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Rebel Recruitment in a Coffee Exporting Economy

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HiCN Working Paper 58

April 2009

Abstract: Recent literature in the political economy of civil war has pointed to the importance of (changes) in the economic environment for the understanding of conflict dynamics. Three channels, negative income shocks, the presence of exportable commodities and indiscriminate violence inflicted on one's community are considered as drivers of conflict. This paper studies these channels with a new fifteen-year panel of community level data on Burundi whose coffee sector is intimately intertwined with the civil war. We find that indiscriminate violence inflicted at the start of the civil war (1993) continued to affect recruitment throughout the entire civil war. We also find that decreases in the producer price of coffee increases recruitment. Aiming to distinguish the resentment aspect from the opportunity aspect in low producer prices, we perform robustness tests with different specifications and with year-province rainfall shocks affecting overall agricultural income, not just coffee. Results indicate that it is the opportunity cost mechanism that drives increased recruitment.

Keywords: Civil war, recruitment, indiscriminate violence, coffee, rainfall

JEL codes: C23 N37, N47

Acknowledgements: We would like to thank seminar participants at the Kennedy School of Government at Harvard University, the fourth HICN annual workshop at Yale University, the CRISE conference on Political Mobilisation and the 2009 CSAE conference both at Oxford University and the February 2009 Poverty Conference in Bujumbura for valuable comments. The data collection was financed by the MICROCON project (EU 6th Framework), the United States Institute of Peace and Wageningen University. All remaining errors are those of the authors alone.

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² Fund for Scientific Research (Flanders, Belgium), University of Antwerp

1 Introduction

The empirical analysis of the causes and consequences of civil war is the subject of study in a growing literature in economics and political science. Scholars have focused on incentives to join rebel movements, on the impact of war on economic growth, on the internal organization of rebel groups and on their strategies. Hafez (2003) and Kalyvas (2006) for example note that indiscriminate instead of targeted violence has generated rebellion in numerous countries. The intuition is as follows: unfair treatment causes anger which drives people who normally would not take up arms into the hands of insurgents (incumbents). Instead of deterring rebellion, indiscriminate violence may thus have the opposite effect. Since there is nothing civilians can do to stop indiscriminate violence it may be a rational choice to join the rebels as they may offer protection. In an environment of conflict, a key determinant of welfare for non-participants is the level of violence they will have to endure. Indeed, joining a military faction may be an important strategy individuals use to avoid the violence perpetrated by the opposing side(s) (Goodwin 2001; Kalyvas and Kocher 2007).

In his study of recruitment, Azam (2006) emphasizes not only the wages paid to fighters, but also the impact of rebellion on the wages of those who choose to remain as farmers. By making it costly for civilians to produce, it becomes more attractive for them to join the warlord's armed group as combatants. The abuse of one's own community depresses the wages that have to be paid to fighters. Participation occurs when the private benefits of joining outweigh the private benefits of not joining.

Humphreys and Weinstein (2008) are sceptical of single argument explanations of participation. Following Lichbach (1998) they advocate testing seemingly rival explanations in one framework. Using ex-combatant data from Sierra Leone's civil war they find support for incentive based explanations as well as grievance based ones. They challenge standard interpretations of grievance-based accounts of participation in rebellion, as poverty, a lack of access to education, and political alienation predict participation in both rebellion and counter-rebellion. They conclude that factors that are traditionally seen as indicators of grievance or frustration may instead proxy for a more general susceptibility to engage in violent action or a greater vulnerability to political manipulation by elites.

Verwimp (2005) used detailed micro-level data to infer the effect of economic outcomes on participation in the Rwandan genocide. Using a political economy framework, he showed how participation was linked to access to land and labour markets. Barron, Kaiser and Pradhan (2004), analysing local conflicts in Indonesia, find a positive correlation between violence and unemployment, as well as violence and income inequality. Do and Iyer (2006) examine determinants of the intensity of civil war in Nepal, measured by the number of conflict-related deaths at the district level. They find statistically significant correlates of greater conflict intensity with higher rates of poverty and lower levels of literacy in the district prior to the outbreak of the Maoist insurgency. This is consistent with the idea that the Maoists had greater recruiting success in areas with fewer economic opportunities. However, causality has to be interpreted with caution given potential omitted variables bias in cross-section analysis.

In this paper we test opportunity or ‘pull’ factors together with grievance of ‘push’ factors. The first represent the idea that potential combatants weigh the benefits and costs of participation and non-participation. In our analysis we consider variation in the producer price of coffee as an indicator of the opportunity cost. This follows the classical argument that lower opportunity costs increase individual propensity to engage in rebellion or crime (see e.g. Becker (1968); Ehrlich 1973; Besley and Persson (2008); Dal Bó and Dal Bó, 2008). The second relies on the idea that recruitment increases when potential recruits are confronted with sharp injustices. In our analysis this will be captured by indiscriminate violence.

