Forced Migration and Crime: Short-Term Evidence from Brazil

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Abstract

This paper provides novel evidence on the short-term impact of forced migration on crime in a developing country. We exploit the unprecedented and massive inflow of Venezuelan forced migrants as an exogenous shock to the dynamics of crime in the state of Roraima, Brazil. Our empirical strategy relies on two main sources of variation: (i) the timing surrounding the first closing of the Venezuelan land border with Brazil in December 2016 and its re-opening in January 2017; and (ii) the intensity of exposure to migration based on the geographical distribution of Venezuelans across municipalities in Roraima. Our results reveal that larger migration exposure increased violent crime rates, following the re-opening of the border, relative to the period before the crisis escalated. We disentangle this effect and find suggestive evidence that the increase in crime rates was driven by homicides and violent crimes involving Venezuelan victims.

Keywords: Forced Migration, Crime, Venezuelan Crisis
ANPEC Field: Área 12 - Economia Social e Demografia Econômica
JEL: J15; F22; K42

Resumo

Este artigo apresenta evidências do impacto de curto prazo da migração forçada na criminalidade em um país em desenvolvimento. Exploramos o fluxo massivo e sem precedentes de migrantes forçados venezuelanos como um choque exógeno à dinâmica da criminalidade no estado de Roraima. Nossa estratégia empírica utiliza duas fontes principais de variação: (i) o momento do primeiro fechamento da fronteira terrestre venezuelana com o Brasil em dezembro de 2016 e sua reabertura em janeiro de 2017; e (ii) a intensidade de exposição à migração com base na distribuição geográfica dos venezuelanos nos municípios de Roraima. Nossos resultados revelam que uma maior exposição à migração aumentou as taxas de crimes violentos, após a reabertura da fronteira, em relação ao período anterior à crise. Encontramos evidências sugestivas de que o aumento nas taxas de criminalidade foi impulsionado por homicídios e crimes violentos envolvendo vítimas venezuelanas.

Palavras-chave: Migração Forçada, Crime, Crise Venezuelana

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1 Introduction

Forced migration is not a new topic neither in the economic literature nor in the political agenda. By the end of 2020, 82.4 million forcibly displaced people had fled their homes and were seeking a safer place to live (UNHCR, 2021). Conflicts and insecurity have contributed to the increasing influx of refugees and asylum seekers worldwide. The humanitarian crises in Syria and Venezuela represent the two largest population exodus in the last decade. These large inflows of forced migration raise concerns about the economic, social, and political impacts on receiving countries. In particular, the increase in crime is one of the most common related concerns reported by native populations (Bianchi et al., 2012).

Under these circumstances, this paper aims to explore the impact of forced migration on crime in host communities within a developing country. Recent findings suggest that there is an increasing share of refugees who seek protection further away in higher-income destinations, however, more than 80% of the displaced population is still hosted by neighboring countries of those in conflict (Devictor et al., 2021). This emphasizes the importance of understanding the consequences of forced displacement on hosting communities that tend to share similar characteristics with those in crisis. Economic incentives for crime, such as weak labor market conditions and lower levels of educational attainment may be stronger drivers in these settings.

The context of our study is the unprecedented influx of Venezuelans to Brazil, following the escalation of the humanitarian crisis caused by the authoritarian regimes of Hugo Cháves and his successor, Nicolás Maduro. According to data reported by the Inter-Agency Coordination Platform for Refugees and Migrants from Venezuela (R4V) in February 2022, Brazil already hosted approximately 325,000 Venezuelans. The migration flow which started in 2015 has increased the Venezuelan population in Brazil by more than one hundred and fifty times compared to the 2010 population census, the last run by the Brazilian Institute of Geography and Statistics (IBGE). In that year, the 2,165 Venezuelans living in Brazil represented only 0,5% of total foreign-borns.

Our identification strategy exploits the rapid and massive inflow of Venezuelan forced migrants as an exogenous shock to the dynamics of crime in the state of Roraima between 2013 and 2019. Located in the North Region of Brazil, it hosts the only official crossing by land with Venezuela. Based on data from the International Traffic System (STI) collected by the Brazilian Federal Police, we estimate that almost 70% of all Venezuelans that have entered Brazil since 2015 came through this port of entry located in the small city of Pacaraima. Thus, its disproportionate exposure to the influx provides an appropriate setting for a quasi-experimental research design (see Tumen, 2015). We highlight that before the crisis the population of Venezuelans in Roraima was limited. In addition, the net inflow of forced migrants represents approximately a 50% increase in the state's total population.

