The Legacy of Natural Disasters: The Intergenerational Impact of 100 Years of Natural Disasters in Latin America

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Abstract

Natural disasters can have long lasting effects, but generalizing such effects and disentangling them from the context where they happen can be challenging. Using information from the national censuses, this paper examines the long term effects and subsequent intergenerational transmission of exposure in childhood to the natural disasters that have occurred in Latin America in the last 100 years. The identification strategy exploits the exogenous variation in geographic location, timing and exposure of different birth cohorts to natural disasters. This study measures individuals' exposure based on the geographic location at birth during the disasters to avoid any bias in the estimations due to the selective migration caused by each disaster. The main results indicate that young children are the most vulnerable to natural disasters and suffer the most long-lasting negative effects including less human capital accumulation, worse health, fewer income and less assets accumulation when they are adults. The data even provide evidence of the intergenerational transmission of shocks, showing that the second generation is negatively affected by the disasters in their human capital accumulation increasing their child labor long after their mothers were hit.

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1 Introduction

Over the last 50 years, the number of natural disasters has been increasing significantly, especially those related to global warming (Helmer et al., 2006; Van Aalst, 2006). Governments and policy makers often evaluate the consequences of these shocks by focusing primarily on the damage to infrastructure (Prestemon et al., 2002). According to these estimates, natural disasters cost an annual average of $901 million. However, this damage estimation does not consider the effect of natural disasters on other dimensions of welfare, such as employment and education, that may have lasting effects (Baez et al., 2010) and which are vital to asses the full impact of these shocks.

Related to these welfare dimensions, there is growing concern among economists and policy makers that negative conditions experienced early in life may have persistent effects. Recent research documents long-lasting effects of shocks experienced in early childhood on child development (Currie, 2009) and on adult outcomes such as education, height, self-reported health and socio-economic outcomes (Alderman, 2006; Almond et al., 2005; Maluccio et al., 2009). Despite the strong evidence that shocks in early childhood have long-term effects and the increasing interest by researchers in the relationship between parental and child health and education (Anger, 2010; Coneus et al., 2011), there is, surprisingly, limited research on the intergenerational transmission of shocks in early life.

Given the recent increase in natural disasters and the long-term welfare effects of exposure to these events, the primary research questions of this paper are: What is the long term effect of natural disasters on education, health, welfare and labor outcomes, and whether this impact be transmitted to the next generation? This paper attempts an estimation of the full impact of natural disasters including the effects on the first and second generations. In particular, the long-run effects of shocks experienced in early childhood and their intergenerational transmission are examined using all the natural disasters that occurred in Latin America in the 20th century. Additionally, this paper explores whether there are generalizable patterns across different types of disasters in different countries.

This paper makes three main contributions. First, this work takes a new comprehensive approach to study the impact of natural disasters by using data about all natural disasters that affected one continent in the last 100 years. The standard approach in the literature focuses on case studies that evaluate the impact of single specific shocks, and are subject to the concern that the observed results may not generalize to other locations or types of shocks. This paper addresses this external validity problem by obtaining an estimation of the truth impact of natural disasters that holds around Latin America, independently and for countries of different income and geographic size. Furthermore, this strategy compares how exposure to different types of natural disasters at birth in different countries leads to poor welfare outcomes, distinguishing the effect of the shock from the intrinsic influence of the location of occurrence of the natural disaster.

Second, another difficulty in capturing the long term impacts of exposure to natural disasters is that migration may occur as a consequence of the disaster. Traditional studies have used individuals' location during surveys as a measure of exposure, missing the fact that selective migration may bias the estimations. This paper accounts for those movements using the birth location included in the national censuses to measure individuals' exposure to each disaster, without which this work would incorrectly classify exposure for 7% of individuals. Moreover, the use of more than 24 millon observations from national censuses allow this study to identify the impact of natural disasters with a enormous precision. As a result, this study also contributes to the literature on natural disasters overcoming some of the limitations of previous attempts to estimate their effects on well-being.

Third, this paper also focus in two innovative dimensions of shocks in early life. This literature of shocks in childhood traditionally focuses on the effects of exposure to shocks during gestation and the first two years of life of the affected generation. In contrast, this paper can distinguish how exposure to different disasters at different ages, in utero up to adolescence, may have different long lasting effects. Moreover, this paper contributes to the literature of shocks in early childhood by providing micro estimates of how the impact of these shocks can be translated to the next generation.

The main results of this paper indicate that the most fragile period for any individual to receive this kind of shock is the first years of life through school age. In particular, those individuals that have been exposed in their childhood suffer long-lasting negative effects including less human capital accumulation, worse health, fewer income and less assets accumulation when they are adults. Unpredictable natural disasters are the ones with the largest impact during gestation and the first two years of life. On the other hand, natural disasters that allow governments to take actions before the disasters hit, such as evacuating the affected areas, are mainly relevant for the school age due to the unavoidable damage to infrastructure. Furthermore, this paper finds that shocks affecting health, are especially disastrous, in particular for education, unemployment and income. This work shows that the analysis of single case studies does not reach to these conclusions. This study also provides evidence of the intergenerational transmission of shocks, showing that the second generation is negatively affected on their capital accumulation, increasing their child labor, by the disasters long after their mothers have been hit.

The remainder of the paper is organized as follows. In the next section, an overview of the natural disasters and the problems caused is presented. Section 3 describes the data used in the analysis and explains the key variables. Section 4 describes the empirical identification strategy, and Section 5 presents the main results and robustness tests followed by a discussion of the results and the policy implications. Finally, Section 6 concludes.

2 The impact of natural disasters

2.1 Natural disasters in the economic literature

Every year natural disasters affect almost every country worldwide. This type of event is usually unpredictable and affects human lives in many different dimensions. At a macroeconomic level, natural disasters may destroy infrastructure affecting industries, growth and employment; while at a microeconomic level, they can destroy assets, affect nutrition and access to education and health services. In addition, natural disasters also may generate water disruptions, generating outbreaks of illness. Furthermore, depending on the intensity of the disasters, they can provoke casualties in the affected areas.

The literature analyzing the impacts of natural disasters largely focuses on their macroeconomic effects (Barro, 2009; Dercon, 2004; Noi, 2009). However, there is growing, but limited, research on the microeconomic impacts of natural disasters. Most of these studies focus on analyzing only a particular event, making it difficult to assess their external validity claims. As discussed above, one possible problem with this type of studies is the tension between external and internal validity.

Since in natural experiments the environment can affect the impact of shocks by either amplifying or reducing them, so the external validity of case studies is always questionable. For instance, it is likely that the impact of natural disaster may be different in poor countries than in rich ones. At the same time, the internal validity of very general studies can be affected as a consequence of the high risk of finding spurious relationships. Unfortunately, there is a lack of empirical studies dealing with this problematic, which makes our results unique. This study fills this gap in the literature by analyzing very particular shocks in particular environments to more general kinds of shocks such as floods, earthquakes, hurricanes, landslides and volcanoes. All the natural disasters registered in the Latin-American continent are used with the aim to obtain general estimation of the effects of this kind of shocks in all the countries involved.

2.2 The intensity of natural disasters

Latin American countries are mostly affected by floods (Table 1). Typically, more than four floods may be expected each year on the continent. Furthermore, the rate of occurrence of floods grows faster than that of all other natural disasters. Among the common effects of floods, the consequences include loss of life, economic losses of planted crops, damage to infrastructure, disruptions in the electric system, contamination of drinking water and loss of sewage disposal facilities. Given that this type of shock affects access to drinking water, outbreaks of waterborne diseases are usually expected after a flood. Each year a large number of people are affected by floods in Latin America, on average 121,145 individuals, with 397 of them killed and $212 million in infrastructure destroyed. Given the direct impact on health, the high frequency and the number of individuals impacted, floods that occur during early childhood are expected to have a long-term effect on those individuals, according to the literature (Mancini et al., 2009).

Tropical storms and hurricanes are the second phenomena with a growing trend in the last 30 years. On average, almost 2 hurricanes impact Latin America per year. Hurricanes generate strong winds that can damage and destroy infrastructure, private property and can cause death. This type of event is highly destructive, causing an average estimated damage of $243 million for each impact. In comparison with the large destruction in infrastructure, the number of people being killed by hurricanes is relatively small, on average affecting 113,128 people and killing 158 of them. Storms and hurricanes are the most predictable events among the natural disasters, which helps to reduce the effects, mainly mortality, of this kind of shock.

The third most numerous of the natural disasters affecting Latin America are earthquakes, with almost 2 earthquakes per year on the continent. Earthquakes are the most damaging type of shock, costing of $243 million in damage to infrastructure per shock. Earthquakes destroy buildings and other rigid structures. The size of the damage increases when there is ground rupture, because of the major risk to large engineering structures such as dams, bridges and nuclear power stations. This type of shock is also one of the most deadly since it is not predictable. Earthquakes affect 149,431 and kill 1,230 people per shock on average.

Every year an average of one landslide is expected in Latin America. Landslides affect an average of 92,600 individuals per landslide, killing 144 in every shock. This kind of event is predictable (Fabbri et al., 2003), which reduces the number of deaths. However, each landslide has a large destructive power, damaging infrastructure at an average rate of $212 million.

Finally, volcanoes are the least frequent natural disaster in Latin America affecting a low number of individuals (35,440 affected individuals) and costing on average $163 million in damages. However, this type of shock is the most deadly of all the shocks, killing 1,510 individuals in each eruption. Moreover, volcanic eruptions may generate respiratory illness as a consequence of their emission of ash.

2.3 Prevention and Alleviation of the consequences of natural disasters

There are usually few policies to prevent and alleviate the consequences of these types of shocks, mainly because of a lack of evidence for the seriousness of the perdurability of effects on individuals produced by natural disasters. This paper does provide evidence of the long-term effects of natural disasters and argues that there is a big need to generate prevention and alleviation policies that focus on the mitigation of their long term effects. Estimating the effect of all the natural disasters and measuring their long-term effects is of paramount importance for researchers, academics and mostly for policy makers and governments. A deep understanding of natural disasters and their effect is essential to designing new, effective and timely policies to preserve human welfare and to reduce the overall risk associated with these types of unfortunate events.

3 Data

3.1 National Censuses

In order to measure the impact of natural disasters on a set of different outcomes that measure welfare, this paper uses the census of each country in Latin America. These surveys provide information about the date and place of birth of each individual. This data is provided by the Integrated Public Use Micro data Series (IPUMS) and includes all the shaded countries in Figure 1. IPUMS-International is a database that contains censuses from all countries and is the world's largest publicly available census samples. The database is organized following the same approach across countries and time to allow researchers to compare the results of their investigations across samples. These cross-sectional surveys provide information at the individual level on demographic topics such as years of education, employment status, income, employment disability status and fertility. The censuses also provide information about household assets, such as access to current water, access to electricity, and number of rooms per capita. In order to capture the wealth of each household, this paper calculates a measure of multidimensional wealth. This is a wealth index based on a principal components approach that includes information about the assets available for each household so as to identify the financial status of households.

