The Legacy of Political Mass Killings: Evidence from the Rwandan Genocide*

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Abstract

We study how political mass killings affect later economic performance, using data from the Rwandan Genocide. To establish causality, we build on Yanagizawa-Drott (2012) and exploit village-level variation in reception of a state-sponsored radio station (RTLM) that explicitly, and successfully, incited killings of the ethnic Tutsi minority population. Our results show that households in villages that experienced higher levels of violence induced by the broadcasts have higher living standards six years after the genocide. They own more assets, such as land, livestock and durable goods. Output per capita from agricultural production is higher, and consumption levels are greater. These results are consistent with the Malthusian hypothesis that mass killings can raise living standards by reducing the population size and redistributing productive assets from the deceased to the remaining population. However, we also find that the violence affected the age distribution in villages, raised fertility rates among female survivors, and reduced cognitive skills of children. Together, our results show that political mass killings can have positive effects on living standards among survivors in the short run, but that these effects may disappear in the long run.

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1 Introduction

Do political mass murders affect later economic performance? Since 1945 there have been nearly 50 political mass murders (genocides and politicides) where an estimated 12 million combatants and 22 million noncombatants have been killed; more than all victims of internal and international wars during the same time period (Harff, 2003). These tragic events and the associated loss of lives thus evidently have immense, direct, negative implications for the welfare of societies. Beyond the immediate impact, however, political mass murders may also result in longer term impacts on the remaining population. But, if so, how?

This question is of particular interest since the consequences are *a priori* unclear, at least with respect to economic aspects of welfare such as per capita income, assets and consumption. On the one hand, political mass murders are typically associated with civil violence and war, which may destroy physical and human capital. In addition, deeper determinants of economic development, such as social capital, institutions and norms conducive to the efficiency of markets, may be adversely affected. These mechanisms would tend to decrease income, assets and consumption.[1] On the other hand, since political mass murders by definition imply the loss of human lives, they are intrinsically linked to reductions in population size. Consequently, factors of production that are fixed, such as land and other natural resources, may increase on a per capita basis. More broadly, the capital intensity among the remaining population may increase, as assets are effectively redistributed from the deceased to the living. This is in essence the Malthusian view of the role of conflict. It is also consistent with the central assumption in the rationalist branch of conflict theory, i.e. that a key motivation for conducting mass killings is looting and rents-capture for the group (e.g., ethnic) conducting the killings (Esteban et al., 2010; Jackson and Morelli, 2011).[2] The key implication is that such mechanisms would tend to increase per capita income, assets and consumption for the remaining population. The (net) effects are thus theoretically ambiguous and, as such, empirical evidence is necessary.

Yet, robust evidence on the legacy of political mass killings on economic performance is scarce. This is not least due to the fundamental challenge of establishing causality, since economic shocks are likely to jointly determine both violence and future economic

[1] The effects under this mechanism would depend on the time horizon. Under a neoclassical production function and perfectly competitive markets, for example, negative effects in the short and medium run may in the long run lead the economy back to the steady state growth rate (Miguel and Roland, 2011).

[2] If ethnic or religious diversity hampers economic performance, as evidence shows (Montalvo and Reynal-Querol, 2005; Hjort, 2012), an additional mechanism of deliberate and systematic destruction of an ethnic or religious group, in whole or in part, may be that it is conducive to economic performance by decreasing diversity.

performance (Miguel et al., 2004; Easterly et al., 2006).[3]

We approach these issues by investigating the economic effects of violence conducted against the ethnic Tutsi minority population during the 1994 Rwandan Genocide. In the history of political mass murders, this is surely a prominent case. During a period of approximately 100 days, the government - lead by extremists of the ethnic Hutu majority - conducted an extermination campaign against the Tutsi population that resulted in an estimated 0.5 to 1 million deaths. Rich household survey data allows us to give a detailed picture of the socio-economic situation in Rwandan villages six years after the genocide. To address the issue of causality, we build on Yanagizawa-Drott (2012, YD hereafter) and exploit local variation in reception of the radio station RTLM (Radio Television Libre des Mille Collines). Backed by the Hutu extremist government and setup shortly before the genocide, the radio station explicitly called upon the Hutu majority population to exterminate the Tutsi minority population. Using local variation in reception induced by Rwanda's hilly terrain to identify causal effects and prosecution data to measure violence, YD finds that villages with good reception experienced significantly higher levels of violence and participation in the killings. Importantly, as the station's transmitters were destroyed with the end of the genocide, the temporary shock in exposure to radio that induced violence against the ethnic minority presents us with a rare opportunity to examine the economic effects of genocidal violence. We estimate the reduced form impact of RTLM reception on later economic outcomes in villages, and, under the arguably plausible assumption that the reception affected later outcomes only through violence, we also present scaled instrumental-variable estimates.[4]

Our results show that households living in villages that experienced greater levels of violence induced by RTLM reception have *higher* living standards six years after the genocide. Specifically, they own more land assets, livestock, durable goods and total assets per capita. Furthermore, we find that per capita income and output from agricultural production, as well as consumption, is significantly higher in villages that exogenously experienced more violence. These effects are also quantitatively meaningful. Our estimates indicate that a 10 percent increase in violence in a village during the 1994 genocide

[3]The direction of the bias is *a priori* unclear. If conflict predominantly breaks out in poorer areas, as peoples opportunity costs of fighting are lower, then a simple bivariate estimate would be downward biased. If richer areas are more prone to fighting, as the stakes are higher, the estimate would be upward biased. The literature on conflict and war has tried to solve this problem by using various difference-in-difference techniques and instrumental variables. Instruments include distances to various borders (Miguel and Roland, 2011; Akresh and de Walque, 2010; Pellillo, 2012) or rebel headquarters (Arcand and Wouabe, 2009).

[4]The broadcasts contained essentially no content that would directly affect productivity or markets, such as information about agricultural technologies or health education. Instead, the content was primarily music mixed with ethnically charged propaganda and direct encouragement to participate in the killings of Tutsis (Kimani, 2007).

is associated with approximately a 10-15 percent increase in per capita income and consumption among households six years afterwards.

These results are thus consistent with the Malthusian view that mass murders can reduce the population, which raises capital intensity and redistributes productive assets, such as land, from the deceased to the remaining population.[5] Thus, to the extent that the violence during the Rwandan Genocide destroyed physical and human capital, or decreased the efficiency of markets more broadly, these effects seem to have been muted and dominated by the Malthusian mechanism. Importantly, the results cannot simply be explained by selective killings based on pre-genocide wealth or human capital. First, Tutsis were generally wealthier and more educated. A pure selection mechanism where relatively poor individuals were killed, leaving survivors that generally had more assets to begin with, is therefore unlikely. Second, we find no evidence that the completed years of schooling or cognitive skills of surviving adults is significantly different in villages that experienced more violence.[6]

It is worth noting that a limitation is that the estimates capture short/medium term effects, as the data allow us to investigate outcomes measured six years after the killings took place. Our results therefore do not directly speak to whether these effects will last in the long term. We do, however, provide some evidence on mechanisms that are informative about the potential long term impacts. First, we find that the violence affected the age distribution of the surviving population. Villages that experienced higher levels of genocidal violence have a higher fraction of the surviving population of working age (13-49). This is informative, not only because it sheds additional light on the mechanisms driving the positive effects on output and income, but also because this suggests that the positive effects may be temporary, as the short term effects would tend to disappear as these cohorts become older and less productive. Second, we find evidence of higher fertility rates among young women. Thus, if an important driver of the positive effects is the increase in the capital intensity when a significant portion of the population is killed, the effects may be transitory as the deceased population is rapidly replaced over time. Third, we find that the violence reduced human capital among surviving children of primary school age at the time of the genocide. Specifically, there is a decrease in cognitive skills, such as the ability to read, write and do simple math. This suggests that these cohorts of children will be relatively less productive as adults, with negative implications for future income that may counteract the positive effects estimated in the short term. Together,

[5]This is also consistent with qualitative evidence showing that looting of the property of killed Tutsis was common (Hatzfeld, 2003).

[6]Unfortunately the data does not allow us to directly test to what extent other channels such as social capital, local institutions and norms are affected.

these results provide suggestive evidence that the estimated increases in assets, income and consumption may be transitory and not persist in the long run.

We add to the literature in several ways. To our knowledge, this paper is the first to demonstrate that conflict in general, and political mass murder in particular, can have positive effects on economic performance.[7] More specifically, it first contributes to the literature on the effects of the genocide in Rwanda on later outcomes (Akresh and de Walque, 2010; Serneels and Verpoorten, 2012; Schindler and Brueck, 2012) by producing novel evidence on the positive effects on living standards. Second, the paper is related to the literature on civil war and ethnic conflict. In recent years, a number of studies have exploited within-country variation to estimate the economic effects of conflict (Davis and Weinstein, 2002; Abadie and Gardeazabal, 2003; Brakman et al., 2004; Miguel and Roland, 2012), with a special focus on human capital (Alderman et al., 2006; Shemyakina, 2011; Chamarbagwala and Moran, 2011).[8]

Our work is also related to a small literature on the effects of ethnic cleansing (Acemoglu et al., 2011; Chaney and Hornbeck, 2012). While Acemoglu et al. (2011) document negative economic effects of the killing of the Jews during the Holocaust in Russia, Chaney and Hornbeck (2012) find that the expulsion of the Moriscos in Spain in 1609 increased economic performance for the remaining population. However, besides considering a more recent setting, our paper establishes that similarly positive effects (although for another time period and horizon) can prevail even in a conflict environment where the ethnic cleansing consists of outright mass killings. As far as the genocide resulted in a population decrease, our paper echoes the findings by Young (2005) and Farmer (1991). The former finds that the large number of HIV deaths in South Africa have positive effects on the surviving population; the latter documents similar effects as a result of the Black Death in Europe, ringing in the Golden Age of the Laborer. Our results also speak to a wider, interdisciplinary literature on resource scarcity and conflict (Homer-Dixon, 1999) and complement the strand of the literature that views the Rwandan Genocide as a Malthusian check (Andre and Platteau, 1998; Diamond, 2005; Verpoorten, 2012).

The remainder of the paper is organized as follows. Section 2 provides some back-

[7]The increase in standards of living for survivors by no means implies that violence increases welfare. After all, mass killings imply immense losses in lives. Assessing social welfare is also a daunting task with significant philosophical challenges, such as how to value a human life, or how to take into account distributional aspects.

[8]Starting in the late 1970s with Organski and Kugler, 1977, 1980 there are also numerous cross-country studies that have looked into the effects of civil conflict on economic recovery and growth (Chen et al., 2008; Collier, 1999; Przeworski et al., 2000; and Cerra and Saxena, 2008). The approach taken in this paper is to exploit village-level variation, and therefore a limitation is that we are unable to estimate the aggregate economic effects of the genocide.

ground information on the Rwandan genocide and the media in Rwanda. Section 3 presents a conceptual framework to guide our empirical analysis. Section 4 describes the data and Section 5 lays out our empirical strategy. Section 6 reports the results and the conclusion summarizes our findings and discusses potential policy implications.

