

# **H i C N** Households in Conflict Network

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## The Long-Term Effects of Conflict on Welfare: Evidence from Burundi<sup>+</sup>

Marion Mercier,<sup>1</sup> Rama Lionel Ngenzebuke,<sup>2</sup> Philip Verwimp<sup>3</sup>

### HiCN Working Paper 198

This draft: September 2015

*Abstract:*

Based on an original three-wave panel data for Burundi, allowing to track individuals from 1998 to 2012 and to compute a local measure of exposure to violence during the whole civil war, we investigate the effects of the conflict on poverty dynamics. We put forward a significant positive correlation between violence exposure and various measures of deprivation at the household level, which turns out to persist until 2012 - 7 years after the conflict termination. Moreover, we find that the adverse effect of the war on welfare mostly stems from poor households whose chances to pull through are significantly and durably reduced when they experienced violence. Violence exposure thus seems to have trapped these households into chronic poverty, while we do not find significant evidence of violence exposure affecting non-poor households' likelihood to fall into poverty.

*JEL classification:* C81, I32, O12, O15, N47.

*Keywords:* Deprivation, Poverty dynamics, Civil war, Panel data, Burundi.

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<sup>+</sup> The authors gratefully acknowledge financial support of the FNRS/FRFC (Fond National de la Recherche Scientifique/Fonds de la Recherche Fondamentale Collective). We also wish to thank Bram de Rock, Veronique Gille, Marion Leturcq, Francois Maniquet, Francisco Pino, Martin Ravallion, and the participants of the PrRESP Summer School of July 2015, for helpful discussions.

<sup>1</sup> Marion Mercier: ECARES, Universite Libre de Bruxelles; DIAL - IRD; IZA, Bonn. E-mail: [mercier@dial.prd.fr](mailto:mercier@dial.prd.fr)

<sup>2</sup> Rama Lionel Ngenzebuke: SBS-EM, ECARES and CERMI, Universite Libre de Bruxelles. E-mail: [ngenzerama-jlionel@yahoo.fr](mailto:ngenzerama-jlionel@yahoo.fr)

<sup>3</sup> Philip Verwimp: SBS-EM, ECARES, Universite Libre de Bruxelles. E-mail: [philip.verwimp@ulb.ac.be](mailto:philip.verwimp@ulb.ac.be)

# 1 Introduction and historical background

After a peak in the early nineties following the end of the Cold War and a decline thereafter, global conflict numbers have increased again since 2010 (see ACLED data (Raleigh et al., 2010), 2015 version). From 1946 to 2012, the world has witnessed more than 250 civil wars, civil conflicts have kicked off every year in 1 to 2% of countries, and have lasted 4 years on average (Simon Fraser University, 2013). Civil wars affect as various outcomes as poverty, institutions, human capital and economic growth, which are also potential factors of risk for the reoccurrence of conflict. Improving knowledge on the consequences of wars, identifying and understanding the various effects of conflicts and their persistence over time, thus appears as a key challenge for economic sciences to enlighten post-conflict policy making and the management of conflict risk.

This paper investigates the legacies of violence on poverty, adopting a micro-level approach with data on Burundi. The civil war in Burundi started in 1993, following the assassination of the country's first democratically-elected president, Melchior Ndadaye, three months after his arrival in power. This murder triggered brutal attacks by Hutu groups followed by retaliation by the Tutsi-dominated army. The conflict, initially concentrated in the north-western parts of the country, soon spread toward the northeastern, central and southern provinces. The whole country was concerned by violence, but at different degrees and at different times, until 2005 (United Nations, 1996; Bundervoet, Verwimp, and Akresh, 2009; Chrétien and Mukuri, 2002). Between 1993 and 2005, the conflict eventually left over 300,000 Burundians dead and displaced 1.2 million people (Ngaruko and Nkurunziza, 2000).

The consequences of civil wars have received increasing attention from the economic literature over the recent years. On the macro side, the literature notably shows that civil wars cause steep short-run fall in output (Cerra and Saxena, 2008), massive destruction of capital (Annan et al., 2006) and outflows of mobile capital (Collier, Hoeffler, and Pattillo, 2004). It is less clear how these effects persist over time, and especially how the disruption of institutions and technology, as well as the political and economic uncertainty that follow a conflict, endanger the post-war recovery predicted by the neoclassical growth model (Blattman and Miguel, 2010).

On the micro side, it is manifest that civil wars have disastrous effects in the short-run, notably

on life quality and on human capital. Direct exposure to violence, property destruction, fear and lack of trust, and the interruption of many daily activities such as schooling, all have consequences on post-war individuals' behaviors and outcomes. However, here again, little is known about the persistence of these effects (Blattman and Miguel, 2010). A recent and dynamic strand of the literature investigates this persistence and points out durable legacies of exposure to war. To date, it has mostly focused on human capital, notably health (Alderman, Hoddinott, and Kinsey, 2006; Bundervoet, Verwimp, and Akresh, 2009) and education (Shemyakina, 2011).

This paper aims at contributing to this micro-economic literature by analyzing the long-term impact of exposure to violence on household-level poverty, relying on three waves of panel data collected in Burundi between 1998 and 2012. The panel dimension of the data as well as the local-level measure of violence that they provide create a rare opportunity to investigate the consequences of violence exposure at the micro level in the context of a poor economy.

Two major challenges arise when trying to assess the long-run legacies of violence. *First*, violence is generally not random. Both on the macro and on the micro side, poor post-war macroeconomic performances and micro-level outcomes could reflect the prevailing conditions that triggered violence in the first place. In particular, the literature has identified poverty and slow growth among the factors that boost the likelihood of conflict onset (Fearon and Laitin, 2003), while they are also likely to be exacerbated by violence itself. Similar endogeneity concerns are omnipresent regarding political and institutional settings, which may both shape the risk of conflict and be affected by the experience of war. *Second*, assessing the persistence of the effects of violence requires observing long-term data, something that is rare in post-conflict settings. In a micro-economic perspective, investigating accurately the long-run consequences of violence necessitates the ability to track individuals and individual-level outcomes over longer periods.

The data that we rely on combine major advantages regarding these methodological concerns. Their first value-added is their long-time longitudinal dimension. Indeed, while the Burundi civil war broke out in 1993 and lasted until 2005, three waves of a nationwide survey have been conducted between 1998 and 2012. In the two first rounds, retrospective questions were asked about local violence exposure over the previous years (from the start of the civil war in 1993 onwards). This

makes it possible to compute the degree of exposure to the conflict at the locality level starting from 1993 and over the whole period that followed.

Moreover, as extensively argued by Voors et al. (2012), standard factors of greed and grievance are poorly explanatory of the pattern of violence in Burundi. Militia attacks (either from the army or from the rebels), indiscriminately brutal and random, affecting the entire country and causing profound fear among the whole population reflect more accurately what happened (Uvin, 1999; Krueger and Krueger, 2007; HumanRightsWatch, 1998). In such a setting, local-level exposure to violence has been shown to be near-exogenous to household characteristics and local economic conditions (Voors et al., 2012). To complement these qualitative and quantitative results, we rely on data from 1990 (ISTEEBU, 1993) and from 1998 (Voors et al., 2012) to investigate the determinants of violence exposure at the level of the localities in Table 9 in the Appendix. The results provide suggestive evidence that pre-war socio-economic conditions were exogenous to the subsequent intensity of violence. Indeed, no systematic correlation appears between, on the one hand, the number of war-related casualties (deaths and wounded) from 1993 to 2007 (and by sub-period) and, on the other hand, the prevailing socio-economic characteristics of the localities. Combined with the previous literature, this result allows to be more confident over the fact that it is possible to exploit the timing and intensity of local exposure to violence to assess the effect of conflict on household welfare and poverty dynamics in Burundi, and that the risk that the estimated effects will be driven by the non-randomness of violence or ‘selection into violence’ is low.

Finally, households were tracked from one wave of the survey to the other: it is thus possible to re-build the history of households’ split-offs over a fifteen-year period without ‘losing’ those who created their own household and/or migrated within the country.

The remainder of the paper is structured as follows. Section 2 presents the survey and data at hand, and gives an overview of poverty in Burundi over the period of analysis. Section 3 and 4 then display the empirical results, respectively on the link between exposure to violence and deprivation, and on the long-run dynamics of poverty. Section 5 concludes.

