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Immigration and violent crime: Evidence from the Colombia-Venezuela Border☆

Brian Knight [a],[*], Ana Tribin [b]

[a] Brown University, United States of America
[b] Regional Bureau for Latin America and the Caribbean United Nations Development Programme, United States of America

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ABSTRACT

This paper investigates the link between violent crime and immigration using data from Colombian municipalities during the recent episode of immigration from Venezuela. The key finding is that, following the closing and then re-opening of the border in 2016, which precipitated a massive immigration wave, homicides in Colombia increased in areas close to key border crossings. Using information on the nationality of the victim, we find that this increase was driven by homicides involving Venezuelan victims, who were disproportionately victimized relative to their size of the population. Thus, in contrast to xenophobic fears that migrants might victimize natives, it was migrants, rather than natives, who faced risks associated with immigration. We then investigate possible mechanisms underlying this link between immigration and violent crime.

1. Introduction

There is a long history of xenophobia, or fear of immigrants, around the world, and these negative perceptions of immigrants can apply to many different issues.[1] This paper investigates the link between immigration and violent crime based upon an analysis of homicide rates in municipalities in Colombia before and after the massive immigration wave from Venezuela that occurred during the past decade. This wave has led to anti-immigrant perceptions and a backlash among natives.[2] Consistent with negative perceptions about international migrants, Rozo and Vargas (2018) document that inflows of internal

migrants into Colombian municipalities does not affect voting behavior, while international migration reduces support for the incumbent party and increases votes for the right-wing candidates.

In this paper, we systematically address these issues using data on crimes in Colombian municipalities. We address two specific research questions. First, has the recent immigration wave from Venezuela led to an increase in violent crime in affected regions of Colombia? Second, if so, did this increase primarily involve crimes against natives or crimes against migrants, and were migrants disproportionately victimized, relative to their size in the population? While xenophobia around criminal activity involves perceptions of more crimes committed by

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[1] Campante et al. (2020) document that the Ebola health scare in the U.S. during 2014 led to more conservative views towards immigrants. According to a 2018 survey by Quinnipiac University, 71 percent of respondents in the United States think that undocumented immigrants illegally crossing the border with Mexico is an important problem, and 37 percent think that undocumented immigrants take jobs away from American citizens (see https://poll.qu.edu/images/polling/us/us04112018_ugnt28.pdf). Donald Trump recently used anti-immigration rhetoric as a key campaign theme, helping to propel him to win the 2016 Presidential Election (Lamont et al. (2017)).

[2] Based upon a survey conducted in Cucuta, a city close to a key border crossing with Venezuela, nearly two-thirds of respondents considered migrants as a threat to the city (FIP (2019)). Likewise, a national survey in Colombia found that 62 percent of respondents had an unfavorable perception of Venezuelan migrants, with only 31 percent having a favorable perception. In the same survey, 54 percent of respondents were in favor of closing the border, with only 40 percent supporting the relatively lax status quo policy. See https://www.semana.com/nacion/articulo/encuesta-invamer-aumenta-el-rechazo-a-los-venezolanos/626177. Furthermore, an OxFam (2019) survey shows that 74 percent of Colombians believe that immigration increases crime and insecurity, a slightly higher percentage than that of Ecuador (68 percent) and Peru (70 percent). Large anti-government protests in the capital city of Bogota during late 2019 further fueled anti-migrant perceptions, with wide circulation of unfounded rumors involving crimes committed by migrants during the protests (see https://www.reuters.com/article/us-colombia-strike-venezuela/protests-in-colombia-spark-backlash-against-venezuelan-migrants-idUSKBN1Y516U).

[3] The United Nations Refugee Agency highlights that migrants from Venezuela are often victimized (see https://www.unhcr.org/5ab8e1a17.pdf accessed July 10, 2020).

immigrants against natives, there is anecdotal evidence that immigrants themselves are at heightened risk for victimization.[3] Moreover, the existing literature on immigration and crime has lacked the nationality data necessary to understand which of these two views is correct.

To answer these research questions, we examine crime patterns in Colombia using both temporal and geographic variation. Our temporal variation involves the closing (August 2015) and subsequent re-opening (August 2016) of the border with Colombia by President Maduro of Venezuela, precipitating a massive immigration wave that accelerated in 2017 and peaked in 2018. The geographic variation involves comparing municipalities closer to and further from five key border crossings along the border between Colombia and Venezuela. To answer the first research question, we use data on homicide rates by municipality and month over the period 2010–2019. To answer the second research question, we also incorporate information on the nationality of homicide victims. We then investigate four possible mechanisms linking immigration to violent crime.

We begin by documenting a first-stage result involving immigration patterns. That is, using Census data, we document an increase in the share of Venezuelan-born individuals in municipalities close to key border crossings, following the closing and then re-opening of the border in 2016. Turning to the first research question, we document an increase in homicides in municipalities close to the five key border crossings following the closing and subsequent re-opening of the border in 2016, relative to the time period prior to the closing and relative to municipalities that lie further from these border crossings. These results are robust to using an alternative temporal definition of the migration wave, focusing on periods of hyperinflation in Venezuela, which helped to fuel the exodus to Colombia. Likewise, the results are robust to using a measure based upon travel times, rather than travel distances, and to using the distance to the two most important border crossings, rather than the distance to all five border crossings. Exploring the timing of homicides more finely, we find that the increase in crime close to the border was at its highest level during 2018, when both hyperinflation in and migration from Venezuela were also at their peak. Exploring more finely the geographic patterns of homicides, we find that the increase in homicides following the closing and subsequent re-opening of the border is driven by municipalities very close to the frontier, those within 100 miles of one of the five key border crossings.

In terms of the second research question, we find that this increase in homicides in this frontier region, following the closing and subsequent re-opening of the border in 2016, was driven by crimes against Venezuelans. We find no statistically significant evidence of an increase in homicides against native Colombians. Exploring more finely the timing of the increase in homicides against Venezuelans in the border region, we find that this increase was again the strongest during 2018, when both hyperinflation in and migration from Venezuela were at their peak. Exploring more finely the geographic patterns surrounding the increase in homicides against Venezuelans following the closing and subsequent re-opening of the border, we find that the results are driven almost exclusively by municipalities very close to the frontier, those within 100 miles of one of the five key border crossings. We then provide evidence that these results are not mechanical in nature; instead, it appears that migrants were disproportionately victimized, relative to their size in the population.

We then shed light, mostly indirect, on four possible mechanisms underlying this increase in homicides against migrants. First, using data on arrests for homicides, we document that Venezuelans were not disproportionately arrested for homicides in these places and time periods, suggesting that our results are not driven by migrants committing crimes against other migrants. Second, using information on cargo thefts, which have been linked to criminal organizations, we document an increase in such crimes close to the frontier following the closing and then re-opening of the border in 2016. While indirect in nature, this evidence is consistent with a link to organized crime increasing violence in these areas. Third, using data on sexual assaults,

we document an increase in such crimes close to the frontier following the closing and then re-opening of the border in 2016, and this pattern is driven by crimes against Venezuelan migrants. While again indirect, this evidence is consistent with the exploitation of migrants in these border regions. Fourth, investigating labor market responses, we provide some evidence of worsened labor market outcomes for natives. This is consistent with a labor market mechanism, in which backlash against migrants by natives is driven by economic considerations.

While our empirical results are specific to this setting of Venezuela and Colombia, the world has witnessed an unprecedented wave of migration in recent decades and at least of some of these cases share similarities with our case.[4] While some migration is driven by economic opportunities in the destination country, such as migration from Eastern Europe to Western Europe, other cases, including ours, are driven by events in the origin country. This includes cases of conflict, such as those in Syria and Ukraine, and cases of climate and natural disasters, such as the recent case of migration from Puerto Rico to the mainland United States. Also in parallel to our setting, migration has been extremely rapid in some cases, such as the current episode involving Ukraine and Poland. In these cases of rapid migration due to events in origin countries, including our setting, resources are often stretched thin in the destination country, potentially leading to backlash among natives.

The paper proceeds as follows. We next review the relevant literature and then provide a more detailed overview of the setting. We then describe our empirical approach and data. Following a presentation and discussion of our empirical results, the final section concludes.

2. Related literature

A large existing literature addresses a similar research question: does immigration increase crime? Broadly speaking, the literature has used two approaches to answering this research question. The first approach uses changes in the legal treatment of already arrived immigrants in the destination country. Pinotti (2017) and Mastrobuoni and Pinotti (2015) exploit exogenous variation in legalization treatment of immigrants in Italy, finding that legalization tends to reduce both crime rates and recidivism rates. Hines and Peri (2019), Miles and Cox (2014), and Treyger et al. (2014) study the Secure Communities program in the United States, finding that increased enforcement of immigration laws and associated deportations did not reduce crime rates in these communities. Freedman et al. (2018) study the Immigration Reform and Control Act of 1986, which granted legal resident status to some migrants but disadvantaged those who had arrived more recently. Using administrative data from San Antonio, Texas, they document an increase in felony charges against those residents negatively impacted by provisions of the law creating obstacles to employment.

Our paper is more closely related to the second approach, which uses immigrant shocks, in both within-country and cross-country analyses, to study the link between immigration and crime. Butcher and Piehl (1998) link immigration patterns to crime rates in metro areas in the United States, finding no correlation between the two factors after controlling for local demographics in these metro areas. Spenkuch (2014) and Light and Miller (2018) address similar issues with an instrumental variables approaches, based upon ethnic differences in settlement patterns.[5] While Light and Miller (2018) find that immigration, if anything, decreases crime rates, Spenkuch (2014) finds a link between immigration and crimes with financial motives and also for those immigrants most likely to have poor labor market outcomes.

