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Violence, trust, and trustworthiness: evidence from a Nairobi slum

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We test with a field experiment in a Nairobi slum whether violence suffered during the 2007 political outbreaks affects trustworthiness when interethnicity becomes salient and participants face opportunism in common pool resource games (CPRGs) between two subsequent trust games (TGs). Our findings do not contradict previous one-shot results but qualify and extend them to a multiperiod setting enriching our understanding on the effects of violence on social preferences. More specifically, victimized exhibit higher trustworthiness in the first trust game but also a significantly stronger trustworthiness reduction after experiencing opportunism and interethnicity in the CPRG game.

JEL Classification: O12, C93, Z13.

1. Introduction

A recent and growing literature investigates the relationship between violence and social capital. Among the existing contributions, Bellows and Miguel (2006, 2009) find a positive relationship between victimization and later individual political mobilization as well as participation in local collective action in Sierra Leone. They argue that the positive reaction of victims is a psychological legacy of what they suffered. Akresh *et al.* (2009) document the negative effect on height of the experience of child soldiering in Burundi, while Blattman and Annan (2010) provide evidence on the psychological distress generated on children by the civil war in Uganda. Voors *et al.* (2012) using behavioural games in Burundi, show that people exposed to wartime violence were more altruistic than those who were not. Bauer *et al.* (2011) find that children in Georgia and adults in

Sierra Leone who were more exposed to conflict are more egalitarian toward in-group members, while Gilligan *et al.* (2011) document that members of communities with greater exposure to violence in Nepal's civil war have significantly higher levels of social capital.

The goal of our paper is to contribute to this literature with a field experiment by investigating the effects of the 2007 post-election violence in Nairobi on two specific components of social capital - trust and trustworthiness - of victimized slum-dwellers.

The growing literature on trust and trustworthiness recognizes them as “lubricants” (Arrow, 1974) of the socioeconomic system, substitutes of formal contracts (Becchetti and Conzo, 2010) and as factors which significantly reduce transaction costs in social and economic interactions by helping to “enforce cooperative agreements in bilateral sequential exchanges” (Greig and Bohnet, 2008). They are shown to have positive effects on economic growth (Keefer and Knack, 1997; Zak and Knack, 2001), institutions (Putnam, 1993; La Porta *et al.*, 1997) firm productivity (Chami and Fullenkamp, 2002), the development of interethnic economic relationships and therefore on economic performance (Alesina *et al.*, 1999; Montalvo and Reynal-Querol, 2005).

We run our experiment in the slum of Kibera, a place considered among those in the world where cooperation and trust/trustworthiness are scarcest. Cassar and Wydick (2010) run a microfinance game experiment in five poor areas in Armenia, Philippines, India, Kenya (in the slum of Kibera) and Guatemala and show that the average players' contribution rate to public goods in Kenya is roughly half of that in all the other four areas. Greig and Bohnet (2008) find in a one shot trust game experiment run in 2004 that Nairobi slum dwellers adhere to norms of *balanced reciprocity* and not of *conditional reciprocity*, with the former generating less social capital than the latter.

One of the factors contributing to this disappointing performance is the presence of circular migration patterns which weaken ties among slum dwellers (Beguy *et al.*, 2010). Another factor we believe affects interethnic trust and trustworthiness is the Kenya's outbreak of interethnic violence occurred between the end of 2007 and the beginning of 2008 after the presidential elections when

the country experienced unprecedented crisis whose social, economic, and humanitarian impact is still burdening Kenyan society (Roberts, 2009).

The originality of our experiment hinges not just on the socioeconomic framework in which it is run but also on its multiperiod and interethnic structure, since most of the previously mentioned papers are one shot with participants playing with members of the same ethnic group.

More specifically, we test whether violence suffered during the 2007 political outbreaks affects two years later changes in trustworthiness when participants experience opportunism and interethnicity becomes salient in Common Pool Resource Games (CPRGs) between two subsequent trust games (TGs). The CPRG aims to mimic the frequent practice of community provision of local public goods (*harambee*) in order to investigate whether such practice affects the law of motion of trustworthiness when individuals suffered consequences of a civil war.¹

Our findings document that victimized are more prosocial in the first trust game (where interethnicity does not come into play), but exhibit a significantly stronger (more negative) change in trustworthiness between the two trust games with a significant trustworthiness reduction in the second TG except when the number of co-ethnics and cooperation is high in CPRGs. They therefore reconcile previous evidence on parochial altruism (Bowles, 2009) with theoretical models postulating the disruptive effect of the war on trade and interethnic social capital (Rohner *et al.*, 2011) and survey evidence for Kenya (Dercon and Gutiérrez-Romero, 2012) where victimized say that they are more likely to resort to negative reciprocity after the violence experience.

2. The Experiment design

¹ *Harambee* means in Swahili “let’s pull together” (Gugerty and Miguel, 2005) and denominates the well known practice of bottom-up collective effort for providing public goods in the area in which we operate (Greig and Bohnet, 2009). This tradition is at the root of community fundraising and/or gratuitous labour supply for building and maintaining schools, clinics and wells (Hughes and Mwiria, 1990; Gugerty and Miguel, 2005). Examples of *harambee* are, for instance, the fund-raising for construction of a local well, children uniforms, funeral expenses, renovation of buildings, etc. *Harambees* can be either private or public. Private *harambees* generally raise funds from family and friends for funerals and weddings, college fees, and medical bills. Public *harambees* collect financial resources for development projects of common interest such as schools, health centres and water projects (Wilson, 1992).

In July-August 2010, we randomly selected 404 slum-dwellers and asked them to participate to an experiment composed of three games plus a demographic survey².

The three games consist of two identical *trust games* where participants play under anonymity, and of a *Common Pool Resource Game* where they interact face-to-face with their peers in groups of four members each. The sequence of the games is i) *Trust Game 1* (TG1) aimed at measuring *ex-ante* trust and trustworthiness levels; ii) *Common Pool Resource Game* (CPRG) aimed at observing cooperation dynamics over five rounds; iii) *Trust Game 2* (TG2) in which participants repeat the TG1; iv) demographic survey.

