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Honduras Migration: Climate Change, Violence, & Assistance

Sarah Bermeo and David Leblang[1]

Executive Summary

This study provides insight into the root causes of migration from Honduras, with a particular emphasis on the interconnected role of climate change and violence. We link U.S. government data on the department (state) of birth for Honduran families apprehended between 2012 and 2019 to department-level measures of rainfall volatility and homicide rates in Honduras. The results indicate that decreases in precipitation are associated with increased migrant flows and that the magnitude of this effect increases with higher levels of violence. These findings can inform discussions about root causes of migration and policy responses.

Root Causes of Migration from Honduras

Honduras is one of the poorest countries in the Western hemisphere, has rising levels of food insecurity linked to the impacts of climate change and has one of the world's highest homicide rates. Drug trafficking groups and street gangs contribute to high levels of violence. Over the last decade the country has suffered from repeated droughts that have increased food insecurity, particularly for subsistence farmers in the Dry Corridor, where some areas have experienced annual crop loss greater than 70%. Poor governance is widely believed to exacerbate these problems and hinder solutions, while efforts to curtail corruption have experienced setbacks in recent years.

In addition to these consistent issues, back-to-back hurricanes Eta and Iota in November 2020 had a devastating humanitarian impact and severely affected infrastructure and food security in Honduras. The effects of COVID-19 contribute to what was already a desperate situation for many in Honduras.

Key Points

- ***The findings support the conclusion that prolonged droughts in the Dry Corridor are contributing to increased apprehensions.*** There is a strong link between rainfall decreases in a department and apprehensions of family units from that department in the U.S. An increase in rainfall deficits, or negative rainfall deviation, from the 25th to the 75th percentile is associated with an additional expected 221 family unit apprehensions from that department the following year.

- ***When the homicide rate is higher, the magnitude of the association between rainfall deviation and family unit apprehensions increases.*** For example, when the homicide rate is 26 per 100,000 people, an increase in negative rainfall deviation from the 50th to the 75th percentile is associated with an expected increase in apprehensions from 366 to 400 (34 apprehensions). When the homicide rate is 81, the same increase in rainfall deviation is associated with an expected increase in apprehensions from 448 to 670 (222 apprehensions).

- ***The strong statistical link between violence, rainfall deviations and out-migration does not support a sharp delineation between asylum seekers and climate migrants.*** A family may leave their land due to climatic changes but leave their country because safe or viable places for internal migration are lacking. Effectively responding to migrants and root causes of migration requires that policymakers account for the intertwined nature of climate change and violence.

- ***Empowering local farmers and organizations in decision-making regarding agricultural investments financed by foreign aid can build civil society capacity while increasing food security.*** Investments to improve agricultural resilience to rainfall deviations, which can provide greater food security and hope for a more stable future, may result in decreases in out-migration in the near-term, even though a more complete response to root causes will require more difficult and lengthy responses to problems of governance, corruption, and violence.

[1] Sarah Bermeo, Duke University Sanford School of Public Policy and Duke Center for International Development: sarah.bermeo@duke.edu. David Leblang, University of Virginia Department of Politics, Batten School of Leadership and Public Policy, Miller Center of Public Affairs: leblang@virginia.edu.

Study Data

The study is based on data for approximately 320,000 family unit ***apprehensions*** by United States Customs and Border Protection (CBP) at the U.S. southern border during the fiscal years 2012-2019. The data, obtained through a Freedom of Information Act request, identify city and department of birth for those apprehended. The yearly totals closely align with published country-level totals of family unit apprehensions, verifying that the data represent the universe of apprehensions in this category.[i]

Data on ***homicides*** by department are from the *Secretaría de Seguridad Policía Nacional in Honduras*.[ii] Data on precipitation aggregated to the department level are available in ten-day increments from the Food and Agricultural Organization.[iii] Because normal rainfall varies by department, we calculate ***negative rainfall deviation*** as the percent difference in department observed rainfall during the rainy season (April-October) from the twenty-year average of rainfall for the department in the same months. We invert this in the statistical analysis for ease of interpretation: higher negative deviations have higher values.[iv] A department-specific ***wealth index*** and department ***population*** from the 2013 Honduran national census are included; in the analysis these vary across departments but not over time.[v] We include a year trend variable to pick up common trends that are not department-specific.

