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## Bullet Proof? Program Evaluation in Conflict Areas: Evidence from Rural Colombia

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# Bullet Proof? Program Evaluation in Conflict Areas: Evidence from Rural Colombia.

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Preliminary and incomplete.

## Abstract

Recently, Conditional Cash Transfer Programs (CCT) became increasingly popular in developing countries due to their positive outcomes on health and education. In this paper, we are particularly interested in testing if children participating in CCT (treated) in conflict affected regions benefit more (or less) than their counterparts in peaceful areas. To test this, we combine longitudinal CCT data from Colombia with a conflict event dataset. This allows us to use standard techniques in treatment evaluation, but it augments the testing equations by adding interactions between dummies identifying different groups and indicators of violence. We find that the CCT program had an extra benefit in conflict areas concerning enrolment. However, grade progression is similar for treated children in low and high conflict regions. Results suggest that the program may work in attracting children to school, but in high conflict regions children tend to do less homework and miss more days in school.

**JEL classification codes:** C23, D74, I21, I38, O54

**Keywords:** Conditional Cash Transfer Program, Education, Conflict, Colombia, Panel Data, Treatment Effects

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## 1. Introduction

In the recent years, there has been a large interest in understanding policies aimed at targeting vulnerable populations. One example of this development are policies aiming at households in conflict areas (Fearon et al 2009, Jordans et al. 2010). These policies may not only avert further deterioration in welfare conditions (e.g. health, income) but also foster post-conflict recovery through different channels (human capital accumulation, rebuilding trust, reducing inter-racial tensions, etc.)

One of the common policies prescribed for vulnerable population (not only those in conflict) are Conditional Cash Transfer (CCT) programs, which aim at ameliorating the constraint that prevent poor children to accumulate human capital in the form of school enrollment and adequate food intake. These programs were implemented in the developing world (e.g Bangladesh, Mexico, Colombia, Argentina, and Turkey). Different researchers have rigorously evaluated the effectiveness of these programs on different outcomes (e.g. health, schooling, see Gertler 2004 for an example of a CCT evaluation).

In this paper, we integrate the findings of the literature of program evaluation with that of micro-level analysis of households in conflict (Verwimp et al. 2009). We make use of longitudinal data generated by a CCT program in Colombia (Attanasio et al. 2010) to understand to what extent the program helps those made vulnerable by conflict. By combining with a very detailed longitudinal dataset on conflict events in Colombia (disaggregated at municipality levels), we can evaluate whether the treatment effect of the program (increased enrollment, grade progression) was homogeneous across treated areas or whether there is evidence of heterogeneity. In this paper we are particularly interested in testing if children treated (participating in the CCT) in conflict afflicted regions benefited more (or less) than their counterparts in more peaceful areas. To test this, we make use of

standard techniques in treatment evaluation, but it augments the testing equations by adding interactions between dummies identifying different groups and indicators of violence.<sup>1</sup>

A priori, it is not clear whether treatment would be more effective in high-conflict vs. low-conflict areas. On the one hand, if households believe that schools will be targets of rebel groups (because they may receive additional resources or distribute food), schooling may increase less in high-conflict areas, because schooling brings under treatment an additional cost in the form of risk of violence. However, households in high conflict areas may suffer from economic hardships and sizeable transfers (conditional on schooling) may prompt households to send children to school (and perhaps consider sending them for longer time, leading to extra grade advancement). We find that the CCT program had an extra benefit in conflict areas in terms of enrollment of children ages 8 to 17 (at the last follow-up). However, grade progression is similar for treated students in low and high conflict regions. We reconcile these findings exploiting the richness of the survey. The program may work in attracting children to school, but in high conflict regions, children tend to do less homework (at least in terms of hours/day) and miss more days in school. This counteracts the positive effect found in terms of enrollment.

The paper is organized as follows. Section 2 gives a background on related literature and on the Colombian conflict. Section 3 introduces the CCT program, called Familias en Acción (Families in Action). Section 4 presents descriptive statistics. Section 5 describes the empirical strategy and presents the main findings, while section 6 discusses different channels that might explain the results. Section 7 concludes.

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<sup>1</sup> It is important to consider two important facts. First, by construction, conflict is uncorrelated with assignment of individuals to different groups. Second, in the last wave, our indicator of violence (log of attacks by illegal groups) was uncorrelated with assignment to treatment or control.

## **2. Motivation**

### **A. Related Literature**

There are just few related papers on Colombia dealing with this topic. Largely, they can be grouped into three categories: (i) the impact of violence and conflict on education, (ii) the influence of welfare programs on household decision-making in a violent environment and (iii) the effect of Conditional Cash Transfer (CCT) programs on education.

There are four papers studying the impact of violent conflict on educational outcomes. Barrera and Ibáñez (2004) present a theoretical model that identifies three different mechanisms through which violence influences decisions on educational investments. First, violence might change the utility of households influencing investments in and consumption of education. Second, violence often includes the destruction of physical capital and creates an atmosphere of uncertainty leading to reductions in investments and production. This development induces negative income shocks on households who consequently cut back their investments in education. Third, a violent environment could decrease the return on education causing less investment in education. When testing their theory empirically for Colombia, Barrera and Ibáñez indeed find lower enrolment rates in those municipalities where homicide rates are above the national median.

Sánchez and Diaz (2005) show that between 1995 and 2002 in municipalities which have contacts with illegally armed groups, enrolment rates for primary and secondary schools did not increase as much as in peaceful municipalities. More students drop out of school in conflict-affected municipalities either because they are recruited by one of the conflict parties or they fear to go to school because of threats by armed groups and public order disruptions.

Dueñas and Sánchez (2007) detect for the eastern region of Colombia that activities of illegal armed groups raises the likelihood to drop out of school. This development was disproportionately observed for poor households.

Rodríguez and Sánchez (2009) find that armed conflict leads to school drop out and increases child labor for children older than eleven years old. They conclude that in conflict-affected areas households experience negative economic shocks, a lower life expectancy and lower school quality which makes attending school less attractive and participating in the labor market at a young age more attractive. Rodríguez and Sánchez (2010) investigate the impact of armed conflict on the quality of schooling. Their results indicate that school quality in conflict zones is lower because of the low quality of teachers in these regions. In a nutshell, conflict and violence have a negative impact on education in Colombia according to these studies.