The design of the CPRG aims at evaluating whether the exposition to group interaction affects the behaviour across the TGs of victimized *vis-à-vis* non-victimized participants. In order to isolate this effect and to avoid possible confounding factors between the two TGs not attributable to the CPRG, we design a control group in which 100 subjects do not play the CPRG between the two TGs. As it will be clearer in the next paragraphs, we further split the CPRG in two treatments (i.e. Restricted Information and Full Information) in order to control for different degrees of peer pressure induced by different degrees of information disclosure.

In order to reduce potential biases caused by the presence of foreign researchers, we trained local staff to carry out with us the experiments and the survey. Field assistants were informed about the details of the games only after the end of the selection period in order to limit word-of-mouth effects and prevent local staff from revealing projects' characteristics beforehand. We also made sure local experimenters alternate each other in each session so to control for various sources of experimenter bias. The amount of money at stake in the game is considerably high since participants received a show-up fee (150 Kenyan Shillings, KSh), may win up to 195 KSh in the survey, and can total up to 795 KSh if trustors (845 KSh if trustees) with 800 KSh being approximately the average weekly wage in the slum. The amount is of value especially if we consider that 70% of the households in Kibera live below the poverty line (Baschieri *et al.*, 2011).

² Individuals have been randomly recruited using a map of the informal buildings in the Kianda area of the slum of Kibera (Nairobi). For details see Becchetti *et al.* (2011).

2.1 Trust Game

The Trust Game we implemented has the same structure of the standard two-player Investment Game (Berg *et al.*, 1995). Participants are told they are matched with a counterpart whose identity is not revealed. If the player is chosen to be a trustor, she must decide how much of her endowment to send to the anonymous counterpart (trustee), knowing that this amount is tripled and that the trustee chooses if and how much of it to return. If the player is chosen to be a trustee, she has to decide how much she will return over a set of ten potential amounts an anonymous trustor may send (strategy method). We adopt the strategy method because it allows us to match trustees with trustors in a non-simultaneous framework and without a prior knowledge of the trustor's choice. In addition, eliciting the full trustee's potential responses to trustor's actions provides us with detailed insights on her strategies.

As it is well known the most common interpretations for trustors' deviation from the Nash Equilibrium are strategic altruism, pure altruism, inequity aversion, risk (Eckel and Wilson, 2004; Karlan, 2005) and betrayal aversion (Bohnet and Zeckhauser, 2004, Bohnet *et al.*, 2008), while those for trustee's deviations pure altruism, inequity aversion, and reciprocity (see, among others, Fehr, 2009).

Participants play the trust game at the beginning of the session and after the CPRG (see Fig. 1). They are informed about neither the sequence of the games nor the payoff from the first trust game until the end of the whole experimental session in order to avoid confounding reputation effects.³

2.2 The Common Pool Resource game

We implement the *Common-Pool Resource Game* (Henrich and Smith, 2004) in order to mimic the well know practice of community provision of local public goods (*harambee*) (Greig and Bohnet,

³ We told participants they would be paid at the end of the whole experimental session and just for one randomly chosen TG. Their initial endowment in each TG was 50 KSh.

2009) (see footnote 1) and check whether the interaction in such group activities causes differential trustworthiness responses among victimized/non-victimized participants.

Each group is randomly composed by four individuals sitting a circle around a pile of 600 KSh. Participants are told that they can withdraw any amount between zero and 150 KSh from the pile and keep it. After it, the money left in the pile is doubled and distributed equally among players. To play the game anonymously and simultaneously, each player writes down on a sheet how many KSh she wants to withdraw. After that, experimenters make the calculations and write down the payoffs accordingly.

Two variations of the CPRG are played according to a *between subject* design (each subject participates to just one of two CPRG treatments) --- restricted information (CPRG-RI) or public/full information version (CPRG-FI).⁴ Each of the two treatments is composed by five rounds but the number of rounds is known only to experimenters in order to reduce endgame behaviour effects. In the CPRG-RI, after the player's sheet reporting the withdrawal decision is handed to the experimenter, payoffs are distributed in envelopes so that players do not know how much other members win. In the CPRG-FI, before calculating and distributing the payoffs, each player has to announce to the group members the amount she withdraws.⁵

3. Descriptive Analysis

3.1 Violence and randomness checks

We did not target participants based on whether or not they experienced violence as we did not want them understanding the aim of the experiment. However, we were confident that by recruiting our participants in Kianda – the poorest village of Kibera - we should have had a sufficient number

⁴ The restricted/full information split induces different degrees of peer pressure that may provide an explanation to trustworthiness changes of victimized participants. The restricted/full information factor will be controlled for in sections 5 and 6.

⁵ In this case payoffs are then distributed without envelopes so that all players see how much each person has withdrawn and her payoff (these instructions are given at the beginning of the round). To make sure all participants get this information, the experimenter also announces each member's payoffs at the end of each round. Additional details on the experiment design are in Becchetti *et al.* (2011).

of individuals affected by violence.⁶ Particularly, we collected data on five types of consequences: i) personal injuries; ii) loss of relatives; iii) material losses (home destroyed or damage to personal property); iv) job losses; v) forced relocation from original living area.

These five types of consequences may be classified in three more general groups: a) (direct or indirect) *physical violence* (hereafter also DIPV) which includes i) and ii); b) *economic losses*, which include iii) and iv) and c) *forced relocation* (hereafter also FR). We further cluster them in just two groups where the first includes a) and c) and the second b). We defined the former as DIPVFR - direct/indirect physical violence and forced relocation - and the latter as EL - economic losses. The rationale for this final taxonomy hinges on the fact that events a) and c) are those with the strongest impact on social capital. Also, we consider forced relocation as having stronger impact than economic losses on social capital and thus we assimilated it to direct or indirect experience of physical violence since individuals who experience it are relocated against their will from the environment in which they built social ties to a new area in which they do not have it.

We found that 54.4% of the sample experienced economic losses, 27.9% physical violence and 17.6% forced relocation. We also noted that participants not affected by any violence are approximately 16%, while 37% experienced both DIPVFR and EL consequences. In addition, only 8% of those belonging to the DIPVFR group were not hit by economic losses whereas 57% of participants experiencing EL did not belong to the DIPVFR group. With minor changes, trustees share the same characteristics of the whole sample.