3.2 Timing and location of each disaster and intensity measures

In order get information about the place and date of the occurrence of natural disasters, this study uses data from the Emergency Events Database (EM-DAT). The EM-DAT is a database of natural disasters that includes variables measuring the intensity of the disasters such us the number of deaths, the number of affected individuals and the estimated damage in U.S dollars. In particular, the natural disasters included in this study are geophysical natural disasters (earthquakes and volcanoes), hydrological natural disasters (floods and landslides) and meteorological natural disasters (hurricanes and tropical storms). This database covers the occurrence of natural disasters worldwide from 1900 to the present. Disasters that do not satisfy a minimum requirement in terms of intensity are not included in this database. A disaster is included in the EM-DAT when it satisfies at least one of the following conditions: if 10 or more people died because of the disaster, if 100 or more people is affected by the disaster, if the affected country declared a state of emergency and/or if the affected country called for international assistance.

In order to measure the intensity of the impact of each disaster, this investigation uses three variables included in the EM-DAT: the number of people killed by each disaster, the number of people affected and the damage estimated in U.S. dollars. When these variables are missing from the database, they are supplied according to data found in another database called DESINVENTAR. DESINVENTAR is an inventory system of the effects of disasters that reports the number of victims, people affected and damage provoked by each natural disaster.

3.3 Timing and location of each disaster and intensity measures

In Table 2, the characteristics of the affected individuals are compared between affected and non-affected districts. In particular, in panel A the characteristics of the adults analyzed in the study are compared. In terms of education and disabilities, affected districts appear to be less deprived than non-affected districts. For other characteristics such as fertility, unemployment and income, the table shows no significant difference across districts. In Panel B, a comparison of the characteristics of households between the affected and the non-affected districts is presented. I observe that the affected areas are wealthier and enjoy greater access to electricity and current water. Finally, in Panel C, this research compares the characteristics of individuals younger than 20 years old. Among the characteristics investigated, this panel shows that only the years of education for individuals 5 to 20 and the probability of finishing primary school for individuals 15 to 20 are statistically different between the affected and the non-affected districts. It indicates that the non-affected districts are the most deprived in these dimensions.

Even though the results from Table 2 indicate that the differences, if any, between districts are favorable to the affected areas, any bias resulting from pre-existing district differences between affected and non-affected districts is avoided with the use of district fixed effects in the identification strategy of this paper. This analysis will be discussed in the next section.

4 Empirical identification strategy

The empirical identification strategy relies on a comparison of each outcome for similarly aged individuals in affected and non-affected districts. The implicit assumption is that differences across birth cohorts in each outcome of interest would be similar across affected and non-affected districts in the absence of the shock. I first estimate the following regression with district and birth cohort fixed effects:

$$Y_{ijt} = \beta(Exposed\,to\,a\,Natural\,Disaster_{jt}) + \alpha_j + \delta_t + \theta X_{ijt} + \mu_{ijt} \tag{1}$$

where Y_{ijt} is the outcome of interest for the individual i that have born in the district j that is part of the cohort t, $Exposed\,to\,a\,Natural\,Disaster_{jt}$ is a dummy variable that takes value one if at the moment t in the district j there have been a natural disaster, δ_t are cohort fixed effects; α_j are district fixed effects; X_{ijt} are individual control variables that include gender fixed effects and district trends; μ_{ijt} is a random, idiosyncratic error term. β measures the impact of natural disasters on the outcome Y for individuals who are part of the cohort j during the impact of the natural disaster in the affected districts.

This model measures the direct effect of natural disasters. For the model, only adults older than 20 years are included in order to consider only individuals who have finished their educational investments. The average years of education in Latin America is 7 for the database used in this paper. So, the assumption that people older than 20 have finished with their education seems reasonable. In this difference-in-difference model, an individual is classified as affected if he is part of the affected cohort and born in the affected district. In the control group I consider individuals born in affected cohorts but in non-affected districts, those born in affected districts in non-affected cohorts, and those born in non-affected areas in non-affected cohorts.

Additionally, in order to identify the effects of the shocks on the next generation, this paper estimates the following equation to determine the intergenerational transmission of the effects using the exposure of the parents of each kid:

$$Y_{ijt} = \beta(Parent\,exposed\,to\,a\,Natural\,Disaster_{jt}) + \alpha_j + \delta_t + \theta X_{ijt} + \mu_{ijt} \tag{2}$$

where Y_{ijt} is the outcome of interest for the individual i with parents that have born in the district j and that are part of the cohort t, $Parent\, exposed\, to\, a\, Natural\, Disaster_{jt}$ is a dummy variable that takes value one if at the moment t in the district j there have been a natural disaster, α_j are district fixed effects, δ_t are cohort fixed effects; X_{ijt} are individual control variables that include gender fixed effects, age fixed effects and district trends; and μ_{ijt} is a random, idiosyncratic error term. β measures the impact of natural disasters on the outcome for offspring of individuals who are part of cohort j during the natural disaster.

The last model measures the indirect impact of natural disasters. For this model, only individuals younger than 20 years are included. This assumption is made because I have only the parents' information if the offspring lived with their parents (because the census follows households, not individuals). So, the purpose is to avoid having older individuals who still live with their parents because that can lead us to a selected sample. Since the starting age of formal education is 5, our sample includes only individuals between 5 and 20 years. An individual is classified as exposed to the shocks if his parents were born in an affected district and if his parents are part of the affected cohort.

The estimation of the equations above assumes that the intensity of each shock is similar. To differentiate the effect of each shock, I control by its intensity, and to corroborate that the observed differences across districts and birth cohorts in each outcome are in fact due to the natural disasters, this paper estimates regressions using intensity measures of the natural disasters in the following way:

$$Y_{ijt} = \beta(Number\, of\, affected\, individuals\, by\, a\, NaturalDisaster_{jt}) + \alpha_j + \delta_t + \theta X_{ijt} + \mu_{ijt} \quad (3)$$

where $Number\, of\, affected\, individuals\, by\, a\, Natural\, Disaster_{jt}$ measures the number of affected individuals by the disaster in district j at the moment t by each 10,000 individuals. I also use the number of deaths and the damage in US dollars caused by the disaster as robustness checks for the intensity measures. All the models include cohort fixed effects and district fixed effects.

5 Results

5.1 Case study examples: A biased generalization

Generalizing case studies' results can drive to not accurate conclusions about the real effect of a shock in different environments. In order to highlight this point, Table 3 presents the effect of different natural disasters in different countries. As is possible to see, different types of shocks in different environments have different impacts. For instance, in column 1, the flood that affected Argentina in 1967 has an impact on the years of education only if it hit individuals before their first five years of life, while the landslide in Brazil in 1966, column 5, has an impact on education if it hit individuals in utero and in their first year of life. In contrast, the results that include all the natural disasters that happen in the last century, presented in the following subsection, contradict these results. Thus, this example allows us to understand the relevance of focus on many realizations in different contexts instead of focusing on the results of different case studies. For this reason, the study estimates the impact of different types of natural disasters with the aim of solving the external validity problems in the literature of natural disasters. In the next subsection, I will include all the natural disasters occurring in the last century in all the countries in our database.

5.2 Effects on Education for the First Generation

By including all the natural disasters that occurred in different contexts, I find that the results differ significantly with the ones presented in the previous subsection. This finding highlights the contribution of combining many similar shock in different countries in the same study. In particular, I find that for education the relevant age of each type of disaster varies in comparison with the effects of the specific shocks used before.

Table 4 shows the estimation of our main model for different types of shocks. The average years of education in our database is seven years. In Latin America schooling begins at the age of five years, so I include only those individuals older than 20 years with the aim of observing the number of completed years of education . According to Table 4 (column 1), an individual hit by a flood while he was in utero has 0.472 fewer years of education compared to those not hit. This effect decreases if the individual is hit after the aged of 6, except for individuals hit at ages 12 to 15 when they are finishing primary school and beginning secondary school.

In column 2, the effect of earthquakes on the years of education is shown. In this case, the effect on education is relevant if the individual is affected during the first four years of life or during the first years of secondary school (ages 12 to 14). Surprisingly, the results for hurricanes in column 3 show that there is no statistically significant effect for individuals hit during the first years of life. However, the impact becomes relevant if the individual is hit at school age. One factor that may explain this differential result is that, in comparison with the two natural disasters previously analyzed, this disaster is predictable, thus giving people enough time to avoid risk areas. Although predictable, hurricanes provoke damage to infrastructure that cannot be safeguarded, which may explain the negative effects found during school age.

In column 4, the estimations suggest that the impact of landslides is relevant from a statistical and economic perspective if the individual is hit between the in utero period and the first 15 years of life. This study finds that the impact is bigger if the landslide impacts individuals younger than seven years old. This type of shock is a great destructive one and unfortunately not predictable. As a consequence, not only schools and health centers can be destroyed but also basic service facilities such as water purification plants that impact on individuals' health. This means that the destruction of infrastructure can reduce the education of an individual hit at the in utero period by 0.486 years, and the greatest impact of this kind of shock occurs during the first seven years of life. Thus, the size of the impact decreases as the age of the impacted individual increases.

Finally, the last column of Table 4 shows that the impact of a volcano is relevant if the individual is hit at the in utero period or at school age. This type of shock allows individuals to escape to avoid part of the impact, but the damage to infrastructure and access to basic services like piped water is total, with almost all the infrastructure destroyed that is touched by lava from the volcano. Moreover, gases emitted by the eruption of the volcano may produce several respiratory illnesses, particularly during the in utero period (Soto-Martinez et al., 2009).

To summarize the effects described in this subsection and to highlight the effect of each type of natural disaster, Figure 3 presents a summary of the results. Since all the statistically significant coefficients obtained in Table 4 are negative, I graph the absolute value of the effect of each type of natural disaster. In Figure 3, the effect of each disaster has a pattern related to the age of the affected individuals. In the appendix, I include one graph per disaster type to better demonstrate that pattern.

5.3 Effects on Health and Labor Outcomes for the First Generation

Apart from the effects on education, natural disasters can affect other dimensions of welfare such us employment disabilities, unemployment and income. In particular I find that natural disasters increase the likelihood that a disability inhibit an individual to work, increase unemployment and reduce income in the long term.

The censuses do not contain questions about health outcomes. However, the data does contain a self-reported employment disability status variable. This question is present in the majority of the countries and identifies individuals who are unable to work because of any kind of disability. In Table 5, I present the estimation of employment disabilities for those that should be able to work. To be consistent with the education estimation, the effects for adults older than 20 are estimated. As possible to see, all the shocks generate significant increments in the probability of being disabled, taking into account that the probability of being disabled to work for the control districts is 0.024, for all the natural disasters analyzed. In addition, hurricanes are the natural disaster with the strongest impact, generating an increase of 0.030 in the probability of being disabled if an individual is shocked in utero. Furthermore, the impact of the shock is stronger when the shock occurs in the first 8 years of life. These results suggest that the effect is driven by the destructive power of each type of disaster. Disasters that generate bigger destruction (hurricanes, earthquakes and landslides) more dramatically increase the probability health problems that prevent the individual from working.

The effects of natural disasters on unemployment are shown in Table 6. Surprisingly, the results are consistent with the findings for education. In column 1, I present results for the impact of floods during early childhood on unemployment in the long-run. Floods are found to increase the unemployment of affected individuals in utero by 0.009. This represents an increase of 10% on the probability of being unemployed. The effects of floods on unemployment are statistically and economically significant if the individuals are shocked in the first five years of life and during the first years of high school, mimicking the results from Table 4.

Column 2 shows the effects of earthquakes on unemployment. In particular, the results indicate that the impact of earthquakes during the first four years of life increases unemployment by 0.003. The impact of this type of shock is also significant for school age individuals. The impact of hurricanes is shown in column 3. For individuals in utero during a hurricane, the probability of being unemployed is 0.009. The effects of hurricanes are relevant if the individual is impacted during the first five years of life and during the transition from primary to secondary school (ages 11 to 13).