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[4] By 2020, United Nations estimates that there are 281 million international migrants all around the globe, representing 3.6 percent of the global population OIM (2021).

[5] MacDonald et al. (2013) apply similar methods to neighborhoods within Los Angeles, finding that immigration tends to reduce crime.

In a study of crime rates in Italy, Bianchi et al. (2012) use a similar approach based upon settlement patterns within Italy and changes in the number of migrants from origin countries to destination countries outside of Italy, finding that increased immigration leads to a small but positive increase in robberies but no change in the overall crime rate. Chalfin (2014) develops an instrument based upon rainfall shocks in Mexico, finding no link between immigration and crime in the United States. Piopiunik and Ruhose (2017) study the collapse of the former Soviet Union and the subsequent immigration of ethnic Germans to Germany. They exploit the exogenous allocation of these migrants across regions of Germany, finding significant increases in crime. Nunziata (2015) uses a split sample instrumental variables approach, finding that immigration does not increase crime rates but does lead to an increase in the fear of crime, especially among natives with unfavorable attitudes towards immigrants, consistent with a link between xenophobia and crime. Billy and Packard (2020) document an increase in crime in Miami, relative to a synthetic control group, following the Mariel Boatlift in 1980.

Relative to this literature, our key contribution involves the use of information on the nationality of the victims.[6] That is, by exploiting incident-level crime data that includes information on whether victims are migrants or natives, we can distinguish between crimes against these two groups. As noted above, Nunziata (2015) documents that, despite no change in crime rates, natives perceive a link between immigration and crime in Europe, and, as noted above, many native Colombians tend to have unfavorable perceptions of migrants from Venezuela. Yet, countering this view, we find that the increase in violent crime in areas most affected by immigration is driven by crimes against migrants rather than by crimes against natives. In addition, we document that Venezuelans were disproportionately victimized, relative to their share of the population in these municipalities.

There is one recent paper, Franco-Mora (2020), developed simultaneously with and independently of this paper, that studies immigration from Venezuela and crime in Colombia. Using monthly data over the time period January 2016 to June 2108, his paper attempts to distinguish between irregular and regular migration, finding that irregular migration increases theft. These two papers are different on several dimensions. First, and most importantly, we distinguish between crimes against natives and crimes against Venezuelans, documenting that the increase in violent crime is driven by crimes against migrants. This finding is inconsistent with anti-immigrant views involving crimes committed by migrants against the native population. Second, while we exploit distance to the border and the closing and subsequent re-opening of the border by Maduro, Franco-Mora (2020) uses the presence of migrants in municipalities during different points in time over this 30-month period. Third, we study a longer time period, 2010–2019, allowing for a substantial time period in our analysis prior to the migration wave.

This paper is also related to a literature on the labor market effects of the Venezuelan refugee crisis in Colombia. Bonilla-Mejia et al. (2020) analyze the extent to which immigration is responsible for increases in unemployment, finding that new migration negatively impacts the labor market conditions for established migrants. That is, their results show that an increase in the share of immigrants increases the probability of unemployment for the immigrant population. On the other hand, migration does not affect the probability of unemployment of non-immigrants since employment losses are compensated by a reduction in participation. In a parallel study, Santamaria (2020) uses a differences-in-differences strategy, exploiting immigration flows and the timing of migration shocks to measure the impact of migrants on labor market outcomes in Colombia. Using google search patterns to identify immigrant host communities in Colombia, the author finds a negligible reduction in wages for both informal workers and less educated workers in the formal sector. In the same vein, Caruso et al. (2019) find that an increase in the supply of immigrant labor reduces informal sector wages in urban areas. These harmful consequences are generated mostly by male workers and are more pronounced for those in low-skilled jobs. Summarizing, these studies find a deterioration in labor market outcomes, especially for migrants, the less educated, and informal workers. These changes in labor market outcomes could represent a contributing mechanism towards changes in violent crime in affected areas. We contribute to this literature by investigating the mechanisms, including labor market impacts, behind the increase in crimes against migrants.

Our paper is also related to an extensive literature on conflict and crime in Colombia, focusing on factors such as the peace agreement (Prem et al. (2018)), illegal gold mining (Idrobo et al. (2014)), drug trafficking (Gaviria (2000)), commodity prices (Dube and Vargas (2013)), and foreign aid (Dube and Naidu (2015)). We contribute to this literature via the identification of a new factor, namely migration from Venezuela into Colombia, potentially driving crime in Colombia.

3. Institutional context

Venezuela has experienced an economic and political crisis during the past decade and especially so during the time period following the death of President Hugo Chavez, which occurred in 2013. Chavez was replaced by his Vice President, Nicolas Maduro, who then won two subsequent Presidential elections that were highly disputed by the opposition over claims of irregularities (Corrales (2020)). During Maduro's time as President, Venezuela has suffered an economic depression. A decline in oil prices during 2016 contributed to a significant reduction in government revenues, leading to shortages, sustained inflationary pressure, and ultimately episodes of hyperinflation (Hernandez and Monaldi (2016)). All told, the economy is estimated to have shrunk by two-thirds between 2013 and 2019.[7] Massive protests over economic and political issues occurred in the country, with significant events occurring in both 2017 and 2019.

By the end of 2019, due to this political and economic crisis, more than 4 million Venezuelans had left their country, out of an estimated population of 28 million in 2010, representing one of the largest migration waves ever.[8] Given its long and relatively open border, Colombia has been disproportionately affected, with roughly 1.8 million Venezuelan migrants living in Colombia, a country with a population of roughly 50 million, by the end of 2019.[9] The Colombian government has managed this challenging situation by providing timely border assistance, relaxing entry requirements, granting temporary permits, and ensuring universal emergency care (OECD (2019)). Of the 1.8 million migrants, a minority (roughly 750,000) are considered to be in legal status with an Special Stay Permit (Permiso Especial de Permanencia or PEP), with the majority (just over one million) in an

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[6] There are two additional contributions in our research. First, we develop a new identification strategy, based upon the closing of the border by Maduro in 2015, the subsequent re-opening in 2016, and the distance to five key crossings on the border between Colombia and Venezuela. Second, while the literature has tended to focus on crime in the United States and Europe, we study South America, which tends to have much higher rates of violent crime. Recent homicide rates in Colombia and Venezuela were 25 per 100,000 and 56 per 100,000, respectively, versus rates of 5 per 100,000 in the United States and only 1 per 100,000 in both Germany and Italy. These statistics are based upon World Bank data, derived from https://data.worldbank.org/indicator/VC.IHR. PSRC.P5?locations=MX (accessed July 9, 2020).

[7] https://www.economist.com/the-americas/2020/03/19/a-tale-of-two-crises-in-colombia

[8] https://www.unhcr.org/en-us/venezuela-emergency.html

[9] https://www.migracioncolombia.gov.co/infografias/total-de-venezolanos-en-colombia-corte-a-31-de-diciembre-de-2019 (accessed July 8, 2020).
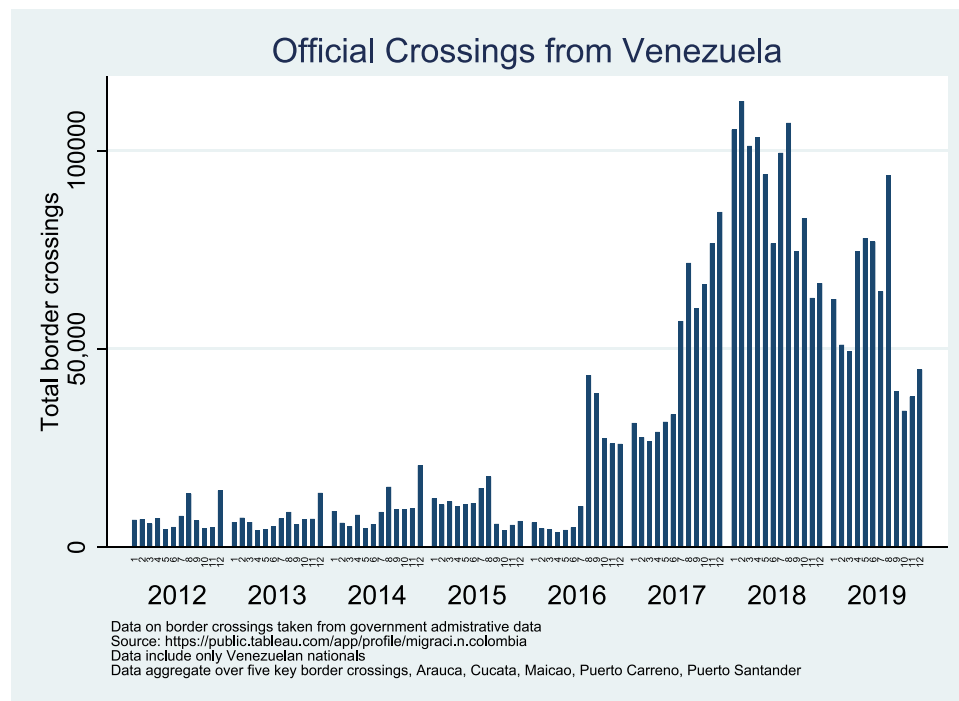
Fig. 1. Migration Patterns from Venezuela to Columbia Over Time.