To verify whether the impossibility of randomizing *ex ante* the violence experience is compensated by *ex post* randomization conditional on observed variables, we look at balance properties of demographic characteristics by group. More specifically, following our taxonomy (DIPVFR, EL and unaffected group) we first compare each group with the rest of the sample and then make a one-

⁶ In Nairobi on average, 10% of the households experienced damages to personal properties or loss of job while 18% were affected by closure or destruction of their own business and 21% have been evicted from their homes. In addition, 5% of the households have seen one of their family members dying as direct consequence of the fights. The violence occurred mainly in the slums. Hence, it is reasonable to assume that the highest number of households hit by forced migration, job losses or physical violence is concentrated in these areas.

by-one comparison (Table 2). We find that affiliation to the DIPVFR group *vis à vis* the rest of the sample is non random in some dimensions since affected individuals are older, less educated, more likely to be married and less likely to be unemployed (18% against 33%).⁷

Our second randomisation check looks at balance properties along the CPRG/control divide for trustees. In this case the experiment design is devised to satisfy randomness *ex ante*. We find that the property is met for all the considered variables at 1% significance level.⁸

3.2 The behaviour in the CPRG

The dynamic behaviour of all subjects in the CPRG does not exhibit the standard pronounced decline in cooperation in the fifth and last round, consistently with the fact that in our design we do not communicate the number of rounds to players in order to avoid end game effects. In our sample, cooperation slightly decreases over rounds, with cooperation being measured in each round both as players' withdrawal ratio at individual level (KSh withdrawn/150) and left-in-the-pot ratio at group level (KSh left by the group/600). Participants seem to observe the behaviour of group members, react strategically to it - if one or more than one defect in a round, others also do in the following round. With regard to violence, we find that victimized tend to be less cooperative than non-victimized even though the difference is not significant at 5% level (Table 2).

4. Hypothesis testing on changes in trustworthiness

In order to check whether involvement in 2007 events affects trust and trustworthiness dynamics we perform non parametric tests and compare the three groups of the sample in terms of changes in trustworthiness between the first and second TG (Table 3a). We find that the change in the average trustee contribution is significantly lower among participants subject to the CPRG who experienced violence (-5.12 for the DIPVFR group against .86 for the rest of the sample and 3.53 for those

⁷ Note however that some of these differences are very small in magnitude (three years for age, one year for education). Results are omitted for reasons of space and available upon request.

⁸ Results are omitted for reasons of space and available upon request.

unaffected by any kind of violence), and even more so when full information on player's strategies is available (PIT).⁹ These results suggest that the reciprocity response to the CPRG experience is affected by the past violence experience.¹⁰

We wonder how and whether interethnicity and opportunism experience in the CPRG may explain what we found. In Table 3b we observe that the reduction in trustworthiness is not generated when victimized experience high cooperation and there are at least two members of the same ethnic group in the CPRG. Hence it seems that both interethnicity and low group cooperation are sufficient conditions to produce the victimized reaction which does not occur only when both conditions are absent.

To further explore behavioural dynamics of the experiment, we repeated our test in Table 3a conditioning trustees' responses on each of the 10 possible trustor contributions by CPRG and control group (Table 3c). We found that significant differences in trustworthiness apply for trustees' responses conditional on a trustor contribution between 20 and 45 KSh (again, when comparing those affected by DIPVFR with the rest of the sample or with those unaffected). The finding is significant among participants subject to the CPRG, while it is not for the control group. Since significant effects occur only for trustees we think that reciprocity is the main driver of trustee behaviour (see also the extended comment to econometric findings in section 5). In other words, individuals who experienced physical violence and/or forced relocation tend to reciprocate less after a *harambee*-like practice. Our main result is in line with evidence proposed by Dercon and Gutiérrez-Romero (2012) documenting that, when asked whether violence should be reciprocated or

⁹ Our main result (the change in trustworthiness for victimized is more negative than that of non victimized) is robust across the variation of the treatment (PIT and RIT) with a stronger reaction of victimized in the PIT. The intuitive interpretation is that in the full information treatment the information on the opportunistic behaviour of other participants to the CPRG is clearer and therefore the negative reaction of victimized is stronger.

¹⁰ We perform analogous non-parametric tests also for trustor's contribution. Consistently with related one-shot experiments in the literature (Gilligan *et al.*, 2011; Bauer *et al.*, 2011; Voors *et al.*, 2012) we find evidence of a significant and positive effect of violence on trustor's contribution in the first TG, with victimized trustors giving on average 27.62 KSh vs. 22.59 KSh sent by the rest of the sample ($z = 2.697$; $p = 0.007$). As shown also in session 5, the positive effect of violence on trust is significant only in the first TG but no longer when considering the difference in contribution between two TGs (0.41 KSh for victimized vs. 1.22 KSh for rest of the sample; $p = 0.967$).

not, those suffering violence in 2007 exhibited a significant positive change in declared negative reciprocity.¹¹

Can endogeneity explain our finding? In our case we have a relationship between a change in performance variable (change in trustworthiness) and a variable (experience violence) which cannot be random by experiment design, but is random *ex post* conditionally on most observables. In addition, the nexus becomes manifest through a third key factor (the exposure to the CPRG game) which is random by experiment design. Endogeneity seems unlikely in our experiment. Even in the case of a variable (i.e. a psychological trait) which both correlates with the change in the performance variable (independently from the treatment) and affects violence targeting, it would be hard to explain why the correlation is observed only when violence interacts with the random CPRG treatment. To have such a situation we should model a driver which correlates with the trustworthiness reaction to the CPRG and victimisation. We will deal with this hypothesis in the sensitivity analysis in section 6.

5. Econometric findings

Our econometric analysis aims to i) gauge the magnitude of our effect net of key demographic variables; ii) evaluate the net effect of different types of violence by controlling for economic losses; iii) address confounding effects (due to selection bias) undermining robustness checks by using inverse propensity score weights; iv) correct for the heterogeneity in the experience of the treatment (CPRG) by controlling for the qualifying features of the CPRG which may have impacted differently on those who suffered violence and those who did. For instance, it could be the case that the observed effect for victimized was mainly driven by a larger ethnic fragmentation¹² or higher mean group withdrawal ratios during the CPRG.