2 Institutional Background

The history of Rwanda is marked by the conflict between Hutu and Tutsi, the two major ethnic groups living in the country. The nature of the distinction between the two groups is strongly debated. Some argue that Tutsi are descendants of Hamitic migrants from Egypt or Ethiopia and that the Hutu belong to the Bantu group, who lived in Rwanda for much longer; others say that the two groups, in fact, share a common ancestry. What goes undisputed is that Belgian colonizers, which took over Rwanda after World War I, radicalized the differences between the two groups, establishing an official register to record the ethnicity of each citizen and explicitly favoring the Tusti minority - believed to be the superior ethnic group - through reserving them access to administrative posts and higher education. When the country gained its independence in 1962 the Hutu managed to take over power, reversing the situation and establishing a one-party state. The ethnic violence that accompanied the event led several hundreds of thousands of Tutsi to flee the country. The following decade recorded an alternation of periods of relative political stability and peace with episodes of unrest and violence, but tensions never sedated. In 1973, following new episodes of violence fueled by unrest in the neighboring Burundi, the Hutu military leader Habyarimana seized power through a military coup, becoming officially elected president in 1978.

By 1990 the country was still under Habyarimana leadership and was still facing an uneasy coexistence between the political and administrative Hutu elite and the economic Tutsi elite. The situation degenerated towards the end of the year, when the Rwandan Patriotic Front (RPF) - a rebel army mostly composed by Tutsi exiles willing to replace the Hutu-led government - started launching attacks in the North of the country from Uganda. A conflict began between the RPF and the national army (the Forces Armes Rwandaises - FAR). Two years of conflicts let to the formation of a multi-party government and one year later a peace agreement under the supervision of the United Nations was signed in Arusha, Tanzania. The power sharing agreement that followed failed in dissipating the tension within the country, which started again when the airplane carrying president Habyarimana was shot down on the 6th of April 1994. Responsibility for the attack is still today disputed, but within only a few days, extremists within the

Hutu-dominated parties, known as the akazu, managed to take over key positions of government and initiate a 100 day lasting period of ethnic cleansing throughout the whole of Rwanda. Leaders at various administrative levels took an active role in the killing supported by the Presidential Guard and the regular Rwandan Hutu Army FAR. Militia gangs such as the Interahamwe and the Impuzamugambi, equipped and trained by the FAR, agitated at local levels. Together these two groups would become known as Hutu Power. Furthermore several hundreds of thousands of civilians joined in the killings. The killings were highly localized, almost 80 to 90 percent of them were committed within one's own village using low technology weapons such as clubs and machetes. There were almost no coordinated defense efforts by the Rwandan Tutsi.

The mass killing ended in mid July, when the RPF rebels conquered the capital city Kigali, defeating the Rwandan army and the various militia groups. Estimates reveal that approximately 800,000 people, mostly belonging to the Tutsi minority, were killed in those 100 days. There was no foreign intervention. More detailed accounts can be found in (Gourevitch, 1998; Des Forges, 1999; Dallaire, 2003; Hatzfeld, 2005, 2006; Straus, 2006).

2.1 Media and RTLM

Prior to the start of the genocide, Rwanda had two national radio stations, namely RTLM and Radio Rwanda. RTLM began broadcasting in July 1993, using two transmitters. One 100 Watt transmitter was placed in the capital, Kigali, and another 1000 Watt transmitter was placed on Mount Muhe, one of the country's highest mountains. Although the government-owned Radio Rwanda had been broadcasting some propaganda before the genocide, it was RTLM that broadcast the most extreme and inflammatory messages. RTLM was set up by members of Hutu Power and until his assassination, President Habyarimana had been one its strongest backers (Des Forges, 2007). One of the station's founders, Ferdinand Nahimana, was also the director of the Rwanda Bureau of Information and Broadcasting (ORINFOR), the agency responsible for regulating mass media. Thus, a connection between the station and top government officials had evidently been established even before April 6 1994. After that date, when key members of Hutu Power took over, the station essentially became the voice of the new government. The broadcasts continued throughout the genocide, and did not abate until RPF rebels seized power in mid-July 1994.

The radio station called for the extermination of the Tutsi ethnic group and claimed that preemptive violence against it was a response necessary for "self-defense" (ICTR, 2003; Frohardt and Temin, 2007). In her content analysis of taped RTLM broadcasts,

Kimani (2007) reports that the most common inflammatory statements consisted of reports of Tutsi RPF rebel atrocities (33 percent); allegations that Tutsis in the region were involved in the war or a conspiracy (24 percent); and allegations that the RPF wanted power and control over the Hutus (16 percent). Key government officials appeared on air, including Prime Minister Jean Kambanda. The language used in broadcasts was dehumanizing, as Tutsis would often be referred to as *inyenzi*, or cockroaches. After April 6 1994, messages from the radio station made it clear that the government had no intention of protecting the Tutsi minority from attacks, and that Hutus engaged in killings would not be held accountable. Instead, the propagated message was that the radio station as well as government officials encouraged the killing of Tutsis.[9]

Alternative print media did exist. The number of independent newspapers at the time of the genocide, including political opposition publications, was between 30 and 60 (Alexis and Mpambara, 2003; Higiro, 2007). However, the circulation and readership of these newspapers in rural areas was limited due to relatively low literacy rates. Consequently, radio was the sole source of news for most people (Des Forges, 1999). Consistently, Yanagizawa-Drott (2012) finds that RTLM had a significant effect on Hutu participation in violence against the Tutsi and that the RTLM broadcasts account for approximately 10 percent of the Tutsi deaths.

3 Conceptual Framework

To guide our empirical analysis we use a version of the standard Solow model. Consider a country that has two ethnic groups, majority group H and minority group T. Each village in the country functions as an independent economy, with a total population of L_t at time t of which L_t^T belong to the minority and L_t^H to the majority. Each village is further equipped with a constant returns to scale Cobb-Douglas production function

$$Y_t = A(K_t^T + K_t^H)^{\alpha}(L_t^T + L_t^H)^{1-\alpha} \tag{1}$$

where Y_t is village output, K_t^T and K_t^H are the stock of capital of group T and H, respectively. Output can be expressed in per capita terms, with $y_t = Y_t/(L_t^T + L_t^H)$ and

[9]The fact that the station was popular and that there was demand for its broadcasts suggests that citizens viewed the broadcasts as contributing important information. For example, Des Forges described the high demand for RTLM as follows: "people listened to the radio all the time, and people who didn't have radios went to someone else's house to listen to the radio. I remember one witness describing how in part of Rwanda, it was difficult to receive RTLM, and so he had to climb up on the roof of his house in order to get a clear signal, and he would stand up there on the roof of his house with his radio to his ear listening to it." Interview with Alison des Forges, available (January 30 2011) at ¡www.carleton.ca/jmc/mediagenocide¿

$$k_t = (K_t^T + K_t^H)/(L_t^T + L_t^H)$$

$$y_t = Ak_t^\alpha \tag{2}$$

As usual, a constant fraction s of output is saved, the capital stock depreciates at rate δ and population grows exogenously at rate n. Equating investment and savings gives

$$(1+n)k_{t+1} = k_t(1-\delta) + sAk_t^\alpha \tag{3}$$

This equation determines the steady state level of capital per capita k^*. Assume that all the villages are still far away from their steady state level of capital intensity, thus they experience transitional growth.

Now assume that the central government is ruled by members of group H, and it initiates a genocide against group T at time $\tilde{t}$. To mobilize group H members in villages the government sends out radio broadcasts encouraging people to engage in the killings by stating that the government has initiated a genocide, implying that group H members will not be punished (alternatively, that non-participation will be heavily punished) if they kill group T members and acquire their capital. Let that signal be sufficiently persuasive for some group H members who are at the margin of participating, then the fraction of group H members that participate, h, will be an increasing function in the fraction of members that receive the broadcasts in a village, r. Furthermore, assume that the number of group T survivors L_g^T is decreasing in h and that group H acquire the property of the killed group T members. To capture that conflict is costly and inefficient, let some fraction l of total capital be destroyed. Consumption per capita some s years after the genocide is therefore:

$$c_{g,\tilde{t}+s} = (1-s)A\left(\frac{(1-l(r))K_{g,\tilde{t}+s}^T + K_{g,\tilde{t}+s}^H}{L_{g,\tilde{t}+s}^T(r) + L_{g,\tilde{t}+s}^H}\right)^\alpha \tag{4}$$

From this very simple framework it is clear that the resulting short to medium term effects of killings of group T (induced by radio reception) on consumption per capita and capital intensity are *a priori* unclear. On the one hand, if the capital destruction is sufficiently large and outweighs the number of group T deaths, then capital intensity and consumption per capita will decline, bringing the village further away from its steady state level. Other mechanisms outside the model could of course also negatively affect output and consumption, for example if violence erodes trust which adversely affects the allocation of capital. Also, poverty trap models even suggest that in the worst case capital destruc-

tion might be so large, that villages are permanently condemned to low consumption.[10] On the other hand, however, if the capital stock of group T gets redistributed to group H and a large number of the minority group T dies (or permanently leaves the village), and the costs of conflict is low, then consumption per capita can ultimately increase after the genocide. [11]

4 Data

We combine several sources of data to construct a household/village-level dataset. The final dataset consists of 4278 households in 332 villages.

RTLM Reception Our main independent variable is predicted RTLM radio coverage at the village level, taken from Yanagizawa-Drott (2012), who uses RTLM transmitter locations and a high precision topographical map of Rwanda (SRTM) to construct the data in ArcGIS. As the country is littered with hills and valleys, there is substantial local variation in topography. Based on technical parameters of the two transmitters (geographic position, antenna height, transmitter power, etc.) the software uses a Longley-Rice algorithm with a 90x90 meter cell precision to calculate what fraction of the village can receive the radio signal at sufficiently high levels for normal radio sets. [12] Figure 1 shows a map of the radio coverage variable.[13]

Violence To show that RTLM coverage is positively correlated with genocide intensity we use participation in violence. Since no direct measure of participation rates is available, we follow Yanagizawa-Drott (2012) and use prosecution rates for crimes committed during the genocide as a proxy. Data are taken from a nationwide sector (village) level dataset, provided from the government agency "National Service of Gacaca Jurisdiction", which records the outcome of the almost 10.000 Gacaca courts set up all over the country. The legal definition consists of: 1) planners, organizers, instigators, supervisors of

[10] If we assume that there is a minimum level below which consumption cannot fall and the savings rate will adjust accordingly, then the above model would also allow for a poverty trap (Miguel and Roland, 2011).

[11] Outside this stylized model, per capita output and consumption might be affected if killing is selective killing based on important individual characteristics that influences labor productivity, such as human capital. We investigate various mechanisms outside this framework in the empirical section.

[12] For further details about the data, see Yanagizawa-Drott (2012).