irregular situation, having exceeded their allowed residence time or entered without authorization.[10]

A key potential driver in any link between immigration and crime involves the demographics of the immigrants. That is, differences in demographics could translate into differences in crime.[11] We investigate these issues in the Online Appendix using data from the 2018 Census, official border crossings data, and the Colombian Household Survey. The first key finding is that migrants from Venezuela residing in Colombia tend to be younger than natives. In particular, while natives are distributed more evenly in the age distribution, migrants from Venezuela tend to be much younger, between 20 and 40 years. In terms of gender, migrants were more likely to be male during the early stages of the migration wave. But there were also many female migrants, and there are not large gender differences overall in the migrant population. In terms of labor market outcomes, migrants are more likely than natives to participate in the labor market but tend to have lower incomes and also experience high informality levels.[12]

As mentioned above, our research design uses both temporal and geographic variation. Regarding temporal variation, we exploit the closing of the border by Maduro in August 2015 and the subsequent re-opening one year later. During August 2015, there was a conflict along the border in which three Venezuelan soldiers were injured by gunfire. This conflict led President Maduro to close the border with Colombia, along with the deportation of some Colombians from

Venezuela. One year later, during August 2016, the border was re-opened.[13] As shown in Fig. 1, the closing led to a substantial decline in border crossings over this period when the border was closed, from August 2015 to July 2016, relative to the prior years, from 2012 to mid-2015. Likewise, there was a large jump in border crossings when the border was re-opened in August 2016. Border crossings remained at elevated levels over the next year, before spiking further in 2018, with roughly 100,000 crossings per month at the peak. These spikes coincide with both political turmoil, as represented by protest activity, and economic turmoil, as represented by hyperinflation in Venezuela.

Regarding geographic variation, Colombia and Venezuela share a land border of nearly 1,400 miles, and we focus our research on the location of five key border crossings, listed from north to south: Maicao, Puerto Santander, Cucuta, Arauca, and Puerto Carreno.[14] As shown in Fig. 2, based upon official border crossings data, Cucuta is the location with the most crossings, resulting from the Cucuta border crossing being located on the Simon Bolívar International Bridge, which links key highways originating in Caracas, the largest city in Venezuela, to key highways that ultimately lead to Bogota, the largest city in Colombia.[15] Maicao is the location with the second most crossings, resulting from its close proximity to Maracaibo, the second largest city in Venezuela, and several large metro areas in the north of Colombia. The next largest crossing is Puerto Santander, which is located just north of the crossing at Cucuta. The other two crossings, Arauca and Puerto Carreno, are located further to the eastern part of Colombia and in more rural areas. These two border crossings have a relatively small number of migrants during the time period analyzed here, 2012–2019.

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[10] The PEP was introduced in 2017 in response to the influx of displaced Venezuelans. It is valid for 90 days at a time, automatically renewable for up to two years, and is by the government of Colombia at no cost.

[11] For example, studies of contemporary Mexican migration to the United States, Chalfin and Deza (2017) and Moehling and Piehl (2009), document that the relationship between immigration and crime depends critically on the age and gender composition of migrants. In particular, they find that immigrants, adjusting for age and gender, are not more likely than natives to be arrested or incarcerated.

[12] See Tribin-Uribe et al. (2020) for more details.

[13] https://www.bbc.com/news/world-latin-america-37072433 (referenced June 30, 2020)

[14] There are also an undetermined number of informal crossings, with migrants paying smugglers to cross illegally. See, for example, https://www.npr.org/2019/04/04/709193469/chronicles-of-a-venezuelan-exodus-more-families-flee-the-crisis-on-foot-every-da

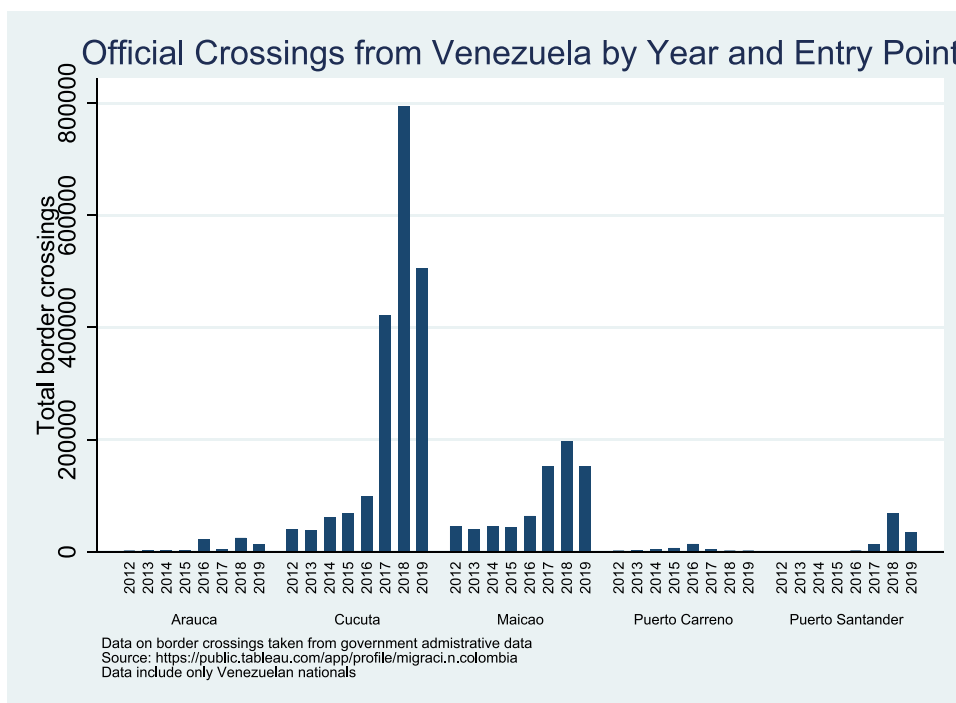[15] These data can be accessed from the website https://public.tableau.com/profile/migraci.n.colombia#!/.

Fig. 2. Migration Patterns for Key Border Crossings.

4. Approach and data

As described above, our empirical approach relies on both temporal and geographic variation. Regarding temporal variation, we exploit timing surrounding the closing and re-opening of the border in August 2016. Regarding spatial variation, we measure the distance between each municipality and the five key border crossings.

To measure exposure to migration across space, we first calculate both the travel distance via roads and the travel time via roads between each municipality urban center and each of the five border crossings. This is implemented using the Google Maps API. In particular, the latter returns information on travel distance and travel time based on the recommended route between start and end points, as calculated by Google Maps. Given that a departure time is not specified, choices of route and duration are based on the road network and average travel time, independent of traffic conditions. We then collapse travel distance, and analogously for travel time, to a single measure of exposure to Venezuelan migrants for each municipality by computing the distance between each municipality and the closest border crossing. That is, we compute the minimum distance to a border crossing for each municipality and likewise for travel times.

Throughout the empirical analysis, we estimate the following regression model:

$$y_{mt} = \alpha_m + \alpha_t + \beta After_t \times ln(distance)_m + \epsilon_{mt}$$

where y_{mt} represents an outcome, such as the homicide rate, in municipality m during month t, α_m represents municipality fixed effects, α_t represents month-by-month fixed effects, $After_t$ indicates the time period following the re-opening of the border in August 2016, $ln(distance)_m$ represents travel distance between the municipality and the closest border crossing, and ϵ_{mt} represents unobserved factors.[16] Our key parameter of interest, β, captures the change in outcomes as a function

of distance to the border following the re-opening of the border in August 2016, relative to the prior time period. Given that our measure of distance is small close to the border and larger further from the border, we hypothesize a negative coefficient in both the analysis of migrant population shares and the analysis of homicides rate. That is, following the re-opening of the border, we hypothesize that both the migrant population share and the homicides rate should fall as distance from the border increases.

Our first outcome, which we include in a first-stage regression, involves the share of Venezuelans in each municipality. This requires information on the number of Venezuelans living in each municipality over time. While we lack high frequency data, we use Census data to develop two measures that vary both over time and across municipalities. First, we use a question in the 2018 Census in which migrants were asked in which year they entered the country. Incorporating information on the current municipality of residence and assuming no internal migration, this retrospective survey question allows us to look backwards, creating a stock of such migrants in each municipality as of 2010 and then adding to this stock migrants who arrived in 2011, 2012, etc. Dividing by municipal population then gives us an estimate of fraction of Venezuelans in each municipality between 2010 and 2018. Our second proxy is simpler but lower-frequency, computing the fraction of Venezuelans in each municipality in the 2005 Census and in the 2018 Census. Using these two points in time, we then conduct a long-run analysis, matching homicides between 2010 and 2014, averaged over this period, for the pre-migration measure and between 2018 and 2019, averaged over this period, for the post-migration measure. Comparing the two, the annual analysis has the advantage of being higher frequency. The long-run analysis, by contrast, better accounts for internal migration and any migrants who might have lived in Columbia prior to 2018 but then left before the 2018 Census. The long-run analysis also allows us to incorporate homicides data from 2019, an important migration year, as shown in Fig. 1. Given all of this, we view these two approaches as complementary.

