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A Phoenix in Flames?

Portfolio Choice and Violence in Civil War in Rural Burundi

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Abstract

This paper challenges the idea that farmers revert to subsistence farming when confronted with violence from civil war. Macro-economic evidence on economic legacies of civil war suggests that civil wars, while obviously disastrous in the short run, do not need to have persistent effects on long term economic outcomes. New micro-level studies are ambiguous about the impact of civil war for welfare. Several studies find long lasting negative effects, particularly through reduced human capital formation while others for example report increased participation in collective action programs and the emergence of local institutions. We investigate to what extend individual incentives for investments are affected by civil war. Using several rounds of (panel) data at the farm and community level, we find that farmers in Burundi who are confronted with civil war violence in their home communities increase export and cash crop growing activities, invest more in public goods, and reveal higher levels of subjective welfare evaluations. We interpret this in the light of similar recent micro-level evidence that points to post-traumatic growth effects after (civil) war fare. Our results are confirmed across specifications as well as in robustness analyses.

Keywords: Civil war, investment, post-traumatic growth

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Tables appear at the end of the paper.

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1 Introduction

The incidence and consequences of shocks in developing countries are a topic of growing interest in economics and political science literature. Its appeal is obvious as countries in which people already struggle to make ends meet, also seem to be particularly prone to adverse weather conditions, epidemic disasters, or civil wars. Sub-Saharan Africa is a prominent example as the continent has seen more incidents of wars, weather and health crises than anywhere else in the world. These phenomena are considered of key importance to explain Africa's slow economic performance in the past decades, together with, or possibly as a result of, other, frequently noted factors in the literature, including ethnic fragmentation (Easterly and Levine 1997), adverse geographic conditions (Sachs and Warner 1997), (pre)colonial legacies (Bertocchi and Canova 2002; Nunn 2004), and underdeveloped institutions (Acemoglu, Johnson, and Robinson 2001).

Shocks in developing countries, not necessarily confined to the African continent, often result in collateral damage including loss of livestock or land, or a decline in their respective values. In the absence of sound institutions and functioning credit and insurance markets, shocks can easily prevent households from making new investments or obtaining (new) sources of credit, hence many remain trapped in poverty. As a result, development efforts may be seriously disrupted or delayed. Jensen (2000), for example, finds that school enrollment rates in Côte d'Ivoire declined by one third to one half when households faced adverse agricultural conditions; Carter and Maluccio (2003) report that an increase in losses (ranging from family deaths to crop failures) leads to a 10 percent decrease in children's nutritional status for households in the KwaZulu-Natal province in South Africa; and Baez and Santos (2007) find that Hurricane Mitch affected children's nutritional status and more than doubled their labor force participation. Reduced human capital formation clearly has persistent lifetime effects. Hoddinot and Kinsey (2001) show that rainfall shocks in Zimbabwe reduce lifetime income by not less than 14 percent; Dercon (2004) demonstrates that the 1984/85 droughts in Ethiopia still affected households' economic growth in the late nineties; and recent evidence by Maccini and Yang (2009) shows that adult women who had higher than average rainfall during their year of birth have higher socio-economic outcomes than others.

In addition to the direct negative impacts of shocks, economic development may also be seriously hindered by the mere threat or anticipation of future shocks, causing people to shy away from riskier activities and profitable investments like for example cash crop production and cattle rearing. Rural households often revert back to subsistence agriculture after having been hit by shocks and shift portfolios to less risky but also less profitable activities (see e.g. Collier 1999; Deiniger 2003; Rosenzweig and Binswanger 1993; Morduch 1990; and Dercon 1996). To date there is a vast amount of empirical literature estimating the impact of various types of shocks at the village, household, or even individual level (see e.g. Bundervoet, Verwimp and Akresh 2009; Cutler 1986; Corbet 1998; Del Ninno, Dorosh, and Smith 2003; Dercon and Krishnan 2000a; Dercon and Krishnan 2000b; Günther and Harttgen 2009; Jacoby and Skoufias 1997; Heltberg and Lund 2009; Hoddinott and Kinsey 2001; Kinsey, Burger, and Gunning 1998; Kochar 1999; Udry 1995; Yamano, Alderman, and Christiaensen 2005). This type of research has picked up rapidly since the early nineties when reliable household data

became increasingly available for many developing countries. An excellent overview is presented in Günther and Harttgen (2009).

Despite increased scholarship, the impact of shocks on households' long term well-being and economic behavior is still not well understood. Partially this is due to the absence of long (panel) data that permits estimation of long term equilibrium outcomes, rather than short tem responses. When faced with for example food shortages, households will need to respond immediately to stay alive, but this may clearly differ from their long term planning horizons. Another part is due to a "time-lag", i.e., the impacts of certain shocks may only surface after several years have passed since the shock took place, including reduced school attainments, and physical or mental illnesses. This clearly depends on the type of shock that is being investigated. Most of the empirical work so far has concentrated on household responses to weather-related shocks, illnesses, or other influential factors that shape poverty patterns over time (see e.g. Carter 1997; Del Ninno, Dorosh, and Smith 2003; Harrower and Hoddinott 2004; Kochar 1999). Only recently scholars have turned to analysing the impacts of shocks of civil war.

Civil wars have obvious immediate negative economic impacts in terms of the destruction of human and physical capital through killings, destruction of houses or infrastructure, and looting of assets. Additionally, the effects of violence in the *aftermath* of the conflict are estimated to be substantial through reduced human capital formation, increased health problems, population displacement, and impediment of economic sector development. Hoeffler and Reynal-Querrol (2003) estimate that a country's involvement in civil war for five years reduces its annual growth rate by not less than 2 percent. (See Abadie and Gardeazabal 2003; Bodea and Elbadawi 2008; Ghobarah, Huth, and Russett 2003; Kondylis 2008 for other (empirical) evidence on the destructive impacts of civil warfare).

So far, impacts of civil wars seem to be comparable to other types of shocks discussed earlier, although its magnitudes can obviously be quite different. There are, however, several other features of civil wars that make them distinctly different from, for example, high weather variability or severe (lethal) illnesses. We discuss them below and argue that *because* of these features, shocks of civil wars should not be treated as yet another shock, but deserve specific attention when designing policy and (post-war) reconstruction programs.

First of all, unlike hurricanes, floods, or (most) severe illnesses, wars typically last long, especially since recent decades. While civil wars during the nineteenth and early twentieth century were relatively short in duration—about one and a half year—since 1944 the average duration has increased up to more than four years (Hironaka 2008) with some lasting for over 20 years (Fearon 2004). Civil wars may thus last for a considerable part of life, as it did, in, for example, Burundi, Sudan, Liberia, and Angola. Even with reasonable credit and insurance markets in place, households are unlikely to absorb shocks for such a long period of time. In that respect adjustment is likely to be more permanent compared to shocks of floods or droughts.

Second, several scholars have shown that countries that have been in civil war have a 20–50 percent chance to relapse back into conflict, within the first five years after the conflict has ended (see e.g., Collier, Hoeffler and Söderbom 2004). The fear for a repeated shock of violence is thus often justified but when and at what scale is often

unpredictable. These fears also likely influence the paths of development (or types of coping mechanisms) households and governments choose. Bodea and Elbadawi (2008: 2) elaborate:

> In addition to its direct destructive effect, political violence undermines the micro-security of the individual as well as the macro-security of communities, nations and countries. Therefore it can change behavior, preferences and public policy.

And third, civil war is increasingly affecting civilians, with armed groups pursuing horrific acts of violence, including gang rapes, amputations, and excessive torture to install fear and commitment of the population. Survivors are left with vivid images of their own account of the violence, and loved ones being killed or (permanently) maimed, in addition to economic losses. Witnessing acts of violence, even though not experienced by oneself, can have severe implications (Yehuda 2002); there are numerous accounts of ex-combatants and civilians being diagnosed with post-traumatic stress disorder after having witnessed acts of violence or seeing horrifying events in the media (see e.g., Blanchard et al. 1982; Macksoud and Aber 1996; Neugebauer et al. 2009) without the act or pain being inflicted on oneself. Witnessing these events may install fear or even anger. While fear is also likely to result from weather-related shocks, or even illnesses, these shocks arguably invite no or few sentiments of anger, while violence clearly can. People for example may seek revenge for what has been done to themselves or their family members. Additionally, people may start behaving recklessly because of what has been done to them or when they expect that (next time) soon they might be killed or tortured. Lorentzen, McMillan, and Wacziarg (2008) for example find that people with lower life expectancy take more risk and invest less than others. Taking all of the above into consideration, it thus comes as no surprise that civil wars are dubbed “development in reverse”.

Recent evidence, however, suggests the picture is not necessarily all that bleak. There is a small literature emerging documenting positive responses to trauma, referred to as post-traumatic growth theory (e.g., Tedeschi and Calhoun 1996): persons affected by violence become better citizens, become reference persons in their community and succeed in transforming the negative event into something positive, for themselves as well as for others. Empirical supporting evidence in economics is provided by for example Bellows and Miguel (2009); Blattman (2008), and Voors and Bulte (2008). They show that political participation, community engagement, and contributions to local public goods are significantly higher among victims of war than non-victims in Sierra Leone and Uganda, respectively. Powell et al. (1993) report that victims of the war in Sarajevo are more affected but also claimed to have experienced more personal growth than others.

Micro-economic evidence exploring this route is, to date, however, limited to personal accounts of (self-)growth, political participation, and community engagement. If war can indeed induce positive responses along those lines, it may also impact on individual economic behavior, either directly, or through the aforementioned mechanisms of increased collective action. Given the empirical evidence for both positive as well as negative behavioral responses to war, we take the view that its direction is a priori unknown. The direction, the magnitude of the response, and how this differs from weather-related shocks or illnesses is instructive for national and international post-conflict intervention programs. Studying portfolio decisions provides insights into

future development paths. If, for example, farmers indeed revert back to subsistence agriculture and grow crops that require low inputs such as cassava, but that are also prone to diseases and yield low returns, households may not be able to escape poverty and the country may face a high risk of falling back into a cycle of violence. If, on the other hand, violence induces more profitable investments and (or resulting from) increased cooperation and trust, economic and institutional development may be accelerated and Burundi's prospects of sustainable peace are much higher.

