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Household Consumption, Prices, and Earthquakes

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ABSTRACT

Do natural disasters reduce food consumption and increase prices? How do natural disasters affect consumption within affected households? In recent years, many countries have faced a growing wave of natural disasters, alongside governments' growing interest in quantifying their impact. Given the difficulty of collecting data in disaster-hit areas, little is known about how a natural disaster affects households in the short term. In this study, we consider the impact of a series of powerful earthquakes that struck Mexico in September 2017 in order to explore their effects on consumption and prices. Using a difference-in-differences approach, the results show the following: (1) the earthquakes decreased food consumption at the intensive and extensive margin; (2) households tried to smooth their consumption by increasing the consumption of goods such as canned tuna; (3) wives tended to sacrifice their own consumption in order to smooth their children's consumption; and (4) there was no evidence that the earthquakes affected prices.

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1 Introduction

Natural disasters worldwide have increased considerably since the 1970s, affecting on average over 200 million people every year (Leaning and Guha-Sapir, 2013). Alongside their greater occurrence, the need to estimate the consequences of natural disasters has also increased. The most visible effects of natural disasters are the loss of human lives and infrastructure. Existing literature has also suggested that natural disasters may affect human capital accumulation, wages, and employment by disturbing prices, assets, and the consumption of families (Baez et al., 2010; Baird et al., 2011; Cuaresma, 2010; Fafchamps et al., 1998; Noy and duPont, 2016). Regarding consumption, the neoclassical economic theory predicts that individuals can maintain their levels of consumption against temporary income shocks; yet, there exists evidence that this is not always the case (Cavallo et al., 2014; Kazianga and Udry, 2006). Moreover, it is unclear what happens inside families regarding consumption, i.e., if there are unequal impacts at the individual level depending on one's position within the family. This paper makes a contribution by addressing the question of the impact of hazards on prices and consumption, as well as the question of heterogeneous effects within households.

To explore the effects of natural disasters on consumption and prices, we consider the impact of a series of powerful earthquakes that struck Mexico in September 2017. These earthquakes caused hundreds of deaths and damages to thousands of buildings. One of these earthquakes was cataloged as the strongest one that had hit Mexico over the last hundred years. Thus, given the unpredictability of natural disasters, we use the occurrence of these earthquakes to explore the effects on consumption and prices. With this in mind, we collected household-level data from two municipalities that were greatly affected, and two municipalities that served as a comparison group. The data contain information pertaining to before (August 2017), and after (October 2017) the occurrence of the earthquakes.

Using a difference-in-differences estimation as the main identification strategy, we evaluate the effect of the earthquakes on respondents' self-reported consumption and prices of 14 items: beans, rice, milk, coffee, canned tuna, soup, limes, chicken, tortillas, tomatoes, bananas, sugar, beef and eggs. We found that the consumption of most of the products analyzed fell following the earthquake, both at the intensive and extensive margins. The only exception to this trend was the consumption of canned tuna, for which there was a massive increase in the quantity demanded. A substitution effect between proteins potentially explains this effect: in times of crisis, households tend to consume the cheapest protein they can afford – in this case, canned tuna – and will stop consuming more expensive proteins such as chicken and beef. Turning our attention to the effects on prices, we found weak evidence pointing to a reduction in prices after the earthquake. In particular, we found subtle drops in prices for five of the fourteen goods analyzed. Yet, these results were not robust.

We also analyzed the effect of earthquakes on consumption decisions within the households. In particular, the results show that the earthquakes increased the number of households where at least one of the household members was left without any of their meals. This effect was, to a greater extent, seen to be exerted on wives and, to a lesser extent, on children. We also analyzed whether the scarcity of resources due to the earthquakes increased conflict and affected decision making within the household. The results show the earthquakes to have had no effects on these last two variables.

In an analysis of heterogeneous effects, we examined the effects of social capital and infrastructure on consumption, finding a fall in consumption among those households that had experienced travel interruptions as a consequence of the earthquake. Moreover, cooperation was found to have increased when there were large negative shocks in consumption.

Our contribution to the existing literature is threefold. First, we provide evidence of a reduction in the consumption of basic foods after a natural disaster, as well as a substitution effect acting on the consumption of less expensive goods. Second, we contribute to an increasing body of literature showing that natural disasters did not affect prices. Finally, we present evidence of heterogeneous effects within the household, in particular that of wives tending to sacrifice their consumption in order to smooth their children's consumption.

The remainder of this paper is organized as follows. In Section 2, we review the literature on the effect of natural disasters, and describe the Mexican context before and after the earthquakes. Section 3 describes the data collection process and the variables used for the analysis. Section 4 describes our empirical strategy and robustness checks. Section 5 summarizes the results. Finally, Section 6 presents concluding remarks and policy implications.

2 Background

2.1 Literature Review

A large body of literature has analyzed the effects of negative income shocks on household's behavior. This literature was initially motivated by the neoclassical life cycle model, also known as the permanent income hypothesis, which suggests that individuals tend to smooth their consumption over their lifetime by saving when they have income surpluses and dissaving during hard times (Modigliani and Brumberg, 1954). However, existing research has also found that precautionary saving is very rare, particularly among uneducated households and individuals at the lower tail of the income distribution (Bernheim and Scholz, 1993; Browning and Lusardi, 1996). Moreover, relevant studies also indicate that negative income shocks can have a variety of consequences on a wide range of aspects: they can increase mortality (Baird et al., 2011; Adda et al., 2009), increase education gender gaps (Bjorkman-Nyqvist, 2013), increase crime and civil conflict (Cortés et al., 2016; Miguel et al., 2004), and reduce inter-generational mobility (Skoufias, 2003).