Our primary crime outcome is the homicide rate, and to measure the incidence of homicides, we use administrative records. In particular, the National Police of Colombia provide data on reported crimes and

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[16] More specifically, we measure distance from the centroid of the municipality to the centroid of the closest municipality with a border crossing. Given that this distance equals zero for the five municipalities with border crossings, we use a standard approximation to log distance based upon the inverse hyperbolic sine transformation.
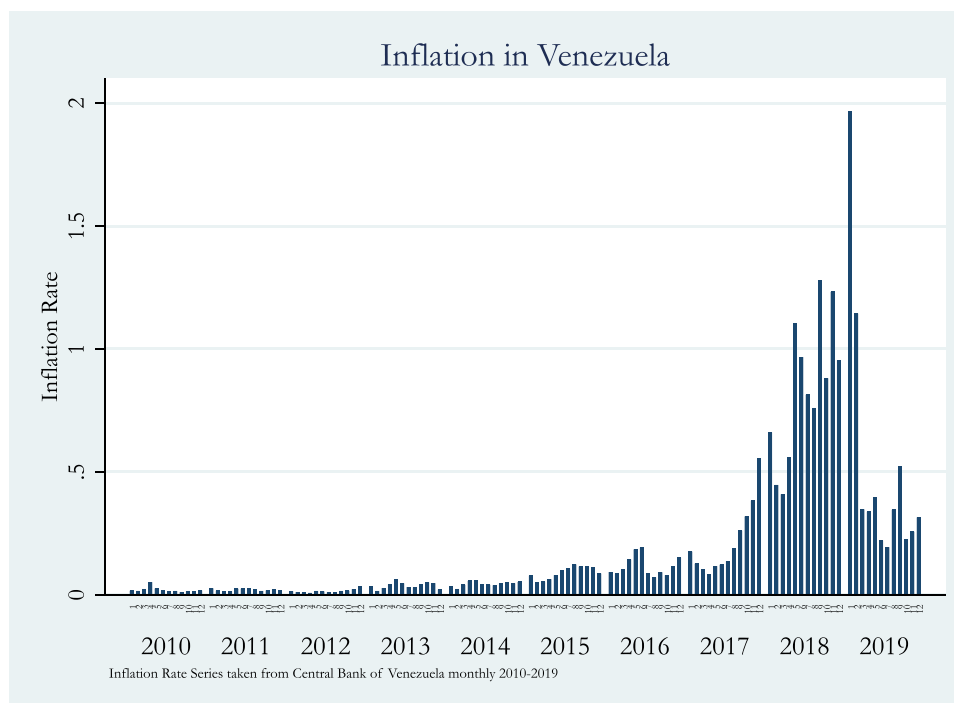
Fig. 3. Patterns of Inflation in Venezuela Over Time.

arrests.[17] The crime data are based on incidents and specify the municipality, date, nationality of the victim, and type of reported crime. We focus on homicides, a measure that does not suffer from self-reporting problems and is not subject to two important changes in the methodology in crime reporting that occurred in the past few years, during the crucial periods of immigration.[18] We use similar measures for arrests, with nationality pertaining to that of the arrested individual rather than to that of the victim. These data are available from 2010 to 2019, and we aggregate these to the municipality-month level.

Measures of both migrant population shares and homicides rates require a high frequency measure of population in each municipality. Towards this end, we use data from the National Administrative Department of Statistics (DANE), which projected annual population at the national and municipality level over the 2005–2020 period. These projections were based on the adjusted results of the 2005 Census and the 1985 to 2005 census reconciliation. Note that, when measuring homicide rates, we use total population in the denominator and do not incorporate information on nationality. We later present results from an analysis in which we investigate whether migrants were disproportionately victimized, relative to their population size.

In alternative specifications, we use measures of the consumer price level and corresponding inflation rate from Venezuela in place of an indicator for the period after the re-opening of the border in August 2016. These data on prices and inflation are available at the monthly level starting in 2008 and are based upon the National Consumer

Price Index (INPC), as published by the Central Bank of Venezuela.[19] As shown in Fig. 3, inflation began rising during 2017, with further increases in 2018, peaking at a monthly inflation rate of almost 200 percent in January 2019. Comparing this series of inflation rates to the monthly series of border crossings in Fig. 1, there is a clear link in the timing between the emergence of hyperinflation and the wave of immigration from Venezuela into Colombia.[20]

5. Results

In this section, we first provide evidence documenting an increase in the number of migrants in areas close to key border crossing after the re-opening of the border in 2016. We then document our key results regarding the relationship between migration and crime. After providing a series of robustness checks, we investigate whether the increase in crime with Venezuelan victims is disproportionate given the increase in the migrant population.

5.1. First-stage migration analysis

We begin by investigating whether there is a greater presence of migrants close to key border crossings after, relative to before, the closing and then re-opening of the border in 2016. We first present this information in the form of a map, documenting the geographic spread of migrants from Venezuela in Colombia using our long-run measure, comparing 2005 and 2018 Census data on the fraction of the population in Colombian municipalities who were born in Venezuela. As shown in the left panel of Fig. 4, which plots deciles of the percentage point change in the percent born in Venezuela, there are overall increases in the fraction of the population that was born in Venezuela, ranging across municipalities from no increase or a small increase to an increase

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[17] Crime data were downloaded directly from the national police web page (https://www.policia.gov.co/grupo-informaci%C3%B3n-criminalidad/estadistica-delictiva) and arrests data were provided through a right of petition.

[18] Starting in 2017, the Nation Attorney General's Office and the National Police integrated their information. Homicide crime in both databases had 98 percent degree of coincidence. Around the same time, the national police introduced a mobile phone app for reporting certain crimes, leading to a surge in newly reported crimes. Importantly, the mobile app did not apply to homicides, given their severity. For more information about these changes in methodology, see Rodriguez-Ortega et al. (2018).

[19] These data were downloaded from http://www.bcv.org.ve/estadisticas/consumidor (last accessed July 3, 2020).

[20] In a similar vein, Bonilla-Mejia et al. (2020) uses the interaction between the share of Venezuelans living in each city in 2005 and the Venezuelan CPI to instrument migration.
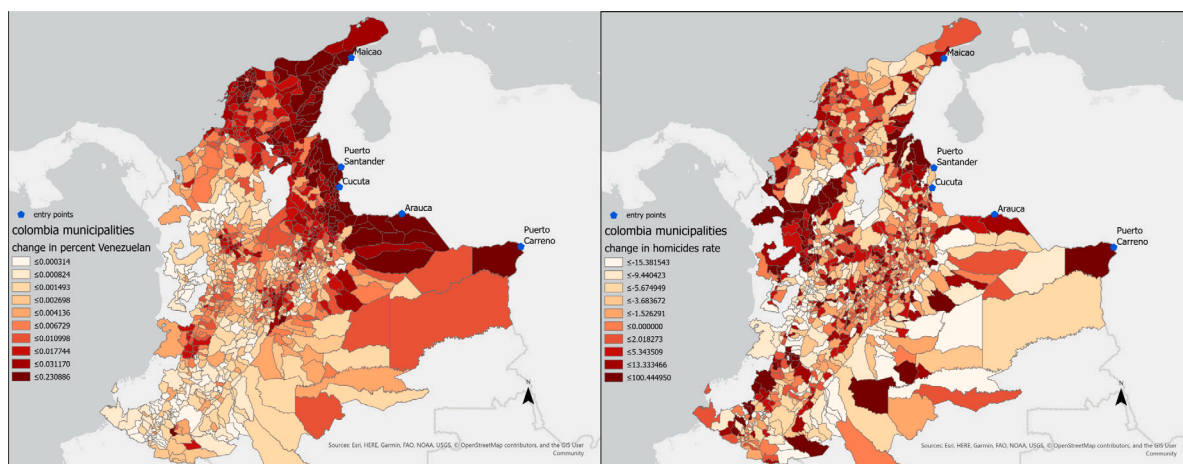
Fig. 4. Change in population and homicide rate after border opening.

Table 1
Population share and homicide share: annual analysis and long-run analysis.
Source: Police Data.

VARIABLES	(1) Ven population share FIRST STAGE	(2) Ven share of victims REDUCED FORM	(3) Ven share of victims 2SLS	(4) Ven population share FIRST STAGE	(5) Ven share of victims REDUCED FORM	(6) Ven share of victims 2SLS
After X Log Distance	−0.0112*** (0.0012)	−0.0183*** (0.0050)		−0.0151*** (0.0019)	−0.0313*** (0.0081)	
Population Share Ven			1.6366*** (0.4523)			2.0745*** (0.3650)
Observations	6,951	6,951	6,951	1,852	1,852	1,852
R-squared	0.7613	0.2986		0.8136	0.6072	

*** p < 0.01, ** p < 0.05, * p < 0.1.
Robust standard errors clustered at the municipality level in parentheses.
Dependent variable is the Venezuelan population share in column 1 and 4 and the Venezuelan share of homicide victims in columns 2, 3, 5 y 6.
Population shares in column 1 measured using the information on arrival years from the 2018 Census.
Population share in column 4 is measured using the 2005 and 2018 Census.
After is an indicator equal to 1 after the re-opening of the border in 2016.
Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.
Monthly panel data regression with municipality and month fixed effect.
Time period covers from 2010 to 2019.

of 23 percentage points. More importantly for our research design, the largest increases are clustered near the land border with Venezuela, with especially large increases in areas close to the five key border crossings.

