Climate of Exclusion: Spillover Effects of Home-Country Natural Disasters on Immigrant Removals from the United States

AGUSTINA LAURITO AND ASHLEY N. MUCHOW

Deportations of immigrants from the United States have grown substantially over the past two decades. While existing research has examined how changes to US laws and policies have contributed to this increase, less attention has been given to how conditions in immigrants' countries of origin shape deportation patterns. This article investigates how an important external shock—home-country natural disasters—influences immigrant removals from the US. We combine annual data on removals by country with information on natural disasters to estimate difference-in-differences models that exploit exogenous variation in the timing and magnitude of natural disasters across countries. Our results show that immigrant removals increased, on average, by 29 percent after salient natural disasters. When we explore mechanisms, we find little evidence that home-country natural disasters increase irregular migration, but we do find that noncitizen and likely undocumented immigrants increase their labor force participation and employment following these shocks. This finding suggests that natural disasters in immigrants' countries of origin may influence the economic behavior of immigrants, putting them at greater risk of detection by immigration enforcement authorities.

Keywords: climate change, natural disasters, immigration, removals, deportation

Deportations of immigrants from the United States have grown substantially over the past two decades. Immigrant removals more than doubled in the first decade of the twenty-first century, from slightly more than 185,000 in 2000 to nearly 432,000 by 2013.[1] While total removals declined in subsequent years, they remained much higher than in the early 2000s.

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1. Authors' calculations using data on removals from the *Yearbook of Immigration Statistics* using years 2000–2019 (https://ohss.dhs.gov/topics/immigration/yearbook). For additional details on the patterns of deportation

As Caitlin Patler and Bradford Jones (2025, this issue) describe in detail, this increase in removals is due, in part, to the growing immigration enforcement apparatus in the US that has leveraged local criminal justice systems to identify, apprehend, and remove noncitizens from the US. Research has examined how immigration enforcement policies, laws, and regulations have contributed to the rise in removals in the post-migration US context—focusing on the role that national, state, and local forces play in shaping deportation patterns (Amuedo-Dorantes et al. 2019; Armenta 2017) and their effect on immigrant outcomes (Amuedo-Dorantes and Antman 2022; Amuedo-Dorantes and Arenas-Arroyo 2019; Amuedo-Dorantes et al. 2020; Bellows 2019; East et al. 2023).[2] Less attention has been paid to the influence of country-of-origin conditions and premigration contexts on removal dynamics, and the little research that has investigated these forces has yet to consider how they influence deportation vulnerabilities of immigrants already present in the US. Thus, to gain a full picture of the forces that shape deportation patterns in the US, we consider the influence of premigration conditions and origin-country contexts on the probability of apprehension and removal.

Natural disasters in immigrants' countries of origin represent a critical, though often overlooked, premigration and post-migration factor that may shape deportation dynamics in the US. On the one hand, natural disasters may increase migration from affected countries to the US (Berlemann and Steinhardt 2017; Ibáñez et al. 2021). If this migration occurs through unauthorized channels, it could lead to a rise in removals by increasing the number of individuals who are legally subject to deportation. On the other hand, natural disasters may also influence the behaviors of immigrants already residing in the US in ways that increase their visibility to immigration enforcement and their risk of deportation. For example, if immigrants need to send financial support to disaster-affected relatives, they may enter the labor force, become employed, or take on additional work. They may also make more frequent visits to locations to wire money, potentially increasing their chances of contact with law enforcement.

This article expands our understanding of deportation dynamics by estimating the effect of home-country natural disasters on immigrant removals from the US. This question is domestically and internationally salient, as natural disasters are expected to increase in frequency and magnitude in the coming years amid a changing climate (Van Aalst 2006). Specifically, we seek to answer two research questions. First, do international natural disasters increase immigrant removals in the US? Second, what are some possible mechanisms that may explain any observed increases in removals following these disasters? To answer these questions, we employ a quasi-experimental research design that exploits exogenous variation in the timing and magnitude of natural disasters across the globe from 2000 to 2019.

To preview our results, we find that salient international disasters increase immigrant removals by 29 percent. This change represents a clear break from prior trends. While we find no evidence that irregular migration grew following these shocks, we do observe increases in the labor force participation and employment of noncitizens and likely undocumented immigrants that range from 20 to 24 percent, as well as increases in remittances. These results suggest that, after salient home-country natural disasters, immigrants from disaster-affected countries living in the US alter their behaviors in ways that increase their vulnerability to detection and subsequent deportation by immigration enforcement authorities.

DETERMINANTS OF IMMIGRANT REMOVALS
The surge in deportations from the US over the last three decades has prompted scholars to

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over time, see Caitlin Patler and Bradford Jones (2025, this issue). We use the terms *deportations* and *removals* interchangeably, though we note that *removals* is the official term used by the US government to describe involuntary expulsions from the country.

2. See also Bennett et al. (2025, this issue); Hong et al. (2025, this issue); Kirksey and Sattin-Bajaj (2025, this issue).

take stock of the underlying reasons behind this growth. Escalations in removals have coincided both with the expansion of the immigration enforcement apparatus and policy changes that broadened the grounds for deportation and curtailed legal immigration pathways (Moinester 2024). A series of legal and policy actions—particularly laws passed between 1986 and 1996—expanded the criminal grounds for deporting noncitizens (Hausman 2021; Miller 2003; Stumpf 2006). These legal changes also increased immigration enforcement spending and facilitated local involvement in the enforcement of federal immigration law—laying the groundwork for today's "formidable immigration enforcement machinery" (Meissner et al. 2013). National security concerns following the terrorist attacks of 9/11 fueled additional spending, with expenditures nearly tripling from $9.2 billion in 2003 to $26 billion by 2021 (American Immigration Council 2021). This expansion was accompanied by increased state and local involvement in identifying, apprehending, and detaining deportable noncitizens through programs such as Section 287(g) and Secure Communities (Transactional Records Access Clearinghouse 2020, 2024).[3] The result was a dramatic increase in deportations, driven not only by policy and institutional growth but also by a broadening set of circumstances under which individuals could be targeted for removal.

Various frameworks have been employed to understand how deportation risk is distributed across immigrant populations, highlighting the significance of factors such as interior immigration enforcement, exposure to the criminal justice system, time in the US, and employment. The initiation of deportation proceedings requires that deportable noncitizens be identified and ultimately apprehended and detained by federal immigration authorities (Moinester 2024). Justifications for immigrant deportation typically hinge on a lack of legal status or criminal history (Hausman 2021; Moinester 2024). But not all undocumented immigrants face deportation, nor are all noncitizens convicted of deportable crimes removed from the country.

Noncitizens with criminal records—especially those convicted of aggravated felonies—are more likely to be targeted for removal (Hausman 2021). Yet even those with low-level convictions or no criminal history may be apprehended and removed, especially under expansive enforcement policies or when lacking legal status (Grimsley and Vásquez 2024). Recent undocumented arrivals may also face increased odds of deportation, especially when apprehended at the border, as was the case during the Biden administration (Muzaffar and Bush-Joseph 2024).

Labor dynamics also play a role in channeling migrant inflows and shaping deportation patterns. In 2007, rates of joblessness among the working class skyrocketed amid the economic turmoil of the Great Recession (Groshen and Holzer 2021). With construction and building sectors contracting during the real estate bust, crucial outlets for Latino immigrant male labor waned. These contractions may have heightened the expendability of immigrant labor and increased deportation risk (De Genova 2002). Indeed, prior work evaluating trends over this period has linked unemployment to increased rates of Immigration and Customs Enforcement (ICE) apprehension (Joyner 2018).

At a more microlevel, employment and labor force participation can influence immigrant exposure to deportation. Working at a site targeted by a federal workplace raid or encountering local law enforcement while commuting to and from work can increase an individual's risk of deportation. In most US states, undocumented immigrants are ineligible for state-issued identification cards or driver's licenses (Urban Institute 2021). Because driving without a license is an arrestable offense, the act of driving for many undocumented immigrants can increase the odds of police apprehension. Under programs like 287(g) and Secure Communities, arrests can easily trigger deportation proceedings if a noncitizen lacks documentation or has committed a deportable offense (Armenta 2017).