The empirical analysis relies on two main sources of variation: (i) the timing surrounding the first closing of the Venezuelan land border with Brazil in December 2016 and its re-opening in January 2017; and (ii) the intensity of exposure to migration based on the geographical distribution of Venezuelans across municipalities in Roraima. We build on the specification proposed by Knight & Tribin (2021) by including a measure of migration exposure rather than only relying on the distance to the border. Since data on forced migration is not available at the municipal level, we follow Ibáñez et al. (2021) and estimate municipal migration exposure as the net monthly inflow of Venezuelan migrants interacted with the inverse distance of each municipality to the border. We test for the validity of this measure using the 2010 population census and find a significant correlation with the presence of Venezuelans in Roraima. The underlying assumption of the constructed measure is that municipalities closer to the border experience increased exposure to migration because migrants tend to settle in these areas. Nonetheless, we argue that this relationship is intensified in our context due to the geographical remoteness of Roraima and the difficulty to access other regions of Brazil.

Our results reveal that larger migration exposure increased violent crime rates, following the re-opening of the border, relative to the period before the crisis escalated. The estimates come from within-municipality monthly variation in the magnitude of our migration exposure measure. We disentangle this effect and find

suggestive evidence that the increase in crime rates was driven by homicides and violent crimes involving Venezuelan victims. Results were similar to those presented by Knight & Tribin (2021) for Colombia and reinforce the need for policies that support and integrate these vulnerable populations. All our estimates use data on violent crimes that resulted in death to overcome methodological issues with self-reporting (see Junger-Tas & Marshall, 1999).

Findings are robust to several tests. First, we estimate lagged effects of migration on violent crime rates to address concerns of reverse causality. Second, we evaluate our identifying assumption that before the inflow of Venezuelan forced migrants trends in violent crime rates for municipalities less and more exposed to migration were similar. Third, we build another migration exposure measure to account for a possible measurement error in our original construction. Fourth, we perform a placebo test by running our main specification with a fake crisis dummy during the period before the migration flows increased. Fifth, we perform a falsification test using suicide rates as our dependent variable.

Our paper contributes to two groups within the empirical migration economics literature. First, it adds to a broader rising literature on the impacts of forced migration in developing countries by providing novel evidence with granular data from Brazil (see Altındağ & Kaushal, 2021; Bahar et al., 2021; Ceritoglu et al., 2017; Ibáñez et al., 2021; Rozo & Vargas, 2021; Tumen, 2016 for example). Second, it contributes to the scarce literature that solely investigates the relationship between migration and crime by finding a positive association in a distinct context than the majority of other papers. On one hand, Bianchi et al. (2012), Bell et al. (2013) find negligible or null effects of immigration on crime in Italy and the United Kingdom, respectively. On the other, in the context only of forced migration, results are mixed. While Kırdar et al. (2022) and Kayaoglu (2022) find either null or negative effects of the Syrian refugees on crime in Turkey, Akbulut-Yuksel et al. (2022) find a positive relationship in the same setting. Dehos (2021) documents a positive association between the share of recognized refugees in Germany and the overall crime rate. Knight & Tribin (2021) find an increase in homicides in Colombia near the border with Venezuela, driven by an increase in crime with Venezuelan victims.

To the best of our knowledge, this paper is the first on the impacts of the Venezuelan forced migration on crime in Brazil. Therefore, it also contributes to the incipient group of studies that investigate the causal effects of this unprecedented refugee crisis in Roraima. Shamsuddin et al. (2021) find that the large influx of forcibly displaced Venezuelans had no short-term effect on fiscal variables. They also document an increase in unemployment among women and a decrease in employment among low-skilled workers. Ryu & Paudel (2021) present similar results and show that the crisis lowered employment and labor force participation, but find no impact on wages.

The remainder of the paper is structured as follows. Section 2 briefly presents the theoretical framework guiding our analysis. Section 3 brings background information on the Venezuelan crisis and its repercussions in the state of Roraima, Brazil. Section 4 reveals the data used to build our panel. Section 5 presents our empirical strategy, which is followed by the results in Section 6. Finally, we conclude our paper with a discussion in Section 7.