[13] White areas on the map indicate an absence of data. This is either due to the presence of national parks and Lake Kivu, or because of difficulties in matching village names across datasets (see below).

the genocide; 2) leaders at the national, provincial or district level, within political parties, army, religious denominations or militia; 3) the well-known murderer who distinguished himself because of the zeal which characterized him in the killings or the excessive wickedness with which killings were carried out; 4) people who committed rape or acts of sexual torture. At the sector level this consists mostly of crimes undertaken by the Interahamwe and Impuzamugambi militias.

Household Data Socio-economic household data is taken from the first wave of the Rwandan Integrated Household Living Conditions Survey (EICV1),[14] conducted in 1999, 2000, and 2001 and representative at national level. 31192 individuals in 6240 households in 486 sectors were surveyed on various socio-economic factors regarding consumption, agricultural production, education and fertility. This data is matched by village names within communes to the RTLM reception data. Unfortunately, the matching in the RTLM data is imperfect, as many villages either have different names in different data sources, or use alternate spelling. It is also not uncommon for two or more villages within a commune to have identical names, which prevents successful matching. Because of these data-matching issues, the final RTLM dataset contains 1065 or about 70 percent of the total 1513 villages in the country. Consistently, we thus match about 70 percent of the villages in the EICV survey (332 of the total 486 villages). As most of these issues are idiosyncratic, the main implication is likely lower precision in the estimates than otherwise would have been the case.

Additional Data Population data was retrieved from the Rwanda 1991 population census provided by IPUMS International and GenoDynamics. In addition, the SRTM topography data and ArcGIS software maps allow us to calculate the village mean altitude, the village variance in altitude, distance to the border, and population density. Using satellite information from Africover, we can also measure the village centroid distance to the nearest major town and the distance to the nearest major road.

5 Empirical Strategy

Our identification strategy builds on two assumptions. First, villages with high RTLM coverage experienced higher genocide violence. This is the result of Yanagizawa-Drott (2012), who used local variation in radio coverage to establish causality. Below, we reproduce these results, and provide additional empirical evidence using the household data.

[14] EICV stands for Enquete Integrale sur les Conditions de Vie des menages.

Second, RTLM coverage does not have a direct effect on any of the socio-economic outcomes but rather only works through genocide violence. Even though one cannot test this assumption directly we can provide some indirect evidence. Specifically, we test if RTLM coverage is correlated with time-invariant or predetermined outcomes (village population in 1991, population density, village size, distance to major town, distance to major road and distance to the border) using the following specification

$$pre\_y_{jc} = \beta rtlm_{jc} + X_{jc}\pi + \gamma_c + \epsilon_{jc}, \tag{5}$$

where pre_y_{jc} is a pre-genocide characteristic of village j in commune c, $rtlm_{jc}$ the share of the village with RTLM coverage, γ_c is a commune fixed effect, and ϵ_{jc} the error term. RTLM had two transmitters in Rwanda, one located in the capital Kigali and the other one on a mountain top in the northwestern part of the country. As the transmitters might have been geographically placed in a strategic manner, we include a vector of controls, X_{jc}, for second order polynomials in distance to the transmitter, mean altitude of a village, altitude variance, latitude and longitude.[15] Identification therefore stems from highly local differences between villages within communes induced through exogenous hills in the line-of-sight of the transmitter and the village. If our RTLM coverage measure is as good as randomly assigned we expect $\beta = 0$. Reassuringly, none of the pre-genocide village characteristics is significantly correlated with RTLM coverage given our controls (regressions 1 to 9 in Table 1).[16]

Two concerns however still remain. The exclusion restriction would be violated if some other radio station, whose broadcasts possibly affect economic well-being, were to use the RTLM transmitters after the genocide or had a similar outreach than RTLM. This is, however, not the case. First, both RTLM transmitters were destroyed at the end of the genocide, and the broadcasts stopped. Furthermore, until 2004 there was only Radio Rwanda broadcasting. Radio Rwanda, also destroyed during the genocide, was reinstalled during the years 1997 to 2000 and obtained essentially national coverage, whereas RTLM's coverage was limited to the areas around the two transmitters. Thus we should not expect their outreach to be correlated. Only in 2004 and thus *after* our sampling period do the first private radio stations go on air.

The exclusion restriction would also be violated if the RTLM broadcasts in 1994 informed about economic issues such as fertilizer use, optimal crop circulation, health ed-

[15]The exact technical reasons for these propagation control variables can be found in Yanagizawa-Drott (2012).

[16]The pre-genocide census from 1991 does not include data on other socio-economic characteristics, such as income and education, at the village level.

ucation, etc. This concern too is likely to be unwarranted, first of all anecdotal evidence suggests that RTLM's broadcasts mainly involved stirring up hatred against the Tutsi minority and playing modern music. Second, to directly assess content relevant for socio-economic outcomes, we obtained and analyzed a 10 percent sample of RTLM's broadcasts and do not find any evidence that RTLM was broadcasting content that could directly affect economic performance.[17]

5.1 Specification

To show that the broadcasts caused more violence, and reproduce the main result in Yanagizawa-Drott (2012), we estimate the following (first stage) equation:

$$h_{jc} = \beta rtlm_{jc} + X_{jc}\pi + \gamma_c + \epsilon_{jc}, \tag{6}$$

where h_{jc} is the genocide participation rate of village j in commune c, and $rtlm_{jc}$ the share of the village with RTLM coverage. X_{jc} is a vector of propagation controls, listed above as well as the pre-genocide village characteristics used in the exogeneity check. γ_c is a commune fixed effect and ϵ_{jc} the error term.

We then run the following reduced form regressions:

$$post\_y_{ijc} = \beta rtlm_{j,c} + X_{ijc}\pi + \gamma_c + \epsilon_{ijc} \tag{7}$$

$post\_y_{ijc}$ is the post-genocide per capita outcome of household i in village j in commune c, $rtlm_{jc}$ the share of the village with RTLM coverage, and the other independent variables are the same as before. Standard errors are clustered at district level.

Throughout, we present the reduced form estimates. In addition, as the station broadcasted content of no directly socio-economic content and the transmitters were destroyed with the end of the genocide, it is reasonable to assume that the temporary shock in exposure to radio affected later economic outcome only by inducing more violence during the genocide. Under this assumption, we also present scaled instrumental-variable estimates. To achieve the best precision, we follow Angrist and Krueger (1992) and use the full sample of 1059 villages to estimate the first stage relationship, and a two-sample instrumental

[17]The radio tapes are retrieved online from Jake Freyers homepage, who downloaded them from the International Criminal Tribunal for Rwanda (ICTR). The ICTR again received the tapes from various different sources, thus we believe this to be a random sample. The ICTR translated about 20 percent of these tapes from Kinyarwanda into English (another 20 percent were originally in French). As the ICTR was mainly interested in finding evidence for genocidal behavior we expect, if at all, the untranslated Kinyarwanda tapes to contain broadcasts about economic or social advice to the listeners. We look for keywords such as school, income, fertilizer, education.

variable (TSIV) approach using the 326 villages with household data, to estimate the effect of violence on later economic outcomes.

Throughout our analysis we will exclude villages in the capital Kigali from our sample, since these experienced extreme amounts of in and out migration. Furthermore, we always include all surveyed households in each village. The results, however, are almost identical when restricting the sample to those households who experienced the genocide at their surveyed location.

6 Results

6.1 First Stage

The first stage relationship between radio coverage and genocide violence is strongly positive at 95 percent confidence (regression 1 in Table 2), and this relationship holds when dropping villages in the capital Kigali (regression 3) and restricting the sample to those villages surveyed in EICV1 (regressions 2 and 4), although we lose significance here because of the large reduction in sample size, from 1065 villages to 332. Regarding magnitude, the point estimate of 0.484 log points (standard error 0.23) in our preferred specification, used in our two sample instrumental variable estimation, suggests that a village with full radio coverage has about 62 percent more perpetrators than a village with no perception or put differently that a one standard deviation increase in radio coverage increases violence by 10 percent.

Reassuringly, radio coverage is also positively and significantly related to child mortality in the household survey (regressions 5 and 6). The regressions use mothers that were present in the village during the genocide and are older than 25 years in the sample, and were thus around 19 years during the genocide.[18] Child mortality is defined as the number of dead children over the total number of children born to each mother in the regression sample. In terms of magnitude, full radio coverage increases child mortality by about 0.083 (standard error 0.03) in our specification with additional controls, given a sample mean of 0.23 this amounts to 36 percent. Furthermore, dividing the sample into girls and boys reveals that this result is driven by the boys. The point estimate for boys nearly doubles to 0.158 (standard error 0.06, regression 8), full radio coverage thus increases boy mortality by about 61 percent. The point estimates for female mortality rates

[18] In the appendix, Table (A.7), we show that the results are not dependent on the exact cutoff age. In particular, the effect gets stronger the older the women were during the genocide which seems reasonable given that younger women are more likely to get more kids after the genocide and thus reduce their child mortality measure.

are close to zero and insignificant. Given that the perpetrators mainly targeted males, this finding is consistent with the genocide producing this high mortality. Unfortunately, we do not observe adult mortality in the data.

6.2 Main Effects

Assets In the first main result, RTLM reception is positively and significantly related to total per capita household assets with a point estimate of 0.354 (s.e.=0.184) in our preferred specification with all controls. Household assets is the sum of farm land, livestock assets, and durable goods. Livestock value is the sum of households cattle, sheep, goat, pigs, rabbits and chicken ownings, each multiplied by its price. Durable goods include assets such as radio, bicycles, cars, refrigerators or furniture. Individual regressions of the various wealth measures on radio coverage confirm the positive results: point estimates are 0.373 for land assets (s.e.=0.163), 0.780 for livestock assets (s.e.=0.403) and 1.004 for durable goods (s.e.=0.472).

The estimates are quantitatively meaningful. Using a two-sample instrumental variable approach, we estimate the relationship between violence and total assets per capita, thus a 10 percent increase in violence increases total assets per capita by about 7 percent, which is USD 306 of the mean. Similarly we can estimate the corresponding point estimates for land assets (0.762), livestock (1.594), and durable goods (2.052), all reported at the bottom of Table 3. Thus, our results show that households living in villages that experienced higher levels of violence induced by RTLM reception own more assets six years after the genocide.

Agricultural Income Table 4 shows that RTLM reception is also positively and again significantly related to farming incomes. Point estimates in our preferred specifications with all controls range from 0.526 (standard error 0.197) for total farm income (regression 2 in Table 4), the sum of agricultural output and livestock output minus running capital costs, such as expenses for fertilizers, transportation, fuel or fencing and external wage payments, to 0.483 (s.e.=0.204) for only agricultural income (regression 4) and are throughout significant at the five percent level.

Results are similar and still significant at the ten percent level when we consider output, thus do not subtract running costs. Again TSIV estimates are reported at the bottom.