We perform three types of analysis. *First*, we assess the effects of the 1993 large-scale indiscriminate violence on recruitment the year after. We find that indiscriminate violence meant to suppress rebellion proved counterproductive, suggesting that grievance over this type of violence, including the loss of family members and property drives people in the arms of rebel movements. Indiscriminate violence at the level of the village increased the probability of recruiting people the year after in the range between 0.25 and 0.37.³ *Second*, we exploit annual variation in coffee prices in the 1993-2007 period to infer the effect of (changes) in the economic environment (and therefore in the opportunity structure) on recruitment. We use the real producer price of coffee. We find that real producer prices are negatively

³ The average unconditional probability of recruitment was about 0.63

associated with recruitment suggesting that reduced opportunity costs play a role. Note that this does not mean that only coffee farmers join the rebellion. As the entire income from coffee is paid to the farmers once per year; they use it to finance substantial expenses. This has economy-wide effects in the coffee producing regions. And *third*, we perform robustness tests whereby we use other measures for changes in the economic environment. Using rainfall shocks as an alternative, exogenous income shock, affecting the entire agricultural sector, not just coffee, confirms the mechanism. Since a low producer price can also be interpreted as a grievance factor (against elites who consume the profit) this latter finding suggests that reduced opportunity costs, rather than a grievance based interpretation of the coffee price drives the negative effect of the price. In a poor, rain-fed economy such as Burundi, coffee is an important but not the sole source of revenue.

Our empirical identification strategies are similar to the one used in two recent papers, but our data allow us to developed tests that go beyond these papers. The first is a paper by Dube and Vargas (2008) who present evidence for Colombia on the mechanism linking the price of export commodities to violence. They show that a drop in the price of coffee substantially increased the incidence and intensity of the civil war in coffee-intensive areas, whereas an increase in the price of oil has a similar effect. They attribute this to the lowering of the opportunity cost of joining a rebel movement (via depressed wages) in the case of coffee and on increase in local state revenue in the case of oil. They however do not have data on recruitment but use war intensity as a proxy for recruitment. In our paper we test the effect of a negative income shock on recruitment directly. In our case this strategy works as we do have micro-level data on recruitment, the government always sets the producer price, and its real value is not correlated with the world market price. Figure 1 shows that world markets prices of coffee indeed are only (positively) correlated at 18 percent.

The second is by Miguel et al (2004). As annual variation in rainfall is likely to be random, Miguel et al. have used it as an exogenous instrument in analyses to solve for problems of endogeneity. They ran IV strategy in a cross-country analysis of the impact of an income shock on the incidence of civil war, with rainfall shocks as an instrument for income. They find a statistically significant effect of a lagged rainfall shock on the incidence of conflict. We will use rainfall variation (standard deviation of rainfall from its long-term average) as a proxy for province-year income shocks in a within-country analysis of conflict. This method circumvents the criticism of

Ciccone (2008) on Miguel et al (2004) arguing that the effect they find can originate from a high level of rain in year $t-2$.

Kuran (1989, 1991), Lohmann (1993), and Van Belle (1996) suggest that temporal dynamics are crucial for understanding recruitment: the conditions for joining late in a rebellion may be considerably less onerous than those for joining early on. Motivating people to participate when the economy is doing well, the return is uncertain and the risks are high is a particularly difficult challenge for armed groups. Humphreys and Weinstein (2008) note that a systematic test of such dynamics requires rich historical information about individuals' contacts with and attitudes towards different factions at multiple points in time. While we do not have data on individual choice to join several rebel movements, we believe the analysis of the community level panel contributes to the search for the mechanisms at work.

The paper is structured as follows: Section 2 describes the course of the civil war in Burundi as well as the importance of the coffee sector. Section 3 presents the modelling framework, empirical results and robustness tests. Section 4 discusses and concludes.

2 The Burundi Case Study

2.1 The course of the civil war

Burundi has until recently been involved in long and a brutal civil war that left hundreds of thousands of people dead, maimed or displaced. Massive bloodshed took place in 1972, where the armed forces slaughtered between 80.000 and 200.000 (mostly wealthy and intellectual) Hutu. In 1988, responding to a similar uprising in the Ngozi and Kirundo provinces where several thousand Tutsi were killed, "peace" was restored by the government forces killing 20.000 Hutu (HRW, 1998). Although no formal investigation into the 1988 massacres was allowed, president Buyoya sought for means to reconcile Hutu and Tutsi rather than controlling the Hutu majority by repression. Several Hutu were appointed to government positions. Many Tutsi however viewed loss of ruling power and the resulting massacres in neighboring Rwanda as a warning sign for what would happen if they started sharing power with the Hutu. They therefore resisted Buyoya's reforms with unsuccessful coups in 1989 and 1992.

Despite internal opposition, elections were held in 1993 and on July 1, Melchior Ndadaye became Burundi's first Hutu president. The newly installed

president made important changes in the local administration and planned to reform the almost exclusively Tutsi army to increase ethnic and regional diversity (HRW, 1998). The attempts to reform however brutally ended with the killing of Ndadaye in October 1993. The eruption of Hutu-led violence following the killing of the president was retaliated by massive indiscriminate violence by the government forces. HRW reports: “The army responded with clashes on Hutu making no distinction between communities involved in violence against Tutsi and those that were not. In a period of only a few weeks anywhere from 30.000 to 50.000 people were slain, roughly an equal number from each ethnic group.” Uvin (1999) elaborates: “On October 21, 1993, low-level soldiers killed President Ndadaye and other dignitaries after only three months in office, with at least passive support from the highest levels of the army. Popular unrest then erupted throughout Burundi, and thousands of Tutsi were brutally killed, especially in the north and center. The army moved in to restore order, killing thousands of Hutu in the process. In total, it is estimated that 50,000 to 100,000 persons were murdered in the three months after the coup; one million fled the country; and hundreds of thousands were internally displaced.”