2 Theoretical Framework

Seminal work on the economics of crime by Becker (1968) and Ehrlich (1973) suggests that an individual's decision on involvement in criminal activity is based on the conscious or subconscious comparison between the expected costs and benefits associated with his action. The expected returns of crime are calculated based on potential monetary earnings and psychic gains, while costs are primarily derived by the probability of punishment compared to potential legal labor market earnings. Thus, in line with the theory of rational choice under uncertainty, individuals decide to engage in criminal activity if the expected benefits exceed the expected costs.

The proposed theory is particularly relevant for property crime because benefits are arguably directly associated with the monetary value of illegally acquired goods. However, in our study, we focus only on

violent crime and thus the economic value involved seems less clear. Grogger (2005) states that violent crime plays a complementary role to other crimes, such as the illegal drug market, and thus we can extend the traditional economic model to these types of crime. That said, understanding the impact of forced migration on violent crime requires the comparison between the costs and benefits of engaging in crime both for natives and the forced migrants in the host community.

Incentives for asylum seekers and refugees to engage in violent criminal activity seem to be affected by several individual factors such as prospects for integration in the host community, duration and specificities of the asylum process, conditions of access to the labor market, the possibility of relocation, and intrinsic vulnerabilities generally associated with victims of forced migration. These are in line with the framework proposed by Becker (1968) and Ehrlich (1973).

In contrast, incentives for natives to engage in criminal activity upon the arrival of migrants seem to be more affected by compositional effects at the aggregate level which are more associated with the macro-structural theory (Messner & South, 1986). These may include tightening of labor market conditions, increased pressure on the healthcare system, and other public services such as education. All of these could lead not only to an overall increase in crime but also to anti-immigration sentiments and hate crimes. In addition, native criminal organizations may seize the opportunity to co-opt vulnerable migrants into criminal activity as they are more likely to live in disadvantaged areas (see Martinez & Jr, 2014).

We hypothesize that in our setting the theoretical channels for a positive effect of forced migration on violent crime could be: (i) a change in demographic composition leading to an increase in the population of young males that tend to be more involved in criminal activity regardless of nationality (see Freeman, 1999), (ii) an already weak formal labor market in the host community, before the arrival of refugees, suffering from increasing competition, (iii) a low cost associated with committing a crime when taking into consideration the risk of deportation and (iv) a pre-existing context of violence with the presence of organized crime leading to a favorable environment.

However, the theory may also support null or negative effects of migration on crime. If so, the main channels driving a negative result in our case could be: (i) increased presence of military forces in the region which received Venezuelan migration flows, (ii) freedom of movement within the host country, (iii) facilitated access to public social services, and (iv) lower language barriers than in other forced migration context.

In essence, the theoretical framework leads to nonconcluding results. Nevertheless, we argue that among the hypothesized channels an already weak formal labor market and the pre-existing institutional and socioeconomic context in Roraima are potential candidates for the strongest channels driving the relationship between forced migration and crime in our setting. In addition, the geographical remoteness of Roraima may put further pressure on these channels, as moving to other regions of Brazil involves high costs and long distances. Thus, we anticipate a positive effect. However, the ambiguity in our hypotheses reinforces the importance of empirical research to understand this relationship in any particular setting. We believe this paper is a first step into shedding light not only on the direction of the effect but the underlying mechanisms driving it.

3 Context

3.1 Venezuelan Crisis

By January 2022, 6.04 million Venezuelans had left their country in search of dignified and safer living conditions (R4V, 2022b). Approximately 4.99 million of them migrated to countries in Latin America and the Caribbean. Colombia is currently host to the largest part of the displaced population, followed by Peru, Ecuador, Chile, and Brazil.

Once one of the richest countries in Latin America and with high prospects of economic growth due to extensive oil reserves, Venezuela's economic and social conditions have consistently deteriorated since 2013 (ECLAC, 2021). The election of Hugo Chávez in 1998 brought major changes to the political and

economic dynamics of Venezuela (Vera, 2015). Although the country benefited from oil revenues during the first years of government, Chávez's regime continued to put forward its controversial and polarizing agenda. Following his death, Nicolás Maduro (former Vice President) assumed office in 2013 under charges of irregularities (Corrales, 2020). Since then, intensified by decreasing oil prices (2014-2020) and international sanctions, the country has been led to a state of humanitarian crisis.