We next investigate these relationships more formally in the context of a first-stage regression analysis. As shown in the first column of Table 1, the analysis based upon annual data documents a statistically significant increase in the fraction of Venezuelans living in municipalities close to border crossings following the closing and re-opening of the border in 2016. This confirms the documented relationships in Fig. 4. In terms of magnitudes, a doubling of distance from, say, 100 miles from the border to 200 miles from the border, is associated with a decrease in the population share equal to 1.1 percentage points. Likewise, column 4 of Table 1 provides similar results for the long-run analysis. In particular, there is again a statistically significant increase in both the share of Venezuelan residents in municipalities close to the border following the re-opening of the border in 2016. In terms of magnitudes, a doubling of distance from, say, 100 miles from the border to 200 miles from the border, is associated with a decrease in the population share equal to 1.5 percentage points. Thus, using both Census measures, there is a statistically significant increase in the number of Venezuelans living close to the border following the re-opening of the border in 2016.

5.2. Crime results

Before presenting our formal regression results on crime, we first provide evidence on the change in the average monthly homicides rate in the form of a map of municipalities in Colombia. The change in the homicides rate compares the time period after the re-opening of the border in (that is, from August 2016 to December 2019) to the time period before the re-opening of the border (that is, from January 2010 to July 2016). As shown in the right panel of Fig. 4, there is a clear increase in homicides close to the border and especially so in municipalities that are in close proximity to the five key border crossings. Yet, the results are noisy in general, with large increases in homicide rates in municipalities further from the border as well. Given this, we next measure both the magnitude and statistical significance of these relationships in a regression analysis.

We begin by presenting regression results that analyze the change in the homicides rate as function of distance to the frontier, comparing the time period following the re-opening of the border in August 2016 to the prior period. As shown in column 1 of Table 2, we find the hypothesized negative coefficient on the interaction between distance and the indicator for the time period following the re-opening of the border, and this relationship is statistically significant at the 95 percent level. That is, municipalities close to the border experienced an increase in crime, relative to municipalities further from the border, following the re-opening of the border, relative to the prior period. Regarding the

Table 2
Homicides, border opening, and distance.
Source: Police Data.

VARIABLES	(1) Homicide rate TOTAL	(2) Homicide rate COLOMBIANS	(3) Homicide rate VENEZUELANS	(4) Homicide rate OTHERS	(5) Homicide rate MISSING
After X Log Distance	−1.3865**	−0.5213	−0.6387***	−0.0108	−0.2157**
	(0.6279)	(0.5937)	(0.1613)	(0.0216)	(0.0975)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.1449	0.1421	0.0436	0.0101	0.0253

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Robust standard errors clustered at the municipality level in parentheses.
Dependent variable uses nationality-specific homicide rate.
After is an indicator equal to 1 after the re-opening of the border in 2016.
Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.
Monthly panel data regression with municipality and month fixed effect.
Time period covers from 2010 to 2019.

magnitude of the relationship, a doubling of distance, from, say 100 miles from the border to 200 miles from the border, is associated with a reduction in the homicides rate equal to 1.39 homicides per million residents per month. This represents a decline in the homicide rate of almost 7 percent relative to the sample average homicides rate of 20.29. Thus, the re-opening of the border led to an increase in violent crime in border areas, relative to areas further from the frontier, and this increase is both statistically and economically significant in magnitude.

In the remaining columns of Table 2, we decompose the change in the homicides rate according to the nationality of the victim. We use total population, rather than nationality-specific population, in the municipality as the denominator. Given this decomposition exercise, these coefficients are not comparable in magnitude. We do, however, later examine whether the increase in homicides against migrants is disproportionate to their size in the population.

As shown in column 2 of Table 2, while there is a negative coefficient for Colombian victims, it is small in magnitude, with a reduction of 0.5213 homicides per million, representing only 38 percent of the total reduction in the homicides rate in column 1. The effect for Venezuelan victims, by contrast, has the hypothesized negative coefficient and is statistically significant at the 95 percent level. Thus, almost one-half of the total reduction in the homicides rate in column 1 can be explained by an increase in homicides with Venezuelans victims. There is no effect for victims from other countries but a negative and statistically significant coefficient for victims for whom the police did not record a nationality. While we lack formal evidence on this point, we conjecture that many of these victims with missing nationality lacked identification cards and were undocumented immigrants from Venezuela.

While our baseline measure in Table 1 is based upon a simple indicator for the re-opening of the border in August 2016, we next investigate the timing of these effects in more detail. In particular, we estimate the following regression model of homicide rates:

$$h_{mt} = \alpha_m + \alpha_t + \beta_y \times ln(distance)_m + \epsilon_{mt}$$

where y indexes years. This regression equation is similar to our baseline regression equation, but, instead of using information on the exact timing surrounding the closing of the border, we instead allow the coefficient on distance to vary in a flexible manner, year by year, with the effect normalized to zero in the first year of our data (2010). That is, we do not incorporate any information regarding the timing of the border opening into this specification. As shown in the left panel of Fig. 5, which displays the key coefficients and the corresponding 90 and 95 percent confidence intervals, there are no statistically significant changes in the role of distance during the time period from 2011 to 2016, relative to the baseline year of 2010. The negative and statistically significant effect documented in Table 2 first emerges in 2017, the first full year following the border re-opening in August 2016. That is, there is a relative increase in homicides close to the border in 2017, relative to the baseline year of 2010 and relative to

municipalities that are situated further from the frontier. Moreover, the documented negative relationship between distance and homicide rates is strongest in 2018, approximating the timing of the arrival of migrants documented in Fig. 1, which also peaked in 2018. In summary, the timing of the change in the homicides rate, as documented in our baseline regression in Table 2, corresponds to the timing of the border opening and the subsequent arrival of migrants from Venezuela.

When focusing on Colombian victims, as shown in the middle panel of Fig. 5, there is no evidence of a statistically significant relationship between distance and homicide rates, relative to the baseline year of 2010, and this is the case for all of the years both before and after the closing of the border in 2016. Thus, similarly to our baseline results in Table 2, the documented relationships between distance and the homicide rate are not driven by Colombian victims. The right panel of Fig. 5 reproduces these results for victims from Venezuelan, documenting a lack of pre-trends prior to 2016 but strong relationships between distance and homicide rates beginning in the year after the border re-opening (2017) and again peaking in 2018, the year with the most migrants arriving from Venezuela.

While our baseline measure of geography in Table 2 assumed a linear relationship between the homicide rate and log distance, we next investigate more fully the geographic patterns underlying these results. In particular, we estimate the following regression model, in which the effects of the border re-opening in August 2016 are measured separately for 100-mile distance bins:

$$h_{mt} = \alpha_m + \alpha_t + \beta_{bin} After_t + \epsilon_{mt}$$

where the effect for the last distance bin, those municipalities that are furthest from the frontier (800 to 900 miles to the closest border crossing), is normalized to zero. Thus, this specification allows for a more flexible relationship between distance and the homicides rate before and after the closing and re-opening of the border in August 2016.

The results for all victims is displayed in the left panel of Fig. 6. As shown, the only positive and statistically significant increase in homicides following the re-opening of the border in August 2016 is for municipalities very close to the border, those within 100 miles. This is consistent with the patterns in the left panel of Fig. 4, which documented strong clustering of migrants very close to the five border crossings between Venezuela and Colombia. Regarding the magnitude, this represents an increase of approximately 5 homicides per million, an increase of roughly 25 percent relative to the sample average homicides rate of 20.29.