To the best of our knowledge, there is just one study investigating the effect of welfare programs on the decisions of households living in a violent environment. Mesnard (2009) analyses migration decisions of very poor Colombian households who are experiencing high levels of violence in their communities and at the same time are participating in the welfare program Familias en Acción. She concludes that until a certain threshold of violence the program prevents people from migrating and enjoying the subsidy. However, if violence exceeds this threshold, households receiving the benefits are more likely to migrate than comparable households without the subsidy. Her explanation for this behavior is that the subsidy relaxes liquidity constraints and allows households to migrate when living in an extremely violent environment.

There are three papers studying the impact of conditional cash transfer programs in Colombia. Attanasio et al. (2010) analyse the effect of the CCT Familias en Acción on

enrolment rates and work participation. They find that the program increases enrolment especially for older children and children living in urban areas. Additionally, children spent less time on household chores than before the implementation of the program.

Garcia and Hill (2010) are using data from *Familias en Acción* as well, but they focus on school achievement and retention rates instead of enrolment. They find that the subsidy has a positive impact on school achievement of children aged 7-12 living in rural areas but a negative effect on the achievement of teenagers. One reason for this negative effect might be due to the fact that the supply side remained unchanged when introducing the program while at the same time enrolment rates of adolescents rose. This development leads to deterioration of the quality of education due to larger classes which in turn results in low achievement results of students.

Barrera et al. (2008) test the impact of three different versions of a CCT implemented in Bogotá: the first version is just based on attendance and is paid out on a regular basis, the second is a savings treatment that postpones a great part of the subsidy (based on attendance in the current year) till the re-enrolment and the third version is not based on attendance but graduation. Their overall conclusion is that targeted children are more likely to attend school and to stay enrolled and at the same time are more likely to graduate and to enlist in a tertiary institution. Particularly effective in this context is the savings treatment taking into account poor family's liquidity constraints and treatment based on graduation rather than on pure attendance. However, the program has a negative impact on siblings of treated students: they work more and their attendance rate is lower than that of students from untreated families. Their overall conclusion is that the design of a CCT matters for success.

The new feature about our paper is that it combines elements of all categories: we are analysing if a welfare program has a different impact on enrolment rates, depending on whether the household lives in a conflict-affected area or not. By doing so, we want to check whether program benefits could mitigate the negative impact of violence (as in Mesnard 2009) on educational outcomes mentioned in Barrera and Ibáñez (2004) and Rodríguez and Sánchez (2009; 2010). Additionally we contribute to the CCT literature and its impact on education by including the conflict / violence dimension, which is a relevant aspect in a conflict-affected country like Colombia.

## **B. Colombia**

### **I. Education**

Central government and municipalities share the responsibility for educational matters. The government sets up the curriculum, distributes teachers and wages to the municipalities and provides financing (originating from income and VAT taxes). The municipalities administer these funds and are responsible for establishing and maintaining educational institutions in their districts. Some municipalities invest additional capital in education coming from local funds via the collection of property taxes.

Colombia's schooling system consists of three categories. Children start the first grade at age five to seven and finish basic primary with the completion of the fifth grade. Afterwards they continue with basic secondary (grades six to nine). Basic primary and basic secondary are referred to as basic education and are compulsory in Colombia. After having completed basic education, students can continue middle secondary (grades ten and eleven) in order to get accepted at a university or a vocational school. The academic year starts in January and finishes in the middle of November (Barrera et al. 2008).



As in many low and middle income countries, in Colombia there is a large gap between enrolment rates in primary and secondary school: while the net attendance rate for primary school reaches 91%, the rate drops to 68% for secondary schools (2004/2005, DHS on [childinfo.org](http://childinfo.org)). Several reasons are responsible for this development: (i) high school fees and other costs associated with education, (ii) opportunity costs go up since the students could also work and earn some money, (iii) low quality of schooling and little relevance of curriculum for after school life and, (iv) limited opportunities to continue education after completion of secondary school (World Bank 2008). These factors are particularly relevant for children living in rural areas and/or in poor families since in these groups attendance rates for secondary school are below 50% (2004/2005, DHS on [childinfo.org](http://childinfo.org)).

## **II. Conflict**

The Colombian conflict has its roots in the unequal distribution of land and wealth. It was fuelled by the establishment of two left wing guerrilla groups – the Revolutionary Armed Forces in Colombia (FARC) and the National Liberation Army (ELN) in the 1960s (Guigale et al., 2002). As to protect themselves against these groups, landowners and drug lords started right wing paramilitary groups. In the second half of the 1980s violence related to the narcotics business increased. In the 1990s, the guerrilla became involved in the drug business as well which intensified the ongoing conflict (Meléndez and Harker, 2008).

As a result of the conflict between 1998 and 2002, 4.2 million people were internally displaced, representing about 10% of the population (Calderón and Ibáñez, 2009).

In 2002, the beginning of our period of study, Uribe was elected president of Colombia. He put an emphasis on democratic security policy to regain state control over the Colombian territory. This aim was achieved by increasing military spending, expanding police presence to all municipalities, eradicating coca cultivation, fighting the guerrilla and demobilizing the

paramilitaries. The results of this policy are mixed: on the one hand the number of kidnappings, homicides and paramilitaries reduced significantly but on the other hand not only did new armed groups emerge, but there is an increased number of armed contacts, thus signalling that the war is still ongoing (International Crisis Group, 2003; Presidencia de la República and Ministerio de Defensa Nacional, 2003).

### **3. The Data**

We use three types of data: (i) a household survey coming from the Familias en Acción program, (ii) a municipality level dataset on violence and conflict and (iii) a dataset describing the economic situation of municipalities.

