household, residence in an IDP camp, the presence of a major source of employment within 10 kilometers of the center of the community, the number of disabled within the household, and binary variables for the ownership of, respectively, a boat, motor vehicle, motorcycle, bicycle, and generator. Additionally district fixed effects are included and errors are clustered at the community level.

The second specification adds variables for the number of household members in school, and binary variables for the presence within the community of markets selling agricultural inputs, agricultural produce, or non-agricultural produce. This specification also includes the number of irrigated fields owned by the household and binary variables for the presence within 5 kilometers of the center of the community of a World Food Programme office or other NGO food distribution center, of NGOs assisting displaced people and former abductees or combatants or internally displaced people/camp. These factors may affect the returns of many of the assets examined.

Several broad patterns emerge from the estimation of equation (4).[21] Table 12 presents the marginal returns for assets at the sample mean when there is no risk ($\frac{\partial C}{\partial a_i}|$risk=0). Most assets have positive returns at the sample mean, implying that increases in household holdings above the mean levels would increase consumption. The returns to education are particularly high. These findings are consistent both with underinvestment by households due to credit constraints (per capita consumption in the sample is $0.30 per day) and with households avoiding assets that can be looted (with the exception of human capital).

The effects of risk are explored in table 13. Interestingly, effect of risk (at the mean level) completely disappears. It is only significantly different from 0 in two of the specifications and its magnitude is so small that it has no practical significance. In combination with the earlier results on portfolios, this suggests that almost all of the results reported in the second chapter are behavioral responses to risk; the general equilibrium effects are practically non-existent. That is, the losses associated with conflict risk – which represent the majority of all household level conflict losses – are driven by household portfolios allocations. The economic insignificant magnitude of the risk coefficient demonstrates that other unmeasured pathways, including

[21] The full results are presented in Appendix 3.

general equilibrium effects, do not account for any of the significant losses associated with conflict.

As noted earlier, the shift in portfolios may be a response to risk induced change in returns to assets. As shown in the lower half of table 13, this is not case as the returns to assets at the sample mean ($\frac{\partial C}{\partial a_i \partial \text{Risk}}$) are generally not significant. The only exceptions are sheep/goats and literacy which are weakly significant in some of the specifications. Notably, these exceptions do not occur when the conceptually superior (subjective) measure is used. Consequently, responses in asset levels do not appear to be due to changes in rates of return induced by conflict risk.

The earlier analysis of cropping portfolios was not able to examine production levels. The returns to land, however, should incorporate changes to production levels and yields as described by the literature. The insignificance of the coefficient for the interaction between conflict risk and land, however, appears at odds with the conflict-risk leading to lowered yields. One possible explanation is that conflict prevents households from using all their land. In that case, land ownership might not fully capture the above mentioned effects.

Overall, the analysis suggests that shifts to asset levels are one of the primarily paths by which conflict-risk decreases consumption. This is reinforced by both the general insignificance of the estimated π coefficients and the small magnitude of the effect of risk at the sample mean (despite significant γ coefficients).

VII. Discussion

Although conflict risk clearly affects household decisions, our empirical understanding has been limited; current analyses have focused on specific responses and therefore do not allow for a comprehensive view of responses and potential tradeoffs. Moreover, the inability to separate the effects of the insecurity from that of violence has made it impossible to quantify the different pathways from conflict to lower post-conflict outcomes. Using unique data, including potentially the largest dataset on conflict (~690,000), this paper has investigated different potential pathways in which households might adjust their livelihoods choices, livestock and crop portfolios, and/or experiences, and the returns to assets.

Although conflict-risk has a very strong effect on the livelihoods of rural households in Northern Uganda, these responses to insecurity primarily were not on the extensive margins, but rather on

the intensive margins. While the analysis focus on the particular context of Northern Uganda, similar results are likely to emerge in many other developing country conflicts. Reflecting the limited options for income diversification in rural Northern Uganda, households do not change livelihoods even in response to vary large changes in conflict-risk. That is, farmers remain farmers. Similarly, while there are changes to labor market behavior, these changes appear to be more limited reflecting the general lack of alternate employment opportunities.

Within the dominant source of rural livelihoods, agriculture, there are substantial shifts in the composition of portfolios. These shifts only partially support the widely held belief that household shift away from profitable but risky (in terms of exposure to violence) activities towards less risk, low return activities. Within livestock portfolios, there is strong shift away from large, grazing livestock, despite the positive marginal returns, to smaller livestock which can be kept within compounds. Moreover, the overall value of livestock herds, which are typically targeted during conflicts, declined by roughly two thirds. In contrast to the clear shift towards low-risk low-return activities in livestock portfolios, this is not as evident in crop portfolios. Insecurity clearly affected the choice of which crops to cultivate, however, these appeared to labor and draught intensive crops.

This suggests a potentially important interaction between the risk reduction in the composition of livestock herds and the choice of crops even in areas where livestock are not the primary source of income. More detailed data would permit this to be verified. More broadly, the results suggest insecurity may affect dietary diversity and overall nutrition by changing the composition of crops. Since local food markets may cease functioning during conflicts, this may have potentially important effects especially on the long run human capital of adolescents.

