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### **A Phoenix in Flame ? Portfolio Choice and Violence in Civil War in Rural Burundi.**

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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. While there is an emerging macroeconomic consensus that wars are detrimental to development, we find contrasting microeconomic evidence. 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 subjective welfare evaluations. We interpret this in the light of similar recent micro-level evidence that points to post-traumatic growth effects after (civil) warfare. Our results are confirmed across specifications as well as in robustness analyses.

**Keywords:** Civil war, investment, post-traumatic growth

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## 1. Introduction

The incidence and consequences of shocks in developing countries is 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 (Easterley and Levine, 1997), adverse geographic conditions (Sachs and Warner, 1997), (pre)colonial legacies (Bertocchi and Canova, 2002; Nunn, 2004) and underdeveloped institutions (Acemoglu *et al.*, 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 household 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 Cote d' Ivoire declined by one third to one half when households faced adverse agricultural conditions; Carter and Maluccio (2003) report that a increase in losses (ranging from family deaths to crop failures) leads to a 10 percent decrease in childrens' nutritional status for households in the KwaZulu-Natal province; and Baez and Santos (2007) find that Hurricane Mitch affected childrens' nutritional status and more than doubled their labor force participation. Reduced human capital formation clearly has persistent life-time 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 and Dorosh, 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 et al., 1998; Kochar, 1999; Udry, 1995). 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-term 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 *et al.*, 2003; Harrower and Hoddinott, 2004; Kochar, 1999;).

Only recently scholars have turned to analyzing the impacts of shocks of civil war. Civil wars have obvious immediate negative economic impacts in terms 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 *et al.*, 2003; Bodea and Elbadawi, 2008; Ghobarah *et al.*, 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 twenty 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) 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 you do not experience them yourself, 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 *et al.*, (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 e.g. Bellows and Miguel (2009); Blattman (2008) and

Voors and Bulte, (2008). They for example 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. Microeconomic 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 say, weather related shocks or illness 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. The paper is organized as follows. Section 2 discusses income portfolios in Burundi. Section 3 describes fourteen years of civil warfare in Burundi. Section 4 and 5 present the data, the estimation strategies, results as well as our handling of issues of endogeneity. In section 6 we provide robustness checks and section 7 concludes.

## **2. Portfolio choice and income diversification in Burundi**

Diversification of income sources in developing countries now seems more the norm than the exception. Few households generate their income from a single source of assets, or use their assets in only one activity. Reasons for farmers to diversify stem from “push” factors including diminishing returns to land or labor, limited access to markets, ex-ante risk management or coping with shocks (see e.g. Reardon, 1988; Reardon, 1996). On the other hand diversification may be induced by “pull” factors including increased public goods provision providing for better access to markets, new (agricultural) policies, or agricultural extension services providing for better inputs and increased knowledge (Morduch, 1995). Diversification induced by the former is often associated with low risk low return activities (see e.g. Dercon 1998). 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). Of course, engaging in multiple activities does not imply a reduction in risk *per se*. Risk can be increased from moving from a single ‘safe’ activity to a mixture of riskier activities depending on whether ‘pull’ or ‘push’ factors are the (main) reason to diversify. In practice, the distinction between pull and push factors might not be easily made as both factors could come into play simultaneously. The focus should thus be on those activities that require a clear trade-off

between higher (lower) risk and higher (lower) expected profits. In this study, risky income activities constitute income from cash crops. 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 many other crops, not less than 3 years of waiting is required before coffee trees produce berries that can be harvested and sold. *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). 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, Kangasniemi (1998) found that farmers prefer to grow bananas over beans because 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 most valued trees, the household members want to keep an eye on potential thieves. There are few things as easy as cutting of a branch of bananas to provide for instant food supplies. Neither tea nor tobacco is of major importance, but if grown its only for the purpose of selling it abroad, therefore they are included as well. 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 (i.e., yields from (cash) crops typically cannot be kept in stock for multiple years without at least processing the produce). 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 FNL and FDD rebel movements were often involved in indiscriminate and disproportionate use of violence against civilians resulting in injury or death. Observations by Human Rights Watch 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 feeling 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.*

In some cases people were killed by knives 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 et al., 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 et al., 2005). We return to this point in the analysis below.