Natural disasters often cause market disruptions due to the destruction of assets and property, and shortages of basic goods. In turn, households react in different ways so as to smooth their consumption and recover from the loss. On one hand, households can choose to sell assets to maintain the same level of consumption. On the other hand, they can reduce their present consumption in order to keep their assets. Hoddinott (2006) finds evidence that poorer households tend to smooth their assets rather than smooth their consumption. Consistent with this finding, Fafchamps et al. (1998) suggest that households in West Africa do not sell their assets after a severe drought. Rather, the authors hypothesize that these households choose to protect their productive investment because the low market price prevailing at the time of the sale would not compensate for the loss.

In addition, the evidence suggests that the effect on consumption depends on the type of natural disaster and the region. Arouri et al. (2015), using data from Vietnam, found that storms, floods and droughts have negative effects on consumption. More interestingly, they found that households with access to micro-credits and remittances were more resilient to the effects of natural disasters. Garbero and Muttarak (2013), using data from Thailand, found that floods and droughts do not have a negative effect on food consumption. Similarly, Sulistyaningrum (2015), using data from Indonesia, found no effects of natural disasters on household expenditure. Kurosaki (2014), using data from Pakistan, found heterogeneous effects depending on the type of natural disaster. In particular, he found that while household consumption was vulnerable to floods, the impact of droughts was negligible. Finally, Hou (2010), using data from Mexico, found that rural households smooth their consumption by replacing more expensive calories (such as animal products) with cheaper calories (such as grains).

As far as price effects are concerned, the neoclassical theory predicts a decrease in consumption, but without a clear direction regarding prices. If the fall in supply is greater than the fall in demand, then an increase in prices should be observed. However, if the fall in demand is greater than the fall in supply, then a decrease in prices would occur. Conversely, the sticky price theory would suggest that prices will remain stable. To the best of our knowledge, there are only two papers that analyze the effects of natural disasters on prices: Cavallo et al. (2014) and Lopez-Salido et al. (2015). Cavallo et al. (2014) study supermarket prices in Chile and Japan after a natural disaster. They found that prices remained relatively stable in the short term and started to increase after 4-6 months. Lopez-Salido et al. (2015) analyze the effects of Hurricane Katrina and other weather-related shocks, also finding subtle price changes following large demand shocks.

2.2 The context of Mexico

Mexico is among the 30 countries most exposed to two types of natural disasters: hurricanes and earthquakes. The population that is most vulnerable to these natural disasters represents around 27% of the country (INEGI, 2013).

In September 2017, two strong earthquakes and multiple aftershocks hit Mexico. The first, which occurred on September 7, had a magnitude of 8.2 on the Richter scale. It is now considered to be the deadliest earthquake to have occurred over the last hundred years in Mexico. This earthquake affected the south and southeast of the country, causing damage to 41,000 homes and affecting more than 1.5 million people (BBC News, 2017; Reuters, 2017). The most affected state was Oaxaca, which reported a death toll of 71 (New York Times, 2017b). Within this state, Juchitán, one of the current study's "treatment" municipalities, was one of the most affected cities: around 400 houses were destroyed and 1,700 damaged as a consequence of the earthquake, representing the destruction of a third of the city's infrastructure (New York Times, 2017a).

The second strongest earthquake on the list took place on September 19. The magnitude of this earthquake was 7.1 and is the strongest earthquake to hit Mexico City since 1985. It affected Mexico City, Morelos, and Puebla. USAID (2017) estimates that there were over 250 fatalities and 20,000 damaged buildings as a result of the earthquake. Jojutla (Morelos), another one of the current "treatment" municipalities, was closest to the epicenter of the earthquake.

3 Data

To estimate the impact of natural disasters on consumption and prices, we used the Survey of Social Mobility in Disaster Zones (SoMoDiZ). The SoMoDiZ data contain information on two selected municipalities affected by the earthquakes: Juchitán in Oaxaca, and Jojutla in Morelos (see Figure 1). Data were also collected from two municipalities that were used as a comparison group: Martínez de la Torre in Veracruz, and Rincón de Romos in Aguascalientes. The criterion for selecting these two control localities was that they had a similar level of income per capita and economic growth trajectory over the last 15 years with respect to the treatment municipalities.[1]

Regarding the data collection, survey streets were randomly selected in each municipality, with five households on each street interviewed until the sample size was reached. The estimated sample size was 400 units in the treatment localities and 400 in the control localities. The objective of the survey was to collect information on the effects of natural disasters on consumption and prices. Specifically, the survey was mainly directed towards women who were either the head of the household or the spouse of the latter. If a woman was not present, the survey was applied to her husband or partner. For the purposes of this study, we limited our sample to women only, interviewing a total of 369 women in the treatment and 399 in the control municipalities.

The survey contained information on 14 items: beans, rice, milk, coffee, canned tuna, soup, limes, chicken, tortillas, tomatoes, bananas, sugar, beef, and eggs. It is worth mentioning that after the earthquakes, the Mexican government claimed to have provided households in the affected municipalities with baskets of basic goods. Among other goods, these baskets contained beans, rice, milk, coffee, canned tuna and soup. All households were asked whether they consumed a specific good at a specific point in time, i.e., before or after the disaster. If the individuals answered yes, they were then asked about the quantities of the good they consumed and the price they paid. With respect to the timeline, the survey was implemented in October 2017, and the respondents were asked to recall information regarding prices and consumption in August 2017.