The scope and intensity of the violence was unprecedented and resulted in a gruesome civil war that lasted sixteen years, leaving the country and its citizens in ruins. The civil war in Burundi was largely a war against civilians, in which some violence was indiscriminate and some had a highly selective character. Incidents of indiscriminate violence are likely to have a different impact on people’s future behavior than violence in which people were selectively targeted.

2.2 The importance of the Coffee Economy

Historical accounts claim that control of the state and its resources has been at the heart of Burundi’s conflicts, where access to the state, in the absence of formal viable institutions, was a source of potential rewards for some groups and deprivation for others (Lemarchand, 1994). Ngakuro and Nkurunziza (2000) write that the coffee sector has become a prime target of government predation. OCIBU (Burundi’s state-run coffee agency) set the producer price annually and was in control of marketing and export. The fact that Burundi is relatively poor in other natural resources affects how the predatory state is shaped. The state is built around the formation of wealth through the sale of resources to an external market and the use of controls and regulations to extract rents from this trade (Oketch and Polzer, 2002). The predatory

nature of the state is directly related to conflict and rebellion as the unequal access to the profits of the coffee economy is a major source of grievance. The army is regarded as the guarantor of the unequal allocation of wealth and has a vested interest in keeping the coffee producing regions under its control. In the period under study (1993-2007), on average 70% of Burundi's total export value came from the coffee, with a peak of 87% in 1997 (Kimonyo and Ntirayibagira, 2007). Revenue from the coffee sales took on politically and economically strategic importance because it could be used freely by the regime in power without attracting the attention of donors.

Income from coffee is an important source of revenue for 600.000 farmers (half of the population) because they receive a substantial sum (20 to 30% of a farmer's monetary income) once a year that can be used to cover expenses on durable goods, house construction, health and education. This sum is then injected in the local economy with effects far beyond the coffee sector. For years however, Burundian farmers however have received a bad deal from their government. Compared to neighboring countries, Burundian coffee producers have received very low prices for their produce. The IMF (1997) writes that part of Burundi's coffee production is regularly being smuggled to neighbouring countries, especially during periods of relatively low producer prices. The average percentage of the world price that producers received was around 35%, whereas this was 76% for Ugandan farmers. Oketch and Polzer (2002) write that this amounts to the appropriation of peasant labour. The International Crisis Group (ICG) describes Burundi in similar terms:

“The lion's share of the profit from the coffee trade goes to the state and various intermediaries for which there can be no economic justification while the producer receives a little less than 35% [of the export price].” And,

“The interaction between an authoritarian regime and the accumulation of economic benefits has been characterized by the exploitation of the elite if income from primary, agricultural and mining resources”.

The coffee sector has been regarded as an instrument draining resources from the mass of the producer population to a tiny urban elite at the helm of the state. On top, farmers were not allowed to rip out coffee trees by law. The exploitative nature of the coffee economy was repeatedly denounced by opposition movements. Rebel activity began in the northern, coffee producing regions in the country and only gradually spread to the southern provinces. Nkurunziza and Ngaruka (2000) write that educational policies favored the southern provinces. The province of Ngozi, a major

producer of coffee, is the least equipped with educational infrastructure of all provinces.

Given the scarcity of land as well as the dynamic internal market for bananas producers neglected their trees, leading to a decrease in the quality of coffee. The government countered anti-coffee campaigns with pro-coffee propaganda. To this should be added that Burundi is one of the poorest countries in the world with almost 70% of the population living in poverty (Verwimp and Bundervoet, 2008), with very few job opportunities outside farming and with increasing land scarcity.

3 Data description

3.1 Data sources and questionnaire design

We use the 1998 and 2007 Burundi Priority Surveys including household and village level variables. The Burundi Priority Survey 1998 was implemented by the Burundi Institute of Statistics and Economic Studies (ISTEEBU) in cooperation with the World Bank. The research was undertaken in all provinces across the country to be nationally representative and took place between October 1998 and March 1999.⁴ In 2007, ISTEEBU collected the second wave of data for a subsample of the 1998 households in cooperation with a team of academics. Household and individual data was collected foremost on socio-economic and demographic characteristics, income, consumption and assets, trust, social capital and subjective welfare measures. The community questionnaire entailed questions about infrastructure, violence, village-level clashes, and recruitment. For the community questionnaire we relied on a set of 'key experts' often the village level leader accompanied by elders. The questionnaires were designed in French but interviews were conducted in 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 were made. 50 interviewers were selected in a competitive exam that included a case study on household composition, consumption and production as well as a range of questions on research ethics. Each team of five interviewers was supervised by a team leader. Two out of five team members were women.

⁴ 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.