We are not the first to establish a causal relation between violence exposure and portfolio choice (in its broadest sense). Earlier studies include Deiniger (2003) who studies net investments and enterprise start-up across violent and non-violent communities in Uganda; Grun (2008) investigating the composition of households' assets across victims and non-victims of violence in Columbia; and Bozzoli and Brück (2009) exploring differences in crop portfolios using cross-sectional post-war data from Mozambique. We contribute to this stream of literature and improve on existing studies in at least four ways by: (i) using unique household and community panel data from rural Burundi from two nationally representative surveys, including fine-grained measures of violence exposure, (ii) corroborate findings from survey questions with results from experimental games that were played with a subset of the households interviewed in 1998 and 2007, (iii) compare decision-making during and after the war, using the panel component of our data, and (iv) provide tentative insights into possible mechanisms that could explain the positive correlation between war victimization and increased risky cash crop farming.

2 Risky Income Activities in Burundi

Several scholars have hypothesized and empirically illustrated that income shocks, or its mere risk, adversely affect investments in productive assets (see e.g., Rosenzweig and Binswanger 1993; Dercon 1998). In this study, investment, or risky activities constitute income from cash crops. (see Austin 2008 for a justification of this classification). We hereby distinguish between export crops, including coffee, tea, and tobacco and cash crops that are produced for the domestic market only, i.e. beer bananas.

Coffee is the primary export cash crop activity and the country's most important export product, accounting for more than 80 percent of Burundi's annual export earnings. Coffee is a typical risky activity in Burundi for several reasons. First, in contrast to popular food crops, like beans that are harvested after one growing season, coffee trees only produce berries after three years for harvesting and selling. Second, until recently, the Burundian government had a strict policy with respect to growing coffee. Once planted, farmers were forbidden to rip out coffee trees, even if, given for example low prices, it would have been much more profitable to grow other crops. In that respect, farmers also face a price risk. And third, armed groups often destroyed coffee trees or looted the harvest (see also Nkurunziza and Ngaruko 2000).[1]

Banana beer is locally brewed and sold and is the most important cash crop in Burundi. For neighboring Rwanda, which has a comparable agricultural economy, Clay, Reardon, and Kangasniemi (1998) found that farmers prefer to grow bananas over beans because

[1] Clearly, food crops like beans, potatoes, and maize can also be stolen but this (almost) never happens.

the former have a higher monetary value per acre of land. The revenue of the beer sales is then used to buy beans on the market. Given the high variability of food crop prices this also poses a risk for the farmers to (partially) depend on the market, instead of producing crops that form the major part of their staple diet themselves. Banana trees are also risky for being prone to theft and destruction. Banana trees are often found very close to the homestead. As they are a farm's most valued trees, the household members want to keep an eye on potential thieves. There are a few things as easy as cutting of a branch of bananas to provide for instant supply. Neither tea nor tobacco are of major importance, but, if grown, then only for the purpose of selling them abroad, therefore they are included.

Other income sources like off-farm wage activities may also comprise some risky element particularly if the type of employment requires specific skills learned in school, but they might just as well be part of a diversification strategy. Off-farm activities are for example to be found among households that face greater variation in farm profits (see e.g., Rosenzweig and Stark 1989; Kochar 1995). These households consciously choose to have a family member involved in steady off-farm employment anticipating future income shocks. Including livestock as risky income is also problematic as livestock can also be held as collateral to obtain credit, or, act as a buffer during hard times (see e.g., Deaton 1991).

We therefore only focus on the aforementioned set of income sources that *unambiguously* reflect high risk activities, in Burundi referring to yields from cash or export crops (Clay, Reardon, and Kangasniemi 1998). For notational clarity we refer to "export crops" as being coffee, tea and tobacco while "cash crops" includes all export crops as well as income from banana beer sales.

3 Civil Warfare: The Burundian Case

Burundi has, since its independence in 1962, been involved in multiple cycles of gruesome violence involving the two main ethnic groups, the Hutus and Tutsis struggle for power. The latest episode ravaging war started in 1993 with the assassination of the Hutu president Melchior Ndadaye and his associates by Tutsi army officers as a result of tensions between the Tutsi-dominated military and the then Hutu-controlled government. The subsequent eruption of Hutu-led violence, slaughtering thousands of civilians was retaliated by massive indiscriminate violence by the government forces. The war in Burundi was largely a war against civilians. Both soldiers of the Burundian armed forces as well as combatants of the Forces Nationales de Libération (FNL) and Forces for the Defence of Democracy rebel movements were often involved in indiscriminate and disproportionate use of violence against civilians resulting in injury or death. Observations by Human Rights Watch (2003: 20) illustrate the disregard of human lives by both armed groups.

> In the early morning of April 23, FNL combatants attacked the national police brigade at Kabezi. Other FNL combatants ambushed soldiers en route to reinforce the brigade, occasioning an exchange of fire in which several civilians were killed. Soldiers then deliberately killed civilians in and near the ambush site.

And,

> Most soldiers fired without regard for the mass of civilians caught on the road between them or fleeing over the hills nearby. At some point during the exchange of fire between government soldiers and the FNL combatants, or shortly thereafter, soldiers reportedly turned their guns on civilians and shot the people in the back that ran (HRW 2003: 22).

In some cases people were killed by knifes or bayonets, but rebels also bombed areas in for example Ruyigi, Gitega, and Cankuzo using shell grenades, sometimes even from helicopter gunships (HRW 2003). In addition to (mass) killings, torture, rape, kidnapping, and destruction, soldiers and rebels also looted goods from civilian houses and their lands. If they had not fled, local villagers were often forced to collaborate with one of the armed groups. Villagers had to cut wood, fetch water, and transport food. There was, however, no evident reciprocal relation; if the village got attacked by the opposing group, civilians were often killed in reprisal. Moreover, non-compliance with orders meant punishment and many were deliberately killed or injured as a result.

In 2005 a peace agreement was brokered between the national authorities and all but one of the rebel movements (FNL) resulting in peace and relative political stability, although occasionally attacks were staged in the nations' capital Bujumbura and its immediate surroundings, Bujumbura Rurale. Although the war ended in 2005, the intensity of violence had already decreased considerably by 2002. Both refugees and internally displaced persons have since then started to return to their home communities. Numbers from displacement camps in the province of Gitega, Kayanza, Kirundo, Muramvya, and Ngozi declined from 284,000 in 2002 to 140,000 by April 2004 (Kamuni, Summit Oketch, and Huggins 2005).

Despite its numerous accounts of horrific acts of violence, and (economic) destruction, optimism is high among Burundians. After years of distress and underdevelopment people want to start a "new life" (Kamuni, Summit Oketch, and Huggins 2005). We return to this point in the analysis below.

4 Data

4.1 The Burundi Household Priority Survey[2]

We make use of two rounds of nationally representative rural household and village level data: the 1998 and 2007 Burundi Priority Surveys, henceforth referred to as BPS. The first round of surveys took place in 1998, five years after the start of the war. This round was conducted by the Burundi Institute of Statistics (ISTEEBU) in cooperation with the World Bank. The initial sample consisted of 3900 rural and 2700 urban households in all provinces, including the capital Bujumbura. The 2007 round was also implemented by ISTEEBU, on behalf of our research program and objectives. The program budget was insufficient to reinterview all households from 2007. Therefore, a random subsample was drawn from the 1998 rural sample. We randomly selected a subsample of 100 out of the 390 villages (administrative "sous-collines" in Burundi)

2 The original surveys are available upon request.

sampled in 1998. In each village or cluster we then interviewed all households that were part of the 1998 sample (10 per cluster).[3] Both household surveys contained detailed questions about demographic and socio-economic indicators, including education, employment, health, production, consumption, assets, and income. The 2007 survey had additional sections on victimization, land (ownership), trust, social capital, and subjective welfare, including recall questions to assess the situation in 1998.

The community questionnaires entailed questions about infrastructure, violence, clashes between the warring factions and rebel recruitment. For the community questionnaire we relied on a group of "key experts", often the village level leader, accompanied by elders. The questionnaires were designed in French, and interviews conducted in the local language Kirundi. We trained 65 interviewers during a one-week training during which we improved the questionnaire. The questionnaire was pilot tested in an out of sample village and final corrections to the survey were made. 50 interviewers were selected in a competitive exam that included a case study on household composition, consumption, and production as well as a range of questions on research ethics. A team leader supervised each team of five interviewers. Two out of five team members were women.

Attrition with respect to the 1998 survey was less than 13 percent, which is reasonable given the long time span of ten years, and the fact that there was a war going between the survey periods, for seven more years. Collines are rather small and isolated, hence people often know about each other's whereabouts. Of the initial 1000 household we eventually were left with 872 usable observations. For the 126 households that could not be found we know for 113 the reason of absence. We refer to Verwimp and Bundervoet (2008) for an analysis and discussion of attrition using these same data. Both surveys entailed the same questions about income sources. Households were asked to indicate the revenue they had obtained from off-farm income. We calculated the value of farm income using detailed questions on production and consumption in the questionnaire.

Table 1A presents the fraction of households that derive income from a particular source, for the average of two years (Column 1) and in a given year (Columns 2–3). A large majority of households derive income from subsistence farming in Burundi. By 2007, only 8.3 percent did not consume any home produce. 60 percent of all households derive income from the sale of food products in 1998. The category "food sales" constitute all major food crops that are typically part of the staple diet in Burundi including e.g., maize, beans, potatoes, and cassava. This increases to nearly 70 percent of all households by 2007. Export crops comprise of revenues derived from coffee, tea, tobacco, and cotton. Note that by 2007 no household in Burundi grows cotton anymore. The data reveal a downward trend; in 1998 more than 50 percent of all households had income from export crops, while in 2007 this figure fell to about one third. Enterprises suffered, less than 3 percent managed to get income from their own business in 2007, while in 1998 almost 17 percent of all households did. Selling banana beer was, and continues to be, an important source of income; about half of all households rely on it for their income. We also observe a decline here by 2007, but not as strong as in the

3 Due to on-going violence in the provinces of Makamba, Bubanza, and Bujumbura rural no "second wave" interviews were undertaken in these areas. In Makamba no interviews were held in 1998 either, while in Bubanza and Bujumbura rural only a very small sample of households was interviewed, then as a result of the war.

case of coffee. Income from rents, livestock products (i.e., milk, honey, eggs, and manure) and off-farm employment (including agricultural wage labor and non-agricultural salaries from public and private sector jobs) are employed by only a small selection, on average not more than 5 percent of the households. The fact that fractions remained low over time suggests that there has not been much diversification of income at least into these activities taken place. Transfers (remittances) remain a source of income for one quarter of the households, although this declines over the years. In sum, (column 4) we see that income from food sales, livestock products, non-farm activities, and wage labor on average has been taken up by more households, while a smaller percentage now derives income from export crops, enterprises, beer sales, and remittances.