## 2 An overview of poverty in Burundi between 1998 and 2012

### 2.1 The Three-round Panel Priority Survey

We rely on a fifteen-year panel with three rounds of data collection, 1998, 2007 and 2012. In 1998, with support from the World Bank, The Government of Burundi undertook a study named “Enquête Nationale sur les Conditions de Vie de la Population”. The “Institut de Statistiques et d’Etudes Economiques du Burundi” (ISTEEBU), Burundi’s national institute of statistics, conducted the underlying LSMS-type survey, named Priority Survey (henceforth 1998 PS). The sample of this household survey consisted of 6,668 households, living in 391 randomly selected rural and urban survey sites.<sup>1</sup>

In 2007, an academic research team, in cooperation with ISTEEBU, undertook a Panel Priority Survey (henceforth 2007 PPS) in Burundi. The goal of the project was to examine the impact of violence on the economic activity choices and welfare outcomes of Burundian households. The 2007 PPS was designed as a second wave of the 1998 PS, which was the most recent dataset containing complete socio-economic and agricultural information. The 2007 PPS returned to 100 randomly selected rural survey sites from the baseline sample of 1998, and targeted to re-interview 1,000 rural households from the original sample. Additionally, households that were formed between 1998 and 2007 by members of the 1998 original households were tracked. They are called “split-off” households.

A total of 874 original households and 534 split-off households were tracked and re-interviewed. The final sample of the 2007 PPS thus consists of 1,408 rural households. In 2012, a household survey was designed as the third round following the 1998 and 2007 PPS ones, allowing to build a three-wave panel and follow the evolution of households’ consumption pattern relying on fully comparable questions. Out of the 1,408 rural households surveyed in 2007, 1,263 were found and re-interviewed in 2012, i.e. a resurvey rate of 89.7%. As in 2007, the 2012 wave was conducted by an experienced interviewers team, with a 5-day training on the questionnaire, a pilot test, and close supervision of the field work. The team leader, the local survey manager as well as several

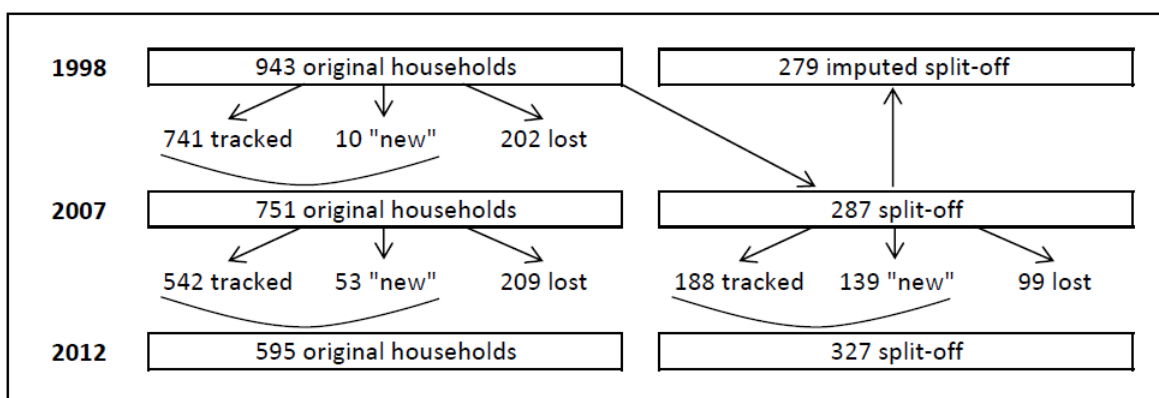
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<sup>1</sup>In the rest of the paper, we use the generic term “locality” to refer to these survey sites.

interviewers were the same in 2007 and 2012.

The empirical analysis displayed hereafter relies on the sample of households for which data on consumption as well as socio-economic and demographic characteristics introduced as control variables are available. Figure 1 describes the composition of this sample, year by year, and distinguishing original and split-off households.

Figure 1: **Sample under study.**



From one round of the survey to the next one, the so-called *tracked* households are those which are present in our sample both at time  $t$  and at time  $t+1$ . Conversely, *lost* households are present in our sample at time  $t$ , but not anymore at time  $t+1$ . This can be due to two reasons: either because they were not interviewed at time  $t+1$  (pure attrition), or because they were interviewed at time  $t+1$  but exhibit missing observations for one (or more) of the variables that we introduce in the analysis. The nature and potential consequences of the attrition issue are investigated in Section 2.3. The last category of households, that we call “*new*” households, are those which have been interviewed but which are not in our sample at time  $t$  because they exhibit missing observations for one (or more) of the variables of our specification, while they enter again the sample at time  $t+1$ . Finally, in 1998, we attribute to split-off households the characteristics of the original household from which they emanate, if the latter are available. This is what we call *imputed* split-off in Figure 1.

To make the different statistics and results presented along the paper more easily comparable, and consistent with each other, we will show them over the set of households which end up in the

sample used in the empirical analysis, as described in Figure 1. These are thus the households which were not only observed, but also for which all the information on the socio-economic and demographic characteristics accounted for in the analysis is available.

## **2.2 Measuring welfare**

### **2.2.1 Valuing household consumption**

In each round of the survey, in an identical module, interviewees were asked about their consumption of a range of food and non-food items. For each food item, respondents declared the quantity consumed by their household over the last seven days in the unit of their choice,<sup>2</sup> and the price per unit on the local market. To compute the nominal value of households' food consumption, we first express all the quantities consumed in kilograms (or liters). We then compute household-level prices per kilograms (or liters) for each item, which allow us to calculate country-level median prices. We eventually use these prices to compute the total value of households' food consumption per month, that we express per adult equivalent. In the absence of market price data, we have to use the information declared by the households which may contain important measurement errors notably if respondents do not accurately remember the price. Taking the median of declared prices, instead of using for each household the price that it declared, allows to mitigate this issue.

The total value of households' consumption is finally the sum between households' food consumption, valued with the vector of country-level median prices, and non-food consumption. The value of the latter is directly derived from the expenditures declared in the questionnaire. Non-food consumption is priced using households' declarations because, as opposed to food items, it is not possible to derive country-level median prices for non-food items such as 'clothing' or 'cell phones': indeed, households declare the total amount spent for each category without specifying a quantity.

### **2.2.2 Poverty line**

We compute the poverty line relying on the cost of basic needs method (Ravallion, 1994, 1998; Ravallion and Bidani, 1994), according to which poverty is "a lack of command over basic con-

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<sup>2</sup>Including quantity bought, produced, and received as gift.

sumption needs, and the poverty line the cost of those needs” (Ravallion and Bidani, 1994). This minimal level of consumption must encompass food and non-food consumption.

To estimate the food component of the basic consumption needs, we specify a consumption bundle deemed adequate to satisfy physical needs in terms of caloric value, and we then estimate its cost. The composition of the basket of goods is derived from the food consumption of the 50% households which have the lowest level of total consumption per month and per adult equivalent. We then calculate the caloric value of the average basket of goods that these households consume, and re-scale it so as to reach the caloric requirement considered as minimum in the context of Burundi (namely, 2,500 calories per day and per adult equivalent (Minecofin, 2002)), without changing the proportions of the different items of the basket. This allows us to derive a basket of goods that exactly corresponds to 2,500 calories per day per adult equivalent, and that is consistent with the consumption habits and preferences of the 50% poorest households. The food component of the poverty line is the value of this basket expressed in local currency and based on the vector of country-level median prices computed as explained above.

Estimating the minimal non-food requirements is trickier than estimating the minimal food requirements in the absence of an equivalent to caloric intake for non-food consumption. To compute the non-food component of the poverty line, we follow Bundervoet (2006) and Verwimp and Bundervoet (2009). Based on the previously cited literature, and using the first waves of the panel data that we rely on, they estimate the share of non-food spending of Burundian households whose total level of consumption is very close from the food poverty line. These households could exactly fit their caloric needs, but instead of doing so they decide to sacrifice a part of their food consumption in favor of non-food consumption. Eventually they do not fulfil their minimal caloric requirements, thus it is arguable that their non-food expenditures correspond to what they consider as absolutely necessary. We use the food share that they estimated for the Burundi context (namely, 82%) to derive the non-food component of the poverty line based on the food component computed as explained above. In the end, the poverty line equals the addition between the food and non-food components, and the household’s poverty status is determined by the difference between its monthly consumption per adult equivalent and the poverty line.