The large decreases in the size and value of livestock herds should result in large proceeds for households. Since the value of livestock portfolio declines by roughly one of fourth of annual mean consumption, this is an important unanswered question that cannot be examined with the data used here. While multiple possibilities exist, it is possible that household conserve the income to insure themselves against potential attacks and to have capital in case of forced migration due to insecurity or the government. At the same time, the saving levels may be higher than desired as the insecurity likely reduces the opportunities for households to productively invest; many peace-time opportunities may not be available while others only payoff over

prolonged periods of time making them very risky during periods of conflict. Consequently, insecurity may lead households to decrease investment in a productive activity, livestock, without providing opportunities to reinvest the funds.

Returning to Rockmore's (2011) analysis of the relative contribution of insecurity and exposure of conflict to household losses, I find that the economic effect of insecurity disappears once portfolio choice is included in the estimation. Combined with the lack of effect of risk measures on productive assets (with the exception of human capital), this suggests that the majority of the changes in livelihoods occur at the intensive as opposed to extensive margins and that any general equilibrium effects are muted.

Table 1: Description of data from NUS and ACLED

	Mean	Min	Max
Estimated objective risk	0.29	0.00	0.97
Estimated objective risk, squared	0.21	0.00	0.94
Estimated objective risk*female head of household	0.09	0.00	0.97
Estimated objective risk 1999	0.25	0.00	0.71
Estimated objective risk 2004 using same model as the 1999	0.28	0.00	0.95
Estimated subjective risk	0.26	0.00	0.97
Estimated subjective risk, squared	0.14	0.00	0.94
Expenditure, ln(per capita annualized household expenditure)	0.08	0.00	0.97
Log of per capita consumption (shillings)	12.10	8.66	15.61
Total number of oxen or cattle	1.40	0.00	200.00
Total number of sheep or goat	2.56	0.00	100.00
Total number of poultry	3.47	0.00	75.00
Total number of pigs	0.22	0.00	15.00
Binary variable for ownership of a hoe (0=no, 1=yes)	0.93	0.00	1.00
Binary variable for ownership of a plough (0=no, 1=yes)	0.12	0.00	1.00
Female head of household	0.31	0.00	1.00
Number of household members in school	1.59	0.00	12.00
Number of disabled individuals in household	0.28	0.00	5.00
Proportion of household members literate aged 10 or older	0.51	0.00	1.00
Presence of market which sells agricultural inputs with LC1 (0=no, 1=yes)	0.05	0.00	1.00
Presence of market which sells agricultural produce with LC1 (0=no, 1=yes)	0.15	0.00	1.00
Presence of market which sells non-agriculture production with LC1 (0=no, 1=yes)	0.24	0.00	1.00
No schooling (0=no, 1=yes), head of household	0.10	0.00	1.00
Some schooling but did not finish primary (0=no, 1=yes), head of household	0.53	0.00	1.00
Finished primary (0=no, 1=yes), head of household	0.14	0.00	1.00
Some secondary schooling (0=no, 1=yes), head of household	0.17	0.00	1.00
Finished secondary (0=no, 1=yes), head of household	0.01	0.00	1.00
Specialized degree or diploma (0=no, 1=yes), head of household	0.05	0.00	1.00
Finished tertiary (0=no, 1=yes), head of household	0.00	0.00	1.00
No answer for schooling (0=no, 1=yes) , head of household	0.00	0.00	1.00
Presence of WFP or other food distribution within 5km of	0.11	0.00	1.00

LC1 center			
Presence of NGO assisting former combatants within 5km of LC1 center	0.07	0.00	1.00
Total land in the largest plots (acres)	3.70	0.00	88.00
Total amount of irrigated land (acres)	0.03	0.00	16.00
Number of individual aged 14-60 from household who are away	0.08	0.00	5.00
Presence of urban center or other major source of employment within 10 km (0=no, 1=yes)	0.14	0.00	1.00
Community, LRA attack in 2004 (0=no, 1=yes)	0.29	0.00	1.00
Community, cattle rustling in 2004 (0=no, 1=yes)	0.17	0.00	1.00
Community, LRA attack since 1992 (0=no, 1=yes)	0.45	0.00	1.00
Household attacked since 1992	0.43	0.00	1.00
Self-Employed, Agriculture (2004)	0.67	0.00	1.00
Self-Employed, Non-Agriculture (2004)	0.13	0.00	1.00
Wage Employment (2004)	0.12	0.00	1.00
of which Temporary (2004)	0.08	0.00	1.00
of which Permanent (2004)	0.04	0.00	1.00
Remittances (2004)	0.07	0.00	1.00
Other Sources (2004)	0.00	0.00	1.00
Self-Employed, Agriculture (1999)	0.73	0.00	1.00
Self-Employed, Non-Agriculture (1999)	0.09	0.00	1.00
Wage Employment (1999)	0.07	0.00	1.00
of which Temporary (1999)	0.03	0.00	1.00
of which Permanent (1999)	0.04	0.00	1.00
Remittances (1999)	0.02	0.00	1.00
Other Sources (1999)	0.00	0.00	1.00
Work	0.98	0.00	1.00
of which Employer	0.00	0.00	1.00
of which Self-Employed	0.87	0.00	1.00
of which Employee	0.11	0.00	1.00
of which Family Worker (unpaid)	0.01	0.00	1.00
Unemployed	0.00	0.00	1.00
Student	0.00	0.00	1.00
Domestic Duties/Homemaker	0.01	0.00	1.00
Other	0.00	0.00	1.00
Any abduction since 1992 (0=no, 1=yes)	0.00	0.00	1.00
Any abduction in 2004 (0=no, 1=yes)	0.06	0.00	1.00
Female head of household	2.61	0.00	12.00

