

Echoes of Home

Home Country Natural Disasters and the Academic Outcomes of Immigrant Students

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Natural disasters are increasingly common, and they are predicted to become more intense and frequent. In 2005, Guyana experienced extensive flooding that affected¹ about 36 percent of the country's population, and Bangladesh suffered natural disasters that taken together affected more than 20 percent of its residents. In 2010, Haiti suffered a serious earthquake that affected approximately 37 percent of the country's overall population. While devastating to the residents of these countries, there is reason to believe that these natural disasters might also affect families, friends and immigrant communities abroad, even children. To date, however, there is almost no empirical evidence of this relationship. This paper tackles two research questions: Do home country natural disasters affect the academic performance of immigrant children in New York City public schools? If so, what are the school-level factors that may moderate this relationship?

To answer these questions, I use the EM-DAT International Disaster Database from the Center for Research in the Epidemiology of Disasters (CRED) matched to administrative records on public school students from the New York City Department of Education (NYCDOE). I obtain information on natural disasters outside of the U.S. from the EM-DAT International Disaster Database² for years 2003 to 2011. I focus on natural disasters and exclude technological disasters.³ Natural disasters include earthquakes, storms, floods, droughts, tsunamis, epidemics, wildfires, extreme temperature events, volcanic activity, and mass movements (landslides, rockfalls, and avalanches). I also obtain information about total deaths, total people affected, and total damage associated with the disaster. I match these natural disasters to student level data from NYCDOE using each student's country of birth and count all natural disasters that happened in a student's country of birth in the year between standardized testing dates. The student-level data contain individual school records of all NYC students enrolled in public school, including demographic characteristics, place of birth, recent immigrant status, program participation (e.g. special education), test scores and attendance. My analytic sample is

¹In this context people affected include: those in need of immediate assistance (e.g., food, water, shelter) or medical attention, those whose homes were destroyed or heavily damaged, those who were killed, and those who were reported missing or presumed dead (International Disaster Database: Explanatory Notes: <http://emdat.be/explanatory-notes>).

² These data are widely used in research on the economics of natural disasters. EM-DAT data has been used to investigate the relationship between losses due to natural disasters and a country's economic development (Kahn, 2005, Toya & Skidmore, 2007), the effect of natural disasters on a country's productivity (Noy, 2009), and the effects of natural disasters on child health (Datar et al., 2015), among many others.

³ Technological disasters include: transport accidents, industrial accidents, airplane crashes, for example. Natural disasters tend to be more common and larger in magnitude than technological disasters. As an example, of the 605 disasters recorded in 2011, 60% were natural disasters and 40% were technological disasters. Total people affected or killed in these natural disasters was 212,826,568 compared to 61,906 affected or killed in technological disasters (Author's calculations from the EM-DAT International Disaster Database).

composed of foreign-born students⁴ enrolled in NYC public schools for at least four consecutive years from 2004 to 2010 in grades 3 to 8. The total number of observations is 268,596 (55,931 unique students).

To be sure, not all disasters will affect students in the same way. The effect of home country natural disasters on academic outcomes likely depends on the magnitude and salience of the disaster. A flood that affected over 20 percent of a country's population, as was the case in Guyana in 2005, is more likely to impact an immigrant family than a storm that affected less than one percent of a country's residents on one day. I calculate magnitude by dividing the total number of people killed and affected by natural disasters in the year before the test by the home country population in the prior year; it is, therefore, a *cumulative* measure. I consider a foreign-born student exposed to a home country natural disaster if, in the year before a test, natural disasters affected at least five percent, 10 percent or 15 percent of the home country population.

The centerpiece of the empirical strategy is a regression model linking exposure to home country natural disasters to test scores in English Language Arts (ELA) and mathematics in a model with individual level demographic controls, grade and year fixed effects. Importantly, the regression includes individual fixed effects so that the coefficient of interest is identified by within student variation in home country disaster exposure. Among other things, student fixed effects control for within country regional, cultural, as well as student specific time invariant sources of bias.⁵

Results

Almost all countries of the world are represented in the student population of NYC public schools. The majority of foreign-born students are from Latin America and the Caribbean (59.4 percent). As for the demographic characteristics of foreign-born students, almost 40 percent are Hispanic, reflecting the large share of Latin American students in NYC public schools. Approximately 19 percent are black, and 29 percent are Asian. Only 12 percent are white. Immigrants from most regions have relatively high performance in both ELA and math. For the largest group of immigrants, however (those from Latin America), average test performance is 0.2 to 0.3 standard deviations below the mean at baseline (AY 2004). For these students, home country natural disasters may further exacerbate an already weaker school performance.