Events like landslides strongly affect the infrastructure and economic situation of the affected area. Column 4 shows that the effect on individuals is relevant during the first years of life. Moreover, the biggest impact of landslides is found when the event occurs during the in utero period, increasing unemployment in the long run by 0.009, meaning that the destruction caused by landslides affects the health status of fetuses during the shock. This effect decreases as the age of the affected individual increases.

Finally, the last column of Table 6 shows the effect of volcanoes on unemployment. The effect of these shocks is significant in the first seven years of life. For instance, an individual shocked in the first year of life suffers an increase in his probability of being unemployed in the long run by 0.015.

In Table 7, the results of the effects of natural disasters on income are presented. In order to facilitate comparison between countries, I use as dependent variables the natural logarithm of the income of each individual. In column 1, the effect of floods on income is presented. The results show that floods reduce the future income of an affected individual during the in utero period by 12.6%. This effect is lower if the individual is affected during the first year of life (5.9%). Moreover, if the individual is impacted during the preschool period and the first year of primary school (ages 3 to 6) the future income of these individuals is reduced by more than 3

Column 2 presents the results for the estimation of the effect of earthquakes on income. Although the effect of earthquakes on the future income of individuals is relevant independent of the age of the affected individual, the effect is greater for individuals affected in utero. These people suffer a reduction of their income by 22.7%, and those affected at the preschool age (4-5) suffer an income reduction of 29.3%. Furthermore, the results found for the ages mentioned above are consistent with those found for years of education.

The effects of hurricanes on income are highlighted in column 3. Individuals exposed to hurricanes in the first five years of life are found to be unaffected in their income. However, individuals affected during school age have a significant reduction of their income. Interestingly, the biggest coefficient is reported for the ages beginning primary and secondary school, making their incomes 40.6% and 49.7% lower respectively when compared to non-affected individuals.

Column 4 shows that the effects of landslides are relevant mainly when the impact is received during the in utero period. An individual shocked in utero by an landslide has an income reduction of 25.8%, while if this individual is hit during his first year of life his future income is reduced by 16.4%. In addition, this study provides evidence that shocks during school age also reduce the income of the exposed individuals.

Finally, the impact of volcanoes reduces income in several stages of life (Column 5). In particular, if an individual is shocked in utero his income is reduced by 28.7%. Additionally, impacts during school ages have strong negative effects on the future income of exposed individuals, mainly at the transition ages, at the beginning and end of primary school and at the beginning of high school.

5.4 Effects on Education and Child Labor for the Second Generation

Effects of exposure to natural disasters during childhood have long lasting effects that may affect the descendants of those that have been affected. In particular, I analyze the performance of the children of the exposed individuals in terms of years of education, disabilities and child labor. This paper does not observe an statistical difference in the probability of being disable between those with affected parents and those with non affected parents. However, my findings suggest that the second generation of individuals have less human capital accumulation and a greater probability of work before their 16 years old.

In Tables 8 and 9 I present our estimation of the intergenerational transmission of shock for affected mothers and fathers, respectively. On both tables I present an estimation of the indirect effect model, coding as the treatment group those children with parents affected by the shock. I find negative and significant effects of natural disasters on years of education for the current age on the next generation of kids with affected parents . Although the effects on the next generation are significant when either of the parents is affected, the effect of having an affected mother is significantly greater than the effect of having an affected father. These results are in line with previous literature that argues that the education of the mother is more relevant than the education of the father (Smith, 1989) when analyzing the effect on the education for the next generation.

The strongest intergenerational effect caused by floods occurs in the in utero period. The fact of having a mother affected in utero by a flood reduces the education of a child by 0.478 in comparison with other children of the same age with non-affected mothers. The effect of having a father affected during his in utero period is to reduce the years of education of the child by 0.02. In the case of earthquakes, this study found statistically and economically relevant results for the education of the next generation when parents are affected before their first three years of life. According to the results, the effect of having an affected mother is ten times greater than the effect of having an affected father.

Column 3 of Tables 8 and 9 show the effects of hurricanes on the education of the next generation. The effects are economically and statistically relevant if the mother was affected during school age (ages 5 to 12). Table 11 shows that the effects of having an affected father are statistically significant independent of his age when shocked, but the size of the effect is considerably less than the effect of having an affected mothers.

The last two columns of Tables 8 and 9 show the effect of having a mother or a father affected by an landslide or a volcano. Mothers in the affected district are found to produce the greater effect. The results show that the fact of having a mother affected by any of these shocks reduces the years of education by 0.2. Smaller reductions in the years of education for the next generation are found if mothers were shocked during their school age by either landslides or volcanoes. On the other hand, children with a father affected during school age suffer a significant but smaller reduction in the years of education.

Finally, in Table 10 and 11 I analyze the effect of the natural disasters on the child labor of the second generation. As in the case of the education results, the fact of having a father that has been affected does not have an impact on the child labor of the second generation but this is not the case when the mother is affected. The results suggest that those with mothers affected in utero by a flood, an earthquake, a landslide or a volcano, have a greater probability or work before their 16 years old. In addition, the impact of hurricanes and landslides (Columns 3 and 4) have increased the child labor of the second generation when the mother those individuals have been exposed during the school age and pre-school age, respectively.

5.5 Effects on Other Outcomes for the First Generation

Natural disasters are a multidimensional shock that can affect many dimensions of welfare apart from education, health and labor outcomes. In particular, this paper finds relevant effects for the asset accumulation and small effects for fertility and no effects migration.

In order to capture the effect of natural disasters on wealth, I generate an index using census information about assets such us rooms per capita, access to current water and ownership of the household. In Table 12 the results for our main specification are shown using the wealth index as our explicative variable in terms of the exposure of the head of household. The first column shows the effects of floods on wealth if the head of the household has been affected. In terms of wealth, the shocks are relevant if the individual is affected at school age, including preschool, primary school and the first years of high school.

This study finds significant effects of earthquakes and volcanoes on wealth for almost all ages. The main difference between these shocks is that the impact in utero is bigger for volcanos, reducing wealth by 0.98 if a head of household is affected in utero. This effect is economically relevant taking into account that the mean of the wealth index is -0.07. In the case of floods, I find a stronger effect if the individual is affected during school age.

Hurricanes and volcanoes affect the wealth of a household if the head of household has been affected during his first four years of life, with the in utero effect greater for hurricanes. The main difference between these natural disasters is that hurricanes affect wealth if the shock affects the head of household during school age, while the effect of landslides during that period is not significant after the first eight years of life.

Table 13 presents results for fertility measured the number of children of the head of the household. Although the estimations present several statistically significant results showing negative effects on the number of kids, the effects are only economically significant for earthquakes occurring in the first four years of life, by floods during the gestation period, and by landslides during school age. This effect overlaps with the effects found for years of education, suggesting that more deprived households have fewer resources to increase the family size. Although this study finds significant evidence of a negative impact on fertility, the results does not seem economically critical.

Finally, although this study finds non-significant results for migration, 7% of the exposed individuals would be misclassified in absence of the birth location information. In order to compute the gain of using birth location instead of location at the time of the survey, this paper re-estimate all the analysis using current location as a measure of exposure. My results indicate that the bias produced as a consequence of this misclassification may lead to estimations up to 14% smaller than the ones presented in the main tables of this paper.

5.6 Discussion of the impact mechanisms of natural disasters

The effects of natural disasters on the first generation may affect the lives of the descendants of those that have been exposed. This subsection finds that the negative effects experienced by the first generation lead to negative effects to the second generation.

Proper understanding of the mechanisms by which natural disasters affect the outcomes studied in this paper is crucial for developing alleviation policies that protect people during and after this kind of event. Unfortunately, the information available in the census does not allow us to answer the question entirely. Although this data is limited, the results presented suggest which mechanisms operate to affect the outcomes studied in this work.

Because of the difference in size of each type of disaster, the size of the shocks should be taken into account before arriving at any conclusion. It is possible that, independent of the type of shock experienced, large shocks affect outcomes in a bigger manner than small shocks do. In order to control for disaster size, the third model is estimated. The results presented in Table 14 show the differences in years of education across different types of natural disasters.

When controlling for the size of each disaster, the results show that the most relevant shock during the gestation period and the first two years of life is earthquakes while during school age is landslides. Both disasters are highly destructive in terms of infrastructure damage but the main difference between them is the predictability. The fact that earthquakes, the most unpredictable disaster, are relevant during early childhood, highlights the importance of the health dimension as a mechanism. In particular, this effect is greater when individuals are shocked in utero. This effect is in line with the existing literature about health shocks during gestation (Almond, 2006). On the other hand, the fact that landslides are relevant during the school age, suggests that the damage in infrastructure is another relevant channel that affect the investment in human capital of the affected children.

Another relevant dimension is the effect on asset loss as a result of disaster. According to the results, floods and earthquakes are shocks that produce asset losses. If the results were driven only by a deterioration of the economic situation of the families of affected individuals, there should not be a greater impact for those exposed in the in utero period or in the first years of life than the impact during school age. However, for both shocks, the greatest effects are present when the individual is hit during the in utero period and during early childhood. Given the existing literature about effects of malnutrition on early childhood, this result suggests that poverty generated by asset loss would affect nutrition of all children in the household, but generating greater negative effects for those affected in early childhood. Our results suggest this mechanism might have been relevant, since children affected in the first years of life and in utero are the most impacted.

Related to the transmission of the shocks to the next generation, there is a large body of literature arguing that the education of the mother is a more important determinant of the education of the children than that of the father. In fact, according to the results, the impact found on years of education for the first generation is mimicked by the effects found on years of education for the second generation. However, there may be a differential impact by gender that can explain why mothers transmit shocks in a stronger way than fathers. In order to test this, I present the results of the main outcomes by gender in Table 15.

According to the results, the impact of natural disasters on employment disabilities and on income is bigger for women, but the impact on years of education is similar for males and females (Table 15). These results suggest that the mechanism operating in the transmission of the shocks may be the deprivation of the household. Since mothers are more deprived than fathers in terms of health and income, the scarcity of resources in households with affected mothers may explain the lower education level of the children.

5.7 Robustness checks

In addition to the previous approaches using an identification strategy to compare different cohorts in different birth districts, I estimate the effects of the natural disasters using the oldest census available as a control group. This allows us to control for individual characteristics that may vary, but this variation is not related with the natural disasters. The identification in this case is driven by individuals born in the same state and of the same age, with some surveyed before and some surveyed after the natural disaster occurred. The results are consistent with the outcomes analyzed in the above sections using the same estimation strategy, suggesting that the identification strategy per se is not capturing spurious relationships.

Since some of the natural disasters are from ancient ages where the records were not as accurate as nowadays, so this paper estimates the main regressions using only natural disasters registered after 1970. As expected, the results are consistent with those results derived from all the disasters from 1900, but they show smaller coefficients because of the inclusion of affected individuals in the control group.

Finally, I estimate false experiments simulating false dates for different types of natural disasters in the affected districts and also simulating false locations for different types of natural disasters for the affected cohorts. After several simulations, I find no effects that strengthen our identification strategy or the reliability of the results.

5.8 Policy implications

In light of these results, this study focus on a key set of policy implications that may mitigate the effects of natural disasters on education, health and labor outcomes. In particular, four dimensions may be improved to prevent and alleviate the negative impact of natural disasters.