In Table 1B, the average income shares are presented. The share of income from cash crops (coffee and banana beer) in overall income has declined from 13 percent in 1998 to 8 percent in 2007.

4.2 Experimental Data 2009

In 2009, the team of academic researchers that were involved in the 2007 survey went back to implement economic games among a subsample of respondents included in the 1998 and 2007 BPS. The aim of the 2009 project was to gauge social, risk, and time preferences among respondents that were affected and not (directly) affected respectively by the war. A series of experiments was conducted using a stratified random (sub)sample of 35 communities. Stratification was based on the experience of community level attacks. The community survey of 2007 contained detailed questions on the incidence, number and intensity (number of people killed and wounded) of violent clashes between the governments' army and rebel groups. 24 communities experienced violence of such kind, 11 did not. The civil war naturally affected the entire country to some extent; if one examines the macro level indicators for Burundi over time, one will surely find (predictable) changes in indicators measuring e.g., economic growth, per capita levels of GDP, and health indicators (see Nkurunziza and Ngaruko 2000), although even there seems to be room for some optimism.[4]

The intensity of violence was geographically widespread and varied significantly across communities leaving some communities practically "untouched" and while others were the stage for (often repeated) scenes of violent acts perpetrated by both rebel groups as well as governmental forces. It is this variation that we focus on in our study. For a detailed description of the design and outcomes of the experiments we refer to Voors et al. (2009).

After the experiments were executed respondents participated in a short exit survey that included additional questions about pre-war conditions and respondents' ethnic origin, something that we until then had been unable to ask during the earlier (large scale) survey waves in 1998 and 2007. This information we use in section 5 below to demonstrate, next to anecdotal evidence, that exposure to (community level) violence

4 The Bertelsmann Stiftung (2006: 16) states "Despite being one of the world's poorest nations and in the midst of civil war, Burundi's level of development improved slightly in the last five years. HDI changed by 0.014 between 1995 (0.311) and 2000 (0.325). In 2002, Burundi's HDI value rose to 0.339".

was random for the individual household. Additionally, we use it to replicate our cross-sectional findings for a smaller sample. The data from 2009 is henceforth referred to as the experimental data (ED).

Table 2 presents summary statistics for questions asked both in the 1998 and 2007 BPS (column 1 and 2), additional questions from the 2007 BPS (column 3 and 4) and for questions that were only asked as part of the exit survey in 2009 (column 5 and 6). For a detailed description of the variables the reader is referred to Appendix 1.

5 Empirical Strategy

5.1 Cross-Section Models

We start our analysis by examining farmers' production decisions exploiting the cross-sectional variation in violence. We believe that community level violence is the appropriate measure to use in this setting for at least two reasons. First, as cited by several examples from the psychological literature in the introduction, merely witnessing violent events is sufficient to result in severe traumas that may induce behavioral changes. Communities in Burundi are small and isolated, hence violent battles never went unnoticed. Second, (self-)reporting may be correlated with characteristics that may also influence an individual's decision to grow export or cash crops, including wealth and education. This potential bias is arguably attenuated when using village level aggregated reports of violence (i.e., systematic under- or overreporting at the village level is unlikely to be correlated to individual level preferences for export of cash crop farming).

We commence by regressing the fraction of export crop farmers in a village in 2007 on the fraction of community members affected by war-related violence during 1993–2003 (column 1, Table 3A). The correlation is positive and significant: we find more current export farmers in communities that were more heavily affected by violence. Next, the dependent is now a dummy reflecting the individual household taking on a value of 1 if the household currently grows export crops and 0 otherwise. The unconditional correlation is similar to the community level regression. Including household and community level controls still leaves the coefficient on violence positive and significant although a bit smaller, suggesting that the violence measure picked up additional factors that influence the decision on whether or not to grow export crops. Indeed, we find that families with male heads, higher educated heads, living in villages that have had post-war NGO projects, areas that are suitable for growing coffee and are densely populated, are more likely to grow export crops than others. A one-standard deviation increase in the mean level of violence increases the probability of growing export crops after the war by 8 percent In column 4 we include individual level data as well. Individual level attacks are positively related to the probability of growing export crops but the coefficient is not significantly different from 0.

Columns (5) and (6) present results including other types of shocks that may have occurred at the village level and may influence the probability of growing cash crops, including floods, droughts, and plant diseases, or to the individual household, including (long term) illness or imprisonment of one or more household members. The coefficient on violence, however, remains practically the same while none of the other shocks has any discernable effect on household probabilities of export crop farming. Lastly, to

mitigate endogeneity concerns, we use instrumental variables in column (7). The endogeneity test in section 5.3, column (2) reveals a negative significant correlation between our measure of violence intensity and distance to the capital. This is unsurprising given that the bulk of rebel activities were concentrated in provinces close to the capital. Export farming, however, is unlikely to be concentrated close to Burundi's capital Bujumbura. For one thing, the export crop variable here constitutes mainly of coffee (more than 90 percent). Coffee can only be grown within a certain altitude range (higher than 1500 and below 2500 meters). These areas are not concentrated among Bujumbura but spread across the entire country. Also, coffee is sold to *local* cooperatives, marketing boards and washing stations that are based in the countryside rather than in capital. There is thus no need for a farmer to be close to the capital to sell his produce. We therefore use distance to the capital as an instrument for violence. In order to test whether our instrument is valid, we need the equation to be overidentified. We therefore use distance to the nearest health center as a second instrument.[5] This is the only other variable significant in regression (2) in Table 6. Although correlated with violence, it may arguably not satisfy the exclusion restriction as distance to health centers may proxy for accessibility or wealth, for example. The first-stage regressions, however, show that the instruments are correctly excluded albeit the partial F-statistics are somewhat small (reported in Annex 2). Column (7) shows that our instrumented violence variable is significant at 5 percent.

Table 3B presents results for cash crops including beer bananas. Results are qualitatively similar for violence but smaller; a one-standard deviation change increases the probability of growing cash crops by a mere 5 percent. Household size is significant and positive. Education and NGO presence are also positive but lose significance compared to the export model. As said, growing bananas for beer is an important income generating activity in Burundi, but requires less knowledge and fewer investments than coffee. Also, NGOs may not be particularly keen on stimulating the production of locally brewed alcohol. Land inequality has a negative effect, but cash crop farmers live in areas where there are on average more disputes among family members or fellow villagers. Possibly, disputes arise at the margin, thus in areas with roughly equally sized landholdings that nonetheless have something worth fighting for (coffee trees, some money, or assets). Lastly, there is a marginal significant positive effect of imprisonment. Other studies have shown that it matters *which* family member is (temporarily) unable to supply labor. It may also be the case that family members were only in prison for a short while (perhaps a few days as is often the case in Burundi). Households would then presumably not shift production modes and hence the positive correlation would then not have any causal interpretation but result from a peculiarity in the data on imprisonment. Here we also use an instrumental variable specification and find similar results to those in table 3A.

In Table 4 we present conditional income shares from export crop production. We also report a positive effect of community level violence on income shares from export sales.[6] Export farmers that live in areas suitable for coffee have larger shares. We also find that the current population pressure is positively related to income shares from cash

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5 Results are similar when we only use distance as an instrument (coefficient is 0.019, *p*-value=0.03).

6 Due to the censored nature of the data on shares we also estimate tobit models. Results are qualitatively the same and available upon request.

crops, this may stem from an increased need to grow crops that provide high monetary return to land (see Platteau 2000) or may lend support to the idea that technology spills over more easily in more populated areas, and/or the presence of economies of scale effects. Households living in areas with more current disputes tend to have lower shares than others. This would contradict the notion that disputes break out in villages or, for that matter, within families that have something worth fighting for (if we believe that the causality indeed runs the other way).

One interpretation consistent with both results is that disputes break out in, or across, families that are only just breaking out of poverty. Remember that we only observe a non-zero value for shares if the household grows export or cash crops. Those at the high end of the distribution with large income shares from export crops will not argue with their children or with fellow villagers, because they or their offspring are likely to have ample other (off-farm) opportunities. Kamuni, Summit Oketch, and Huggins (2005) furthermore note that wealthy landowners maintain, but underutilize their land, and keep it purely for purposes of speculation or access to bank loans, leading to increased tensions in these areas.

Results from shares that include income from banana beer are very similar in magnitude although standard errors are bigger and hence significance levels lower ($p<0.10$ in all models). These results are not shown but available upon request.

5.2 Panel Models

Next we use the panel component of our data to determine the effect of violence on cash crop farming. Remember that the first wave of survey data collection took place in 1998, which is about halfway through the war. Households may hence have adjusted farming decisions well before 1998. Even when only considering violence that took place after 1998, we cannot pretend that the 1998 data can serve as a credible baseline if communities attacked in 1998 and later were also likely to have been attacked earlier on. Regressing a community level variable that measures the incidence (number) of violent attacks up till 1997 on the incidence (number) of violent attacks that took place since 1998 and a set of controls, indeed shows that violence persists in communities that were attacked earlier (results not shown). This, however, has, as we show later as part of the exogeneity test, nothing to do with particular community characteristics.

However, we believe that the panel component is useful for a different purpose, namely to disentangle the "overall" effect of simply living in a country during times of war, from that of being a direct victim of civil war fare. The overall effect of the war will be reflected in the time dummy for the year in which the second wave took place (i.e., 2007). A positive value reflects positive effects over time. Analogously, a negative value confirms expectations about the overall destructive effects of the war. Naturally both forces could work simultaneously; the former dominates the latter if the coefficient is positive and vice versa if we find a negative result. Note that the time dummy picks up all developments—not only the ending of the war—between 1998 and 2007 that are non-specific to communities.[7] We fit conditional logit estimates to investigate changes within households with respect to cash crop farming activities. We report conditional

[7] For example aggregate income shocks that affect the entire country would be reflected in the time dummy.

logit estimates in Table 6. This is simply conditional maximum likelihood (ML), following Chamberlain (1980). Here, only observations for which transitions in the dependent variables are observed are used. This takes care of the selection problem estimating the probability of being an export or cash crop farmer conditional on $y_1 + y_2 = 1$. The sample is consequently reduced to about 600 observations.