## 4. Data

### 4.1 The Burundi Household Priority Survey

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 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 programme 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) sampled in 1998. In each village or cluster we then interviewed all households that were part of the 1998 sample (10 per cluster).<sup>4</sup> 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. 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

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<sup>4</sup> 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.

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% 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 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 average income shares are presented. The share of income from cash crops (coffee + banana beer) in overall income has declined from 13% in 1998 to 8% in 2007.

<<Insert Tables 1A & 1B>>

#### **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 sub-sample 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.<sup>5</sup> At the end of the day however, people base decisions on their own experiences of war or violent events that happened within their own community, not because national accounts are affected by warfare. 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 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.

<<Insert Table 2>>

## 5. Empirical strategy

### 5.1 Cross-section models

We start our analysis by examining farmer's production decisions exploiting the cross-sectional variation in violence. We believe that community level violence is

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<sup>5</sup> The Bertelsmann Stiftung 2006 country report for Burundi 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*".

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 individuals' 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 over reporting 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 on the fraction of community members affected by war-related violence (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 %. 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, column (7) includes distance to Bujumbura as an additional control. The endogeneity test in section 5.3 reveals a negative significant relation between violence intensity and distance to the capital. Here we show with our data that distance has no direct effect on cash crop farming, other than through violence. Section 5.3 substantiates this result by providing arguments why there is no selection effect. 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%. 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.

**<<Insert Table 3A & 3B>>**

In Table 4 we present conditional income shares from export crop production. We also report a positive effect of community level violence income shares from

export sales.<sup>6</sup> Export farmers that live in areas suitable for coffee have larger shares. We also find that current population pressure is positively related to income shares from cash 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 et al., (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). Results are not shown but available upon request.

**<<Insert Table 4>>**

## **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

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

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. Rather, successive attacks seem to result from the idea that violence begets violence. That being said, 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 warfare. Using difference-in-differences allows us to do so. The effect of war versus peace will be reflected in the time dummy for the year in which the second wave took place. A positive value reflects positive effects of times of war compared to the years at peace. Analogously, a negative value confirms expectations about the overall destructive effects of the war. The interaction of the time dummy with the violence measure will reveal the effect of first-hand violence exposure on post-war economic outcomes. 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. Weather shocks are an obvious candidate but climatic conditions in Burundi are widely dispersed and shocks of this kind display a lot of variation across communities. We can thus easily control for them in the panel regressions as we did before in the cross-sections. We fit conditional logit estimates to investigate changes within households with respect to cash crop farming activities. We report conditional logit estimates in Table 6. This is simply Conditional Maximum Likelihood, 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 a export or cash crop farmer conditional on  $y_1 + y_2 = 1$ . The sample however 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).<sup>7</sup> 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 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).

<<Insert Table 5 >>

### 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 Kruger, 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 prewar population density. We find none of the variables to be significant. Column (2) presents the results for our preferred

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<sup>7</sup> Outcomes are similar using the full sample in a random effects specification (see Appendix 2 for results of the RE models).

measure of community level violence that is used throughout the paper. None of the variables is statistically significant except the distance to the capital which is negatively correlated with the intensity of violence. This is unsurprising given that the bulk of rebel activities were concentrated in provinces close to the capital. This is the case for Cibitoke, Mwaro, Muyinga, Kayanza, Ngozi, and Gitega for which we have data as well, as for Bujumbura rural and Bubanza for which we do not have data. Export farming however is unlikely to be concentrated close to Burundi's capital, Bujumbura.<sup>8</sup> 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.