[1] In particular, we applied the following steps in order to select the counterfactual territories. First, we sorted the municipalities by their per capita income levels and retained those with similar income levels to those of Jojutla and Juchitán. Within this set of municipalities, we then selected those localities that had a similar Marginality Index and similar population levels. By 2010, Jojutla's population was about 19,000 inhabitants, while Juchitán's was about 74,000. Within the municipalities with similar income levels, the set of control localities to choose from were those that had a population between 18,000 and 28,000 for Jojutla, and between 60,000 and 90,000 for Juchitán. Within the set of localities ordered by per capita municipal income, and that were within the same population range as Jojutla and Juchitán, we chose those that had similar Marginality Indexes and a similar growth trend in municipal per capita income for 2000 to 2010 and 2010 to 2015. Some other localities with similar characteristics to those of Juchitán and Jojutla were also hit by the September 2017 earthquakes, and were thus kept out of the selection. Table 1 shows the main variables used for the selection of control localities.

Table 2 contains descriptive statistics of the database. The table shows the three main outcomes: a consumption dummy that takes the value of 1 if the household consumed the product analyzed, and 0 otherwise; a variable representing the amount of consumption in a standardized measure depending on the particular product; and, finally, self-reported prices per household measured in Mexican pesos of 2017. The table shows that the percentage of consumption of eight out of the 14 products was higher for the treatment group before the earthquake took place. The biggest difference lies in the consumption of coffee, bananas and beef. At the intensive margin, it can also be seen that households in the treatment group consumed larger quantities of all of the products analyzed. Likewise, the price level of these products was higher among the treatment group.

When the means of the consumption variables are compared in the period after the earthquake, there is a decrease in the size of the difference between the treatment and comparison groups. In some cases, this leads to a difference in means that is statistically equal to zero or that reverts the sign of the difference. This pattern suggests that consumption in the treatment group decreased significantly after the earthquake. On the other hand, the treatment group still reported higher prices than the comparison group, suggesting that prices remained stable after the earthquake.

4 Empirical Strategy

We used a difference-in-differences (DID) approach as our main identification strategy to examine the effect of the Mexican earthquakes on household consumption, and prices. The main specification is the following:

$$Y_{it} = \beta_0 + \beta_1 After_t + \beta_2 T_i + \beta_3 (After_t * T_i) + X_i\theta_i + e_{it}$$

where Y_{it} is the outcome of interest for household i at time t; $After_t$ takes the value of 1 in the period after the shock; T_i takes the value of 1 in the municipalities affected by the natural disaster and zero otherwise; X_i is a set of control variables that include family size, number of children in the household, type of family (nuclear vs extended family), and dummies for whether the household i received any type of cash assistance. The standard errors are clustered at the street level. Notice that the coefficient of interest is β_3. It estimates the ef- fect that a natural disaster had in the treated municipalities compared to the comparison group.

In order to identify the causal effect, the above difference-in-differences (DID) estimator needed to satisfy the following:

1. That the additive structure imposed was correct.

2. $cov(e_{it}, After_t * T_i) = 0$.

The latter assumption is known as *parallel-trend*, meaning that the outcome variables of the treatment and comparison groups followed the same trend over time before the earthquakes took place. In other words, the unobserved characteristics that created a gap between the measured treatment and control outcomes are assumed to be time invariant, consequently eliminating the problem of omitted variable bias.

While the survey collected information for localities that followed a similar trajectory in terms of economic growth over the last 15 years, we only had two data points for the variables and, as a consequence, were unable to test the parallel trends assumption. To address this problem of potentially omitted variables, we employed the bounding approach proposed by Altonji et al. (2005) and refined by Oster (2017). Altonji et al. (2005) observed that a common approach towards evaluating robustness in terms of omitted variable bias has been 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 unlikely to be biased. This strategy implicitly assumes that the selection on observables informs the selection on unobservables. Oster formalizes this idea, and provides conditions for bounds and identification. Namely, if the bounds exclude zero, then the results from the regression can be considered to be robust to omitted variable bias (see Appendix A).

5 Results

5.1 Difference in Differences

Table 3 presents the results of the difference-in-differences model. The standard errors are clustered at the street level. All regressions include a set of control variables: family size, number of children in the household, type of family (nuclear vs extended family), and a set of dummies on the type of cash assistance received by households. Columns (1) and (2) display the results for the consumption dummies. Consumption at the extensive margin can be seen to have decreased for nine out of the 14 products. The greatest decreases in consumption occurred in proteins: households affected by the earthquakes decreased their consumption of beef by 18 percentage points, and that of chicken by 20 percentage points after the earthquake. However, the results show an increase in canned tuna consumption by 28 percentage points after the earthquakes. This suggests that the decrease in the consumption of chicken and beef is partly associated with a substitution effect of these with the consumption of canned tuna.

Columns (3) and (4) present the results for the logarithm of the quantity consumed. At the intensive margin, we find a decrease in the consumption of seven out of the 14 products. In other words, households not only stopped consuming certain goods, but also consumed less of them. The largest decrease in the intensive margin occurred for chicken (27 p.p.), beef (18 p.p.) and milk (20 p.p.). Again, in this case, there was an increase in the quantity of canned tuna consumed, of 57 p.p. This lends further support to the hypothesis that households substituted more expensive proteins for canned tuna.