In the remaining figures, we decompose this effect into homicides for victims of differing nationalities. When analyzing homicide rates for victims with Colombian nationality, as shown in the middle panel of Fig. 6, the effect for the first border bin is positive but smaller in magnitude, relative to the effect in the left panel, and is statistically insignificant. Thus, similarly to our baseline results in Table 2, the documented relationship between distance to the frontier, the opening
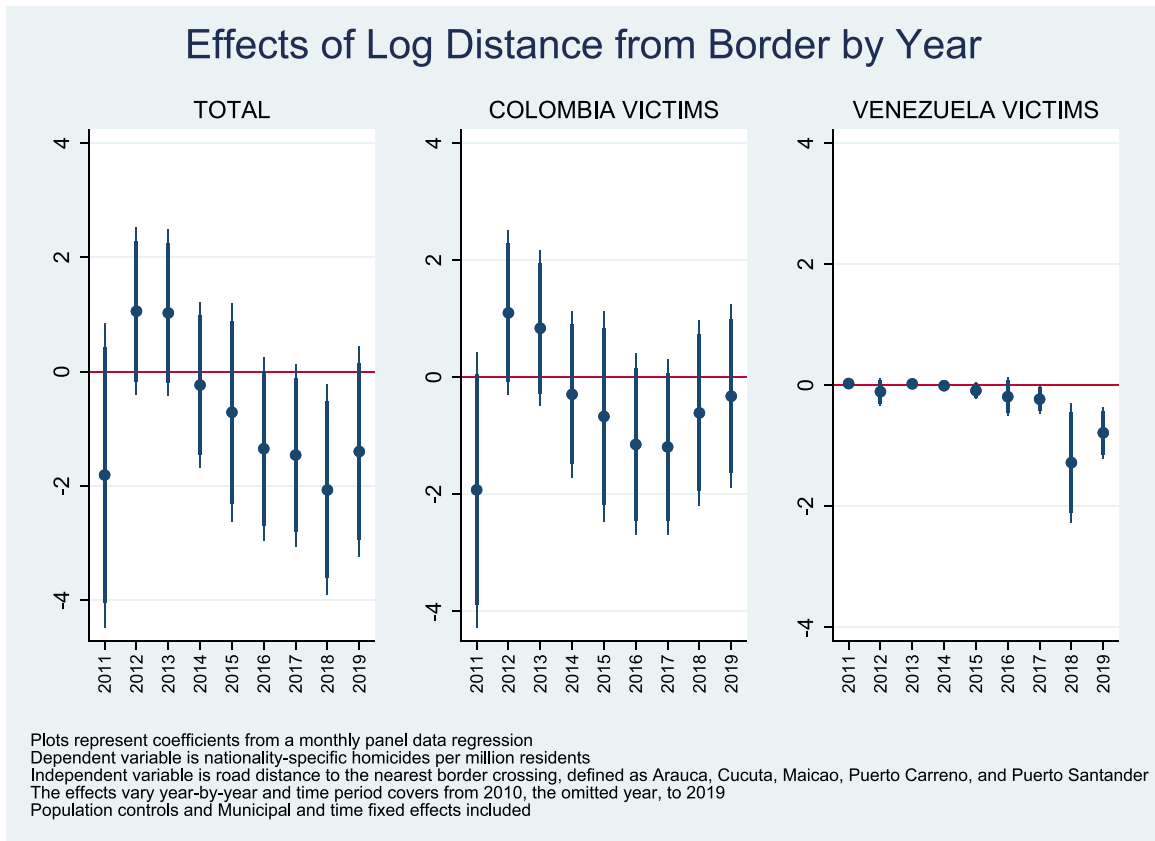
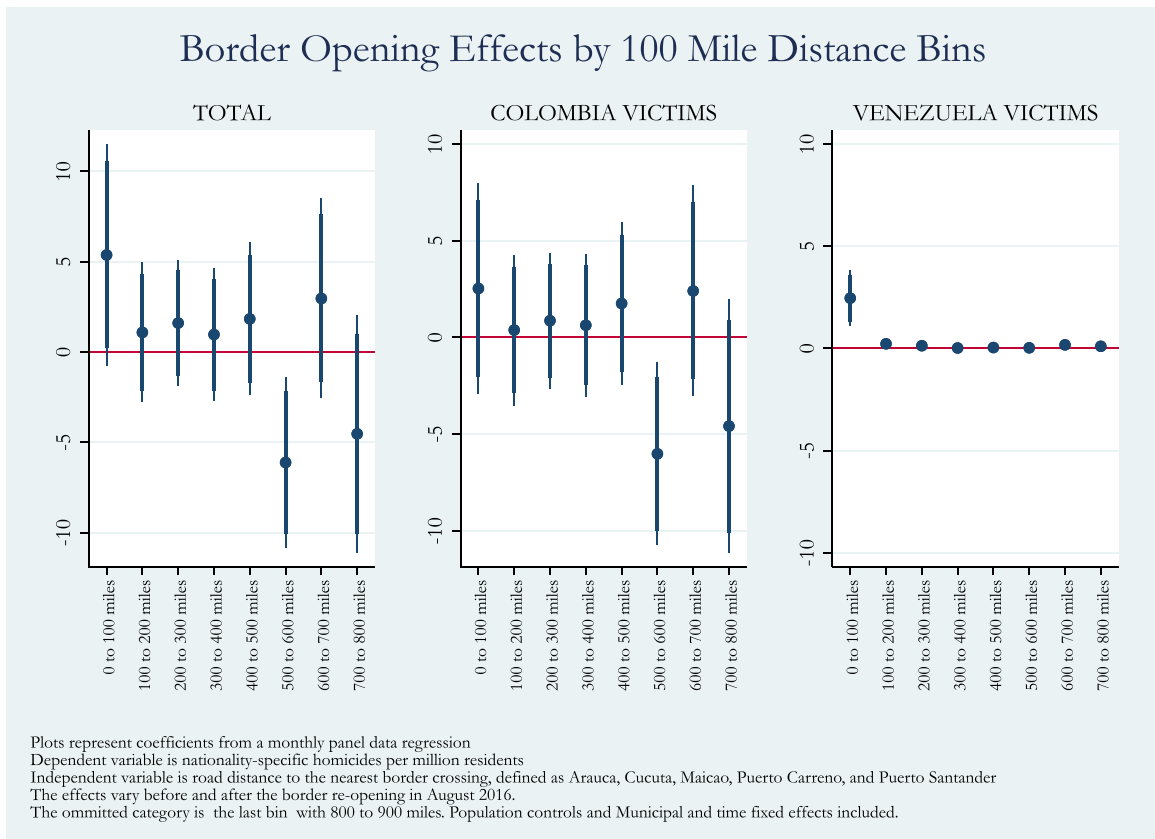Fig. 5. Homicide Rates and Distance to the Border Year-by-Year.

Fig. 6. Geographic Patterns in Homicide Rates and the Closing and Re-opening of the Border.

Table 3

Homicides, inflation, and distance.

Source: Police Data.

VARIABLES	(1) Homicide rate TOTAL	(2) Homicide rate COLOMBIANS	(3) Homicide rate VENEZUELANS	(4) Homicide rate OTHERS	(5) Homicide rate MISSING
Inflation Rate X Log Distance	−1.7061**	−0.1968	−1.1396***	0.0151	−0.3848***
	(0.7368)	(0.6441)	(0.3696)	(0.0104)	(0.1209)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.1449	0.1421	0.0467	0.0101	0.0253

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

Robust standard errors clustered at the municipality level in parentheses.

Dependent variable uses nationality-specific homicide rate.

Inflation Rate is the change in the price index as reported by the Central Bank of Venezuela.

Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

Table 4

Homicides, distance, and price index.

Source: Police Data.

VARIABLES	(1) Homicide rate TOTAL	(2) Homicide rate COLOMBIANS	(3) Homicide rate VENEZUELANS	(4) Homicide rate OTHERS	(5) Homicide rate MISSING
Log Price Index X Log Distance	−0.1137**	−0.0174	−0.0714***	−0.0018	−0.0232***
	(0.0576)	(0.0522)	(0.0162)	(0.0034)	(0.0076)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.1449	0.1421	0.0465	0.0102	0.0253

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

Robust standard errors clustered at the municipality level in parentheses.

Dependent variable uses nationality-specific homicide rate.

Price Index is the level of the price index as reported by the Central Bank of Venezuela.

Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

of the border, and homicides rate is not driven by Colombian victims. For Venezuelan victims, by contrast, there is a very sharp increase in homicides close to the border, representing an increase of roughly 2.5 homicides per million, as shown in the right panel of Fig. 6, and this result is statistically significant at conventional levels. There are also statistically significant increases in the next two distance bins, representing municipalities between 100 and 200 miles and between 200 and 300 miles from the nearest border crossing, but these effects are much smaller in magnitude.

5.3. Alternative measures and robustness checks

While our baseline temporal measure is based upon an indicator for the re-opening of the border in August 2016, we next develop an alternative measure based upon the inflation rate in Venezuela. As noted above, the month-by-month inflation series indicated hyperinflation during this period, peaking in late 2018 and early 2019. As shown in Table 3, the results are qualitatively similar to those in Table 2, with a statistically significant shift in the relationship between distance and the overall homicides rate during months with very high inflation rates. That is, there is a relative increase in homicides in Colombian municipalities close to the frontier with Venezuela and during periods of high inflation, relative to municipalities further from the frontier and during time periods of lower inflation. As shown in the remaining columns, there is not a statistically significant relationship for Colombian victims, and these results are again driven by Venezuelan victims and those victims for whom the police did not report a nationality. Quantitatively, the evidence with respect to Venezuelan victims is even stronger, with the coefficient of −1.1396 on the interaction between distance and inflation in column 3, representing 67 percent of the overall effect of −1.7061 in column 1. Conversely, the coefficient on the interaction between distance and inflation for Colombian victims equals −0.1968, as shown in column 2, representing only 12 percent of the overall effect in column 1.

Table 4 presents similar results to those in Table 3 but uses the log of the price level rather than the inflation rate. This measure might better account for the fact that migrants who tend to arrive from Venezuela during periods of high inflation might remain in Colombia even after the inflation rates have fallen back to lower levels, as happened during the middle and end of 2019, as previously shown in Fig. 3. As shown in Table 4, the results are similar to those in Tables 2 and 3, with a statistically significant relationship between the homicide rate and the interaction between distance and the price level, and this relationship is again driven by homicides involving Venezuelan victims and those with missing nationality information. There is again no statistically significant evidence of a relationship between homicide rates for Colombians and the interaction between the price level and distance, and thus the increase in crime during period with high price levels is driven by homicides against Venezuelans and those with missing nationality.

We next present results from two robustness checks on our baseline measure of distance to the nearest of the five border crossings, as described above. The first robustness check accounts for the fact, as previously documented in Fig. 2, that the number of crossings in the official data are driven in large part by two key border crossings that link important highways in Colombia and Venezuela: Maicao and Cucuta. As shown in Table 5, our results are similar when defining distance to the border as the minimum distance to Maicao and Cucuta, with slightly stronger magnitudes in column 1 of Table 5, when compared to the results in column 1 of Table 2. Regarding the nationality of victims, the results based upon these two border crossings are again only statistically significant for victims from Venezuela and those victims with missing information on nationality, with no evidence of a statistically significant increase for homicides of native Colombians. Thus, our results are robust to this alternative measure and are even a bit stronger, suggesting that our baseline results are driven by these two most significant border crossings.

Our second robustness check is based upon a measure of travel times, rather than travel distance. This measure, as noted above, does

Table 5

Homicides, border opening, and distance to Maicao/Cucuta.

Source: Police Data.