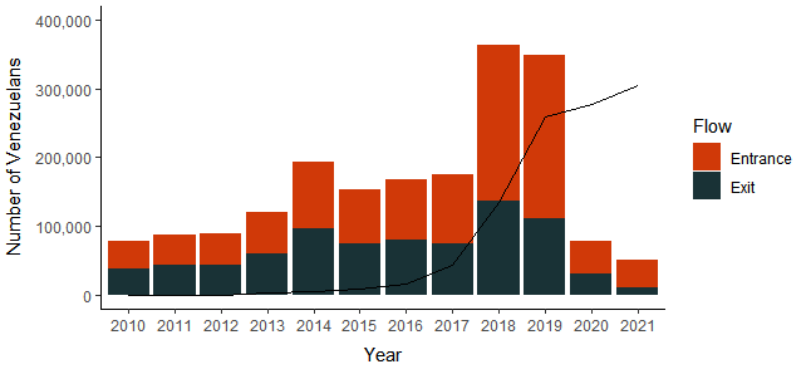
Venezuela has been facing a systematic shortage of food across the country and the population has restricted access to basic healthcare necessities. Doocy et al. (2019) assess data from a variety of sources and suggest that food insecurity has nearly reached the entire population and acute malnutrition among children has become increasingly common. In addition, human rights violations and repression by the authoritarian regime have become a persistent threat not only to oppositionists but to the general population (Human Rights Watch, 2020).

3.2 Roraima: the main entrance to Brazil

The city of Pacaraima, located in the state of Roraima, hosts the only official crossing by land between Brazil and Venezuela. As the main gateway to Brazil, it has received a rapid and unprecedented influx of forced migrants, since the crisis escalated. Based on data from the International Traffic System (STI) collected by the Brazilian Federal Police, we estimate that almost 70% of all Venezuelans that have entered Brazil since 2015 came through the port of entry located in Pacaraima.

Figure 1 shows the yearly flow and accumulated stock of Venezuelans in Brazil between 2010 and 2021. As a consequence of the migration flow, the population of Venezuelans in Brazil has increased by more than one hundred and fifty times compared to the 2010 population census. In that year, the 2,165 Venezuelans living in Brazil represented only 0,5% of total foreign-borns.

Figure 1: Yearly Flow and Accumulated Stock of Venezuelan Forced Migrants in Brazil (2010-2021)

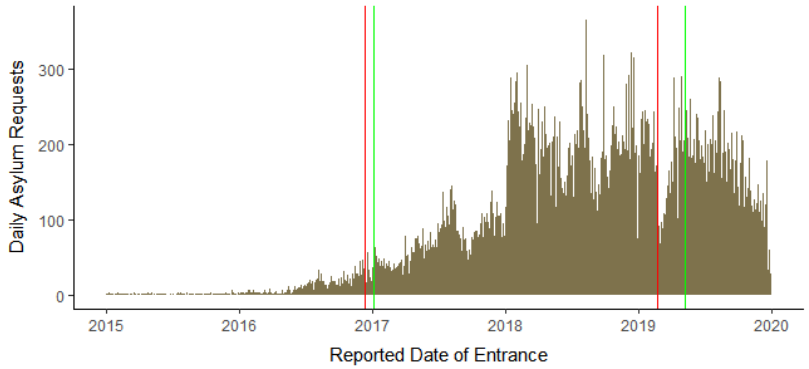


Notes: The black line represents the yearly accumulated stock since 2010. It is calculated using the yearly net inflow of Venezuelans. The sharp decrease in migration flows during 2020 and 2021 are attributed to the closing of borders during the COVID-19 pandemic. The data refers to all Brazilian ports of entry.Source: Author's calculation from the International Traffic System (STI) organized by Brazilian Federal Police. Data made publicly available by the Observatory of International Migration (OBMigra).