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 risk and investment compared to those who left the village. We believe that our community data permit us to mitigate this concern. We do two things. *First*, we include the fraction of households that permanently left the village before 1998. The intuition is that households who left are likely to have been the more adventurous type. This assumption makes is plausible in the context of Burundi, where the stakes are high. Population pressure is extremely high (well over 300 people per square km, only second to Rwanda as being the most densely populated country in Africa) and land rights are often not clearly defined. Leaving your land then consequently means giving up everything without knowing what, if anything would be available at the reception site. From our community survey we know the fraction of people that left. If we find a significant positive (negative) correlation between the fraction that left and the

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<sup>8</sup> In table 3A we showed that the distance to the capital does not explain the share of income derived from export crops.

intensity of attacks, our measure of community level violence might proxy for having a more risk averse (risk loving) population. A positive correlation would not bother us as this would in fact argue *against* the selection effect that could drive the positive correlation between violence and risky income generating activities. A negative correlation would on the other hand be a reason for concern. This would imply more risk seeking households were left in the violent areas compared to the non-violent ones; households that were more likely to grow cash crops anyhow (even though we control for initial conditions). *Secondly*, we include the fraction of 1993 refugees that have returned to their communities. The idea here is analogous to the one above. Villages with high fractions of returned refugees (the more “adventurous” types) 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. Both variables are far from being significant. This provides confidence in the idea that the distribution of risk attitudes is the same in both the violent as well as the non-violent areas. Column (3) in Table 7 further shows that (visible) wealth such as cash crops, and cattle ownership had no effect on the % 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 other ethnic group. 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.<sup>9</sup> 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 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 that 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, yet as argued before, this is the most we can do.

<<Insert Table 6>>

## 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 the 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 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 other types of shocks. The pre-war control for export crop farming is a strong predictor for farming export cash crops now. This result is at odds with the conventional idea that farmers revert back to subsistence agriculture, once hit by a shock. Male household heads are also more likely to grow high value export

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

cash crops, confirming standard results that men rather than women control these crops.

<<Insert Table 7>>

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.

<<Insert Table 8>>

Secondly, we use different dependent variables, to examine if the positive results of community level violence extend to investments in the more general sense.<sup>10</sup> 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. 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 agro-forestry arguably have a more public good character than improved seeds and fertilizer). Subsequently we investigate to impact of violence on household total wealth,

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<sup>10</sup> 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.

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% increase in schooling expenditures (which then amounts up to about half a US dollar per household per 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 and 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 yourself as extremely poor by 0.4 percent (at mean levels).

The number of (prewar) 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 wellbeing than other mitigates the possible concern that omitted variables, and not violence exposure are driving the result.

**<<Insert Table 9>>**

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 over-report. *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, Linke and Hegre (2009). 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.

**<<Insert Table 10>>**

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**

The paper demonstrates that contrary to the conventional idea that wars are “development in reverse” war can change people’s paradigms and leave them less myopic than before. Using three unique household and community samples from Burundi we find that households exposed to high levels of violence 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 although results are confined to the cross-sectional models. Effects for individual level violence are not robust across specifications. We however cannot be sure that self-reporting of household level violence may correlate with household characteristics that also explain its decision to grow coffee or bananas. Moreover, other evidence from reports including those of Human Rights Watch, suggests that individual level violence is likely to be severely underreported in our data. Given that communities in Burundi are small and isolated, everyone has one way or the other been affected by violence, although perhaps not directly. We argue that the mere witnessing of extreme acts of violence is sufficient to induce behavioral changes, possibly not in an emotional sense, but merely practically when making decisions about e.g. farming practices. We 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. Regressing our violence indicator on a set of pre-war and time-invariant controls does not provide us with a single predictor that could explain the occurrence of violence in a particular village and that is plausibly related to cash crop farming or durable investments. Using the panel component of our data for the period 1998-2007 we examine to what extent households make different decisions during peacetime compared to when in war