While research has documented how noncitizens alter their behavior to reduce visibility

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3. For additional details on related laws, policies, and programs, see Caitlin Patler and Bradford Jones (2025, this issue).

and limit exposure to the expanding immigration enforcement apparatus (Amuedo-Dorantes and Antman 2022; Asad 2023; East et al. 2023; Wong and Shklyan 2024), immigrants—regardless of documentation status—also engage in selective avoidance (Asad 2023). Thus, life in the US requires immigrants to navigate a tension between avoiding situations that could lead to detection and deportation, and engaging with institutions—such as schools, workplaces, or hospitals—that increase their visibility as they settle in the US and meet social responsibilities (Asad 2023). Thus, if the immigrant experience consists of a balance between engagement and avoidance, we ask in this article whether home-country natural disasters influence this dynamic in ways that increase immigrant vulnerability to deportation.

CONCEPTUAL FRAMEWORK
Given these internal enforcement dynamics, we identify two key pathways through which natural disasters may increase removals of immigrants from affected countries. As depicted in figure 1, home country natural disasters could influence removals through two main mechanisms. First, they may motivate unauthorized migration to the US from disaster-affected countries. Second, they could alter the behavior of immigrants from those countries living in

the US in ways that increase their vulnerability to detection and deportation.

Natural Disasters and International Migration
Growing scholarly attention to the link between natural disasters and migration has been spurred by concerns about the increased frequency and severity of these events in a changing climate (Van Aalst 2006). While estimates vary, some suggest that in the next thirty years as many as two hundred million people could be affected by climate-related displacement (Kaczan and Orgill-Meyer 2020; Newland 2011). Climate-related shocks may directly induce internal and international migration through their effects on agricultural output. They may also indirectly prompt migration by increasing wage gaps between and within countries, making migration from less to more developed countries more attractive (Berlemann and Steinhardt 2017).

Prior research has documented these shifts, highlighting that climate and natural disasters may have a larger impact on migration in agriculture-dependent economies (Berlemann and Steinhardt 2017; Ibáñez et al. 2021; Kaczan and Orgill-Meyer 2020; Newland 2011). For example, existing research has shown that changes in rainfall and temperature increase migration from Mexico to the US (Berlemann

Figure 1. Conceptual Framework: Effect of Home-Country Natural Disasters on Immigrant Removals
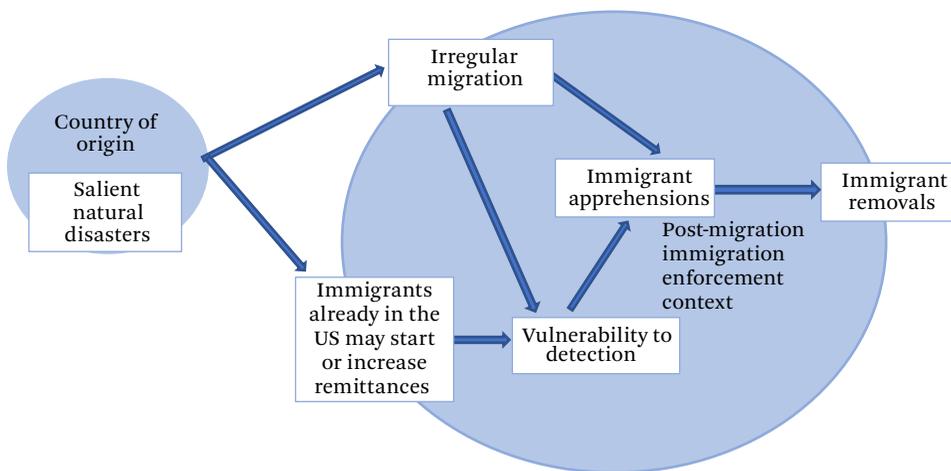
Source: Authors' compilation.

and Steinhardt 2017). Similarly, Ana Maria Ibáñez and colleagues (2021) find that extreme temperature changes also increase international migration, likely to the US, from agricultural-dependent households in El Salvador. Taken together, this body of research supports the notion that migration to the US may increase after international natural disasters and extreme weather events. Focusing specifically on hurricanes, Parag Mahajan and Dean Yang (2020) find that the share of immigrants from hurricane-affected countries entering the US increased following these events. Their article also finds increases in regular migration that benefited from preexisting networks within the US, for example, through direct sponsorship. This focus on regular migration, however, does not preclude the possibility that natural disasters may also encourage undocumented migration.

Understanding whether and to what extent international natural disasters increase regular or irregular migration is important because prevailing premigration conditions create inequities that may facilitate or hinder regular migration (Patler and Jones 2025, this issue), and a migrant's status affects their probability of removal from the US. In other words, if natural disasters increase unauthorized migration, we might observe an increase in removals after these salient shocks because of the higher number of deportable immigrants entering the US. While policies such as Temporary Protected Status (TPS) protect some unauthorized immigrants from deportation, TPS designation tends to occur in the wake of large-scale natural disasters that generate widespread attention and international response (for example, the Haiti earthquake of 2010). TPS designation is much less likely when countries experience multiple smaller-scale disasters that cumulatively produce substantial human and economic costs. While such disasters are less likely to garner widespread attention and a policy response, they may still increase international migration through the direct and indirect channels outlined above. Thus, after salient home-country natural disasters, we may observe an inflow of undocumented immigrants

arriving in the US that increases removals following these shocks.

Migrant Transnationalism and Increased Vulnerability to Detection

Periods of acute need in immigrants' home countries may activate transnational obligations in ways that increase the exposure of immigrants in the US to immigration enforcement. A large body of work has shown that immigrants maintain home-country connections (Akay et al. 2017; Orozco and Burgess 2011; Portes et al. 1999; Soehl and Waldinger 2010; Waldinger 2013, 2015). For example, many immigrants maintain regular communication with family and friends in their home countries and visit if they are able to travel. Importantly, immigrants are key players in a system of transnational social protection (Boccagni 2017; Levitt et al. 2017) because they contribute financially to their home countries directly through regular remittances, and indirectly by aiding hometown associations engaged in philanthropic and local development projects such as building schools or other infrastructure (Chen 2021; Orozco and Burgess 2011; Smyth 2017). In 2019, remittances accounted for roughly 5 percent of a country's gross domestic product (GDP), on average, with substantial variation across countries and regions.[4] Research has also shown that after natural disasters, remittances and other forms of assistance to home countries increase (Bragg et al. 2018; Chen 2021; Mohapatra et al. 2012; Orozco and Garcia-Zanello 2009; Rehman and Kalra 2006; Smyth 2017). Further, countries with higher shares of immigrants benefit more from these remittance flows (Mohapatra et al. 2012). In El Salvador, for example, households that had access to remittances were better able to cope with extreme temperature shocks and less likely to migrate as a result (Ibáñez et al. 2021).

To send this assistance, immigrants in the US may adjust or change their behaviors in ways that increase their vulnerability to detection by immigration authorities and the likelihood of removal. While research exploring these dynamics is limited, survey evidence from Haitian immigrants in the US has found

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4. Authors' calculation using World Bank development indicators: remittances received as a percent of GDP.

that many started or increased their remittances following the 2010 earthquake that devastated the country (Orozco and Burgess 2011). As a result, immigrants may make more frequent trips to locations where remittances are sent, increasing their chances of detection during these visits. Some immigrants may draw from their savings to provide such assistance (Orozco and Burgess 2011), but for the most economically vulnerable, working more or finding a job may be the primary way in which they obtain the financial resources to start or increase economic assistance to their home country. These behavioral changes may increase immigrants' vulnerability to removal if they become more publicly visible. This may be especially relevant for undocumented and noncitizen immigrants, who may be working in industries more likely to be targeted by federal workplace raids (Amuedo-Dorantes and Antman 2022). For example, engaging in additional work may increase the probability of immigrants being stopped by authorities while traveling to and from job sites, or of being present during an ICE raid. It is possible that after salient home-country natural disasters, immigrants are more willing to put themselves at risk of detection and apprehension to maintain or increase financial assistance to their disaster-affected country. If this is the case, we might see that after salient home-country natural disasters, noncitizens, including undocumented immigrants, work more to send remittances to their home countries, thus increasing their vulnerability to deportation.