It is worth mentioning that after the earthquake, the Mexican government claimed that they provided households in the affected municipalities with baskets of basic goods. Among other goods, these baskets contained beans, rice, milk, coffee, canned tuna and soup. Unfortunately, our database cannot identify if these families actually received these baskets and for how long. Yet, even with reference to the goods included in the basket, a drop can be observed in the consumption of certain goods, such as beans and milk.

Regarding prices, nine of the 14 analyzed products remained stable after the earthquake. However, we found that the pries of five products decreased by up to 8.1 percent. This suggests that neither the earthquake nor the distribution of basic supplies by the government generated immediate changes in the majority of market prices.

5.2 Oster's bounding methodology

We applied Oster's bounding methodology as a robustness test and also to check for the parallel trend assumption, i.e., that our results were not driven by omitted variable bias. Oster proposes a method for testing the robustness of results under the assumption that the relationship between the observables and the treatment is informative of the relationship between the unobservables and the treatment. This assumption allowed us to yield some bounds for β_3 (see Section 4, Empirical Strategy).

Table 4 reports the results of this methodology. To check the robustness of this methodology, we only include those results that were statistically significant at the 5 per cent level. Column (1) presents a summary of the results from Table 3. Columns (2) and (3) display a solution for the coefficients that would have been obtained if we had assumed that the observables were at least as important as the unobservables ($\delta = 1$ and $\delta = -1$) for the corresponding assumption on R_{max}. In general, we find that the coefficients regarding consumption that were significant in the difference-in-differences model are robust, the only exceptions being with regard to canned tuna and tomatoes. In relation to the coefficients associated with the quantity demanded, they can be observed to be robust, with the exception of rice and canned tuna. Finally, it can be seen that the coefficients associated with prices are not robust using this methodology. Overall, these results confirm that a decrease in consumption was what could be observed, and not an effect on prices.

5.3 Intra-household consumption

Given the consistent results suggesting a trend towards a reduction in consumption, we tested who in the household took on most of the burden. Table 5 Columns (1)-(3) show a difference-in-differences model, using as the outcome a dummy indicating whether the member of the household ate fewer meals a day. Our results suggest that women were 23.2 p.p. more likely to eat fewer meals per day after the earthquake. Men were also 20.8 p.p. more likely to reduce their consumption per day. It seems that the reduction in consumption among men and women in these households aimed to smooth children's consumption. Children were 11.1 p.p. more likely to eat fewer meals a day after the earthquakes, which was about half the reduction in consumption of their parents. We also analyzed if the scarcity of resources increased the conflicts within the household or affected household decision making, finding no evidence that the earthquakes affected these outcomes (see Columns 4 and 5).

5.4 Heterogeneous effects

In this section, we evaluate whether the effects of the earthquakes differed for people with different types of vulnerability. In particular, we aimed to test the effect of the difference-in-differences model for: (1) homes that suffered road interruptions as a result of the earthquake; and (2) households that cooperated with their neighbors in order to help each other.

Figure 2 displays the results pertaining to road disruptions. The latter is an important indicator because, on one hand, it gives us the opportunity to assess the extent of earthquake infrastructure damage, providing a potential indication of the intensity of the shock for the households analyzed. On the other hand, it enables an approximation of the extent to which the supply of products in the area may have been affected. The results show that road disruptions did generate differential effects. In particular, those households that had road disruptions recorded the biggest drops in the consumption of beef, chicken and bananas. These households also seemed to be the drivers of the fall in consumption of the other goods that had a significant effect in the DID model. In addition, these households also reported a smaller increase in canned tuna consumption.

These results suggest that households that experienced road interruptions were also those that experienced greater food insecurity after the earthquakes. This could have happened due to a combination of three scenarios: the governments' food baskets did not reach these households; the supply of goods decreased due to the difficult access to markets near these households; and/or the demand for goods fell more in these places due to the fact that these households suffered greater losses and had to sacrifice more consumption.

Finally, we analyzed the differential effects between households that cooperated with their neighbors after the earthquake and those that did not. Figure 3 displays the results for this set of regressions, indicating that households that cooperated with their neighbors had slightly more reduced consumption. In other words, those households that decided to cooperate did so because the earthquake hit them harder. Thus, it seems that social capital increases when there are large negative income shocks.

6 Concluding remarks

This paper examines how two natural disasters in the context of Mexico: a) affect consumption and prices; b) impact upon the strategies used by the families to smooth their consumption; and c) highlight factors that increase the vulnerability of the families' consumption. The results show the following: (1) while the earthquakes reduced the studied households' consumption, there was no effect on prices; (2) the families tried to smooth their consumption through cheapest calories, such as canned tuna, and by reducing the consumption of adults (principally women) in order to smooth the consumption of children; and (3) families who experienced road interruptions were also those that experienced greater food insecurity after the earthquakes.

In terms of public policy, the Mexican government claimed to have provided food baskets for families affected by the earthquakes. The current study evidence suggests that these baskets were not sufficient to smooth the consumption of these families. Additionally, the results suggest that those families who suffered road interruptions possibly had less access to these baskets. In light of these findings, it is recommended that the government review the contents of these baskets, taking into account the number of each household's members and the temporality in the distribution of such baskets. In addition, the government should consider particular strategies for bringing food to those who suffered road interruptions and who could be the most affected.