Despite signs that the exodus started in 2015, Figure 2 reveals an intensification of the migratory flow following the first closing and re-opening of the Venezuelan border with Brazil in December 2016 and January 2017, respectively. On the occasion, Nicolás Maduro claimed to be fighting smuggling groups and the hoarding of bolivars by money changers (Lozano, 2016). In February 2019, the Venezuelan government announced another closing of the borders in midst of the political turmoil involving the oppositionist, Juan Guaido (Mundo, 2019). The re-opening only happened in May of that same year. However, on this second occasion, the intensity of the migration flow didn't increase compared to the moment right before the closing. As suggested by Figure 2, migration flow didn't cease completely during both periods of closure. Anecdotal evidence suggests that it was due to the use of irregular routes and eventual reporting errors as

the date of entrance is self-reported during the asylum claim process[1] (Pêgo & Moreira, 2021).

Figure 2: Daily asylum requests from Venezuelans entering Brazil through Roraima (2015-2020)



Notes: The first red vertical line represents the closing of the Venezuelan land border with Brazil on 13th December 2016, the second represents the closing on 21th February 2019. The first green vertical line represents the re-opening of the border on 6th January 2017, the second represents the re-opening on 10th May 2019. We atribute crossings with borders closed to: (i) the use of irregular routes to enter Brazil and (ii) eventual reporting errors as the date of entrance is self reported during the asylum claim process. Source: Author's calculation from the International Traffic System - Alert and Restriction Modeul (STI-MAR) organized by Brazilian Federal Police. Data made publicly available by the Observatory of International Migration (OBMigra).

According to official statistics, Roraima is the least populated state in Brazil and has the lowest population density. Both factors are related to its remote geographical characteristics and long distances from major Brazilian economic centers.[2] Moreover, Roraima's labor market relies highly on the public and service sectors which together accounted for 84,9% of the GDP, on average, between 2013 and 2019 (DAPP, 2020). Unemployment among young people between 25 and 39 years old was, on average, 8.9% for the same period, 0.3 percentage points above the national average, according to the IBGE.

With regard to criminality, between 2011 and 2018, Roraima witnessed a dramatic increase in violent crime rates (Cerqueira et al., 2021). In 2018, it became the state with the highest homicide rate in Brazil. The time frame does coincide with the increase in the Venezuelan migration flow and with the period used in our empirical strategy (i.e. 2013-2019). However, another factor has also played a key role in local criminal dynamics. A dispute between three of the major crime organizations in Brazil escalated substantially during this period and increased violent conflicts among local groups in the northern states of Brazil (Carvalho, 2019; Madeiro, 2019).[3] The month with the highest number of violent crimes was January 2017 which coincides with the first re-opening of the border. However, what drove this number was the third-largest massacre in the history of Brazil's prison system. Media coverage suggests a direct connection between the massacre with the increasing tension among criminal organizations (Alessi & Benites, 2017). On the occasion, all registered deaths were of Brazilian males.

Finally, two other aspects are important in our setting. First, with the constant increase in migration flows, several humanitarian organizations arrived in Roraima in 2018 to provide shelter and protection for Venezuelan migrants. In the same year, under public and political pressure the Brazilian federal government adopted a centralized response with support from the Brazilian Army (see Mori, 2018 for an interview with the mayor of Boa Vista; and Alvim, 2018 for early violent local response to migration). The *Operação Acolhida* (Operation Shelter) has been the main humanitarian response to the crisis. It was structured

[1]Daily asylum requests are used as a proxy for daily migration flow because official crossing statistics were only made available on the monthly level. Nonetheless, claiming asylum was the main legal channel that Venezuelans relied on when they first arrived in Brazil.

[2]On one hand, access to the state of Roraima from other regions of Brazil is limited to a 748km road that connects Boa Vista (the capital city of Roraima) to Manaus (the capital city of Amazonas, a neighboring state) or a small airport with flights to six destinations in Brazil. On the other, access to Roraima from Venezuela also requires a long journey. The region of Venezuela that borders Roraima is also among the least populated in the country. According to Google Maps API, the travel distance between the capital city of Caracas and Pacaraima is 1,272km.

[3]Recall, that the region is a major drug route for cocaine produced in Colombia, Peru, and Ecuador.

to receive, provide shelter, health support, social protection, and documentation to all migrants arriving through Pacaraima. An important pillar of the response has been the *Estratégia de Interiorização* (Interiorization strategy). It aims to reduce pressures on the state of Roraima and promote socioeconomic integration through the monthly voluntary relocation of Venezuelans to other states. Until February 2022, 70,428 forced migrated had benefited from the program and had been relocated to more than 600 municipalities across Brazil (MDS, 2022).