### 2.3 Attrition

The overall re-contact rate of the survey was of 87.4% between 1998 and 2007 and of 89.7% between 2007 and 2012, which can be considered as a success given the time laps of respectively 9 and 5 years between each round and the widespread nature of the violence that affected the country between the first and the second wave. Still, as displayed in Figure 1, a certain number of households are lost from one wave of the panel to the next one – either because they were not re-contacted, or because they were re-interviewed but exhibit missing data for our variables of interest. Such an attrition could bias the results, in particular if households which exit the sample have specific characteristics which are correlated either with consumption or with violence exposure. To document this issue, we provide the results of two different tests in the Appendix.

Table 10 first shows the tests of differences of means between households which are tracked and households which exit the sample from one wave of the panel to the next one. These tests are ran over the socio-economic and demographic characteristics of the households; the measure of local exposure to violence, namely the number of war-related casualties in the locality (deaths and wounded); and the different dependent variables investigated in the empirical analysis that follows. More precisely, three variables are relied on to capture households' deprivation. First, the level of monthly consumption (expressed in logarithm). Second, the household's poverty status (computation method described in Section 2.2). Last, the rank of the household, computed by ranking the sample from the poorest household (rank equal to 1) to the richest one.

Second, Table 11 displays the results of Probit estimations testing for selective attrition. They are performed, respectively, on the sample of 1998 (Columns (1) and (2)) and on the sample of 2007 (Columns (3) and (4)). The dependent variable is a dummy equaling one if the household remains in the sample of the subsequent wave, i.e. in 2007 for Columns (1) and (2), and in 2012 for Columns (3) and (4).

These two tests suggest that some socio-economic and demographic characteristics are significantly associated with the probability to be tracked. In particular, households which were more numerous at time  $t$ , as well as households whose heads were younger at time  $t$ , are significantly more likely to be tracked at time  $t+1$ . To a lesser extent, the occupation of the household head

and his gender also turn out to be correlated with the likelihood to exit the sample. These results confirm the importance of controlling for socio-economic and demographic characteristics in the analysis.

Turning to the violence variables, it appears that households which exit the sample between 1998 and 2007 were living in 1998 in areas that had been on average slightly less exposed to violence between 1993 and 1998, but not significantly differently exposed between 1998 and 2007. On the other hand, no significant correlation appears between violence exposure (during the two sub-periods) and the probability to exit the sample in 2012. Finally, the t-tests do not reveal any significant difference in terms of consumption, share of poor, and average ranking between households which stay and households which exit the sample, neither in 2007 nor in 2012. However, the multivariate analysis suggests that households which exit the sample in 2007 had a slightly lower level of consumption in 1998, as compared to tracked households. The differences between households which remain in the sample and households which exit have to be kept in mind when interpreting the empirical results.

## 2.4 Descriptive statistics

Figure 2 displays the evolution of households' monthly expenditures per adult equivalent (deflated and expressed in Burundi Franc (BIF) in 1998 prices) between 1998, 2007 and 2012, distinguishing original and split-off households. Note that this Graph is computed based on the sample under study (as displayed in Figure 1).<sup>3</sup> In 1998 (first round of survey), there are no split-off households yet since split-off households were formed between the first two rounds. The average original household spends, per month and adult equivalent, 7,052 BIF in 1998, 7,232 BIF in 2007 and 11,640 BIF in 2012. On the other hand, split-off households consume on average 8,363 BIF per month in 2007 and 9,088 BIF per month in 2012. Monthly expenditures have thus undergone a clear upward trend, for both types of households, which has been much more pronounced between 2007 and 2012 than between 1998 and 2007 as far as the original households are concerned.

Table 1 presents the first-, second- and third-degree Foster-Greer-Thorbecke poverty mea-

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<sup>3</sup>Computing this Graph over the whole sample yields comparable results. Results available upon request.

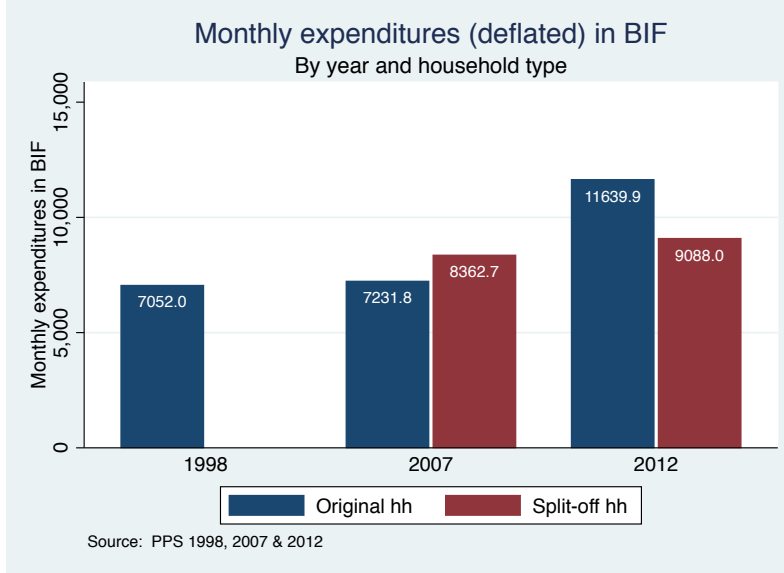


Figure 2: **Monthly expenditures in BIF, deflated.**

sures (Foster, Greer, and Thorbecke, 1984), by household type and over time. For a continuous expenditure distribution, the FGT-index is given by:

$$P_{\alpha} = \int_{i=1}^z \{((z - y_i)/z)^{\alpha} f(y)\} dy \quad (1)$$

where  $z$  and  $y$  are, respectively, the poverty line and amount of expenditures. For  $\alpha = 0$  and 1, the index measures, respectively, the prevalence of poverty (poverty headcount) and the intensity of poverty (poverty gap), while for  $\alpha = 2$  it provides a measure of the poverty severity (Ravallion, 1992; Bigsten et al., 2003). Again, Table 1 focuses on the sample of households under study in the analytical section.

Overall, around 69% of the sample are poor households in 1998. The headcount ratio slightly decreases afterward, to reach a bit less than 68% in 2012. While we observe almost constant headcount poverty over fifteen years, there is a clear upward increase in the poverty gap (from nearly 31% in 1998 to nearly 39% in 2012) and poverty severity (from 18% in 1998 to more than 26% in 2012), which goes with an increase of inequalities. Indeed, the Gini index consistently increases over time, for both original and split-off households (see Table 12 in the Appendix).

The poverty profile is different by household type, i.e. across original and split-off households.

*First*, while the prevalence of poverty among original households is around 71% and 69% in 2007 and 2012, respectively, split-off households fare better with around 65% of them deemed as poor in 2007 and 2012. Poverty is thus more severe among original households, although the difference between the two groups goes slightly decreasing between 2007 and 2012 since the share of poor original households decreases more than the share of poor split-off households. *Second*, although the poverty gap and poverty severity follow an upward trend for both original and split-off households, poverty is deeper and more severe among original households. Taken together with Figure 2, these results are consistent with inequality having increased relatively more among original households than among split-off households (see Table 12 in the Appendix for Gini indexes by type of household and year).

Table 1: **Poverty by household type and year.**

Type of HH	Statistics	Year		
		1998	2007	2012
All	# of HH	943	1,038	922
	Headcount ratio	69.14	68.98	67.68
	Poverty gap	30.91	36.14	38.89
	Poverty severity	18.00	23.29	26.49
Original	# of HH		751	595
	Headcount ratio		70.57	69.41
	Poverty gap		37.84	40.10
	Poverty severity		24.81	27.50
Split-off	# of HH		287	327
	Headcount ratio		64.81	64.53
	Poverty gap		31.67	36.71
	Poverty severity		19.33	24.66

*Source:* PPS 1998, 2007 & 2012. *Note:* There is no split-off household in 1998 since it was the first round of survey.