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7 Tables and Figures

Figure 1: Municipalities affected by the earthquakes: Juchitán in Oaxaca, and Jojutla in Morelos

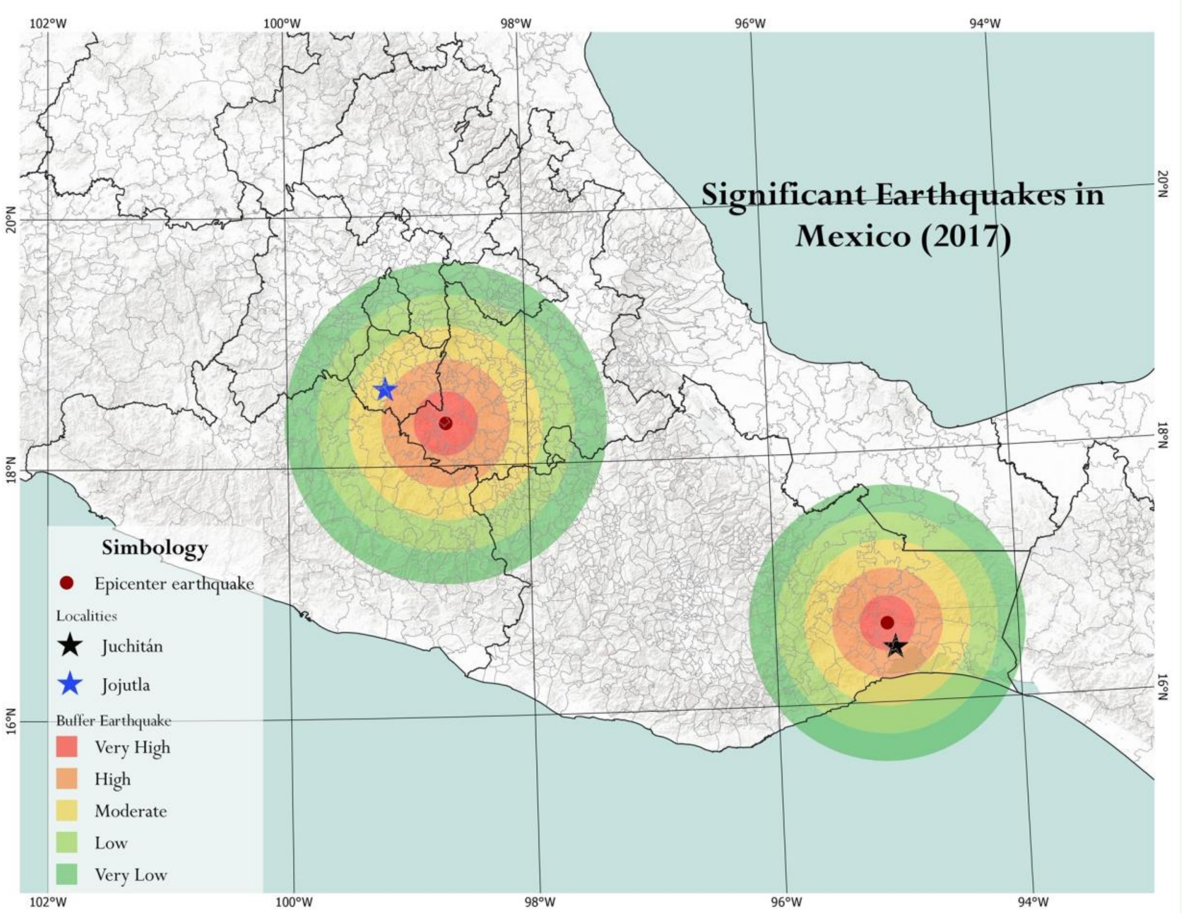


Table 1: Selection of counterfactual localities

Locality	Per capita income 2000	Per capita income 2010	Per capita income 2015	Population 2000	Population 2010	Marginality Index 2000	Marginality Index 2010	Affected by earthquakes
Joutla	1,745	2,212	2,859	20,398	18,867	-1.74	-1.35	Yes
Rincón de Romos	1,635	1,915	2,569	22,570	27,988	-1.72	-1.28	No
Juchitán	907	1,909	2,684	64,642	74,825	-1.12	-0.89	Yes
Martínez de la Torre	881	2,129	2,568	49,565	60,074	-1.18	-0.96	No

Source: INEGI, CONAPO, and World Bank.