With the 2007 round we targeted 1.000 households out of the 1998 sample that encompassed 3908 rural households in sixteen provinces. We randomly selected a subsample of 100 out of the 390 clusters (villages or ‘collines’ in French). In each cluster we then interviewed all households that were part of the 1998 sample (10 per cluster). Of the initial 1.000 households we were able to re-interview 872, having an attrition rate of less than 13%. This is reasonable considering that a civil war was going on in the years between the survey rounds; causing many deaths and massive displacements and hence led to an increased chance that entire households had completely disappeared.⁵

The high rate of successful tracing was influenced by at the least the following three factors; First, the team of researchers spent much time to train local interviewers in tracing household members who were interviewed in 1998. If a household was not found the interviewer would approach neighbors and other people from the colline to get information as detailed as possible about the household, i.e. why it moved, and where it moved to. Our interviewers even often managed to obtain information on, sometimes distinctly different, reasons for moving of the household head and the remaining members respectively. Second, the country is very small and people live isolated at the collines, where everyone knows about each others’ whereabouts. Third, in Burundi the pressure of land is extraordinary high (population density is the second highest on the African continent, after Rwanda). As a result people may have only have fled at the very last minute, if there was no other option, and return immediately after the violence (clashes) as to ensure their claim to land. Most often, our survey team would find the households in the same location as in 1998.

Nonetheless, attrition no matter how small, can be a problem if it is selective, i.e., characteristics of the households that were not interviewed are systematically related to outcome variables such as income (World Bank, 2000). Although our analysis is at the village level, some of our variables are computed by aggregating and subsequently averaging household level data. Generally speaking, not worrying about attrition implies that the following assumption would hold:

$$E[\varepsilon_{jc} | X_{jc}, Z_{jc}] = 0 \tag{1}$$

⁵ By comparison, a review of the World Bank (2000) discusses among the many challenges associated with collecting longitudinal household data in developing countries, the problem of attrition that is often substantial; they report attrition rates for Sub-Sahara African countries up to 50%.

where Z_{jc} depicts the probability of being in the second round. In words, the conditional expected error term of the outcome equation is uncorrelated with the error of the selection equation. We employed different methods (i.e., a simple comparison of means, and a probit model) to check for attrition bias within our sample. The results are not presented in this paper, but reported in (Verwimp and Bundervoet, 2008). We find that households that were interviewed in both rounds were larger in size, had younger heads, a higher number of cattle, and were less likely to have a female head. At the village level we only find a marginally significant negative effect for access to markets, proxied by the time it takes to get to the market. None of these significant variables however play a role in any of our models below.

3.2. Descriptive statistics

Table 1 presents summary statistics for our main variables of interest at the household and village level. As our analysis is at the community level we do not discuss particular household characteristics other than those that have been scaled up to the community level. Panel A describes community characteristics for the period 1993-2007 including factors that were only measured in 1998 but are plausibly constant over time and thus do not jeopardize our identification strategy. In panel B various indicators of violence, both at the household and village level are presented. For a detailed description of the variables the reader is referred to Annex 1.

4. Indiscriminate violence and recruitment

4.1 Results for recruitment in response to indiscriminate violence at the village level

It is well documented that the violence that took place in response to Hutu uprising after the assassination of Burundi's first democratically elected president was retaliated by excessive indiscriminate violence of the (foremost Tutsi) army. We test whether this type of indiscriminate violence facilitated rebellion using colline level data on recruitment in the year 1994.⁶

⁶ In sharp contrast to for example recruitment during the civil war in Uganda, Sierra Leone or Sudan, recruitment in Burundi had a predominantly 'voluntary' character, meaning that people were rarely abducted or taken by physical or mental force. Obviously, if becoming a rebel has been perceived as the only way to safeguard your family, the term voluntary would be rather inappropriate here. Here it thus only serves to make a clear distinction between the two types of recruitment. In the former cases recruitment

Simply looking at the distribution of recruitment over time indeed reveals a sharp increase in the number of villages in which recruitment took place during this period. To our knowledge, no other events have been reported that could plausibly explain this sudden spike in recruitment. Therefore we are somewhat confident that our outcomes are not driven by omitted variables but indeed result from large-scale indiscriminate violence. The reduced form model looks as follows:

$$R_{ct=1994} = \alpha + \beta_1 V_{ct=1993} + \beta_2 X_c + \varepsilon_{ct} \quad (2)$$

Where V is a dummy variable that is 1 if the village experienced attacks of indiscriminate violence in 1993, and 0 otherwise; X_c is a vector of village level controls, and ε_{ct} the error term. Table 2 presents the results.

Column 1 presents the unconditional correlation between indiscriminate violence in 1993 and recruitment in 1994. Indiscriminate violence is positively associated with the probability of recruitment the year after. In column two we added village level controls that may plausibly have affected the probability of recruitment as well. The positive effect of indiscriminate violence remains and becomes even a bit stronger. Communities who voted in favor of president Ndadaye have a higher propensity to experience rebel recruitment in the year after. NGO presence prior to the war negatively affects recruitment. NGO projects may have had beneficial effects in terms of local institutions, infrastructure, and social norms that made people less willing to take up weapons.⁷

Column three has all the controls included and accounts for province fixed effects. We find that perceived low income levels in 1993 were strongly negatively related to recruitment. Note that a high value for this variable indicates less wealth, not more. We have three arguments for this finding. (a) it indicates that richer people were more concerned about their assets and joined the rebels in order to protect their wealth as a result of indiscriminate violence in 1993; (b) an alternative explanation for the latter finding is that these areas are uncontested, already under government control (see e.g. Kalyvas, 2006 for discussion of this argument) and (c) the pre-war wealth variable reflects respondents' perceptions (based on recall) of their pre-war situation.

would be random, thus independent of initial conditions or characteristics of the individual, whereas in our case people's initial conditions and personal traits would explain who becomes a rebel and who not.