In the course of the time span of our panel, some households fall into poverty whereas others escape from it. The poverty states of a household at two consecutive points in time are not independent. Table 2 shows the state-transition matrices that map the changes in welfare, i.e. movements in and out poverty. Panel A of Table 2 is the poverty state-transition matrix between 1998 and 2007. Nearly 59% of the non-poor households in 1998 fall into poverty by 2007, while poor households in 1998 are more likely to remain into poverty as less than 28% of them escape

poverty. Panel B of Table 2 maps the poverty state-transition matrix between 2007 and 2012. It shows that that less than 44% of non-poor households in 2007 remain non-poor in 2012. Among poor households in 2007, there are less than 25% to escape poverty by 2012. Last, Panel C of Table 2 presents the transition matrix over the 1998-2012 time span, and shows that less than 38% of non-poor households in 1998 are still non-poor by 2012, while nearly 71% of poor households in 1998 remain poor by 2012.

Table 2: **Poverty transition matrices between 1998, 2007 and 2012.**

<b>Panel A. Transition matrix 1998-2007.</b>			
	<b>Poverty status in 2007</b>		
<b>Poverty status in 1998</b>	Non Poor	Poor	Total
Non Poor	41.26	58.74	100.00
Poor	27.54	72.46	100.00
Total	31.17	68.83	100.00

<b>Panel B. Transition matrix 2007-2012.</b>			
	<b>Poverty status in 2012</b>		
<b>Poverty status in 2007</b>	Non Poor	Poor	Total
Non Poor	43.91	56.09	100.00
Poor	24.80	75.20	100.00
Total	30.82	69.18	100.00

<b>Panel C. Transition matrix 1998-2012.</b>			
	<b>Poverty status in 2012</b>		
<b>Poverty status in 1998</b>	Non Poor	Poor	Total
Non Poor	37.93	62.07	100.00
Poor	29.16	70.84	100.00
Total	31.50	68.50	100.00

*Source:* PPS 1998, 2007 & 2012.

Another angle to view the poverty dynamics among households is to look at the distribution of households at the lens of a threefold poverty status over the whole fifteen-year period. With three points in time and two possible states (poor or non-poor) each time, each household falls exclusively into one of eight possible combinations. Table 3 gives the distribution of the households over these eight combinations. Column (1) displays this distribution for all the households whose poverty status is observed in 1998, 2007 and 2012 (namely, 1,223 households). In the empirical analysis that follows (see Section 4), we investigate the determinants of this threefold poverty status

relying on the subsample of households whose poverty status is observed in 1998, 2007 and 2012, but also whose socio-economic and demographic characteristics are observed in 1998. There are 996 such households. Column (2) of Table 3 displays the distribution by threefold poverty status of the households of this subsample.

Roughly speaking, the distribution by threefold poverty status is comparable between the two samples. Over the period, there are only as few as 6% of households which have never been poor. On the other hand, around 39% of the households are in chronic poverty (i.e., always poor) during the same time span. The remaining 55% are households to which we broadly refer as “switchers”: across the three points in the panel, they are one time poor (non-poor) and two times non-poor (poor), regardless of the sequence of the switch.

Table 3: **Threefold poverty status in 1998, 2007 & 2012.**

Threefold status	(1)	(2)
	Number of HH (%)	
	Whole sample	Subsample
Non Poor & Non Poor & Non Poor	76 (6.21)	58 (5.82)
Non Poor & Non poor & Poor	72 (5.89)	62 (6.22)
Non Poor & Poor & Non Poor	59 (4.82)	50 (5.02)
Non Poor & Poor & Poor	119 (9.73)	102 (10.24)
Poor & Non Poor & Non Poor	116 (9.48)	83 (8.33)
Poor & Non Poor & Poor	148 (12.10)	117 (11.75)
Poor & Poor & Non Poor	162 (13.25)	132 (13.25)
Poor & Poor & Poor	471 (38.51)	392 (39.36)
Total	1,223 (100)	996 (100)

*Source:* PPS 1998, 2007 & 2012.

### 3 Violence exposure and deprivation

The descriptive statistics displayed in Section 2.4 suggest that, over the period under study, the incidence of poverty has remained rather stable in aggregate, while its severity has deepened and transitions in and out of poverty have been numerous. Table 4 displays the average level of consumption, prevalence of poverty, and rank<sup>4</sup> of the households in each of the three survey waves, distinguishing households which have been exposed to violence and households which have not.

<sup>4</sup>Households' rank is computed by ranking the sample from the poorest household (rank equal to 1) to the richest.

The dummy variable used to build the groups of exposed and non-exposed households equals one if at least one war-related casualty was counted over the past in the area where the household lives, and zero otherwise.

Table 4: **Violence exposure and deprivation – Differences of means.**

		Not exposed to violence	Exposed to violence	Difference
<i>Panel A: 1998</i>	Consumption (in log)	8.696	8.347	0.349*** (0.057)
	Poverty	0.656	0.811	-0.155*** (0.035)
	Rank	845.8	642.1	203.8*** (33.92)
	<i>Number of households</i>	<i>726</i>	<i>217</i>	<i>943</i>
<i>Panel B: 2007</i>	Consumption (in log)	8.555	8.367	0.188*** (0.063)
	Poverty	0.660	0.745	-0.085*** (0.030)
	Rank	703.9	618.9	85.01*** (25.95)
	<i>Number of households</i>	<i>670</i>	<i>368</i>	<i>1,038</i>
<i>Panel C: 2012</i>	Consumption (in log)	8.623	8.470	0.154** (0.078)
	Poverty	0.656	0.716	-0.061* (0.032)
	Rank	626.5	580.7	45.72* (24.21)
	<i>Number of households</i>	<i>598</i>	<i>324</i>	<i>922</i>

Significance of the difference between exposed and non-exposed households using a paired t-test. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1. Standard errors in parentheses.

Violence exposure measures the number of casualties in the locality. It is computed over the past, i.e. between 1993 and 1998 for Panel A, and between 1993 and 2007 for Panels B and C. Note that the differences are comparable in size, and generally more strongly significant, if we do not only focus on the sample that will be relied on in the subsequent empirical analysis but rather consider the whole available sample (results available upon request).

Households exposed to violence over the past exhibit a significantly lower average level of consumption in the subsequent years. Moreover, while no violence is observed between 2007 and 2012, households exposed to violence before 2007 and households not exposed still exhibit a significant difference in terms of consumption in 2012, thus suggesting that the decrease in welfare associated with violence exposure is persistent over time. The group of exposed households consistently gathers a significantly larger share of poor in 1998, 2007 and 2012. This difference is very clear in 1998 and in 2007, and becomes statistically weaker in 2012. The same is true when considering the rank variable: the rank of exposed households is on average smaller than the rank of non-exposed households, which suggests that they suffer from a larger relative deprivation that persists over

time, but this difference goes attenuating in 2012.

We investigate further the correlation between violence exposure and households' deprivation over time in a multivariate setting by estimating Equation (2):

$$Y_{i,j,t} = \alpha_1 + \gamma_1 X_{i,t} + \delta_1 ViolenceExposure_{j,t-1,t} + \varepsilon_{i,j,t}, \quad (2)$$

with  $i$  indexing households,  $j$  indexing localities, and  $t$  indexing time periods. Index  $t$  can take three values: 1998, 2007 and 2012. We investigate different dependent variables  $Y_{i,j,t}$  to capture different aspects of deprivation:

1. *Consumption* is the level of monthly consumption per adult equivalent, expressed in deflated BIF (in 1998 prices), and *Consumption growth* is its growth rate from time t-1 to time t. The method of computation of the level of consumption is presented in Section 2.2. These two variables provide information on the global level of welfare of the households under study.
2. *Poverty status* is a dummy variable equal to one if the household's monthly consumption per adult equivalent is below the poverty line, and zero otherwise. The method of computation of the poverty line is presented in Section 2.2. This variable provides information on the level of deprivation of the household with respect to the food and non-food requirements considered as minimal in the context of Burundi.
3. *Rank* is computed by ranking the sample from the poorest household (rank equal to 1) to the richest one. It provides information on the relative level of deprivation of the household with respect to the rest of the sample. We also investigate *Delta rank*, the difference between the household's rank at time t and its rank at time t-1, to capture the progression of the household within the sample. To complement this variable, we use the dummy *Ascending households* that equals one if the household saw its rank in terms of consumption improve from one wave to the next one.

We are interested in the correlation between (these various measures of) deprivation and the exposure to war over the past. More precisely,  $ViolenceExposure_{j,t-1,t}$  indicates the number of



casualties in locality  $j$  between 1993 and 1998 (respectively, between 1998 and 2007 and between 2007 and 2012<sup>5</sup>) in 1998 (respectively, in 2007 and in 2012).