Exposure to home country natural disasters is not rare. Indeed, over a one-year period, more than 70 percent of foreign-born students were exposed to at least one home country natural disaster prior to the ELA or math standardized test. More than a third of students in the sample were born in countries with natural disasters that affected or killed between one and five percent of the population, while almost 30 percent experienced disasters that affected over five percent of the home country population. This means that a substantial number of students were exposed to home country shocks that may be salient enough to hurt their academic performance (table 1).

⁴ I include children born in Puerto Rico, American Samoa, Guam, and the U.S. Virgin Islands in my sample of immigrant students. Results reported later in the paper are not sensitive to this choice. Magnitude and significance remains if I exclude these students.

⁵ Note that I do not know the region of birth of students. To be sure, natural disasters may happen in regions that are not represented in the foreign-born student population of NYC, especially in large countries. If this is the case, estimates will be biased toward zero.

Regression results show that natural disasters in a student’s home country negatively affect academic performance (table 1). Foreign-born students exposed to home country natural disasters that cumulatively affected or killed at least five percent of the home country population in the prior year, score 0.04 standard deviations lower on standardized ELA exams. Children born in countries with severe natural disasters in which at least 15 percent of the population was affected or killed experience a slightly larger drop in test scores. For these children, the negative consequences include test score losses of 0.05 standard deviations in ELA. In line with other literature, I find no effects on math.

These results show that the home country is an important context shaping the educational outcomes of immigrant children. I also investigate subgroup differences by gender, age, as well as by recent immigrant status and test the robustness of results in a number of different ways. Finally, a last set of analyses explore whether school characteristics ameliorate or exacerbate these negative effects. I focus on the demographic composition of the school (percent from the same county or region), spending on counseling services, spending on attendance and outreach, and teacher-pupil ratios.

Table 1: Exposure to home country natural disasters by magnitude

Percent of home country population affected or killed	Unique students	%
Less than 1 percent	18,561	33.19
Between 1 and 5 percent	21,175	37.86
Between 5 and 10 percent	3,516	6.29
Between 10 and 15 percent	5,883	10.52
15 percent or more	6,796	12.15
Total	55,931	100.00

Notes: Sample is restricted to foreign born students continuously enrolled in NYC public schools for at least four years in grades 3 to 8. Magnitude calculated based on the total number of people affected or killed by natural disasters in the home country between ELA tests divided by the home country’s population in the prior year. Total people affected includes those in need of medical attention due to physical or emotional reasons, those who lost their homes or whose home was heavily damaged, and those in need of immediate assistance such as food, water or shelter. Total killed includes people who died, as well as those reported missing, and those presumed dead. First column on table shows maximum disaster magnitude exposure between AY2003/04-2009/10 (ever exposed). Students never exposed to a home country natural disaster are included in the less than 1 percent category.

Table 2: Home country natural disasters and ELA test scores

DV: z-score ELA	Percent of home country population affected or killed					
	5%		10%		15%	
	(1)	(2)	(3)	(4)	(5)	(6)
Disaster	-0.041*	-0.037*	-0.014	-0.034*	-0.061**	-0.051*
	(0.019)	(0.015)	(0.033)	(0.016)	(0.017)	(0.021)
Student controls	Y	Y	Y	Y	Y	Y
Lagged test scores (t-1)	Y	N	Y	N	Y	N
Country FX	Y	N	Y	N	Y	N
Student FX	N	Y	N	Y	N	Y
Observations	227,429	227,429	227,429	227,429	227,429	227,429
R-squared	0.502	0.777	0.502	0.777	0.502	0.777

Standard errors in parentheses

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

Notes: Student controls include: female, black, Hispanic, Asian, free lunch, reduced price lunch, free/reduced lunch missing, home language not English, limited English proficiency, special education, recent immigrant. All models include year, and grade fixed effects. Value added models include an indicator for lagged test scores missing. Standard errors are clustered at the country-year level. Disaster equals one if students were born in a country that experienced a natural disaster above the five, 10, or 15 percent threshold. Sample includes foreign-born students in grades 3 to 8 between AY 2003/04-2009/10 continuously enrolled for at least four years. Students born in Puerto Rico, American Samoa, Guam, and the U.S. Virgin Islands are included in the sample.

References

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