The estimates are also quantitatively meaningful and similar to the effects on assets. The scaled TSIV estimates imply that a 10 percent increase in violence increases per capita income six years after the genocide by approximately 10-11 percent, corresponding to

about 140 USD in the sample, and output by 8 percent.

Consumption Finally, and perhaps most importantly, we find that consumption is positively affected. The reduced form effects are highly significant at 99 percent confidence level, and the TSIV estimates imply that a 10 percent increase in violence in 1994 increased consumption per capita six years later by 13-15 percent, or approximately USD 100.[19] When breaking down the consumption goods into food, non-food and durable goods, all the coefficients are positive. The overall effects are seemingly not primarily driven by food expenditures, but rather (and consistent with Engel's law) non-food expenditures: both durable goods consumption and small non-food consumption (this includes for instance expenses for hygiene, medicine, leisure). Other expenditures such as net-transfers to other households, schooling or festival expenses are also strongly positively related to genocide violence.

Interpretation Our results show that households living in villages that experienced higher levels of violence induced by RTLM reception have higher living standards six years after the genocide. They own more assets per capita, such as land, livestock, and durable goods.[20] This is consistent with qualitative evidence showing that looting of the property of killed Tutsis was common (Hatzfeld, 2003). Furthermore, we find that per capita output and income from agricultural production, as well as consumption, are significantly higher in villages that exogenously experienced more violence. The effects are also quantitatively meaningful. Our estimates indicate that a 10 percent increase in violence in a village during the 1994 genocide is associated with approximately a 10-15 percent increase in per capita income and consumption among households six years afterwards. These results are thus consistent with the Malthusian view that mass murders that reduce the population can raise capital intensity by effectively redistributing capital, such as land, from the deceased to the survivors. This raises the living standards of the

[19] It is worth noting that when using OLS to estimate the effect of violence on the outcomes, the estimates are generally close to zero and insignificant, implying that the OLS estimates are negatively biased and suggesting that greater levels of poverty increased participation in the killings of Tutsis.

[20] Note that these positive effects are not driven by nominal price effects (something one might worry about since we are considering monetary values): using Kling et al.'s (2007) method to calculate average effects we show that RTLM reception is unrelated to prices of the six major Rwandan crops but on the contrary positively and strong significantly associated with the corresponding crop quantities, thus we can document a real effect (regressions 1 to 8 in Table A.1). Similarly, radio coverage is unrelated to average livestock and durable goods prices (regression 5 to 8). Item by item regressions confirm the average effects (Table A.2 to A.5). Furthermore, we can also rule out that post-conflict public goods provision by the central government or some NGO are driving the positive results. Communities with high levels of violence are not more likely to report government funded infrastructure construction, such as schools, clinics, roads, bridges or water sources (regressions 1 to 10 in Table A.6).

remaining population. Since the underlying process is a conflict between ethnic groups, the results are also consistent with rationalist explanations of why genocides may occur as the remaining population will tend to consist of members of the attacking group. Moreover, to the extent that the violence during the Rwandan Genocide destroyed physical and human capital, or decreased the efficiency of markets more broadly, these effects seem to have been muted and dominated by the Malthusian mechanism.[21]

A limitation of the study is that since the genocide occurred in 1994 and the outcomes are measured six years afterwards, the estimates capture short/medium term effects. Our results therefore do not directly speak to whether these effects will last in the very long term. However, we can use the existing data on socio-economic outcomes to further investigate the mechanisms by which the violence resulted in the effects we detect, which may also be informative about potential persistencies.

6.3 Additional Results and Mechanisms

Technology Adaption A natural question is whether the positive effects arose not only due to the direct effects on productive assets, but also whether they are due to productivity increases resulting from technology adaption. One reason we might expect such a mechanism comes from poverty trap models with credit constraints and a non-convex production function. That is, if the first-order effect of genocide is an increase in assets for the survivors, this capital injection may in turn facilitate investments in technologies with high fixed costs.

In Table 6 we investigate whether violence induced by the RTLM is associated with higher use of irrigation, fertilizers, fuel use or transport and storage. The endogenous variables take on the value one if the household accrued any expenses for these items. Transport and storage as well as fuel use potentially proxy for having taken fixed cost of vehicles or mechanization. Except for irrigation which is significant at 90 percent in one specification (regression 2), there is no evidence that technology adaption was affected. Point estimates are throughout close to zero. Furthermore, irrigation solely cannot explain our main effects as less than 1 percent of the households (mean=0.0039) have irrigation systems.

Age and Gender Composition An additional channel by which violence could have affected output per capita is that the surviving population is more productive due to dif-

[21] Again, it is important to note that the positive effects on standards of living for survivors by no means imply that violence increases welfare. After all, mass killings imply (gross) losses in welfare due to lost lives.

ferences in age, and, to the extent that there is differential labor supply and productivity across gender, gender composition. Table 7 shows that that there is no evidence that the gender composition among adults was affected by the violence. Thus, the differential mortality rates among male children shown in Table 2 is not mirrored among adults. The point estimates in regressions 1 to 4 do point towards relatively fewer females in high violence villages, but they are far from being significant.

Turning to age composition, we find evidence that the violence increased the working age population share (age 13-49) when measured six years after the genocide. The TSIV estimates in regressions 7-8 imply that a 10 percent increase in genocide violence increases the working age population share by 2.2-2.3 percentage points.[22] This suggests that the the most vulnerable, children and the elderly, were more likely to suffer deaths from the violence. Importantly, the results indicate that an explanation for the positive effects on output per capita, in addition to the increase in per capita assets, is that a higher share of the population is of working age and thus increased the productive capacity of the typical person.

Human Capital Violence may affect human capital in at least two ways. First, the killings during the genocide may have been overrepresented among more educated adults, and relatively highly educated individuals may have migrated into the high violence villages after the genocide. Second, the violence may have been disruptive for children of school age during the genocide, for example because experience of violence in the villages hampers the learning process, or because schooling supply decreases (schools are destroyed, teachers are killed), or because the opportunity costs of education increases (e.g., the returns to child labor is higher because households own more land assets). We proxy for human capital by years of schooling, as is standard in the literature. For children, we also have measures of cognitive skills based on survey test results of reading, writing and simple math. Furthermore, we consider the effects on three distinct age groups: children that were below primary school age during the genocide, children of primary school age and children of secondary school age.

We find negative effects on cognitive skills among children. First, there is some evidence that children of primary school age during the genocide living in high violence villages have fewer years of schooling, as the coefficient is negative with a p-value of 0.105. Regressions 2-4 in Table 8 show highly significant estimates and display that cognitive skills are adversely affected, as these children are less likely to be able to read, write

[22]Children of age 13 have usually finished schooling (very few go on to do secondary school) and life expectancy in Rwanda at the time (and before) was around 49.

and do simple math. The effects are quantitatively substantial, as the TSIV estimates imply that a 10 percent increase in violence decreases the likelihood of being able to read by 3.5 percentage points, the ability to write by 4.3 percentage points, and the ability to do simple math by 4.9 percentage points. Secondary schooling cohorts seem unaffected, point estimates are all insignificant and close to zero. Finally, we find no differences in human capital for young cohorts that were below primary school age at the time of the genocide, ruling out that the genocide had persistent effects on schooling supply, for example through missing teachers or destroyed schools.

However, the loss in human capital for the primary school cohort seems to be persistent: point estimates are very similar to the ones we obtain above when we restrict the sample to those children which are currently out of school (regressions 5-8 in Table 8), thus it seems unlikely that these children (young adults) will catch up. Since the schooling supply side does not seem to be driving this result, one alternative explanation, consistent with our findings for wealth and income above, is that the genocide temporarily prevented children from going to school, however, once the killings were over it became more attractive to work in agriculture rather than return to school since land and capital intensity had increased. However, we find no evidence that human capital among adults is affected (regressions 1 to 4 in Table 9). The point estimates are small and highly insignificant.

The negative effects on human capital among children suggest that affected cohorts will be relatively less productive as adults, with negative implications for future income. Although speculative, this mechanism may counteract the positive effects estimated in the short term, as the effects on income and consumption may be transitory and not persist in the longer run.

Population and Fertility Finally, since a first-order effect of political mass killings is the reduction in population size, a natural mechanism to investigate that is informative about the potential dynamic effects is how migration and fertility are affected. First, since there is a demonstrated positive effect on land assets, if fixed costs of migration are low one might expect individuals from low violence areas to move into high violence areas because the returns to labor are higher. We use a special community survey attached to the EICV1 survey which includes a question about whether communities saw their population growing after the genocide to investigate this possibility. There is no strong evidence pointing towards this mechanism. The point estimates are positive (regressions 1-2 in Table 10), but statistically insignificant. This suggests that fixed costs of migration may be non-trivial.

On the other hand we find strong evidence for internal population growth, thus fertility: radio coverage is positively and statistically significant at 5 percent level associated with the total number of children per young women (age 13 to 29) conceived after the genocide, in order to exclude involuntary births through rape. The point estimates imply that a 10 percent increase in violence increases fertility by approximately 0.25 more children. We do not find any significant effects for the two older cohorts, women between 30 and 39 or between 40 and 49, respectively.

It is interesting to note that we can rule out that young mothers in high violence villages are simply "replacing" those children lost during the genocide. Point estimates are robust or even somewhat larger when we restrict the sample of women to those who did not suffer from any child death (regressions 5-6). The point estimates for women between 30 and 39 also increase in magnitude. Furthermore, differences in school attendance among young women are also unlikely to drive the results: point estimates get even stronger when we drop those women who are currently enrolled in school (regressions 7-8).

These results are interesting in their own right, but also informative about the potential persistence of the positive effects on per capita assets, income and consumption. If a key reason for the short term effects was an increase in capital intensity, then higher fertility rates would tend to suppress these effects over time. Together with the effects on the age distribution and lower human capital among children, it seems that the positive effects are likely to be muted over time, potentially disappear, and, in the extreme case, turn negative.

7 Discussion and Conclusion

To the best of our knowledge, this paper is the first to demonstrate that conflict in general, and political mass murder in particular, can have positive effects on economic performance. Our results show that households living in villages that experienced higher levels of violence induced by RTLM reception have higher living standards six years after the genocide. Specifically, they own more land assets, livestock, durable goods and total assets per capita. Furthermore, we find that per capita output and income from agricultural production, as well as consumption, are significantly higher in villages that exogenously experienced more violence. These effects are also quantitatively meaningful. Our estimates indicate that a 10 percent increase in violence in a village during the 1994 genocide is associated with approximately a 10-15 percent increase in per capita income and consumption among households six years afterwards. Although our main results

showcase that political mass murders can have positive effects on economic performance in the short to medium run, we find additional evidence on age distribution, human capital and fertility, that indicate that these effects are likely to be temporary and perhaps disappear in the long run.