Results are presented in Table 5 below. We report a positive significant effect of violence on the probability of being an export or cash crop farmer in 2007, meaning that on average, more households in the high violence areas changed from having no export or cash crops in 1998, to participating in these activities by 2007 compared to the areas where there was less violence. A one-unit increase in the violence variable increases the odds of growing (export) cash crops by 3 to 4 percent (across all specifications).[8] The year dummy is strongly negative, suggesting an overall decrease over time of cash crop farming, although this is partially offset by the increase in cash crop activities in the previously violent areas. Post-war aid flows and reconstruction projects that rushed in after the war, as reflected by the NGO indicator variable, do not seem to drive this result: their influence is statistically negligible and even has a negative sign in the default specification (2). Results are very similar for cash crops including beer bananas (not shown).

5.3 Testing for Endogeneity

We take the view that violence in Burundi was random with respect to socio-economic conditions. There exists a substantial body of literature that describes the brutality and the indiscriminate nature of the violence employed both by the rebels as well as the governments' army (see e.g., HRW 1998 and Krueger and Krueger 2007). Admittedly, given that both sources stem from outsiders (foreigners) that were either based in the capital, or necessarily relied on second-hand information from survivors, some selection may have gone unnoticed. We therefore also rely on an empirical strategy to purge the concern that export or cash crop farmers or otherwise households with characteristics that would lead them to increased adoption of (export) cash crops, self-selected into violence that would hence explain the positive correlation between violence exposure and (export) cash crop activities or its income shares. We use both the BPS and the ED sample to examine selection into violence.

In Column (1) of Table 6 we regress a dummy variable of community level violence on a set of fixed village level characteristics and pre-war population density. We find none of the variables to be significant. Column (2) presents the results for our preferred measure of community level violence that is used throughout the paper.

Tackling the issue of a non-random distribution of attitudes towards export farming is challenging. It could be that households who remained in their dwelling throughout the civil war have different attitudes towards investment compared to those who left the village. A priori it is unclear whether the more risk-seeking or more risk-averse people stay behind. We use our community data to probe into this issue. We include the fraction of 1993 refugees that have returned to their communities. The idea here is that villages with high fractions of returned refugees (that left the village prior to the start of

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8 Outcomes are similar using the full sample in a random effects specification (not reported but available upon request).

the violence) may have different risk attitudes than villages that only had a small fraction of returned refugees. Note that in Burundi, even though the actual number of refugees is still in the tens of thousands, the majority returned, and almost all to their home community. The variable is far from being significant. This provides confidence in the idea that pre-war risk attitudes were the same in both the violent as well as the non-violent areas.

Column (3) in Table 7 further shows that (visible) wealth before the war (evidenced by cash crops, and cattle ownership) had no effect on the percentage of households experiencing violent attacks. Also, potential differences in political beliefs, or the presence of local authorities cannot explain the variation in violent attacks. The log of distance to the capital remains significant though even in the small sample and we report a negative effect of pre-war population density. Armed groups may have been less inclined to attack villages where there was a dense village population that may resist and fight back. Note that population density in the regression models is *positively* correlated with income share from cash and export crop production, attenuating a possible concern of selection bias driving the positive relation between violence and (export) cash crop production. Column (4) and (5) present the result for individual level violence. We regress individual reports of violence (4) on household variables that could plausibly explain selection into violence, including wealth, traditional leadership before the war, and ethnic origin, and a set of village level dummies. We find that Hutu respondents had a higher chance of being victimized than respondents belonging to the Tutsis. There is, however, no a priori reason to assume that Hutus are more likely to grow cash crops or invest more than others, hence this is unlikely to be the driver of our results.[9]

In column (5) we try to deal with the potential problem of having a sample of survivors only. From our 2009 survey we know whether households had one or more of their household members killed because of the war. Although this obviously does not eliminate the concern of the selection bias, this is given the data the best we can do. As shown, households that had family members killed as a result did not systematically differ from those who all survived. The dependent variable, however, contains many zeros; only 17 percent of our sample reported the violent death of a household member. The results should thus be interpreted with caution.

6 Robustness

As part of our robustness check we first replicate the cross-section models using additional controls from the 2009 sample. Although the sample consequently reduces to 250 observations, we now can control for pre-war variables including export (cash) crop farming. If indeed selection would be driving the result, including relevant pre-war variables like export crop farming prior to the war would then presumably pick up all the variation and then leave the violence variable insignificant. Column (1)–(2) are the usual unconditional correlations, column (3) uses the same specification as before, only with the smaller 2009 sample. Including pre-war controls in column (4) does not change

9 Contrary to popular belief the two groups, however, are hardly distinguishable on physiological features, language, cultural characteristics, and geographic settlement (Nkurunziza and Ngaruko 2000).

the results much, suggesting that selection into violence through wealth (i.e., export crop farming) is not driving our results. Results are similar when including individual exposure or other types of shocks (column 5–7). The pre-war control for export crop farming ("HH grew cash crops before the war") is a strong predictor for farming export cash crops now. Male household heads are also more likely to grow high value export cash crops, confirming standard results that men rather than women control these crops. Lastly, the 2009 survey also included a question about land tenure security. Security over land is commonly believed to stimulate investment on it (e.g., Besley 1995). We include a dummy variable for tenure security; results do not change and the variable is insignificant (p=0.92) (not shown).

Table 8 presents the results for export crop shares. Coefficients are similar across specifications; there is a positive effect of violence on shares from export crops. More populous areas are positively associated with export crop shares in all models. Ethnic heterogeneity has a positive impact on shares. One explanation might be that the converse, ethnic homogeneity proxies isolation meaning that in ethnic homogeneous societies traditional customs and behavior are sustained. Traditions are more likely to break up with increased heterogeneity. Note that we also found a positive effect of ethnic heterogeneity on the probability to grow export crops, although there it was not significant at conventional levels.

Also we use different dependent variables, to examine if the positive results of community level violence extend to other types of investments.[10] We define two types. The first constitutes investments in schooling, including the set-up of new schools, the latter having a clear public good character.[11] And second, we use a subset of soil improvement techniques that have more of a public good character than others (i.e., anti-erosion techniques and agroforestry arguably have a more public good character than improved seeds and fertilizer). Subsequently we investigate the impact of violence on household total wealth, using both "objective" and "subjective" wealth indicators.

Results are displayed in Table 9 below. Column (1) presents results for investments in schools. We find that exposure to violence increases investments in schooling. A one-standard deviation increase in violence leads to 36.3 percent increase in schooling expenditures (which then amounts up to about half a US dollar per household per

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10 We also investigated potential effects of violence on enterprise ownership. In some of the conditional logit models we find a marginally significant positive effect of violence on positive changes in enterprise ownership. Results are, however, not robust across specifications and therefore not reported in the paper. One interpretation for the absence of any effect is that ownership of small enterprises is flux in countries like Burundi. Businesses are typically started with a small amount of own or borrowed capital and often comprise of small shops where villagers can buy varieties of soap, mobile phone cards, and canned food. Civil warfare may affect economic development through reduced spending (i.e., people need their money for other goods) and destruction of capital goods or infrastructure. This implies that communities may not need to have been affected directly by violence but enterprises within the community are affected through the impact of war on the economy as a whole. On the other hand, events not necessarily related to the war may cause people to default on loans or rental payments, and shops easily close down because of this, providing yet an alternative interpretation why we do not find a robust effect.

11 Variation in school expenditures may also result from a difference in provision by the government or NGOs and hence not necessarily reflect increased public good provision by the community members themselves. The coefficients are, however, unaffected when including a dummy variable for school projects.

month). Larger households, more densely populated and coffee growing communities are all positively associated with investments in schooling. Soil problems and current disputes are all negatively associated with this type of investment. Column (2) presents results for the "public" soil improvement techniques. We find violence to be a strong positive predictor of investing in high input techniques that have some public good character. Pre-war export crop farmers are more likely to invest, also households living in areas that have few current disputes. If we believe that current disputes somehow proxy cohesion, it comes to no surprise that this is a negative predictor of investments that have a larger public good character. Column (3) presents results for monthly household income. Although the coefficient is positive, it is not significant at conventional levels ($p<0.18$). We therefore conclude that there is no discernable effect of violence on household income across violent and non-violent communities. Column (4) presents results on households' *subjective* perception of their welfare. Here we find that households exposed to higher levels of violence systematically attach a higher score to their level of welfare than others. (Note that the scale is reversed, with 1 being at the highest and 6 at the lowest possible level, hence the negative correlation indeed shows that more violence leads to higher perceived current welfare). Due to the low number of possible values for the dependent variable we use an ordered logit model here. The coefficient in column (4) presents the marginal effect of violence on the probability that a household will consider itself "extremely poor" (belonging to category 6). A one-unit increase in violence decreases the probability of perceiving oneself as extremely poor by 0.4 percent (at mean levels).

The number of (pre-war) wealthy farmers (if we proxy wealth by cattle ownership) seem to be roughly equally distributed across violent and non-violent areas, as shown by the endogeneity test. Hence results cannot be simply interpreted as a "selective" initial wealth effect. Rather, the fact that the more exposed *systematically* attach a higher value to their level of well-being than other mitigates the possible concern that omitted variables, and not violence exposure are driving the result.