DATA

We draw on data from multiple sources to construct a country-by-year panel dataset to carry out our analyses. We collect data on the number of removals per year by country of nationality from the Department of Homeland Security. These data are publicly available in the *Year-book of Immigration Statistics*, which is published every year and can be downloaded from the Office of Homeland Security Statistics.[5]

We use data on international natural disasters by country and year from the Emergency Events Database (EM-DAT): The International Disaster Database, maintained by the Centre for Research on the Epidemiology of Disasters (CRED). These data are also publicly available and have worldwide coverage. The EM-DAT dataset includes a record of all disasters that meet at least one of the following conditions: produce at least ten deaths; affect one hundred or more people; involve a declaration of emergency; or involve a call for international assistance. The data include both natural and technological disasters and have been widely used to study the social and economic consequences of disasters (Datar et al. 2013; Kahn 2005; Laurito 2022; Toya and Skidmore 2007). We restrict our focus to natural disasters and exclude technological events for two primary reasons. First, natural disasters account for the majority of disasters and are the largest in magnitude. Second, natural disasters are more policy-relevant in the context of climate change, as many of these disasters are predicted to increase in frequency and magnitude (Van Aalst 2006).[6]

Using these data, we calculate the share of people affected or killed by natural disasters by country each year. People affected include those who need medical attention because of physical or emotional injuries, those whose home are damaged or lost, and those who need food or other forms of assistance. People killed include those who lose their lives or are missing and presumed dead.[7] We create a measure of disaster magnitude by adding the total number of people affected or killed by any natural disaster in a given country and year. We divide this sum by the country's population in the prior year. Similar cumulative measures have been used in prior research (Austin and McKin-

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5. We focus on removals, which do not include voluntary departures.

6. Online appendix figure A.1 shows the distribution of natural disasters by type during the sample period. The most common disasters are floods and storms, which account for 64 percent of all disasters during the 2000–2019 period. The online appendix can be found at https://www.rsfjournal.org/content/11/4/78/tab -supplemental.

7. For additional details see the EM-DAT documentation: https://doc.emdat.be/docs/.

ney 2016; Laurito 2022). We prefer to use this cumulative measure because, while a few large-scale disasters occurred during our study period (for example, the Indian Ocean tsunami in 2004, the Haiti earthquake in 2010), most countries tended to experience small- to medium-scale disasters that, when added together over a year, affected a large share of the country's population. Because these disasters tended to attract less international attention and aid (Strömberg 2007), they may have motivated out-migration or been more likely to increase the need for immigrants abroad to send remittances. We match the share of people affected or killed by natural disasters lagged one year to the immigrant removals data. We use a one-year lag to allow time for immigrants to respond to these home-country shocks.

We supplement these data with a series of control variables capturing home-country characteristics as well as features of the immigrant population in the US. We gathered yearly data on the TPS of each country from the US Department of Justice. We obtained each country's unemployment rate using World Bank development indicators, and each country's disaster vulnerability and readiness index from the University of Notre Dame Global Adaptation Initiative. These indexes are composed of a series of indicators that reflect a country's ability to take disaster adaptation and coping actions (readiness) and the probability that a country will be negatively affected by disasters (vulnerability) (University of Notre Dame Global Adaptation Initiative 2023). Readiness includes three dimensions: political, economic, and social. Vulnerability also includes three dimensions: exposure, sensitivity, and adaptive capacity (University of Notre Dame Global Adaptation Initiative 2023).[8] We use the version of the indexes that adjusts for country GDP given its influence on vulnerability and readiness, though results are not sensitive to this choice.

We rely on the American Community Survey (ACS) Public Use Microdata (Ruggles et al. 2023), which we aggregate to calculate the number of immigrants aged eighteen to sixty-five in the US from each country that are male, have a high school degree or less, are noncitizens, and are likely undocumented.[9] We also use the ACS to identify likely undocumented immigrants from each country who are recent arrivals, which we define as having been in the US for less than three years. We use these data to estimate the number of noncitizens and likely undocumented immigrants in the labor force and employed, and to calculate their average number of weekly hours worked. We impute missing data using linear interpolation for the country unemployment rate and the variables constructed using the individual-level ACS, as not all countries are represented every year in these data.

We also collect information on immigrant remittances for each country to use in supplemental analyses. We gathered data from the World Bank on two variables: personal remittances as a percent of a country's GDP and personal transfers from nonresident household members in US dollars (logged).[10] While these data are not restricted to remittances and transfers from the US, they should still convey whether patterns of financial assistance respond to salient home-country natural disasters.

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8. More details on these indexes and their component indicators can be found in the full technical report (University of Notre Dame Global Adaptation Initiative 2023).

9. We follow the approach used by George J. Borjas and Hugh Cassidy (2019) to determine likely undocumented status. Foreign-born respondents with none of the aforementioned traits were considered undocumented: arrived in the US before 1980; are a US citizen; receive Social Security benefits or Supplemental Security Income; are a veteran or currently in the Armed Forces; work in the government sector; were born in Cuba; work in an occupation that requires licensing (such as physicians, registered nurses, lawyers); or have a spouse that is a legal immigrant or citizen.

10. Personal remittances include both personal transfers from nonresident household members and compensation of employees working in a country where they do not reside, as well as compensation of resident employees who work for nonresident employers. For additional details, see World Bank development indicators documentation: https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS.

EMPIRICAL STRATEGY

We employ a difference-in-differences approach leveraging exogenous variation in the timing and magnitude of international natural disasters to estimate their impact on total removals. We assume that only salient natural disasters will produce a response through the mechanisms previously discussed and outlined in figure 1. Thus, following prior research (Laurito 2022), we consider a country to have experienced salient natural disasters (to be treated) if, over the course of the prior year, natural disasters affected or killed more than 1 percent of the home country population.[11] We use this cutoff for theoretical and practical reasons. Theoretically, disasters covered by this threshold are large enough to be meaningful for a country. According to World Bank data, in 2019—the last year of our sample—average population growth around the world was 1.06 percent.[12] Thus, for roughly 40 percent of the countries in our sample, our chosen cutoff is equivalent to more than a year of population growth.[13] Practically, this threshold results in a similar number of observations for treated and untreated groups. We experiment with higher cutoffs to check the sensitivity of our results to the choice of disaster magnitude threshold and use a lower cutoff to confirm that only disasters

deemed cumulatively salient produce a response.[14]

As is customary in difference-in-differences designs, once a country is exposed to salient natural disasters, it remains treated for the remainder of the study period. Specifically, we compare the change in immigrant removals before and after a country was first exposed to salient natural disasters with the change in removals of immigrants from countries that never experienced disasters of that magnitude. Provided that treated and untreated units follow parallel trends prior to the disaster, the difference in this change should yield an unbiased estimate of the effect of salient natural disasters on removals.[15] This baseline specification takes the following form:

$$(1) \; \log (TotRemoved)_{it} = \alpha_i + \beta Disaster_{it\text{-}1} + X'_i\theta + \delta_t + \varepsilon_{it},$$

where the outcome consists of the logged total number of removals of immigrants from country i in year t.[16] Our key independent variable, *Disaster*, equals one starting when a country first experienced natural disasters that cumulatively affected or killed more than 1 percent of the population, and remains one for the rest of the sample period. The *Disaster* indicator is

11. This roughly equates to the share of people affected or killed being in the 85th percentile of the overall distribution. Note that in subsequent analyses, we estimated the sensitivity of our results to this threshold by re-estimating our analyses using 5 percent and 10 percent threshold.

12. Authors' calculation using World Bank development indicators: Population growth (annual %): https://data.worldbank.org/indicator/SP.POP.GROW.

13. Average population growth in our sample from 2000 to 2019 is 1.31 percent. About 40 percent of countries in our sample had negative population growth or population growth ranging from 0 to 1 percent.

14. Note that our measure is at the country level and does not account for regional variations within countries in the probability of natural disasters or migration flows into the US. If immigrants in the US come from regions that were not affected by natural disasters, they may be less likely to respond to these events through the hypothesized mechanisms. This source of measurement error should bias our estimates toward zero.

