War on Drugs vs. Natural Disasters: Which Affects More Household Decisions in Mexico?

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September 19, 2018

Abstract

This paper estimates the effects of Mexico's war on drugs and natural disasters on consumption, assets, credit, children's employment, school attendance, and use of time. Using fixed-effects models, the results suggest that: i. there is no effect of violence and natural disasters on consumption; and ii. families smooth their consumption affecting their children's human capital instead of using assets or getting more credits. Yet, the way they affect the children's human capital depends on the type of shock. The violence increases children's labor supply (particularly males) and the natural disasters decrease school attendance. Finally, a different effect of these shocks on the use of time is observed. While the violence increases the time spent on household activities, the natural disasters decrease the time spent on household activities. In summary, natural disasters and the war on drugs affect the decisions of households; yet, they each affect the decisions of households differently.

Keywords: Natural Disasters, War on Drugs, Consumption, Human Capital

JEL: I14, I24, Q546.

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1 Introduction

Mexico is one of the countries most exposed to natural disasters and a war on drugs in recent years. In particular, Mexico is among the top 30 countries most exposed to two types of natural disasters: hurricanes and earthquakes. According to the World Bank (2012), 27% of the population in Mexico is exposed to storms, hurricanes, and floods; and 26% to earthquakes. Regarding the war on drugs, it is believed that the declaration of war by President Calderon increased the number of homicides from 8,500 to nearly 25,000 between 2007 and 2010 (Guerrero-Gutiérrez, 2011).

Although both shocks affect a considerable number of families, the war on drugs has received more attention. For example, the winners of the last two presidential elections have promised the reduction of homicides due to the war on drugs. These promises responded to the perception of the population. According to INEGI (2011), around 70% of the population considered insecurity as the most important problem for the country, while natural disasters were a problem for only 2% (Figure 1). One potential hypothesis that may explain this perception is that the war on drugs affects families more severely than natural disasters.

This paper analyzes how families react to shocks due to the war on drugs and natural disasters on consumption, credit, assets, children's labor, school attendance, and use of time. Individual fixed effects models are estimated using longitudinal data combined with municipality-level monthly homicides and exposure to natural disasters. Results show that: i. natural disasters and violence do not affect household's consumption; ii. families smooth their consumption affecting

their children's human capital instead of using assets or getting more credits; iii. young adults exposed to natural disasters are less likely to attend school (particularly when their parents have lower levels of education); iv. young adults exposed to local violence are more likely to be employed (particularly boys); and v. local violence increases the time spent on household activities while the natural disasters decrease the time dedicated to household activities.

For Mexico, there is evidence that the war on drugs has affected the accumulation of human capital; yet, little evidence exists regarding the effects of natural disasters. In the case of adults, the increase in the homicide rate has increased the likelihood of being risk averse, but has no effect on mental health (Nasir et al., 2017). Also, exposure to local violence reduces labor supply for women and self-employed men (Brown et al., 2015). In the case of children, the violence measured by homicides rate increases the probability that young people (14-17 years old) are employed, but it has not affected young's cognitive abilities (Brown and Velásquez, 2017). In addition, an increase in the homicide rates reduces height-for-age while in utero (Nasir, 2015) and decreases birth weight (Brown, 2018). In the case of natural disasters, Rodriguez-Oreggia et al. (2013) find that natural disasters have an adverse effect on the Human Development Index developed by United Nations Development Programme (UNDP) and increase the levels of poverty.

There are two main contributions of this study: first, it is the first paper that analyzes the effects of natural disasters on consumption, credit, assets, child labor, school attendance, and use of time for Mexico at the national level. Regarding consumption, the economic theory predicts that individuals maintain the levels of

consumption against income shocks, yet there is evidence that this is not always the case (Kazianga and Udry, 2006). This paper does not find evidence of a reduction on consumption due to a natural disaster in the medium term. To smooth the levels of consumption, households can handle the shock by selling their durable goods, accessing to credit or taking out children from school. I find a reduction in the possession of assets, yet it is not clear if they were used to smooth consumption or they were destroyed as a consequence of natural disasters. In addition, I do not find evidence that the use of credit has been the channel to smooth consumption. On the contrary, it is observed a decrease in the access to credit. Finally, it appears that the households adjusted their consumption affecting the human capital of their children. This last strategy has been documented for other countries. Jensen (2000) find that school attendance for boys fell more than for girls in response to a drought in Cote d'Ivore. However, Cameron and Worswick (2001), using data from a crop failure in Indonesia, find that school enrollment for girls fell more than that of boys. In the case of Mexico, I do not find evidence of heterogeneous effects by gender, but heterogeneous effects depending on the education of the head of the household. When the head of the household has secondary education or less, then it is more likely that the children stop attending school.

Secondly, it complements the previous work on the effects of the drug on wars in Mexico on human capital and household decisions. The results show that the households smooth their consumption, but this was not a result of selling their assets or accessing more credit. I do not find evidence that families take their children out of school. Yet, I find evidence that the children incorporate into the labor market. One of the main concerns is that these young people may be joining

the activities of the organized crime. This hypothesis is plausible when we observe that the children increased their time on agricultural activities which potentially can be related to drug's cultivation.

In terms of public policy, it has been announced that Mexico will implement a program of scholarships and training to decrease the probability that young people incorporate into the organized crime (this under the slogan "Scholars Yes, Hitman No"). Yet, it is also necessary to implement public policies for adolescents who have abandoned the school as a consequence of natural disasters.

The remainder of the paper is organized as follows: Section 2 describes the situation of natural disasters and the evolution of the war on drugs in Mexico, Section 3 describes the data and methodology, Section 4 presents the results, and Section 5 concludes.