Total number in household younger than 14	2.28	0.00	9.00
Total number in household between 14-60	0.20	0.00	3.00
Total number in household older than 60	0.06	0.00	3.00
Total number in household older than 60	0.02	0.00	4.00
Head of household migrated due to insecurity, 2004 (0=no, 1=yes)\	0.02	0.00	1.00
Head of household migrate due to insecurity, ever (0=no, 1=yes)	0.22	0.00	1.00
Distance to nearest attack 1997, ACLED	0.83	0.02	2.43
Distance to nearest attack 1998, ACLED	0.45	0.00	1.36
Distance to nearest attack 1999, ACLED	0.86	0.01	2.22
Distance to nearest attack 2000, ACLED	0.92	0.00	2.49
Distance to nearest attack 2001, ACLED	0.69	0.01	2.11
Distance to nearest attack 2002, ACLED	0.37	0.00	1.60
Distance to nearest attack 2003, ACLED	0.21	0.00	0.95
Distance to nearest attack 2004, NUS	0.34	0.00	1.09
Distance to nearest attack 1999, NUS	0.28	0.00	1.25
Distance to nearest attack 1992. NUS	0.31	0.00	1.37

Table 2: Description of data from the 2002 Ugandan Census

	Mean	Min	Max
Was there any rebel activity in the parish in the past 12 months?	0.40	0.00	1.00
Estimated Risk (Logit)	0.39	0.00	0.75
Estimated Risk*Estimated Risk (Logit)	0.19	0.00	0.57
Any livestock in the household (0=no, 1=yes)	0.65	0.00	1.00
Any crops in the household (0=no, 1=yes)	0.82	0.00	1.00
Goats, owned (total)	2.37	0.00	133.00
Sheep, owned (total)	0.94	0.00	196.00
Pigs, owned (total)	0.11	0.00	29.00
Cattle, owned (total)	1.64	0.00	190.00
Chicken, owned (total)	3.27	0.00	104.00
Cassava, grown in last season (Jan-Jun 2002)	0.33	0.00	1.00
Sweetpeas, grown in last season (Jan-Jun 2002)	0.18	0.00	1.00
Groundnuts, grown in last season (Jan-Jun 2002)	0.08	0.00	1.00
Sorghum, grown in last season (Jan-Jun 2002)	0.17	0.00	1.00
Maize, grown in last season (Jan-Jun 2002)	0.22	0.00	1.00
Beans, grown in last season (Jan-Jun 2002)	0.31	0.00	1.00
Millet, grown in last season (Jan-Jun 2002)	0.15	0.00	1.00
Sesame, grown in last season (Jan-Jun 2002)	0.17	0.00	1.00
Male household members, aged 0-5	0.61	0.00	10.00
Male household members, aged 6-16	0.88	0.00	15.00
Male household members, aged 17-50	1.00	0.00	48.00
Male household members, aged 51 or older	0.19	0.00	10.00
Female household members, aged 0-5	0.61	0.00	10.00
Female household members, aged 6-16	0.84	0.00	18.00
Female household members, aged 17-50	1.12	0.00	19.00
Female household members, aged 51 or older	0.18	0.00	11.00
Proportion of household members aged 10 or older who are literate	0.36	0.00	1.00
Head of the household male, (0=no, 1=yes)	0.78	0.00	1.00
Head of the household married, (0=no, 1=yes)	0.84	0.00	1.00
Head of the household, no education	0.33	0.00	1.00

Head of the household, some education	0.38	0.00	1.00
Head of the Household, completed P7	0.16	0.00	1.00
Head of the Household, completed J3	0.09	0.00	1.00
Head of the Household, completed S6	0.01	0.00	1.00
Head of the Household, completed a certificate	0.02	0.00	1.00
Head of the Household, completed diploma training	0.01	0.00	1.00
Head of the Household, completed a degree	0.00	0.00	1.00
Is the head of the household literate? (0=no, 1=yes)	0.60	0.00	1.00
Age of the head of the household	41.16	10.00	95.00
Own a house, (0=no, 1=yes)	0.95	0.00	1.00
Own land, , (0=no, 1=yes)	0.04	0.00	1.00
Own at least one motorvehicle, (0=no, 1=yes)	0.00	0.00	1.00
Own at least one motorcycle, (0=no, 1=yes)	0.01	0.00	1.00
Own at least one bicycle, (0=no, 1=yes)	0.40	0.00	1.00
One at least one mobile phone, (0=no, 1=yes)	0.01	0.00	1.00
Did the LC1 experience any cattle rustling in the past 12 months? (0=no, 1=yes)	0.15	0.00	1.00
Did the LC1 experience any incidence of rebel activity in the past 12 months? (0=no, 1=yes)	0.27	0.00	1.00
Did the LC1 experience any drought in the past 12 months? (0=no, 1=yes)	0.76	0.00	1.00
Is there a market place for crops in the LC1? (0=no, 1=yes)	0.21	0.00	1.00
Is there a market place for animals/poultry in the LC1? (0=no, 1=yes)	0.05	0.00	1.00
Did the LC1 experience any major disease affecting crops in the past 12 months? (0=no, 1=yes)	0.90	0.00	1.00
Did the LC1 experience any major disease affecting livestock in the past 12 months? (0=no, 1=yes)	0.95	0.00	1.00
Did the LC1 experience any human epidemic in the past 12 months? (0=no, 1=yes)	0.86	0.00	1.00
Do you have any formal micro-credit institutions in the LC1> (0=no, 1=yes)	0.10	0.00	1.00
Is there an all weather road in or bordering the LC1? (0=no, 1=yes)	0.42	0.00	1.00
Is there an a seasonal road in or bordering the LC1? (0=no, 1=yes)	0.56	0.00	1.00
Distance of the parish to an urban center	21.30	0.40	68.90
Fraction of the parish which is populated	0.99	0.24	1.00
Fraction of the parish covered by water	0.01	0.00	0.76
Fraction of the parish covered by trees/shrub	0.00	0.00	0.27
Fraction of the parish covered by herbaceous	0.36	0.00	1.00
Fraction of the parish in the humid agro-ecological zone	0.01	0.00	1.00