⁷ We also included mean years of schooling at the village level, and % of households that had had some education/were literate, but this variable was always far from being significant in any specification.

Respondents may perceive their economic situation during the civil war as “bad” and hence state that they were much better off before the war. We thus do not want to put too much emphasis on these results. In fact, the effects of indiscriminate violence and low income are even a bit stronger. The other variables however become insignificant once unobserved characteristics at the province level are accounted for, suggesting that areas of high population density, presence of NGOs/aid projects are spatially clustered and thus otherwise captured by the fixed effects.

4.2 Recruitment at the village level during the civil war

After the large-scale retaliations in 1993 violence started to get a more selective character. We begin our empirical investigation on selective violence at the village (colline) level. In order to be able to test the hypotheses about the influence of coffee prices on recruitment, we construct a 15-year panel for the years 1993-2007. We have annual data available on our dependent and some key explanatory variables at the village or province level. Using annual variation in addition to pure cross-section analyses supports a causal interpretation of our results and allows us to hone in on the impact of economic shocks on violence. We start our analysis using variation in coffee prices to explain annual and regional variation in recruitment. A somewhat crude way to test for an effect of coffee prices is to include year dummies for exceptional good (bad) years. Figure 1 presents the development in the (real) world market price and the (real) prices paid to producers. The figure clearly shows a spike in coffee prices in 1998, whereas real prices dropped to unprecedented levels in 2005. Figures 2 and 3 show that the negative relation between the coffee price and recruitment is particularly strong in coffee-producing regions. In year t following year $t-1$ in which farmers only received a very small percent of the world market price, recruitment is on the increase, in coffee producing regions.⁸ We specify a reduced form model as follows:

$$R_{ct} = \alpha + \beta_1 p + \beta_2 X_{ct} + \beta_3 X_c + p * C + \lambda + \varepsilon_{ct} \quad (3)$$

⁸ Our results are confirmed when we use the percentage of the world market price that goes to farmers. We used this percentage in Figures 2 and 3 since it fitted better in the same graph together with recruitment.

With p the producer price, X_{ct} , X_c time-variant and –invariant controls respectively, the interaction and a time trend λ .

The producer price is related to the farmer's opportunity costs of joining the rebels. We therefore expect high producer prices to be negatively related to the propensity of becoming a rebel. Also, as coffee farmers in Burundi are being paid in one go, after harvest, low producer prices will also distort the local (village) economy and hence spill over to other households that do not necessarily grow coffee but e.g. have a small shop, and who happen to live in a coffee-producing region. Results are presented in Table 3.

The first column reports findings for a subset of the variables specified in equation (3) without interaction effects. It includes the lagged clashes variable, the producer price for coffee and a linear time trend. The producer price is negatively related to the probability of recruitment the year after. In the second model we include the dummy for coffee regions and its interaction with the producer price. We observe that low producer prices are negatively associated with the probability of recruitment. The interaction term (Pi and Pp taken together) reported in the lower end of the table is statistically significant at the 1% level. Thus, low producer prices for coffee are particularly influential in coffee growing regions, strengthening our hypothesis. We also find that clashes at the village level in the previous year are a strong predictor for recruitment the year after. The third column shows that results do not change when including all possible controls, thereby mitigating potential omitted variable bias. In the fourth column when we include province fixed effects, results are confirmed. Clashes and negative price shocks in year $t-1$ (in particular in coffee producing regions) as well as indiscriminate violence in 1993 seem to explain recruitment in year t across specifications.

4.3 Robustness check: rainfall shocks

As coffee is not the only source of revenue, we perform a robustness check employing a more general understanding of an adverse economic shock. To this end we use annual deviations from long-term, province levels of rainfall. If low opportunity costs, reflected by low producer prices for coffee indeed are important in explaining recruitment we expect to observe similar effects when looking at general negative (co-variate) shocks, which also decrease farm income. Rainfall has the advantage to be exogenous to the conflict and to only influence recruitment via its

effect on income. Because we do not have annual income data, we cannot use an IV strategy as in Miguel et al (2004), neither can we instrument the producer price of coffee with rainfall because the producer price is not affected by rainfall levels at all. We thus introduce rainfall shocks directly into the regression as a proxy for income shocks. The results are summarized in Table 4. Negative rainfall shocks are associated with higher propensities of recruitment. This confirms the idea that low(er) opportunity costs in general are conducive to recruitment by rebel organizations.