¹¹ The pre (2 week ahead) and post election surveys on a regionally representative sample of 1,207 Kenyans commented by the authors show that after the election violence victims are 20% more likely to support actions outside the law while 40% are more likely to resort to violence.

¹² On the role of ethnic fragmentation on social capital see, among others, Alesina and La Ferrara (2005).

As a first econometric step we want to frame the violence/trustworthiness effect into a broader context in which we compare changes in giving of all players in the game (trustors and trustees, participants or not to the CPRG).

We estimate the following specification with OLS:

$$\Delta TG_i = \alpha_0 + \alpha_1 DIPVFR_i + \alpha_2 EL_i + \alpha_3 Trustee_i + \alpha_4 Trustee * DIPVFR_i + \alpha_5 TG1_i + \sum_j \beta_j X_{ij} + \varepsilon_i \quad (1)$$

where the dependent variable $\Delta TG_i = TG2_i - TG1_i$ is the difference in player's giving (if trustor) or returning (if trustee) between the second and first TG.¹³ Regressors include a dummy which takes value of one if the individual is part of the DIPVFR group, a dummy which takes value of one if she is part of the EL group, a dummy which takes value of one if the individual plays as a trustee, a slope dummy for trustees who witnessed DIPVFR, the amount sent or returned by all players in the first trust game (TG1) and a set of X-controls which include socio-demographic characteristics (see Table 1 legend). When excluding the sample of individuals in the control group, the set of X-controls contains also factors capturing the heterogeneity of the CPRG experience such as group ethnic and gender fragmentation, the payoff from the round of the CPRG randomly selected for payment, the average respondent's and group mean withdrawal ratios in the CPRG, the number of friends known by name in the CPRG group, the restricted/full information CPRG treatment, etc.

Results are reported in Table 4a. In column 1 we show the estimates of equation (1) on the full sample in which we add the control group dummy. In columns 2-3 we estimate equation (1) on the sample of participants in the CPRG only and add the above-mentioned CPRG-game controls. In columns 4-6 we report regression results when we repeat all the estimates of columns 1-3 excluding demographic controls.

Results document a positive effect of the trustees' dummy as well as a positive effect of violence (DIPVFR) in the whole sample; however and more importantly, this effect is reversed for victimized trustees highlighting a negative effect of victimization on changes in trustworthiness.

¹³ Trustees contributions are average contributions elicited with the strategy method.

The coefficient of the control group indicator is negative but not significant at 5% and the first TG contribution level is negative too indicating a sort of convergence effect (Table 4a, column 1).

When in columns 2-3 we restrict our focus to the sample of CPRG treated, we introduce factors measuring what happens in the CPRG game (ethnic and gender fragmentation, player's and mean group's withdrawal ratios, player's CPRG payoffs). The victimisation-trustworthiness effect (i.e. the interaction *Trustee*DIPVFR*) remains strongly significant together with a negative and significant impact of gender fragmentation (Table 5a, columns 2-3)¹⁴.

Finally, all these findings are robust to the exclusion of socio-demographic controls (Table 4a, columns 4-6). Consistently with our hypotheses and the non-parametric tests from the previous section, the main result from this preliminary regression analysis is that victimization (DIPVFR) implies a significant decrease in trustworthiness relative to its initial levels.

In Table 4b we also look at what happens to changes in trust and find that the standard one shot result found in the literature ¹⁵ is confirmed: victimized exhibit more trust in TG1 (the situation corresponding to one shot games in which interethnicity is not made salient) while not in TG2. A possible explanation to why the victimization effect in the TG2 is found only for trustees and not for trustors hinges on the nature of the trust game. As it is well known from the literature, the most common interpretations for trustors' deviation from the Nash Equilibrium are generally strategic altruism, pure altruism, inequity aversion, risk (Eckel and Wilson, 2004; Karlan, 2005) and betrayal aversion (Bohnet and Zeckhauser, 2004; Bohnet *et al.*, 2008), while those for trustee's deviations pure altruism, inequity aversion, and reciprocity (see, among others the survey paper of Fehr, 2009). Hence, non-overlapping rationales for the behaviour of the sender and the receiver in trust games are strategic altruism, risk aversion, betrayal aversion (for the sender), and reciprocity (for the receiver). Since an effect which impacts only on receivers is highly likely to work across reciprocity,

¹⁴ The negative and significant coefficient of gender fragmentation highlights the negative impact of gender heterogeneity in CPRG groups on the change in contribution in the second TG, with members of more gender-diversified groups reducing their ex-post trust/trustworthiness levels. This result confirms the gendered characteristic of the balanced reciprocity norm tested by Greig and Bohnet (2009).

¹⁵ Bauer *et al.* (2011), Gilligan *et al.* (2011), and Voors *et al.* (2012).

one possible reason why it impacts less on trustors may be that strategic altruism is a barrier to the materialisation of the effect. If conflicts weaken inter-ethnic social capital (and the CPRG refreshes the memory of the violence through opportunism and/or ethnic heterogeneity), the strategic motivation which exists only in trustor's (and not in trustee's) choices prevents the effect from realizing its consequences on trustors.

Consider also that in low-income countries, people with a history of violent ethnic conflict and displacement with physical and/or emotional trauma and post-traumatic stress disorder (PTSD) often face an uncertain future with respect to food, shelter, physical and social security, and human rights violations. In line with the literature on the negative impact of PTSD, mental health and social organization in post-conflict areas¹⁶, our evidence suggests that the experience of opportunism and ethnic fragmentation in the management of the commons re-activate the above mentioned trauma for victimized individuals which in turn induces grievances and punishment under the form of higher negative reciprocity.