Fraction of the parish in the sub-humid agro-ecological zone	0.13	0.00	1.00
Fraction of the parish in the semi-humid agro-ecological zone	0.84	0.00	1.00
Fraction of the parish in the transition agro-ecological zone	0.01	0.00	1.00
Fraction of the parish covered by coniferous plantation	0.00	0.00	0.30
Fraction of the parish covered by woodland	0.15	0.00	1.00
Fraction of the parish covered by bushland	0.05	0.00	1.00
Fraction of the parish covered by grassland	0.13	0.00	1.00
Fraction of the parish with wetland cover	0.00	0.00	0.36

Table 3: Logit Estimating Objective and Subjective Risk of Community Attacks

	Obj	**Subj**
Distance to nearest attack 1992. NUS	0.41	-0.8
	[3.14]	[2.04]
Distance to nearest attack 1999, NUS	0.49	2.56
	[5.42]	[2.92]
Distance to nearest attack 2004, NUS	-6.16**	-1.54
	[2.92]	[2.61]
Distance to nearest attack 1997, ACLED	1.98	8.00***
	[2.02]	[1.81]
Distance to nearest attack 1998, ACLED	-0.56	-1.92
	[2.11]	[1.80]
Distance to nearest attack 1999, ACLED	-0.16	-8.14***
	[1.99]	[2.19]
Distance to nearest attack 2000, ACLED	-1.97	0.73
	[1.56]	[1.65]
Distance to nearest attack 2001, ACLED	-0.5	1.19
	[2.51]	[2.06]
Distance to nearest attack 2002, ACLED	-2.54	-5.04***
	[2.60]	[1.81]
Distance to nearest attack 2003, ACLED	-15.52***	-1.56
	[4.18]	[1.84]
Constant	3.22***	0.43
	[1.16]	[0.50]
Observations	353	353
Pseudo R^2	0.59	0.35
Percent of LRA attacks in 2004 correctly classified	89.2%	80.2%

Robust standard errors in brackets, community weights used

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

Table 4: Logit Estimating Objective and Subjective Risk of Community Attacks for 2004, 1999

	Obj 1999	Obj 2004
Distance to nearest attack t-1, ACLED	-3.27***	-20.40***
	[0.64]	[4.04]
Distance to nearest attack t-2, ACLED	-1.29***	-6.52***
	[0.39]	[2.11]
Constant	0.96**	2.95***
	[0.39]	[0.62]
Observations	353	353
Pseudo R^2	0.22	0.53
Percent of LRA attacks in 2004 correctly classified	78.7%	87.8%

Robust standard errors in brackets, community weights used

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

Table 5: Logit Estimating Objective Risk for the Census data

	Attack
Distance to nearest activity	-0.18***
	[0.02]
Constant	1.12***
	[0.13]
Observations	1174
Pseudo R^2	0.14
Percent of LRA attacks in 2004 correctly classified	69.0%

Robust standard errors in brackets, community weights used

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

Table 6: Placement of LRA Attacks and Estimated Risk in 1999 and 2004

	% Communities Attacked			Estimated Obj. Risk		
Region	1999	2004	Change	1999	2004	Change
Acholi	84.4%	98.6%	14.2%	60.1%	80.4%	20.3%
Karamoja	5.3%	10.5%	5.3%	6.0%	11.0%	5.0%
Lango	37.8%	48.8%	11.0%	46.0%	51.5%	5.5%
Teso	7.7%	14.2%	6.5%	14.5%	11.1%	-3.4%
West Nile	9.9%	2.8%	-7.0%	11.1%	8.9%	-2.2%

Table 7: Changes in Sources of Income Between Households in non-IDP Communities with the Greatest Increase and Decrease in Estimated Risk Between 1999 and 2004

Group Type: **Quintile**

	1st	5th	Difference
Change in risk levels between 1999 and 2004	-0.27	0.33	0.60***
Average risk levels in 1999	0.36	0.35	0.00
Sample size	512	486	