Lastly we use different measures of violence. As noted all our measures of violence are self-reported. This may be problematic if responses systematically vary with other characteristics that influence the outcome variable. Even though the problem may be less in our case as we regress household outcomes on village level responses, we cannot completely rule out this alternative interpretation. Villages with a large proportion of wealthy, literate cash farming households may on average be more likely to report incidents of violence than others. We do two things to show that this potential response bias is not driving the results. First, we use data from the 2007 community questionnaire rather than the aggregated household level responses. Arguably, community leaders differ less from each other than individual households across communities. All community leaders in our sample were literate and although some are better off than others differences are small. We thus do not expect them to systematically under or overreport. Second, we use "objective" data from the International Peace and Research Institute Oslo (PRIO). The ACLED (Armed Conflict Location and Events Dataset) is a publicly available dataset that codes the location of reported incidents of conflict across the world. For more details on ACLED refer to Raleigh, Hegre, Karlsen, and Linke (2010). Since 2003, local conflict data is available for Burundi. Using the GIS codes we were able to match the PRIO data to ours. Table 10 below presents the results, column (1) uses the community level dummy variable that equals 1 if the village high more than the average fraction of its members killed, in column (2) we use a dummy that is 1 if a

PRIO attack took place in any given year, and column (3) reports results for using a PRIO variable reflecting war intensity: the number of attacks up until 2003.

Clearly, using different measures of violence does not change the results qualitatively. Community level violence affects the probability of farming export crops after the war positively and significantly.

7 Conclusion

We use three waves of unique household and community data from Burundi to examine the effect of civil war violence on households' investment decisions. The cross-sectional models show that households exposed to violence in their community during the Burundi war are increasingly likely to have portfolios shifted towards more sustainable and more profitable activities than others. We also find that income shares from export crop farming are larger for those living in previously violent areas. By contrast, farmers' behavior is unresponsive to other type of covariate shocks, including droughts, flood, and plant diseases, and even to idiosyncratic shocks that may influence labor supply such as sickness and imprisonment.

The panel data allow us to examine the changes in household behavior over time. Also, we attempt to separate a country-wide effect of warfare from violence inflicted on one's community. The household and year-fixed effects specifications show that households exposed to violence in their community are more likely to grow export crops by 2007 than others. The negative time-dummy suggests that the war and/or possibly other developments still have harmful consequences in 2007. In addition to the panel we use a smaller (sub)sample collected in 2009, with information on pre-war socio-economic variables as well as respondents' ethnic origins. The first part of the robustness check includes these variables and replicates the cross-sectional models. We find that results are remarkably robust. The second part of our robustness checks for a possible selection in reporting incidents of violence. We use objective violence accounts from PRIO to address this concern. We find qualitatively similar results. Finally, we investigate whether our results extend to more general type of investments, not necessarily related to farm production. We find that they do. People exposed to violence are more likely to spend money on school (construction), invest more in soil improvement techniques with public good characteristics, and report higher levels of self-perceived welfare than others.

We attempt to rule out the possibility that selection bias drives the results: those villages with more cash farming activities were not particularly targeted for their appropriable wealth. We explicitly control for the possible endogeneity of violence in our two-stage least squares specifications in two of our cross-section models. They show similar results. These positive responses unlikely result from rushed in aid projects after the war (naturally most often found in the worst affected areas) as our NGO variable controls for that. Our results confirm experimental evidence from the same data as recently shown by Voors et al. (2009). This provides confidence in the idea that experiments of this kind are also externally valid; i.e., the outcomes of the economic games are consistent with actual behavior.

In this paper we do not explicitly deal with mechanisms that may underlie these positive relations between investment and violence. Instead, we offer some explanations that are

consistent with the patterns in the data. The fact that those farmers who are exposed to violence also spend more on public goods provision might point to increased community cohesion as a result from the war. The joint experience of traumas may bring people closer together, which translates into increased community participation and, possibly, profitable cash crops production through, for example, joint insurance or a increased sense of safety. This interpretation resonates with findings in the aforementioned experimental paper as well as other empirical evidence from post-war societies including Uganda and Sierra Leone: respondents exposed to violence reveal more altruism towards their fellow villagers than those that were not, or less heavily, exposed. There may even be some optimism as reflected in the positive correlation between self-perceived welfare levels and violence, particularly since "objective" current wealth indicators do not confirm that they are better off by monetary standards. This may lend tentative support to the existence of post-traumatic growth effects after civil warfare.

The paper presents evidence that contrary to the conventional idea that wars are "development in reverse" war can have positive outcomes as well. Our outcomes contrast other micro level evidence regarding crop production and investments after civil warfare in e.g. Uganda and Mozambique, suggesting at the very minimum, that war impacts are context dependent. Indeed, the wars in Uganda and Mozambique were fought for different reasons and had a distinctly different character than the war in Burundi. That said, we do believe that, as foremost psychological and recent economic evidence shows, traumatic experiences, while clearly unwarranted, may have positive consequences as well. This may have profound implications for countries' post-war development paths.

References

Abadie, A., and J. Gardeazabal. 2003. The economic costs of conflict: a case study of the Basque Country. *American Economic Review* 93 (1): 113–32.

Acemoglu, D., S. Johnson, and J. A. Robinson. 2001. The colonial origins of comparative development: an empirical investigation. *The American Economic Review* 91 (5): 1369–1401.

Baez, J. E., and I. V. Santos. 2007. Children's vulnerability to weather shocks: a natural disaster as a natural experiment. Mimeo.

Bellows, J., and E. Miguel. 2009. War and local collective action in Sierra Leone. *Journal of Public Economics* 93 (11–12): 1144–57.

Bertocchi, G., and F. Canova. 2002. Did colonization matter for growth? An empirical exploration into the historical causes of Africa's underdevelopment. *European Economic Review* 46 (10): 1851–71.

Blanchard. E., L. Kolb, T. Pallmeyer, and R. J. Gerardi. 1982. A psychophysiological study of posttraumatic stress disorder in Vietnam veterans. *Psychiatric Quarterly* 54: 220–9.

Bodea, C., and I. A. Elbadawi. 2008. Political violence and economic growth. Policy Research Working Paper 4692. Washington, DC: World Bank.

Bozzoli, C., and T. Brück. 2009. Agriculture, poverty, and postwar reconstruction: micro-level evidence from Northern Mozambique. *Journal of Peace Research* 46 (3): 377–97.

Bundervoet, T., P. Verwimp, and R. Akresh. 2009. Health and civil war in rural Burundi. *Journal of Human Resources* 44: 536–63.

Carter, M. R. 1997. Environment, technology, and the social articulation of risk in West African agriculture. *Economic Development and Cultural Change* 45: 557–90.

Carter, M. R., and J. A. Maluccio. 2003. Social capital and coping with economic shocks: an analysis of stunting of South African children. *World Development* 31 (7): 1147–63.

Chamberlain, G. 1980. Analysis of covariance with qualitative data. *The Review of Economic Studies* 47 (1): 225–38.

Collier, P. 1999. On the economic consequences of civil war. *Oxford Economic Papers* (51): 168–83.

Collier, P., A. Hoeffler, and M. Söderbom. 2004. On the duration of civil war. *Journal of Peace Research* 41 (3): 253–73.

Corbett, J. E. M. 1988. Famine and household coping strategies. *World Development* 16 (29): 1099–112.

Cutler, P. 1986. The response to drought of Beja famine refugees in Sudan. *Disasters* 10 (3): 181–88.

Deiniger, K. 2003. Causes and consequences of civil strife: micro-level evidence from Uganda. *Oxford Economic Papers* 55: 579–606.

Del Ninno, C., P. A. Dorosh, and L. C. Smith. 2003. Public policy, markets and household coping strategies in Bangladesh: avoiding a food security crisis following the 1998 floods. *World Development* 31 (7): 1221–38.

Dercon, S. 1996. Risk, crop choice, and savings: evidence from Tanzania. *Economic Development and Cultural Change* 44 (3): 385–415.

—— 1998. Wealth, risk and activity choice: cattle in Western Tanzania. *Journal of Development Economics* 55: 1–42

—— 2004. Growth and shocks: evidence from rural Ethiopia. *Journal of Development Economics* 74 (2): 309–29.

Dercon, S., and P. Krishnan. 2000a. In sickness and in health: risk sharing within households in rural Ethiopia. *Journal of Political Economy* 108 (4): 688–727.

—— 2000b. Vulnerability, poverty and seasonality in Ethiopia. *Journal of Development Studies* 36 (6): 25–53.

Fearon, J. D. 2004. Why do some civil wars last so much longer than others? *Journal of Peace Research* 41 (3): 275–301.

Ghobarah, H. A., P. Huth, and B. Russett. 2003. Civil wars kill and maim people—long after the shooting stops. *American Political Science Review* 97 (2): 189–202.

Grun, R. E. 2008. Household investment under violence: the Colombian case. Policy Research Paper 4713. Washington, DC: World Bank.

Günther, I., and K. Harttgen. 2009. Estimating households' vulnerability to idiosyncratic and covariate shocks: a novel method applied in Madagascar. *World Development* 37 (7): 1222–32.

Harrower, S. and J. Hoddinott. 2005. Consumption smoothing in the zone Lacustre, Mali. *Journal of African Economies* 14 (4): 489–519.

Heltberg, R. and N. Lund. 2009. Shocks, coping and outcomes for Pakistan's poor: health risks predominate. *Journal of Development Studies* 45 (6): 889–910.

Hironaka, A. 2008. *Neverending wars: the international community, weak states, and the perpetuation of civil war*. Cambridge, MA: Harvard University Press.

Hoddinot, J., and B. Kinsey. 2001. Children growth in the time of drought. *Oxford Bulletin of Economics and Statistics* 63 (23): 409–36.

Hoeffler, A., and M. Reynol. 2003. Measuring the costs of conflict. Mimeo.

Human Rights Watch. 1998. *Civilians in the war in Burundi*. New York: Human Rights Watch.

—— 2003. *Everyday victims.* New York: Human Rights Watch.

Jacoby, H. G., and E. Skoufias. 1997. Risk, financial markets, and human capital in a developing country. *The Review of Economic Studies* 64 (3): 311–35.

Jensen, R. 2000. Agricultural volatility and investments in children. *AER Papers and Proceedings* 90 (2): 399–404.

Kamuni, P. M., J. Summit Oketch, and C. Huggins. 2005. Land access and the return and resettlement of IDPs and refugees in Burundi. In *From the ground up: land rights, conflict and peace in Sub-Saharan Africa*, ed. C. Huggins and J. Clover. Pretoria: ACTS Press/Institute for Security Studies.

Kinsey, B., K. Burger, and J. W. Gunning. 1998. Coping with drought in Zimbabwe: survey evidence on responses of rural households to risk. *World Development* 26 (1): 89–110.