Furthermore, in light of these findings, one should be cautious when generalizing the effects. Important heterogeneities are expected. For example, like many developing countries, the Rwandan economy is overwhelmingly agrarian where land assets play a particularly prominent role. The positive effects on output are therefore less surprising in this context. By contrast, Acemoglu et al. (2011) find that the persecution of the Jewish population in Russia during the Holocaust had long-lasting negative effects on economic performance. In this case, the loss in human capital is likely to dominate any effect of a population decrease. In an agricultural environment such as Rwanda, human capital might not be as important as other factors of production, and the differences in human capital between Tutsi and the general population in Rwanda were arguably an order of magnitude smaller than the difference between the Jewish and the general population in Russia. These two contracting cases highlight that there are no good reasons to believe that the effects of political mass killings must be homogeneous and that living standards are expected to increase in all contexts. Further theoretical and empirical research that can shed light on the conditions determining the economic effects of political mass murders would be useful, not to mention the potentially negative effects on mental and physical health, and the social fabric of societies.

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Figure 1: Rwandan Villages, Radio Coverage.

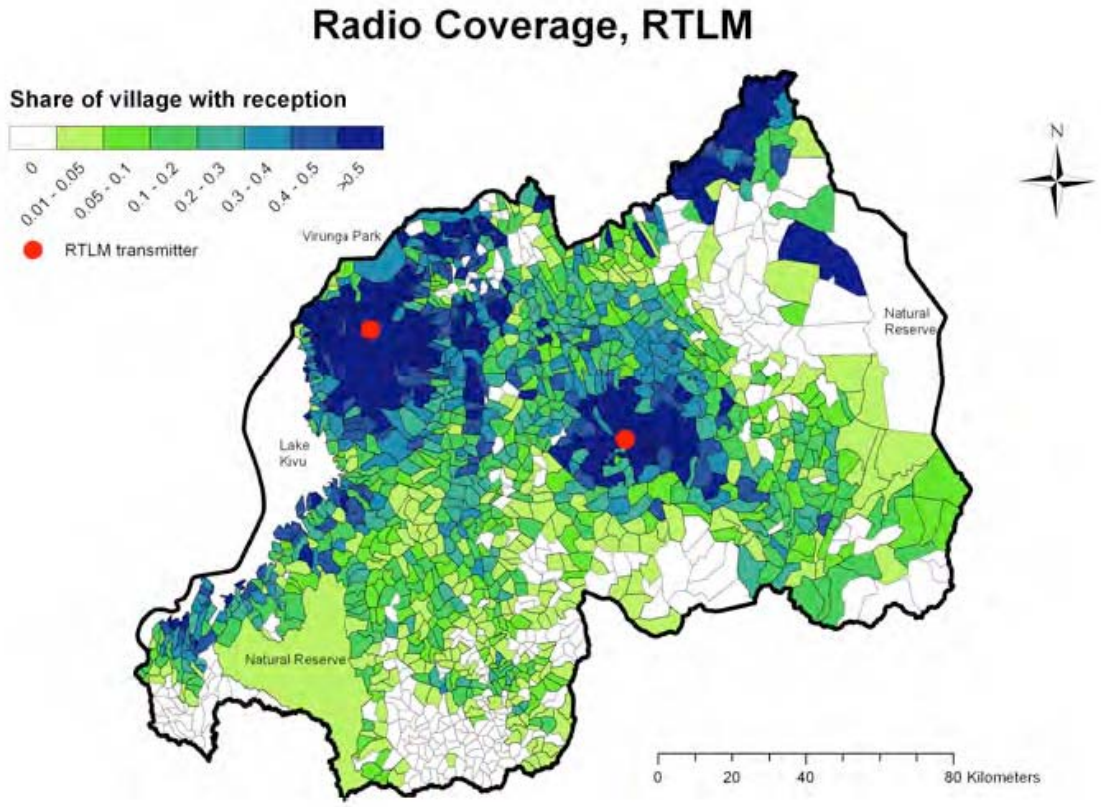

Table 1: Exogeneity check

	Population in 1991, log	Population Density in 1991, log	Distance to Major Town, log	Distance to Major Road, log	Distance to the Border, log	North Sloping	East Sloping	South Sloping	West Sloping
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Radio Coverage in Village	−0.194	−0.115	0.024	−0.247	0.068	0.088	−0.118	−0.034	0.065
	(0.277)	(0.577)	(0.127)	(0.341)	(0.356)	(0.408)	(0.270)	(0.326)	(0.366)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.66	0.60	0.96	0.80	0.95	0.41	0.39	0.37	0.43
N	332	332	332	332	332	332	332	332	332

Note: Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 2: First Stage

	Full sample		No Kigali		In sector during Genocide					
	Genocide Violence				Mortality		Male Mortality		Female Mortality	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Radio Coverage in Village	0.545	0.708	0.484	0.496	0.088	0.083	0.144	0.158	−0.016	−0.034
	(0.229)**	(0.830)	(0.232)**	(0.880)	(0.039)**	(0.035)**	(0.053)**	(0.059)**	(0.058)	(0.064)
Population 1991, log	0.589	0.468	0.591	0.449		−0.006		0.028		−0.048
	(0.148)***	(0.284)	(0.150)***	(0.293)		(0.019)		(0.028)		(0.020)**
Population density 1991, log	0.004	0.227	0.010	0.268		0.003		0.006		0.011
	(0.113)	(0.167)	(0.115)	(0.182)		(0.011)		(0.013)		(0.015)
Distance to Major Town, log	−0.233	−0.367	−0.218	−0.285		−0.016		−0.050		0.007
	(0.161)	(0.519)	(0.160)	(0.556)		(0.032)		(0.042)		(0.054)
Distance to Major Road, log	−0.245	−0.273	−0.237	−0.239		0.032		0.053		0.026
	(0.100)**	(0.158)*	(0.100)**	(0.161)		(0.015)**		(0.022)**		(0.016)
Distance to Border, log	0.030	−0.360	0.030	−0.349		0.051		0.052		0.041
	(0.122)	(0.330)	(0.121)	(0.320)		(0.025)*		(0.028)*		(0.045)
North Sloping, dummy	0.041	0.143	0.035	0.113		−0.005		0.015		−0.020
	(0.106)	(0.239)	(0.106)	(0.245)		(0.026)		(0.031)		(0.032)
East Sloping, dummy	0.098	0.058	0.102	0.054		−0.015		−0.011		−0.010
	(0.076)	(0.210)	(0.077)	(0.213)		(0.017)		(0.028)		(0.020)
South Sloping, dummy	−0.028	0.067	−0.025	0.078		−0.035		−0.033		−0.036
	(0.122)	(0.227)	(0.122)	(0.227)		(0.022)		(0.028)		(0.025)
Rural Household, dummy					0.067	0.044	0.105	0.083	0.032	0.001
					(0.035)*	(0.027)	(0.055)*	(0.050)	(0.068)	(0.054)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean					0.23	0.23	0.26	0.26	0.21	0.21
R^2	0.55	0.72	0.55	0.73	0.09	0.09	0.09	0.09	0.09	0.09
N	1065	332	1059	326	2009	2009	1844	1844	1848	1848

Note: Genocide Violence is measured as the number of people prosecuted for genocide violence in the Gacaca courts, category 1 normalized by village population. Mortality is measured as the number of dead children (boys/girls) over the number of total children per mother (boys/girls). Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Regression 1 uses the full sample of sectors from Yanagizawa-Drott (2012). Regression 2 uses that subset which overlaps with the EICV1 Survey. Regressions 3 and 4 exclude Kigali. Regressions 5-10 use women (from EICV1 Survey) that are older than 25 and who resided in the surveyed sector during the genocide. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 3: Assets

	Total Assets Log		Land Assets Log		Livestock Log		Durable Goods, Log	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.479	0.354	0.471	0.373	0.793	0.780	0.703	1.004
	(0.265)*	(0.184)*	(0.199)**	(0.163)**	(0.362)**	(0.403)*	(0.536)	(0.472)**
Distance to Major Town, log		−0.001		0.201		0.065		−0.894
		(0.221)		(0.180)		(0.292)		(0.505)*
Distance to Major Road, log		0.073		0.003		−0.037		−0.472
		(0.076)		(0.067)		(0.085)		(0.129)***
Distance to Border, log		0.258		0.226		0.267		−0.049
		(0.097)**		(0.086)**		(0.213)		(0.225)
Population 1991, log		−0.073		−0.073		−0.104		0.282
		(0.109)		(0.099)		(0.148)		(0.162)*
Population density 1991, log		−0.110		−0.062		0.041		0.064
		(0.060)*		(0.049)		(0.101)		(0.129)
North Sloping, dummy		0.049		0.083		0.038		0.165
		(0.094)		(0.087)		(0.175)		(0.143)
East Sloping, dummy		0.062		0.062		−0.026		0.172
		(0.088)		(0.085)		(0.106)		(0.169)
South Sloping, dummy		−0.020		0.041		0.020		0.180
		(0.102)		(0.094)		(0.127)		(0.149)
Rural Household, dummy	0.219	0.079	−0.328	−0.427	−0.135	−0.105	−2.179	−1.457
	(0.188)	(0.225)	(0.190)*	(0.221)*	(0.310)	(0.293)	(0.478)***	(0.427)***
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	4224.00	4224.00	3828.50	3828.50	698.42	698.42	157.80	157.80
R^2	0.12	0.13	0.13	0.14	0.13	0.13	0.23	0.24
N	4027	4027	3847	3847	2451	2451	3612	3612
TSIV estimate	0.976	0.724	0.960	0.762	1.614	1.594	1.432	2.052
	(0.539)*	(0.376)*	(0.404)**	(0.333)**	(0.737)**	(0.824)*	(1.093)	(0.964)**

Note: All dependent variables are in logged per capita monetary values. Per capita refers to the assets of the household, divided by the number of persons living in the household. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4: Agricultural Income and Output

	Income, Log				Output, Log			
	Livestock & Agriculture		Agriculture		Livestock & Agriculture		Agriculture	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.546	0.526	0.500	0.483	0.408	0.397	0.380	0.374
	(0.197)**	(0.212)**	(0.193)**	(0.204)**	(0.198)*	(0.212)*	(0.188)*	(0.202)*
Distance to Major Town, log		0.242		0.204		0.160		0.149
		(0.203)		(0.203)		(0.196)		(0.197)
Distance to Major Road, log		−0.040		−0.025		−0.034		−0.030
		(0.085)		(0.088)		(0.079)		(0.083)
Distance to Border, log		−0.238		−0.227		−0.154		−0.159
		(0.123)*		(0.121)*		(0.112)		(0.109)
Population 1991, log		−0.183		−0.177		−0.144		−0.152
		(0.137)		(0.136)		(0.136)		(0.148)
Population density 1991, log		0.078		0.070		0.068		0.079
		(0.070)		(0.067)		(0.071)		(0.078)
North Sloping, dummy		0.122		0.113		0.101		0.099
		(0.112)		(0.112)		(0.106)		(0.105)
East Sloping, dummy		0.099		0.097		0.085		0.075
		(0.097)		(0.099)		(0.088)		(0.089)
South Sloping, dummy		0.138		0.131		0.151		0.146
		(0.120)		(0.122)		(0.119)		(0.120)
Rural Household, dummy	0.223	0.181	0.262	0.217	0.193	0.170	0.250	0.229
	(0.391)	(0.438)	(0.383)	(0.423)	(0.354)	(0.403)	(0.354)	(0.398)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	1388.75	1388.75	1363.71	1363.71	1467.62	1467.62	1417.70	1417.70
R^2	0.23	0.23	0.24	0.24	0.24	0.24	0.26	0.26
N	3775	3775	3783	3783	3833	3833	3833	3833
TSIV estimate	1.112	1.076	1.018	0.988	0.830	0.812	0.775	0.764
	(0.400)**	(0.433)**	(0.394)**	(0.416)**	(0.403)*	(0.434)*	(0.383)*	(0.412)*