2 Violence and Natural Disasters in Mexico

Before the 2006 election, violence levels were relative stable in Mexico (Figure 2). Newly elected President Felipe Calderon declared a war on drug-trafficking organizations (DTOs) on December 11, 2006. In the subsequent years the number of homicides increased from 8 to 22 homicides per 100,000 inhabitants between 2007 and 2010 (Figure 2). In addition, the violence spread around the country. The number of municipalities with a rate of 12 homicides per 100,000 inhabitants or more increased for 48 municipalities to 148 municipalities between 2007 and 2010

(Brown et al., 2015).

Different researchers have tried to understand this unexpected increase in the homicide rate, and we can group these results into three lines of analysis. The first line is related to a tougher domestic drug enforcement policy. Lindo and Padilla-Romo (2018) find that the capture of a drug-trafficking organization leader in a municipality increases its homicides rate by 61% in the six months following the capture and this effect appears to persist into subsequent periods. Dell (2015) presents evidence that the number of drug-trade related homicides are driven by close PAN (party of former President Calderón) mayoral victories. The second line of analysis is related to external shocks. Castillo et al. (2014) find that a reduction in cocaine supply from Colombia (Mexico's principal supplier) could account for 10%-14% of the increase in Violence in Mexico. Dube et al. (2013) show that access to guns from the United States have contributed to rising violence along the border and Dube et al. (2016) provide evidence that declining in maize prices stimulate drug production. The third line of analysis is related to socioeconomic factors. Enamorado et al. (2016) find that an increment of one point in the Gini coefficient represents an increase of more than 6 homicides per 100,000 inhabitants.

Regarding natural disasters, 27% of the population in Mexico is exposed to storms, hurricanes, and floods; 26% to earthquakes; and 19% to droughts (World Bank, 2012). Using data from the National Center for the Prevention of Disasters (CENAPRED), during the period 2005-2013, an average of 547 municipalities suffered some type of natural disaster (Table 1). Taking into account that Mexico has 2,474 municipalities, this implies that on average one in five municipalities was

impacted by a natural disaster per year. In this period, 86% of natural disasters were hydrometeorological, 5% related to droughts, 4% were earthquakes, and 5% were another type of natural disaster (Table 1).

Although earthquakes occur less frequently than hydrometeorological phenomena, the former are more deadly. According to Ordaz-Schroeder and Zeballos-Cabrera (2007), on average the hydrometeorological phenomena have caused 79 deaths per event while the geological phenomena have caused 279 deaths per event between 1929 and 2005. Finally, Zapata and Madrigal (2009) value that the economic damages from natural disasters on GDP have not exceeded 1% per year between 1985 and 2007 in Mexico.

3 Data and Methodology

3.1 Data

The data used in this paper is a match of the INEGI monthly homicide reports at the municipality level, the CENAPRED monthly natural disasters report at the municipality level, and the Mexican Family Life Survey (MxFLS). The Mexican Family Life Survey (MxFLS) is a longitudinal and national representative panel with surveys in 2002 (MxFLS1), 2005-2006 (MxFLS2), and 2009-2013 (MxFLS3). The 2002 baseline includes data from 8,440 households and 35,600 individuals from 136 municipalities and 16 states through Mexico. The attrition rates were 89 percent and 87 percent of respondents re-interviewed in the second (MxFLS2) and

third wave (MxFLS3) respectively.

3.1.1 Violence and natural disasters

Homicides are used as the measure of violence. In particular, I use death certificates from the vita statistics of the National Institute of Statistics and Geography (INEGI).[1] In order to use homicide rates, I use the estimations of population at the municipality level prepared by the National Council of Population (CONAPO). Using this information, I obtain the average number of homicides per 100,000 inhabitants in a municipality in 12 months prior to the interview date as my measure of domestic violence. I focus on the MxFLS2 and MxFLS3 since the first follow-up was conducted between 2005 and 2006, which is a period of low levels of violence; and the second follow-up was performed from 2009 and 2013, which correspond to a period of elevated violence.

Regarding the number of natural disasters, I use the number of natural disasters that affected each family at the municipality level between the periods when they were interviewed using the data from the National Center for the Prevention of Disasters (CENAPRED).

[1]Since December 2006 the Mexican Government through the President's Office started to collect drug-related homicides. Yet, I use the INEGI data in order to compare the results from other papers analyzing the war on drugs in Mexico. One argument to use the INEGI data is given by Lindo and Padilla-Romo (2018) who point out concerns regarding how "drug related" or "not drug related" homicides are classified in the data prepared by the President's Office. Finally, (Brown et al., 2015) compared the INEGI data with the data on homicides reported by the President's Office and find similar trends.

3.1.2 Consumption, access to credit, and assets

The data regarding consumption asks the families if they have consumed a determined product within the last 7 days. This information is classified in five categories: i. typical food; ii. vegetables and fruits; iii. cereals and grains; iv. meets and diary products; and v. processed food. The typical food includes: corn tortillas, bakery, chicken, steak, pasteurized milk, eggs, tomato, beans, and sugar. The vegetables and fruits include: onions, potatoes, chilies, bananas, apples, oranges, other fruits, and other vegetables. Cereals and grains include: pasta, rice, cookies, legumes, and other grain products. Meets and diary products include: beef, pork, tuna, fish, cheese, other milk products, other animal products, and other type of meat. Processed food includes: juices, coffee, vegetable oil, and other industrialized products. In addition, the survey asks for the consumption of tobacco, soda, and gambling. I group these three products into the category of risk behavior consumption. I generate dummy variables for each item, and then I added the items by each of these six categories.

The data also collected information for fourteen assets which are dwelling, land, bicycles, motorized vehicles, electric appliances, washing machines, domestic appliances, savings, tractors, cows, horses, pigs, domesticated fowls, and other assets. I add these items into a variable called assets. Regarding credit, the question asks the following: "How much money does the household owe for credits or loans incurred in the past 12 months?" Using this information, I generate a dummy variable that takes the value of one if the families reported a positive value; and zero otherwise.