Finally, we introduce the following vector  $X_{i,t}$  of control variables, measured for household  $i$  at time  $t$ :

- The number of members,
- The age of the household's head,<sup>6</sup>
- A dummy indicating whether the head of the household is a woman,
- A dummy indicating whether the head of the household has some education,
- Two dummies capturing the occupation of the head of the household: agriculture with at least one exportation culture, and non agricultural occupation (agriculture with no exportation culture being the omitted category),
- A dummy indicating whether the household migrated between two waves. This variable is based on the *commune* of residence, which is the third degree of territorial disaggregation in Burundi (the territory being composed of *sous-collines*, *collines*, *communes*, and *provinces*).<sup>7</sup>
- A dummy indicating whether the household is a split-off.<sup>8</sup>
- Last, we introduce the interaction between *Violence exposure* and *Split-off* to capture the potential heterogeneity of the impact of the war on welfare across the two categories of households.

For each dependent variable, three econometric specifications are estimated. As argued in Section 1, the location of violent events during the Burundi civil war was mostly unrelated to pre-war

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<sup>5</sup>Note that the number of casualties between 2007 and 2012 is always equal to zero.

<sup>6</sup>Alternatively, we ran all the estimations displayed below controlling for the average age of household's members. These two variables being significantly and strongly correlated (coefficient of correlation of 72%), we do not include them at the same time, but the results prove to be remarkably stable when we replace the head's age by the average age (results available upon request).

<sup>7</sup>The *Migrant* dummy thus does not consider as migrants households which moved within the same *commune*. The rationale behind this choice is based on the context under study, movements within the same *commune* being frequent (including on a temporary basis) and difficult to accurately capture in the data.

<sup>8</sup>Note that, by construction, this variable is always equal to zero in 1998.

economic conditions, and as such we are confident over the fact that households living in exposed localities did not have ex-ante specific characteristics making them subsequently exhibit specific consumption patterns. However, once violence occurs, people do react to it and they may adapt their behaviour in a way that depends on household-level characteristics. The time-varying control variables introduced in Equation 2 capture part of these characteristics. As a first, naive, approach, we estimate Equation 2 using OLS and controlling for province dummies. Second, we estimate Equation 2 with household fixed effects. This allows ruling out all the time-invariant household-level characteristics that affect consumption patterns. In this setting, we estimate the within-household correlation between violence exposure and consumption pattern over time.<sup>9</sup> Alternatively, we exploit the tracking dimension of the data to introduce original household (rather than household) fixed effects. In this setting, we estimate the correlation between violence exposure and consumption pattern, over time, within each original household but across the different households that emanate from it (i.e., still the household of origin composed of the remaining members, plus all the split-off households).

The results are displayed in Table 5 (Columns (1) to (3) for *Consumption*, Columns (4) to (6) for *Consumption growth*, Columns (7) to (9) for *Poverty*) and Table 6 (Columns (1) to (3) for *Rank*, Columns (4) to (6) for *Delta rank*, Columns (7) to (9) for *Ascending household*).

Focusing first on the socio-economic and demographic variables, it turns out that all six dependent variables are significantly correlated with the number of members: bigger households tend to consume less (per adult equivalent), to be poorer and to see their welfare decrease faster as compared to smaller households. Households headed by an older person appear to be characterized by a slightly higher average level and growth of consumption, but the significance of this coefficient disappears when household or original household fixed effects are introduced. Households headed by a woman are worse off on average, and they see their welfare decrease faster than the others. On the other hand, households whose head has some education tend to be richer (the significance of this coefficient being weaker when we rely on within-households variations). Households are

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<sup>9</sup>Note that, when the dependent variable is computed over two periods (i.e., *Consumption growth*, *Delta rank* and *Ascending household*), it is not possible to introduce simultaneously household fixed effects and the *Split-off* dummy, since the latter does not vary within households after 1998.

relatively better off when the head's occupation is not related to agriculture and, to a lesser extent, when the head is involved in at least one culture of exportation (as opposed to households whose head's main occupation is agriculture without any exportation culture). Finally, no correlation between the *Migrant* dummy and the six welfare variables appears to be statistically robust across the different econometric specifications.

Turning to the variable of interest, the results of Tables 5 and 6 reveal a significant correlation between violence exposure in the past and subsequent deprivation, that is quite robust to the use of alternative outcomes and of different econometric specifications. Indeed, households living in exposed areas in the past are characterized by lower level and growth of consumption, by a higher likelihood of being poor, and by lower level and variation of their rank within the sample. The point estimates suggest in particular that a 100 increase in the number of casualties in the locality is associated with a 12 percent decrease in a household's level of consumption, and with a 3% percent increase in its likelihood to be poor.

The specificity of split-off households is tricky to analyze in this setting, since deciding to split-off from the original household could well be a strategy endogenous to violence exposure. The results of Tables 5 and 6 suggest that split-off households tend to be worse off on average, while the coefficient associated with the interaction between *Split-off* and *Violence exposure* generally has the sign opposed to the coefficient of *Violence exposure*. Taken together, these results could indicate that split-offs emanate from relatively poorer households, and that the negative effect of exposure to war on welfare is mitigated for them. This supports the idea of splitting-off as a coping strategy, but should be taken with caution in the absence of a proper strategy accounting for the endogeneity of splitting-off.<sup>10</sup>

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<sup>10</sup>One of the authors of this paper is preparing a separate analysis of the determinants of household splitting in Burundi.

Table 5: Violence exposure and welfare over time – Part 1.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
	OLS	HH FE	Orig. HH dummies	OLS	HH FE	Orig. HH dummies	OLS	HH FE	Consumption growth	Orig. HH dummies	OLS	HH FE	Poverty	HH FE	Orig. HH dummies			
Number of members	-0.0739*** (0.00775)	-0.104*** (0.0129)	-0.0989*** (0.0153)	-0.0634*** (0.0133)	-0.145*** (0.0392)	-0.0944*** (0.0309)	0.0323*** (0.00420)	0.0412*** (0.00687)										
Head – Age	0.00285** (0.00129)	0.00221 (0.00231)	0.00259 (0.00230)	0.00610** (0.00238)	0.00857 (0.00817)	0.00692 (0.00493)	-0.000992 (0.000661)	-0.00183 (0.00115)										
Head – Female	-0.188*** (0.0500)	-0.306*** (0.0787)	-0.273*** (0.0950)	-0.129* (0.0688)	-0.493* (0.262)	-0.347* (0.176)	0.0605** (0.0232)	0.125*** (0.0417)										
Head – Educ	0.264*** (0.0347)	0.0740 (0.0550)	0.0662 (0.0585)	0.0730 (0.0532)	0.0249 (0.186)	0.0660 (0.120)	-0.113*** (0.0182)	-0.0645** (0.0301)										
Head – AgrExp	0.142*** (0.0410)	0.156*** (0.0576)	0.177** (0.0678)	0.0573 (0.0658)	-0.0255 (0.147)	0.0347 (0.154)	0.00369 (0.0168)	-0.00535 (0.0257)										
Head – NonFarm	0.436*** (0.0870)	0.250** (0.0973)	0.373*** (0.115)	0.253*** (0.0918)	0.381* (0.208)	0.460** (0.192)	-0.149*** (0.0358)	-0.0844 (0.0513)										
Migrant	-0.0851 (0.0900)	-0.129 (0.101)	-0.0581 (0.110)	-0.0672 (0.113)	-0.0677 (0.233)	-0.0168 (0.208)	-0.00457 (0.0369)	0.0131 (0.0431)										
Violence exposure	-0.00138** (0.000603)	-0.00119*** (0.000418)	-0.00125*** (0.000538)	-0.00480 (0.00310)	-0.0150* (0.00764)	-0.0140* (0.00738)	0.000351*** (7.71e-05)	0.000285*** (0.000108)										
Split-off	-0.0320 (0.0530)	-0.0361 (0.0895)	0.0205 (0.0874)	0.121 (0.0739)		-0.0609 (0.191)	0.00457 (0.0258)	-0.0847* (0.0460)										
Violence exposure x Split-off	-0.000883 (0.00189)	-0.00206* (0.00109)	-0.000512 (0.00191)	0.00728** (0.00366)	0.0106 (0.00843)	0.0106** (0.00523)	-0.000304 (0.00124)	0.000551 (0.00103)										
Constant	9.212*** (0.119)	8.965*** (0.135)	7.629*** (0.162)	-0.0290 (0.208)	0.466 (0.482)	-0.814** (0.385)	0.360*** (0.0558)	0.575*** (0.0730)										
Province dummies	Yes	No	No	Yes	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
Observations	3,182	3,182	3,182	1,955	1,955	1,955	3,182	3,182	1,955	1,955	3,182	3,182	3,182	3,182	3,182	3,182	3,182	3,182
R-squared	0.144	0.069	0.502	0.041	0.033	0.366	0.111	0.054	0.366	0.366	0.111	0.054	0.054	0.054	0.054	0.054	0.054	0.054
Number of HH	1,389	1,389	1,389	1,225	1,225	1,225	1,389	1,389	1,225	1,225	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389