VARIABLES	(1) Homicide rate TOTAL	(2) Homicide rate COLOMBIANS	(3) Homicide rate VENEZUELANS	(4) Homicide rate OTHERS	(5) Homicide rate MISSING
After X Log Distance	−1.5890**	−0.8955	−0.4763***	−0.0145	−0.2027**
	(0.6735)	(0.6067)	(0.1349)	(0.0280)	(0.0791)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.1449	0.1421	0.0399	0.0101	0.0252

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robust standard errors clustered at the municipality level in parentheses.

Dependent variable uses nationality-specific homicide rate.

After is an indicator equal to 1 after the re-opening of the border in 2016.

Road distance to the nearest border crossing, defined as Cucuta and Maicao only.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

Table 6

Homicides, travel time, and border opening.

Source: Police Data.

VARIABLES	(1) Homicide rate TOTAL	(2) Homicide rate COLOMBIANS	(3) Homicide rate VENEZUELANS	(4) Homicide rate OTHERS	(5) Homicide rate MISSING
After X Log Travel Time	−1.1099*	−0.2182	−0.6650***	−0.0083	−0.2183**
	(0.5982)	(0.5799)	(0.1604)	(0.0215)	(0.1032)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.1449	0.1421	0.0438	0.0101	0.0253

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robust standard errors clustered at the municipality level in parentheses.

Dependent variable uses nationality-specific homicide rate.

After is an indicator equal to 1 after the re-opening of the border in 2016.

Travel time to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

not account for traffic but does account for speed limits. In particular, we measure travel time from each municipality to each of the five border crossings and then take the minimum such time for each municipality across these five crossings. As shown in Table 6, the results are broadly similar to those in our baseline results in Table 2. The key coefficient in column 1 is a bit smaller in magnitude but remains statistically significant at the 90 percent level. Regarding the nationality of victims, the results based upon travel times are again only statistically significant for victims from Venezuela and those victims with missing information on nationality, and the result is statistically insignificant when considering homicides against native Colombians. Thus, our results are robust to this alternative measure of the exposure of municipalities to the frontier with Venezuela.

5.4. Disproportionate risk

While we have documented an increase in homicides with Venezuelan victims close to the border following the closing and re-opening of the border in August 2016, these findings could reflect two possible realities. First, it could be that Venezuelans are victimized at the same rate as natives, and the increase reflects the fact that more Venezuelans are in these areas and thus at risk for homicide. Second, it could be that Venezuelans are disproportionately victimized, when compared to natives, and the increase reflects these unsafe conditions for migrants.

In order to shed light on this important distinction, we compare changes in the share of Venezuelans living in each municipality following the closing and re-opening of the border and across municipalities, as documented above in our first-stage analysis, to changes in the share of homicides that involve Venezuelan victims. To the extent that Venezuelans are victimized at the same rate as natives, we expect that these shares should increase proportionally. To the extent that Venezuelans are disproportionately victimized, by contrast, we expect the share of homicides involving Venezuelan victims to rise more quickly than the share of Venezuelans living in these areas.

More formally, using information on population shares and homicide shares, we consider three regressions. The first stage, as discussed above, measures the change in the share of Venezuelans living in municipalities close to border crossings, following the closing and then re-opening of the border in 2016. The reduced form measures the change in the share of Venezuelan homicide victims in municipalities close to border crossings, again following the closing and then re-opening of the border in 2016. Finally, the 2SLS analysis, by definition, reports the ratio of the reduced form coefficient to the first-stage coefficient. A 2SLS coefficient equal to one is inconsistent with Venezuelans being disproportionately victimized, in the sense that the share of Venezuelan victims in homicides rose in proportion to their share in the population. A 2SLS coefficient that exceeds one, by contrast, is consistent with Venezuelans being disproportionately victimized, in the sense that the share of Venezuelan victims in homicides rose more quickly than their share in the population. We conduct both annual analyses, using estimates of Venezuelans living in each municipality on an annual basis, and a long-run analysis, using Census data from 2005 and 2018.

As noted above, the annual analysis, as shown in column 1 on Table 1, documents a significant relationship increase in the fraction of Venezuelans living in municipalities close to border crossings following the closing and re-opening of the border in 2016. As shown in column 2, we also find a statistically significant relationship increase, based upon annual data, in the fraction of Venezuelan victims in homicides in municipalities close to border crossings following the closing and re-opening of the border in 2016. Likewise, as shown in the column 3, the reduced form coefficient is larger than the first-stage coefficient, by a ratio of 1.64, meaning that a 10 percentage point increase in the share of Venezuelans living in a municipality leads to an 16.4 percentage point increase in the share of Venezuelan victims of homicides in these places.

The long-run analysis also documents a statistically significant increase in both the share of Venezuelan residents (column 4), as noted

Table 7
Homicides arrests, distance, and border opening.
Source: Police Data.

VARIABLES	(1) Share of arrest TOTAL	(2) Share of arrest COLOMBIANS	(3) Share of arrest VENEZUELANS	(4) Share of arrest OTHERS	(5) Share of arrest MISSING
After X Log Distance	−0.1262	0.0453	−0.1727**	0.0012	0.0000
	(0.4726)	(0.4192)	(0.0805)	(0.0017)	(0.0000)
Observations	125,880	125,880	125,880	125,880	125,880
R-squared	0.0426	0.0426	0.0174	0.0092	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Robust standard errors clustered at the municipality level in parentheses.
Dependent variable uses nationality-specific rate of arrest.
After is an indicator equal to 1 after the re-opening of the border in 2016.
Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.
Monthly panel data regression with municipality and month fixed effect.
Time period covers from 2010 to 2019.

above, and the share of Venezuelan homicide victims (column 5) in municipalities close to the border following the closing and re-opening of the border in 2016. As shown in column 6, the reduced form coefficient is again larger than the first-stage coefficient, by a ratio of 2.07, meaning that an 10 percentage point increase in the share of Venezuelans living in a municipality leads to an 20.7 percentage points increase in the share of Venezuelan victims of homicides in these places. While we cannot reject the hypothesis of proportional risk in the annual analysis (column 3), we can do so in the long run analysis (column 6), as the 95 percent confidence interval has a lower bound of 1.3591 and thus does not include one, the benchmark coefficient for proportional risk.

While we do find that Venezuelans are disproportionately victimized during this recent migration wave, it is important to note that Colombians may have still been affected by this spike in crime. For example, natives might have witnessed this lethal violence, leading to trauma. Moreover, any law enforcement response would need to be funded by natives, and it also possible that violence brings negative economic consequences.

6. Mechanisms

Summarizing, our empirical analysis documents an increase in homicides in Colombia in municipalities close to the Venezuelan border following the closing and then re-opening of the border, and these homicides are consistent with Venezuelan migrants being disproportionately victimized, relative to Colombian natives. While we lack definitive evidence on the exact mechanisms underlying these results, we next describe and provide suggestive evidence on the role of four possible contributing factors.

The first possible mechanism is that Venezuelans are committing homicides against other Venezuelans close to the border, perhaps due to competition for economic resources. To investigate this, we analyze data on the geographic and temporal pattern of arrests for homicides. These data do not include information on the nationality of the victim but do include information on the nationality of the individual arrested for the crime, and there are not missing nationalities in this case. While we cannot directly link these arrests incidents data to the crime incidents data, we do aggregate them in a similar manner, at the level of the municipality-month. As shown in the first column of Table 7, we find no statistically significant change in the relationship between distance and arrest rates following the re-opening of the border in August 2016. As shown in column 3, we do find some evidence of an increase in arrests of Venezuelans close to the border, as should be expected given the very large increase in their presence close to the border. But there is no increase in arrests of Colombians or those from other countries, as shown in columns 2 and 4.

Of course, and in parallel to our discussion above, the increase in arrests of Venezuelans could merely be driven by more Venezuelans at risk for arrest given the increase in their population close to the

border. To address this issue, and in parallel to above, we next compute the Venezuelan share of arrests for homicides and then compare the first-stage coefficients to those from the reduced form. As shown in the first three columns of Table 8, the first-stage and reduced form coefficients using annual data are similar in magnitude, with the ratio, as shown in column 3, equaling 0.9041. Thus, there is not evidence that Venezuelans are arrested at rates disproportionate to their population. In the long-run analysis, as shown in the final three columns of Table 8, the 2SLS coefficient, which equals 1.4347, does exceed one, the benchmark for proportional relationships, but is smaller in magnitude than the corresponding coefficient for homicides of 2.0745 in Table 1. Taken together, the results are in general inconsistent with the increase in homicides against migrants from Venezuela being disproportionately committed by other migrants. There are two important caveats to this finding. First, the results are relatively noisy, and the confidence intervals in the 2SLS arrests analysis overlap with those in the 2SLS homicides analysis, meaning that we cannot formally reject equal coefficients.[21] Second, clearance rates for homicides in Colombia are relatively low, averaging just over 20 percent in 2015.[22] Thus, most homicides do not have a corresponding arrest, adding some noise to the analysis.

Second, the route from Venezuela into Colombia often involves passing through dangerous territory, making migrants more likely to interact with violent actors. In particular, the border between Venezuela and Colombia has become one of the most dangerous globally as criminal groups operate in such areas.[23] García-Pinzón and Mantilla (2020) point out that criminal actors actively participate in border management and control of the immigrant population. In particular, criminal organizations have recruited Venezuelan migrants into their armed structures or integrated them into illegal markets, such as drug production (García-Pinzón and Mantilla (2020)). To investigate this hypothesis, we use the crime data but explore a different outcome, cargo theft offenses, which have been found to be related to organized crime.[24] Panel A of Table 9 analyzes reports of cargo theft offenses per

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[21] For the annual analysis, the 95 percent confidence intervals equal [0.7501,2.5231] in Table 1 and [0.3357,1.4725] in Table 8. For the long-run analysis, the 95 percent confidence intervals equal [1.3591,2.7899] in Table 1 and [0.6244,2.2450] in Table 8.