Note: All dependent variables are in logged per capita monetary values. Per capita refers to the output or income of the household, divided by the number of persons living in the household. Income is defined as output minus running costs. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 5: Consumption

	Total Log		Food Log		Non-Food Log		Durable Goods Log		Other Expenses Log	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Radio Coverage in Village	0.643	0.736	0.196	0.248	0.663	0.905	0.763	0.920	0.552	0.755
	(0.242)**	(0.237)***	(0.157)	(0.116)**	(0.647)	(0.612)	(0.245)***	(0.275)***	(0.308)*	(0.343)**
Distance to Major Town, log		−0.331		−0.210		−0.695		−0.363		−0.444
		(0.410)		(0.201)		(0.630)		(0.496)		(0.684)
Distance to Major Road, log		−0.206		−0.155		−0.337		−0.197		0.103
		(0.070)***		(0.056)**		(0.134)**		(0.101)*		(0.103)
Distance to Border, log		−0.235		−0.235		−0.473		−0.171		0.171
		(0.093)**		(0.100)**		(0.236)*		(0.141)		(0.156)
Population 1991, log		0.010		−0.009		0.065		0.067		0.352
		(0.096)		(0.069)		(0.188)		(0.111)		(0.155)**
Population density 1991, log		−0.032		−0.041		−0.052		−0.046		0.002
		(0.088)		(0.054)		(0.124)		(0.112)		(0.122)
North Sloping, dummy		0.152		0.051		0.361		0.119		0.217
		(0.090)		(0.049)		(0.126)***		(0.152)		(0.120)*
East Sloping, dummy		0.250		0.099		0.661		0.162		0.284
		(0.072)***		(0.040)**		(0.130)***		(0.127)		(0.147)*
South Sloping, dummy		0.166		0.049		0.482		0.168		0.238
		(0.103)		(0.055)		(0.170)***		(0.134)		(0.092)**
Rural Household, dummy	−0.805	−0.585	−0.571	−0.428	−1.755	−1.355	−0.643	−0.417	−0.278	−0.131
	(0.184)***	(0.167)***	(0.132)***	(0.122)***	(0.289)***	(0.271)***	(0.276)**	(0.235)*	(0.283)	(0.305)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	630.63	630.63	121.82	121.82	216.11	216.11	346.80	346.80	227.72	227.72
R^2	0.21	0.22	0.18	0.19	0.18	0.20	0.16	0.17	0.13	0.14
N	4039	4039	4039	4039	3872	3872	3513	3513	2783	2783
TSIV estimate	1.310	1.504	0.399	0.507	1.350	1.849	1.554	1.880	1.123	1.544
	(0.492)**	(0.485)***	(0.321)	(0.237)**	(1.319)	(1.251)	(0.499)***	(0.563)***	(0.628)*	(0.701)**

Note: All dependent variables are in logged per capita monetary values. Per capita refers to the consumption of the household, divided by the number of persons living in the household. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 6: Technology Adaption

	Irrigation, dummy		Fertilizer Use, dummy		Diesel & Oil		Transport & Storage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.015	0.016	−0.068	−0.080	−0.001	−0.002	0.095	0.119
	(0.009)	(0.009)*	(0.075)	(0.083)	(0.001)	(0.002)	(0.082)	(0.078)
Distance to Major Town, log		0.002		0.054		0.006		−0.052
		(0.009)		(0.111)		(0.005)		(0.034)
Distance to Major Road, log		0.002		−0.035		−0.001		−0.013
		(0.005)		(0.019)*		(0.001)		(0.014)
Distance to Border, log		0.004		−0.003		0.001		−0.027
		(0.004)		(0.046)		(0.001)		(0.031)
Population 1991, log		−0.005		−0.018		−0.002		0.048
		(0.004)		(0.033)		(0.002)		(0.020)**
Population density 1991, log		0.006		0.007		−0.000		−0.002
		(0.003)*		(0.022)		(0.000)		(0.013)
North Sloping, dummy		−0.004		0.001		−0.000		−0.007
		(0.003)		(0.030)		(0.000)		(0.018)
East Sloping, dummy		0.001		0.008		0.001		0.002
		(0.002)		(0.031)		(0.001)		(0.016)
South Sloping, dummy		0.002		−0.002		−0.001		0.013
		(0.002)		(0.028)		(0.001)		(0.017)
Rural Household, dummy	0.001	0.001	0.034	0.045	0.001	0.001	0.011	0.042
	(0.002)	(0.003)	(0.046)	(0.059)	(0.001)	(0.001)	(0.043)	(0.040)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	0.0039	0.0039	0.1244	0.1244	0.0003	0.0003	0.0556	0.0556
R^2	0.09	0.09	0.14	0.14	0.02	0.03	0.06	0.06
N	3833	3833	3833	3833	3833	3833	3833	3833
TSIV estimate	0.031	0.033	−0.141	−0.165	−0.001	−0.005	0.197	0.246
	(0.019)	(0.019)*	(0.156)	(0.171)	(0.002)	(0.005)	(0.169)	(0.160)

Note: All dependent variables are dummies indicating whether the household accrued the corresponding costs (e.g. irrigation costs in regression 1 and 2). Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 7: Age and Gender Composition

	Fraction Male		Female Head		Age of Head		Fraction Age: 13-49		Fraction Male Age: 13-49	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Radio Coverage in Village	0.055	0.061	−0.030	−0.051	−3.851	−4.869	0.109	0.112	0.106	0.107
	(0.060)	(0.051)	(0.145)	(0.126)	(2.480)	(2.628)*	(0.033)***	(0.033)***	(0.053)*	(0.049)**
Distance to Major Town, log		0.009		0.029		2.622		−0.040		0.000
		(0.019)		(0.051)		(1.644)		(0.031)		(0.023)
Distance to Major Road, log		−0.011		0.008		−1.106		−0.007		−0.011
		(0.013)		(0.019)		(0.822)		(0.009)		(0.011)
Distance to Border, log		−0.037		0.033		1.085		−0.012		−0.014
		(0.014)**		(0.039)		(1.387)		(0.024)		(0.022)
Population 1991, log		−0.008		−0.036		−0.911		0.002		−0.003
		(0.012)		(0.032)		(0.841)		(0.010)		(0.011)
Population density 1991, log		0.010		0.014		0.161		−0.008		−0.001
		(0.010)		(0.021)		(0.603)		(0.007)		(0.008)
North Sloping, dummy		−0.001		0.032		−0.096		0.013		0.002
		(0.017)		(0.024)		(0.935)		(0.011)		(0.012)
East Sloping, dummy		0.001		−0.034		−1.144		0.027		0.011
		(0.015)		(0.028)		(0.948)		(0.014)*		(0.011)
South Sloping, dummy		0.009		−0.000		−0.335		−0.002		0.006
		(0.014)		(0.026)		(0.813)		(0.011)		(0.011)
Rural Household, dummy	−0.048	−0.040	0.088	0.069	3.567	3.565	−0.064	−0.053	−0.061	−0.054
	(0.027)*	(0.026)	(0.060)	(0.044)	(1.207)***	(1.731)*	(0.023)***	(0.025)**	(0.025)**	(0.022)**
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	0.46	0.46	0.32	0.32	44.46	44.46	0.53	0.53	0.24	0.24
R^2	0.04	0.04	0.05	0.06	0.05	0.05	0.07	0.07	0.05	0.05
N	4039	4039	4039	4039	4039	4039	4039	4039	4039	4039
TSIV estimate	0.113	0.127	−0.062	−0.105	−7.957	−10.060	0.225	0.232	0.219	0.220
	(0.124)	(0.106)	(0.300)	(0.259)	(5.123)	(5.430)*	(0.068)***	(0.068)***	(0.109)*	(0.101)**

Note: All fractions correspond to the household level, e.g. regressions 9 and 10 use the fraction of household members which are male and between 13 and 49 years old. Female head is a dummy variable. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 8: Human Capital, All School Age Children

	All Children				Children out of School			
	Years of Schooling	Ability to Read	Ability to Write	Ability to do Maths	Years of Schooling	Ability to Read	Ability to Write	Ability to do Maths
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage x Under Primary School Age	0.136	0.004	−0.002	−0.030	−0.254	−0.132	−0.095	−0.121
	(0.289)	(0.099)	(0.098)	(0.066)	(0.482)	(0.084)	(0.068)	(0.075)
Radio Coverage x Primary School Age	−0.734	−0.172	−0.209	−0.237	−0.777	−0.288	−0.307	−0.297
	(0.438)	(0.067)**	(0.068)***	(0.080)***	(0.533)	(0.094)***	(0.095)***	(0.104)***
Radio Coverage x Secondary School Age	−0.011	−0.077	−0.022	−0.080	0.590	−0.037	0.006	−0.042
	(0.853)	(0.122)	(0.118)	(0.132)	(0.578)	(0.104)	(0.108)	(0.112)
Age	0.316	0.054	0.053	0.053	0.258	0.033	0.033	0.030
	(0.018)***	(0.004)***	(0.004)***	(0.004)***	(0.025)***	(0.006)***	(0.006)***	(0.006)***
Father's Schooling	0.148	0.015	0.014	0.014	0.150	0.019	0.018	0.018
	(0.010)***	(0.002)***	(0.003)***	(0.003)***	(0.016)***	(0.003)***	(0.003)***	(0.003)***
Mother's Schooling	0.113	0.008	0.010	0.010	0.125	0.012	0.014	0.014
	(0.011)***	(0.003)**	(0.003)***	(0.003)***	(0.019)***	(0.004)**	(0.004)***	(0.005)***
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Additional Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune x Age Group Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	3.15	0.51	0.48	0.53	2.93	0.51	0.48	0.51
Dep. Mean: Primary School	3.66	0.65	0.62	0.66	2.80	0.51	0.49	0.53
R^2	0.46	0.28	0.29	0.26	0.46	0.35	0.35	0.36
N	8190	8190	8190	8190	4180	4180	4180	4180
TSIV estimates								
Genocide Violence x Under Primary School Age	0.281	0.007	−0.005	−0.061	−0.525	−0.272	−0.196	−0.251
	(0.596)	(0.205)	(0.202)	(0.136)	(0.997)	(0.174)	(0.140)	(0.155)
Genocide Violence x Primary School Age	−1.517	−0.356	−0.432	−0.489	−1.605	−0.596	−0.634	−0.614
	(0.906)	(0.139)**	(0.140)***	(0.165)***	(1.101)	(0.194)***	(0.196)***	(0.214)***
Genocide Violence x Secondary School Age	−0.023	−0.159	−0.045	−0.166	1.220	−0.077	0.013	−0.086
	(1.762)	(0.252)	(0.245)	(0.274)	(1.194)	(0.215)	(0.223)	(0.231)