Second, as has been mentioned, the migratory status may be a key variable to integration in the host community and thus influence incentives for criminal behavior. Over the past years, the Brazilian federal government has constantly adapted its response to regularize the migratory status of Venezuelans. The National Committee for Refugees has granted asylum to 49,000 Venezuelans, 94,000 are still asylum seekers, while approximately 185,000 have been granted residence permits (R4V, 2022a). We highlight that despite the status, all are entitled to a working permit, are free to move within the country, and have access to all public services (i.e. health, education, and social programs).

4 Data and Descriptive Statistics

The data used in our empirical analysis were grouped into three categories: (i) violent crime, (ii) Venezuelan forced migration, and (iii) control variables. They were collected for each municipality in the state of Roraima between August 2013 and December 2019. Each of the categories is described in the subsections below.

4.1 Violent Crime

Monthly data on violent crime comes from the Mortality Information System (SIM) organized by the Brazilian Health Ministry and implemented with the support of Health Secretaries at the state and municipal level.[4] The main input for the SIM is the Death Statement (DO), a standardized document issued by a medical doctor that includes the cause of the reported death based on the International Classification of Diseases and Related Health Problems (ICD-10). The DO also includes several information on the victim, such as the date of death, nationality, gender, marital status, municipality of death, and the municipality of residence. Following Cerqueira et al. (2021), we compute total violent crimes as a sum of these two major categories:

- **Homicides**: deaths resulting from aggression (ICD-10 codes: X85-Y09, Y35-Y36). Within this category, we can also identify homicides caused by firearms, legal intervention, and other forms of aggression.
- **Violent Deaths By Undetermined Cause**: deaths resulting from undetermined cause (ICD-10 codes: Y10-Y34).

Our monthly crime rates are constructed by dividing the number of violent crimes in a specific municipality by its annual population and multiplying the result by 100,000. Table 1 provides descriptive statistics for violent crime rates and the two subcategories presented above. The average monthly violent crime rate among all municipalities was 2.91 per 100,000 people during our period of study. The average monthly homicide rate was 2.77, while the rate of violent deaths by undetermined cause was significantly lower at 0.14. We highlight that in some of the municipalities in our sample the violent crime rate per 100,000 people was 0 for several months, while in others it peaked reaching 37.26.

[4] As has been mentioned, all our estimates use data on violent crime that resulted in death to overcome methodological issues with self-reporting.

Table 1: Descriptive Statistics: Outcomes, Controls, Migration Data and Variable of Interest

Variables	N	Mean	Std. Dev.	Min	Max
Outcome: Crime Rates (per 100,000 people)					
Violent Crime Rate	1155	2.91	5.40	0	37.26
Homicide Rate	1155	2.77	5.31	0	37.26
Violent Death by Undetermined Cause	1155	0.14	1.04	0	13.68
Suicide Rate	1155	0.83	2.67	0	19.17
Pre-crisis Static Controls					
Venezuelan Settlements in 2010 (as % of total pop.)	15	0.06	0.13	0	0.54
N. of Families in Extreme Poverty in 2012	15	0.54	0.15	0.29	0.78
GDP per Capita in 2010 (in reais)	15	9,606.45	2,394.44	6,752.15	18,023.26
Human Development Index in 2010	15	0.61	0.07	0.45	0.75
Mun. Public Expenditures in 2010 (millions)	15	58.83	150.81	7.24	621.69
Unemployment Rate in 2010	15	0.09	0.08	0.06	0.32
Urban pop. in 2010 (as % of total pop)	15	0.44	0.23	0.13	0.98
Pop. of young men between ages 15-39 in 2010	15	0.21	0.02	0.18	0.25
Population Density (per km2) in 2010	15	5.41	14.77	0.37	70.2
Venezuelan Forced Migration					
Distance from Municipality to Border	15	301.44	142.81	0.1	528.53
Net Inflow Forced Migrants	1155	5323.73	7043.88	-75	28750
Asylum Requests by Date of Entrance	1155	1786.87	2105.16	2	5712
Variable of Interest					
Migration Exposure	1155	3566.86	22520.08	-750	287500
Std. Migration Exposure	1155	0.07	1.24	-0.17	15.74

Sources: authors' calculations based on data from Mortality Information System (SIM-SUS), International Traffic System (STI) from the Brazilian Federal Police, Google Maps API, Brazilian Institute of Geography and Statistics (IBGE), Brazilian Ministry of Citizenship, Secretary of Finance of the State of Roraima (SEFAZ).