Kochar, A. 1995. Explaining household vulnerability to idiosyncratic income shocks. *American Economic Review*, Papers and Proceedings 85 (2): 159–64.

—— 1999. Smoothing consumption by smoothing income: hours-of-work responses to idiosyncratic agricultural shocks in rural India. *Review of Economics and Statistics* 81 (1): 50–61.

Kondylis, F. 2008. Agricultural outputs and conflict displacement: evidence from a policy intervention in Rwanda. *Economic Development and Cultural Change* 57: 31–66.

Krueger, R., and K. Krueger. 2007. *From bloodshed to hope in Burundi*. Austin, TX: University of Texas Press.

Lorentzen, P., J. McMillan, and R. Wacziarg. 2008. Death and development. *Journal of Economic Growth* 13: 81–124.

Maccini, S., and D. Yang. 2009. Under the weather: health, schooling, and economic consequences of early-life rainfall. *American Economic Review* 99 (3): 1006–26.

Macksoud, M. S., and J. Lawrence Aber. 1996. The war experiences and psychosocial development of children. *Child Development* 67 (1): 70–88.

Morduch, J. 1990. Risk, production and savings: theory and evidence from Indian households. Manuscript. Cambridge, MA: Harvard University.

—— 1995. Income smoothing and consumption smoothing. *The Journal of Economic Perspectives* 9 (3): 103–14.

Neugebauer, R., P. W. Fisher, J. Blake Turner, S. Yamabe, J. A. Sarsfield, and T. Stehling-Ariza. 2009. Post-traumatic stress reactions among Rwandan children and adolescents in the early aftermath of genocide. *International Journal of Epidemiology* 38 (4): 1033–45.

Nunn, N. 2004. Historical legacies: A model linking Africa's past to its current underdevelopment. *Journal of Development Economics* 83 (1): 157–75.

Platteau, J.-P. 2000. *Institutions, social norms and economic development*. Amsterdam: Harwood Academic Publishers.

Powell, S., R. Rosner, W. Butollo, R. G. Tedeschi, and G. Calhoun. 2003. Posttraumatic growth after war: A study with former refugees and displaced people in Sarajevo. *Journal of Clinical Psychology* 59 (1): 71–83.

Raleigh, C., H. Hegre, J. Karlsen, and A. Linke. 2010. Introducing ACLED-Armed Conflict Location and Event Data. *Journal of Peace Research* 47.

Reardon, T., and J. E. Taylor. 1996. Agroclimatic shock income inequality and poverty evidence from Burkina Faso. *World Development* 24 (5): 901–14.

Reardon, T., P. Matlon, and C. Delgado. 1988. Coping with household-level food insecurity in drought-affected areas of Burkina Faso. *World Development* 16 (9): 1065–74.

Rosenzweig, M. R., and H. Binswanger. 1993. Wealth, weather risk and the composition and profitability of agricultural investments. *The Economic Journal* 103 (416): 56–78.

Rosenzweig, M. R., and O. Stark. 1989. Consumption smoothing, migration, and marriage: evidence from rural India. *Journal of Political Economy* 97 (4): 905–26.

Sachs, J. D., and A. M. Warner. 1997. Sources of slow growth in African economies. *Journal of African Economies* 6 (3): 335–76.

Tedeschi, T. C., and L. Calhoun. 1996. The posttraumatic growth inventory: measuring the positive legacy of trauma. *Journal of Traumatic Stress* 9: 455–71.

Udry, C. 1995. Risk and saving in Northern Nigeria. *The American Economic Review* 85 (5): 1287–1300

Voors, M., and E. Bulte. 2008. Unbundling institutions at the micro-level: conflict, institutions and income in Burundi. Working Paper 49. Sussex: Household in Conflict Network.

Voors, M., E. Nillesen, P. Verwimp, E. Bulte, R. Lensink and D. van Soes. 2009. Do shocks of civil war change preferences?. Unpublished manuscript.

Yamano, T., H. Alderman, and L. Christiaensen. 2005. Child growth, shocks and food aid in rural Ethiopia. *American Journal of Agricultural Economics* 87 (2): 273–88.

Yehuda, R. 2002. Post-traumatic stress disorder. *New England Journal of Medicine* 346: 108–14.

Verwimp, P and T. Bundervoet. 2008. Consumption growth, household splits and civil war. Working Paper 48. Sussex: Households in Conflict Network.

Appendix A1: Data description of key variables

Community level violence: percentage of households that had been personally attacked by one of the armed groups. Attacks included the destruction of one's house or fields and the theft of crops, livestock, assets, or money.

Individual attacks: dummy=1 if at least one household member experienced of torture, ambushes, kidnapping or had to work without payment.

Export farmer: dummy=1 if the household grows coffee, tea or cotton.

Cash crop farmer: dummy=1 if the household grows coffee, tea, cotton or beer bananas.

Export/cash crop shares: monthly revenue from export (cash crops) as a fraction of total monthly income in constant (1998) Burundian Francs (BIF).

Appendix A2: RE Logit Models for Export Farming (BPS)

	(1) ML	(2) ML	(3) ML	(4) ML	(5) ML
HH attacked (%)	0.041***	0.042***	0.040***	0.042***	0.041***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)
Individual attack			0.139		
			(0.235)		
Age^2		-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Head is male		0.578***	0.576***	0.576***	0.579***
		(0.204)	(0.204)	(0.204)	(0.204)
Years at school		0.035	0.035	0.036	0.035
		(0.034)	(0.034)	(0.034)	(0.034)
HH size		0.151***	0.151***	0.153***	0.150***
		(0.048)	(0.049)	(0.049)	(0.049)
NGO		0.316	0.332	0.383	0.316
		(0.240)	(0.242)	(0.248)	(0.240)
Flood				0.115	
				(0.339)	
Drought				0.274	
				(0.267)	
Plant diseases				0.017	
				(0.296)	
Dummy for *t*=2	-2.259***	-2.411***	-2.437***	-3.101***	-2.421***
	(0.260)	(0.283)	(0.288)	(0.755)	(0.286)
Sickness					0.001
					(0.003)
Prison					0.021
					(0.228)
Constant	0.130	-1.388**	-1.374**	-1.381**	-1.391**

	(0.107)	(0.657)	(0.659)	(0.658)	(0.658)
Observations	1744	1724	1724	1724	1724
Number of hhid	872	872	872	872	872

#

Table 1A: Share of households deriving income from a particular source

Income derived from:	All years (%)	1998 (%)	2007 (%)	Direction of Δ
Home consumption	92.2	93.7	91.7	-
Food sales	64.4	60.1	68.7	+
Export crops	41.8	52.1	31.5	-
Enterprises	9.8	16.7	2.7	-
Beer	47.5	50.8	44.1	-
Non-farm activities	5.2	4.4	5.8	+
Transfers	22.3	29.2	25.8	-
Livestock products	4.8	2.7	6.8	+
Wage labor	6.2	6.0	6.4	+
Other	13.9	0.2	17.5	+

Sources: Authors' own calculations based on the Burundi Priority Surveys 1998 and 2007 for individual households and communities.

Table 1B: Average household income shares

Share derived from:	All years (%)	1998 (%)	2007 (%)	Direction of Δ
Home consumption	67.19	65.5	68.8	+
Food sales	9.3	6.8	11.8	+
Export crops	5.8	6.6	5.0	-
Enterprises	2.1	3.9	0.3	-
Beer	4.7	6.5	2.9	-
Non-farm activities	0.4	0.5	0.3	-
Transfers	3.2	5.0	1.3	-
Livestock products	0.1	0.1	0.1	=
Wage labor	3.6	4.3	2.9	-
Other	1.8	0.0	3.6	+

Sources: Authors' own calculations based on the Burundi Priority Surveys 1998 and 2007 for individual households and communities and the Experimental Economics Project 2009.

Table 2: Summary statistics

Year of survey	1998 and 2007		2007		2009	
	Mean	(SD)	Mean	SD	Mean	(SD)
Panel A: Household characteristics						
Age (years)	46.55	(15.87)			48.65	(14.52)
Years at school (years)	1.54	(2.45)			1.41	(2.25)
HH size (adult eq.)	4.29	(1.90)			4.49	(1.97)
Head is male	0.74	(0.44)			0.69	(0.46)
HH grows cash crops	0.42	(0.49)			0.33	(0.47)
HH owns cattle	0.16	(0.37)			0.08	(0.27)
Number of months one or more HH members were ill			10.83	(7.56)		
Soil quality index (scale 1-6, with 1=good, 6=bad quality)					2.69	(0.51)
HH grew cash crops before the war					0.57	(0.50)
HH owned cattle before the war					0.14	(0.35)
Fraction income cash crops	0.06	(0.13)				
Respondent is Hutu					0.61	(0.49)
Respondent is Tutsi					0.26	(0.44)
HH invests in soil improvement techniques					0.18	(0.39)
≥ 1 HH member was a traditional authority before the war					0.28	(0.45)
HH monetary income (*log*)	7.41	(2.57)				
Perceived current wealth (with 1=wealthy and 6=poor)			4.8	(1.0)	4.8	(0.95)
Household has security over land			0.75	(0.43)		
Panel B: village characteristics						
Fraction HH below poverty line	0.69	(0.22)			0.70	(0.21)
Fraction literate HH members	0.30	(0.12)			0.29	(0.12)
Ethnic homogeneity (%)[12]					87.68	(14.69)
Distance to health center	2.65	(0.84)			3.07	(1.02)
Distance to nearest market	1.62	(0.60)			2.49	(0.78)
Distance to drinking water	3.22	(0.90)			1.71	(0.72)
Distance to main road	3.34	(1.66)			3.48	(1.84)
Suitable for coffee (0/1 based on altitude > 1500m and < 2500m)	0.83	(0.37)			0.80	(0.41)
Altitude (m)					1663.143	(173.5)
Distance to Bujumbura (km)					95.59	(34.82)
Density (*log*) 1990					5.46	(0.49)
Density (*log*) 2008					5.71	(0.45)

[12] Model results all report the effect of ethnic heterogeneity.