	% reporting each source in 1999		
Sources	1st	5th	Difference
Self-Employed, Agriculture	0.83	0.81	-0.02
Self-Employed, Non-Agriculture	0.10	0.05	-0.05**
Wage Employment	0.05	0.12	0.07***
of which Temporary	0.03	0.03	0.00
of which Permanent	0.02	0.10	0.08***
Remittances	0.01	0.01	0.00
Other Sources	0.00	0.00	0.00

	Difference between 1999 and 2004 in % reporting each source		
Sources	1st	5th	Difference
Self-Employed, Agriculture	-0.06	-0.07	-0.01
Self-Employed, Non-Agriculture	0.01	0.02	0.01
Wage Employment	0.02	0.02	0.00
of which Temporary	0.02	0.04	0.02
of which Permanent	0.01	-0.01	-0.02*
Remittances	0.03	0.02	0.00
Other Sources	0.00	0.00	0.00

*,**,*** Significant at the 1, 5, 10% level, respectively

Table 8: Labor Force Status for Non-Disabled Adults (14-61) by Risk Group

Full Sample

	Quintile		
	1st	5th	Difference
Work	0.66	0.65	-0.02
of which Employer	0.00	0.00	0.00
of which Self-Employed	0.36	0.36	0.00
of which Employee	0.04	0.08	0.04***
of which Family Worker (unpaid)	0.26	0.20	-0.06***
Unemployed	0.00	0.01	0.01*
Student	0.26	0.25	-0.01
Domestic Duties/Homemaker	0.05	0.08	0.03
Other	0.02	0.01	-0.01
Sample Size	1,681	1,617	

Non-IDP Population

	Quintile		
	1st	5th	Difference
Work	0.66	0.67	0.00
of which Employer	0.00	0.00	0.00
of which Self-Employed	0.36	0.36	0.00
of which Employee	0.04	0.08	0.04***
of which Family Worker (unpaid)	0.26	0.22	-0.04*
Unemployed	0.00	0.00	0.00
Student	0.27	0.24	-0.03
Domestic Duties/Homemaker	0.04	0.07	0.03*
Other	0.02	0.02	-0.01
Sample Size	1,345	1,349	

*,**,*** Significant at the 1, 5, 10% level, respectively

Table 9: Labor Force Status for Non-Disabled Adults (18-61) by Risk Group and Gender

Full Sample

	Female			**Male**		
	1st	5th	Difference	1st	5th	Difference
Work	0.85	0.86	0.01	0.90	0.90	-0.01
of which Employer	0.004	0.00	-0.004*	0.002	0.01	0.01
of which Self-Employed	0.35	0.39	0.04	0.71	0.67	-0.04
of which Employee	0.05	0.07	0.02	0.07	0.16	0.09***
of which Family Worker (unpaid)	0.45	0.39	-0.05	0.12	0.05	-0.07**
Unemployed	0.001	0.001	0.0002	0.005	0.01	0.01*
Student	0.04	0.02	-0.02	0.05	0.07	0.02
Domestic Duties/Homemaker	0.09	0.12	0.03	0.01	0.02	0.01
Other	0.02	0.004	-0.01*	0.02	0.004	-0.02
Sample Size	621	630		510	505	

Non-IDP Population

	Female			**Male**		
	1st	5th	Difference	1st	5th	Difference
Work	0.86	0.87	0.004	0.91	0.90	-0.01
of which Employer	0.005	0.002	-0.003	0.00	0.01	0.004
of which Self-Employed	0.36	0.39	0.03	0.72	0.65	-0.07
of which Employee	0.05	0.06	0.01	0.07	0.19	0.12***
of which Family Worker (unpaid)	0.45	0.41	-0.04	0.12	0.06	-0.06**
Unemployed	0.001	0.00	-0.001	0.001	0.01	0.01
Student	0.04	0.01	-0.03**	0.06	0.06	0.01
Domestic Duties/Homemaker	0.08	0.11	0.03	0.01	0.02	0.01
Other	0.02	0.01	0.00	0.03	0.01	-0.02
Sample Size	502	506		411	391	

*,**,*** Significant at the 1, 5, 10% level, respectively

Table 10: The Relationship Between Livestock Holdings and the Risk of Violence

	Goats	Sheep	Pigs	Cattle	Poultry
Coefficient on Estimated Risk-Linear Term	-5.14***	-12.27***	3.55***	-10.66***	-2.54***
	(0.42)	(1.13)	(0.53)	(0.90)	(0.36)
Coefficient on Estimated Risk-Quadratic Term	5.79***	13.0***	-3.27***	15.05***	2.53***
	(0.42)	(1.51)	(0.64)	(1.17)	(0.45)
R^2	0.05	0.13	0.10	0.11	0.04
Sample Size	690,615	690,658	690,764	690,514	690,714
Effect of Risk Evaluated at Sample Mean	-0.87	-2.24	0.74	-1.22	-0.49
Percent of Households with Positive Holdings	40.8%	10.9%	4.5%	20.0%	50.2%
Average Holdings for Households with Positive Holdings	5.8	8.6	2.4	8.2	6.5
Mean Effect as Percent of Average Positive Holdings	-14.9%	-26.1%	30.2%	-14.9%	-7.6%