4.2 Venezuelan Forced Migration

Data on migration flow, regardless of legal status, comes from the International Traffic System (STI) organized by the Brazilian Federal Police and made publicly available by the Observatory of International Migration (OBMigra). The data is aggregated at the annual level and includes variables such as nationality, entry point, sex, age, and nature of the movement (entry or exit). However, upon request, STI data at the monthly level was shared by OBMigra for the official port of entry in Pacaraima, Roraima.[5]

Since recent data on the number of migrants is not available at the municipal level, we follow Ibáñez et al. (2021) and estimate a measure of municipal migration exposure. The underlying assumption is that municipalities closer to the border experience increased exposure to migration because migrants tend to settle in these areas. Nonetheless, this relationship is intensified in our context due to the remoteness of Roraima and the difficulty to access other regions of Brazil. The measure is constructed as follows:

$$Migration\ Exposure_{m,t} = Venezuelan\ Net\ Inflow_t * \frac{1}{Distance_m} \tag{1}$$

where $Venezuelan\ Net\ Inflow_t$ is the net inflow of Venezuelan forced migrants entering Brazil through Pacaraima's official port of entry in each month *t* and $Distance_m$ is the distance from the center of each municipality *m* to the border. The distance in kilometers was calculated using Google Maps API. We test for the validity of this measure using the 2010 population census, the last available official statistic mapping the presence of migrants across municipalities in Brazil. Our estimate finds a significant negative correlation between the distance of each municipality to the border and the pre-existing settlement of Venezuelans in Roraima (see Table A.1).

Table 1 shows that the average monthly net inflow of forced migrants during the period of our study was 5,323. However, at the peak of the crisis, 28,750 Venezuelans arrived in Roraima in a single month. The

[5]Before August 2013, STI data for the port of entry in Pacaraima didn't include nationality. Thus, imposing a limit to the period of our analysis.

average distance of each municipality from the border is 301.44km. The nearest city is Pacaraima which hosts the port of entry, while the farthest is 528.53km away.

4.3 Control Variables

Our pre-crisis static control variables at the municipal level come from three different sources. Early Venezuelan settlements, GDP per capita, human development index, unemployment rate, urban population (as % of the total population), the population of young men between ages 15-39 (as % of the total population), and population density in km^2 come from the Brazilian Institute of Geography and Statistics (IBGE). The number of families in extreme poverty comes from the Cadastro Único collected by the Brazilian Ministry of Citizenship. Data on municipal public expenditures comes from the Secretary of Finance of the State of Roraima (SEFAZ).

5 Empirical strategy

Our identification strategy exploits two sources of exogenous variation: (i) the timing surrounding the first closing of the Venezuelan land border with Brazil in December 2016 and its re-opening in January 2017; (ii) the intensity of exposure to migration based on the geographical distribution of Venezuelans across municipalities in Roraima. Thus, to evaluate the impact of the Venezuelan exodus on violent crime in Roraima we estimate the following two-way fixed effects model:

$$Y_{m,t} = \beta Migration\ Exposure_{m,t} * Crisis_t + \alpha_t + \alpha_m + \gamma t_m + X_{m,t} + \epsilon_{m,t} \tag{2}$$

where $Y_{m,t}$ is the violent crime rate per 100,000 people in municipality m at month-year t; $Migration\ Exposure_{m,t}$ is defined in Equation 1 and standardized for purpose of interpretation; $Crisis_t$ is a dummy variable indicating the period following the first re-opening of the border in January 2017; α_m are municipality fixed effects to control for time-invariant characteristics at the municipal level; α_t: year-month fixed effects to control for variables and shocks that are constant across municipalities but vary over time; γt_m is the time trend by municipality; and $X_{m,t}$ is a vector of pre-crisis static municipal characteristics interacted with year dummies.[6] Standard errors are clustered at the municipal level to account for common unobserved correlations within municipalities.

The parameter of interest, β, can be interpreted as the marginal change in violent crime rate when migration exposure increases by one standard deviation, following the re-opening of the border, relative to the pre-crisis period. β comes from within-municipality variation in the magnitude of our municipal migration exposure measure.