Robust standard errors clustered at the level of enumeration sections in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

Head – Female equals one if the household head is a woman, zero otherwise. Head – Educ equals one if the household head ever went to school, zero otherwise. Head – AgrExp equals one if the household head's main occupation is agriculture with at least one exportation culture, zero otherwise. Head – NonFarm equals one if the household head's main occupation is not related to agriculture, zero otherwise. The omitted occupation is agriculture without exportation culture. Violence exposure measures the number of casualties over the previous period.

Table 6: Violence exposure and welfare over time – Part 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rank		Orig. HH dummies	OLS	Delta rank		Orig. HH dummies	Ascending household	
	OLS	HH FE	Orig. HH dummies	OLS	HH FE	HH FE	Orig. HH dummies	HH FE	Orig. HH dummies
Number of members	-39.64*** (3.689)	-53.50*** (6.010)	-50.26*** (6.826)	-24.69*** (5.614)	-53.31*** (17.84)	-37.51*** (13.04)	-0.0213*** (0.00595)	-0.0450** (0.0174)	-0.0398*** (0.0131)
Head – Age	-0.540 (0.639)	-3.160** (1.209)	-2.496* (1.276)	1.607 (1.036)	0.495 (3.782)	1.065 (2.305)	0.00120 (0.00102)	0.000902 (0.00365)	0.000810 (0.00213)
Head – Female	-97.52*** (20.07)	-183.5*** (34.08)	-151.4*** (37.50)	-34.65 (27.33)	-180.8* (105.3)	-112.8* (66.75)	-0.0332 (0.0289)	-0.157 (0.0978)	-0.114* (0.0656)
Head – Educ	109.2*** (14.94)	28.93 (25.04)	26.85 (26.80)	8.001 (22.86)	-11.62 (80.29)	23.65 (52.18)	0.0145 (0.0234)	0.0664 (0.0683)	0.0571 (0.0495)
Head – AgrExp	73.09*** (17.89)	83.81*** (26.40)	88.64*** (29.55)	19.42 (27.49)	-2.607 (60.89)	16.97 (60.18)	0.0238 (0.0307)	0.0406 (0.0604)	0.0348 (0.0618)
Head – NonFarm	180.0*** (34.55)	105.8** (46.34)	139.1*** (50.18)	72.95* (39.14)	180.0* (100.5)	158.5* (80.46)	0.0415 (0.0394)	0.211** (0.0910)	0.154** (0.0758)
Migrant	-52.59 (32.54)	-83.58** (40.33)	-56.13 (41.83)	-46.23 (50.33)	-52.74 (96.07)	-39.69 (83.37)	-0.0543 (0.0421)	-0.0637 (0.0957)	-0.0389 (0.0824)
Violence Exposure	-0.429** (0.185)	-0.427** (0.166)	-0.416* (0.211)	-0.471 (0.956)	-5.243** (2.018)	-4.124** (1.894)	-0.00122 (0.00208)	-0.00659* (0.00384)	-0.00648 (0.00396)
Split-off	-107.6*** (22.03)	-167.9*** (44.84)	-131.4*** (40.00)	76.79** (33.38)		-59.56 (80.64)	0.0334 (0.0315)		-0.120 (0.0728)
Violence Exposure x Split-off	0.197 (0.778)	0.282 (0.734)	0.653 (0.977)	2.774** (1.164)	4.953* (2.700)	4.149** (1.607)	0.00402 (0.00272)	0.00457 (0.00477)	0.00688** (0.00319)
Constant	1,168*** (55.64)	1,136*** (70.84)	642.2*** (83.66)	-112.4 (80.70)	216.0 (211.5)	-239.6 (173.6)	0.408*** (0.0827)	0.623*** (0.190)	0.144 (0.153)
Province dummies	Yes	No	No	Yes	No	No	Yes	No	No
Observations	3,182	3,182	3,182	1,955	1,955	1,955	1,955	1,955	1,955
R-squared	0.176	0.103	0.531	0.057	0.026	0.388	0.049	0.028	0.417
Number of HH	1,389	1,389	1,389	1,225	1,225	1,225	1,225	1,225	1,225

Robust standard errors clustered at the level of enumeration sections in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

Head – Female equals one if the household head is a woman, zero otherwise. Head – Educ equals one if the household head ever went to school, zero otherwise. Head – AgrExp equals one if the household head's main occupation is agriculture with at least one exportation culture, zero otherwise. Head – NonFarm equals one if the household head's main occupation is not related to agriculture, zero otherwise. The omitted occupation is agriculture without exportation culture. Violence exposure measures the number of casualties over the previous period.

## 4 The long-run dynamics of poverty

The previous results emphasize a negative correlation between exposure to the war and welfare (measured through different consumption-related variables) over time. This section aims at going further in the analysis of the consequences of violence in the long run, by investigating who mostly bears them and how they affect the patterns of transition into and out from poverty. The two empirical exercises displayed below investigate how households' initial characteristics and exposure to violence correlate with their subsequent likelihood to switch poverty status, i.e. become poor while they used to be non-poor and *vice versa*; and with their threefold poverty status, i.e. their status of poverty across the three periods. In this setting, the sample of analysis will gather the households for which all the control variables are available in 1998, and whose poverty status is available in 1998, 2007 and 2012.<sup>11</sup> There are 996 such households, among which 760 are original households.

Table 7 focuses on poverty status switches. It first analyses the likelihood to go out of poverty of households which were poor in 1998, by comparing those who remained in their initial poverty status to those who subsequently switched (regardless whether it happened in 2007 or in 2012). Over the 724 households which were poor in 1998, 332 (45.86%) became non-poor afterwards. The analysis is performed separately for original households (Column (1)) and for the whole sample (Column (2)), the dummy for split-off households and its interaction with violence exposure being controlled for in the latter case. Columns (3) and (4) display the symmetric analysis: they question the determinants of the likelihood to fall into poverty by comparing households which were non-poor in 1998 and who remained in the same poverty status in 2007 and 2012, to households which were initially non-poor but who fell into poverty in 2007 or in 2012. Over the 272 households which were non-poor in 1998, 214 (78.68%) became poor afterwards (either in 2007 or in 2012).

The control variables are measured in 1998, except the *Split-off* and *Migrant* dummies which are only observed afterwards.<sup>12</sup> Moreover, this specification allows to further distinguish violence

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<sup>11</sup>We do not restrict the sample to “purely tracked” households here, i.e. whose other characteristics are also available in 2007 and 2012. We only impose the socio-economic and demographic variables to be observed in 1998 and the poverty status to be observed at each period.

<sup>12</sup>More precisely, both dummies are always equal to zero in 1998.