Since trustees' contributions captured by TG1 or TG2 variables in the previous regression are actually an average of the ten conditional trustees' responses in the strategy method we concentrate on them now and further restrict the focus to the sample of trustees participating to the CPRG. The specification we test is therefore:

$$[\Delta TG_i | Tr(x)] = \alpha_0 + \alpha_1 DIPVFR_i + \alpha_2 EL_i + \sum_j \beta_j X_{ij} + \varepsilon_i \quad (2)$$

where $[\Delta TG_i | Tr(x)] = [TG(2)_i | Tr(x)] - [TG(1)_i | Tr(x)]$, i.e. the difference in trustee's contribution between second and first TG game conditional to a given trustor contribution ($x = 5, 10, \dots, 50$).

Remember that, given the adoption of the strategy method, trustees can observe neither first nor second round trustors' behaviour in the TG before their second TG choice. Their only experience of

¹⁶ Beiser *et al.* (2010) document the negative effects disasters of human design play both on the psyche and on communities and their social organization since the socio-culturally disintegrated environment is unable to provide basic human needs and strivings. They argue that the effects after the conflict affect self-healing forces that would otherwise help afflicted individuals.

the consequences of the behaviour of the other players in the experiment is therefore the CPRG game if they were not in the control group.

Estimates findings show that the victimization effect (DIPVFR) is not significant at the extremes and tends to be high in the middle upper part of potential trustor contributions (Table 4c).¹⁷ In terms of magnitude, the largest significant effect is that conditional to a contribution of 40 KSh from the trustors for which trustees belonging to the DIPVFR group return around 10 KSh less in the TG2 relative to the TG1. Since average trustee's contribution in the first TG round for CPRG treated is equal to 32.89 this implies a maximum reduction in trustworthiness close to 30%. Note also that material or economic losses are not significant as additional controls and non-treated do not contribute significantly differently from CPRG treated when the effect of the violence experience is controlled for.¹⁸

6. Robustness checks

In order to evaluate in the metric of balanced/conditional reciprocity the observed change in trustworthiness of DIPVFR participants subject to the CPRG treatment we follow Greig and Bohnet (2009) and find that non victimized improve in reciprocity, while the effect for victimized is not significant.¹⁹ Our results from Table 4c do not change when we estimate the same models with a WLS regression where the weights are the inverse of the average propensity score for DIPVFR and Economic Losses (Table 5).²⁰

¹⁷ We have two possible interpretations for this fact: i) consistently with Sapienza *et al.* (2007) in case of top contributions from the trustors (45 and 50) there might be less scope for negative reciprocity to occur --- the CPRG interacted with the violence experience generates a negative reciprocity response, the significance of which is attenuated by the generous behaviour of the trustee when (s)he receives the maximum amount of trust; ii) for bottom contributions the variability is low by definition because of the limited action set (ie. if the trustor gives 5 the answer may just be 5 or 0); this creates less room for a significantly different behaviour between victimized and non victimized trustees. Further investigation on this point is however left to future research with an *ad hoc* design which may more directly test the two above-mentioned explanations.

¹⁸ We perform several other robustness checks which we omit here for reasons of space. More evidence on them may be found in Becchetti *et al.*, 2011.

¹⁹ Results are omitted for reasons of space and available upon request.

²⁰ Specifically, for each individual, the weights are computed as:

$$\left[\left(\frac{DIPVFR_i}{pscore_{(DIPVFR)_i}} + \frac{1 - DIPVFR_i}{1 - pscore_{(DIPVFR)_i}} \right) + \left(\frac{EL_i}{pscore_{(EL)_i}} + \frac{1 - EL_i}{1 - pscore_{(EL)_i}} \right) \right] / 2$$

Finally, using the propensity score matching estimator we evaluate in a final robustness check the Average Treatment Effect on the Treated (ATT) of victimization (DIPVFR) on the probability of observing a TE's contribution in the TG1 greater than in the TG2²¹. Our results are consistent with those from the previous sections since the probability that a trustee sends on average more in the TG1 than in the TG2 is around 20% higher if she belongs to the DIPVFR group ($ATT = 0.190$, $t = 2.422$). When restricting the computation of the ATT just to the control group we find that such probability declines and is no longer significant ($ATT = 0.118$; $t = 0.356$). Conversely, the ATT of victimization for the trustees who played the CPRG is 0.212 and remains significant. This result confirms our core finding, that is, individuals who witnessed the 2007 post-election violence tend to reciprocate less after they have face-to-face interacted in the CPRG group experience.

The validity of the matching estimator heavily relies on the assumption of conditional independence of potential outcomes and treatment assignment given observables. In other terms, conditioning on observed covariates, the treatment assignment is independent of potential outcomes (Conditional Independence Assumption, CIA). In order to assess whether and to what extent the estimated ATT is robust to possible deviations from the CIA we carry out the sensitivity analysis proposed by Ichino *et al.* (2006)²². The approach assumes that the CIA is not satisfied and tackles the problem by modelling an unobservable additional binary variable (confounder). In order to do that, we make assumptions on the effects of such a variable on our data and use it as an additional covariate in the matching regression. In such a way, we are able to assess to what extent our baseline ATT is robust to the exclusion of a potential confounder that might have different characteristics.

Description of this methodology as well as results of the analysis are reported in an Appendix available upon request. The sensitivity analysis shows that our estimations are robust in most of the cases and leads us to support the main idea of the paper also when the CIA is removed, that is victimization reduces reciprocity after the interaction in a group project.

where *pscore* is a non-parametric estimate of the propensity score. For details on this strategy see, among others, Blattman and Annan (2010) and Hirano *et al.* (2003).

²¹ We use the radius matching and control for all the demographic and game regressors used in Table 4a.

²² See also Rosenbaum and Rubin (1983), Imbens (2003) and Blattmann and Annan (2010)..

7. Conclusions

Our paper contributes to the literature on the effects of violence on social capital with a “sandwich” experiment in which a Common Pool Resource Game is played between two Trust Games.

Our main finding is that victimized exhibit a significantly stronger reduction in trustworthiness vis-à-vis non-victimized when they are exposed to the CPRG. The different behaviour seems to be driven by exposition of victimized players to opportunistic behaviour in the CPRG and/or the heterogeneous ethnic composition of the group. A possible interpretation is that memory of the past ethnic conflict becomes salient for victimized players especially when they face low-cooperation and/or interact with peers from another (possibly hostile) ethnic group. By reopening the old the wounds of the civil war, this memory would induce the negative reciprocal reaction we observe for victimized people unless the number of co-ethnics is high and cooperation is high in CPRGs.