Note: The school age of the interaction terms refer to the age during the 1994 Rwandan Genocide. The cognitive skills outcomes are dummy variables. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Additional Controls include distance to the road, distance to the border, distance to major city, population and population density, and sloping dummies as well as a dummy for rural areas. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 9: Human Capital, Adults

	Years of Schooling	Ability to Read	Ability to Write	Ability to do Maths
	(1)	(2)	(3)	(4)
Radio Coverage in Village	0.298	−0.004	−0.011	−0.030
	(0.576)	(0.077)	(0.091)	(0.085)
Age	−0.058***	−0.009***	−0.008***	−0.009***
	(0.003)	(0.001)	(0.001)	(0.001)
Father's Schooling	0.359***	0.022***	0.026***	0.024***
	(0.028)	(0.005)	(0.005)	(0.005)
Mother's Schooling	0.168***	−0.006	−0.006	−0.005
	(0.033)	(0.005)	(0.005)	(0.005)
Propagation Controls	yes	yes	yes	yes
Additional Controls	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes
Dep. Mean	2.90	0.47	0.44	0.46
R^2	0.35	0.13	0.13	0.13
N	5710	5710	5710	5710
TSIV estimate	0.616	−0.009	−0.023	−0.061
	(1.190)	(0.160)	(0.188)	(0.176)

Note: The cognitive skills outcomes are dummy variables. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Additional Controls include distance to the road, distance to the border, distance to major city, population and population density, and sloping dummies as well as a dummy for rural areas. The regressions use adults, thus older than 24 years. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 10: Population and Fertility

			Dependent variable: Number of Children (born at least 1 year after the genocide)					
					Women who never lost a child			
	Growing Pop., dummy		All women		All women		Out of School	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.213	0.181						
	(0.370)	(0.355)						
Radio Coverage x Women (13-29)			0.181	0.184	0.204	0.203	0.269	0.269
			(0.076)**	(0.069)**	(0.066)***	(0.062)***	(0.085)***	(0.077)***
Radio Coverage x Women (30-39)			0.011	0.001	0.343	0.305	0.394	0.343
			(0.231)	(0.214)	(0.182)*	(0.184)	(0.201)*	(0.209)
Radio Coverage x Women (40-49)			−0.101	−0.101	−0.018	−0.062	−0.013	−0.064
			(0.155)	(0.171)	(0.587)	(0.588)	(0.594)	(0.597)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Additional Controls	no	yes	no	yes	no	yes	no	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Commune x Age Effects	no	no	yes	yes	yes	yes	yes	yes
Dep. Mean: Women (13-29)			0.33	0.33	0.28	0.28	0.37	0.37
Dep. Mean	0.37	0.37	0.47	0.47	0.39	0.39	0.47	0.47
R^2	0.52	0.54	0.38	0.38	0.43	0.43	0.40	0.41
N	310	310	5825	5825	4286	4286	3510	3510
TSIV estimates								
Genocide Violence	0.440	0.374						
	(0.764)	(0.734)						
Genocide Violence x Women (13-29)			0.373	0.381	0.422	0.419	0.557	0.556
			(0.156)**	(0.143)**	(0.137)***	(0.127)***	(0.175)***	(0.160)***
Genocide Violence x Women (30-39)			0.022	0.003	0.708	0.631	0.815	0.708
			(0.477)	(0.442)	(0.375)*	(0.381)	(0.415)*	(0.432)
Genocide Violence x Women (40-49)			−0.209	−0.210	−0.038	−0.127	−0.026	−0.133
			(0.321)	(0.354)	(1.214)	(1.216)	(1.228)	(1.234)

Note: The dependent variable in regressions 1 and 2 is a dummy indicating whether community population increased after the genocide. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Additional Controls include distance to the road, distance to the border, distance to major city, population and population density, and sloping dummies. Age and a dummy for rural areas are also controlled for. Women's age in the interaction term refer to the age during the sample period. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Appendix

Table A.1: Prices and Quantities, Average Effects

	Crop Quantities, log		Crop Prices, log		Livestock Prices, log		Durable Goods Prices, log	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.448	0.477	−0.304	−0.272	0.226	0.242	−0.416	−0.547
	(0.183)**	(0.172)***	(0.272)	(0.210)	(0.186)	(0.185)	(0.475)	(0.560)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Additional Controls	no	yes	no	yes	no	yes	no	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
N	15397	15397	9357	9357	2411	2411	1136	1136

Note: The dependent variable in regressions 1 and 2 is measured in log kilograms per household and includes the six major crops in Rwanda. Livestock prices are from cattle, pigs, sheep, goats, chicken and rabbits. Durable goods prices are from radios, beds, chairs and lamps. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Additional Controls include distance to the road, distance to the border, distance to major city, population and population density, and sloping dummies as well as a dummy for rural areas. The coefficients represent the average effects of radio coverage on various prices and crop quantities, respectively (Kling et al. (2007)). Standard errors in parentheses, clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.2: Livestock Prices

	Cattle	Sheep	Goat	Pig	Rabbit	Chicken	Livestock Value pc. (1,3,5,6)	Livestock Value pc. (2,4)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	0.061	0.292	0.058	0.420	−0.061	0.015	0.935	0.348
	(0.696)	(0.169)*	(0.237)	(0.478)	(0.381)	(0.167)	(0.434)**	(0.408)
Distance to Major Town, log	−0.046	0.384	−0.103	0.157	0.201	0.074	0.269	0.075
	(0.232)	(0.231)	(0.086)	(0.302)	(0.302)	(0.100)	(0.329)	(0.224)
Distance to Major Road, log	0.080	0.078	0.009	−0.069	0.003	−0.052	−0.030	−0.085
	(0.063)	(0.079)	(0.031)	(0.179)	(0.116)	(0.034)	(0.082)	(0.140)
Distance to Border, log	−0.155	−0.499	−0.005	0.106	−0.354	−0.011	0.370	−0.294
	(0.226)	(0.145)***	(0.067)	(0.268)	(0.288)	(0.083)	(0.224)	(0.258)
Population 1991, log	0.062	−0.035	−0.000	−0.138	−0.215	0.036	−0.144	0.084
	(0.138)	(0.122)	(0.045)	(0.138)	(0.179)	(0.061)	(0.139)	(0.205)
Population density 1991, log	0.199	0.188	−0.030	0.102	0.215	−0.005	0.075	0.060
	(0.047)***	(0.061)***	(0.030)	(0.144)	(0.143)	(0.022)	(0.079)	(0.117)
North Sloping, dummy	−0.063	0.014	−0.013	0.065	0.316	−0.023	0.032	0.174
	(0.202)	(0.140)	(0.049)	(0.157)	(0.136)**	(0.053)	(0.179)	(0.189)
East Sloping, dummy	0.010	0.057	0.087	−0.170	0.434	0.028	0.066	0.173
	(0.111)	(0.119)	(0.047)*	(0.200)	(0.132)***	(0.057)	(0.125)	(0.146)
South Sloping, dummy	0.031	0.075	0.017	−0.063	0.145	−0.015	0.070	0.134
	(0.111)	(0.091)	(0.044)	(0.104)	(0.126)	(0.049)	(0.129)	(0.107)
Rural Household, dummy	−0.128	0.182	−0.265	−0.216	−0.059	−0.245	−0.247	0.071
	(0.149)	(0.237)	(0.136)*	(0.262)	(0.390)	(0.111)**	(0.328)	(0.338)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	140.77	13.97	15.25	19.57	1.19	2.07	27.64	7.66
R^2	0.20	0.44	0.21	0.28	0.40	0.31	0.14	0.24
N	791	413	1374	577	383	1051	2209	866
TSIV estimate	0.126	0.603	0.120	0.867	−0.126	0.032	1.932	0.720
	(1.438)	(0.350)*	(0.490)	(0.987)	(0.788)	(0.346)	(0.897)**	(0.844)

Note: Dependent variables in regression 1 to 6 are the corresponding livestock prices reported by the household. The dependent variable in regression 7 (8) is the per capita monetary value of households cattle, goat, chicken and rabbit (sheep and pig) ownings. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.3: Durable Goods Prices

	Bed	Chair	Lamp	Radio	Durable Goods Value pc. (1,2,3)		Durable Goods Value pc. (Rest)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Radio Coverage in Village	−0.521	−0.955	−0.517	0.097	0.822	0.985	−0.298	0.173
	(1.233)	(0.843)	(0.731)	(0.619)	(0.330)**	(0.303)***	(0.694)	(0.785)
Distance to Major Town, log	−0.656	−0.261	−0.627	−1.172		−0.648		−1.123
	(0.722)	(0.435)	(0.635)	(0.394)***		(0.388)		(0.567)*
Distance to Major Road, log	0.113	−0.002	−0.107	−0.008		−0.357		0.119
	(0.228)	(0.211)	(0.157)	(0.141)		(0.101)***		(0.162)
Distance to Border, log	1.160	0.144	0.228	0.082		−0.042		0.152
	(0.521)**	(0.250)	(0.260)	(0.289)		(0.214)		(0.175)
Population 1991, log	−0.171	0.117	0.094	0.186		0.133		0.303
	(0.460)	(0.287)	(0.180)	(0.239)		(0.128)		(0.227)
Population density 1991, log	0.321	−0.110	−0.132	−0.215		0.002		−0.032
	(0.166)*	(0.142)	(0.175)	(0.122)*		(0.092)		(0.185)
North Sloping, dummy	−0.224	0.140	0.142	−0.119		0.126		−0.199
	(0.305)	(0.246)	(0.187)	(0.176)		(0.128)		(0.192)
East Sloping, dummy	−0.304	0.267	0.070	−0.067		0.001		−0.239
	(0.445)	(0.230)	(0.213)	(0.217)		(0.151)		(0.151)
South Sloping, dummy	−0.396	−0.033	0.173	−0.180		0.114		−0.020
	(0.195)*	(0.204)	(0.129)	(0.124)		(0.132)		(0.204)
Rural Household, dummy	−1.311	−1.346	−1.046	−0.497	−1.038	−0.559	−0.596	−0.387
	(0.431)***	(0.303)***	(0.321)***	(0.245)*	(0.349)***	(0.341)	(0.381)	(0.390)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	13.55	5.16	3.06	8.60	36.69	36.69	285.56	285.56
R^2	0.67	0.64	0.49	0.37	0.16	0.17	0.21	0.22
N	296	274	568	459	3533	3533	1542	1542
TSIV estimate	−1.077	−1.973	−1.069	0.199	1.698	2.035	−0.616	0.357
	(2.548)	(1.742)	(1.509)	(1.278)	(0.682)**	(0.626)***	(1.434)	(1.621)