*,**,*** Significant at the 1, 5, 10% level, respectively

Standard Errors in Parentheses

Table 11: The Relationship Between Crop Choice and the Risk of Violence

	Cassava	Sweetpea	Groundnuts	Sorghum	Maize	Beans	Millet	Sesame
Coef. on the Estimated Risk-Linear Term	0.72***	0.41***	0.08	0.23***	-0.14***	1.00***	-0.85***	-1.62***
	(0.06)	(0.07)	(0.08)	(0.07)	(0.06)	(0.06)	(0.07)	(0.07)
Coef. on the Estimated Risk-Quadratic Term	-0.97***	-0.49***	-0.43***	-0.27***	0.05	-1.39***	0.94***	1.62***
	(0.07)	(0.08)	(0.09)	(0.07)	(0.01)	(0.07)	(0.08)	(0.08)
R^2	0.18	0.18	0.14	0.30	0.16	0.28	0.18	0.20
Sample Size	673,870	689,737	689,737	689,737	690,836	689,737	689,737	672,694
Marginal Effect at Mean								
Estimated Risk-Linear Term	0.22***	0.09***	0.01	0.04***	-0.04***	0.25***	-0.16***	-0.33***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Estimated Risk-Quadratic Term	-0.29***	-0.10***	-0.06***	-0.05***	0.01	-0.35***	0.18***	0.33***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Overall Effect on Probability to Grow Crop	-7.4%	-1.6%	-4.6%	-0.7%	-2.4%	-9.7%	1.6%	0.1%
Percent of Sample Growing Crop	32.6%	17.9%	8.5%	17.3%	22.1%	30.1%	15.2%	16.9%

*,**,*** Significant at the 1, 5, 10% level, respectively

Standard Errors in Parentheses

Table 12: Marginal Returns to Assets at Mean Levels

	Objective Risk		Subjective Risk	
	Specification		Specification	
	1	2	1	2
Cattle/Oxen	0.02***	0.02***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Sheep/Goats	0.00	0.00	0.01	0.01
	(0.01)	(0.01)	(0.00)	(0.00)
Poultry	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Pigs	0.03	0.03	0.03	0.03
	(0.03)	(0.02)	(0.03)	(0.03)
Total land owned (acres)	0.02***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
Proportion Literate, aged 10+	0.20***	0.17***	0.21***	0.19***
	(0.04)	(0.04)	(0.04)	(0.04)

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Average and Marginal Effects of Risk at Mean Levels

	Objective Risk		**Subjective Risk**	
	Specification		Specification	
Effect of Risk	1	2	1	2
Average Effect (with no assets)	-0.00**	-0.26	-0.00**	0.00
	(0.00)	(0.35)	(0.00)	(0.00)
Marginal Effect (with no assets)	0.16	0.19	-0.83***	-0.78***
	(0.25)	(0.25)	(0.33)	(0.33)
Marginal Effect of Risk on Asset				
Cattle/Oxen	0.11	0.10	-0.07	-0.05
	(0.11)	(0.11)	(0.09)	(0.10)
Sheep/Goats	0.15*	0.13	-0.01	-0.02
	(0.08)	(0.09)	(0.06)	(0.06)
Poultry	0.00	0.00	-0.01	-0.01
	(0.05)	(0.05)	(0.05)	(0.05)
Pigs	-0.12	-0.07	-0.02	0.09
	(0.29)	(0.30)	(0.31)	(0.31)
Total land owned (acres)	0.00	0.00	0.06	0.05
	(0.05)	(0.05)	(0.07)	(0.07)
Proportion Literate, aged 10+	-0.86*	-0.78*	-0.35	-0.36
	(0.46)	(0.45)	(0.51)	(0.50)

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 1: Changes in Sources of Income Between Households in non-IDP Communities with the Greatest Increase and Decrease in Estimated Risk Between 1999 and 2004

Group Type: **Quartile**

	1st	4th	Difference
Change in risk	-0.24	0.28	0.52***
Average risk in 1999	0.33	0.32	-0.01
Sample size	852	926	

	% reporting each source in 1999		
Sources	1st	4th	Difference
Self-Employed, Agriculture	0.84	0.81	-0.03
Self-Employed, Non-Agriculture	0.09	0.07	-0.03
Wage Employment	0.05	0.11	0.06***
of which Temporary	0.03	0.03	0.00
of which Permanent	0.02	0.08	0.06***
Remittances	0.02	0.01	0.00
Other Sources	0.00	0.00	0.00

	Difference between 1999 and 2004 in % reporting each source		
Sources	1st	4th	Difference
Self-Employed, Agriculture	-0.05	-0.08	-0.03
Self-Employed, Non-Agriculture	0.00	0.02	0.02
Wage Employment	0.02	0.03	0.01
of which Temporary	0.02	0.04	0.03**
of which Permanent	0.01	-0.01	-0.01*
Remittances	0.02	0.02	0.00
Other Sources	0.00	0.00	0.00