This result does not contradict previous one shot findings, but qualifies and extends them to a multiperiod setting enriching our understanding on the effects of violence on social preferences: victimized are more pro-social with people of the same ethnic group in “ideal conditions” in which they do not make negative experiences with their counterparts (the first TG game), but the violence experienced makes them significantly less reciprocating when they experience opportunism in multiperiod games in which interethnicity becomes salient.

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Table 1 Variable legend

$\Delta TG = TG2 - TG1$	change in contributions between the TGs	<i>playermeanwithdrawalratio</i>	Mean individual's withdrawal ratio over all CPRG rounds.
<i>TG1</i>	player's contribution in the I round of trust game	<i>groupmeanwithdrawalratio</i>	Mean group's withdrawal ratio over all CPRG rounds.
<i>TG2</i>	player's contribution in the II round of trust game	<i>relatives_death</i>	= 1 if the respondent has lost a relative after the 2007 post-election conflict.
<i>withdrawalratio</i>	= amount withdrew by the participant in the CPRG/maximum the individual can withdraw (150 KSh).	<i>personal_injury</i>	= 1 if the respondent has suffered a personal injury after the 2007 post-election conflict.
<i>age</i>	Respondent's age	<i>home_distraction</i>	= 1 if the respondent has witnessed the destruction of the house after the 2007 post-election conflict.
<i>female</i>	=1 if the respondent is female	<i>property_damaged</i>	= 1 if the respondent has witnessed damages to personal property after the 2007 post-election conflict.
<i>married</i>	=1 if the respondent is married	<i>job_loss</i>	= 1 if the respondent has lost the job after the 2007 post-election conflict.
<i>widowed</i>	=1 if the respondent is widowed	<i>business_distraction</i>	= 1 if the respondent has witnessed destruction or closure of a business the 2007 post-election conflict.
<i>separated</i>	=1 if the respondent is separated	<i>eviction</i>	= 1 if the respondent has suffered a personal injury after the 2007 post-election conflict.
<i>n_house_members</i>	n. of house components	<i>moved_in</i>	= 1 if the respondent moved with relatives or others in the area after the 2007 post-election conflict.
<i>kikuyo</i>	=1 if the respondent is from the ethnic group "Kikuyo"	<i>relocated_other_rural_area</i>	= 1 if the respondent was relocated to another rural area in Kenya after the 2007 post-election conflict.
<i>luo</i>	=1 if the respondent is from the ethnic group "Luo"	<i>relocated_other_part_of_town</i>	= 1 if the respondent was relocated to another part of town after the 2007 post-election conflict.
<i>lubian</i>	=1 if the respondent is from the ethnic group "Lubian"	<i>relocated_other_town_in_kenya</i>	= 1 if the respondent was relocated to another town in Kenya after the 2007 post-election conflict.
<i>luhya</i>	=1 if the respondent is from the ethnic group "Luhya"	<i>Direct/Indirect Physical Violence (DIPV)</i>	= 1 if relatives_death &/or personal_injury =1
<i>muslim</i>	=1 if the respondent is Muslim.	<i>economiclosses (EL)</i>	= 1 if home_distraction=1 or property_damaged=1 or job_loss=1 or business_distraction =1 or eviction=1
<i>years_schooling</i>	Respondent's years of schooling	<i>Forced Relocation (FR)</i>	= 1 if moved_in =1 or relocated_other_rural_area =1 or relocated_other_partoftown =1 or relocated_other_town =1 or relocated_other_country =1
<i>food_expenditure_day</i>	daily food expenditure for the respondent's family.	<i>DIPVFR (Direct/Indirect Physical Violence and/or Forced Relocation)</i>	= 1 if DIPV=1 and/or FR=1
<i>unemployed</i>	= 1 if the respondent is unemployed	<i>Unaffected</i>	= 1 if DIPVFR =0 & EL= 0
<i>CPRG_FI</i>	= 1 if the respondent participates in the CPRG full information treatment.	<i>CPRG_payoff</i>	Payoff of the randomly selected round of the CPRG for payment.
<i>mfi_now</i>	= 1 if the respondent is member of a microfinance	<i>ethnicfragmentation</i>	Ethnic fragmentation index in CPRG groups measures the likelihood that four randomly drawn members belong to different ethnic groups = $1 - \sum(\text{fraction of members belonging to each of the ethnic groups})^2$. NB: if =0, fully ethnic-homogeneous group; if =1, fully ethnic-heterogeneous group.
<i>volunteer</i>	= 1 if the respondent volunteers more than once a month.	<i>genderfragmentation</i>	Gender fragmentation index in CPRG groups measures the likelihood that four randomly drawn members belong to different gender groups = $1 - \sum(\text{fraction of members belonging to each of the two gender groups})^2$. NB: if =0, fully gender-homogeneous group; if =0.50, fully gender-heterogeneous group.
<i>riskaverse</i>	= 1 if the respondent is risk averse (has chosen lotteries with the payoffs at closer distance - see experiment design)	<i>trustee</i>	= 1 if the respondent played as trustee in the TG.
<i>betrayalaverse</i>	= 1 if the respondent is betrayal averse ("strongly agrees" or "agrees" on two statements about revenge - see experiment design)	<i>n_friends</i>	n. of people known by name in the CPRG.
<i>impatient</i>	= 1 if the respondent is highly impatient (has chosen the lottery with payoffs at higher distance, i.e. need higher payoff in the future to be willing to wait - see experiment design)	<i>control</i>	= 1 if the respondent has not played the CPRG between the two TGs.