Apprehensions by Department of Birth

Table 1 shows the total number of family unit apprehensions by CBP at the U.S. southern border during fiscal years 2012-2019 by department of birth in Honduras. Departments are listed by descending number of total apprehensions and summary statistics for each department are included. The largest number of families apprehended list Cortés as department of birth. Cortés is the most populous department and includes the city of San Pedro Sula; it also has the highest average number of homicides of any department in this period.

The apprehension rate (as percent of population) is quite high for some departments: both Colón and Olancho had apprehensions at the U.S. border during this period that totaled more than 7% of their 2013 population. These two departments also experienced severe rainfall deficits, each observing at least one year where rainfall during the rainy season was down more than 20% from its average. Atlántida, Copán and Ocotepeque also saw apprehensions totaling more than 5% of their population, with Atlántida experiencing one of the highest homicide rates and Copán and Ocotepeque experiencing large negative rainfall shocks. The data in Table 1 confirm broad variation across departments in percentage of people migrating, as well as variation in homicide rates and rainfall deviations.

Table 1: Apprehensions of Family Units by Department of Birth, 2012-2019

Department of Birth	Apprehensions	Population	Percent Population Apprehended	Largest Negative Rainfall Deviation in Period	Mean Homicide Rate per 100,000	Wealth Index
Cortés	56,220	1,621,762	3.5%	-24.8%	98	74.9
Olancho	38,866	537,306	7.2%	-35.8%	54	56.8
Yoro	29,516	613,473	4.8%	-23.3%	76	63.9
Atlántida	25,688	449,822	5.7%	-11.1%	92	69.4
Colón	24,913	319,786	7.8%	-23.5%	69	65.9
Copán	24,708	382,722	6.5%	-27.9%	72	57.8
Francisco Morazán	23,186	1,553,379	1.5%	-17.4%	65	72.1
Santa Bárbara	17,355	434,896	4.0%	-36.1%	61	60.2
Comayagua	15,645	511,943	3.1%	-4.7%	61	65.4
Choluteca	10,120	447,852	2.3%	0.0%	26	51.3
Lempira	9,204	333,125	2.8%	-26.5%	53	44.1
Ocotepeque	8,216	151,516	5.4%	-37.2%	56	60.8
Valle	7,158	185,227	3.9%	-5.9%	20	55.7
Intibucá	5,409	241,568	2.2%	-9.8%	30	47.2
El Paraíso	5,148	458,472	1.1%	-12.4%	27	51.7
La Paz	2,785	206,065	1.4%	-21.1%	26	52.4
Islas de la Bahía	929	65,932	1.4%	n/a	32	74.7
Gracias a Dios	220	94,450	0.2%	-26.9%	22	33.1

Statistical Analysis: Precipitation, Homicides and Their Interaction

Our analysis examines the relationship between number of family unit apprehensions from a department and department-specific characteristics. To ensure we are capturing measurements prior to the apprehension period, we lag homicides and rainfall deviation by one year. Tables 2 and 3 present our main statistical results.[vi] The results from Model 1 show a positive relationship between the one-year lagged value of negative rainfall deviation and apprehensions.[vii] The effect is substantial:

A change in the value of rainfall deviation from the 25th to the 75th percentile is associated with an expected increase in yearly apprehensions from a department from 320 to 541.

Model 2 includes a measure for the two-year lag of rainfall deviation, showing that both the one- and two-year lags are associated with an increase in apprehensions, although with declining magnitude over time. A three-year lag of rainfall deviation was not associated with a significant change in apprehensions.

The results in Models 1 and 2 show a positive but not statistically significant relationship between homicides and apprehensions (p=0.49 in Model 1). We do not interpret this as evidence of no link between violence and apprehensions. Homicide rate is a crude measure of violence that was on the decline throughout this period, while other forms of violence that are less easily measured at the department level remained high.[viii] Additionally, while the decline in homicides is a positive development, Honduras consistently ranks in the five countries with the highest homicide rates. Rising migration in the presence of a persistently high homicide rate, even in the context of a relative decline, is consistent with an interpretation of the cumulative impact increasing over time as people lose confidence in the government's ability to improve security.[ix]

Evidence of a cumulative effect on migration from the multiple problems plaguing Honduras – including violence, climate change, corruption and poor governance – is further reinforced by the strong and significant impact of the year trend variable. This is consistent with an interpretation that migrants and asylum seekers increasingly see these problems as persistent rather than temporary. The positive relationship between the wealth index and apprehensions suggests that those from departments with higher initial wealth are more likely to migrate. It is important to note that rainfall deviations, which are also associated with increased migration, reflect negative income shocks: this suggests that the impact of income on likelihood of migration is a complex mix dependent on both initial resources and unexpected shocks.[x]

The estimate of the coefficient on the interaction term ***Homicides*Rainfall Deviation*** in Model 3 demonstrates the interactive nature of the relationship that rainfall deviations and homicides have with apprehensions:

When the homicide rate is higher, the magnitude of the association between rainfall deviations and apprehensions increases.