Table 2 and Table 3 present information regarding consumption, assets, and access to credit. Period 1 refers to data collected from the MxFLS2 and period 2 from the MxFLS3. In the case of Table 1, "Treatment" refers to a family who has been affected by at least one natural disaster; and "Control" when a family has not been affected by a natural disaster. In the case of Table 2, "Treatment" refers to families living above the median homicides rates in 2009 (11 per 100,000 inhabitants); and "Control" when they are below that median. These cuts are used as a reference to present these descriptive statistics; but in the econometric analysis, I will use these variables as continuous.

Table 2 compares the families affected by at least one natural disaster (treatment) with those that have not been affected (control). It is observed a general increase in the consumption of the treatment group (contrary to the hypothesis of a fall in consumption due to shocks), a decrease in assets in the treatment group, and a reduction in the access to credit for the treatment group.

Table 3 compares the families living above the median homicides rates in 2009 (11 per 100,000 inhabitants) with those that are below that median. It is observed an increase for almost all the categories of consumption for the treatment families, but also an increase in the consumption of the control families. Regarding assets, it is observed a small decrease for the treatment group, but also for the control group. Finally, in the case of access to credit, it is observed an increase from 25% to 27% in the treatment group and a decrease from 27% to 22% in the control)$group$.

3.1.3 Children's employment and school attendance

I also analyze the effects of natural disasters and homicides on employment and school attendance of children who are between 10 and 21 years old in the MxFLS3. Regarding employment, I generate a dummy variable using the following question: "During the last 12 months, did (name of children) work or developed any activity to help with household expenses?" In the case of school attendance, I generate a dummy variable using the following question: "Does (name of children) currently attend school?"

Table 2 presents descriptive statistics of children's school attendance and working depending on whether their families have been affected by at least one natural disaster. Regarding children working, an important difference is not observed between the treatment and the control group for both periods. Regarding school attendance, it is observed a decrease in both the treatment and control groups.

Table 3 presents descriptive statistics comparing children living in municipalities above the median homicides rates in 2009 (11 per 100,000 inhabitants) with those that are below that median. The number of children working was around 5% in period 1 for the treatment and control groups. Yet, the number of children working in period 2 is 18% for the treatment group and 15% for the control group. Regarding school attendance, an important difference is not observed between the treatment and the control groups for both periods.

3.1.4 Use of time

Moreover, I analyze how the households responded to the use of time as a consequence of natural disasters and local violence. The question asks the following to adults who are 15 years or older: "Between Monday and Sunday of last week, how many hours did you (...)?" The list of activities are the following: sports, watching TV, reading, cooking, washing clothes or cleaning the house, care elderly or sick, internet, and agricultural activities.

Table 2 presents evidence that on average individuals living in areas affected by at least one natural disaster decreased the time spent exercising (from .75 to .45) more than those living in areas not affected by a natural disaster (from .69 to .59). It is also observed a decrease in the time destined to watch TV, reading, and washing clothes for the treatment group, but also for the control group. Regarding cooking and agricultural activities, it is observed a decrease in the treatment group and an increase in the control group. Finally, it is observed an increase in both treatment and control groups for the use of internet and taking care of elderly or sick.

Table 3 presents the data comparing adult's use of time in municipalities above the median homicide rate in 2009 (11 per 100,000 inhabitants) with those that are below that median. It is observed a decrease in the treatment and control groups for sports, watching TV, reading, and washing clothes. In the case of agricultural activities, it is observed an increase in the treatment group and a decrease in the control group. Finally, it is observed an increase in the treatment and control groups for cooking, care of elderly, and internet.

3.2 Empirical strategy

I use the following fixed-effects model:

$$Y_{i,j,t} = \beta_1 HomicideRate_{j,t} + \beta_2 NaturalDisasters_{j,t} + \delta X_{i,j,t} + \theta_i + \gamma_t + \eta_{state} + \delta_{months} + u_{i,j,t}$$

Where $Y_{i,j,t}$ is the outcome for household (individual) i living in municipality j in survey t; $HomicideRate_{j,t}$ is the quartic root of the homicide rate per 100,000 people over the 12 months prior to interview in municipality j at time t; and, $NaturalDisasters_{j,t}$ is the quartic root of the number of natural disasters affected the household (individual) between the periods of being interviewed. $X_{i,j,t}$ refers to control variables which for households outcomes are: age, age squared, sex, and education of the head of the household. I include also household members and living in a rural area. In addition, information for participation in social programs and other sources of income are included: procampo, 70 and elderly program, food support, scholarships, remittances, receiving a pension, and other government support. For the variables regarding children's school attendance and labor, I include the following controls: sex, age, and age squared of the children. Finally, θ_i are individual fixed effects, γ_t are time fixed effects, η_{state} are state fixed effects, and δ_{months} are months of interview fixed effects. Standard errors are clustered at the municipality level. The coefficients of interest are β_1 and β_2, which represent the effect of homicides and natural disasters on the outcome of interest.

State-fixed effects account for unobserved time-invariant characteristics; yet, it is still possible that unobserved time-variant characteristics affect the results. To check the robustness of the results, I use a bounding approach proposed by Altonji et al. (2005) and refined by Oster (2017). Altonji et al. (2005) observed that a common approach to evaluate robustness to omitted variable bias is to include additional control variables on the right hand side of the regression. If such additions do not affect the coefficient of interest, then this coefficient can be considered to be unlikely biased. This strategy implicitly assumes that selection on observables is informative about selection on unobservables. Oster formalizes this idea, and provides conditions for bounds and identification. In addition, Oster points out that it is not only necessary to add controls, but to observe the movements in the R-squared.