Table 2 Violence experience and CPRG behaviour

TE's mean withdrawal ratio in the CPRG treatment			
Physical violence & forced relocation vs. rest of the sample	Param.	means:	0.72 vs .71
		Pr [diff != 0]	0.848
	Non Param.	z:	0.068
		p:	0.946
Economic Losses vs. rest of the sample	Param.	means:	.73 vs .66
		Pr [diff != 0]	0.178
	Non Param.	z:	-1.13
		p:	0.258
Unaffected vs. rest of the sample	Param.	means:	.644 vs .734
		Pr [diff != 0]	0.075
	Non Param.	z:	1.286
		p:	0.198
Physical violence & forced relocation vs. unaffected	Param.	means:	.72 vs .64
		Pr [diff != 0]	0.184
	Non Param.	z:	-0.893
		p:	0.371
Economic Losses vs. unaffected	Param.	means:	.73 vs .64
		Pr [diff != 0]	0.089
	Non Param.	z:	-1.276
		p:	0.201

Table 3a Change in trustworthiness by violence and treatments

	ΔTG	Obs.	Mean	p-value
CONTROL	DIPVFR	21	-2.962	
	Rest of Sample	29	-0.041	0.261
	Unaffected	14	-2.829	0.698
CPRG	DIPVFR	62	-5.12	
	Rest of Sample	90	0.86	0.009
	Unaffected	31	3.529	0.019
PIT	DIPVFR	25	-8.314	
	Rest of Sample	52	1.477	0.055
	Unaffected	16	5.456	0.090
RIT	DIPVFR	37	-2.962	
	Rest of Sample	38	0.016	0.093
	Unaffected	15	1.473	0.104

p-value: non parametric test on the significance of the difference of the group in raw with DIPVFR

Table 3b Change in trustworthiness by n. of coethnics, cooperation in CPRG and violence

	ΔTG	CPRG less cooperative	CPRG cooperative	TOTAL
n. coethnics<2	NO DIPVFR	1.47	0.45	1.06
	DIPVFR	-5.71	-5.94	-5.81
	$P(T > t)$	0.000	0.003	0.000
n. coethnics≥2	NO DIPVFR	1.33	1.05	1.20
	DIPVFR	-3.43	0.24	-1.72
	$P(T > t)$	0.004	0.367	0.023
TOTAL	NO DIPVFR	1.91	-0.79	0.86
	DIPVFR	-4.25	-6.25	-5.12
	$P(T > t)$	0.000	0.002	0.000

Legend: The tested variable is ΔTG . *n. coethnics*: n. of group members of the same ethnic group as the participant's one. CPRG is defined as *less cooperative* if the group withdrawal ratio averaged over rounds (var. "groupmeanwithdrawalratio", Table 1) is strictly greater than the overall withdrawal ratio (averaged over all rounds and groups); CPRG is defined as *cooperative* otherwise.

Table 3c Change in trustworthiness by violence and CPRG experience (TE's conditional responses)

		CONTROL						CPRG					
		DIPVFR (1) vs. rest of the sample (0)			DIPVFR (1) vs. unaffected (0)			DIPVFR (1) vs. rest of the sample (0)			DIPVFR (1) vs. unaffected (0)		
Tr	Send	Obs	Mean	z, p	Obs	Mean	z, p	Obs	Mean	z, p	Obs	Mean	z, p
5	0	29	-0.086	0.121	14	-0.786	-0.887	90	-2.533	-0.106	31	-2.032	-0.473
	1	21	0.048	0.903	21	0.048	0.375	62	-2.427	0.916	62	-2.427	0.636
10	0	29	-1.103	-1.888	14	-0.857	-1.526	90	-0.878	0.827	31	-0.452	0.853
	1	21	0.476	0.059	21	0.476	0.127	62	-3.274	0.408	62	-3.274	0.394
15	0	29	-0.655	-0.461	14	-1.429	-0.773	90	-0.156	0.298	31	0.806	0.914
	1	21	-0.024	0.644	21	-0.024	0.44	62	-2.548	0.766	62	-2.548	0.361
20	0	29	0	1.494	14	-2.143	0.526	90	1.061	2.132	31	1.065	1.165
	1	21	-3.19	0.135	21	-3.19	0.599	62	-3.548	0.033	62	-3.548	0.244
25	0	29	1.121	1.761	14	-1.786	0.686	90	1.006	1.782	31	5	2.301
	1	21	-3.214	0.078	21	-3.214	0.492	62	-4.032	0.075	62	-4.032	0.021
30	0	29	1.103	1.069	14	-3.071	-0.052	90	1.233	2.152	31	3.742	1.653
	1	21	-2.857	0.285	21	-2.857	0.958	62	-6.5	0.031	62	-6.5	0.098
35	0	29	0.983	1.456	14	-5.786	0.31	90	0.044	2.061	31	3.226	1.703
	1	21	-5.786	0.145	21	-5.786	0.757	62	-7.444	0.039	62	-7.444	0.089
40	0	29	-0.483	0.623	14	-4.571	0.273	90	3.967	3.942	31	6.742	3.257
	1	21	-5.476	0.533	21	-5.476	0.785	62	-9.258	0	62	-9.258	0.001
45	0	29	-3.017	0.178	14	-3.929	0.187	90	3.356	1.843	31	9.29	2.088
	1	21	-7.214	0.858	21	-7.214	0.852	62	-6.476	0.065	62	-6.476	0.037
50	0	29	1.724	-0.11	14	-3.929	-0.505	90	1.5	1.248	31	7.903	1.456
	1	21	-2.381	0.912	21	-2.381	0.613	62	-5.694	0.212	62	-5.694	0.145

The table reports average changes in trustees' contribution between second and first TG game conditional to trustor contribution of x indicated in row (x= 5,10,...,50)

Table 4a Determinants of changes in contribution (whole sample)