First, every natural disaster is different. There is no a recipe for alleviate the effects of all the natural disaster. As I show in this work, different type of disasters affect different types of outcomes and have relevant effects on different stages of childhood. For that reason, there is no an unique contingency plan for natural disasters. Each prevention and alleviation plan should depend on the type and size of the disaster.

Second, information plays an important role. The predictability of certain types of natural disasters allow policy makers to take preventive policies and avoid the impacts related to health. Thus, the improvement of the alert and information systems is presented as an effective prevention policy. The improvement of the predictability of these kind of shocks will concede individuals the opportunity to evacuate the affected areas.

Third, the cost-benefit evaluation of any alleviation policy should take into account the hidden cost of the intergenerational transmission of the shocks. Natural disasters do not only affect the first generation of exposed individuals but also the second generation of individuals. Moreover, the effect is transmitted to the next generation if the mother has been exposed highlighting the importance of targeting the alleviation policies mainly on females.

Finally, the targeting of the alleviation policies should be very specific. Based on our estimations, the main focus of the alleviation policies should be pregnant women, and children on their first years of life and school age, depending on the type of disaster.

5.9 The Cost of Climate Change

Over the last 20 years there have been a controversy about the real cost of climate change. In particular, traditional studies predict that the frequency of the hurricanes and floods would increase approximately by 50% (Webster and Holland, 2005 and Walsh et al., 2013) in the next years. This study is able to provide an estimation of the expected increase in the frequency of hurricanes and floods.

An individual in Latino America has 4% and 9% of being affected by a hurricane or a flood at least, respectively. According to my estimations, an individual that it is hit by a hurricane lose on average 0.10 years of education, increase the probability of being disable in 3.3% and reduce the future income in 41.5% while an individual that it is hit by a flood lose on average 0.16 years of education, increase the probability of being disable in 0.5% and reduce the future income in 3.1%.

Supposing an the increase of 50% in terms of frequency of floods and hurricanes, that increase would represent an average loss of 0.13 years of education, an increase of the probability of being disable of 1.9% and a decrease of 22.3% of potential income for the first generation in addition to the cost to the next generation that would represent an additional loss of 0.08 in terms of years of education.

6 Conclusion

This study evaluated and estimated the effect of natural disasters in a variety of dimensions including education, health, income, employment, fertility and wealth and their intergenerational transmission. To conduct this research all the disasters occurring from 1900 to 2000 in Latin America were analyzed. As such, this is the first paper to measure the welfare impacts of all the natural disasters registered in one continent. I find that the results obtained from simple case studies have questionable external validity since there are relevant differences of results compared with results obtained from analyzing all disasters available.

This study finds that natural disasters affect the education, health, labor outcomes and wealth of the individuals exposed. To identify these effects, I exploit the exogenous variation in the location and timing of natural disasters, as well as the exposure of different cohorts to the shock. This study finds that the effect of natural disasters differs depending on the type, size and age of the affected individual. Our main results indicate that the most fragile period for any individual to receive this kind of shock is the first years of life as well as school age. Furthermore, I find that shocks related with health are especially disastrous for education, fertility, unemployment and income. Hurricanes strongly affect the probability of suffering an employment disability and also a decrease in the future income of affected individuals. On the other hand, volcanos are found to produce a large impact on income and wealth. Our analysis of the intergenerational transmission of the shocks shows that mothers exposed to shocks are more likely to affect their children's education than fathers' exposure. Finally, our robustness check shows that the results described in this study are robust to the usage of measures of the intensity of the natural disasters.

A critical reason for studying the impact of natural disasters on welfare outcomes is the lack of measures of their full and true impact. This is necessary in order to guide the elaboration, design and targeting of alleviation policies. This study may be useful and worthy for governments and policy makers in a variety of ways. First, this study identifies the individuals most vulnerable to natural disaster exposure. Based on our estimations, the main focus of alleviation policies should be pregnant women, children in their first years of life and school age. According to our estimations, the cost of any intervention should take into account that the average negative effect on income for someone affected in utero is 14% and also the hidden cost on the human capital accumulation and the child labor of next generation.

The results in this paper contribute to a growing literature that estimates the welfare impacts of natural disasters. This approach generalize the impact of different types of disasters avoids dealing with selected samples, strengthens our confidence in the results and confirms that natural disasters negatively affect individuals in their childhood and their descendants. The findings in this study also benefit the knowledge of a broader issue, the long-term growth and development consequences of natural disasters. Since I have shown the long-term effects of these shocks during childhood, the effects of natural disasters may be overcome with well-targeted and flexible social plans such as conditional cash transfers to support the exposed population.

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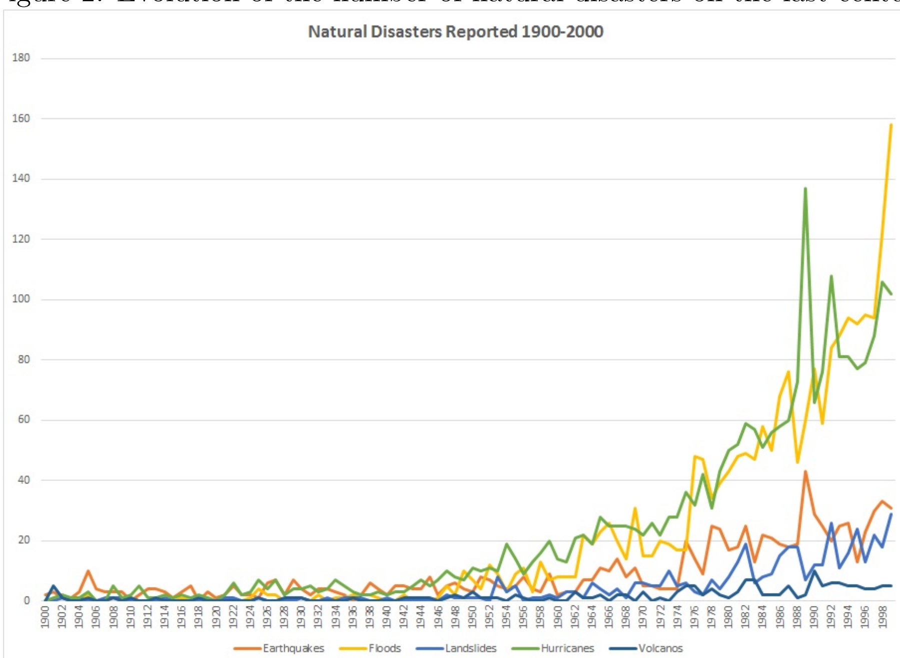
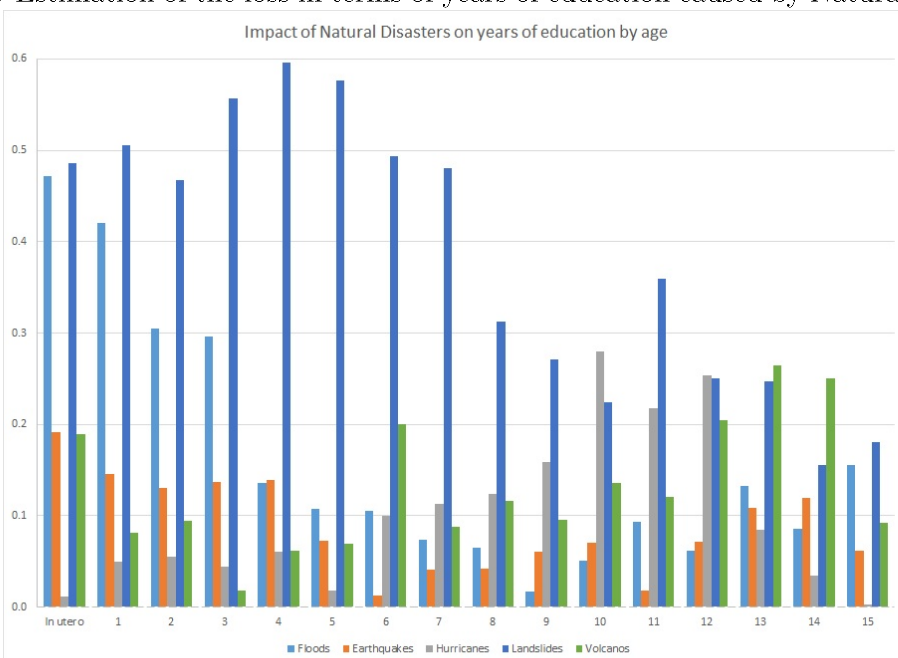
Figure 1: Countries included in the database

Figure 2: Evolution of the number of natural disasters on the last century



Data source: EM-DAT.

Figure 3: Estimation of the loss in terms of years of education caused by Natural Disasters



Notes: Own estimations of the absolute value of the loss in terms of years of education based on Table 4.

Table 1: Disasters Characteristic

Variables	Number of Shocks	Mean	Standard Deviation
Floods	**419**		
People Killed		158	1,701
Affected		127,160	546,226
Damage in millon dollars		168	442
Earthquakes	**177**		
Killed		1,231	6,313
Affected		149,431	485,488
Damage in millon dollars		265	631
Hurricanes	**190**		
Killed		158	550
Affected		113,129	286,959
Damage in millon dollars		243	657
Landslides	**124**		
Killed		144	496
Affected		92,600	535,355
Damage in millon dollars		212	330
Volcanos	**44**		
Killed		1,510	5,421
Affected		35,440	71,027
Damage in millon dollars		163	343
Total	**954**		
Killed		397	3,155
Affected		121,145	477,746
Damage in millon dollars		212	548

Notes: This table contains all the natural disasters included in this study. In particular, this study includes all the natural disasters occurred during the 20th century in Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Haiti, Jamaica, Mexico Nicaragua, Panama, Peru, Uruguay and Venezuela. Data source: EM-DAT and DESINVENTAR

Table 2: Balance Between Affected and Non-Affected Districts

Variables	Affected district (1)	Control district (2)	Mean Difference (3)
Panel A: Adult Characteristics			
Y of Education	7.126	6.588	0.538*
	(0.239)	(0.193)	(0.307)
Employment Disabilities	0.020	0.024	-0.004***
	(0.001)	(0.001)	(0.002)
Fertility (Number of kids)	1.699	1.763	-0.063
	(0.035)	(0.044)	(0.057)
Unemployment	0.094	0.089	0.006
	(0.009)	(0.007)	(0.011)
Per capita annual Income in US Dollars	3180	3700	-514
	(420)	(269)	(420)
Panel B: Household Characteristics			
Wealth index	0.041	-0.178	0.219**
	(0.074)	(0.056)	(0.093)
Asset Poverty	0.825	0.846	-0.022
	(0.018)	(0.015)	(0.024)
Land Ownership	0.751	0.735	0.016
	(0.011)	(0.014)	(0.018)
Access to Current Water	0.176	0.092	0.084***
	(0.035)	(0.034)	(0.049)
Access to Electricity	0.917	0.857	0.059***
	(0.008)	(0.017)	(0.019)
Panel C: Child Characteristics			
Y of Education for kids 5 to 20	8.887	8.007	0.880***
	(0.176)	(0.240)	(0.297)
Y of Education for kids 15 to 20	9.116	8.649	0.467
	(0.543)	(0.153)	(0.564)
Enrollment for kids 5 to 20	0.294	0.311	-0.016
	(0.013)	(0.011)	(0.018)
Child Labor for kids 5 to 15	0.203	0.198	0.005
	(0.024)	(0.026)	(0.036)