15. Some countries are likely to experience other salient natural disasters after this first exposure. To address concerns that our treatment definition may not fully capture multiple exposures, we conduct a supplemental analysis evaluating their impact on removals and review the results later in the article.

16. We do not transform the removal variable before logging to preserve zeros. We do so because there are very few observations with zero removals in a given year (thirty observations) and dropping these observations as a result of the log transformation should not alter our conclusions. That said, we conducted additional analyses to check this assumption. Specifically, we added a value of one to the removal counts before logging them. As expected, our results do not change. These tables are available from the authors.

always zero for countries that never experienced salient natural disasters. This variable is lagged one year to permit time for immigrants to respond. The model also includes a vector of baseline country characteristics (X_i), which includes TPS designation, readiness and vulnerability scores, home-country unemployment, the logged number of male immigrants in the US aged eighteen to sixty-five, and the logged number of immigrants in the US aged eighteen to sixty-five with a high school degree or lower.[17] We also include year fixed effects (δ) and country fixed effects (α). Year fixed effects should account for factors that affected all countries in a given year, while country fixed effects account for time-invariant, country-specific factors such as their proximity to the US. Our coefficient of interest is β, which captures the effect of salient home-country natural disasters on total removals and, again, it should be an unbiased estimate under the parallel trends assumption.

Indeed, an important underlying assumption of our empirical approach is that, prior to the occurrence of salient natural disasters, removals of immigrants from affected countries did not differ systematically from those of countries never exposed to such disasters. A violation of this parallel trends assumption would suggest that factors other than salient home-country natural disasters are driving the observed differences in removal patterns between treated and untreated countries. To test the plausibility of this assumption, we estimate event studies of the following form:

$$(2)\ \log{(TotRemoved)}_{it} = \alpha_i + \sum_{k=-10}^{k=10} \beta_k Disaster_{it-1} + X'_i\theta + \delta_t + \varepsilon_{it}.$$

Equation (2) includes a series of dummy variables that capture the number of years before and after a country first experienced salient natural disasters. If immigrant removals are affected by these shocks, we should see an increase in removals following the salient natural disasters and no change before. Observing that removals were increasing in the pre-period would suggest that factors other than home-country natural disasters are driving our results. The rest of the equation is as before.

We estimate all regressions using the estimator developed by Brantly Callaway and Pedro Sant'Anna (2021) instead of using a traditional two-way fixed effects model and present aggregated average treatment effect on the treated (ATT) estimates for the pre- and post-disaster periods in all tables. As a growing body of research has shown, two-way fixed effects models can bias the estimated coefficient in the presence of differential treatment timing as they use both good and bad comparisons, with bad comparisons consisting of units that have already been treated and no longer serve as good counterfactuals (Callaway and Sant'Anna 2021; Goodman-Bacon 2021; Roth et al. 2023; Sun and Abraham 2021). In the present empirical set up, this estimator is preferable as it allows us to account for potential bias owing to the fact that countries were exposed to salient natural disasters at different points in time. Further, the Callaway and Sant'Anna estimator also relies on baseline covariates for estimation. This is important as many relevant control variables in our model are likely affected by salient natural disasters and would not be appropriate to include as controls in a traditional two-way fixed effects regression. We restrict our analyses to a window of ten years before and after salient natural disasters to allow time for a delayed response while ensuring that more distal time periods, which are more likely to be affected by factors unrelated to natural disasters, are not driving our results.[18] We dropped thirty-eight countries that experienced salient natural disasters in 2000 and thus were considered treated for the full period. The Callaway and Sant'Anna estimator relies on a balanced panel for estimation in which, for each treatment cohort, only observations with balanced pairs be-

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17. Results are robust to removing the age restriction for these last two variables.

18. We test the sensitivity of our results to this choice and find that our results are robust when restricting our time frame to five, six, seven, eight, and nine years before and after salient natural disasters.

tween each pre-period year and the post-period years are used for identification.

To explore the possible mechanisms that might explain changes in removals after salient natural disasters, we estimate equations (1) and (2) for the following outcomes: logged likely undocumented immigrants present in the US for less than three years; logged noncitizen and likely undocumented immigrants in the labor force; logged noncitizen and likely undocumented immigrants who are employed; and noncitizen and likely undocumented immigrants' average weekly hours worked. These analyses will shed light on whether changes in removals following salient natural disasters are driven by increases in irregular migration or increased vulnerability to detection as immigrants engage in additional or new employment.

RESULTS

We begin by descriptively documenting the geographic distribution of immigrant removals as well as natural disaster exposure across the countries in our sample in figure 2. As seen in panel A, immigrants from across the globe are subject to removal from the US, but countries across the Americas are overrepresented among those deported during our study period. This is particularly true for Mexico, Brazil, Canada, Venezuela, Bolivia, Peru, Ecuador, and Colombia; countries in Central America such as Guatemala, El Salvador, and Honduras; and countries in the Caribbean. India and China also include substantial numbers of removals, while most European and African countries have the lowest numbers.

In panel B, we see that while countries around the world experienced natural disasters that affected at least 1 percent of the country's population over the sample period, countries in South America, the Caribbean, Central America, Africa, and South and East Asia expe-

rienced the largest disasters. Taken together, this figure shows that there is substantial geographic variation in both removals and cumulative disaster magnitude.
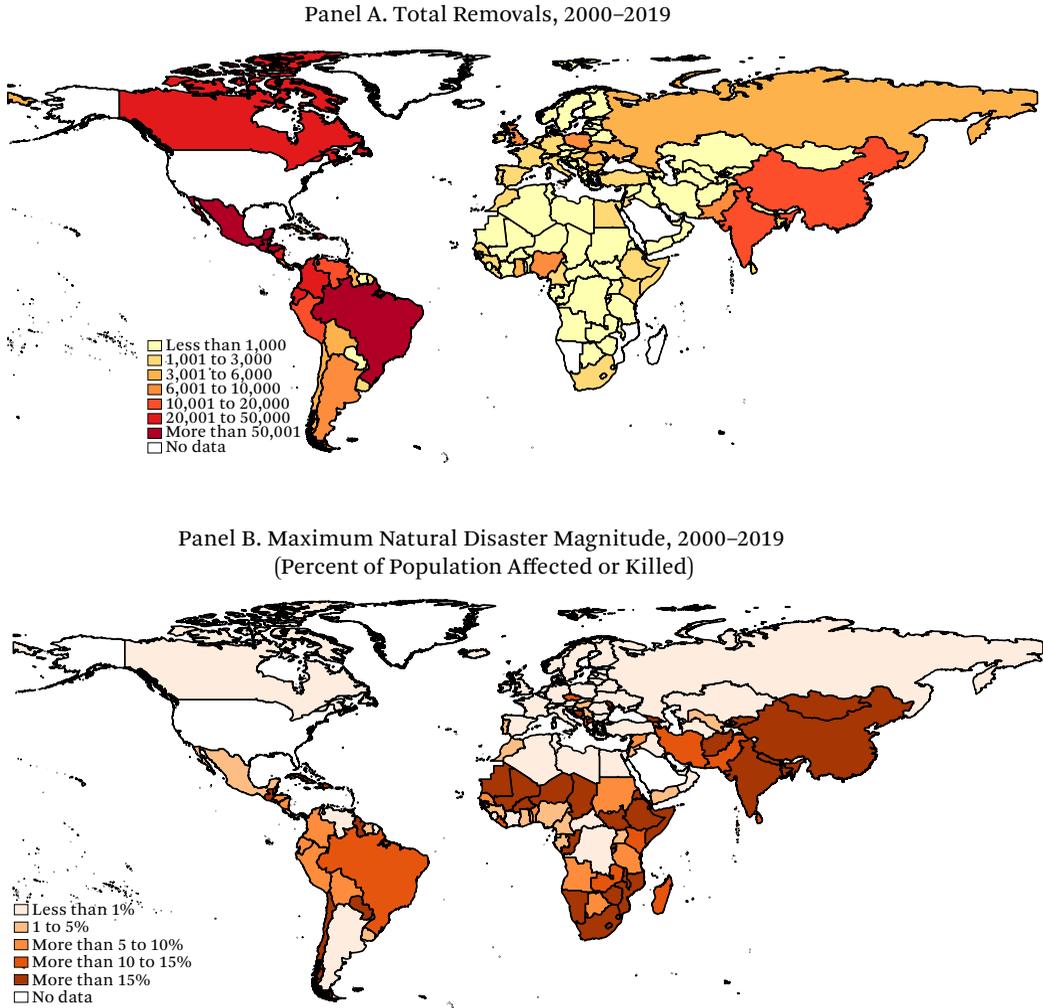
Table 1 provides descriptive statistics for our sample of countries at baseline. Overall, only 6 percent of countries had TPS in 2000, but that number was higher among countries that experienced salient natural disasters over the study period (9 percent). As expected, countries that have experienced salient natural disasters have lower readiness and higher vulnerability scores. We also see that there are more male immigrants aged eighteen to sixty-five in the US from disaster-affected countries than from non-affected countries, as well as more immigrants with a high school degree or less. A look at the regional distribution shows that 30 percent of countries in our sample are in Europe and Central Asia, 25 percent are in Africa, 18 percent in Latin America and the Caribbean, and 13 percent are in East Asia. This distribution changes when we focus on countries that have experienced salient natural disasters. Countries in Latin America, the Caribbean, and Africa are overrepresented among this group, while countries in Europe and Central Asia are more than half of the countries that did not experience these salient shocks.