The first dataset was established in order to analyze the effects of a Conditional Cash Transfer (CCT) program on nutrition, health and education of children aged 0-17. It was implemented by the Colombian government, the World Bank and the Inter-American Development Bank. The first survey was conducted in 2002, the second survey was carried out in 2003 and the third survey took place in 2005 or 2006, respectively. These surveys collected information on more than 11,000 poor households living in 122 rural municipalities. In order to be eligible for the program, a municipality had to dispose over a bank as well as over basic education and health infrastructure. Additionally, the municipality's number of inhabitants should not exceed 100,000. 57 municipalities fulfilled these criteria and thus received the program and 65 missed at least one criterion and are so called control municipalities. In 26 out of 57 treatment municipalities the program was already started before the first survey was conducted. That is why we will call these municipalities *early treatment* municipalities in the remainder of this paper. Accordingly, in *late treatment* municipalities the program was just implemented after the first survey. Every

family living in a treatment municipality with at least one child aged 0 – 17 and belonging to the poorest quintile (SISBEN 1) of the population is qualified for the program.<sup>2</sup>

The mother receives a monthly subsidy of 14,000 pesos (US\$ 6) per child attending primary school and 28,000 pesos (US\$ 12) per child going to secondary school. In order to receive the benefits, a child has to attend 80% of the classes. Additionally, mothers get 46,500 pesos (ca. US\$ 20) for children aged 0-6 if they bring them to health check-ups and attend classes on nutrition, hygiene, etc. (Attanasio et al. 2010, Mesnard 2009). Compared to the minimum wage of 309,000 pesos (ca. US\$ 135) in 2002, these transfers could make up a substantial share of a household's income: for a family with one child in primary and one child in secondary school, the subsidy is about 13.5% of the minimum wage and if this family has an additional child aged 0-6, the subsidy increases to 29% of the minimum wage.

We used the first and the sixth module of the household surveys for our analysis. In these modules information about the socio-economic structure of the household, housing conditions, household assets, education, access to infrastructure, usage of healthcare services, household consumption, labor supply, income and transfers were collected. Moreover, we included some information of the municipality questionnaire on health and educational institutions and commercial activity in our dataset.

The second dataset, assembled by Universidad de los Andes' Center of Economic Development Studies (CEDE for its acronym in Spanish), includes information about violence and conflict intensity (which will be discussed in more detail later) and it also contains municipality characteristics. These characteristics include the department the municipality is located in, the total inhabitants of each municipality as well as the share of urban and rural population at municipality level. Since the homicide rates are missing for the years 2005 and

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<sup>2</sup> See Attanasio et al. (2006) for details regarding the selection process on treatment and control municipalities.

2006, we complemented this dataset with data on homicide rates obtained from the National Administrative Department of Statistics (DANE for its acronym in Spanish) and the National Police.

The third dataset comes from Colombia's National Planning Department (DNP for its acronym in Spanish) and comprises information on the municipality's industrial and commercial taxes (ICA for its acronym in Spanish). Since taxes were indicated in current Colombian pesos we converted them into real Colombian pesos using the Consumer Price Index (CPI) calculated by DANE. Tax collection indicators capture the municipality's economic situation, which affects labor demand and may also have an impact on the level of violence.

#### **4. Descriptive Statistics**

##### **A. Enrollment Rates, Household and Municipality Characteristics in Treatment and Control Areas**

Our empirical analysis focuses on a sample of more than 18,000 children aged 8 – 17 in the second survey. As illustrated in section 2BI, enrolment rates vary with age and rural-urban provenance. For this reason we divided the children into four subgroups: (i) children aged 8 – 13 living in rural areas, (ii) children aged 14-16 living in rural areas, (iii) children aged 8-13 from urban areas and, (iv) children aged 14 – 16 from urban areas.

Additionally, we have to take into account whether a child belongs to the treatment or control group in order to observe whether the development of enrolment rates is different in the treatment and control group. Remember that we have two different treatment groups: families in *early treatment* municipalities already receive the subsidy before the first survey whereas households in *late treatment* municipalities only do so after the first survey.

A problem could be that households of the *late treatment* group know that they will receive

the program soon and change their behavior now anticipating the program. Thus, children in treatment municipalities either get the program or have knowledge about it which might contaminate/influence enrolment rates in the first survey. In order to avoid this problem we include retrospective data from 2001 on enrolment which we will refer to as baseline in the following.<sup>3</sup>

[Insert Table 1 here]

Enrolment rates for children aged 8-13 living in rural areas at baseline are 89% for late treatment municipalities, 91% for early treatment municipalities and 86% for control municipalities. Over time, the enrolment rate increases by 6% in late treatment municipalities, 4% in early treatment municipalities and 3% in control municipalities. We observe that even before the start of the program, enrolment rates are lowest in control areas and grow less over time compared to treatment regions. The picture is similar for children (8-13) going primary school in urban areas: enrolment rates for late treatment and control municipalities are 93% and reach 96% for early treatment municipalities. Again, enrolment rates grow faster in late treatment municipalities than in early treatment and control regions.

Enrolment rates for adolescents (14-16) attending secondary school in rural areas reach 60% in early treatment regions, 58% in late treatment municipalities and just 52% in control areas at baseline. Rates grow by 14% and 13% in late and early treatment groups, respectively, but just by 7% in the control group. Enrolment rates for children (14-16) going to secondary school in urban areas are higher than in rural areas initially but grow at a lower rate. Again, initial enrolment is highest in early treatment municipalities (86%), followed by late

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<sup>3</sup> See section on methodology for potential anticipation effects.

treatment (76%) and control municipalities (73%). Across time, enrolment rates increase about 10% in treatment groups and 6% in the control group.

To sum up, we observe enrolment rates are lower in rural areas than in urban areas and decrease from primary to secondary school. In each of the four subgroups (urban/rural primary; urban/rural secondary) the initial enrolment rate is highest in the early treatment group and lowest in the control group. Over time, enrolment rates grow faster in the late treatment group than in early treatment and control municipalities. Hence, at the time of the third survey, enrolment rates in early and late treatment municipalities are approximately the same, whereas they are still lower in control municipalities. However, we do not know at this stage if the program leads to a higher increase of enrolment rates in treatment municipalities or if these municipalities are inherently different from control municipalities.

[Insert Table 2 here]

Table 2 summarizes some of the main characteristics across early treatment, late treatment and control areas at the first survey. We observe that there are no significant differences across treatment and control group with respect to (i) age of child, head of household and spouse, (ii) whether a child is female, (iii) educational level of head of household and spouse. There are small differences with respect to the material used to build the walls of the house and the services available. Overall, households in treatment and control areas are not significantly different from each other according to these characteristics.

[Insert Table 3 here]

Table 3 presents some characteristics of treatment and control municipalities. We observe that treatment and control groups are significantly different in about 50% of the characteristics. There are no differences across treatment and control areas with respect to

(i) proportion of households with sewage facilities, (ii) urban population, (iii) number of urban public schools, (iv) number of health centers, (v) number of banks and (vi) share of households coming from the Oriental or the Pacific region. Control municipalities possess less rural public schools, hospitals, small health care centers and pharmacies than treatment municipalities. The rural population in control areas is greater and the proportion of households with piped water is higher than in treatment areas. Moreover, significantly more households from the control group live in the Atlantic and the Central region. In a nutshell, control municipalities are more rural and dispose over less infrastructure (an exception being the proportion of households with piped water) than treatment municipalities.