Table 2: Apprehensions, rainfall deviations and homicides, 2012-2019

	Model 1	Model 2	Model 3
Lag Rainfall Deviation (inverted)	0.015***	0.014***	-0.060***
Lag2 Rainfall Deviation (inverted)		0.004**	
Lag Homicide rate (log)	0.174	0.191	0.229
Homicides*Rainfall Deviation			0.020***
Wealth index	0.071***	0.070**	0.070***
Population (log)	0.646*	0.653*	0.678**
Year Trend	0.710***	0.692***	0.697***
Constant	-1439***	-1402***	-1412***
Observations	136	136	136

Notes: Random effects regression with robust standard errors clustered on department. Unit of analysis is department-year. Dependent variable is the natural log of apprehensions of family units at the U.S. southern border. Rainfall deviations measured as percent deviation from average during the rainy season, inverted so that the highest values represent the largest negative deviations. *p < 0.10; **p < 0.05; ***p < 0.01

Table 3 explores the interactive relationship between rainfall and homicides in more depth. The first column shows the level of homicides per 100,000 people at its mean value (46) and its value one standard deviation below (26) and above (81) the mean (converted from log values). The second column shows that the estimate of the slope value relating negative rainfall deviation and apprehensions varies across homicide levels: higher homicide rates are associated with a larger increase in apprehensions in response to an increase in rainfall deviation (this difference is statistically significant).

Table 3: Estimated Apprehensions by Rainfall and Homicide Rate

Homicide Rate (per 100,000 people)	Estimated Slope	Rainfall Deviation 50th Percentile	Rainfall Deviation 75th Percentile
26	0.007*	366	400
46	0.018***	405	518
81	0.030***	448	670

Based on Table 2, Model 3. Numbers converted from log values.

The final two columns of Table 3 show expected values of apprehensions for the given homicide rate when negative rainfall deviations are at the 50th and 75th percentile of observed deviations. When the homicide rate is lower (26), an increase in the rainfall deviation from the 50th to the 75th percentile is associated with an expected increase in apprehensions from 366 to 400. The magnitude of this increase is significantly higher when the homicide rate is 81: the same increase in rainfall deviation is associated with an expected increase in apprehensions from 448 to 670.

Policy Implications and Foreign Assistance

The analysis is consistent with the conclusion that larger negative precipitation shocks during the rainy season are associated with larger apprehensions of family units at the U.S. southern border the following year. This supports news reports of migrants fleeing due to historic droughts in the Dry Corridor since 2014. This issue is not declining: Even prior to the COVID-19 crisis, weather patterns from 2019 had led to a further increase in food insecurity.