Table 2: Descriptive statistics

	Before			After		
Variables	Treated	Comparison	Difference	Treated	Comparison	Difference
Consumption dummy						
Beans	98.1	98.0	0.1	94.7	98.2	−3.5***
Rice	94.8	93.2	1.6	94.2	90.5	3.7*
Milk	91.3	88.7	2.6	89.2	92.4	−3.2
Coffee	84.5	52.3	32.2***	91.6	62.5	29.1***
Tuna	58.6	50.3	8.3**	94.0	57.5	36.5***
Soup	89.9	91.7	−1.8	94.8	91.3	3.5*
Lemon	89.7	79.1	10.6***	84.2	80.0	4.2
Chicken	97.3	89.2	8.1***	84.5	95.6	−11.1***
Tortillas	99.2	100.0	−0.8*	98.9	99.7	−0.8
Tomatoes	98.9	99.0	−0.1	92.0	98.2	−6.2***
Banana	91.6	74.4	17.2***	81.0	75.8	5.2*
Sugar	98.4	92.9	5.5***	93.6	93.7	−0.1
Beef	87.8	73.6	14.2***	74.2	78.7	−4.5
Eggs	97.6	92.4	5.2***	93.6	92.1	1.5
Consumption quantity						
Beans	1.8	1.7	0.1	1.6	1.6	0.0
Rice	1.4	1.2	0.2**	1.7	1.3	0.4
Milk	4.5	3.3	1.2***	3.8	3.5	0.3
Coffee	1.3	0.6	0.7***	1.4	0.7	0.7***
Tuna	2.5	1.4	1.1***	5.1	1.5	3.6***
Soup	3.3	2.8	0.5***	3.5	2.7	0.8***
Lemon	2.3	1.3	1.0**	1.9	1.2	0.7**
Chicken	2.3	1.3	1.0***	1.9	1.6	0.3*
Tortillas	7.9	7.4	0.5	7.1	7.1	0.0
Tomatoes	2.9	2.4	0.5***	2.4	2.3	0.1
Banana	2.5	1.4	1.1***	2.0	1.4	0.6***
Sugar	1.9	1.7	0.2	1.7	1.5	0.2**
Beef	1.5	1.1	0.4***	1.2	1.1	0.1
Eggs	3.1	2.1	1.0**	2.8	2.0	0.8**
Prices						
Beans	30.5	21.4	9.1***	30.6	23.0	7.6***
Rice	16.9	14.7	2.2***	18.8	15.9	2.9***
Milk	24.7	16.0	8.7***	23.6	16.4	7.2***
Coffee	34.2	27.8	6.4***	41.8	31.4	10.4***
Tuna	17.3	12.2	5.1***	18.8	13.0	5.8***
Soup	8.0	5.4	2.6***	7.5	5.6	1.9***
Lemon	16.6	11.9	4.7***	15.1	10.1	5.0***
Chicken	56.5	43.4	13.1***	56.8	46.2	10.6***
Tortillas	22.9	11.8	11.1***	25.8	12.7	13.1***
Tomatoes	21.1	14.3	6.8***	17.0	12.0	5.0***
Banana	12.3	9.8	2.5***	12.4	10.1	2.3***
Sugar	19.5	20.8	−1.3	23.6	20.9	2.7*
Beef	95.0	69.7	25.3***	96.6	77.1	19.5***
Eggs	29.3	22.3	7.0***	32.5	24.5	8.0***

Note: Quantity consumed takes the value of zero if the individual reported not to consumed the product. Prices are measured in Mexican Pesos per unit of measurement. Items with † belong to the basket that FONDEN provided.

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

Table 3: DiD - Effects on consumption and prices

	Consumption		Quantity		Price	
Variables	Estimate	Obs.	Estimate	Obs.	Estimate	Obs.
Beans	−0.036** (0.018)	1505	−0.054* (0.028)	1481	−0.074*** (0.027)	1408
Rice	0.020 (0.021)	1486	0.060** (0.028)	1464	−0.007 (0.027)	1335
Milk	−0.056** (0.028)	1457	−0.200*** (0.053)	1436	−0.047 (0.033)	1293
Coffee	−0.035 (0.045)	1370	0.050 (0.038)	1327	−0.032 (0.058)	967
Tuna	0.281*** (0.049)	1271	0.574*** (0.087)	1252	−0.037 (0.041)	763
Soup	0.052* (0.027)	1455	0.070* (0.042)	1437	−0.081** (0.031)	1282
Lemon	−0.067* (0.040)	1445	−0.068 (0.044)	1417	0.031 (0.047)	1148
Chicken	−0.197*** (0.034)	1468	−0.265*** (0.037)	1451	−0.024 (0.023)	1320
Tortillas	−0.001 (0.007)	1513	−0.085** (0.036)	1502	−0.076*** (0.020)	1494
Tomatoes	−0.062*** (0.017)	1514	−0.104*** (0.030)	1492	−0.065* (0.039)	1437
Banana	−0.120*** (0.036)	1460	−0.167*** (0.047)	1434	0.014 (0.036)	1133
Sugar	−0.055** (0.022)	1492	−0.029 (0.026)	1474	0.019 (0.029)	1371
Beef	−0.182*** (0.033)	1432	−0.184*** (0.033)	1415	−0.068*** (0.030)	1110
Eggs	−0.040 (0.024)	1493	−0.042 (0.037)	1467	−0.033 (0.039)	1367

Note: This table displays, for each outcome, the interaction term of the DiD model and the number of observations in the regression. Standard errors clustered at the street level are displayed in parenthesis. Controls in the regression are family size, number of children in the household, type of family and a dummy for whether the family received any cash or in-kind assistance.