### **B. Violence/Conflict**

We proxy the level of conflict at the village level using very disaggregated data provided by CEDE. In our sample, the median number of attacks of illegal groups (paramilitaries and guerrillas) per village is 0.35% of observations include at least one attack, and 17% more than 2 attacks in the municipality. At baseline, the mean number of attacks per municipality (for the sample in the regressions shown in section 5) was 0.94 incidents/year (max=10). It increased to 1.20 incidents/year in the first wave (max=14) and decreased to 0.43 (max=7) in the second follow up. Because of the skewness of the number of attacks we have resorted to  $\log(1+\text{attacks})$ , called  $\log(\text{attacks})$  as a variable of interest, to avoid large influence of extreme values. Figure 1 displays a kernel density estimate of  $\log(\text{attacks})$ .

[Insert Figure 1 here]

## 5. Estimation Strategy and Econometric Results

We use panel data on school enrollment and school progression, including baseline data. At the time of the first survey the program had already started in *early treatment* areas. Because treatment units were decided but not implemented at the same time, *anticipation effects* may have affected households that were deemed to be treated in the future (Attanasio et al. 2010).

The basic specification that we use to estimate the impact of the program on outcome  $Y$  follows Attanasio et al. (2010). In a linear model, this is represented as follows:

$$Y_{it} = \alpha_0 + \sum_{j=1}^2 \alpha_{1j} I(t = j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \theta Z_{it} + u_{it} \quad (1)$$

for  $t=0$  (baseline),  $t=1$  (first survey) and  $t=2$  (second survey). In the first wave, some *treatment* areas had already received the program support, whereas others (*late treatment*) were still to receive the program. In  $t=2$  all *treatment* areas had received treatment.  $P=1$  is a dummy for *treatment areas* (regardless of whether they were *early* or *late treatment*), and 0 otherwise.  $A=1$  in *late treatment* areas in  $t=1$ .  $T=1$  for *late treatment* areas in  $t=2$ .  $Z_{it}$  is a vector of pre-program characteristics at the individual, household and community levels<sup>4</sup>. The coefficient of interest to measure the effect of the program is  $\alpha$ .

In our case, we are interested in how the program effect varies with conflict variable  $X$ .

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<sup>4</sup> At the individual level, we control for groups defined whether the individual was aged 8-13 or 14-17 at the time of the second survey interacted by the urban-rural status of where s(he) lives. This defines 4 groups. A linear time trend interacted with group dummies is also included.

We also control for age and age squared and sex of the student at baseline, as well as the interaction of age with sex. Household characteristics control for whether the household has the following services: electricity, gas (by pipe), water (by pipe), sewage system, rubbish collection, whether the household used loans to buy the land/build the property, whether the household was built with bricks, mud, wood, cardboard. Age of the head of household and his(her) spouse is also included, along with a dummy for whether the head is female, educational categories for head of household and spouse and labor situation of the head of household.

Community level controls are the log (urban/rural) population, log (population), log(Industry and Commerce taxes per capita), number of hospitals, health facilities (small/large), number of schools (urban/rural) and number of pharmacies.



$$Y_{it} = \alpha_0 + \sum_{j=1}^2 \alpha_{1j} I(t = j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \alpha_2^X P \times X + \alpha_3^X A \times X + \alpha_4^X T \times X + \theta Z_{it} + u_{it} \quad (2)$$

In this case, the value of interest is:

$$\alpha_4 + \alpha_4^X \times X \quad (3)$$

which measures the difference in Y operated by the interaction of treatment and conflict variable X. This shows us the differential effect of treatment with respect to a comparable individual given a particular level of conflict variable X. This specification creates a monotonic response in X. One may be interested in testing for nonlinearities.

$$Y_{it} = \alpha_0 + \sum_{j=1}^2 \alpha_{1j} I(t = j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \alpha_2^X P \times X + \alpha_3^X A \times X + \alpha_4^X T \times X + \alpha_2^{X^2} P \times X^2 + \alpha_3^{X^2} A \times X^2 + \alpha_4^{X^2} T \times X^2 + \theta Z_{it} + u_{it} \quad (4)$$

Here, the value of interest is

$$\alpha_4 + \alpha_4^X T \times X + \alpha_4^{X^2} T \times X^2 \quad (5)$$

[Insert Table 4 here]

Table 4 shows probit estimates of (1), (3), and (5), for the dichotomous outcome of enrollment, where X=log(attacks against civilians by illegal armed groups). To calculate the impact on the probabilities of enrollment in a nonlinear model, we simulate the impact of T for plausible values of X.

[Insert Figure 2 here]

This results in Figure 2. The impact of the program is nonlinear in the (log) number of attacks. The effect appears to be positive and significant in cases where attacks level are higher than 1.25 log(attacks)/year (as a reference 1.39 log(attacks)/year ranks in percentile 90) This suggests that the program is particularly successful where is needed (in regions where schooling was negatively affected by conflict).

However, enrollment *per se* may not be a good indicator of human capital accumulation, whereas grade progression would. In this case, we estimate (1), (3) and (5) by using Y=grade progression with respect to baseline.

[Insert Table 5 here]

Table 5 shows OLS estimates for grade where X=log(attacks) against civilians by illegal armed groups). Because OLS is a linear model, interactions are easier to compute.

[Insert Figure 3 here]

Results are plotted in Figure 3. The impact of the program is only significant in villages with low levels of (log) attacks. However, since the log(attack) distribution is highly skewed to the right, most treatment villages undergoing attacks (albeit low levels) benefit from the program in terms of grade progression.

## 6. Discussion of Results

The impact of the program differs by the intensity of conflict, mainly in terms of schooling, but not in terms of grade progression. What could explain these findings?

First, we used data on time use of children ages 8-17 in the second wave. As before, we estimated an equation of the form

$$Y_{ait} = \alpha_{0a} + \sum_{j=1}^2 \alpha_{1aj} I(t = j) + \alpha_{2a} P + \alpha_{3a} A + \alpha_{4a} T + \alpha_{2a}^X P \times X + \alpha_{3a}^X A \times X + \alpha_{4a}^X T \times X + \alpha_{2a}^{X^2} P \times X^2 + \alpha_{3a}^{X^2} A \times X^2 + \alpha_{4a}^{X^2} T \times X^2 + \theta_a Z_{it} + u_{ait} \quad (6)$$

where  $Y_{at}$  is the time (in hours/day) that the individual spent on a certain activity.