*,**,*** Significant at the 1, 5, 10% level, respectively

Appendix 2: Labor Force Status for Non-Disabled Adults (14-61) by Risk Group

Full Sample

	Quartile		
	1st	4th	Difference
Work	0.66	0.63	-0.03
of which Employer	0.00	0.00	0.00
of which Self-Employed	0.36	0.36	0.00
of which Employee	0.04	0.08	0.04***
of which Family Worker (unpaid)	0.26	0.20	-0.06***
Unemployed	0.00	0.01	0.01***
Student	0.26	0.26	0.00
Domestic Duties/Homemaker	0.06	0.08	0.02
Other	0.02	0.01	-0.01
Sample Size	2,070	2,025	

Non-IDP Population

	Quartile		
	1st	4th	Difference
Work	0.66	0.67	0.01
of which Employer	0.00	0.00	0.00
of which Self-Employed	0.36	0.36	0.00
of which Employee	0.04	0.08	0.04***
of which Family Worker (unpaid)	0.26	0.23	-0.03*
Unemployed	0.00	0.00	0.00
Student	0.26	0.24	-0.02
Domestic Duties/Homemaker	0.06	0.07	0.01
Other	0.02	0.02	-0.01
Sample Size	1,686	1,683	

*,**,*** Significant at the 1, 5, 10% level, respectively

Appendix 3: Returns to Assets and the Effect of Risk on These Returns

		Objective Risk		Subjective Risk	
		Specification		Specification	
β_i		1	2	1	2
	Cattle/Oxen	0.02***	0.02***	0.03***	0.03***
		(0.01)	(0.01)	(0.01)	(0.01)
	Sheep/Goats	0.00	0.00	0.01	0.01
		(0.01)	(0.01)	(0.00)	(0.00)
	Poultry	0.01***	0.01***	0.01**	0.01**
		(0.00)	(0.00)	(0.00)	(0.00)
	Pigs	0.03	0.03	0.03	0.03
		(0.03)	(0.02)	(0.03)	(0.03)
	Total land owned (acres)	0.02***	0.02***	0.02***	0.02***
		(0.01)	(0.01)	(0.01)	(0.01)
	Proportion Literate, aged 10+	0.20***	0.17***	0.21***	0.19***
β_{ij}		(0.04)	(0.04)	(0.04)	(0.04)
	Cattle*Cattle	-0.00*	-0.00*	-0.00**	-0.00**
		(0.00)	(0.00)	(0.00)	(0.00)
	Sheep*Sheep	0.00**	0.00**	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Poultry*Poultry	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Pigs*Pigs	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Land*Land	-0.00***	-0.00***	-0.00**	-0.00*
		(0.00)	(0.00)	(0.00)	(0.00)
	Literate*Literate	0.08	0.10	0.04	0.06
		(0.10)	(0.10)	(0.10)	(0.10)
	Cattle*Sheep	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Cattle*Pigs	0.01	0.01	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)
	Cattle*Poultry	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Sheep*Pigs	-0.01	-0.01	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Sheep*Poultry	0.00	0.00	0.00	0.00

		(0.00)	(0.00)	(0.00)	(0.00)
	Pigs*Poultry	0.00	0.00	-0.01**	-0.01**
		(0.00)	(0.00)	(0.00)	(0.00)
	Cattle*Land	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Land*Pigs	0.00	0.00	0.00	0.00
		(0.01)	(0.01)	(0.00)	(0.00)
	Land*Poultry	-0.00**	-0.00**	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Land*Sheep	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Cattle*Literate	0.00	0.00	0.01	0.01
		(0.02)	(0.02)	(0.01)	(0.01)
	Literacy*Pigs	0.02	0.03	0.08**	0.08**
		(0.03)	(0.03)	(0.03)	(0.03)
	Literacy*Poultry	0.01	0.01	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)
	Literate*sheep	0.01	0.01	0.02*	0.02
		(0.01)	(0.01)	(0.01)	(0.01)
	Literate*Land	0.00	0.00	0.00	0.00
π_i		(0.01)	(0.01)	(0.01)	(0.01)
	Cattle*Risk	0.11	0.10	-0.07	-0.05
		(0.11)	(0.11)	(0.09)	(0.09)
	Sheep*Risk	0.15*	0.12	-0.01	-0.02
		(0.08)	(0.08)	(0.06)	(0.06)
	Poultry*Risk	0.00	0.00	-0.01	-0.01
		(0.05)	(0.05)	(0.05)	(0.05)
	Pigs*Risk	-0.12	-0.07	-0.02	0.09
		(0.29)	(0.29)	(0.31)	(0.31)
	Land*Risk	0.00	0.00	0.06	0.05
		(0.05)	(0.05)	(0.07)	(0.07)
	Literate*Risk	-0.86*	-0.78*	-0.35	-0.36
θ_{ij}		(0.46)	(0.45)	(0.51)	(0.50)
	Land*Land*Risk	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.01)	(0.01)
	Literate*Literate*Risk	-1.02	-0.98	0.28	0.19
		(1.18)	(1.19)	(1.33)	(1.33)