Oster shows that a consistent estimator of the parameter of interest can be obtained; yet, it is a function of two parameters unknown by the econometrician: (1) the R-squared for a hypothetical model that contains both the observable and unobservable variables; and, (2) the proportion of selection of unobservables on observables. In particular, Oster defines R_{max} as the overall R-squared of the model, that is the R-squared that would be obtained from a regression of the dependent variable (Y) on the variable of interest (T), observables(X_1), and unobservables (X_2). Also, Oster defines δ to be a parameter that ensures the equality $\frac{Cov(T,X_2)}{Var(X_2)} = \delta\frac{Cov(T,X_1)}{Var(X_1)}$, i.e. this relationship formalizes the idea that the magnitude and sign of the relationship between T and X_1 provides some information about the magnitude and sign of the relationship between T and X_2. Oster argued that selection on unobservables should not be greater than selection on observables.

Thus, the lower bound of δ is zero and the upper bound is one. To determine R_{max}, Oster tested the robustness of treatment parameters from randomized control studies published in top economic journals between 2008 and 2013 by using $R_{max} = min\{\pi\tilde{R}, 1\}$ with various values of π and $\tilde{R}$ being the R-squared of regressing Y on T and X_1. Oster found that only 20% of results were robust when $R_{max} = 1$ while using $R_{max} = 1.3\tilde{R}$ (or $\pi = 1.3$) reproduced 90% of randomized results. Thus, Oster suggests that β^* (the parameter of interest) be calculated for the following ranges of δ: $0 \leq \delta \leq 1$. This allows one to construct the set $[\beta^*(\delta = 0), \beta^*(\delta = 1)]$ assuming $R_{max} = 1.3\tilde{R}$. If this set excludes zero, the results from the controlled regressions can be considered to be robust to omitted variable bias. In other words, the results indicate that $\beta^* \neq 0$.

4 Results

4.1 Consumption

Table 4 provides results for household fixed effects regarding consumption as well as extended versions that explore heterogenous effects by sex and education of the head of the household. To simplify the presentation of the results, I added the categories of typical food, vegetables and fruits, cereals and grains, meets and diary products, and processed food into the variable consumption. I maintain the category for risk behavior which includes soda, tobacco, and gambling. The results in Table 4 show that there is no evidence that the homicides and the natural disasters have a significant effect on consumption and risk behavior consumption. In

addition, it is not observed any heterogenous effect by the head of the household's sex or education.

4.2 Assets and credits

Table 5 provides analysis regarding assets and access to credits. I find evidence that natural disasters reduce the possession of assets, but there is no evidence that assets have been affected by homicides. Moreover, there is no evidence of heterogenous effects of natural disasters by the sex of the head of the household, but there is evidence by education. Specifically, the results suggest that households affected by at least one natural disaster with: i. household head having secondary education or less experienced a reduction of .16 assets [2]; and ii. household head having more than secondary education observed a reduction of .45 assets. In the case of access to credits, it is observed a reduction of 5.4% as a consequence of natural disasters (statistical significant at the 10%), but there is no evidence that homicides have impacted this variable. Finally, there is no evidence of heterogenous effects by sex or education of the head of the household.

4.3 Children's employment and school attendance

Table 6 presents results regarding employment and school attendance. There is no evidence that homicides or natural disasters have affected the labor participation of young people. Yet, it is observed important heterogenous effects depending on the sex of the children and the education of the head of the household. Specifically, a young male that experience an annual increase in homicide rates (assuming 10 in

[2]This is calculated as $(-.455 + .289) * (1^{1/4})$. This method will be used to calculate the effects of natural disasters.

100,000) increases the likelihood of working in approximately 10 percentage points [3] (column 2). In addition, when the head of the household has secondary education or less, it increases the probability of working in approximately 4.6 percentage points.

There is no evidence that homicides or natural disasters have affected the outcome regarding school attendance. Yet, there is evidence of heterogenous effects depending on the education of the head of the household. In particular, there is evidence that young people living in a household affected by at least one natural disaster and with the head of the household having secondary education or less, experience a decrease in the probability of attending school by approximately 3.5 percentage points (column 4).

4.4 Use of time

Table 7 presents results regarding the use of time for adults who are 15 years or older. In general, it is observed that homicides increase the use of time spent on household activities; yet, it is only statistically significant for cooking and washing. In the case of natural disasters, it is observed that they decrease the time spent on the activities analyzed; yet, it is only statistically significant for sports, cooking, and washing.

To better understand the effects of natural disasters and homicides on the use of time, the results are presented by father, mother, and children. The increase

[3] This is calculated as $(-.016 + .071) * (10^{1/4})$. This method will be used to calculate the effects of homicides in the rest of the paper

of time spent on cooking as a consequence of homicides is observed for children, mothers, and fathers. In the case of the increase observed in washing clothes as a consequence of homicides is principally driven by children. Regarding the decrease observed in cooking and washing as a consequence of natural disasters, it is principally observed among mothers. The reduction in time dedicated to sports due to natural disasters is observed principally for fathers and children. Finally, it is observed an increase in agricultural activities due to an increase in homicides for the case of the children.

4.5 Threats to identification

There are three potential threats to identification which are migration, sample attrition, and unobserved time-variant variables.

4.5.1 Migration

I construct a dummy variable to indicate whether the householdâs municipality changed between the second (MxFLS2) and third waves of the data (MxFLS2). The households who migrated between the MxFLS2 and MxFLS3 represent around 3 per cent of the sample. Using OLS, this indicator of migration is regressed on the change in homicides rates between 2005 and 2009, the number of natural disasters between the periods when they were interviewed, controlling for head of the household's characteristics, other sources of income, and state fixed effects. Columns 1 and 2 of Table 8 confirm that migration is not associated with homicides and natural disasters.

4.5.2 Attrition

I generate a dummy variable that takes the value of 1 if the household was not present in the MxFLS3 conditional of being present in the MxFLS2 and 0 otherwise. The attrition rate between the MxFLS2 and MxFLS3 represents around 12 per cent of the sample. I run an OLS to analyze the association between homicides and natural disasters on attrition. Columns 3 and 4 of Table 8 confirm that attrition is not associated with natural disasters. Regarding homicides, the coefficient is statistically significant at the 10 per cent level and the small value of the coefficient suggests a small impact of homicides on attrition.