and attempt to disentangle an overall effect of warfare and that of first-hand violence experience. Using a household –and year fixed effects specification we find that households exposed to violence in their community are more likely to have become export farmers by 2007 than others. Even when households may have been affected prior to 1998 and responded accordingly, we would then expect to find no effect rather than a strong positive one. These positive responses are unlikely to be a result from rushed in aid projects after the war (which are naturally most often found in the worst affected areas) as our NGO variable controls for that. Also, the fact that the time dummy in the panel models is negative and significant suggests that the mere effect of going-on war (and possibly other developments) indeed has negative consequences, but is also suggestive of something different going on in areas that are particularly hard hit by the violence. We also show that farmers' behavior is largely unresponsive to other type of covariate shocks, including droughts, floods and plant diseases, but even to idiosyncratic shocks that may influence labor supply such as sickness and imprisonment. The most recent sample we use has been collected in March and April 2009 as part of an experimental economics research project. Additional survey questions provided us with crucial information regarding pre-war socio-economic variables as well as respondents' ethnic origins. The first part of the robustness check shows that including these variables and replicating the cross-sectional models for the smaller sample does not change the results. In the second part we check for possible selection in reporting incidents of violence using objective measures of violence from PRIO. 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) and invest more in soil improvement techniques with public good characteristics. Although speculative, this might point to increased community cohesion as a result from the war that makes people more willing and able to invest in public goods like schools and profitable cash crops through e.g. joint insurance or increased sense of safety (if you trust your neighbor he will keep an eye on your coffee trees while you're elsewhere you may be more inclined to

invest in them). 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. Perhaps as a result, they feel better off than others as they systematically perceive to be better off than others even though “objective” current wealth indicators do not confirm this difference. This may lend tentative support to the existence of post-traumatic growth effects after civil warfare.

With this paper we have attempted to show how the conflict in Burundi affects farmers’ decision-making. Using a wide range of specifications and three waves of unique household and community level data we find that people exposed to violence invest more, are more likely to get involved in cash crop farming (both for domestic as well as export crops) and hold larger conditional income shares from (export) cash crops than others. These results confirm experimental evidence from the same data as recently shown by Voors et al., (2009) providing 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. We speculate that social cohesion has increased as a result of the common traumatic incidence of war which might lead farmers to increase public goods such as schools that hopefully provides for a more prosperous future generation, increase trust and rely more on their fellow villagers for joint insurance or simply for being a “friendly watch-dog” and hence induce more risky investments. 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. The wars in Uganda and Mozambique were fought for different reasons and had a distinctly different character than the war in Burundi. The results are however not necessarily at odds with the broader macro-economic consensus that wars are detrimental for development. The negative time dummy in our panel models reflect an overall economic downturn during the war and the net, aggregate, national effect may hence well be negative. 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' postwar development paths.

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**Table 1a** Share of households deriving income from a particular source

<i>Income derived from:</i>				
	All years (%)	1998 (%)	2007 (%)	Direction of $\Delta$
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

<i>Share derived from:</i>				
	All years (%)	1998 (%)	2007 (%)	Direction of $\Delta$
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

**Table 2** Summary statistics

Year of survey	1998 and 2007		2007		2009	
	Mean	(SD)	Mean	SD	Mean	(SD)
<b>Panel A: Household characteristics</b>						
Age (yrs)	46.55	(15.87)			48.65	(14.52)
Years at school (yrs)	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 employs soil improvement techniques					0.83	(0.38)
HH invests in high level soil improvement techniques					0.18	(0.39)
≥ 1 HH member was a trad. authority before the war					0.28	(0.45)
HH monetary income ( <i>log</i> )	7.41	(2.57)				
Perceived current wealth (with 1=wealthy and 6=poor)			4.8	(1.0)	4.8	(0.95)
<b>Panel B: village characteristics</b>						
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 (%) <sup>11</sup>					87.68	(14.69)

<sup>11</sup> Model results all report the effect of ethnic heterogeneity.

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 provincial road	3.34	(1.66)	3.48	(1.84)
Distance to nearest bus stop	3.22	(1.48)		
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)
Rainfall (mm/yr)			1213.75	(202.6)
Density ( <i>log</i> ) 1990			5.46	(0.49)
Density ( <i>log</i> ) 2008			5.71	(0.45)
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)	
<b>Panel C: War shocks</b>				
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)
Fraction of abandoned HH			0.03	(0.06)
PRIO (ACLED) dummy for attack			0.20	(0.40)
PRIO (ACLED) # attacks			2.19	(4.49)
<b>Panel D: Other village level shocks</b>				
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)