EFFECT OF HOME-COUNTRY NATURAL DISASTERS ON IMMIGRANT REMOVALS

Table 2 presents results from our difference-in-differences analyses examining the impact of salient home-country natural disasters on immigrant removals. On average, salient home-country natural disasters increase immigrant removals by 29 percent in the years following their occurrence (column 1).[19] This estimate is similar in models that include home country and US immigrant population baseline controls (column 2).[20] This increase marks a clear

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19. Because the outcome is logged, we exponentiate all coefficients to interpret their magnitude as a percent change, as follows: $100 \times (e^{\beta} - 1)$.

20. Because some countries have missing data for the controls, the sample size in column 2 is reduced. Additional analyses show that any differences in the point estimates between columns 1 and 2 are not caused by compositional changes in the sample resulting from adding controls. Analyses are available from the authors.

Figure 2. Total Immigrant Removals and Maximum Natural Disaster Magnitude by Country

Panel A. Total Removals, 2000–2019

Less than 1,000
1,001 to 3,000
3,001 to 6,000
6,001 to 10,000
10,001 to 20,000
20,001 to 50,000
More than 50,001
No data

Panel B. Maximum Natural Disaster Magnitude, 2000–2019
(Percent of Population Affected or Killed)

Less than 1%
1 to 5%
More than 5 to 10%
More than 10 to 15%
More than 15%
No data

Source: Authors' compilation based on *Yearbook of Immigration Statistics* (US Department of Homeland Security, n.d.) and Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/).
Note: Total removals reflect the sum of all removals from 2000 to 2019. Disaster magnitude captures the percent of the country's population that was affected or killed by natural disasters. The map reflects the maximum magnitude experienced by a country from 2000 to 2019.

departure from the removal patterns witnessed prior to the occurrence of salient natural disasters, as seen in the pre-period estimates reported in this table.

Event study results shown in figure 3 confirm these findings. Specifically, we see a clear increase in removals shortly following salient home-country natural disasters. These estimates range from 31 to 47 percent. Importantly, we do not observe statistically significant changes in the period before salient natural disasters, suggesting that our results are not merely continuations of prior trends driven by unobserved or unaccounted-for factors.[21]

21. We estimate the pre-period coefficients using the long difference from base period $T - 1$, which is the best approximation of the standard event study regression and is most appropriate for visual inspection of pre-trends (Callaway and Sant'Anna 2021).

Table 1. Mean Sample Characteristics at Baseline

	All	Salient Natural Disasters	No Salient Natural Disasters
Panel A. Country and immigrant characteristics			
TPS	0.06	0.08	0.02
	(0.24)	(0.27)	(0.16)
Country readiness score	0.01	−0.01	0.04
	(0.08)	(0.06)	(0.12)
Country vulnerability score	−0.02	0.00	−0.06
	(0.08)	(0.07)	(0.07)
Country unemployment rate	8.52	8.10	9.45
	(5.88)	(5.84)	(5.92)
Male immigrants 18–65 years old in US	88,795.20	111,906.80	38,626.05
	(392,388.00)	(471,668.70)	(57,815.56)
Immigrants with high school or less in US 18–65 years old	112,136.90	147,284.60	35,840.68
	(619,651.70)	(746,510.10)	(59,769.48)
Panel B. Country region			
East Asia and Pacific	0.12	0.16	0.05
	(0.33)	(0.37)	(0.22)
Europe and Central Asia	0.32	0.17	0.63
	(0.47)	(0.38)	(0.49)
Latin America and Caribbean	0.21	0.27	0.07
	(0.41)	(0.45)	(0.26)
Middle East and North Africa	0.08	0.04	0.15
	(0.27)	(0.21)	(0.36)
North America	0.01	0.00	0.02
	(0.09)	(0.00)	(0.16)
South Asia	0.05	0.07	0.00
	(0.21)	(0.25)	(0.00)
Sub-Saharan Africa	0.22	0.29	0.07
	(0.42)	(0.46)	(0.26)
Observations	130	89	41

Source: Authors' compilation based on the *Yearbook of Immigration Statistics* (US Department of Homeland Security, n.d.), Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/), ACS (Ruggles et al. 2023), World Bank development indicators (https://databank.worldbank.org/source/world-development-indicators), and the University of Notre Dame Global Adaptation Initiative 2023.
Note: Sample is restricted to countries with non-missing removals and non-missing data at baseline (year 2000). Disaster readiness and vulnerability are GDP adjusted; unadjusted values range from 35 to 44 for readiness and from 39 to 49 for vulnerability. Countries with salient natural disasters are those that experienced natural disasters that cumulatively affected or killed more than 1 percent of the population in the prior year. Standard deviations are shown in parentheses.

Table 2. Effect of Home-Country Natural Disasters on Immigrant Removals

DV: Log (total removals)	(1)	(2)
Panel A. Main results: 1 percent threshold		
Pre-disaster	−0.034	−0.003
	(0.085)	(0.135)
Post-disaster	0.258**	0.255*
	(0.084)	(0.123)
Observations	2,135	1,793
Panel B. Robustness check: 5 percent threshold		
Pre-disaster	0.093	0.179
	(0.091)	(0.102)
Post-disaster	0.214*	0.263*
	(0.091)	(0.116)
Observations	2,567	2,110
Panel C. Robustness check: 10 percent threshold		
Pre-disaster	0.022	0.023
	(0.103)	(0.118)
Post-disaster	0.236*	0.271*
	(0.098)	(0.129)
Observations	2,727	2,271
Country and immigrant demographic controls	No	Yes
Country fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

Source: Authors' compilation based on the *Yearbook of Immigration Statistics* (US Department of Homeland Security, n.d.), Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/), ACS (Ruggles et al. 2023), World Bank development indicators (https://databank.worldbank.org/source/world-development-indicators), and the University of Notre Dame Global Adaptation Initiative 2023.