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The adults characteristics include all the individuals older than 20 years old while the child characteristics include all the individuals younger than 21 years old. Data source: Last available National Censuses

Table 3: Biased Effects on Year of Education of Generalizing Cases Studies

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Years of Education				
Exposed in utero	-0.272***	-0.193***	-0.354**	-0.128***	-0.405**
	(0.068)	(0.038)	(0.151)	(0.043)	(0.179)
Exposed at age 0-1	-0.271***	-0.202***	-0.432***	-0.079**	-0.007
	(0.068)	(0.036)	(0.143)	(0.042)	(0.178)
Exposed at age 1-2	-0.181***	-0.031	-0.121	-0.014	-0.165
	(0.068)	(0.037)	(0.144)	(0.043)	(0.178)
Exposed at age 2-3	-0.252***	-0.015	-0.347**	0.026	-0.067
	(0.070)	(0.039)	(0.153)	(0.043)	(0.175)
Exposed at age 3-4	-0.168**	-0.073	-0.291**	0.005	-0.050
	(0.068)	(0.057)	(0.145)	(0.044)	(0.173)
Exposed at age 4-5	-0.188***	-0.034	-0.249	0.020	-0.170
	(0.071)	(0.119)	(0.160)	(0.045)	(0.209)
Exposed at age 5-6	0.076	0.005	-0.274*	0.010	-0.106
	(0.069)	(0.095)	(0.152)	(0.043)	(0.183)
Exposed at age 6-7	0.058	0.130	-0.422**	0.163	-0.101
	(0.070)	(0.129)	(0.182)	(0.106)	(0.193)
Exposed at age 7-8	0.085	0.113	-0.044	-0.061	-0.682
	(0.069)	(0.086)	(0.157)	(0.056)	(0.211)
Exposed at age 8-9	-0.025	0.081	-0.291	-0.077	-0.076
	(0.067)	(0.142)	(0.185)	(0.105)	(0.229)
Exposed at age 9-10	-0.021	0.016	0.076	0.029	-0.372*
	(0.066)	(0.118)	(0.193)	(0.105)	(0.217)
Exposed at age 10-11	0.068	-0.014	0.179	0.139	-0.165
	(0.066)	(0.114)	(0.139)	(0.105)	(0.224)
Exposed at age 11-12	-0.003	-0.031	0.197	0.009	-0.042
	(0.068)	(0.036)	(0.122)	(0.043)	(0.216)
Exposed at age 12-13	0.080	-0.041	0.199	0.719	-0.137
	(0.066)	(0.035)	(0.147)	(0.662)	(0.226)
Exposed at age 13-14	0.061	-0.043	0.125	-0.046	-0.313
	(0.069)	(0.052)	(0.140)	(0.103)	(0.203)
Exposed at age 14-15	0.366	0.032	0.205	0.059	-0.770***
	(0.415)	(0.108)	(0.149)	(0.103)	(0.273)
Observations	2,282,648	1,628,660	6,780,584	5,885,309	220,062

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. The regressions presented in this table are cases studies selected in order to show the how the generalization of these results can lead to inconsistent conclusions when they are compared with a greater number of shocks. The cases studies selected includes a flood in Argentina in 1967, an earthquake in Peru in 1970, a hurricane in Mexico in 1976, a landslide in Brazil in 1966 and a volcano in Costa Rica in 1963. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 4: Effects of Natural Disasters on Years of Education

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Years of Education				
Exposed in utero	-0.472***	-0.191***	-0.012	-0.486***	-0.189**
	(0.016)	(0.012)	(0.033)	(0.039)	(0.082)
Exposed at age 0-1	-0.420***	-0.146***	0.050	-0.506***	0.081
	(0.016)	(0.012)	(0.034)	(0.039)	(0.055)
Exposed at age 1-2	-0.305***	-0.130***	-0.055*	-0.467***	-0.094*
	(0.015)	(0.012)	(0.032)	(0.039)	(0.054)
Exposed at age 2-3	-0.296***	-0.137***	0.045	-0.557***	0.018
	(0.021)	(0.015)	(0.034)	(0.044)	(0.071)
Exposed at age 3-4	-0.136***	-0.139***	0.061	-0.596***	0.061
	(0.020)	(0.015)	(0.033)	(0.045)	(0.069)
Exposed at age 4-5	-0.107***	-0.073***	0.018	-0.576***	-0.069
	(0.021)	(0.015)	(0.032)	(0.046)	(0.077)
Exposed at age 5-6	-0.105***	0.013	-0.100***	-0.494***	-0.200***
	(0.021)	(0.016)	(0.037)	(0.046)	(0.058)
Exposed at age 6-7	-0.074***	-0.041***	-0.113***	-0.480***	0.088
	(0.021)	(0.016)	(0.037)	(0.047)	(0.058)
Exposed at age 7-8	-0.065***	-0.042***	-0.124***	-0.313***	-0.116**
	(0.017)	(0.014)	(0.037)	(0.041)	(0.059)
Exposed at age 8-9	-0.018	-0.060***	-0.159***	-0.271***	-0.095*
	(0.017)	(0.014)	(0.038)	(0.043)	(0.055)
Exposed at age 9-10	-0.051***	-0.070***	-0.280***	-0.224***	0.136
	(0.017)	(0.014)	(0.034)	(0.043)	(0.093)
Exposed at age 10-11	-0.093***	-0.018	-0.218***	-0.359***	-0.121**
	(0.018)	(0.014)	(0.033)	(0.044)	(0.060)
Exposed at age 11-12	-0.062***	-0.071***	-0.254***	-0.250***	-0.204***
	(0.018)	(0.014)	(0.035)	(0.045)	(0.063)
Exposed at age 12-13	-0.132***	-0.109***	-0.084**	-0.247***	-0.264***
	(0.017)	(0.013)	(0.037)	(0.029)	(0.051)
Exposed at age 13-14	-0.086***	-0.119***	-0.034	-0.155***	-0.250***
	(0.016)	(0.013)	(0.037)	(0.030)	(0.050)
Exposed at age 14-15	-0.155***	-0.062***	-0.004	-0.181***	-0.093
	(0.017)	(0.015)	(0.037)	(0.048)	(0.092)
Observations	24,079,057	24,079,057	24,079,057	24,079,057	24,079,057

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 5: Effects of Natural Disasters on Employment Disabilities

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Probability of suffering an employment disability				
Exposed in utero	0.006***	0.011***	0.030***	0.007***	0.008***
	(0.001)	(0.001)	(0.003)	(0.001)	(0.002)
Exposed at age 0-1	0.004***	0.011***	0.030***	0.008***	0.011***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)
Exposed at age 1-2	0.007***	0.011***	0.043***	0.011***	0.007***
	(0.001)	(0.001)	(0.006)	(0.001)	(0.002)
Exposed at age 2-3	0.004***	0.008***	0.020***	0.007***	0.007***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.002)
Exposed at age 3-4	0.006***	0.007***	0.025***	0.006***	0.007***
	(0.001)	(0.001)	(0.006)	(0.001)	(0.002)
Exposed at age 4-5	0.006***	0.012***	0.015***	0.008***	0.011***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)
Exposed at age 5-6	0.006***	0.007***	0.041***	0.007***	0.010***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)
Exposed at age 6-7	0.000***	0.007***	0.044***	0.005***	0.010***
	(0.000)	(0.001)	(0.007)	(0.001)	(0.002)
Exposed at age 7-8	0.006***	0.012***	0.035***	0.008***	0.010***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.002)
Exposed at age 8-9	0.005***	0.005***	0.037***	0.007***	0.009***
	(0.001)	(0.001)	(0.003)	(0.001)	(0.002)
Exposed at age 9-10	0.005***	0.005***	0.025***	0.006***	0.012***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.002)
Exposed at age 10-11	0.005***	0.005***	0.043***	0.008***	0.009***
	(0.001)	(0.001)	(0.007)	(0.001)	(0.002)
Exposed at age 11-12	0.004***	0.008***	-0.066	0.009***	0.007***
	(0.001)	(0.001)	(0.080)	(0.001)	(0.002)
Exposed at age 12-13	0.006***	0.006***	0.030***	0.007***	0.010***
	(0.001)	(0.001)	(0.008)	(0.001)	(0.002)
Exposed at age 13-14	0.003***	0.003**	0.027***	0.007***	0.006***
	(0.001)	(0.001)	(0.008)	(0.001)	(0.002)
Exposed at age 14-15	0.001	0.005***	0.010	0.009***	0.007***
	(0.001)	(0.001)	(0.007)	(0.001)	(0.002)
Observations	15,136,357	15,136,357	15,136,357	15,136,357	15,136,357

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. Employment Disabilities indicates if the respondent was economically inactive because of disabilities. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 6: Effects of Natural Disasters on Unemployment

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Probability of being unemployed				
Exposed in utero	0.009***	0.003***	0.009**	0.009***	-0.006
	(0.001)	(0.001)	(0.004)	(0.002)	(0.004)
Exposed at age 0-1	0.007***	0.002*	-0.001	0.008***	0.015***
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 1-2	0.005***	0.002**	0.007**	0.006***	0.010***
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 2-3	0.003***	0.004***	0.015***	0.004**	0.017***
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 3-4	0.003***	0.004***	0.009***	0.003*	0.017***
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Exposed at age 4-5	0.002**	-0.001	0.010***	-0.002	0.012***
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Exposed at age 5-6	0.001	0.001	-0.005	-0.001	0.009***
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 6-7	0.000	0.001	-0.006	-0.001	0.005*
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 7-8	0.001	0.001	0.007*	0.006***	-0.004
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 8-9	0.001	0.003***	0.002	-0.001	-0.001
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 9-10	0.001	0.005***	-0.004	-0.001	0.004
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Exposed at age 10-11	0.001	0.003***	-0.001	0.004**	-0.003
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Exposed at age 11-12	0.002**	0.003***	0.007*	0.000	-0.002
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 12-13	0.002*	0.004***	0.009**	0.004**	-0.001
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 13-14	0.003***	0.004***	-0.002	-0.002	-0.001
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Exposed at age 14-15	0.001	0.002**	-0.003	-0.001	0.002
	(0.001)	(0.001)	(0.004)	(0.002)	(0.003)
Observations	13,965,247	13,965,247	13,965,247	13,965,247	13,965,247

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 7: Effects of Natural Disasters on Income