[Insert Table 6 here]

Table 6 shows all types of activities considered. As before, we selected some activities for which there were differential effects of treatment on time use (conditional on attack

intensity). The values of interest for  $X=\log(\text{attacks})$  are  $\alpha_{4a} + \alpha_{4a}^X T \times X + \alpha_{4a}^{X^2} T \times X^2$ . This is displayed in Figure 4.

[Insert Figure 4 here]

We observe that hours spent in school is almost constant on  $\log(\text{attacks})$  when compared to subjects not receiving treatment. However, as conflict level increases, children in school tend to devote more hours to paid work (out of home), affecting in a detrimental way hours devoted to homework. This could explain why despite an increasing enrollment gap in  $\log(\text{attacks})$  (comparing  $T=1$  vs  $T=0$ ) the same trend is not observed in grade progression.

Second, to explain the rise in hours worked, one needs to observe what happens at the household level. Our conjecture is that conflict adversely affects the ability to generate household income by the head/spouse. To check this, we perform a panel regression with fixed (individual-time) effects:

$$\ln(\text{Income})_{it} = \alpha_i + \sum_{j=1}^2 \alpha_{1j} I(t = j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \alpha_5 X + \alpha_6 X^2 + u_{it} \quad (7)$$

This is run for heads of households and his (her) spouses and it includes all type of income. The sample size is 56,475 observations. We then compute the impact of attacks on  $\log(\text{income})$ , which is displayed in Figure 5.

[Insert Figure 5 here]

Here we observe that as the number of attacks increases, the household falls under strict income constraints. It is plausible that in this scenario, heads of household may consider more eagerly apply for the cash transfer, while at the same time, may try to ask their children to work some hours (if a job is available). Both actions may alleviate income constraints and are therefore compatible with our findings shown in Figure 4.

Third, we would also like to know if part of the difference between attendance and grade completion is due to absenteeism. For this we use the already shown equation (4)

$$Y_{it} = \alpha_0 + \sum_{j=1}^2 \alpha_{1j} I(t = j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \alpha_2^X P \times X + \alpha_3^X A \times X + \alpha_4^X T \times X + \alpha_2^{X^2} P \times X^2 + \alpha_3^{X^2} A \times X^2 + \alpha_4^{X^2} T \times X^2 + \theta Z_{it} + u_{it} \quad (8)$$

where this time Y is the number of days the student missed school in the last month. We again compute our comparative-static of interest, that is  $\alpha_4 + \alpha_4^X T \times X + \alpha_4^{X^2} T \times X^2$  and obtain as a result figure 6. Thus, even if minimal (on average, a student misses 3.15 days/month), the absenteeism channel may be operating in detriment of grade advancement. The students can be still considered enrolled, but their “investment” (in terms of school presence) is reduced.

[Insert Figure 6 here]

In sum, there are several channels that explain the results shown in section 5. Households under conflict may experience hardships. A conditional cash transfer program is badly needed in these circumstances. This explains the higher enrollment “return” in conflict areas. However, at the same time, the hardships may condition grade progression because students may have to sacrifice hours devoted to schoolwork to generate additional sources of income.

## 7. Conclusion

There are few papers documenting the effectiveness of policy interventions in conflict affected regions. Here, we used longitudinal data from a Conditional Cash Transfer intervention in Colombia together with a rich dataset on conflict events (disaggregated by year and municipality level) to understand to what extent these transfers could alleviate the

hardship of households in conflicts. We find that these programs are effective in conflict areas (in the sense that the treatment effect is larger in high conflict vs. low conflict areas) at least in terms of increasing enrollment. However, they are not a panacea and thus we do not find heterogeneous effects in terms of grade progression.

With the data at hand, we provide evidence that the lack of extra improvement in grade progression is driven by different factors. Treated children in conflict areas tend to do less homework and work more than children with similar attributes in low conflict areas. This may reduce the speed of human capital accumulation. Moreover, school attendance is affected to some degree by conflict (comparing “treated” in conflict vs. low conflict areas), reinforcing the effect described in the previous sentence.

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## 9. Tables and Figures

**Table 1: Enrolment Rates in Late-Treat, Early-Treat and Control Areas in Baseline, First, Second and Third Surveys (%)**

	Late Treat	Early Treat	Control
<b>Rural 8-13</b>			
Baseline	88.77	91.23	85.92
First Survey	91.67	93.21	83.35
Second Survey	91.30	93.29	84.75
Third Survey	94.55	94.88	88.98
<b>Rural 14-16</b>			
Baseline	57.51	60.17	51.69
First Survey	59.38	59.91	43.56
Second Survey	62.74	67.37	50.60
Third Survey	71.95	72.67	59.01
<b>Urban 8-13</b>			
Baseline	92.92	96.52	93.39
First Survey	95.23	95.56	90.43
Second Survey	95.22	95.88	91.59
Third Survey	97.00	98.29	95.62
<b>Urban 14-16</b>			
Baseline	75.88	85.93	73.15
First Survey	75.57	83.80	68.55
Second Survey	78.62	86.58	73.42
Third Survey	85.26	87.39	78.97

Note: Baseline data refer to a preprogram period; age at baseline is age at first survey - 1.