VARIABLES	(1) ML	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML	(7) ML
HH attacked (%)	0.007*** (0.002)	0.006*** (0.001)	0.009*** (0.002)	0.009*** (0.003)	0.009*** (0.002)	0.009*** (0.002)	0.008*** (0.003)
Individual attack				0.014 (0.039)			
Age			0.007 (0.007)	0.007 (0.007)	0.007 (0.007)	0.007 (0.007)	0.007 (0.007)
Age <sup>2</sup>			-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*** (0.036)	0.132*** (0.036)	0.131*** (0.036)	0.130*** (0.036)	0.136*** (0.036)
Years at school			0.014* (0.008)	0.014* (0.008)	0.014* (0.008)	0.014* (0.008)	0.014* (0.008)
NGO			0.124* (0.067)	0.125* (0.067)	0.126* (0.067)	0.125* (0.067)	0.122* (0.069)
HH size			0.014 (0.011)	0.014 (0.011)	0.015 (0.011)	0.013 (0.011)	0.015 (0.011)
Suitable for coffee			0.127** (0.060)	0.126** (0.061)	0.129** (0.060)	0.126** (0.061)	0.106 (0.066)
Density 2008			0.278*** (0.076)	0.279*** (0.076)	0.278*** (0.077)	0.277*** (0.076)	0.262*** (0.076)
Land Gini			0.100 (0.165)	0.101 (0.166)	0.101 (0.164)	0.101 (0.165)	0.096 (0.162)
Current disputes			0.622 (0.408)	0.623 (0.411)	0.604 (0.404)	0.621 (0.409)	0.587 (0.422)
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 ( <i>log</i> )							-0.119 (0.097)
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	100	872	798	798	798	798	798

*Notes:* Clustered standard errors in parentheses.

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

Maximum Likelihood Logit estimates. Marginal effects reported, valued at the mean. Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and provincial road.

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

VARIABLES	(1) ML	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML
HH attacked (%)	0.005*** (0.002)	0.005*** (0.001)	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)
Individual attack				-0.005 (0.043)		
Age			0.007 (0.007)	0.007 (0.007)	0.008 (0.007)	0.007 (0.007)
Age <sup>2</sup>			-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Head is male			0.135*** (0.046)	0.135*** (0.046)	0.133*** (0.046)	0.126*** (0.046)
Years at school			0.011 (0.010)	0.011 (0.010)	0.013 (0.010)	0.011 (0.010)
NGO			0.032 (0.055)	0.032 (0.054)	0.039 (0.054)	0.034 (0.055)
HH size			0.020* (0.012)	0.020* (0.012)	0.022* (0.012)	0.020* (0.012)
Suitable for coffee			0.130 (0.081)	0.130 (0.080)	0.134* (0.079)	0.122 (0.083)
Density 2008			0.110* (0.059)	0.110* (0.058)	0.113* (0.058)	0.112* (0.059)
Land Gini			-0.262** (0.133)	-0.263** (0.133)	-0.265** (0.133)	-0.267** (0.131)
Current disputes			0.518* (0.281)	0.517* (0.281)	0.503* (0.272)	0.520* (0.283)
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)
Regional FE	No	Yes	Yes	Yes	Yes	Yes
Observations	100	872	798	798	798	798

Notes: Clustered standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Marginal effects reported, valued at the mean. Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and provincial road.

**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*** (0.0005)	0.002*** (0.0006)	0.002*** (0.0006)	0.002*** (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 <sup>2</sup>	-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

The shock variables are multiplied with an indicator variable that is 1 if the household grows cash crops in 2007. Suppressed community variables include distance variables to: nearest market, health center, drinking water provision and provincial road.