4.5.3 Unobserved time-variant variables

Many studies treat natural disasters as exogenous, yet the results can potentially be biased as a consequence of omitted variables affecting both natural disasters and the outcome of interest. While fixed-effects account for time-invariant characteristics, it is possible that unobserved time-variant characteristics affect the results. Regarding homicides, the identification strategy assumes it was exogenous. Brown (2018) provides some evidence that violence was exogenous using pre-escalation trends for 135 baseline municipalities to predict the change in the homicide rate between 2005 and 2009. The results show no evidence that the pre-escalation trends affect the change in homicides.

To better check the robustness of the results, I apply the bounding methodology proposed by Oster (2017). In particular, I check six results: i. heterogenous effects of homicides by education of the head of the household on children's labor; ii. heterogenous effects of homicides by sex of the children on children's labor; iii.

heterogenous effects of natural disasters by education of the head of the household on school attendance; iv. effects of homicides on cooking; v. effects of natural disasters on cooking; and vi. effects of natural disasters on washing clothes. Table 9 presents the results of the bounding methodology. I find that the bounds for all the outcomes analyzed do not include the zero, suggesting that results are robust.

5 Conclusion

The results show that natural disasters and homicides did not have an impact on household's consumption. It is possible that families can smooth their consumption through access to credit or selling assets. Yet, I do not find evidence that they increase their access to credits. Regarding assets, I observe a decrease in assets as a consequence of natural disasters. Yet, it is not possible to determine if this is a consequence of loosing them during the natural disaster or if they sold them to smooth their consumption. Another potential strategy to smooth consumption is affecting the human capital of their children. The children affected by homicides increase the labor supply (particularly males) and the children affected by natural disasters decreased their school attendance. In both cases, the most affected where children living in households with a head of household having lower levels of education.

It is also analyzed the effects of homicides and natural disasters on the use of time. In the case of children, they are most affected by the homicides. In particular, it is observed that they increase the time spent on activities within the

household (cooking and washing clothes) and on agricultural activities. Finally, in the case of natural disasters, it is observed that children decrease the time devoted to sports.

Regarding public policy, the war on drugs has attracted considerable public attention. In fact, the creation of a new program has been announced to discourage children from joining organized crime through a system of scholarships and training (this under the slogan "Scholarship Yes, Hit man No"). Yet, it is also necessary to pay attention to the effects of natural disasters. It is estimated that 27% of the population is exposed to hurricanes and 26% to earthquakes in Mexico. And, as this study illustrates, natural disasters have important effects on school attendance, particularly for children whose parents have lower levels of education.

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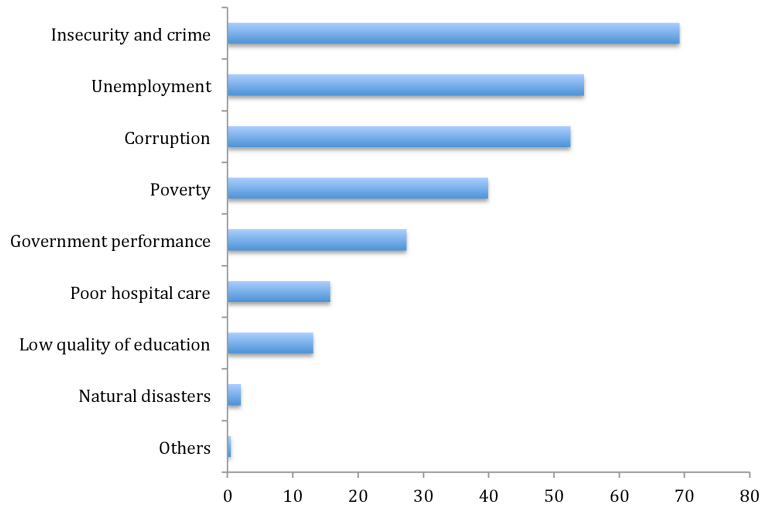
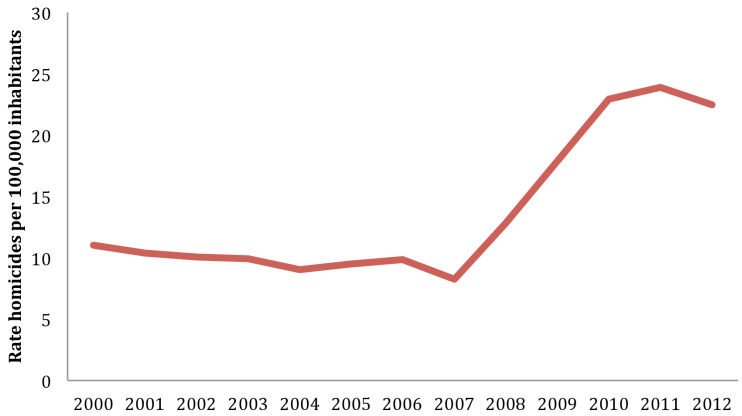
6 Appendix

Figure 1: Perception on problems in the country



Source: National Survey on Quality and Government Impact, 2011

Figure 2: Homicides per 1000,000 inhabitants



Source: Author's calculation using INEGI data

Table 1: Natural Disasters at the Municipality Level, 2005-2013

Year	Hurricanes	Droughts	Earthquakes	Other	Total
2005	1031	13	0	2	1046
2006	113	0	0	22	135
2007	545	0	7	4	556
2008	316	0	41	2	359
2009	95	0	11	1	107
2010	733	0	5	121	859
2011	345	240	22	16	623
2012	417	2	114	8	541
2013	657	0	19	17	693
Mean	472	28	24	21	547
Percentage	86	5	4	5	100

Source: National Center for the Prevention of Disasters .