**Table 2: Summary of Main Characteristics across Late-Treat, Early-Treat and Control Areas at the First Survey**

	Late Treat	SD	Early Treat	SD	Control	SD
<b>Age of Child</b>	11.020	2.830	11.190	2.830	11.120	2.810
<b>Child is female</b>	0.477	0.499	0.479	0.499	0.469	0.499
<b>Age of Head</b>	44.648	12.200	45.526	12.300	45.594	12.680
<b>Age of Spouse</b>	39.177	10.420	39.781	10.582	40.147	11.113
<b><i>Education level of head</i></b>						
None	0.283	0.451	0.258	0.438	0.265	0.442
Primary (complete & incomplete)	0.606	0.489	0.624	0.484	0.601	0.489
Secondary or higher	0.111	0.314	0.118	0.322	0.134	0.341
<b><i>Education level of spouse</i></b>						
None	0.222	0.416	0.202	0.401	0.221	0.415
Primary (complete & incomplete)	0.661	0.473	0.676	0.468	0.626	0.484
Secondary or higher	0.117	0.321	0.122	0.328	0.153	0.360
<b><i>House walls</i></b>						
Brick	0.442	0.497	0.415	0.493	0.473	0.499
Mud	0.414	0.493	0.379	0.485	0.325	0.468
Good quality wood	0.104	0.305	0.147	0.354	0.164	0.370
Bad quality wood	0.029	0.169	0.043	0.203	0.024	0.154
Cardboard/None	0.010	0.101	0.150	0.122	0.140	0.116
Has piped gas	0.061	0.240	0.099	0.299	0.086	0.280
Has piped water	0.655	0.473	0.528	0.499	0.646	0.478
Has sewage system	0.285	0.452	0.197	0.398	0.258	0.438
Has rubbish collection	0.303	0.460	0.252	0.434	0.352	0.478

Note: Sample of households with at least one child aged 8-17 in the second survey.

**Table 3: Characteristics of Treatment and Control Municipalities**

	Treatment		Control	
Proportion of households with piped water	0.597	[0.491]	0.649	[0.477]*
Proportion of households with sewage facilities	0.252	[0.434]	0.265	[0.442]
Urban population	16310.53	[17981.92]	13334.48	[17172.30]
Rural population	13394.68	[7898.578]	8062.092	[7658.948]*
Number of urban public schools	8.679	[8.253]	6.692	[8.253]
Number of rural public schools	42.464	[3.996]	25.554	[23.437]*
Number of hospitals	0.857	[0.401]	0.646	[0.482]*
Number of health care centers	1.071	[1.412]	0.815	[1.144]
Number of small health care centers	5.054	[4.317]	3.292	[4.996]*
Number of pharmacies	9.768	[7.500]	6.476	6.169]*
Number of banks	1.694	[1.925]	1.077	1.995]
<i>Region of residence</i>				
Atlantic	0.405	[0.491]	0.431	[0.495]*
Oriental	0.198	[0.398]	0.214	[0.410]
Central	0.265	[0.442]	0.218	[0.413]*
Pacific	0.132	[0.338]	0.138	[345]

Note: Standard deviations in parentheses. A \* indicates that variable is statistically significant across treatment and control municipalities (based on t-tests at the 5% level of significance).

**Table 4: Probit Estimates: Enrolment**

	Eq(1)	Eq(2)
log(attacks)	0.051 [0.040]	0.181 [0.118]
(T=1)*log(attacks)	0.075 [0.060]	-0.229 [0.177]
log(attacks) <sup>2</sup>		-0.078 [0.074]
(T=1)*log(attacks) <sup>2</sup>		0.248 [0.116]**
Constant	2.731 [0.454]***	2.492 [0.460]***
Observations	21222	21222

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 5: OLS Estimates: Grade Progression**

	Eq(1)	Eq(2)
log(attacks)	-0.038 [0.036]	-0.452 [0.107]***
(T=1)*log(attacks)	-0.076 [0.052]	-0.109 [0.132]
log(attacks) <sup>2</sup>		0.278 [0.069]***
(T=1)*log(attacks) <sup>2</sup>		0.019 [0.074]
Constant	-7.009 [0.385]***	-6.917 [0.388]***
Observations	18087	18087
R-squared	0.71	0.71

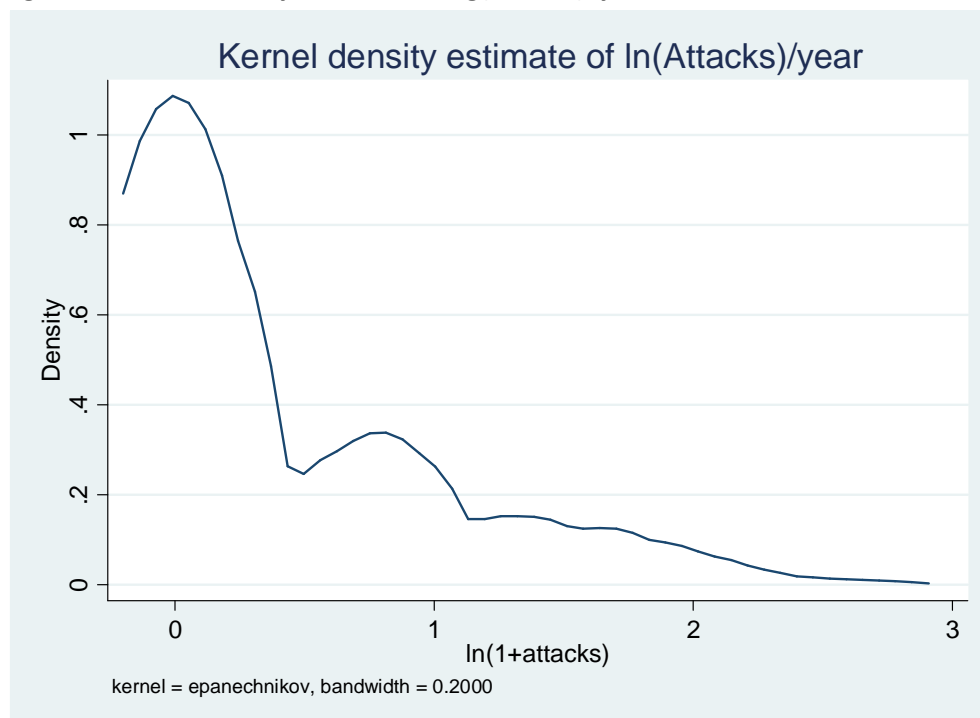
Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6: OLS Estimates: Time Use**