Note: Table shows aggregated ATTs obtained with the Callaway and Sant'Anna estimator predicting log total immigrant removals using alternative cutoffs to define salient natural disasters. All models include the following baseline country and immigrant demographic controls: TPS, home country readiness score, home country disaster vulnerability score, US immigrant male population aged 18 to 65 (logged), US immigrant population aged 18 to 65 with a high school degree or less (logged), and the home country unemployment rate. Models also include country and year fixed effects. Always-treated units are omitted from the analyses. Mean number of removals at baseline (year 2000) is 1,441.
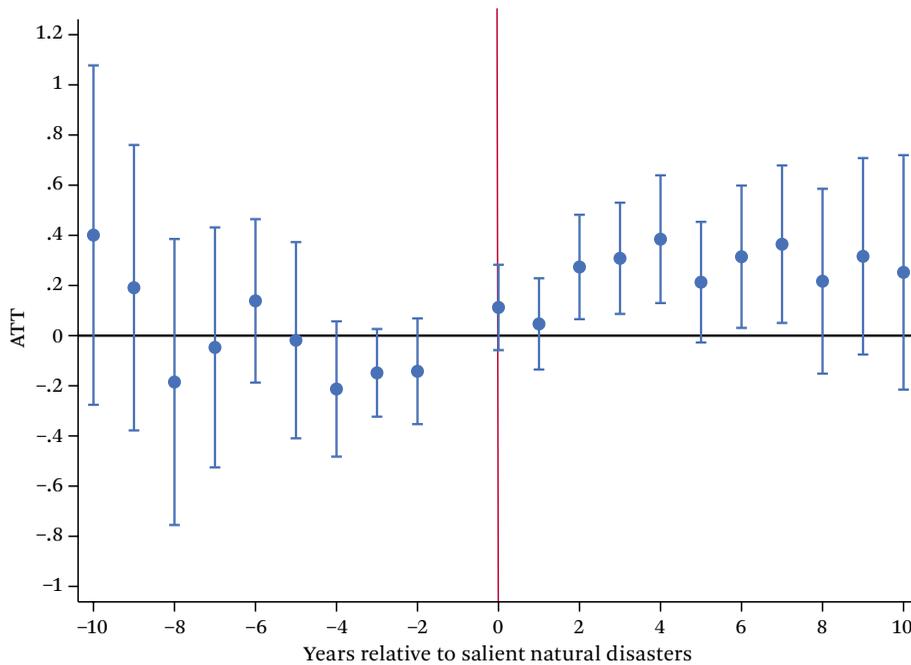
Standard errors in parentheses (clustered by country)

$*p < .05$; $**p < .01$

We check the sensitivity of our findings to our choice of treatment cutoff by reestimating these models using two alternative cutoffs: natural disasters in which the share of people affected or killed was more than 5 percent and more than 10 percent of the home country population. As seen in panels B and C of table 2, our results are robust to these modifications,

Figure 3. Event Study Estimates Predicting the Effect of Home-Country Natural Disasters on Immigrant Removals

Source: Authors' compilation based on the *Yearbook of Immigration Statistics* (US Department of Homeland Security, n.d.), Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/), ACS (Ruggles et al. 2023), World Bank development indicators (https://databank.worldbank.org/source/world-development-indicators), and the University of Notre Dame Global Adaptation Initiative 2023.

Note: Figure shows results from event studies estimated using the Callaway and Sant'Anna estimator. The model includes baseline controls: TPS, disaster readiness, disaster vulnerability, US male immigrant population aged 18 to 65 (logged), US immigrant population aged 18 to 65 with a high school degree or less (logged), and the country unemployment rate. Models also include country and year fixed effects. Salient natural disasters are defined as those in which more than 1 percent of the population was affected or killed by natural disasters over the prior year. The outcome is total immigrant removals (logged). Always-treated units are omitted from the analyses.

with point estimates showing increases in removals following salient home-country natural disasters ranging from 24 to 31 percent.[22]

To further assess the sensitivity of our main results to our choice of estimation strategy, we reestimated our models using the estimator developed by Liyang Sun and Sarah Abraham (2021) for dynamic difference-in-differences. The results, presented in online appendix table A.2, align with our main findings. After salient home-country natural disasters that affected or killed more than 1 percent of the home country population over the course of the prior year, we see a 20 to 22 percent increase in immigrant

22. We also performed a falsification test using a cutoff lower than 1 percent (75th percentile instead of roughly the 85th represented by our 1 percent cutoff). There should be no change following disasters below this threshold since this threshold includes disasters that are not deemed salient and, therefore, unlikely to produce a change through the hypothesized mechanisms. As seen in online appendix table A.1, we find no evidence that disasters of this magnitude affect removal patterns.

removals, which also constitutes a clear break from prior trends (table A.2, panel A) and in event study estimates plotted in online appendix figure A.2.[23] These results are robust to other disaster magnitude thresholds as well, ranging from 18 to 30 percent (online appendix tables A.2, panels B and C).

A concern with including more distal time periods is that factors other than natural disasters might be more influential and have an outsized impact on removals. To ensure our results are not sensitive to our ten-year time window, we reestimate our preferred model specification while restricting the time frame to five, six, seven, eight, and nine years before and after salient natural disasters.[24] Our results, shown in online appendix table A.3, are not affected by these changes. Specifically, salient home-country natural disasters increase immigrant removals between 25 percent (five-year window) to 29 percent (nine-year window).[25]

The analyses discussed up to this point examine the impact of a country's first exposure to salient natural disasters that, in the course of a year, affected or killed more than 1 percent of a country's population. Our empirical approach does not differentiate countries that experienced subsequent natural disasters above the 1 percent threshold from those that did not. In our sample, roughly 35 percent of countries were never exposed to disasters at this threshold, about 13 percent were exposed in only one year, and approximately 11 percent were exposed in only two years. This leaves a little over a third of countries in the sample exposed to salient natural disasters for more than two years. To test whether these additional exposures matter, we conducted a supplemental analysis stratifying the sample by whether the first exposure was the only one or not. As seen in online appendix table A.4, we find little evidence that additional exposures have a differential effect. Removals increased by 40 percent in countries exposed to salient natural disasters over only one year and by 28 percent in countries exposed for two or more years. However, a test for equality of coefficients revealed these estimates to be not statistically different from one another.[26]

EXPLORING MECHANISMS

A secondary objective of this article is to explore plausible mechanisms driving the increases in immigrant removals following salient home-country natural disasters.[27] In table 3, we begin by examining whether these disasters increased the number of recent likely un-

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23. We also estimated a two-way fixed effects regression using the most parsimonious specification shown in column 1 of table 2. Using time-varying controls in this case would not be appropriate, as many of our control variables are simultaneously affected by salient natural disasters. Results from this specification show an increase in removals of 22 percent, and event studies reveal that there were no prior differences in removals before salient natural disasters (online appendix figure A.3). These results further suggest that our findings are not driven by the choice of estimator.

24. As an additional sensitivity check, we estimated these results without control variables finding that our conclusion remains unchanged. In these regressions, average effects range from 24 percent to 29 percent. Results are available from the authors.

25. Considering that most immigrant removals affect immigrants from Mexico and Central America, we reestimated our regression removing removals from Mexico, Honduras, El Salvador, Guatemala, and Nicaragua from the sample. Our results remain unchanged, suggesting the estimated removal patterns are not driven by these countries. Results are available from the authors.

26. We performed this test following Raymond Paternoster and colleagues (1998), which yielded: $Z = 0.479$ ($p > .10$). These analyses are also robust when using the Sun and Abraham estimator, which yields an increase in removals of 15 percent among the sample exposed to salient natural disasters only once and 20 percent among the sample exposed for two or more years.

27. In a set of supplementary analyses, we estimated the effect of salient home-country natural disasters on immigrant apprehensions. If immigrant apprehensions are a necessary precursor to removal, we should observe an increase in this outcome following these home-country shocks. If we do not see this increase, it could cast

Table 3. Exploring Mechanisms: Migration and Employment

	Recent Likely Undocumented Immigrants (1)	Noncitizen Immigrants		
		Labor Force Participation (2)	Employed (3)	Hours Worked (4)
Pre-disaster	0.092	−0.059	−0.066	0.210
	(0.107)	(0.057)	(0.062)	(0.449)
Post-disaster	−0.018	0.183*	0.183*	−0.938
	(0.145)	(0.083)	(0.086)	(0.690)
Mean outcomes (baseline)	25,323.30	69,800.32	63,969.68	39.99
Observations	1,896	1,909	1,909	1,909

Source: Authors' compilation based on the *Yearbook of Immigration Statistics* (US Department of Homeland Security, n.d.), Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/), ACS (Ruggles et al. 2023), World Bank development indicators (https://databank.worldbank.org/source/world-development-indicators), and the University of Notre Dame Global Adaptation Initiative 2023.
Note: Table shows aggregate ATTs using the Callaway and Sant'Anna estimator. All models include the following baseline country and immigrant demographic controls: TPS, home country readiness score, home country disaster vulnerability score, US immigrant male population aged 18 to 65, US (logged), immigrant population aged 18 to 65 with a high school degree or less (logged), and the home country unemployment rate. Models also include country and year fixed effects. Always-treated units are omitted from the analyses. Salient natural disasters are defined as those in which more than 1 percent of the home country population was affected or killed in the prior year. Baseline is the year 2000. Standard errors in parentheses (clustered by country)
*p < .05; **p < .01

documented immigrants (column 1). We do not find evidence that undocumented migration increases after salient home-country natural disasters.