<i>Dep. Var: ΔTG</i>	(1)	(2)	(3)	(4)	(5)	(6)
DIPVFR	2.637** (1.282)	2.372 (1.620)	2.387 (1.622)	2.280* (1.234)	1.943 (1.538)	1.927 (1.528)
Economiclosses	-1.182 (1.200)	-2.280 (1.429)	-2.241 (1.427)	-0.870 (1.113)	-1.987 (1.363)	-1.920 (1.361)
TG1	-0.430*** (0.0671)	-0.432*** (0.0674)	-0.434*** (0.0672)	-0.423*** (0.0675)	-0.428*** (0.0714)	-0.430*** (0.0719)
Trustee	7.039*** (1.483)	7.436*** (1.905)	7.501*** (1.805)	6.753*** (1.441)	7.409*** (1.816)	7.433*** (1.734)
Trustee*DIPVFR	-6.160*** (1.905)	-6.993*** (2.321)	-7.207*** (2.312)	-5.669*** (1.960)	-6.107** (2.424)	-6.265*** (2.397)
Control	-2.040* (1.056)			-1.853* (0.948)		
CPRG_FI		0.460 (1.275)	0.797 (1.152)		-0.363 (1.308)	0.0469 (1.214)
n_friends		-1.368* (0.784)	-1.389* (0.756)		-1.133 (0.816)	-1.178 (0.791)
ethnicfragmentation		5.424 (4.682)	5.522 (4.605)		4.508 (3.724)	4.837 (3.645)
genderfragmentation		-13.80*** (4.614)	-14.49*** (4.587)		-12.14*** (4.471)	-12.82*** (4.388)
playermeanwithdrawalratio		1.036 (3.980)			-0.415 (3.888)	
groupmeanwithdrawalratio		-0.255 (4.764)			2.443 (4.844)	
CPRG_payoff			0.0171 (0.0123)			0.0140 (0.0134)
<i>SOCIO-DEMOGRAPHIC CONTROLS</i>	Yes	Yes	Yes	No	No	No
Observations	401	301	301	403	303	303
R-squared	0.338	0.401	0.405	0.306	0.341	0.343

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Socio-demographic controls include respondent's age, gender, civil status, n. of house members, ethnic group, years of schooling, daily food expenditures, employment status, participation to microfinance groups, social preferences (volunteering, betrayal aversion), risk aversion and discount rates.

Table 4b Determinants of Trust

	(1)	(2)	(3)	(4)	(7)
<i>Dep Var:</i>	<i>TG1</i>	<i>TG1</i>	<i>TG2</i>	<i>TG2</i>	ΔTG
CPRG_FI				0.331 (1.548)	0.331 (1.548)
n_friends				-2.472** (1.198)	-2.472** (1.198)
ethnicfragmentation				12.02* (6.297)	12.02* (6.297)
genderfragmentation				-9.837* (5.688)	-9.837* (5.688)
playermeanwithdrawalratio				3.021 (5.125)	3.021 (5.125)
groupmeanwithdrawalratio				-2.508 (7.897)	-2.508 (7.897)
CPRG_payoff				0.0138 (0.0191)	0.0138 (0.0191)
DIPVFR	4.105** (1.662)	4.071** (1.580)	1.515 (1.200)	0.338 (1.621)	0.338 (1.621)
Economiclosses	-1.892 (1.775)	-3.818* (1.992)	-0.0877 (1.226)	0.423 (1.490)	0.423 (1.490)
TG1			0.688*** (0.0660)	0.678*** (0.0696)	-0.322*** (0.0696)
<i>SOCIO-DEMOGRAPHIC CONTROLS</i>	No	Yes	No	Yes	Yes
Observations	202	201	201	150	150
R-squared	0.030	0.210	0.502	0.609	0.349

Robust standard errors in parentheses

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

Table 4c Determinants of changes in Trustworthiness
(changes in TE's conditional responses, OLS)

<i>Dep. Var.: ΔTG</i>	(1) TR send 5	(2) TR send 10	(3) TR Send 15	(4) TR send 20	(5) TR send 25	(6) TR send 30	(7) TR send 35	(8) TR send 40	(9) TR send 45	(10) TR send 50
DIPVFR	-0.466 (1.131)	-1.898 (1.404)	-2.097 (1.370)	-5.02*** (1.731)	-5.025** (2.161)	-8.01*** (2.635)	-7.307* (4.084)	-10.16** (4.114)	-6.636 (4.184)	-7.211 (5.370)
Economic losses	-0.266 (1.047)	0.0386 (1.306)	-0.240 (1.544)	1.153 (1.953)	-2.016 (2.313)	-0.351 (3.032)	-2.667 (4.126)	-0.0938 (4.152)	-4.949 (4.663)	-2.296 (6.111)
Control	1.479 (1.248)	-0.389 (1.534)	1.508 (1.595)	0.488 (2.000)	-0.0601 (2.417)	2.119 (3.013)	2.020 (4.381)	-2.328 (4.807)	-6.930 (5.059)	-2.670 (6.144)
CPRG_FI	-0.199 (1.391)	0.114 (1.646)	1.192 (1.744)	-0.0683 (2.216)	-0.211 (2.429)	-1.799 (3.264)	-1.267 (4.427)	-2.116 (4.268)	-0.501 (4.623)	-4.573 (5.668)
SOCIO-DEMOG. CONTROLS (see Table 4a)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	201	201	201	201	201	201	201	201	201	201
R-squared	0.120	0.105	0.085	0.089	0.097	0.091	0.103	0.121	0.119	0.079

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5 Determinants of changes in Trustworthiness (changes in TE's conditional responses, WLS)

<i>Dep Var: ΔTG</i>	(1) TR send 5	(2) TR send 10	(3) TR Send 15	(4) TR send 20	(5) TR send 25	(6) TR send 30	(7) TR send 35	(8) TR send 40	(9) TR send 45	(10) TR send 50
DIPVFR	-0.795 (1.021)	-1.784 (1.355)	-2.340* (1.262)	-5.297*** (1.637)	-5.923*** (2.102)	-8.691*** (2.630)	-7.230* (3.939)	-10.46*** (3.883)	-7.363* (3.925)	-8.141 (5.412)
Economic losses	-0.274 (0.889)	-0.182 (1.193)	0.191 (1.279)	1.731 (1.595)	0.453 (1.868)	1.067 (2.450)	-1.168 (3.475)	2.095 (3.454)	-1.107 (3.845)	1.720 (5.501)
Obs.	201	201	201	201	201	201	201	201	201	201
R-squared	0.134	0.127	0.144	0.181	0.198	0.189	0.171	0.251	0.281	0.263

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Models estimated are the same as in Table 4c. Results on regression controls are omitted and available upon request. WLS have been built by calculating separately the score and the weight for the DIPVFR and economic losses variables and then averaging the two weights for each individual as in Blattman and Annan (2010) and Hirano, Imbens and Ridder (2003) - see footnote 20.