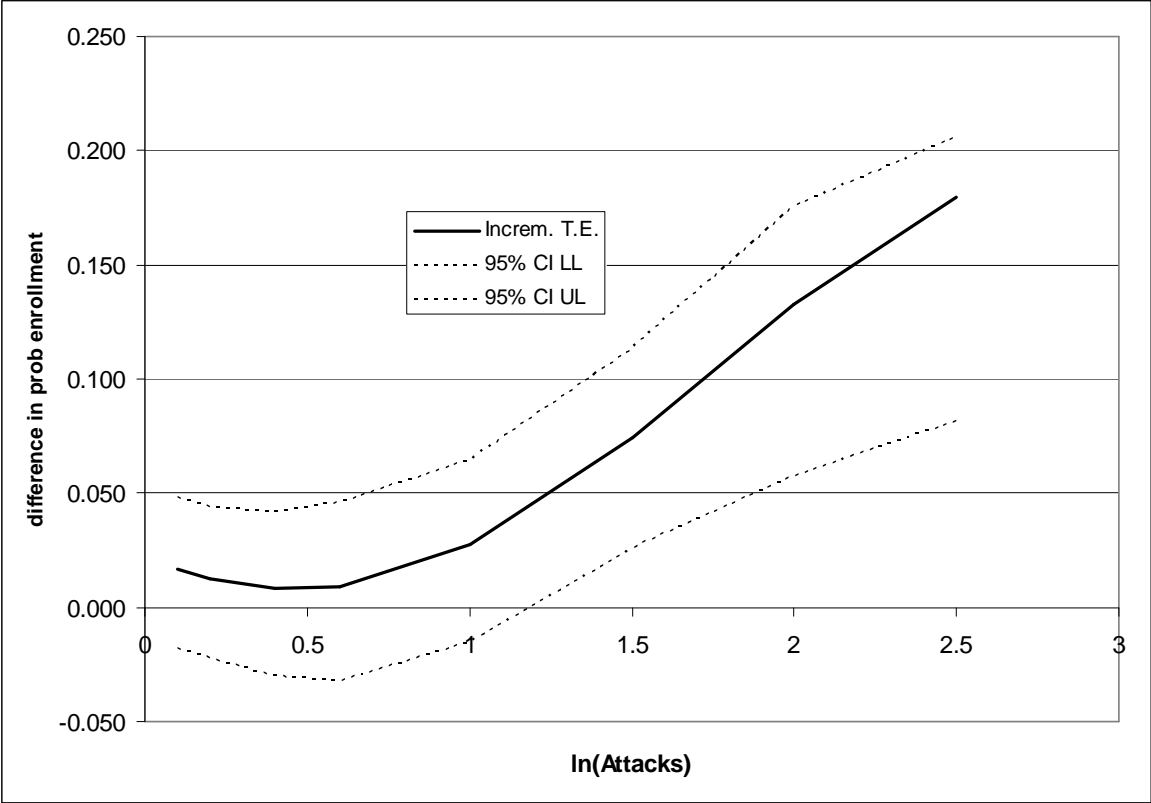
	Paid hours worked out of house	Unpaid hours worked out of house	Hours in school	Hours worked at home business	Homework	Housework
<b>T=1</b>	-0.208 [0.068]***	-0.03 [0.060]	0.288 [0.000]	-0.04 [0.021]*	0.121 [0.042]***	-0.198 [0.062]***
<b>(T=1)*log(attacks)</b>	0.163 [0.172]	0.129 [0.142]	-0.086 [0.270]	-0.003 [0.054]	-0.216 [0.108]**	0.502 [0.162]***
<b>(T=1)*log(attacks)<sup>2</sup></b>	-0.008 [0.092]	-0.01 [0.083]	0.05 [0.152]	0.009 [0.027]	0.057 [0.057]	-0.284 [0.087]***
<b>Observations</b>	18134	18127	18132	18116	18125	18124
<b>R-squared</b>	0.09	0.06	0.08	0.01	0.05	0.13
<b>Joint test: (T=1)*log(attacks)+(T=1)*log(attacks)<sup>2</sup></b>						
<b>p-value</b>	0.0468**	0.1133	0.947	0.6286	0.0072***	0.0047***

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

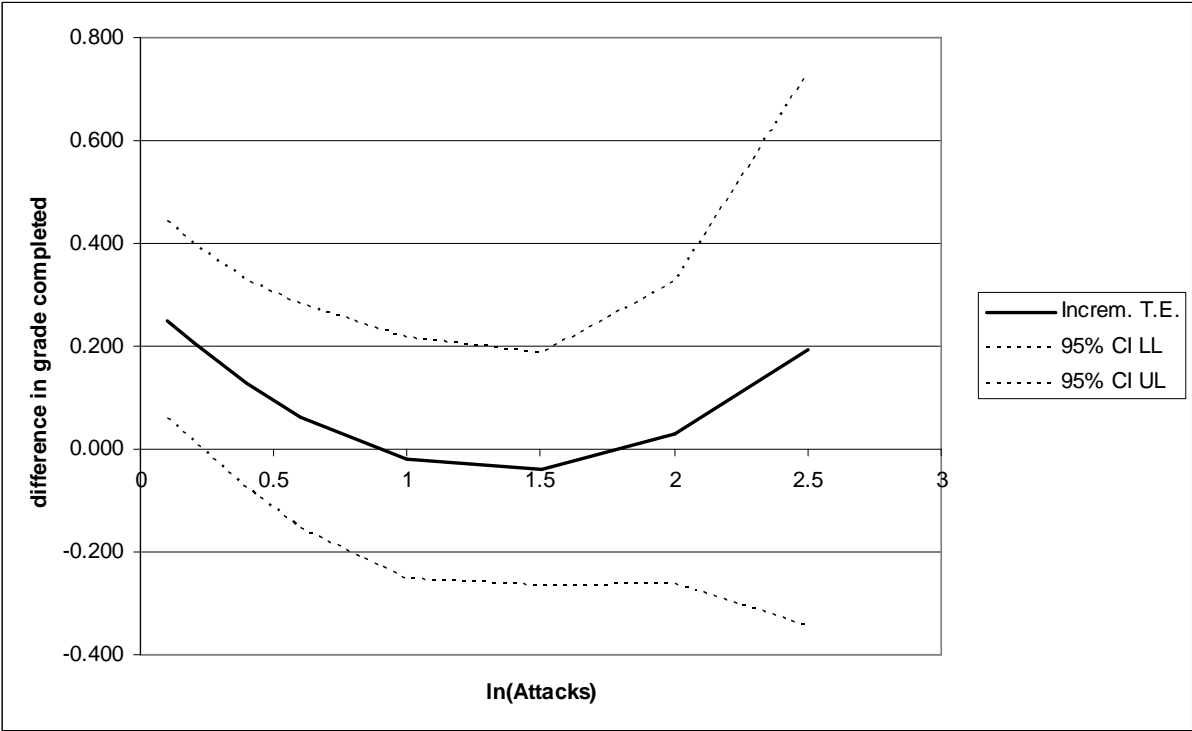
**Figure 1: Kernel Density Estimate of log(attacks)/year**