5. Conclusion

This paper addresses issues of recruitment during the Burundi civil war. We use a novel household and community level dataset to analyze the effect of changes in the opportunity set as well as past grievances on recruitment and the community level. These questions have been important in the political and economic literature on civil war, but have not been answered satisfactorily due to data constraints. The variables used to identify the opportunity set as well as the past grievances can vary from country to country. In the context of Burundi, where the coffee sector is intimately intertwined with the control of the state and with the resentment felt by large segments of the population towards the countries' elite, we use the producer price of coffee as an indicator for the opportunity cost and indiscriminate violence as an indicator for grievances from the past.

We find that large-scale indiscriminate violence in 1993 was counter effective; instead of repressing rebellion it led to a large increase in recruitment the year after. Following 1993, the war got a more selective character. We test to what extent coffee producer prices affected recruitment at the village level. We find that lower producer prices have a strong effect on recruitment the year after, which is likely to result from lower opportunity costs due to depressed prices. This interpretation is confirmed in our robustness analysis where we found that province-year deviations of long-term rainfall affect recruitment.

The paper sheds light on a very complicated issue namely what drives rebellion during civil war. We have shown that shocks in coffee prices and rain levels are associated with recruitment and provide plausible explanations for potential transmission channels. While the findings presented in this paper apply to Burundi because of the nature of the predatory state, the coffee economy and the civil war, they may also apply to other export crop dependent, war-prone economies.

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Annex 1 Data definitions

- *Distance to market*: categorical variable (1-6) minutes/hours/days to get to the nearest market by foot. A value of 1 indicates less than 15 minutes, 6 is more than half a day.
- *Main road through village*: Dummy variable that is 1 if there was a main road, and 0 otherwise
- *NGO presence prior to war*: Dummy variable that is 1 if an NGO had been operational in the village before the war and 0 otherwise.
- *(log) Population density 1990*: Data from 1990 census
- *Prewar wealth (subjective)*: aggregated household level variable. Households were asked to indicate their perceived level of wealth in 1993 on scale (1-6) where 1 is “very rich” and 6 is “very poor”.
- *Coffee producer price*: annual data (1993-2007) on prices paid to coffee producers in Burundi Francs (BUF) per kg. Source: Kimonyo and Ntiranyibagira (2007, p.9), Burundi Poverty Reduction Strategy Paper (2007) and authors own calculations.
- *Coffee world market price*: annual data (1993-2007) on world market prices of coffee. US\$ converted in BUF/kg using XXX exchange rates.
- *Coffee intensity*: % coffee farmers within each village; regions with at least 30% coffee farmers were defined as coffee regions.
- *Votes Ndadaye*: % votes in favor of Ndadaye at the commune level during the presidential elections in 1993.
- *Recruitment 1994*: Dummy variable that is 1 if recruitment took place in 1994, and 0 otherwise.
- *Recruitment >1994*: Dummy variable that is 1 if recruitment took place in year t , and 0 otherwise.
- *Indiscriminate violence 1993*: Dummy variable that is 1 if a village experienced indiscriminate violence in 1993, and 0 otherwise.
- *Clashes 1994-2007*: Dummy variable that is 1 if a village experienced violent confrontations between the government and rebel forces in year $t-1$, and 0 otherwise.
- *Rainfall shocks*: annual deviation of rainfall levels compared to the long term (provincial) average.

Annex 2 Coffee prices

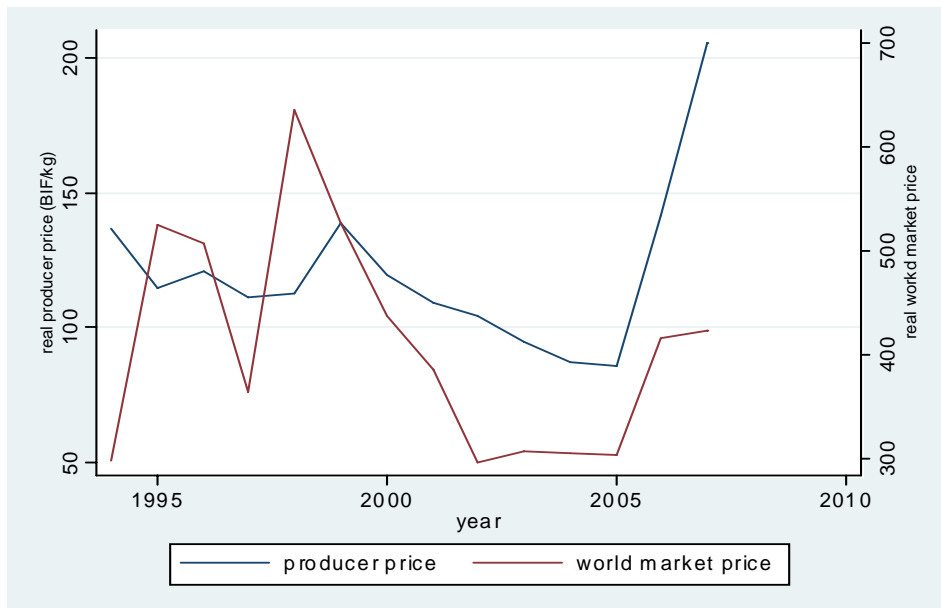
Table A1: Producer Price and World Market Price for Arabica Coffee