Fraction of HH involved in current disputes		0.06	(0.07)		
Land GINI coefficient		0.26	(0.21)		
Fraction votes for Ndadaye		0.65	(0.18)		
Panel C: War shocks					
HH attacked (%)		22.13	(10.9)		
≥ 1 HH member attacked		0.32	(0.47)		
≥ 1 HH member violently killed				0.18	(0.38)
Number of HH members in prison		0.13	(0.45)		
Fraction of returned 1993 refugees				0.07	(0.15)
PRIO (ACLED) dummy for attack				0.20	(0.40)
PRIO (ACLED) # attacks				2.19	(4.49)
Panel D: Other village level shocks					
Fraction of villages with post-war NGO projects		0.36	(0.48)		
Average # floods		1.69	(0.33)		
Average # droughts		160	(0.48)		
Average # plant disease events		1.92	(0.45)		
Number of household observations	1744	872			250
Number of village observations	100	100			35

Sources: Authors' own calculations based on the Burundi Priority Surveys 1998 and 2007 for individual households and communities and the Experimental Economics Project 2009.

Table 3A: Cross-section models for victimization and export cash crop farming (BPS 1998/2007)

	(1) ML	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML	(7) IV-2SLS
HH attacked (%)	0.007***	0.006***	0.009***	0.009***	0.009***	0.009***	0.014**
	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.006)
Individual attack				0.014			
				(0.039)			
Age			0.007	0.007	0.007	0.007	0.005
			(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Age^2			-0.000	-0.000	-0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head is male			0.132***	0.132***	0.131***	0.130***	0.117**
			(0.036)	(0.036)	(0.036)	(0.036)	(0.033)
Years at school			0.014*	0.014*	0.014*	0.014*	0.014*
			(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
NGO			0.124*	0.125*	0.126*	0.125*	0.115*
			(0.067)	(0.067)	(0.067)	(0.067)	(0.064)
HH size			0.014	0.014	0.015	0.013	0.010
			(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Suitable for coffee			0.127**	0.126**	0.129**	0.126**	0.132*
			(0.060)	(0.061)	(0.060)	(0.061)	(0.076)
Density 2008			0.278***	0.279***	0.278***	0.277***	0.231***
			(0.076)	(0.076)	(0.077)	(0.076)	(0.055)
Land Gini			0.100	0.101	0.101	0.101	0.115
			(0.165)	(0.166)	(0.164)	(0.165)	(0.133)
Current disputes			0.622	0.623	0.604	0.621	0.641*
			(0.408)	(0.411)	(0.404)	(0.409)	(0.381)
Flood					0.006		
					(0.022)		
Drought					-0.002		
					(0.020)		
Plant diseases					0.017		
					(0.017)		
Sickness						0.000	
						(0.000)	
Prison						0.027	
						(0.034)	
Distance to Bujumbura (*log*)							
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	100	872	798	798	798	798	798
Log-likelihood		-544.07	-436.54	-436.48	-435.98	-436.25	
χ^2		22.41	90.01	90.26	93.68	92.98	
Pseudo-R^2		0.02	0.126	0.126	0.127	0.126	
Adj. R^2	0.07						0.127

Notes: Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
ML Logit estimates. Marginal effects reported, valued at the mean. Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and main road. Column (7) uses distance to the capital and distance to the nearest health center as instruments. First-stage test-statistics are reported in Annex A1.

Table 3B: Cross-section models for victimization and cash crop farming (BPS 1998/2007)

	(1) OLS	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML	(7) IV-2SLS
HH attacked (%)	0.241**	0.005***	0.007***	0.007***	0.007***	0.007***	0.011**
	(0.113)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)
Individual attack				-0.005			
				(0.043)			
Age			0.007	0.007	0.008	0.007	0.005
			(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Age^2			-0.000	-0.000	-0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head is male			0.135***	0.135***	0.133***	0.126***	0.125***
			(0.046)	(0.046)	(0.046)	(0.046)	(0.040)
Years at school			0.011	0.011	0.013	0.011	0.010
			(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
NGO			0.032	0.032	0.039	0.034	0.044
			(0.055)	(0.054)	(0.054)	(0.055)	(0.052)
HH size			0.020*	0.020*	0.022*	0.020*	0.016
			(0.012)	(0.012)	(0.012)	(0.012)	(0.010)
Suitable for coffee			0.130	0.130	0.134*	0.122	0.144**
			(0.081)	(0.080)	(0.079)	(0.083)	(0.073)
Density 2008			0.110*	0.110*	0.113*	0.112*	0.099*
			(0.059)	(0.058)	(0.058)	(0.059)	(0.055)
Land Gini			-0.262**	-0.263**	-0.265**	-0.267**	-0.191*
			(0.133)	(0.133)	(0.133)	(0.131)	(0.108)
Current disputes			0.518*	0.517*	0.503*	0.520*	0.528*
			(0.281)	(0.281)	(0.272)	(0.283)	(0.276)
Flood					0.048**		
					(0.023)		
Drought					0.002		
					(0.028)		
Plant diseases					0.027		
					(0.018)		
Sickness						-0.001	
						(0.001)	
Prison						0.079*	
						(0.042)	
Distance to Bujumbura (*log*)							

Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	100	872	798	798	798	798	798
Log-likelihood		-581.08	-491.87	-491.84	-487.70	-489.88	0.106
χ^2		8.43	78.55	81.18	90.46	85.28	
Pseudo-R^2		0.01	0.09	0.09	0.10	0.09	
Adj. R^2	0.04						

Notes: Clustered standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 Marginal effects valued at the mean reported in column (2)-(6). Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and main road. Column (8) uses distance to the capital and distance to the nearest health center as instruments. First-stage test-statistics are reported in Annex A2.

Table 4: Cross-section models for victimization and income shares from export crops

(BPS 1998/2007)

	(1) OLS	(2) OLS	(3) OLS	(4) OLS
HH attacked (%)	0.002***	0.002***	0.002***	0.002***
	(0.0005)	(0.0006)	(0.0006)	(0.0005)
Individual attack		-0.017		
		(0.015)		
Age	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Age^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Head is male	0.019*	0.020*	0.018*	0.018*
	(0.010)	(0.010)	(0.010)	(0.010)
NGO	-0.014	-0.015	-0.014	-0.014
	(0.014)	(0.014)	(0.014)	(0.014)
Years at school	-0.000	-0.001	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
HH size	-0.001	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Suitable for coffee	0.042***	0.044***	0.042***	0.042***
	(0.016)	(0.016)	(0.016)	(0.016)
Land Gini	0.007	0.006	0.006	0.007
	(0.037)	(0.037)	(0.037)	(0.037)
Density 2008	0.059***	0.058***	0.059***	0.058***
	(0.016)	(0.016)	(0.017)	(0.017)
Current disputes	-0.117*	-0.121*	-0.120*	-0.118*
	(0.067)	(0.066)	(0.067)	(0.067)
Flood			-0.000	
			(0.005)	
Drought			-0.001	
			(0.006)	
Plant diseases			0.003	
			(0.005)	
Sickness				0.000
				(0.000)
Prison				0.004
				(0.014)
Regional FE	Yes	Yes	Yes	Yes
Observations	798	798	798	798

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and main road. Due to the censored data of our dependent we also estimated Tobit models. Results are available upon request.

Table 5: Panel models for vicimization and export cash crop farming (BPS 1998/2007)

	(1) ML	(2) ML	(3) ML	(4) ML	(5) ML
HH attacked (%)	0.04**	0.04**	0.03**	0.04***	0.04**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Individual attack			0.567*		
			(0.326)		
Age		-0.038	-0.046	-0.050	-0.022
		(0.055)	(0.059)	(0.058)	(0.057)
Age^2		0.001	0.001	0.001	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Head is male		0.021	-0.033	0.108	0.043
		(0.429)	(0.441)	(0.450)	(0.434)
Years at school		0.013	0.027	0.011	0.012
		(0.094)	(0.095)	(0.106)	(0.094)
HH size		0.205**	0.214**	0.213**	0.200**
		(0.091)	(0.092)	(0.090)	(0.090)
NGO		-0.012	0.052	0.155	0.051
		(0.397)	(0.404)	(0.416)	(0.386)
Flood				0.305	
				(0.547)	
Droughts				0.590	
				(0.448)	
Plant diseases				0.106	
				(0.496)	
Dummy for *t*=2	-2.207***	-2.401***	-2.515***	-4.177***	-2.441***
	(0.404)	(0.515)	(0.532)	(1.257)	(0.535)
Sickness					0.010
					(0.006)
Prison					-0.733
					(0.480)
Household FE	Yes	Yes	Yes	Yes	Yes
Observations	614	602	602	602	602

Notes: Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Testing for endogeneity

Sample	BPS	BPS	ED	ED	ED
Dependent	Violent	HH attacked	HH attacked	HH member	HH member
Years at school	-0.007	0.010	0.046	0.010	-0.003
	(0.051)	(0.013)	(0.029)	(0.020)	(0.021)
Age	-0.012	0.000	-0.003	0.003	0.007*
	(0.009)	(0.002)	(0.004)	(0.003)	(0.004)
Head is male	0.216	0.100	0.009	0.141*	0.121
	(0.313)	(0.082)	(0.181)	(0.080)	(0.088)
Respondent is Tutsi				0.208	-0.022
				(0.177)	(0.207)
Respondent is Hutu				0.294**	0.052
				(0.121)	(0.247)
HH grew cash crops before the war			0.038	-0.027	-0.081
			(0.114)	(0.094)	(0.123)
HH owned cattle before the war			-0.123	-0.121	-0.038
			(0.208)	(0.084)	(0.096)
HH member was a traditional authority before the war			0.086	0.088	0.067
			(0.158)	(0.089)	(0.106)
Ethnic heterogeneity			-0.001		
			(0.002)		
Suitable for coffee	0.291	-0.068	-0.004		
	(0.215)	(0.049)	(0.088)		
Fraction of 1993 returned refugees			0.079		
			(0.162)		
Distance to Bujumbura (log)	-0.013	-0.118***	-0.131		
	(0.160)	(0.053)	(0.090)		
Density 1990 (log)	0.164	-0.009	-0.124		
	(0.111)	(0.038)	(0.082)		
Altitude (log)	-0.517	0.177	-0.004		
	(0.534)	(0.173)	(0.088)		
Fraction votes for Ndadaye	0.004	0.001	0.001		
	(0.003)	(0.001)	(0.002)		
Constant		-0.709	-0.481		
		(1.212)	(2.886)		
Regional/Village FE	Yes	Yes	Yes	Yes	Yes
Observations	95	95	35	199	141

Notes: Clustered standard errors for (4) and (5) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Models (1) (4) and (5) are ML Logit estimates. Marginal effects reported, valued at the mean. Model (2) and (3) are estimated using OLS.