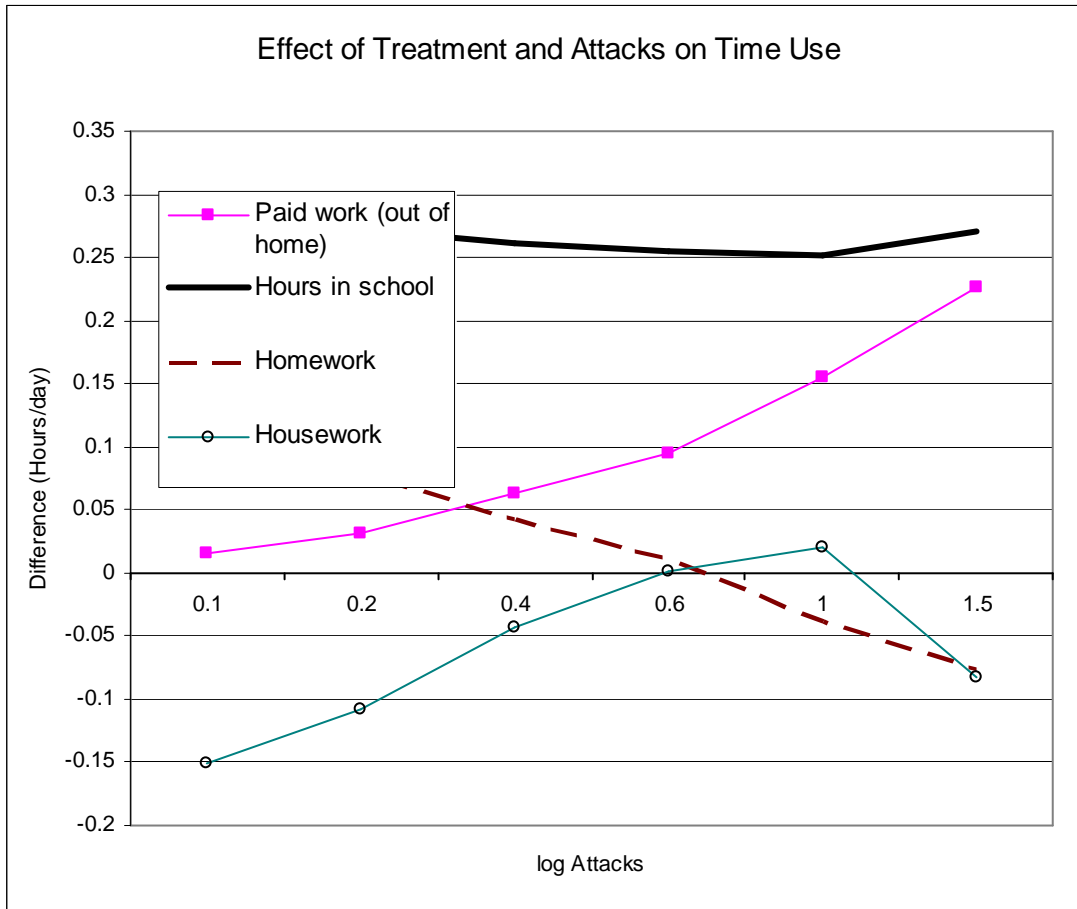
**Figure 2: Multiplicative effect of Treatment and log(attacks) on Enrollment**



**Figure 3: Multiplicative effect of Treatment and log(attacks) on Grade Progression**



**Figure 4: Effect of Treatment and Attacks on Time Use**



**Figure 5: Impact of log(attacks) on Income of Husband and Wife**

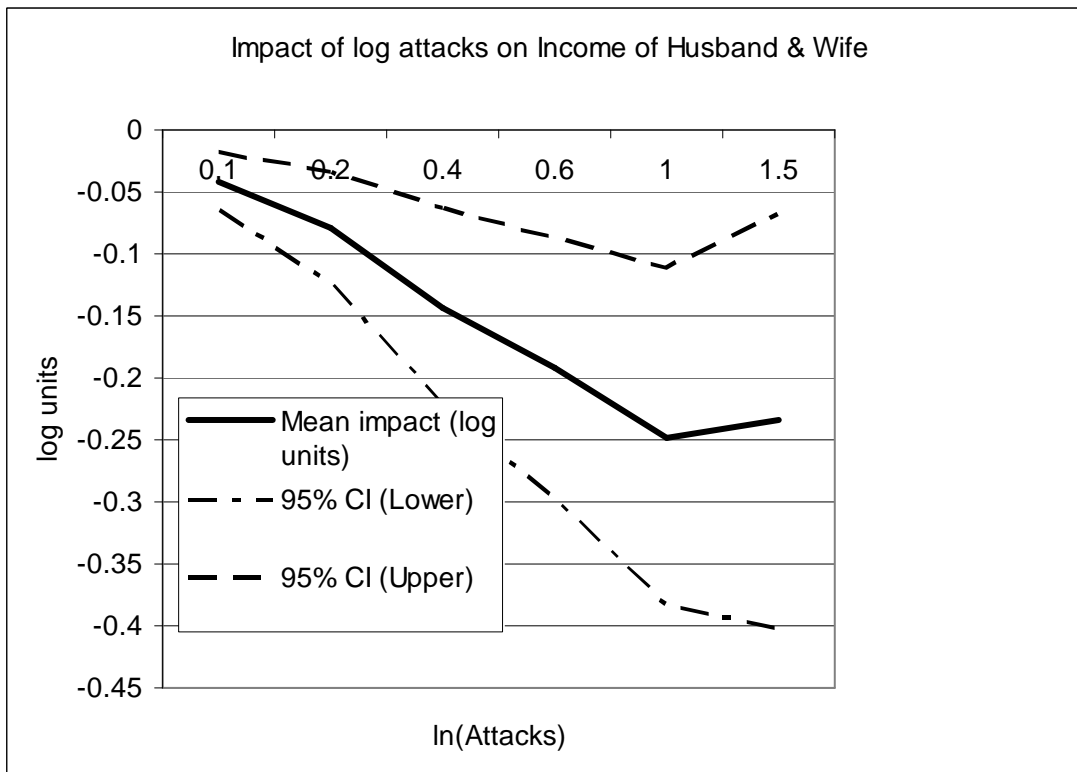


Figure 6: Days missed at school (Treatment vs. Control) by log(attacks)