Year	Nominal price	World Price in US \$ per Kg	Consumer Price Index	Real Producer Price	Exchange Rate BuF-US\$	Real World Price in BuF	% of World Price to Producers
1991/92	175	1,86	104,5	167,46	208,3	372,30	44,98
1992/93	175	1,40	114,6	152,71	242,8	298,49	51,16
1993/94	180	1,55	131,7	136,67	252,7	298,69	45,76
1994/95	180	3,30	157,2	114,5	249,8	524,52	21,83
1995/96	240	3,32	198,7	120,79	302,8	506,74	23,84
1996/97	290	2,68	260,6	111,28	352,4	363,57	30,61
1997/98	330	4,15	293,1	112,59	447,8	635,46	17,72
1998/99	420	2,97	303,1	138,57	536,6	526,69	26,31
99/2000	450	2,28	376,7	119,46	720,5	437,19	27,32
2000/01	450	1,91	411,8	109,28	830,4	386,27	28,29
2001/02	450	1,37	430,3	104,58	930,7	296,35	35,29
2002/03	450	1,35	476,4	94,458	1083	307,77	30,69
2003/04	450	1,41	514,5	87,464	1110	304,716	28,7
2004/05	500	1,77	583,4	85,704	998	302,84	28,3
2005/06	900	2,52	637,6	141,15	1050	416,13	33,92
2006/07	1500	3,06	729,4	205,65	1000	422,26	48,7

Source : Kimonyo and Ntiranyibagira (2007, p.9), Burundi Poverty Reduction Strategy Paper (2007) and authors own calculations.

Figures and Tables

Figure 1 Annual development of (real) coffee prices (BUF)



Note: the correlation between the world market price and the price paid to producers (in real 1990 BUF) is rather low at 0.18.

Figures 2 and 3: Recruitment and coffee prices in coffee and non-coffee producing regions

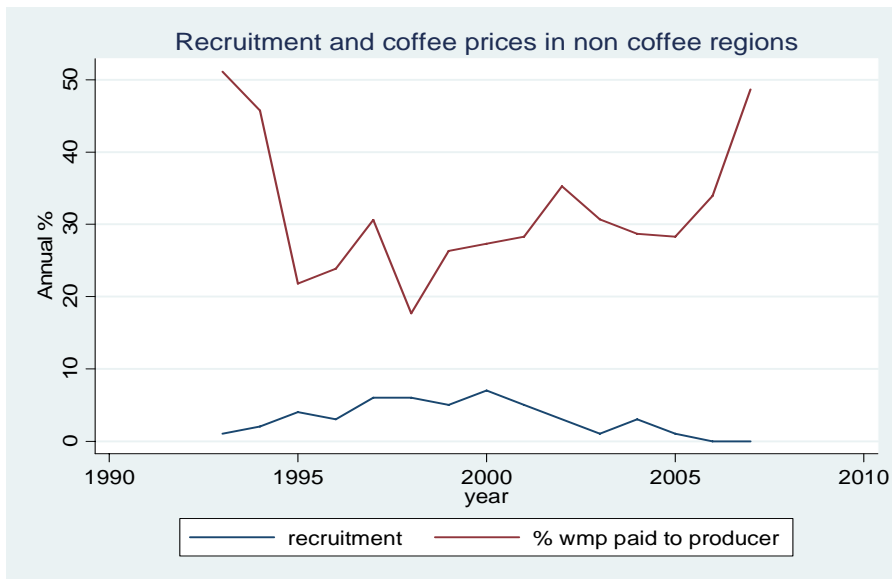
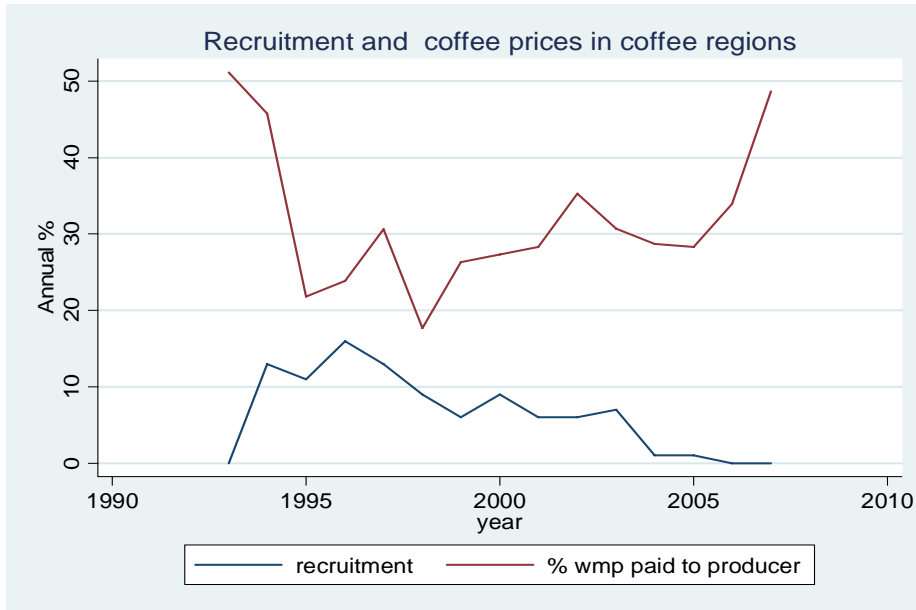