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:			Ln(Income)		
Exposed in utero	-0.126***	-0.227***	-0.489	-0.258***	-0.287**
	(0.018)	(0.030)	(0.354)	(0.045)	(0.122)
Exposed at age 0-1	-0.059***	-0.132***	-0.501	-0.164***	0.024
	(0.018)	(0.031)	(0.354)	(0.045)	(0.108)
Exposed at age 1-2	-0.028	-0.119***	-0.496	-0.056	-0.330***
	(0.018)	(0.030)	(0.354)	(0.046)	(0.120)
Exposed at age 2-3	-0.028	-0.099***	-0.504	0.058	0.070
	(0.018)	(0.030)	(0.354)	(0.046)	(0.127)
Exposed at age 3-4	-0.035*	-0.057*	-0.497	-0.021	-0.238*
	(0.018)	(0.031)	(0.354)	(0.046)	(0.125)
Exposed at age 4-5	-0.035*	-0.293***	-0.517	-0.011	0.141
	(0.018)	(0.029)	(0.354)	(0.047)	(0.139)
Exposed at age 5-6	-0.039**	-0.046	-0.406***	-0.066	0.082
	(0.018)	(0.033)	(0.032)	(0.047)	(0.144)
Exposed at age 6-7	0.007	-0.014	-0.331***	-0.080*	-0.396**
	(0.018)	(0.030)	(0.036)	(0.047)	(0.161)
Exposed at age 7-8	-0.016	-0.125***	-0.399***	-0.082*	-0.297*
	(0.018)	(0.031)	(0.038)	(0.048)	(0.170)
Exposed at age 8-9	-0.003	-0.088***	-0.337***	-0.081*	0.140
	(0.018)	(0.031)	(0.054)	(0.048)	(0.141)
Exposed at age 9-10	0.001	-0.085***	-0.331***	0.027	-0.449*
	(0.019)	(0.030)	(0.070)	(0.049)	(0.237)
Exposed at age 10-11	-0.025	-0.073**	-0.278***	-0.148***	-0.519***
	(0.019)	(0.030)	(0.078)	(0.050)	(0.185)
Exposed at age 11-12	-0.020	-0.085***	-0.358***	-0.015	0.158
	(0.019)	(0.031)	(0.050)	(0.051)	(0.210)
Exposed at age 12-13	-0.034*	-0.117***	-0.497***	-0.046	0.222
	(0.020)	(0.030)	(0.027)	(0.052)	(0.224)
Exposed at age 13-14	-0.024	-0.088***	-0.330***	-0.096*	-0.484**
	(0.020)	(0.032)	(0.052)	(0.053)	(0.232)
Exposed at age 14-15	0.012	-0.141***	-0.361***	-0.095*	0.223
	(0.020)	(0.030)	(0.047)	(0.050)	(0.262)
Observations	9,973,728	9,973,728	9,973,728	9,973,728	9,973,728

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 8: Effects of Having a Mother Hit by Natural Disasters on Years of Education

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Years of education				
Mother's Exposure in utero	-0.478***	-0.193***	-0.076	0.039	-0.086
	(0.017)	(0.013)	(0.047)	(0.057)	(0.154)
Mother's Exposure at age 0-1	-0.090***	-0.230***	-0.063***	-0.203***	-0.212**
	(0.005)	(0.010)	(0.005)	(0.018)	(0.094)
Mother's Exposure at age 1-2	-0.101***	-0.184***	-0.049***	-0.086**	-0.226
	(0.004)	(0.011)	(0.004)	(0.044)	(0.162)
Mother's Exposure at age 2-3	-0.094***	-0.139***	-0.044***	-0.093**	-0.024
	(0.004)	(0.011)	(0.004)	(0.044)	(0.206)
Mother's Exposure at age 3-4	-0.100***	-0.011**	-0.040***	-0.053*	-0.047
	(0.004)	(0.005)	(0.002)	(0.032)	(0.035)
Mother's Exposure at age 4-5	-0.048***	0.008	-0.108***	-0.158***	-0.096***
	(0.004)	(0.008)	(0.007)	(0.014)	(0.031)
Mother's Exposure at age 5-6	-0.105***	-0.064***	-0.295***	-0.100***	0.058
	(0.004)	(0.008)	(0.015)	(0.028)	(0.037)
Mother's Exposure at age 6-7	-0.022***	-0.012***	0.002	-0.123***	0.064
	(0.001)	(0.004)	(0.001)	(0.029)	(0.040)
Mother's Exposure at age 7-8	-0.077***	-0.014***	-0.178***	-0.024	0.013
	(0.004)	(0.004)	(0.015)	(0.023)	(0.040)
Mother's Exposure at age 8-9	-0.073***	-0.016***	-0.038***	-0.090***	-0.127***
	(0.004)	(0.004)	(0.013)	(0.013)	(0.026)
Mother's Exposure at age 9-10	-0.078***	0.005	-0.736***	-0.052**	-0.061
	(0.005)	(0.003)	(0.173)	(0.022)	(0.211)
Mother's Exposure at age 10-11	-0.028***	-0.016***	-0.120	-0.016	-0.110**
	(0.004)	(0.004)	(0.082)	(0.024)	(0.043)
Mother's Exposure at age 11-12	-0.007	-0.060***	-0.454***	-0.103***	0.183
	(0.004)	(0.004)	(0.087)	(0.025)	(0.355)
Mother's Exposure at age 12-13	-0.056***	-0.002***	-0.008	0.079***	-0.094***
	(0.004)	(0.000)	(0.011)	(0.013)	(0.029)
Mother's Exposure at age 13-14	-0.002	-0.002***	0.006	-0.029*	-0.021
	(0.004)	(0.000)	(0.008)	(0.016)	(0.025)
Mother's Exposure at age 14-15	-0.023**	-0.002***	-0.051*	-0.085***	0.174
	(0.009)	(0.000)	(0.030)	(0.026)	(0.239)
Observations	9,570,450	9,570,450	9,570,450	9,570,450	9,570,450

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 5 and younger than 20 years old. Data source: Last available National Censuses.

Table 9: Effects of Having a Father Hit by Natural Disasters on Years of Education

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:	Years of education				
Father's Exposure in utero	-0.020***	-0.017***	-0.053***	-0.004**	-0.007*
	(0.001)	(0.001)	(0.003)	(0.001)	(0.004)
Father's Exposure at age 0-1	-0.019***	-0.014***	-0.053***	0.000	-0.009**
	(0.001)	(0.001)	(0.003)	(0.002)	(0.004)
Father's Exposure at age 1-2	-0.011***	-0.012***	-0.056***	-0.003**	0.004
	(0.001)	(0.001)	(0.003)	(0.001)	(0.004)
Father's Exposure at age 2-3	-0.010***	-0.007***	-0.057***	0.002	-0.005
	(0.001)	(0.001)	(0.002)	(0.001)	(0.004)
Father's Exposure at age 3-4	-0.010***	-0.006***	-0.052***	-0.002*	-0.011***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.004)
Father's Exposure at age 4-5	-0.013***	-0.003***	-0.061***	-0.002	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 5-6	-0.009***	-0.003***	-0.041***	-0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 6-7	-0.012***	0.000	-0.036***	-0.004***	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 7-8	-0.004***	-0.002**	-0.033***	-0.006***	-0.017***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 8-9	-0.002***	-0.002***	-0.027***	-0.011***	-0.009***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 9-10	-0.009***	0.002***	-0.032***	-0.012***	-0.007**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 10-11	-0.008***	-0.001	-0.021***	-0.008***	-0.009***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 11-12	-0.006***	0.001	-0.023***	-0.009***	-0.014***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 12-13	-0.007***	0.002***	-0.022***	-0.012***	-0.008***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 13-14	-0.003***	0.005***	-0.016***	-0.004***	-0.010***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Father's Exposure at age 14-15	-0.006***	0.005***	-0.015***	-0.014***	-0.005*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Observations	9,570,450	9,570,450	9,570,450	9,570,450	9,570,450

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 5 and younger than 20 years old. Data source: Last available National Censuses.

Table 10: Effects of Having a Mother Hit by Natural Disasters on Child Labor

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:			Child Labor		
Mother's Exposure in utero	0.012***	0.009*	0.039	0.036*	0.076*
	(0.005)	(0.005)	(0.028)	(0.021)	(0.039)
Mother's Exposure at age 0-1	-0.004	0.004	0.042	0.008	0.014
	(0.005)	(0.007)	(0.042)	(0.012)	(0.024)
Mother's Exposure at age 1-2	0.005	0.000	0.008	-0.015	-0.019
	(0.005)	(0.007)	(0.034)	(0.011)	(0.024)
Mother's Exposure at age 2-3	-0.006	0.005	-0.010	0.018*	-0.009
	(0.005)	(0.007)	(0.029)	(0.011)	(0.024)
Mother's Exposure at age 3-4	-0.004	0.010	0.063**	0.006	0.026
	(0.004)	(0.007)	(0.028)	(0.010)	(0.025)
Mother's Exposure at age 4-5	-0.004	0.007	0.031	0.021**	0.015
	(0.004)	(0.007)	(0.020)	(0.009)	(0.024)
Mother's Exposure at age 5-6	-0.004	0.007	-0.009	-0.001	0.014
	(0.004)	(0.006)	(0.020)	(0.009)	(0.023)
Mother's Exposure at age 6-7	0.004	0.008	0.034*	0.024***	0.002
	(0.004)	(0.006)	(0.018)	(0.009)	(0.022)
Mother's Exposure at age 7-8	-0.007	-0.001	0.051***	0.010	0.011
	(0.005)	(0.006)	(0.016)	(0.008)	(0.023)
Mother's Exposure at age 8-9	0.002	-0.001	0.058***	-0.003	0.020
	(0.004)	(0.006)	(0.016)	(0.008)	(0.026)
Mother's Exposure at age 9-10	-0.008	0.010	0.062***	-0.006	0.012
	(0.005)	(0.006)	(0.014)	(0.008)	(0.022)
Mother's Exposure at age 10-11	-0.007	-0.005	0.016	0.003	-0.018
	(0.005)	(0.004)	(0.013)	(0.008)	(0.021)
Mother's Exposure at age 11-12	0.001	0.009	0.043***	0.012	0.008
	(0.004)	(0.006)	(0.014)	(0.007)	(0.021)
Mother's Exposure at age 12-13	-0.002	-0.005	0.024*	-0.009	0.006
	(0.004)	(0.006)	(0.013)	(0.007)	(0.020)
Mother's Exposure at age 13-14	-0.003	0.004	-0.001	0.004	0.005
	(0.004)	(0.006)	(0.013)	(0.007)	(0.019)
Mother's Exposure at age 14-15	-0.004	0.006	0.000	0.006	-0.003
	(0.004)	(0.007)	(0.013)	(0.007)	(0.019)
Observations	528,790	528,790	528,790	528,790	528,790

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals younger than 16 years old. Data source: Last available National Censuses.

Table 11: Effects of Having a Father Hit by Natural Disasters on Child Labor

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:			Child Labor		
Father's Exposure in utero	-0.003	0.004	-0.014	0.030	-0.011
	(0.008)	(0.010)	(0.034)	(0.026)	(0.046)
Father's Exposure at age 0-1	0.005	0.010	0.045	-0.021	0.054
	(0.007)	(0.009)	(0.045)	(0.025)	(0.045)
Father's Exposure at age 1-2	-0.008	0.011	-0.025	-0.023	-0.017
	(0.007)	(0.009)	(0.044)	(0.024)	(0.036)
Father's Exposure at age 2-3	0.001	0.003	0.015	-0.011	0.007
	(0.006)	(0.009)	(0.051)	(0.018)	(0.043)
Father's Exposure at age 3-4	-0.004	0.006	0.014	-0.001	-0.019
	(0.006)	(0.008)	(0.045)	(0.021)	(0.038)
Father's Exposure at age 4-5	0.007	-0.003	0.029	0.018	0.030
	(0.005)	(0.008)	(0.028)	(0.019)	(0.041)
Father's Exposure at age 5-6	0.000	0.007	-0.038	0.004	-0.055
	(0.005)	(0.008)	(0.046)	(0.018)	(0.039)
Father's Exposure at age 6-7	0.004	0.005	0.005	0.030	0.020
	(0.005)	(0.008)	(0.038)	(0.019)	(0.036)
Father's Exposure at age 7-8	-0.004	0.008	0.035	0.010	0.004
	(0.005)	(0.008)	(0.036)	(0.017)	(0.023)
Father's Exposure at age 8-9	-0.005	0.007	-0.039	0.025	0.024
	(0.005)	(0.007)	(0.037)	(0.016)	(0.038)
Father's Exposure at age 9-10	-0.003	0.003	0.021	-0.002	-0.026
	(0.005)	(0.005)	(0.030)	(0.015)	(0.035)
Father's Exposure at age 10-11	-0.006	0.006	-0.035	0.007	-0.017
	(0.005)	(0.007)	(0.029)	(0.015)	(0.042)
Father's Exposure at age 11-12	-0.000	0.006	0.005	0.005	0.045
	(0.005)	(0.007)	(0.030)	(0.009)	(0.037)
Father's Exposure at age 12-13	0.003	0.007	-0.043	-0.020	-0.029
	(0.005)	(0.007)	(0.033)	(0.014)	(0.034)
Father's Exposure at age 13-14	0.000	0.008	-0.033	-0.002	-0.042
	(0.004)	(0.007)	(0.031)	(0.014)	(0.033)
Father's Exposure at age 14-15	-0.000	0.007	0.003	0.005	-0.039
	(0.004)	(0.007)	(0.015)	(0.008)	(0.033)
Observations	528,790	528,790	528,790	528,790	528,790

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals younger than 16 years old. Data source: Last available National Censuses.