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

	(1)	(2)	(3)	(4)	(5)
	ML	ML	ML	ML	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 <sup>2</sup>		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 (0.397)	0.052 (0.404)	0.155 (0.416)	0.051 (0.386)
Flood				0.305 (0.547)	
Droughts				0.590 (0.448)	
Plant diseases				0.106 (0.496)	
Dummy for $t=2$	-2.207*** (0.404)	-2.401*** (0.515)	-2.515*** (0.532)	-4.177*** (1.257)	-2.441*** (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		ED		
	Violent attacks (0/1)	HH attacked (%)	HH attacked (%)	HH member attacked	HH member violently killed
Years at school	0.012 (0.051)	0.006 (0.013)	0.046 (0.029)	0.010 (0.020)	-0.003 (0.021)
Age	-0.010 (0.009)	0.000 (0.002)	-0.003 (0.004)	0.003 (0.003)	0.007* (0.004)
Head is male	0.166 (0.302)	0.070 (0.076)	0.009 (0.181)	0.141* (0.080)	0.121 (0.088)
Respondent is Tutsi				0.208 (0.177)	-0.022 (0.207)
Respondent is Hutu				0.294** (0.121)	0.052 (0.247)
HH grew cash crops before the war			0.104 (0.117)	-0.027 (0.094)	-0.081 (0.123)
HH owned cattle before the war			-0.083 (0.192)	-0.121 (0.084)	-0.038 (0.096)
HH member was a traditional authority before the war			0.127 (0.159)	0.088 (0.089)	0.067 (0.106)
Ethnic heterogeneity			0.002 (0.002)		
Suitable for coffee	0.099 (0.155)	-0.043 (0.035)	0.082 (0.077)		
Fraction of 1993 returned refugees			0.055 (0.161)		
Fraction of abandoned			-2.325		

HH			(1.510)		
Distance to Bujumbura (log)	-0.137	-0.114***	-0.221**		
	(0.170)	(0.040)	(0.092)		
Density 1990 (log)	0.100	-0.006	-0.178*		
	(0.106)	(0.027)	(0.088)		
Fraction votes for Ndadaye			0.002		
			(0.002)		
Constant		0.635**	1.767**		
		(0.305)	(0.819)		
Regional/Village FE	Yes	Yes	Yes	Yes	Yes
Observations	95	95	33	199	141

Notes: Clustered standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Models (1) (4) and (5) are Maximum Likelihood Logit estimates. Marginal effects reported,  
valued at the mean. Model (2) and (3) is estimated using OLS.

**Table 7** Cross section models for victimization and export cash crops including pre-war controls  
(ED)

VARIABLES	(1) OLS	(2) ML	(3) ML	(4) ML	(5) ML	(6) ML	(7) ML
HH attacked (%)	0.009*	0.008***	0.010**	0.010**	0.010**	0.009*	0.010**
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
Individual attack					0.066		
					(0.062)		
Soil quality index				0.053	0.048	0.094	0.078
				(0.169)	(0.160)	(0.206)	(0.159)
HH grew cash crops before the war				0.213***	0.212***	0.220***	0.229***
				(0.067)	(0.066)	(0.081)	(0.067)
HH owned cattle before the war				0.071	0.072	0.052	0.087
				(0.150)	(0.146)	(0.146)	(0.144)
NGO			0.039	0.053	0.049	0.079	0.083
			(0.099)	(0.093)	(0.091)	(0.109)	(0.109)
Age			-0.002	-0.006	-0.007	-0.006	-0.006
			(0.011)	(0.011)	(0.011)	(0.012)	(0.011)
Age <sup>2</sup>			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***
			(0.051)	(0.054)	(0.053)	(0.055)	(0.046)
Years at school			0.017	0.025	0.023	0.023	0.022
			(0.015)	(0.017)	(0.017)	(0.018)	(0.017)
HH size			0.022*	0.009	0.008	0.008	0.014
			(0.012)	(0.015)	(0.015)	(0.016)	(0.016)
Current disputes			-0.889	-0.534	-0.608	0.366	-0.350
			(1.154)	(1.128)	(1.140)	(1.525)	(1.017)
Density 2008			0.312**	0.249	0.260	0.262	0.258
			(0.156)	(0.188)	(0.188)	(0.196)	(0.175)
Suitable for coffee			0.053	0.020	0.003	0.035	0.043
			(0.066)	(0.065)	(0.065)	(0.060)	(0.067)
Land Gini			0.051	-0.125	-0.140	-0.099	-0.152

			(0.271)	(0.226)	(0.222)	(0.218)	(0.228)
Ethnic heterogeneity				0.005	0.006	0.006	0.003
				(0.004)	(0.004)	(0.005)	(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)
Constant	0.135						
	(0.107)						
Ethnicity FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35	250	236	236	236	236	236