Table 7: **Violence exposure by period and poverty status switches.**

	(1)		(2)		(3)		(4)	
	Out of poverty		Into poverty		Original HH		All	
	Original HH	All	Original HH	All	Original HH	All	Original HH	All
Number of members	-0.0124 (0.0102)	-0.00947 (0.00946)	0.00980 (0.0123)	0.0174 (0.0120)				
Head – Age	0.00372** (0.00169)	0.00212 (0.00147)	-0.000886 (0.00207)	-0.00173 (0.00201)				
Head – Female	0.00872 (0.0620)	-0.00577 (0.0500)	-0.0245 (0.0747)	-0.0127 (0.0733)				
Head – Educ	0.116** (0.0463)	0.0996** (0.0445)	-0.100* (0.0598)	-0.0795 (0.0573)				
Head – AgrExp	0.0101 (0.0551)	-0.0388 (0.0515)	-0.0435 (0.0778)	-0.0271 (0.0723)				
Head – NonFarm	0.0758 (0.0951)	0.0644 (0.0863)	-0.256** (0.112)	-0.207* (0.109)				
Migrant	-0.0194 (0.0612)	-0.0112 (0.0531)	-0.102 (0.0801)	-0.143* (0.0770)				
Violence exposure before 1998	-0.000165 (0.000228)	-0.000153 (0.000221)	3.94e-05 (0.000275)	0.000126 (0.000321)				
Violence exposure after 1998	-0.00350*** (0.00132)	-0.00271** (0.00111)	-0.00134 (0.00498)	-0.00166 (0.00483)				
Split-off		0.0879** (0.0441)		0.0118 (0.0832)				
Violence exposure before 1998 x Split-off		-1.62e-06 (0.000422)		0.000282 (0.000984)				
Violence exposure after 1998 x Split-off		0.00461* (0.00242)		0.00769 (0.00548)				
Constant	0.588*** (0.150)	0.643*** (0.141)	0.655*** (0.161)	0.669*** (0.153)				
Province dummies	Yes	Yes	Yes	Yes				
Observations	526	724	234	272				
R-squared	0.079	0.080	0.199	0.172				

OLS estimations. Robust standard errors clustered at the level of enumeration sections in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1

Head – Female equals one if the household head is a woman, zero otherwise. Head – Educ equals one if the household head ever went to school, zero otherwise. Head – AgrExp equals one if the household head's main occupation is agriculture with at least one exportation culture, zero otherwise. Head – NonFarm equals one if the household head's main occupation is not related to agriculture, zero otherwise. The omitted occupation is agriculture without exportation culture.

exposure over the first (1993 – 1998) and second period (1998 – 2007) of the war.

The vector of households' characteristics performs less well in explaining poverty status switches than the different dependent variables related to welfare investigated in Tables 5 and 6. This is likely to stem from the fact that we are here only controlling for initial characteristics (measured in 1998), while Tables 5 and 6 relied on the panel dimension of the data to document the joint evolution of, on the one hand, socio-economic and demographic characteristics, and, on the other hand, welfare. Still, the coefficients that are significantly correlated with the likelihood of poverty status switches are consistent with the results obtained in Tables 5 and 6. Notably, poor households whose head is educated are more likely to pull through, and non-poor households whose head is educated are less likely to fall into poverty. It also turns out that households whose head is older are slightly more likely to escape poverty, and that households whose head has a non-agricultural occupation as well as migrant households are slightly less likely to fall into poverty.

Turning to the violence exposure variables, three main results emanate from Table 7. *First*, it reveals an asymmetry in the effect of war on poverty switches, both over the sample of original households and over the whole sample. Indeed, while violence exposure appears to be strongly negatively correlated with the likelihood of poor households to become non-poor, it does not seem to significantly affect the probability of initially non-poor households to fall into poverty. Said differently, the results suggest that violence exposure traps initially poor households into poverty. Violence makes it more difficult for them to pull through, while we do not find any evidence that it makes non-poor households more likely to fall into poverty. Note that this result may have to do with the measures of poverty (based on consumption) and of violence (number of casualties) that we use here, none of them being asset-based. Indeed, one could imagine that non-poor households are disproportionately affected by violence through the destruction of their assets (while poor households rarely hold assets), and/or that non-poor households' coping strategies in front of a shock such as violence exposure are more related to selling assets than to sacrificing part of their daily consumption (we refer to Verwimp (2015) for further discussion on this).

*Second*, the table suggests that the effect of violence exposure on subsequent poverty switches channels through the recent period of the war (1998 – 2007), while poverty status switches do not



appear to be significantly affected by violence over the first period of the war (1993 – 1998).<sup>13</sup>

*Last*, the results of Column (2) provide additional suggestive evidence that splitting-off allows to mitigate the consequences of violence exposure on poverty. Indeed, split-off households which were poor in 1998 are both characterized by a larger likelihood to escape poverty than original households, and by a smaller impact of violence exposure on their probability to escape poverty.

To complement the analysis of poverty status switches, Table 8 displays a multinomial analysis focusing on households' long-term poverty status. Three long-term statuses are possible: permanent non-poverty (i.e. households which are non-poor in 1998, nor in 2007, nor in 2012), chronic poverty (i.e. households which are poor during the three periods of observation), and households which change poverty status at least once between 1998, 2007 and 2012. The latter is the chosen reference category (the “switchers”). Columns (1) and (2) show the results of the multinomial logit over original households, and Columns (3) and (4) over the whole sample, violence exposure being disaggregated by period and the split-off dummy and its interaction with exposure to war being controlled for in the last two columns. Again, the control variables (except the *Split-off* and *Migrant* dummies) are measured in 1998.

The various explanatory variables do not systematically have symmetric effects on the likelihoods to be permanently non-poor and to be chronically poor. On the one hand, initially larger households are both more likely to be chronically poor and less likely to be permanently non-poor than to change poverty status, and households with an educated head in 1998 are both less likely to be in chronic poverty and more likely to be in permanent non-poverty than to change poverty status. On the other hand, having a head who is not working in the agricultural sector in 1998 makes households more likely to be permanently non-poor on average than to change poverty status, but does not affect their likelihood to be in chronic poverty as opposed to change poverty status. Similarly, older heads make their households less likely to be chronically poor than to switch (as far as original households are concerned), but they do not have significantly different chances to remain permanently non-poor than to change poverty status. Finally, migrant households are

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<sup>13</sup>Note that this is re-assuring over the fact that attrition is not biasing our results, given that Tables 10 and 11 suggest that households which exit the sample had been differently exposed to violence before 1998 but not after 1998.

Table 8: Violence exposure by period and long-term poverty status.

<i>Multinomial logit.</i> <i>Reference = "switching" households.</i>	Origin households		All	
	(1)	(2)	(3)	(4)
	Permanent Non-Poor	Chronic Poor	Permanent Non-Poor	Chronic Poor
Number of members	-0.166** (0.0779)	0.151*** (0.0389)	-0.217*** (0.0754)	0.120*** (0.0362)
Head – Age	-0.00604 (0.0110)	-0.0122* (0.00630)	0.00576 (0.00941)	-0.00659 (0.00576)
Head – Female	-0.0583 (0.454)	0.149 (0.221)	-0.168 (0.408)	0.193 (0.183)
Head – Educ	0.969** (0.385)	-0.703*** (0.172)	0.891*** (0.339)	-0.611*** (0.166)
Head – AgrExp	-0.147 (0.511)	0.0744 (0.206)	-0.224 (0.450)	0.257 (0.199)
Head – NonFarm	1.273** (0.566)	-0.351 (0.355)	1.136** (0.504)	-0.273 (0.333)
Migrant	0.675 (0.470)	0.232 (0.245)	0.791** (0.394)	0.195 (0.206)
Violence exposure before 1998	-8.62e-05 (0.00319)	0.00154 (0.00115)	-0.00121 (0.00357)	0.00137 (0.00110)
Violence exposure after 1998	-0.0129 (0.0215)	0.0181*** (0.00640)	-0.00747 (0.0216)	0.0155*** (0.00554)
Split-off			-0.0696 (0.373)	-0.123 (0.174)
Violence exposure before 1998 x Split-off			-0.0376 (0.0298)	-0.000615 (0.00162)
Violence exposure after 1998 x Split-off			-0.0302 (0.0635)	-0.0227** (0.0113)
Constant	-0.472 (0.732)	-1.855*** (0.615)	-0.726 (0.671)	-1.955*** (0.533)
Province dummies	Yes	Yes	Yes	Yes
Observations	760	760	996	996

Robust standard errors clustered at the level of enumeration sections in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1  
Head – Female equals one if the household head is a woman, zero otherwise. Head – Educ equals one if the household head ever went to school, zero otherwise. Head – AgrExp equals one if the household head's main occupation is agriculture with at least one exportation culture, zero otherwise. Head – NonFarm equals one if the household head's main occupation is not related to agriculture, zero otherwise. The omitted occupation is agriculture without exportation culture. Violence exposure measures the number of casualties.

slightly more likely to be permanently non-poor than “switching” households, although they do not exhibit a significantly different likelihood to be in chronic poverty.