Table 12: Effects of Natural Disasters on Wealth

	(1) Floods	(2) Earthquakes	(3) Hurricanes	(4) Landslides	(5) Volcanos
Dependent Variable:			Wealth index		
Exposed in utero	-0.006	-0.071***	-0.054***	-0.036***	-0.098***
	(0.004)	(0.004)	(0.014)	(0.009)	(0.020)
Exposed at age 0-1	0.001	-0.063***	-0.016	-0.008	-0.107***
	(0.004)	(0.004)	(0.014)	(0.009)	(0.017)
Exposed at age 1-2	-0.003	-0.063***	-0.072***	-0.015	-0.110***
	(0.004)	(0.004)	(0.012)	(0.009)	(0.016)
Exposed at age 2-3	-0.008**	-0.053***	-0.069***	-0.019**	-0.121***
	(0.004)	(0.004)	(0.013)	(0.009)	(0.016)
Exposed at age 3-4	-0.008**	-0.052***	-0.050***	-0.021**	-0.110***
	(0.004)	(0.004)	(0.012)	(0.009)	(0.015)
Exposed at age 4-5	-0.001	-0.037***	-0.012	0.000	-0.093***
	(0.004)	(0.004)	(0.011)	(0.009)	(0.017)
Exposed at age 5-6	-0.006*	-0.047***	-0.018	-0.039***	-0.092***
	(0.004)	(0.004)	(0.013)	(0.008)	(0.016)
Exposed at age 6-7	-0.003	-0.028***	-0.043***	-0.016*	-0.094***
	(0.003)	(0.004)	(0.013)	(0.008)	(0.016)
Exposed at age 7-8	-0.008**	-0.015***	-0.034***	-0.025***	-0.083***
	(0.003)	(0.004)	(0.012)	(0.008)	(0.016)
Exposed at age 8-9	-0.008**	-0.025***	-0.039***	-0.007	-0.103***
	(0.003)	(0.004)	(0.013)	(0.008)	(0.015)
Exposed at age 9-10	-0.003	-0.016***	-0.040***	0.002	-0.085***
	(0.003)	(0.004)	(0.011)	(0.008)	(0.017)
Exposed at age 10-11	-0.006*	-0.016***	-0.049***	-0.009	-0.096***
	(0.004)	(0.004)	(0.011)	(0.008)	(0.016)
Exposed at age 11-12	0.003	-0.017***	-0.078***	0.012	-0.098***
	(0.004)	(0.004)	(0.011)	(0.009)	(0.015)
Exposed at age 12-13	-0.007*	-0.006	-0.036***	-0.002	-0.081***
	(0.004)	(0.004)	(0.012)	(0.009)	(0.016)
Exposed at age 13-14	-0.010***	-0.012***	-0.054***	0.006	-0.088***
	(0.004)	(0.004)	(0.012)	(0.009)	(0.015)
Exposed at age 14-15	-0.001	0.002	-0.038***	-0.021**	-0.035**
	(0.004)	(0.004)	(0.012)	(0.009)	(0.016)
Observations	10,409,323	10,409,323	10,409,323	10,409,323	10,409,323

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 13: Effects of Natural Disasters on the Number of Kids of the Head of Household

	(1)	(2)	(3)	(4)	(5)
	Floods	Earthquakes	Hurricanes	Landslides	Volcanos
Dependent Variable:	Number of Kids of the Head of Household				
Exposed in utero	-0.083***	-0.099***	0.011	-0.072***	0.025
	(0.005)	(0.006)	(0.020)	(0.011)	(0.026)
Exposed at age 0-1	-0.065***	-0.126***	-0.023	-0.047***	0.014
	(0.005)	(0.006)	(0.018)	(0.011)	(0.022)
Exposed at age 1-2	-0.048***	-0.103***	-0.035**	-0.068***	-0.043**
	(0.005)	(0.006)	(0.018)	(0.011)	(0.021)
Exposed at age 2-3	-0.049***	-0.103***	0.011	-0.057***	-0.061***
	(0.005)	(0.006)	(0.018)	(0.011)	(0.021)
Exposed at age 3-4	-0.041***	-0.105***	-0.028*	-0.076***	-0.033*
	(0.005)	(0.006)	(0.017)	(0.011)	(0.020)
Exposed at age 4-5	-0.054***	-0.080***	-0.014	-0.103***	-0.054**
	(0.005)	(0.006)	(0.017)	(0.011)	(0.021)
Exposed at age 5-6	-0.041***	-0.075***	-0.041**	-0.081***	-0.042**
	(0.005)	(0.006)	(0.020)	(0.011)	(0.021)
Exposed at age 6-7	-0.043***	-0.078***	-0.022	-0.101***	-0.077***
	(0.005)	(0.006)	(0.019)	(0.011)	(0.020)
Exposed at age 7-8	-0.031***	-0.114***	-0.043**	-0.093***	0.032
	(0.005)	(0.006)	(0.020)	(0.011)	(0.020)
Exposed at age 8-9	-0.034***	-0.074***	-0.014	-0.112***	0.028
	(0.005)	(0.006)	(0.020)	(0.011)	(0.018)
Exposed at age 9-10	-0.038***	-0.062***	-0.031*	-0.114***	-0.087***
	(0.005)	(0.006)	(0.017)	(0.011)	(0.022)
Exposed at age 10-11	-0.034***	-0.064***	0.007	-0.114***	0.016
	(0.006)	(0.006)	(0.017)	(0.012)	(0.020)
Exposed at age 11-12	-0.031***	-0.056***	-0.033*	-0.118***	-0.053***
	(0.006)	(0.006)	(0.018)	(0.012)	(0.021)
Exposed at age 12-13	-0.030***	-0.066***	0.025	-0.091***	0.012
	(0.006)	(0.006)	(0.019)	(0.012)	(0.021)
Exposed at age 13-14	-0.022***	-0.048***	0.013	-0.111***	-0.009
	(0.006)	(0.007)	(0.019)	(0.012)	(0.020)
Exposed at age 14-15	-0.033***	-0.069***	0.014	-0.146***	-0.052**
	(0.006)	(0.007)	(0.020)	(0.012)	(0.022)
Observations	10,543,282	10,543,282	10,543,282	10,543,282	10,543,282

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 14: Effects of Natural Disasters on Years of Education Standardized by the Number of Hit Individuals

	(1)	(2)	(3)	(4)	(5)
	Floods	Earthquakes	Hurricanes	Landslides	Volcanos
Dependent Variable:	Years of Education				
Intensity of Exposure in utero	-0.044***	-0.072***	-0.005	-0.032***	-0.036
	(0.007)	(0.006)	(0.004)	(0.011)	(0.236)
Intensity of Exposure at age 0-1	-0.060***	-0.075***	-0.009**	-0.062***	-0.032
	(0.007)	(0.006)	(0.004)	(0.010)	(0.021)
Intensity of Exposure at age 1-2	-0.050***	-0.054***	-0.007	-0.067***	-0.081***
	(0.008)	(0.006)	(0.004)	(0.011)	(0.022)
Intensity of Exposure at age 2-3	-0.049***	-0.042***	-0.003	-0.089***	-0.025
	(0.008)	(0.006)	(0.004)	(0.011)	(0.021)
Intensity of Exposure at age 3-4	-0.028***	-0.045***	-0.007	-0.067***	-0.015
	(0.008)	(0.006)	(0.004)	(0.011)	(0.021)
Intensity of Exposure at age 4-5	-0.034***	-0.018***	-0.008**	-0.070***	-0.003
	(0.008)	(0.006)	(0.004)	(0.011)	(0.021)
Intensity of Exposure at age 5-6	-0.031***	-0.031***	-0.029***	-0.085***	-0.012
	(0.008)	(0.006)	(0.004)	(0.011)	(0.019)
Intensity of Exposure at age 6-7	-0.030***	-0.023***	-0.028***	-0.100***	-0.020
	(0.008)	(0.006)	(0.004)	(0.012)	(0.021)
Intensity of Exposure at age 7-8	-0.005***	-0.002	-0.019***	-0.115***	-0.091
	(0.001)	(0.007)	(0.004)	(0.012)	(0.191)
Intensity of Exposure at age 8-9	-0.006***	-0.022***	-0.018***	-0.140***	-0.051***
	(0.001)	(0.007)	(0.004)	(0.013)	(0.020)
Intensity of Exposure at age 9-10	-0.007***	-0.004	-0.037***	-0.165***	-0.072***
	(0.001)	(0.007)	(0.005)	(0.013)	(0.020)
Intensity of Exposure at age 10-11	-0.008***	-0.007	-0.029***	-0.170***	-0.068***
	(0.001)	(0.007)	(0.004)	(0.013)	(0.020)
Intensity of Exposure at age 11-12	-0.006***	-0.016**	-0.032***	-0.140***	-0.036*
	(0.001)	(0.007)	(0.005)	(0.014)	(0.020)
Intensity of Exposure at age 12-13	-0.050***	-0.034***	-0.007	-0.142***	-0.026
	(0.009)	(0.007)	(0.005)	(0.015)	(0.021)
Intensity of Exposure at age 13-14	-0.009***	-0.035***	-0.006	-0.153***	-0.081***
	(0.001)	(0.007)	(0.005)	(0.015)	(0.020)
Intensity of Exposure at age 14-15	-0.069***	-0.065***	-0.009*	-0.122***	-0.034
	(0.009)	(0.007)	(0.005)	(0.015)	(0.021)
Observations	24,079,057	24,079,057	24,079,057	24,079,057	24,079,057

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Table 15: Effects of Natural Disasters on Education, Disabilities and income by Gender