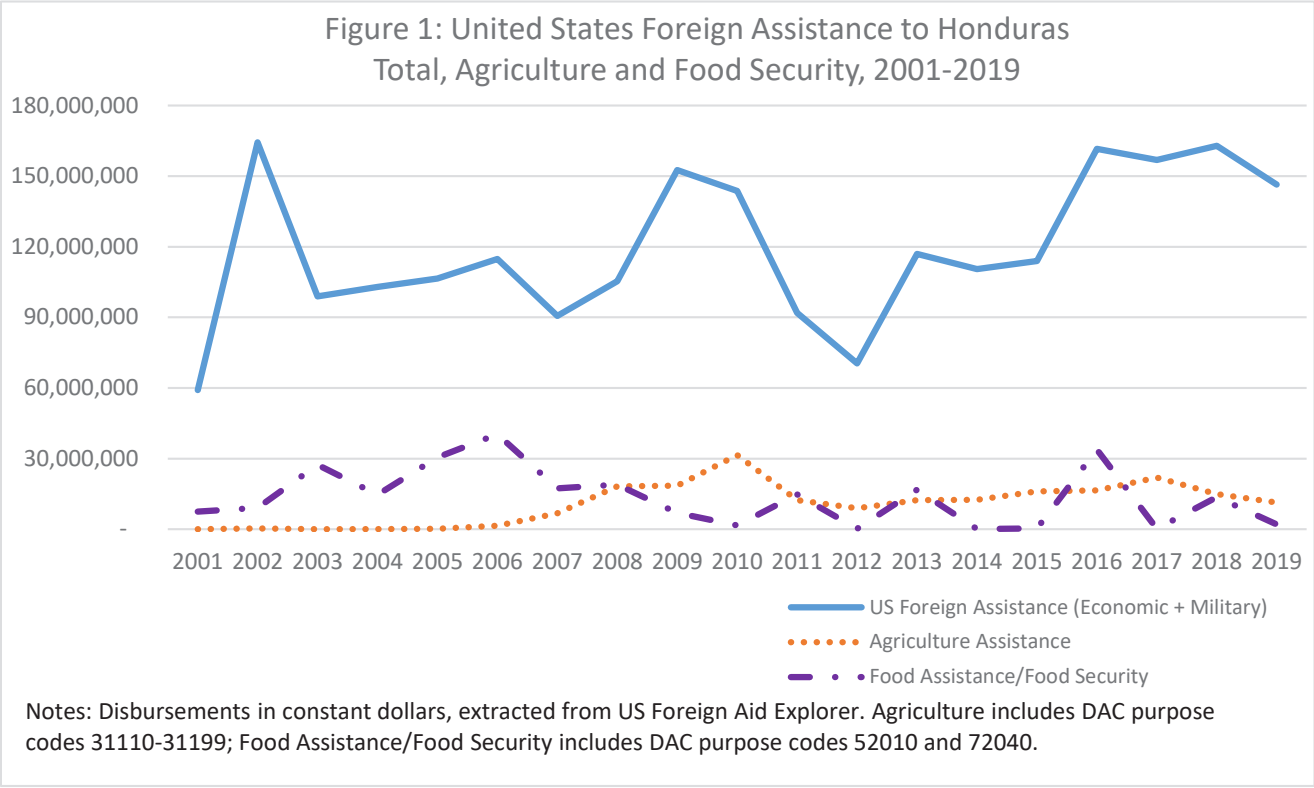
> ***If a climate migrant decides to migrate externally rather than internally because internal migration is unsafe, then the threat of violence, as well as climate change, is responsible for the decision to migrate.***

There is also evidence of a relationship between rainfall deviations and violence: the increase in apprehensions associated with rainfall deviations is significantly larger when the department also experiences a higher homicide rate. These findings call into question the sharp distinction between migrants fleeing violence and those leaving due to climate change. If a climate migrant decides to migrate externally rather than internally because internal migration is unsafe, then the threat of violence, as well as climate change, is responsible for the decision to migrate.

In many countries, climate shocks lead to internal migration, such as rural to urban relocation. The evidence presented here suggests that climate shocks are more likely to lead to external migration when internal options are unsafe. We cannot tell from our analysis which people within a department migrate: the migration associated with rainfall deviations could be a result of rural populations migrating externally, of internal rural-to-urban migration creating stress on systems that leads to migration, or – very likely – both. One key takeaway is similar:

The desire for external migration is likely to decrease as a department becomes more resilient to precipitation shocks, less violent, or both.

The results of this study and numerous other works suggest an increasing role is possible for outside assistance to improve agricultural resilience and land management in order to decrease the need for relocation. In Olancho, the department that ranks second highest for apprehensions overall and as a proportion of population in our study, scholars and local organizations have been documenting the impact of deforestation and agricultural failure on migration for over two decades, as well as the link between violence and illegal logging. More general analyses of Honduras by the World Food Programme, Food and Agricultural Organization and International Labor Organization document the impact of climatic changes and call for increased investment in



Notes: Disbursements in constant dollars, extracted from US Foreign Aid Explorer. Agriculture includes DAC purpose codes 31110-31199; Food Assistance/Food Security includes DAC purpose codes 52010 and 72040.

agricultural resiliency. A report by Global Water Initiative and Catholic Relief Services highlighted vulnerabilities to food insecurity in Honduras associated with reliance on rain-fed agriculture in 2014, before years of persistent drought, while also suggesting strategies for increasing resilience. Outside agencies such as USAID recognize that climate change is further threatening food security, access to water, and natural ecosystems.