Table 1 Descriptive statistics

	Mean	SD	Min	Max	Observations
<i>Panel A community characteristics</i>					
Distance to market	2.65	1.07	1	5	1400
Main road through village			0	1	1400
NGO presence prior to war	0.1	0.09	0	1	1400
Population density 1990 (<i>log</i>)	5.38	0.51	3.71	6.27	1400
Prewar wealth	3.78	0.41	2.83	4.56	1400
Coffee producer price (BUF/kg)	120.15	29.05	85.7	205.7	1400
Coffee world market price (BUF/kg)	409.23	103.2	296.4	635.5	1400
Coffee intensity (%)	52.1	34.5	0	100	1400
Votes in favor of Ndadaye in 1993 (%)	63.04	18.2	3.1	93.5	1400
Rainfall shocks	0.10	0.18	-0.52	0.45	1051
<i>Panel B Measures of violence</i>					
Indiscriminate violence in 1993	0.4	0.5	0	1	100
Recruitment in 1994	0.15	-	0	1	100
Recruitment after 1994	0.10	0.30	0	1	1400
Clashes rebel-government (94-07)	0.61	0.49	0	1	1400

Source: Burundi Priority Panel, 2007, Community level Questionnaire

Table 2 Recruitment in 1994 and indiscriminate violence in 1993 at the village level

Dependent: Recruitment (0/1)	(1)	(2)	(3)
Indiscriminate violence	0.25** (0.09)	0.29*** (0.10)	0.37*** (0.15)
Prewar wealth (subjective)		-0.32 (0.13)	-0.38** (0.18)
Population density 1990 (<i>log</i>)		-0.25 (0.15)	-0.35 (0.31)
Coffee intensity		0.06 (0.16)	-0.07 (0.29)
Main road through village		-0.18 (0.16)	-0.21 (0.21)
Votes Ndadaye in 1993		0.005*** (0.003)*	0.00 (0.00)
NGO		-0.41*** (0.15)	-0.30 (0.29)
Province fixed effects	No	No	Yes
Observations	100	99	89

Notes: marginal effects (valued at mean) reported.

Standard errors in parentheses and clustered at the communal level

*, **, *** significant at 10%, 5% and 1% respectively

Table 3 Panel (logit) regressions on recruitment and producer price of coffee

Dependent Recruitment (0/1)	(1)	(2)	(3)	(4)
Clashes $t-1$	1.28*** (0.25)	1.24*** (0.25)	0.69** (0.31)	0.69** (0.31)
Real coffee producer price $t-1$ (Pp)	-0.014*** (0.004)	-0.021* (0.011)	-0.025* (0.013)	-0.025* (0.013)
Coffee intensity		-0.932 (1.44)	-1.363 (1.61)	-1.384 (1.64)
Producer price x coffee intensity (Pi)		0.0102 (0.012)	0.014 (0.014)	0.014 (0.014)
Votes for Ndadaye in 1993			0.018 (0.011)	0.018 (0.011)
Indiscriminate violence 1993			0.707** (0.30)	0.711** (0.29)
Population density 1990 (<i>log</i>)			-1.085** (0.50)	-1.087 (0.50)
Prewar wealth (subjective)			-0.348 (0.38)	-0.350 (0.38)
Main road			-0.173 (0.33)	-0.173 (0.33)
NGO			-1.114 (0.81)	-1.115 (0.81)
Interaction effect (Pi+Pp=0)		-0.011*** (0.004)	-0.011** (0.004)	- 0.011*** (0.004)
Time trend	Yes	Yes	Yes	Yes
Province fixed effects	No	No	No	Yes
Observations	1400	1400	1400	1400

Notes: When using community (village) fixed effect, more than half of total number of observations is lost due to the fact that there are many villages that never had any recruitment and thus have no variation in the dependent. The interaction term is then only significant at 15%. (Results not reported but available upon request). We attempt to overcome the problem by including time-invariant or pre-conflict variables as regressors in the other regressions, and cluster our standard errors at the village level to correct for potential intra-group correlation. Standard errors in parentheses. *** sign. at 1%, ** at 5%, * at 10%

Table 4 Panel (logit) regressions for recruitment and climatic shocks

Dependent: recruitment (0/1)	(1)	(2)
Clashes t-1	0.14** * (0.05)	0.09* (0.06)
Rainfall shock t-1	- 0.06** * (0.02)	-0.05* (0.03)
Main road through village		-0.05 (0.04)
Population density 1990 (log)		-0.02 (0.03)
Prewar wealth (subjective)		- 0.05** * (0.01)
Votes Ndadaye		0.001* * (0.000)
NGO		- 0.05** * (0.01)
Indiscriminate violence in 1993		0.06 (0.04)
Time trend	Yes	Yes
Observations	1051	1038

Notes: When using village fixed effect, about half of total number of observations is lost due to the fact that there are many villages that never had any recruitment and thus have no variation in the dependent. Therefore they drop out in the estimation. The rainfall variable however remains negative and significant (not reported but available upon request.)

We attempt to overcome this problem by including time-invariant or predetermined variables as regressors in most specifications, instead of using village dummies. Standard errors in parentheses and clustered at the province level to correct for potential intra-group correlation.