	(1)	(2)	(3)	(4)	(5)	(6)
	Male	Female	Male	Female	Male	Female
Dependent Variable:	Years of education		Probability of disability		Ln(Income)	
Exposed in utero	-0.271***	-0.307***	0.005***	0.009***	-0.123***	-0.158***
	(0.011)	(0.011)	(0.001)	(0.001)	(0.025)	(0.019)
Exposed at age 0-1	-0.237***	-0.216***	0.007***	0.010***	-0.006	-0.060***
	(0.011)	(0.011)	(0.001)	(0.001)	(0.024)	(0.019)
Exposed at age 1-2	-0.225***	-0.204***	0.007***	0.009***	0.030	-0.047**
	(0.011)	(0.011)	(0.001)	(0.001)	(0.024)	(0.018)
Exposed at age 2-3	-0.218***	-0.203***	0.004***	0.006***	0.000	-0.027
	(0.015)	(0.014)	(0.001)	(0.001)	(0.024)	(0.018)
Exposed at age 3-4	-0.170***	-0.177***	0.005***	0.004***	-0.008	-0.037**
	(0.015)	(0.015)	(0.001)	(0.001)	(0.024)	(0.018)
Exposed at age 4-5	-0.136***	-0.095***	0.006***	0.008***	-0.052**	-0.085***
	(0.016)	(0.015)	(0.001)	(0.001)	(0.024)	(0.018)
Exposed at age 5-6	-0.061***	-0.068***	0.004***	0.006***	-0.013	-0.044**
	(0.016)	(0.015)	(0.001)	(0.001)	(0.025)	(0.018)
Exposed at age 6-7	-0.076***	-0.072***	0.005***	0.006***	-0.045*	-0.022
	(0.016)	(0.015)	(0.001)	(0.001)	(0.025)	(0.018)
Exposed at age 7-8	-0.013	-0.075***	0.005***	0.009***	-0.004	-0.056***
	(0.013)	(0.013)	(0.001)	(0.001)	(0.025)	(0.018)
Exposed at age 8-9	-0.040***	-0.061***	0.004***	0.005***	0.019	-0.055***
	(0.013)	(0.013)	(0.001)	(0.001)	(0.025)	(0.018)
Exposed at age 9-10	-0.071***	-0.097***	0.003***	0.006***	-0.018	0.006
	(0.013)	(0.013)	(0.001)	(0.001)	(0.026)	(0.019)
Exposed at age 10-11	-0.049***	-0.074***	0.005***	0.005***	0.009	-0.078***
	(0.013)	(0.013)	(0.001)	(0.001)	(0.026)	(0.019)
Exposed at age 11-12	-0.096***	-0.098***	0.004***	0.006***	-0.037	-0.014
	(0.014)	(0.014)	(0.001)	(0.001)	(0.026)	(0.019)
Exposed at age 12-13	-0.139***	-0.131***	0.004***	0.008***	-0.068***	-0.026
	(0.013)	(0.013)	(0.001)	(0.001)	(0.026)	(0.020)
Exposed at age 13-14	-0.113***	-0.079***	0.003***	0.004***	-0.033	-0.025
	(0.013)	(0.013)	(0.001)	(0.001)	(0.027)	(0.020)
Exposed at age 14-15	-0.082***	-0.095***	0.004***	0.003***	0.007	-0.029
	(0.015)	(0.014)	(0.001)	(0.001)	(0.026)	(0.020)
Observations	11,586,810	12,492,247	7,270,242	7,866,115	5,400,244	4,573,484

Notes: Robust standard errors in brackets, clustered at the region level. *Significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include region fixed effects, cohort fixed effects, gender fixed effects and regional trends. The regressions are based on individuals older than 20 years old. Data source: Last available National Censuses.

Figure A.1: Estimation of the loss in terms of years of education caused by Floods

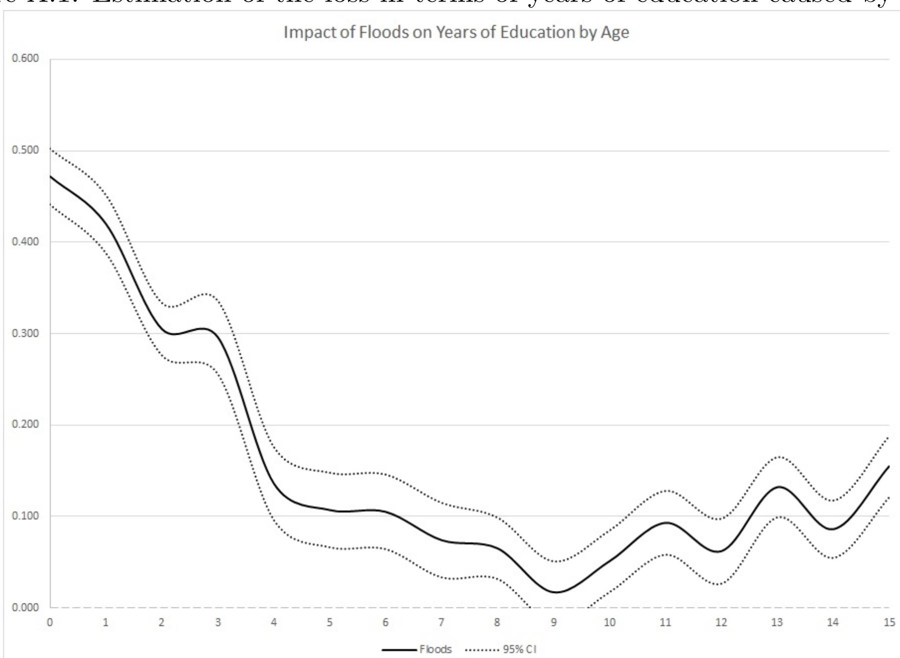


Figure A.2: Estimation of the loss in terms of years of education caused by Earthquakes

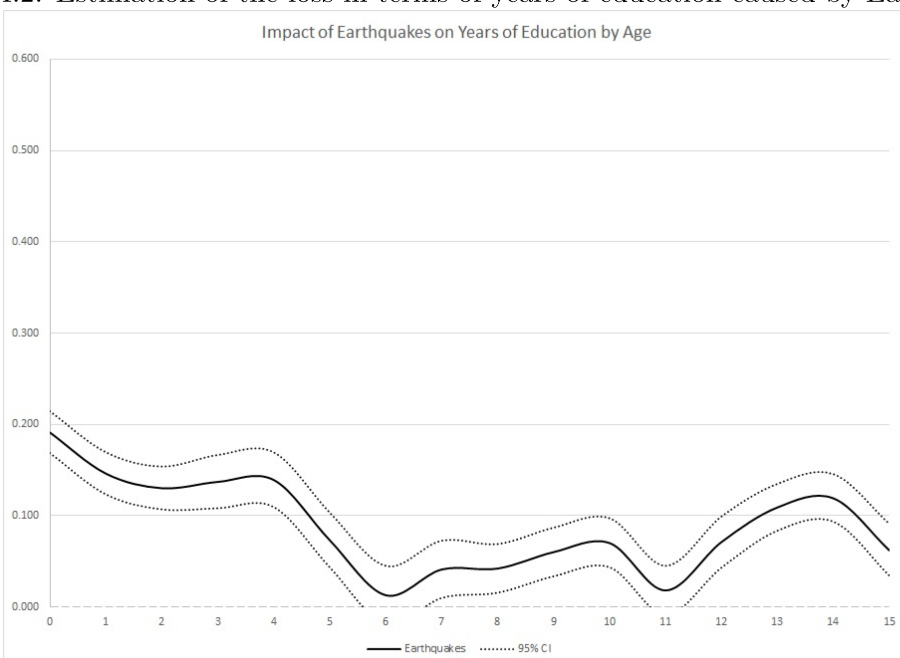


Figure A.3: Estimation of the loss in terms of years of education caused by Hurricanes

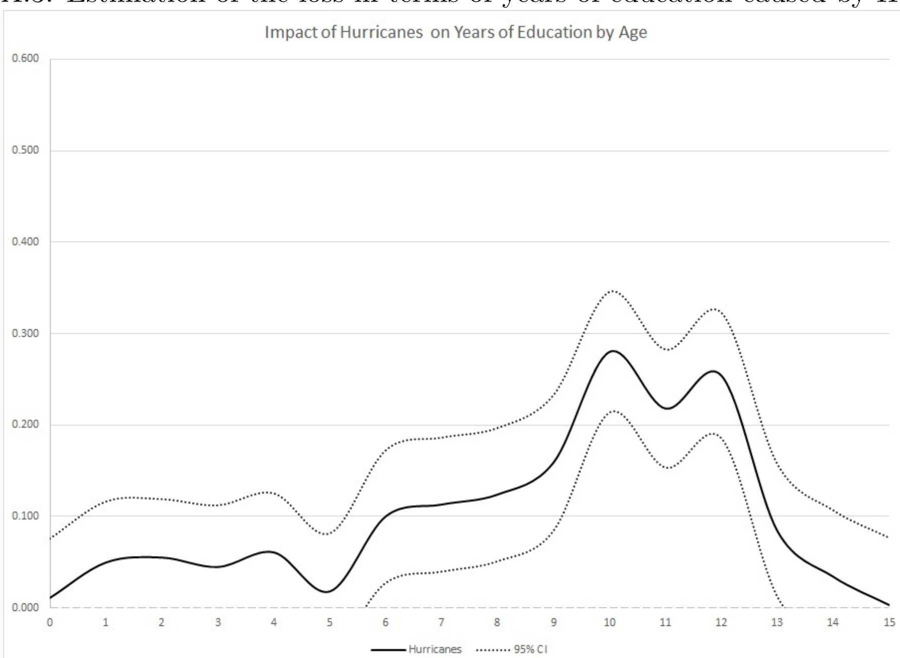


Figure A.4: Estimation of the loss in terms of years of education caused by Landslides

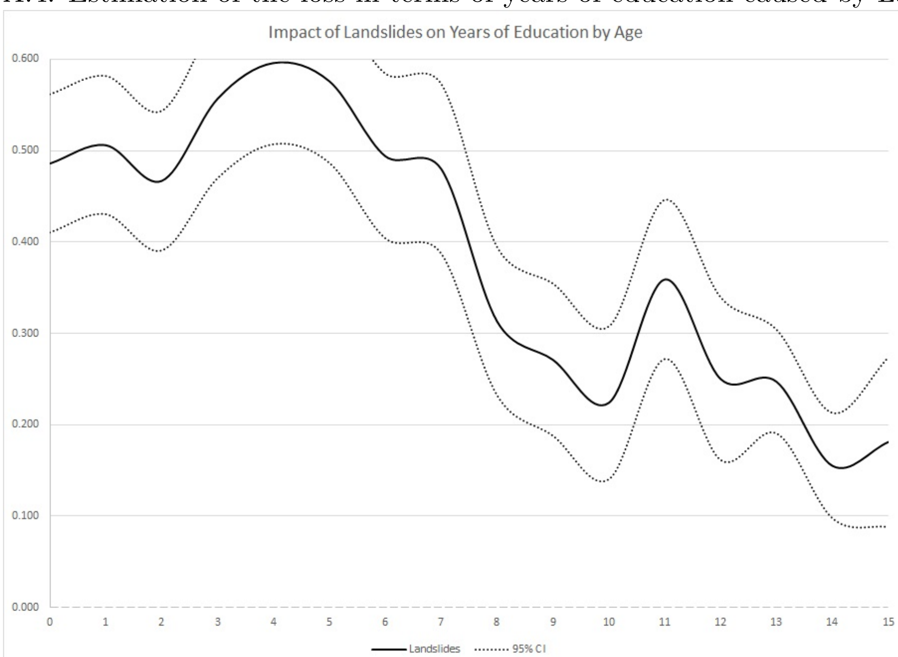


Figure A.5: Estimation of the loss in terms of years of education caused by Volcanos