Yet another channel through which salient natural disasters may increase the number of apprehensions and subsequent removals is if immigrants from disaster-affected countries in the US alter their work behavior so that they can send financial assistance to their home country. If immigrants work more in response to natural disasters, they may be more vulnerable to detection by immigration authorities and subsequent deportation as they become more publicly visible. Columns 2 through 4 explore whether salient home-country natural disasters increase the labor force participation,
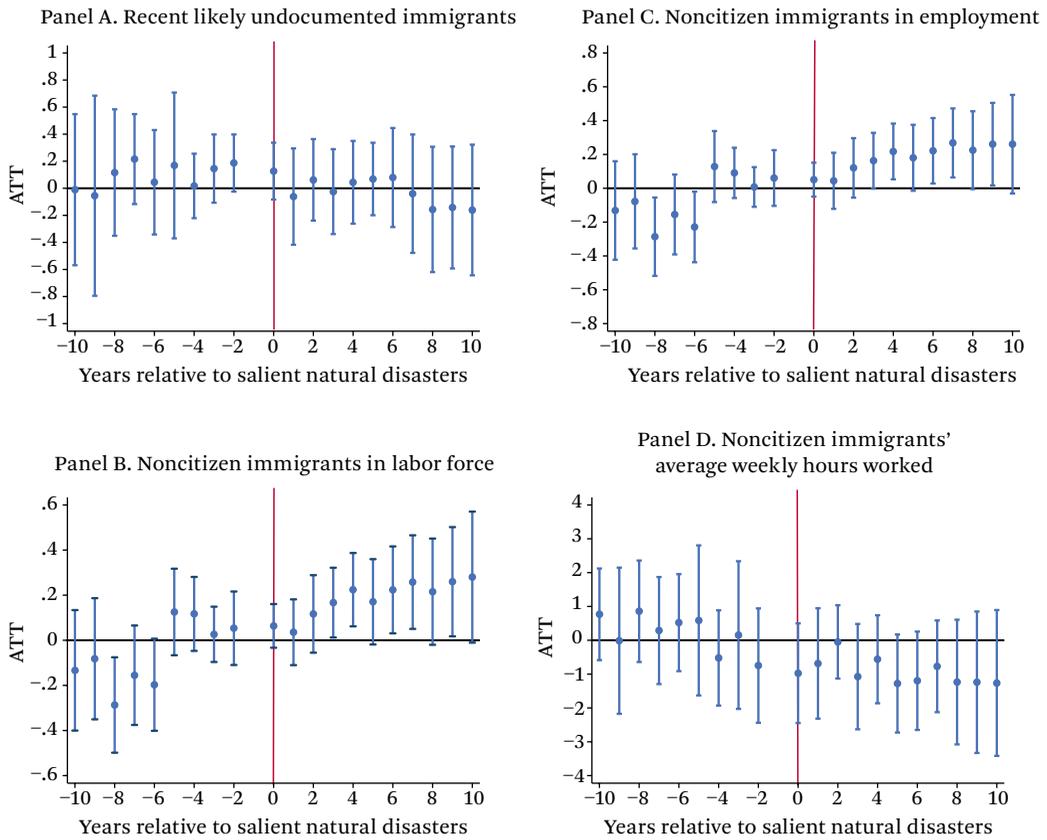
employment, and hours worked of noncitizen immigrants. Overall, we see that noncitizen immigrants increase their labor force participation and employment following salient home-country natural disasters by 20 percent. We find no evidence that salient natural disasters positively affect the average number of hours noncitizens work per week, which could suggest that most immigrants are already working full time.[28]

As before, we use event studies to inspect whether the estimates reported in table 3 are not attributable to preexisting or otherwise unaccounted for factors. The results presented in figure 4 confirm our findings. Panel A shows no change in recent likely undocumented immigrant arrivals. Although panel D shows no

doubt on whether our proposed mechanisms are driving changes in removal patterns. Our results reveal that apprehensions increased by 40 percent following salient home-country natural disasters (online appendix figure A.4).

28. Based on our analyses of ACS data, noncitizen immigrants work an average of thirty-nine hours per week.

Figure 4. Event Study Estimates Predicting the Effect of Home-Country Natural Disasters on Likely Undocumented Immigrant Arrivals and Noncitizen Labor Market Outcomes

Panel A. Recent likely undocumented immigrants

Panel C. Noncitizen immigrants in employment

Panel B. Noncitizen immigrants in labor force

Panel D. Noncitizen immigrants' average weekly hours worked

Source: Authors' compilation based on the *Yearbook of Immigration Statistics* (US Department of Homeland security, n.d.), Emergency Events Database (EM-DAT): The International Disaster Database (https://doc.emdat.be/docs/), ACS (Ruggles et al. 2023), World Bank development indicators (https://databank.worldbank.org/source/world-development-indicators), and the University of Notre Dame Global Adaptation Initiative 2023.
Note: Figure shows results from event studies estimated using the Callaway and Sant'Anna estimator. The model includes baseline controls: TPS, disaster readiness, disaster vulnerability, US male immigrant population aged 18 to 65 (logged), US immigrant population aged 18 to 65 with a high school degree or less (logged), and the country unemployment rate. Models also include country and year fixed effects. Salient natural disasters are defined as those in which more than 1 percent of the population was affected or killed by natural disasters over the prior year. The outcome is total immigrant removals (logged). Always-treated units are omitted from the analyses.

change in noncitizen average weekly hours worked, panels B and C reveal that the increases in labor force participation and employment shown in table 3 emerged shortly after salient natural disasters.

We reach similar conclusions to those presented in columns 2 through 4 of table 3 when we restrict our focus to likely undocumented

immigrants, which we identify following the approach by George J. Borjas and Hugh Cassidy (2019), instead of all noncitizen immigrants. As seen in online appendix table A.5 and online appendix figure A.5, we find that salient home-country natural disasters increase likely undocumented immigrants' labor force participation and employment by 23 and 24 percent, respec-

tively, which represents a break from prior trends. Interestingly, these analyses show a statistically significant decline of approximately 1.4 weekly hours worked. This change is small and represents a 3.6 percent decline relative to the mean.

Altogether, our results indicate that increases in removals following salient natural disasters are not driven by the presence of more deportable immigrants in the US, as the number of recent undocumented immigrants did not increase. Our findings, then, suggest that immigrants already present in the US alter their behaviors in ways that may make them more vulnerable to detection and deportation after these home-country shocks.

One concern with these labor market analyses is the potential influence of unobserved factors in immigrants' US state of residence that could affect labor force participation and employment outcomes. For example, local natural disasters may affect employment patterns—as seen among immigrants working in the reconstruction and recovery process following Hurricane Katrina (Donato et al. 2007; Fussell 2009a, 2009b)—an effect that may be more likely among those working in sectors sensitive to fluctuations in the economy and immigration enforcement (Amuedo-Dorantes and Antman 2022; East et al. 2023). To address these concerns, we reestimated our models using individual-level ACS data. We augmented our baseline specification by including state-by-year fixed effects, which capture state-specific time shocks, and industry-by-year fixed effects, which adjust for industry-specific time shocks. This last set of fixed effects is important given that immigrants tend to be overrepresented in particular industries and occupations for various systemic reasons (Laurito et al. 2024; Tesfai and Thomas 2020). We also include a richer set of individual-level variables and migration-year fixed effects.[29] The results, presented in online appendix table A.6, largely support our main conclusions. We do not see an increase in the labor force participation of noncitizen immigrants (column 1, panel A), but we observe a 1 percent increase in employment following salient home-country natural disasters (column 2, panel A). While pre-period estimates are negative, they are statistically different from zero, suggesting that employment was declining prior to these home-country shocks. We also observe a small increase in the number of hours worked, which is about 0.6 percent relative to the mean. Taken together, these additional analyses provide evidence that noncitizen immigrants alter their labor market outcomes in response to home-country shocks. In the case of undocumented immigrants (panel B), we do not find statistically significant changes, but all post-disaster estimates are positive.