This asymmetry also appears regarding violence exposure. Households which suffered violence are not statistically significantly less likely to be permanently non-poor than to change poverty status, but households which suffered violence are significantly more likely to be chronically poor than to be “switchers”. Consistently with Table 7, the latter effect turns out to be driven by exposure to violence after 1998. Finally, the coefficient associated with the interaction between *Split-off* and *Violence exposure after 1998* in Column (4) is significantly negative, which suggests that the effect of exposure to war on the probability of being trapped into poverty is mitigated for split-off households.

## 5 Conclusion

Relying on rich panel data on Burundi, we analyze the correlation between violence exposure and poverty dynamics at the household level. Year-by-year data on war-related casualties at the local level allow us to account for exposure to war since the very beginning of the conflict in 1993, while three survey waves allow us to draw an overview of the evolution of poverty during fifteen years (from 1998 to 2012) among original (i.e., present in the first wave of the survey) as well as split-off households. To the best of our knowledge, this is the first paper that offers an analysis of the long-term effects of violence on welfare in Burundi.

The evolution and spread of the Burundi civil conflict has been shown by both historical and econometric analyses to be mostly exogenous to pre-war local economic conditions. This considerably attenuates the risk that the correlations that we observe between war exposure and poverty dynamics are driven by the endogenous location of brutal events – and thus that some household-level characteristics simultaneously determine the probability to be exposed and the subsequent consumption pattern.

We find that the incidence of poverty in Burundi has been almost constant between 1998 and 2012, while its severity – and, at the same time, inequalities – have increased. At the micro-level, we also observe a lot of descents into and escapes from poverty. This makes it even more crucial to

understand the dynamics of poverty in order to enlighten post-conflict recovery policies. It turns out that conflict exposure is significantly and positively associated with a range of measures of deprivation, and that this effect is persistent over time and still visible in 2012.

Moreover, the adverse effect of the war on welfare appears to have channeled mostly through poor households which, if exposed to violence, become less likely to escape from poverty. Violence exposure thus seems to have contributed to the development of poverty traps in post-conflict Burundi. Non-poor households do not appear to be subsequently significantly more at risk to fall into poverty when they experienced violence, at least as far as poverty is measured based on daily consumption. Last, the results also suggest that splitting-off from original households has allowed recent households to mitigate somehow the adverse effect of violence exposure on their welfare.

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# Appendices

Table 9: **The determinants of violence exposure.**

<i>Dependent:</i>	(1)	(2)	(3)	(4)
<i>Casualties</i>	1993 – 2007	1993 – 1998	1999 – 2007	
Distance to Bujumbura	-32.41 (32.77)	-27.62 (33.06)	-4.787 (4.319)	-4.490 (4.056)
Altitude	-144.2 (97.82)	-120.2 (98.88)	-24.04 (20.89)	-20.79 (18.42)
Literacy HHH – 1990	-0.230 (1.176)	0.118 (1.172)	-0.349 (0.259)	-0.433 (0.300)
Consumption (log) – 1990	-128.0 (82.21)	-123.0 (81.92)	-5.064 (6.344)	-5.280 (7.049)
Population density – 1990	0.0278 (0.0641)	0.0586 (0.0654)	-0.0309 (0.0186)	-0.0317* (0.0183)
Share votes Ndadaye – 1993	0.211 (0.304)	0.0984 (0.307)	0.112 (0.0679)	0.0780 (0.0517)
Literacy HHH – 1998				-0.0587 (0.0627)
Age HHH – 1998				-0.106 (0.112)
Sex HHH – 1998				-0.120 (0.0903)
Socioeconomic homogeneity – 1998				1.366 (1.151)
Constant	2,734** (1,209)	2,459** (1,204)	274.8* (151.5)	264.5* (143.1)
Observations	94	94	94	93
R-squared	0.124	0.105	0.188	0.229

OLS estimations. Robust standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . Literacy HHH measures the share of household heads who are literate. Consumption (log) measures the average yearly consumption. Share votes Ndadaye – 1993 measures the share of votes obtained by Melchior Ndadaye, the first democratically-elected president, whose assassination a few months after his arrival in power triggered the beginning of the war. Age HHH measures the average age of the household heads. Sex HHH measures the share of households headed by women. Distance to Bujumbura, Altitude, Population density – 1990, Share votes Ndadaye – 1993, and all the variables measured in 1998 are provided by Voors et al. (2012) at the level of the survey sites. Literacy HHH – 1990 and Consumption (log) – 1990 are provided by ISTEERBU (1993) at the province level.

Table 10: **Testing for selective attrition.**

<i>Characteristics in 1998</i>	Tracked in 2007	Drop out in 2007	Difference
Number of members	5.115	4.371	0.743***
Head – Age	40.36	50.97	-10.60***
Head – Female	0.220	0.347	-0.127***
Head – Educ	0.343	0.282	0.061
Head – AgrNoExp	0.312	0.361	-0.050
Head – AgrExp	0.605	0.520	0.085**
Head – NonFarm	0.084	0.119	-0.035
Violence exposure before 1998	32.96	17.40	15.57**
Violence exposure after 1998	3.233	2.064	1.169
Consumption (in log)	8.611	8.633	-0.022
Poverty status	0.696	0.673	0.023
Rank	795.4	812.1	-16.75
<i>Number of households</i>	<i>741</i>	<i>202</i>	<i>943</i>
<i>Characteristics in 2007</i>	Tracked in 2012	Drop out in 2012	Difference
Number of members	5.314	4.870	0.444***
Head – Age	42.25	42.78	-0.529
Head – Female	0.225	0.169	0.056**
Head – Educ	0.441	0.455	-0.013
Head – AgrNoExp	0.452	0.497	-0.045
Head – AgrExp	0.455	0.370	0.085**
Head – NonFarm	0.093	0.133	-0.040*
Migrant	0.092	0.101	-0.009
Violence exposure before 1998	34.55	28.07	6.477
Violence exposure after 1998	3.596	3.708	-0.112
Consumption (in log)	8.487	8.493	-0.006
Poverty status	0.685	0.701	-0.016
Rank	673.2	675.2	-1.925
<i>Number of households</i>	<i>730</i>	<i>308</i>	<i>1,038</i>

Significance of the differences using a paired t-test. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.



Table 11: **Testing for selective attrition - Probit estimations.**

<i>Dependent:</i>	(1)	(2)	(3)	(4)
<i>Drop out in...</i>	...2007		...2012	
Number of members	-0.100*** (0.0241)	-0.100*** (0.0241)	-0.0888*** (0.0212)	-0.0832*** (0.0244)
Head – Age	0.0260*** (0.00319)	0.0259*** (0.00318)	0.00673** (0.00339)	0.00769* (0.00449)
Head – Female	0.131 (0.138)	0.127 (0.137)	-0.470*** (0.143)	-0.453*** (0.145)
Head – Educ	0.0419 (0.131)	0.0353 (0.130)	-0.0373 (0.0777)	-0.0405 (0.0789)
Head – AgrExp	-0.0797 (0.147)	-0.0761 (0.146)	-0.0877 (0.101)	-0.0883 (0.101)
Head – NonFarm	0.426** (0.176)	0.432** (0.176)	0.170 (0.151)	0.168 (0.151)
Migrant			0.0833 (0.124)	0.0847 (0.124)
Split-off				0.0676 (0.152)
Violence exposure before 1998	-0.00126* (0.000728)	-0.00120* (0.000727)	-0.000519 (0.000456)	-0.000520 (0.000458)
Violence exposure after 1998		-0.00419 (0.00395)	0.00125 (0.00273)	0.00114 (0.00275)
Consumption (in log)	-0.141* (0.0768)	-0.143* (0.0770)	-0.0670 (0.0433)	-0.0674 (0.0431)
Constant	-0.0933 (0.774)	-0.0696 (0.774)	0.895* (0.462)	0.807 (0.543)
Province dummies	Yes	Yes	Yes	Yes
Observations	943	943	1,038	1,038

Robust standard errors clustered at the level of enumeration sections in parentheses.

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

Control variables are measured in 1998 in Columns (1) and (2), and in 2007 in Columns (3) and (4).

Table 12: **Gini coefficients by household type and year.**

Type of HH	Year		
	1998	2007	2012
All	0.360	0.485	0.613
Original HH		0.488	0.651
Split-off HH		0.473	0.521

*Source:* PPS 1998, 2007 & 2012.

*Note:* There is no split-off household in 1998 since it was the first round of survey.