[22] See Collazos et al. (2017).

[23] For discussion around this point, see https://www.crisisgroup.org/latin-america-caribbean/andes/colombiavenezuela/84-disorder-border-keeping-peace-between-colombia-and-venezuela.

[24] Burges (2013) highlights that the highways close to the borders in Colombia are among the most targeted by cargo thieves in South America. The explanation is that the border between Venezuela and Colombia is quite porous and has a high presence of drug traffickers and criminal organizations that hijack cars and trucks to transport drugs and commit other violent crimes. Additionally, Jung et al. (2021) find a high correlation between homicides, road piracy, robberies in general, and kidnappings in Colombia.

Table 8

Population share and arrests share: annual analysis and long run analysis.

Source: Police Data.

VARIABLES	(1) Ven population share FIRST STAGE	(2) Ven share of arrest REDUCED FORM	(3) Ven share of arrest 2SLS	(4) Ven population share FIRST STAGE	(5) Ven share of arrest REDUCED FORM	(6) Ven share of arrest 2SLS
After X Log Distance	−0.0111***	−0.0100***		−0.0152***	−0.0217**	
	(0.0014)	(0.0034)		(0.0023)	(0.0097)	
Population Share Ven			0.9041***			1.4347***
			(0.2900)			(0.4134)
Observations	5,566	5,566	5,566	1,638	1,638	1,638
R-squared	0.7814	0.2374		0.8245	0.5392	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robust standard errors clustered at the municipality level in parentheses.

Dependent variable is the Venezuelan population share in column 1 and 4 and the Venezuelan share of arrests for homicides in columns 2, 3, 5 and 6.

Population share in column 1 is measured using information on arrival years from the 2018 Census.

Population share in column 4 is measured using the 2005 and 2018 Census.

After is an indicator equal to 1 after the re-opening of the border in 2016.

Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

Table 9

Cargo theft and sexual assaults.

Source: Police Data.

Panel A: CARGO THEFT

VARIABLES	(1) Cargo Theft TOTAL	(2) Cargo Theft COLOMBIANS	(3) Cargo Theft OTHERS	(4) Cargo Theft MISSING	
After X Log Distance	−0.2010***	−0.1655***	0.0006	−0.0375	
	(0.0713)	(0.0523)	(0.0006)	(0.0408)	
Observations	107,040	107,040	107,040	107,040	
R-squared	0.0617	0.0410	0.0094	0.0430	

Panel B: SEXUAL ASSAULTS

VARIABLES	(1) Sexual assault TOTAL	(2) Sexual assault COLOMBIANS	(3) Sexual assault VENEZUELANS	(4) Sexual assault OTHERS	(5) Sexual assault MISSING
After X Log Distance	2.0069***	1.8520***	−0.1636***	0.0148**	0.2954
	(0.6979)	(0.5392)	(0.0420)	(0.0070)	(0.4011)
Observations	107,040	107,040	107,040	107,040	107,040
R-squared	0.1571	0.1506	0.0147	0.0098	0.1234

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robust standard errors clustered at the municipality level in parentheses.

For Panel A Dependent variable uses nationality-specific cargo theft offenses per million residents.

For Panel B Dependent variable uses nationality-specific sexual assaults per million residents.

After is an indicator equal to 1 after the re-opening of the border in August 2016.

Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.

Monthly panel data regression with municipality and month fixed effect.

Time period covers from 2010 to 2019.

million residents as a function of distance to the frontier and the period after the reopening of the border. We find that cargo theft offenses, like homicides, increase to a greater extent near key border crossings following the closing and then re-opening of the border in 2016. It should be noted that those who are victims of cargo theft are primarily Colombians, as shown in column 2. Venezuelans, by contrast, did not report a single cargo theft. But, as argued above, migrants can still be affected by the presence of organized crime indicated by these results.

Third, the irregular situation of many migrants means that they might therefore be more exposed to violence.[25] In particular, the increase in migration among the undocumented makes them vulnerable to exploitation, extortion, trafficking, sexual abuse, and violence.[26]

This hypothesis is explored by analyzing official crime data on sexual assaults. As shown in Panel B of Table 9, there is a reduction in sexual assaults overall close to the border. Yet, as shown in the third column, for Venezuelan victims, sexual abuse increased near the border after the migratory shock. For Colombians, by contrast, sexual assaults decrease near the key border crossings following the closing and then re-opening of the border in 2016. Thus, these results indicate that the incidence of sexual violence across municipalities and time is very different for Venezuelans, who face a greater vulnerability near key border crossings, following the closing and then re-opening of the border in 2016. Overall, these results suggest that our homicides results could be driven by the exploitation of migrants in areas close to the frontier.

Fourth, competition for jobs between migrants and natives can potentially lead to economic-motivated violence. In particular, there is existing evidence that immigration tends to have adverse effects on unskilled workers (Caruso et al. (2019), Penaloza-Pacheco (2019), Tribin-Uribe et al. (2020) and Bonilla-Mejia et al. (2020)). Further, there is evidence linking crime with unemployment and economic stress (Khanna et al. (2019)). To address these points in the context of our identification strategy, we use data from the Colombian Household

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[25] According to official data from Migración Colombia, as of the end of 2019, roughly 57 percent of Venezuelan migrants were in an irregular situation.

[26] See reports on migrants from Venezuelans: "Venezuelan Migrants at High Risk for Trafficking and Abuse," CARE, June, 2019. https://www.care.org/newsroom/press/press-releases/venezuelan-migrants-high-risk-for-trafficking-and-abuse and "Venezuela situation", UNHCR, December, 2018, https://www.unhcr.org/5ab8e1a17.pdf

Table 10
Unemployment and participation.
Source: Household survey

Panel A: UNEMPLOYMENT			
VARIABLES	(1) Unemployment Rate TOTAL	(2) Unemployment Rate COLOMBIANS	(3) Unemployment Rate VENEZUELANS
After X Log Distance	−0.2286 (0.2026)	−0.1909 (0.2041)	0.2335 (0.5415)
Observations	644	644	644
R-squared	0.7868	0.7836	0.1345
Panel B: UNEMPLOYMENT			
VARIABLES	(1) Participation Rate TOTAL	(2) Participation Rate COLOMBIANS	(3) Participation Rate VENEZUELANS
After X Log Distance	0.3787*** (0.0810)	0.5074*** (0.0777)	1.9992 (1.3984)
Observations	644	644	644
R-squared	0.8183	0.8228	0.4294

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Robust standard errors clustered at the municipality level in parentheses.
For Panel A Unemployment rate is obtained by dividing the number of unemployed by the number of people in the labor force for each nationality.
For Panel B Labor participation is calculated as labor force divided by the population.
After is an indicator equal to 1 after the re-opening of the border in August 2016.
Road distance to the nearest border crossing, defined as Arauca, Cucuta, Maicao, Puerto Carreno, and Puerto Santander.
Quarterly panel data regression with municipality and quarter fixed effects.
Time period covers from 2013 to 2019.

Survey, covering 2013–2019, to explore the implications of migration on labor market outcomes that could be driving the violence against migrants. In this case, our sample is much smaller as the survey only covers 23 larger cities in Colombia. Using these data, we analyze two labor outcomes: unemployment rates and labor market participation rates.[27] Table 10 shows the relation between these outcomes and distance to the key border crossings, before and after the closing and re-opening of the key border crossings. As shown, labor market outcomes were worsened for natives, with a reduction in labor market participation and an increase in unemployment near the frontier, even though the results for unemployment are not statistically significant at conventional levels. Results for migrants are statistically insignificant but also very noisy, reflecting the small sample sizes of migrants in these surveys in some cities, especially before the migration wave. Overall, these results are consistent with the idea that worsened labor market outcomes for natives might have contributed to violence against migrants.[28]

7. Conclusion

In this paper, we have brought new data and a new setting to a classic question regarding the relationship between immigration and crime. Our first research question involved the relationship between migration and crime, and the key finding here is that homicide rates increased in areas close to the border with Venezuela following the closing and then re-opening of the border in 2016. Thus, immigration of Venezuelans is associated with an increase in crime rates in the receiving municipalities. Our second research question involves addressing whether this increase in homicide rates is driven by homicides against immigrants or homicides against native Colombians. Using information

on the nationality of the victim, we find that the increase in the homicide rate was driven by homicides involving Venezuelan victims, with no evidence of a statistically significant increase in homicides involving native Colombians. We also provide evidence that Venezuelans are disproportionately victimized, relative to their population size. Given all of this, it is important, from an academic perspective, to account for the nationality of victims when analyzing the link between crime and immigration. We then investigate possible mechanisms. Using arrests data, we find little evidence for the view that our results are driven by homicides of migrants by other migrants. We do find evidence, though indirect, that our results could be driven by the presence of organized crime, the exploitation of migrants, and negative economic impacts for native workers.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jdeveco.2022.103039.

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[27] We classify as Venezuelans those individuals born in Venezuela who lived in Venezuela 5 years before the survey.

[28] Our findings are similar to Bonilla-Mejia et al. (2020) and Tribin-Uribe et al. (2020). They do not find a significant impact on unemployment on non immigrants but found a significant reduction in labor participation. Our results indicate that nearby municipalities to the border guide this effect.

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