Table 2: Descriptive Statistics (Natural Disasters)

	Period 1		Period 2	
	Treatment	Control	Treatment	Control
Household				
Typical food	6.22	6.30	6.44	6.31
Vegetables	5.20	5.57	5.31	5.44
Cereals	2.76	2.57	2.87	2.68
Meets	3.71	3.40	3.81	3.45
Processed food	2.82	2.63	2.96	2.73
Risk Behavior Consumption	0.76	0.74	0.77	0.74
Assets	4.84	4.85	4.52	4.79
Savings	0.11	0.13	0.10	0.11
Credits	0.27	0.25	0.24	0.26
Age of head of household	49.48	48.62	52.82	51.95
Sex of head of household (female 1)	0.19	0.22	0.25	0.26
Education of head of household:	0.82	0.84	0.81	0.83
1 Secondary or less 0 Otherwise				
Number of household members	4.59	4.79	5.12	5.43
Procampo program	0.06	0.07	0.07	0.09
Other goverment support	0.03	0.01	0.03	0.05
70 and older program	0.00	0.00	0.08	0.09
Food support	0.00	0.00	0.02	0.02
Other scholarships	0.03	0.02	0.02	0.02
Remittances	0.02	0.03	0.02	0.03
Pension	0.05	0.04	0.07	0.05
Rural	0.42	0.41	0.50	0.41
Number of observations	3121	4024	3121	4024
Children				
Work (last 12 months)	0.05	0.04	0.16	0.17
School attendance	0.89	0.85	0.66	0.62
Age	11.41	11.30	15.82	15.66
Sex (1 male)	0.49	0.50	0.49	0.51
Number of observations	2452	3673	2542	3673
Use of time (hours per week)				
Sports	0.75	0.69	0.45	0.59
Watch TV	11.14	10.80	10.67	10.61
Read	2.19	1.91	1.77	1.65
Cook	6.88	5.85	6.71	6.34
Wash clothes/clean house	5.69	5.46	5.27	5.32
Care Eederly or sick	6.00	6.61	7.44	8.06
Internet	0.76	0.58	1.33	1.14
Agricultural activity	1.47	1.50	1.32	1.71
Number of observations	7152	9113	7152	9110

Note: Period 1 refers to the round 2005-2006 of the Mexican Family Life Survey. Period 2 refers to the round 2009-2012 of the Mexican Family Life Survey. Treatment refers to the municipalities that were affected at least one time by a natural disaster between the periods of data collection. Typical food includes tortilla, bakery, chicken, steak, pasteurized milk, eggs, tomato, beans, and sugar. Vegetables include onions, potatoes, chiles, bananas, apples, oranges, other fruits, and other vegetables. Cereals include pasta soup, rice, cookies, legumes, and other cereals. Meets include beef, pork, tuna, fish, cheese, other milk, other animal products, and other type of meat. Processed food includes juices, coffee, vegetable oil, other industrialized products, and spices. Risk behaviour consumption includes soda, tobacco, and gambling.

Table 3: Descriptive Statistics (Homicides)

	Period 1		Period 2	
	Treatment	Control	Treatment	Control
Household				
Typical food	6.28	6.25	6.31	6.43
Vegetables	5.40	5.42	5.30	5.46
Cereals	2.61	2.70	2.70	2.81
Meets	3.53	3.54	3.63	3.58
Procesed food	2.68	2.75	2.79	2.88
Risk Behavior Consumption	0.75	0.75	0.76	0.74
Assets	4.85	4.83	4.78	4.56
Savings	0.11	0.14	0.11	0.10
Credits	0.25	0.27	0.27	0.22
Age of head of household	48.84	49.15	52.09	52.57
Sex of head of household	0.21	0.21	0.26	0.25
Education of head of household:	0.83	0.84	0.82	0.82
1 Secondary or less 0 Otherwise				
Number of household members	4.66	4.75	5.27	5.33
Procampo program	0.09	0.05	0.10	0.06
Other goverment support	0.02	0.01	0.03	0.04
70 and older program	0.00	0.00	0.09	0.08
Food support	0.00	0.00	0.02	0.02
Other scholarships	0.02	0.02	0.03	0.02
Remittances	0.03	0.03	0.03	0.03
Pension	0.04	0.05	0.05	0.06
Rural	0.45	0.38	0.45	0.45
Number of observations	3609	3536	3609	3536
Children				
Work (last 12 months)	0.05	0.04	0.18	0.15
School attendance	0.86	0.87	0.63	0.64
Age	11.47	11.22	15.82	15.62
Sex (1 male)	0.50	0.49	0.50	0.49
Number of observations	3149	3066	3149	3066
Use of time (hours per week)				
Sports	0.76	0.67	0.57	0.48
Watch TV	11.37	10.52	10.91	10.35
Read	2.10	1.96	1.76	1.65
Cook	6.27	6.34	6.60	6.41
Wash clothes/clean house	5.62	5.51	5.52	5.07
Care Eederly or sick	6.22	6.46	8.13	7.43
Internet	0.69	0.62	1.22	1.23
Agricultural activity	1.51	1.46	1.72	1.35
Number of observations	8299	8036	8229	8036

Note: Period 1 refers to the round 2005-2006 of the Mexican Family Life Survey. Period 2 refers to the round 2009-2012 of the Mexican Family Life Survey. Treatment refers to families living above the median homicides rates in 2009 (11 per 100,000 inhabitants). Typical food includes tortilla, bakery, chicken, steak, pasteurized milk, eggs, tomato, beans, and sugar. Vegetables include onions, potatoes, chiles, bananas, apples, oranges, other fruits, and other vegetables. Cereals include pasta soup, rice, cookies, legumes, and other cereals. Meets include beef, pork, tuna, fish, cheese, other milk, other animal products, and other type of meat. Processed food includes juices, coffee, vegetable oil, other industrialized products, and spices. Risk behaviour consumption includes soda, tobacco, and gambling.