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

Table 4: Oster's bounding methodology

	DiD	$R_{max} = 1.3\tilde{R}$		Robust
		β for $\delta = 1$	β for $\delta = -1$	
Consumption dummy				
Beans	−0.037**	[-0.028,	-.0034]	Yes
Milk	−0.056***	[-0.079,	-0.025]	Yes
Tuna	0.281***	[-0.259,	0.424]	No
Chicken	−0.197***	[-0.282,	-0.052]	Yes
Tomatoes	−0.062***	[0.361,	-0.068]	No
Banana	−0.120***	[-0.200,	-0.042]	Yes
Sugar	−0.055**	[-0.085,	-0.027]	Yes
Beef	−0.182***	[-0.258,	-0.077]	Yes
Quantity demanded				
Rice	0.060**	[-0.055,	0.085]	No
Milk	−0.200***	[-0.338,	-0.096]	Yes
Tuna	0.574***	[-0.436,	0.927]	No
Chicken	−0.265***	[-0.407,	-0.091]	Yes
Tortillas	−0.085**	[-0.045,	-0.094]	Yes
Tomatoes	−0.104***	[-0.160,	-0.088]	Yes
Banana	−0.167***	[-0.342,	-0.032]	Yes
Beef	−0.184***	[-0.282,	-0.078]	Yes
Prices				
Beans	−0.074***	[-0.276,	0.210]	No
Soup	−0.081**	[-0.212,	0.163]	No
Tortillas	−0.076***	[-0.380,	0.026]	No
Beef	−0.068**	[-0.249,	0.163]	No

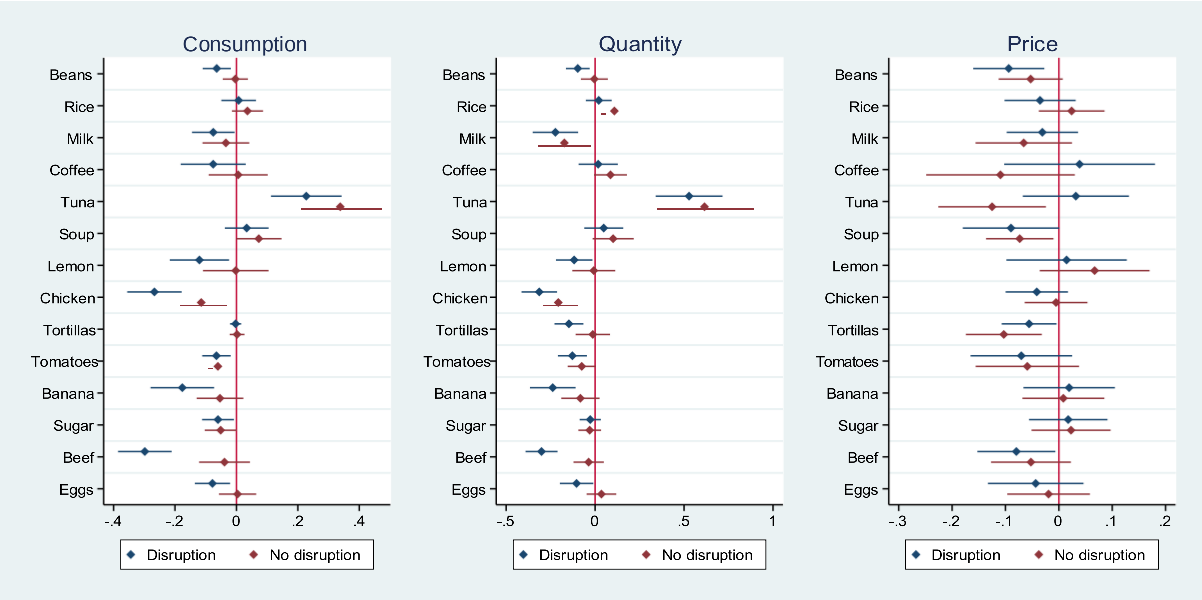
Table 5: DiD - Effects on consumption within the household

	Who consumed less meals?			Conflicts	Household
	Woman	Man	Their children		Decisions
After	-0.011	-0.010	-0.002	.001	-0.008
	(0.011)	(0.013)	(0.010)	(0.031)	(0.012)
Treatment	0.116***	0.123***	0.112***	0.151**	0.114
	(0.029)	(0.030)	(0.026)	(0.077)	(0.028)
After×Treatment	0.232***	0.208***	0.111**	0.005	0.004
	(0.033)	(0.041)	(0.023)	(0.052)	(0.016)
Controls	C	C	C	C	C
Observations	1,505	1,247	1,501	1,522	1,519

Note: OLS regressions with dichotomous outcomes displayed. Standard errors clustered at the street level in parenthesis. Controls in the regressions include family size, number of children in the household, type of family and a dummy for whether the family received any cash or in-kind assistance.