Cattle*Cattle*Risk	-0.02**	-0.02**	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)
Sheep*Sheep*Risk	-0.02***	-0.01***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Poultry*Poultry*Risk	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Pigs*Pigs*Risk	0.05	0.03	0.01	-0.01
	(0.05)	(0.05)	(0.04)	(0.04)
Cattle*Sheep*Risk	0.01	0.01	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)
Cattle*Pigs*Risk	0.07	0.06	0.02	0.01
	(0.09)	(0.08)	(0.08)	(0.07)
Cattle*Poultry*Risk	-0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Sheep*Pigs*Risk	0.03	0.03	0.02	0.02
	(0.03)	(0.04)	(0.04)	(0.04)
Sheep*Poultry*Risk	-0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Pigs*Poultry*Risk	0.01	0.01	0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Cattle*Land*Risk	0.02	0.02	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.01)
Land*Pigs*Risk	0.06	0.06	0.04	0.05
	(0.08)	(0.08)	(0.06)	(0.06)
Land*Poultry*Risk	-0.01	-0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Land*Sheep*Risk	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Cattle*Literate*Risk	-0.04	-0.03	-0.07	-0.03
	(0.20)	(0.19)	(0.20)	(0.19)
Literate*Pigs*Risk	0.06	0.16	-0.66	-0.69
	(0.38)	(0.38)	(0.46)	(0.45)
Literate*Poultry*Risk	0.07	0.07	-0.06	-0.04
	(0.10)	(0.10)	(0.09)	(0.09)
Literate*Sheep*Risk	-0.04	-0.01	-0.13	-0.14
	(0.14)	(0.15)	(0.11)	(0.11)
Literate*Land*Risk	0.19*	0.21**	-0.20	-0.25*

	(0.11)	(0.10)	(0.15)	(0.14)
Cattle*Risk*Risk	-0.18	-0.16	0.11	0.08
	(0.13)	(0.13)	(0.13)	(0.13)
Sheep*Risk*Risk	-0.20*	-0.17	0.02	0.05
	(0.10)	(0.10)	(0.08)	(0.08)
Poultry*Risk*Risk	0.02	0.03	0.03	0.03
	(0.06)	(0.06)	(0.05)	(0.05)
Pigs*Risk*Risk	0.14	0.11	0.03	-0.05
	(0.32)	(0.32)	(0.40)	(0.40)
Land*Risk*Risk	0.00	0.00	-0.07	-0.07
	(0.06)	(0.06)	(0.08)	(0.08)
Literate*Risk*Risk	0.56	0.47	0.17	0.21
	(0.55)	(0.54)	(0.63)	(0.60)
Land*Land*Risk*Risk	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.01)	(0.01)
Literate*Literate*Risk*Risk	1.74	1.76	0.22	0.44
	(1.35)	(1.35)	(1.62)	(1.63)
Cattle*Cattle*Risk*Risk	0.03**	0.02**	-0.01	-0.01
	(0.01)	(0.01)	(0.00)	(0.00)
Sheep*Sheep*Risk*Risk	0.03***	0.02***	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)
Poultry*Poultry*Risk*Risk	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Pigs*Pigs*Risk*Risk	-0.06	-0.05	-0.04	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)
Cattle*Sheep*Risk*Risk	-0.01	-0.01	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.01)
Cattle*Pigs**Risk*Risk	-0.08	-0.08	0.00	0.02
	(0.12)	(0.12)	(0.18)	(0.17)
Cattle*Poultry*Risk*Risk	0.01	0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Sheep*Pigs*Risk*Risk	-0.03	-0.03	0.03	0.03
	(0.04)	(0.04)	(0.05)	(0.05)
Sheep*Poultry*Risk*Risk	0.01	0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Pigs*Poultry*Risk*Risk	-0.02	-0.03	-0.05	-0.06
	(0.04)	(0.04)	(0.05)	(0.05)

	Cattle*Land*Risk*Risk	-0.01	-0.01	0.00	0.00
		(0.02)	(0.02)	(0.02)	(0.02)
	Land*Pigs*Risk*Risk	-0.06	-0.06	-0.04	-0.04
		(0.09)	(0.09)	(0.06)	(0.06)
	Land*Poultry*Risk*Risk	0.00	0.00	0.00	0.00
		(0.01)	(0.01)	(0.01)	(0.01)
	Land*Sheep*Risk*Risk	-0.01	-0.01	-0.01	-0.01
		(0.01)	(0.01)	(0.01)	(0.01)
	Cattle*Literate*Risk*Risk	0.02	0.01	0.10	0.05
		(0.25)	(0.24)	(0.25)	(0.23)
	Literate*Pigs*Risk*Risk	0.00	-0.11	1.05*	1.04*
		(0.41)	(0.41)	(0.55)	(0.55)
	Literate*Poultry*Risk*Risk	-0.13	-0.13	0.07	0.05
		(0.12)	(0.11)	(0.11)	(0.11)
	Literate*Sheep*Risk*Risk	0.06	0.02	0.14	0.15
		(0.18)	(0.18)	(0.17)	(0.17)
	Literate*Land*Risk*Risk	-0.26**	-0.30***	0.19	0.23
γ_m		(0.11)	(0.11)	(0.15)	(0.15)
	Risk	0.16	0.19	-0.83**	-0.78**
		(0.25)	(0.25)	(0.33)	(0.32)
	Risk*Risk	-0.40	-0.41	0.99**	0.93**
		(0.28)	(0.28)	(0.39)	(0.38)
	Observations	3467	3437	3467	3437
	R-squared	0.42	0.43	0.42	0.42

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

District-level fixed effects

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