Table 4: FE Estimates: Effects of Natural Disasters and Homicides on Consumption and Risk Behavior products

	(1) Total	(2) Sex	(3) Education
$\sqrt[4]{}$ **Consumption**			
$\sqrt[4]{}$ Homicide rate	-0.129	-0.128	0.167
	(0.336)	(0.353)	(0.664)
$\sqrt[4]{}$ Natural Disasters	0.360	0.438	0.555
	(0.703)	(0.725)	(0.974)
$\sqrt[4]{}$ Homicide rate × I(Female=1)		-0.011	
		(0.402)	
$\sqrt[4]{}$ Natural Disasters × I(Female=1)		-0.322	
		(0.439)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)			-0.336
			(0.628)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)			-0.252
			(0.555)
Observations	13168	13168	13168
$\sqrt[4]{}$ **Risk behavior**			
$\sqrt[4]{}$ Homicide rate	-0.026	-0.029	-0.009
	(0.023)	(0.024)	(0.045)
$\sqrt[4]{}$ Natural Disasters	0.020	0.009	0.015
	(0.030)	(0.034)	(0.053)
$\sqrt[4]{}$ Homicide rate × I(Female=1)		0.012	
		(0.028)	
$\sqrt[4]{}$ Natural Disasters × I(Female=1)		0.046	
		(0.040)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)			-0.020
			(0.049)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)			0.006
			(0.049)
Observations	13456	13456	13456
Oher controls	Yes	Yes	Yes
State (FE)	Yes	Yes	Yes
Year of interview (FE)	Yes	Yes	Yes
Month of interview (FE)	Yes	Yes	Yes

Note: Standard errors clustered at the municipality level in parentheses. Other controls are: age, age squared, sex, and education of the head of the household. occupational status, and educational background. In addition: number of household members, procampo program, other goverment support, 70 and older program, food support, scholarships, remittances, pension, and living in a rural area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: FE Estimates: Effects of Natural Disasters and Homicides on Assets and Credits

	(1) Total	(2) Sex	(3) Education
Assets			
$\sqrt[4]{}$ Homicide rate	0.090	0.091	0.037
	(0.078)	(0.073)	(0.122)
$\sqrt[4]{}$ Natural Disasters	-0.226*	-0.261**	-0.455***
	(0.120)	(0.124)	(0.127)
$\sqrt[4]{}$ Homicide rate × I(Female=1)		0.003	
		(0.090)	
$\sqrt[4]{}$ Natural Disasters × I(Female=1)		0.148	
		(0.096)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)			0.063
			(0.121)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)			0.289**
			(0.113)
Observations	13627	13627	13627
Credits			
$\sqrt[4]{}$ Homicide rate	0.015	0.012	0.010
	(0.012)	(0.015)	(0.050)
$\sqrt[4]{}$ Natural Disasters	-0.054*	-0.045	-0.090**
	(0.028)	(0.028)	(0.041)
$\sqrt[4]{}$ Homicide rate × I(Female=1)		0.013	
		(0.023)	
$\sqrt[4]{}$ Natural Disasters × I(Female=1)		-0.036	
		(0.025)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)			0.007
			(0.054)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)			0.046
			(0.044)
Observations	13502	13502	13502
Oher controls	Yes	Yes	Yes
State (FE)	Yes	Yes	Yes
Year of interview (FE)	Yes	Yes	Yes
Month of interview (FE)	Yes	Yes	Yes

Note: Standard errors clustered at the municipality level in parentheses. Other controls are: age, age squared, sex, and education of the head of the household. occupational status, and educational background. In addition: number of household members, procampo program, other goverment support, 70 and older program, food support, scholarships, remittances, pension, and living in a rural area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: FE Estimates: Effects of Natural Disasters and Homicides on Children's Employment and School Attendance

	(1) Total	(2) Sex Children	(3) Sex Parents	(4) Education Parents
Employment				
$\sqrt[4]{}$ Homicide rate	0.019	-0.016	0.017	-0.026
	(0.012)	(0.012)	(0.010)	(0.018)
$\sqrt[4]{}$ Natural Disasters	-0.012	-0.025	-0.016	-0.017
	(0.014)	(0.017)	(0.015)	(0.017)
$\sqrt[4]{}$ Homicide rate × I(Male=1)		0.071***		
		(0.023)		
$\sqrt[4]{}$ Natural Disasters × I(Male=1)		0.024		
		(0.021)		
$\sqrt[4]{}$ Homicide rate × I(Female=1)			0.012	
			(0.033)	
$\sqrt[4]{}$ Natural Disasters× I(Female=1)			0.026	
			(0.029)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)				0.052**
				(0.026)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)				0.008
				(0.020)
Observations	11976	11976	11976	11976
School Attendance				
$\sqrt[4]{}$ Homicide rate	0.015	0.022	0.019	0.043
	(0.016)	(0.021)	(0.019)	(0.028)
$\sqrt[4]{}$ Natural Disasters	-0.012	-0.006	-0.010	0.059**
	(0.021)	(0.029)	(0.022)	(0.027)
$\sqrt[4]{}$ Homicide rate × I(Male=1)		-0.015		
		(0.022)		
$\sqrt[4]{}$ Natural Disasters × I(Male=1)		-0.013		
		(0.028)		
$\sqrt[4]{}$ Homicide rate × I(Female=1)			-0.022	
			(0.031)	
$\sqrt[4]{}$ Natural Disasters × I(Female=1)			-0.021	
			(0.032)	
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)				-0.034
				(0.026)
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)				-0.094***
				(0.025)
Observations	12019	12019	12019	12019
Oher controls	Yes	Yes	Yes	Yes
State (FE)	Yes	Yes	Yes	Yes
Year of interview (FE)	Yes	Yes	Yes	Yes
Month of interview (FE)	Yes	Yes	Yes	Yes