Note: Dependent variables in regression 1 to 4 are the corresponding durable goods prices reported by the household. The dependent variable in regressions 5 and 6 (7 and 8) is the per capita monetary value of households bed, chair and lamp (other durable goods) ownings. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.4: Crop Prices

	Sorghum		Cassava		Sweet Potato		Dry Beans		Cooking Banana		Beer Banana	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Radio Coverage in Village	0.029	0.001	−0.032	−0.032	−0.277	−0.216	−0.035	−0.029	−0.467	−0.184	−0.362	−0.492
	(0.248)	(0.218)	(0.631)	(0.448)	(0.171)	(0.153)	(0.099)	(0.103)	(0.212)**	(0.297)	(0.293)	(0.308)
Distance to Major Town, log		−0.031		0.522		0.251		0.058		−0.458		0.317
		(0.108)		(0.226)**		(0.115)**		(0.073)		(0.170)**		(0.210)
Distance to Major Road, log		−0.064		0.048		0.045		0.038		−0.022		−0.013
		(0.031)**		(0.098)		(0.078)		(0.022)*		(0.072)		(0.084)
Distance to Border, log		−0.138		−0.101		−0.118		0.009		−0.031		0.117
		(0.062)**		(0.238)		(0.108)		(0.036)		(0.166)		(0.090)
Population 1991, log		−0.036		−0.179		−0.206		0.055		−0.028		−0.218
		(0.040)		(0.092)*		(0.064)***		(0.038)		(0.103)		(0.074)***
Population density 1991, log		0.029		0.168		0.189		−0.010		0.099		0.050
		(0.025)		(0.124)		(0.046)***		(0.023)		(0.066)		(0.057)
North Sloping, dummy		−0.033		0.360		0.102		−0.002		0.073		0.074
		(0.047)		(0.143)**		(0.073)		(0.037)		(0.087)		(0.197)
East Sloping, dummy		−0.045		0.278		0.035		−0.032		0.174		0.183
		(0.046)		(0.126)**		(0.070)		(0.038)		(0.064)**		(0.081)**
South Sloping, dummy		−0.019		0.092		−0.028		−0.020		0.079		−0.106
		(0.031)		(0.064)		(0.074)		(0.031)		(0.067)		(0.087)
Rural Household, dummy	0.529	0.558	0.524	0.540	0.629	0.617	0.768	0.738	0.495	0.571	0.365	0.317
	(0.091)***	(0.074)***	(0.231)**	(0.187)***	(0.183)***	(0.156)***	(0.088)***	(0.086)***	(0.182)**	(0.179)***	(0.231)	(0.208)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	5.29	5.29	5.12	5.12	2.31	2.31	7.38	7.38	2.88	2.88	1.50	1.50
R^2	0.26	0.26	0.51	0.54	0.41	0.43	0.25	0.25	0.27	0.29	0.37	0.39
N	2136	2136	667	667	1250	1250	3512	3512	901	901	785	785
TSIV estimate	0.060	0.002	−0.065	−0.066	−0.572	−0.446	−0.072	−0.060	−0.965	−0.381	−0.747	−1.016
	(0.512)	(0.451)	(1.304)	(0.926)	(0.354)	(0.317)	(0.205)	(0.213)	(0.438)**	(0.614)	(0.605)	(0.637)

Note: Dependent variables are the corresponding crop prices per kilogram reported by the household. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.5: Crop Quantities

	Sorghum		Cassava		Sweet Potato		Dry Beans		Cooking Banana		Beer Banana	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Radio Coverage in Village	0.612	0.642	0.377	0.546	0.936	0.892	0.680	0.750	0.399	0.408	0.325	0.297
	(0.490)	(0.442)	(0.409)	(0.416)	(0.181)***	(0.164)***	(0.258)**	(0.248)***	(0.442)	(0.403)	(0.606)	(0.512)
Distance to Major Town, log		0.083		−0.037		0.146		−0.140		−0.256		−0.318
		(0.299)		(0.338)		(0.202)		(0.193)		(0.195)		(0.309)
Distance to Major Road, log		0.072		−0.014		−0.043		−0.014		−0.155		−0.193
		(0.077)		(0.092)		(0.081)		(0.055)		(0.095)		(0.072)**
Distance to Border, log		0.086		0.342		0.022		−0.091		−0.131		−0.157
		(0.222)		(0.206)		(0.165)		(0.127)		(0.222)		(0.259)
Population 1991, log		−0.154		0.097		−0.085		−0.074		−0.106		−0.296
		(0.097)		(0.126)		(0.156)		(0.096)		(0.232)		(0.117)**
Population density 1991, log		0.135		−0.030		−0.044		0.133		0.045		0.221
		(0.055)**		(0.065)		(0.070)		(0.055)**		(0.104)		(0.060)***
North Sloping, dummy		0.321		−0.004		0.024		0.186		0.160		−0.049
		(0.068)***		(0.133)		(0.109)		(0.078)**		(0.121)		(0.160)
East Sloping, dummy		0.212		0.054		0.191		0.299		0.047		−0.042
		(0.064)***		(0.106)		(0.113)		(0.081)***		(0.168)		(0.101)
South Sloping, dummy		0.178		0.012		0.075		0.211		0.163		0.136
		(0.081)**		(0.138)		(0.125)		(0.087)**		(0.129)		(0.142)
Rural Household, dummy	0.120	0.062	0.284	0.296	0.622	0.586	−0.159	−0.073	−0.857	−0.734	−0.471	−0.299
	(0.396)	(0.410)	(0.464)	(0.507)	(0.420)	(0.432)	(0.276)	(0.260)	(0.274)***	(0.230)***	(0.401)	(0.470)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	113.31	113.31	423.80	423.80	795.46	795.46	103.58	103.58	304.56	304.56	698.79	698.79
R^2	0.27	0.28	0.23	0.23	0.27	0.27	0.26	0.27	0.38	0.38	0.22	0.23
N	2148	2148	2473	2473	3220	3220	3546	3546	1669	1669	2341	2341
Radio Coverage in Village	1.265	1.327	0.778	1.129	1.934	1.843	1.405	1.549	0.823	0.843	0.671	0.614
	(1.013)	(0.913)	(0.846)	(0.859)	(0.375)***	(0.339)***	(0.534)**	(0.513)***	(0.914)	(0.833)	(1.253)	(1.059)

Note: Dependent variables are measured in log kilograms per household of the corresponding crop. Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.6: Public Goods, constructed after Genocide

	Schools		Clinics		Bridges		Roads		Water Sources	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Radio Coverage in Village	−0.107	−0.108	−0.006	−0.004	0.007	0.029	−0.036	−0.046	0.122	0.114
	(0.245)	(0.230)	(0.034)	(0.036)	(0.087)	(0.068)	(0.059)	(0.066)	(0.187)	(0.194)
Distance to Major Town, log		0.151		−0.004		0.003		−0.027		−0.023
		(0.159)		(0.023)		(0.065)		(0.064)		(0.124)
Distance to Major Road, log		0.058		−0.003		−0.021		−0.013		−0.013
		(0.057)		(0.013)		(0.032)		(0.028)		(0.053)
Distance to Border, log		0.113		−0.008		0.020		−0.001		−0.155
		(0.083)		(0.026)		(0.048)		(0.022)		(0.124)
Population 1991, log		0.004		0.022		0.100		0.012		−0.024
		(0.084)		(0.022)		(0.075)		(0.030)		(0.103)
Population density 1991, log		0.005		−0.011		0.003		−0.031		0.014
		(0.040)		(0.011)		(0.021)		(0.022)		(0.075)
North Sloping, dummy		−0.018		0.029		0.012		−0.028		0.027
		(0.064)		(0.021)		(0.039)		(0.027)		(0.068)
East Sloping, dummy		0.024		−0.003		0.054		0.013		0.036
		(0.082)		(0.010)		(0.027)*		(0.050)		(0.064)
South Sloping, dummy		0.071		0.012		0.020		−0.023		0.072
		(0.096)		(0.020)		(0.019)		(0.033)		(0.094)
Propagation Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dep. Mean	0.10	0.10	0.01	0.01	0.02	0.02	0.02	0.02	0.09	0.09
R^2	0.44	0.45	0.33	0.34	0.44	0.49	0.38	0.40	0.57	0.58
N	310	310	310	310	310	310	310	310	310	310
TSIV estimate	−0.222	−0.224	−0.012	−0.008	0.015	0.061	−0.075	−0.096	0.253	0.236
	(0.506)	(0.475)	(0.070)	(0.074)	(0.180)	(0.140)	(0.121)	(0.137)	(0.387)	(0.400)

Note: All dependent variables are dummies indicating whether the corresponding public good (e.g. schools in regression 1 and 2) was built in the community after the genocide (funded by government or NGOs). Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A.7: First Stage Robustness Check

	Women (> 15 years)	Women (> 17 years)	Women (> 19 years)	Women (> 21 years)	Women (> 23 years)
	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Child Mortality				
Radio Coverage in Village	0.035	0.079	0.083	0.093	0.105
	(0.037)	(0.040)*	(0.035)**	(0.038)**	(0.055)*
Propagation Controls	yes	yes	yes	yes	yes
Additional Controls	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes
Dep. Mean	0.22	0.22	0.23	0.23	0.24
R^2	0.09	0.09	0.09	0.11	0.12
N	2324	2180	2009	1831	1695
	Dependent Variable: Boy Mortality				
Radio Coverage in Village	0.138	0.171	0.158	0.154	0.166
	(0.055)**	(0.052)***	(0.059)**	(0.060)**	(0.061)**
Propagation Controls	yes	yes	yes	yes	yes
Additional Controls	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes
Dep. Mean	0.24	0.25	0.26	0.26	0.26
R^2	0.09	0.09	0.09	0.10	0.11
N	2067	1970	1844	1704	1592
	Dependent Variable: Girl Mortality				
Radio Coverage in Village	−0.105	−0.071	−0.034	−0.011	0.024
	(0.062)	(0.067)	(0.064)	(0.058)	(0.066)
Propagation Controls	yes	yes	yes	yes	yes
Additional Controls	yes	yes	yes	yes	yes
Commune Effects	yes	yes	yes	yes	yes
Dep. Mean	0.20	0.20	0.21	0.21	0.22
R^2	0.08	0.08	0.09	0.10	0.11
N	2068	1971	1848	1701	1586

Note: Mortality is measured as number of dead children (boys/girls) over the number of total children (boys/girls). Propagation controls are: latitude, longitude, a second order polynomial in village mean altitude, village altitude variance, and a second order polynomial in the distance to the nearest transmitter. Each regression uses a different subsample of women, defined in the header, e.g. regression 1 women above age 15. Standard errors in parentheses are clustered at district level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.