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

VARIABLES	(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 <sup>2</sup>	-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 expenditures ( <i>log</i> )	(2) Soil improvement	(3) Household income ( <i>log</i> )	(4) Perceived wealth
HH attacked (%)	0.033** (0.016)	0.004* (0.002)	0.034 (0.021)	-0.004** (0.002)
Soil quality index	-0.589 (0.526)	0.013 (0.063)	0.135 (0.507)	0.052 (0.072)
HH grew cash crops before the war	-0.164 (0.432)	0.089** (0.045)	1.008*** (0.324)	-0.080** (0.038)
HH owned cattle before the war	0.171 (0.491)	-0.029 (0.032)	1.204** (0.481)	-0.025 (0.061)
NGO	0.819** (0.345)	0.040 (0.116)	0.175 (0.436)	0.050 (0.048)
Age	0.103 (0.068)	0.005 (0.009)	0.007 (0.081)	0.004 (0.011)
Age <sup>2</sup>	-0.001* (0.001)	-0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)
Head is male	-0.246 (0.384)	0.037 (0.039)	1.332*** (0.458)	-0.019 (0.054)
Years at school	0.139** (0.067)	-0.001 (0.009)	0.228** (0.093)	-0.024 (0.016)
HH size	0.579*** (0.084)	-0.012 (0.013)	0.077 (0.098)	-0.036** (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 Maximum Likelihood (ML). Marginal effects are reported. Suppressed (fixed) community variables include distance variables to: nearest market, health center, drinking water provision and provincial road. Dependent in model (3) is the log of total monetary monthly household income. Model (4) is an ordered logit model estimated with Maximum Likelihood. 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

VARIABLES	(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** (0.132)	0.294** (0.126)	0.182 (0.131)
HH grew cash crops before the war	0.189*** (0.072)	0.182** (0.076)	0.209*** (0.065)
HH owned livestock before the war	0.068 (0.122)	0.077 (0.141)	0.025 (0.120)
NGO	0.182* (0.097)	0.101 (0.078)	0.139 (0.086)
Age	-0.002 (0.010)	-0.006 (0.011)	0.000 (0.011)
Age <sup>2</sup>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Head is male	0.104** (0.053)	0.110** (0.050)	0.096* (0.052)
Years at school	0.027 (0.017)	0.024 (0.018)	0.031** (0.015)

HH size	0.009 (0.015)	0.015 (0.014)	0.004 (0.014)
Current disputes	-0.179 (1.145)	1.216 (1.054)	0.036 (1.059)
Density 2008	0.153 (0.135)	-0.005 (0.145)	0.100 (0.114)
Suitable for coffee	0.186*** (0.039)	0.037 (0.060)	0.080 (0.060)
Land Gini	-0.313* (0.176)	-0.307* (0.164)	-0.256 (0.164)
Ethnic heterogeneity	0.002 (0.003)	0.004 (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. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The first two columns present Maximum Likelihood 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.

## **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*** (0.009)	0.042*** (0.009)	0.040*** (0.009)	0.042*** (0.010)	0.041*** (0.009)
Individual attack			0.139 (0.235)		
Age <sup>2</sup>		-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Head is male		0.578*** (0.204)	0.576*** (0.204)	0.576*** (0.204)	0.579*** (0.204)
Years at school		0.035 (0.034)	0.035 (0.034)	0.036 (0.034)	0.035 (0.034)
HH size		0.151*** (0.048)	0.151*** (0.049)	0.153*** (0.049)	0.150*** (0.049)
NGO		0.316 (0.240)	0.332 (0.242)	0.383 (0.248)	0.316 (0.240)
Flood				0.115 (0.339)	
Drought				0.274 (0.267)	
Plant diseases				0.017 (0.296)	
Dummy for $t=2$	-2.259*** (0.260)	-2.411*** (0.283)	-2.437*** (0.288)	-3.101*** (0.755)	-2.421*** (0.286)
Sickness					0.001 (0.003)
Prison					0.021 (0.228)
Constant	0.130 (0.107)	-1.388** (0.657)	-1.374** (0.659)	-1.381** (0.658)	-1.391** (0.658)
Observations	1744	1724	1724	1724	1724
Number of hhid	872	872	872	872	872