Note: Standard errors clustered at the municipality level in parentheses. Other controls are: age, age squared, sex, and education of the head of the household. occupational status, and educational background. In addition: number of household members, procampo program, other goverment support, 70 and older program, food support, scholarships, remittances, pension, and living in a rural area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: FE Estimates: Effects of Natural Disasters and Homicides on Use of Time

	(1) Sports	(2) TV	(3) Read	(4) Internet	(5) Cooking	(6) Wash	(7) Ederly	(8) Agriculture
All								
$\sqrt[4]{}$ Homicide rate	0.181	0.225	0.102	0.006	0.743***	0.460*	0.200	0.390
	(0.333)	(0.360)	(0.097)	(0.097)	(0.252)	(0.245)	(0.556)	(0.252)
$\sqrt[4]{}$ Natural Disasters	-0.824*	-0.177	-0.106	0.027	-0.711**	-0.578**	-0.110	-0.219
	(0.445)	(0.468)	(0.130)	(0.213)	(0.332)	(0.281)	(0.896)	(0.289)
Observations	3098	30668	30668	30668	30668	30668	30668	30668
Children								
$\sqrt[4]{}$ Homicide rate	0.181	0.636	0.511	-0.025	0.754**	0.853*	-0.191	0.922*
	(0.333)	(0.779)	(0.468)	(0.424)	(0.348)	(0.493)	(1.011)	(0.522)
$\sqrt[4]{}$ Natural Disasters	-0.824*	-0.721	-0.205	0.143	-0.595	-0.790	-2.130	0.125
	(0.445)	(1.261)	(0.698)	(0.838)	(0.544)	(0.587)	(1.796)	(0.610)
Observations	3098	3098	3098	3098	3098	3098	3098	3098
Mother								
$\sqrt[4]{}$ Homicide rate	-0.091	0.087	0.013	0.013	0.883*	0.634	0.696	-0.011
	(0.075)	(0.419)	(0.100)	(0.076)	(0.488)	(0.504)	(0.986)	(0.186)
$\sqrt[4]{}$ Natural Disasters	-0.148	-0.001	-0.210	0.158	-1.309*	-1.037*	0.530	-0.086
	(0.161)	(0.550)	(0.195)	(0.185)	(0.702)	(0.542)	(1.755)	(0.160)
Observations	12137	12137	12137	12137	12137	12137	12137	12137
Father								
$\sqrt[4]{}$ Homicide rate	-0.055	-0.029	0.254	-0.023	0.290**	0.093	-0.054	0.643
	(0.148)	(0.374)	(0.170)	(0.147)	(0.115)	(0.119)	(0.294)	(0.517)
$\sqrt[4]{}$ Natural Disasters	-0.359**	-0.654	-0.048	-0.223	-0.182	-0.215	-0.407	-0.046
	(0.174)	(0.679)	(0.287)	(0.250)	(0.172)	(0.185)	(0.405)	(0.871)
Observations	8198	8198	8198	8198	8198	8198	8198	8198
Oher controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State (FE)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of interview (FE)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month of interview (FE)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors clustered at the municipality level in parentheses. Other controls are: age, age squared, sex, and education of the head of the household. occupational status, and educational background. In addition: number of household members, procampo program, other goverment support, 70 and older program, food support, scholarships, remittances, pension, and living in a rural area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Threats to Identification: Migration and attrition between MxFLS2 and MxFLS3

	Migration		Attrition	
	(1)	(2)	(3)	(4)
Homicide rate	0.000	0.000	-0.0005**	-0.0004*
	(0.000)	(0.000)	(0.0002)	(0.0002)
Natural Disasters	0.011	0.025	-0.001	0.002
	(0.012)	(0.019)	(0.004)	(0.005)
Age of head of household		-0.004***		-0.012***
		(0.001)		(0.002)
Age square of head of household		0.000***		0.000***
		(0.000)		(0.000)
Sex of head of houdeshold		0.007		0.008
		(0.004)		(0.010)
Education of head of household		0.005		-0.052***
		(0.009)		(0.012)
Number of household members		-0.001		-0.016***
		(0.001)		(0.001)
Procampo program		0.001		-0.010
		(0.007)		(0.011)
Other goverment support		-0.020**		-0.033*
		(0.010)		(0.017)
Other scholarships		-0.014		-0.011
		(0.015)		(0.019)
Remittances		0.001		-0.046*
		(0.014)		(0.024)
Pension		-0.005		-0.012
		(0.008)		(0.018)
Rural		-0.010		-0.054***
		(0.012)		(0.010)
Observations	7063	6867	8050	7811
Mean of dependent variable	3.22%	3.24%	11.96%	11.77%
State FE	No	Yes	No	Yes

Note: Standard errors clustered at the municipality level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Bounding Methodology: Effects of Natural Disasters and Homicides on Household's Decisions

	(1) Employment	(2) School attendance	(3) Cooking	(4) Washing
$\sqrt[4]{}$ Homicide rate × I(Secondary or less=1)	[0.048, 0.056]			
$\sqrt[4]{}$ Homicide rate × I(Male=1)	[0.064, 0.078]			
$\sqrt[4]{}$ Natural Disasters × I(Secondary or less=1)		[-0.078, -0.110]		
$\sqrt[4]{}$ Homicide rate			[0.585, 0.900]	
$\sqrt[4]{}$ Natural Disasters			[-0.402, -1.021]	[-0.460, -0.696]
Oher controls	Yes	Yes	Yes	Yes
State (FE)	Yes	Yes	Yes	Yes
Year of interview (FE)	Yes	Yes	Yes	Yes
Month of interview (FE)	Yes	Yes	Yes	Yes
Observations	11976	12019	30668	30668

Note: Standard errors clustered at the municipality level in parentheses. Other controls are: age, age squared, sex, and education of the head of the household. occupational status, and educational background. In addition: number of household members, procampo program, other goverment support, 70 and older program, food support, scholarships, remittances, pension, and living in a rural area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$