Despite the widely documented worsening of food security in rural areas, there has been no large increase in outside funding for agriculture in Honduras. Figure 1 shows funding from the U.S. to Honduras since 2001. Even when total U.S. aid was increasing, there is no evidence of a sustained increase in funding for agriculture. Spikes in food security assistance occur in the wake of disasters such as Hurricane Stan in 2005 and the sustained drought that began in 2014. This ex-post response to disasters cannot substitute for sustained investment in building agricultural resilience and enhanced food security. The relatively low emphasis on agriculture and food security extends to other donors: from 2010-2019 members of the OECD's Development Assistance Committee (DAC) allocated 14% of their funding to Honduras for agriculture and food security; multilateral agencies reporting to the DAC spent less than 6% of their aid on these sectors during this period. [xi]

Well-designed and targeted outside assistance would help Honduras increase food security, which could ease the desire to migrate even in the near-term. Investments in improved governance and violence prevention would be necessary to create a sustainable, long-term and peaceful development solution in Honduras. These reforms are politically difficult, particularly as corruption has grown and outside donors express reluctance to channel money to the government in the absence of improvements.

A study of U.S. aid to Honduras, El Salvador and Guatemala by the Wilson Center found that investing in governance is key to overcoming challenges facing the region. It also uncovered concern that U.S. aid programs often rely on U.S.-based contractors rather than local and international groups. Programs designed to address food security while empowering local groups to propose and carry out reforms can bolster civil society and local governance while simultaneously increasing climate resilience. While this alone cannot solve the multiple challenges facing Honduras, it would be a step in that direction.

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[i] We use the natural log of apprehensions as the dependent variable in our analysis. For 82% of apprehensions the department of birth was specified. When the department was not specified but city of birth was specified, we attempted to match the recorded city to a department. After this process we were able to assign 95% of apprehensions to a specific department. Full coding rules for assigning department are available from the authors.

[ii] Available at https://www.sepol.hn/sepol-estadisticas-incidencia-departamento.php; accessed March 2021. We calculate the homicide rate per 100,000 people (based on 2013 census) and use the natural log in the analysis.

[iii] Available at http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=HND; accessed June 2020.

[iv] Twenty-year average calculated 1989-2008, representing the first 20 years for which the data are available. No results change substantively if the rainy season is extended to include November. There is no assumption that the "average" value is optimal for a department; simple correlations between deviations and apprehensions show that apprehensions decline for values above the average. We calculate the departmental average simply to account for differences across departments. Calculation for negative rainfall deviation (x and t index department and year, respectively):

$$-100^{*}\left(\frac{observed\ rainy\ season\ precipitation_{xt} - average\ rainy\ season\ precipitation_{x}}{average\ rainy\ season\ precipitation_{x}}\right)$$

[v] The mean international wealth index score from Global Data Lab Area Database 4.0 is used, based on household surveys; the values used are from 2011 (latest available), which is a baseline right before the time period analyzed

(https://globaldatalab.org; accessed March 2021). The official Honduran census from 2013 (latest census) is used to measure department population; the natural log of department population is used in the analysis (https://www.ine.gob.hn/V3/baseine; accessed March 2021).

[vi] In Model 1 we estimate the following random effects equation, with robust standard errors clustered on department (Model 2 is analogous but also includes a two-year lag for rainfall deviation; Model 3 includes the interaction between rainfall deviation and homicides):

$$\ln(apprehensions)_{x,t} = \beta_0 + \beta_1 rainfall\_deviation_{x,t-1} + \beta_2 \ln(homicides)_{x,t-1} + \beta_3 wealth_x + \beta_4 \ln(population)_x + \beta_5 Year + \gamma_x + \varepsilon_{x,t}$$

[vii] We performed the analysis using alternate measures of rainfall deviations, including the median rainy season monthly deviation from long-term mean in a given department-year, with qualitatively similar results.

[viii] There was a sizeable overall decline in homicides in Honduras during this period (from a high of 84 per 100,000 in 2011 to a low of 39 per 100,000 in 2018 according to the World Bank's World Development Indicators).

[ix] Related research examining homicides at the municipal level – a more precise geographical unit than the department level used here – finds a strong relationship between homicides and apprehensions of unaccompanied children (Clemens 2017).

[x] To control for the potential of a non-linear relationship between wealth and apprehensions, we estimate models including a squared wealth term: in these cases the coefficient on the squared term is significant and negative but its inclusion did not substantively change the results related to other variables. We also do not find an interactive effect of wealth and rainfall deviations.

[xi] Data on foreign aid disbursements (constant dollars) from the United States are from the USAID Foreign Aid Explorer (https://explorer.usaid.gov); accessed March 9, 2021. Data for DAC and multilateral donors are from the OECD CRS database (https://stats.oecd.org) measured in constant dollars; accessed March 22, 2021. See Figure 1 notes for purpose codes included in agriculture and food categories.