Lastly, to better understand the rationale behind these increases in labor force participation and employment, we also examine whether remittance flows have similarly increased following salient home-country natural disasters. Within a framework of transnational social protection (Boccagni 2017; Levitt et al. 2017), assistance from remittances may constitute an important element for both disaster recovery as well as preparedness for future disasters. Online appendix table A.7 and online appendix figure A.6 show results from these analyses.[30] Aggregate post-treatment estimates show positive but statistically insignificant increases in remittances and personal transfers. Yet in online appendix figure A.5, we observe statistically significant increases in remittances and personal transfers after salient natural disasters and, most importantly, a clear

29. In addition to country fixed effects, we include the following controls: male, number of children, Hispanic, Black, Asian, other race or ethnicity, age in years, an indicator for presence in the US for less than ten years, married, speaks only English, does not speak English or has limited English proficiency, high school or less, some college, migrated before age twelve, as well as baseline controls for home-country readiness, vulnerability, and unemployment. Note that because of its added flexibility for cross-sectional analyses and different fixed effects, we use the Sun and Abraham estimator for these individual-level analyses.

30. In these specifications, we control for country-level characteristics, as well as year and country fixed effects. We exclude controls specific to US immigrant populations because the remittance data are not limited to transfers originating from the US.

break in prior trends. While suggestive, these results provide support for our hypothesized mechanism that immigrants respond to these salient shocks by engaging in behavior that would allow them to start or increase remittances. This behavior may increase immigrants' probability of apprehension and subsequent deportation as they become more publicly visible.

CONCLUSION AND DISCUSSION

This article examines how country of origin contexts shape patterns of immigrant removals during a period of intensified immigration enforcement in the US. We focus our attention on the influence of salient natural disasters, which are expected to increase in frequency and magnitude because of climate change (Van Aalst 2006). Our analysis finds that natural disasters affecting more than 1 percent of the home-country population increase immigrant removals from the US by 29 percent. This result comes from employing a difference-in-differences strategy that exploits exogenous variation in the timing and magnitude of natural disasters across the world. Our findings are robust to alternative disaster magnitude thresholds, difference-in-differences estimators, time windows around these salient shocks, and adjustments for various home-country characteristics and attributes of immigrants living in the US. In terms of magnitude, our results seem plausible, suggesting an increase of 418 additional removals per year based on the baseline mean. This is roughly equivalent to one additional day of removals at baseline.

Our investigation into the channels through which salient home-country natural disasters increase immigrant removals points to behavioral changes among immigrants already residing in the US—rather than increases in irregular migration—as the primary driver of these effects. We found no evidence that these disasters increase the number of recent arrivals of likely undocumented immigrants.

We observe large increases in the labor force participation and employment of noncitizen and likely undocumented immigrants after salient home-country natural disasters. These effects ranged from a 20 percent increase for noncitizen immigrants to roughly 24 percent among likely undocumented immigrants. We also find that remittances and personal transfers increase after salient natural disasters, suggesting that observed changes in labor market outcomes might be the result of immigrants' decisions to start or increase financial assistance to their home countries. The changes we observe in employment outcomes may expose immigrants who are vulnerable to deportation to heightened risk of detection and subsequent removal by immigration authorities. Previous research has highlighted that even minor interactions, such as a routine traffic stop, can initiate deportation proceedings for those lacking legal status or noncitizens who have committed one of the myriad offenses that trigger deportation (Armenta 2017). Although we cannot definitively prove a link between employment and increased encounters with law enforcement, our findings suggest that participation in the labor force may elevate immigrants' visibility and exposure to the extensive immigration enforcement system in the US. Indeed, prior work has shown that likely undocumented immigrants negatively adjust their labor market outcomes in response to heightened immigration enforcement, likely in an attempt to avoid deportation (Amuedo-Dorantes and Antman 2022). When faced with the need to send remittances or assistance to their disaster-affected countries, immigrants—many of whom may be economically vulnerable—may not take these precautions. Further research examining the connection between employment and deportation risk would be a valuable addition to the limited body of existing literature exploring the factors contributing to immigrants' vulnerability to deportation and its interaction with home-country shocks. Additionally, starting or sending more frequent remittances may also increase the vulnerability of immigrants to detection and apprehension if they make more frequent trips to money transfer locations in the US, where they can be detected by immigration enforcement authorities. Again, while we do not have data linking increased remittance activity and immigration enforcement encounters, we believe isolating this mechanism would be a fruitful area for future research further linking immigrants' behav-

iors, home-country shocks, and deportation risks.

Our study is not without its limitations. First, we rely on publicly available, aggregated, country-level data, which means we are unable to explore how local enforcement conditions influence or moderate the effect of home-country natural disasters on removals. It could be the case that less welcoming immigration climates put immigrants at greater risk of detection by immigration authorities following natural disasters. Understanding the interactions between home-country shocks and the local context where immigrants live in the US would be an important area for future research.

Second, our data do not allow us to explore more direct pathways that might explain the observed increases in removals, such as whether immigrants residing in areas with more immigration enforcement activity are more likely to be removed following these home-country shocks. Understanding whether, and to what extent, immigrants are more likely to be detected by law enforcement, to be transferred to federal immigration authorities, and to receive less favorable rulings in immigration court after home-country natural disasters is an important line of future research.

Third, our country-level analysis may mask nuanced responses to local conditions in immigrants' home countries or prevailing conditions in US residential areas. Our lack of information on localities of origin may bias our estimates toward zero, as immigrants may be more likely to respond to natural disasters that affect their hometowns but not alter their behavior otherwise. Further, because our analyses capture national shifts in employment and removals, we are unable to assess how local US conditions affect observed patterns. These conditions could push estimates upward or downward. For example, if local natural disasters increase demand for workers for reconstruction, employment estimates may be driven upward. Conversely, local recessions could drive these estimates downward. In the case of removals, local variation in immigration climate and enforcement could have similar opposing effects.

Fourth, while we did not find evidence that salient home-country natural disasters in-crease irregular migration to the US, our ability to fully assess this relationship is limited by several factors. Our analyses do not rule out potential heterogeneity in this effect because of a country's proximity or difficulty of migration to the US. Unfortunately, our sample size of countries is not large enough to confidently estimate models stratified by region. In addition, our study combines all natural disasters within a country over a one-year period. To the extent that some types of disasters are more likely to generate out-migration, our analyses may also hide this heterogeneity. Future research should examine how different types of natural disasters affect premigration conditions and influence the likelihood of undocumented migration. Moreover, the ACS data we use to estimate recent migration do not include undocumented arrivals who are detained at the border and turned away. Thus, it is likely that our measure underestimates recent undocumented arrivals, providing an incomplete picture of the effect of natural disasters on this type of out-migration.

Despite these limitations, this article provides compelling evidence that home-country natural disasters constitute important pre- and post-migration contexts that alter deportation patterns in the US. Our findings show that the influence of migrants' home countries persists even after they leave. Immigrants live transnational lives and are key players in transnational networks providing social assistance for disaster recovery and reconstruction, which may explain why home-country conditions influence immigrants' behaviors and, ultimately, their risk of apprehension and removal post-migration.

This article sheds light on the important, yet often overlooked, transnational dimension of disaster vulnerability. Research on disaster vulnerability has shown that immigrants in the US are less likely to prepare for natural disasters, more likely to suffer negative consequences from these events, and less likely to benefit from post-disaster reconstruction and recovery (Méndez et al. 2020; Tierney 2019). Yet, this work has largely ignored how disasters in immigrants' home countries affect their vulnerability and experiences in the US. This article expands our understanding of disaster vulner-

ability by showing that home-country natural disasters can have tangible impacts on the lives of immigrants living in the US. As our results reveal, immigrant lives happen in both the US and in their home countries. Therefore, to fully understand the consequences of the deportation system in the US, we must take into account the local and transnational lives of immigrants and how these dynamics interact with each other.

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