Table 7: Cross-section models for victimization and export cash crops including pre-war controls

(ED)

	(1) OLS	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML	(7) ML	(8) ML
HH attacked (%)	0.009*	0.008***	0.010**	0.010**	0.010**	0.009*	0.010**	0.010**
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Individual attack					0.066			
					(0.062)			
Soil quality index				0.053	0.048	0.094	0.078	0.059
				(0.169)	(0.160)	(0.206)	(0.159)	(0.116)
HH grew cash crops before the war				0.213***	0.212***	0.220***	0.229***	0.206***
				(0.067)	(0.066)	(0.081)	(0.067)	(0.070)
HH owned cattle before the war				0.071	0.072	0.052	0.087	0.063
				(0.150)	(0.146)	(0.146)	(0.144)	(0.135)
NGO			0.039	0.053	0.049	0.079	0.083	0.069
			(0.099)	(0.093)	(0.091)	(0.109)	(0.109)	(0.094)
Age			-0.002	-0.006	-0.007	-0.006	-0.006	-0.008
			(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Age^2			0.000	0.000	0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head is male			0.090*	0.106**	0.108**	0.108*	0.136***	0.104**
			(0.051)	(0.054)	(0.053)	(0.055)	(0.046)	(0.052)
Years at school			0.017	0.025	0.023	0.023	0.022	0.031*
			(0.015)	(0.017)	(0.017)	(0.018)	(0.017)	(0.01)
HH size			0.022*	0.009	0.008	0.008	0.014	0.011
			(0.012)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Current disputes			-0.889	-0.534	-0.608	0.366	-0.350	-0.342
			(1.154)	(1.128)	(1.140)	(1.525)	(1.017)	(1.207)
Density 2008			0.312**	0.249	0.260	0.262	0.258	0.260
			(0.156)	(0.188)	(0.188)	(0.196)	(0.175)	(0.173)
Suitable for coffee			0.053	0.020	0.003	0.035	0.043	0.051
			(0.066)	(0.065)	(0.065)	(0.060)	(0.067)	(0.076)
Land Gini			0.051	-0.125	-0.140	-0.099	-0.152	-0.110
			(0.271)	(0.226)	(0.222)	(0.218)	(0.228)	(0.235)
Ethnic heterogeneity				0.005	0.006	0.006	0.003	0.003
				(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Flood						-0.144		
						(0.242)		
Drought						-0.117		
						(0.153)		
Plant diseases						0.104		
						(0.187)		
Prison							-0.113	
							(0.073)	
Sickness							-0.001	

							(0.001)	
Land tenure security								0.164**
								(0.064)
Constant	0.135							
	(0.107)							
Ethnicity FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35	250	236	236	236	236	236	231

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Suppressed community variables include distance variables to: nearest market, health center, drinking water provision, and provincial road.

Table 8: Cross-section models for victimization and income shares from export crops including pre-war controls (ED sample)

	(1) OLS	(2) OLS	(3) OLS	(4) OLS
HH attacked (%)	0.294*	0.296*	0.313*	0.292*
	(0.165)	(0.168)	(0.181)	(0.163)
Individual attack		-0.014		
		(0.023)		
Soil quality index	-0.045	-0.044	-0.053	-0.045
	(0.040)	(0.039)	(0.045)	(0.040)
HH grew cash crops before the war	0.035*	0.036*	0.035*	0.033*
	(0.019)	(0.020)	(0.018)	(0.018)
HH owned cattle before the war	0.024	0.023	0.029	0.027
	(0.021)	(0.021)	(0.023)	(0.020)
NGO	-0.044	-0.044	-0.042	-0.051
	(0.043)	(0.043)	(0.043)	(0.045)
Age	0.001	0.001	0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Age^2	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Head is male	0.026	0.026	0.024	0.019
	(0.019)	(0.019)	(0.019)	(0.016)
Years at school	-0.001	-0.001	-0.002	-0.001
	(0.004)	(0.004)	(0.005)	(0.005)
HH size	0.001	0.002	0.002	0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Current disputes	-0.325	-0.318	-0.262	-0.297
	(0.306)	(0.300)	(0.271)	(0.292)
Density 2008	0.065**	0.063**	0.072**	0.065**
	(0.029)	(0.029)	(0.032)	(0.029)
Suitable for coffee	0.031	0.033	0.032	0.026
	(0.027)	(0.027)	(0.028)	(0.027)
Land Gini	0.033	0.038	0.036	0.031
	(0.049)	(0.054)	(0.052)	(0.048)
Ethnic heterogeneity	0.002**	0.002***	0.003**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Flood			-0.014	
			(0.011)	
Drought			-0.003	
			(0.009)	
Plant diseases			0.016	
			(0.015)	
Prison				0.035
				(0.033)
Sickness				-0.000

				(0.000)
Constant	0.150			
	(0.219)			
Observations	223	223	222	223
R-squared	0.220			

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Suppressed (fixed) community variables include distance variables to: nearest market, health center, drinking water provision, and provincial road.

Table 9: Cross-section models for victimization and different dependent variables

	(1) School	(2) Soil	(3) Household	(4) Perceived
HH attacked (%)	0.033**	0.004*	0.034	-0.004**
	(0.016)	(0.002)	(0.021)	(0.002)
Soil quality index	-0.589	0.013	0.135	0.052
	(0.526)	(0.063)	(0.507)	(0.072)
HH grew cash crops before the	-0.164	0.089**	1.008***	-0.080**
	(0.432)	(0.045)	(0.324)	(0.038)
HH owned cattle before the war	0.171	-0.029	1.204**	-0.025
	(0.491)	(0.032)	(0.481)	(0.061)
NGO	0.819**	0.040	0.175	0.050
	(0.345)	(0.116)	(0.436)	(0.048)
Age	0.103	0.005	0.007	0.004
	(0.068)	(0.009)	(0.081)	(0.011)
Age^2	-0.001*	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Head is male	-0.246	0.037	1.332***	-0.019
	(0.384)	(0.039)	(0.458)	(0.054)
Years at school	0.139**	-0.001	0.228**	-0.024
	(0.067)	(0.009)	(0.093)	(0.016)
HH size	0.579***	-0.012	0.077	-0.036**
	(0.084)	(0.013)	(0.098)	(0.015)
Current disputes	-3.623	-0.916**	-0.627	0.749*
	(3.472)	(0.466)	(4.551)	(0.429)
Density 2008	-0.073	0.089	0.386	-0.136***
	(0.450)	(0.057)	(0.496)	(0.043)
Suitable for coffee	-0.560*	0.118***	0.047	-0.005
	(0.324)	(0.022)	(0.428)	(0.030)
Land Gini	-1.059	0.069	-1.145	0.034
	(0.782)	(0.096)	(1.375)	(0.099)
Ethnic heterogeneity	0.030**	0.002	0.015	-0.004**
	(0.013)	(0.002)	(0.017)	(0.002)
Constant	3.376		4.348	
	(2.532)		(3.280)	
Ethnicity FE	Yes	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes	Yes
Observations	236	235	236	235
R-squared	0.341		0.238	

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Dependent variable in column (1) is monthly expenditures on school construction and school fees in 1998 prices. Dependent variable in column (2) is a dummy variable that is 1 if the household currently invests in soil improvement techniques with a high public good character, including ant-erosion gulls and agro-forestry. The model in column (2) is estimated using ML. Marginal effects are reported. Suppressed (fixed) community variables include distance variables to: nearest market, health center, drinking water provision, and main road. Dependent in model (3) is the log of total monetary monthly household income. Model (4) is an ordered logit model estimated with ML. Dependent is subjective evaluation of welfare on a scale from 1–6 with 1, being very rich and 6 being extremely poor.

Table 10: Cross-section models for different measures of violence and cash crop farming

	(1) ML	(2) ML	(3) ML
Dummy for % of community deaths is > average	0.426***		
	(0.105)		
Dummy for ACLED record of attack		0.456***	
		(0.172)	
# Attacks recorded by ACLED			0.029***
			(0.008)
Soil quality index	0.268**	0.294**	0.182
	(0.132)	(0.126)	(0.131)
HH grew cash crops before the war	0.189***	0.182**	0.209***
	(0.072)	(0.076)	(0.065)
HH owned livestock before the war	0.068	0.077	0.025
	(0.122)	(0.141)	(0.120)
NGO	0.182*	0.101	0.139
	(0.097)	(0.078)	(0.086)
Age	-0.002	-0.006	0.000
	(0.010)	(0.011)	(0.011)
Age^2	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Head is male	0.104**	0.110**	0.096*
	(0.053)	(0.050)	(0.052)
Years at school	0.027	0.024	0.031**
	(0.017)	(0.018)	(0.015)
HH size	0.009	0.015	0.004
	(0.015)	(0.014)	(0.014)
Current disputes	-0.179	1.216	0.036
	(1.145)	(1.054)	(1.059)
Density 2008	0.153	-0.005	0.100
	(0.135)	(0.145)	(0.114)
Suitable for coffee	0.186***	0.037	0.080
	(0.039)	(0.060)	(0.060)
Land Gini	-0.313*	-0.307*	-0.256
	(0.176)	(0.164)	(0.164)
Ethnic heterogeneity	0.002	0.004	0.003
	(0.003)	(0.003)	(0.003)
Ethnicity FE	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes
Observations	236	236	236

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1The first two columns present ML Logit estimates, marginal effects are reported. Dependent in column (1) is a dummy that is 1 if the percentage of community member that got killed as a result of violent clashes is above the average percentage killed. Dependent in column (2) is a dummy that is 1 if a violent attack between 1993 and 2003 has been recorded for that particular community within the ACLED database. Dependent in column (3) uses the number of attacks recorded by PRIO during the entire period of war since 1993. Suppressed community variables include distance variables to: nearest market, health center, drinking water provision, and provincial road.