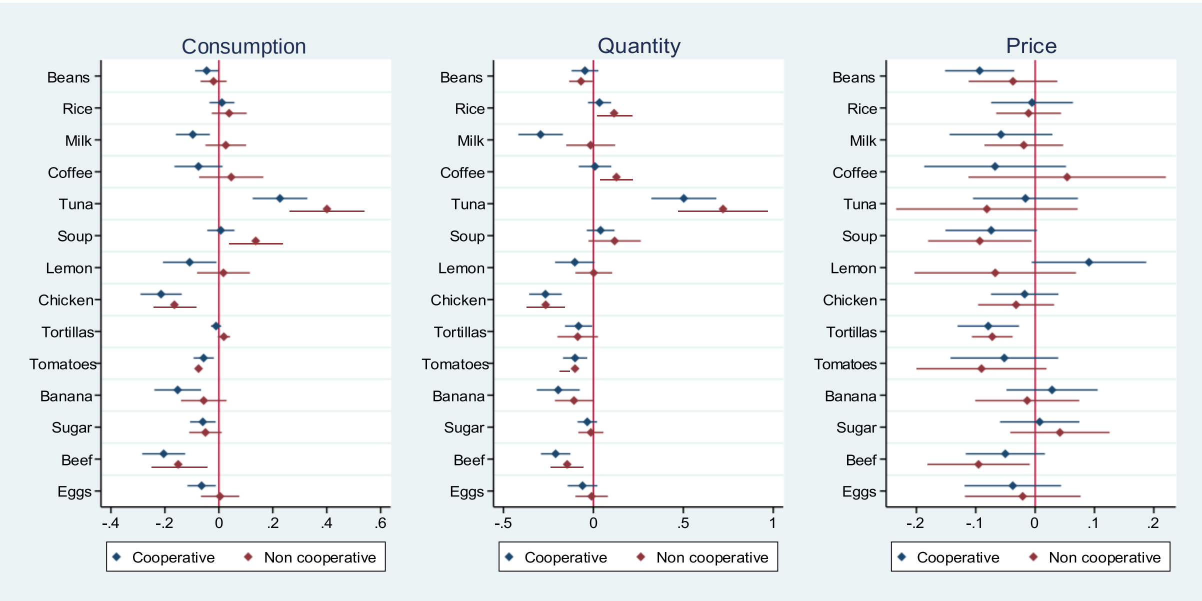
*** p<0.01, ** p<0.05, * p<0.1

Figure 2: Heterogeneous effects on highway disruption



Note: This figure displays, for each outcome, the interaction term of the DiD model and the number of observations in the regression. Standard errors clustered at the street level. Controls in each regression include family size, number of children in the household, type of family, a set of dummies for any cash or in-kind assistance the household received, and fixed effects at the municipality level. Outcomes are measured as follows: consumption corresponds to a dummy indicating whether the product was consumed; quantity corresponds to the logarithm of the quantity consumed if the household reports any consumption of the product and zero otherwise; and prices are measured as the logarithm of the value reported in Mexican pesos. *** p<0.01, ** p<0.05, * p<0.1

Figure 3: Heterogeneous effects on cooperative attitudes



Note: This figure displays, for each outcome, the interaction term of the DiD model and the number of observations in the regression. Standard errors clustered at the street level. Controls in each regression include family size, number of children in the household, type of family, a set of dummies for any cash or in-kind assistance the household received, and fixed effects at the municipality level. Outcomes are measured as follows: consumption corresponds to a dummy indicating whether the product was consumed; quantity corresponds to the logarithm of the quantity consumed if the household reports any consumption of the product and zero otherwise; and prices are measured as the logarithm of the value reported in Mexican pesos. *** p<0.01, ** p<0.05, * p<0.1

8 Appendix A

Following the notation in Oster, the full model takes the following form:

$$Y = \beta T + X_1 + X_2 + e.$$

where T is the variable of interest (in our case $After_t * T_i$), X1 contains the observed control variables multiplied by their coefficients, and X2 contains all unobserved variables multiplied by their coefficients. Finally, e is a random error representing the measurement error in Y, and is uncorrelated with X1, X2 and T. Oster suggests the following approach to account for omitted variable bias:

(1) Regress Y on T, and report the parameter on T, denoted by β^0, and the R-squared coefficient, denoted by R^0.

(2) Regress Y on T and X_1, and report the parameter on T, denoted by $\tilde{\beta}$, and the R-squared coefficient, denoted by $\tilde{R}$.

(3) Define R_{max} as the overall R-squared of the model, that is, the R-squared that would be obtained from a regression of Y on both observables (T, X_1) and unobservables (X_2).

(4) Define δ to be a parameter that ensures equality $\frac{Cov(T,X_2)}{Var(X_2)} = \delta \frac{Cov(T,X_1)}{Var(X_1)}$. In other words, this relationship formalizes the idea of Altonji et al. (2005) 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. For example, if $-1 \leq \delta \leq 1$, then the variable of interest (T) is no more correlated with the unobservables (X_2) than it is correlated with the observables (X_1). The case $0 \leq \delta \leq 1$ has a similar interpretation, with the additional assumption that the relationship between T and X_1 has the same sign as the relationship between T and X_2.

Oster shows that $\beta^* \approx \tilde{\beta} - \delta \frac{(\beta^0 - \tilde{\beta})(R_{max} - \tilde{R})}{(\tilde{R} - R^0)}$ is a consistent estimator of the effect of T on Y, β. It should be noted that this is a close approximation to the consistent estimator and is used to present the intuition regarding the methodology. The complete approximation is presented in Oster (2017).

In order to estimate $\beta*$, estimates of δ and R_{max} are required. Oster proposes assumptions for δ and R_{max} that allows one to determine whether $\beta*$ is different to zero. Oster proposes that $R_{max} = min\{1.3\tilde{R}, 1\}$, where $\tilde{R}$ is as defined above. The cut-off value of 1.3 is derived from a sample of papers containing randomized controlled trials and nonrandomized data, and published in the *American Economic Review*, *Quarterly Journal of Economics*, and *The Journal of Political Economy* from 2008-2010. She determined that using this cut-off allowed 90% of the randomized and 50% of the nonrandomized results to continue being statistically significant. After determining the value of R_{max}, Oster suggests that $\beta*$ be calculated for all the following ranges of δ: $0 \leq \delta \leq 1$ (the current paper also presents the results for δ: $-1 \leq \delta \leq 0$), enabling the construction of the set: $[\tilde{\beta}, \beta*]$. 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 $\beta* \neq 0$.

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