Our identification is only valid if before the inflow of Venezuelan migrants trends of violent crime rates for municipalities less and more exposed to migration were similar. We test time trends in the pre-crisis period in Section 6 and confirm the validity of the common trend assumption. We also address three sources of endogeneity. First, characteristics of municipalities that attracted migrants may be correlated with crime. To deal with this threat, we included $X_{m,t}$ in our main specification to flexibly control for selection characteristics into municipalities that may also be determinants of crime and other municipal-specific characteristics that influence criminality dynamics. Second, changes in violent crime rates may affect migration exposure. To deal with reverse causality, we test for the lagged effects of migration exposure on violent crime rates. Third, our migration exposure may be misleading. That is, the monthly net inflow of Venezuelan migrants may be over or underestimated. We use monthly asylum requests instead of net monthly migration flow to calculate our migration exposure measure to deal with potential measurement error.

[6]The use of yearly pre-treatment static variables interacted with time dummies is necessary because time-invariant controls would be swept away by the fixed effects, while time-varying controls may be affected by treatment. Thus, interaction with time dummies allows trends in crime to be affected by the controls, without letting them affect violent crime rate levels.

With regard to the selection characteristics in $X_{m,t}$, we control for GDP per capita in 2010, human development index in 2010, unemployment rate in 2010, extreme poverty in 2012, municipal public expenditures in 2010 (Becker, 1968; Bianchi et al., 2012; Ehrlich, 1973) and the share of Venezuelans as % of the total population in 2010 (McKenzie & Rapoport, 2010; Munshi, 2003; Pedersen et al., 2008). The other municipal-specific characteristics in $X_{m,t}$ are population density in 2010, the urban population as % of the total population in 2010 (L. Glaeser & Sacerdote, 1999), the population of young men between ages 15-39 as % of the total population in 2010 (D. Levitt, 1998; Freeman, 1999; Grogger, 2005).

Furthermore, we argue that the push factor (i.e. Venezuelan crisis) plays a bigger role than pull factors (i.e. socioeconomic conditions in the municipalities of destination) in our setting. Thus, the Venezuelan forced migration flow can be used as a source of sudden and exogenous variation. In addition, Venezuelan presence in Roraima was negligible before the beginning of the humanitarian crisis, downplaying the role of pre-existing networks in the migration decision. The literature argues that supply-push events are important determinants of migration outflows and on these occasions, settlements tend to be independent of regional differences within the host country (Angrist & Kugler, 2003; Card, 1990; Friedberg, 2001).

In Section 6 we decompose our panel and estimate the effects of the migration flow on violent crime rates according to the sex of the victim, nationality, and different types of violent crimes. Besides dealing with the endogeneity concerns mentioned above, in Section 6 we also run a placebo and a falsification test to assess the robustness of our estimates.

6 Results

Table 2 and 3 present the results of our baseline Equation 2 with contemporaneous and lagged effects, respectively. In both tables, we gradually include fixed effects and the controls to assess the robustness of our main estimates in column (5).

We find that an increase in one standard deviation in migration exposure results in 2.02 additional cases of violent crimes per 100,000 people, following the re-opening of the border in January 2017, relative to the pre-crisis period. The magnitude of our finding is very relevant, as it represents a 69.4% increase from the average violent crime rates during the period of our study. We observe that including municipality time trends and pre-crisis static controls increases the magnitude of our estimates, however, at the cost of a higher significance threshold. Socioeconomic characteristics at the municipal level may be capturing part of the effects presented in columns (3) and (4). However, all of the parameters suggest a positive and quantitatively significant association between the increase in migration exposure and violent crime rates in Roraima after the crisis escalated.

While the one-month lagged estimates suggest that our main finding fades out quickly, the two and three-month estimates reveal that it actually increases in magnitude by 21.8% and 39.2%, respectively. These results relieve our concerns with reverse causality and the fact that our migration exposure measure could be suffering from changes in the violent crime rate. We hypothesize that the lagged effects may be associated with the geographical remoteness of Roraima. The potential channels (i.e. weak formal labor market and pre-existing institutional and socioeconomic context) driving the relationship between forced migration and crime persist because the positive net inflow increased the stock of forced migrants in the region throughout the period of our analysis.

6.1 Decomposed estimates

To understand what may be driving our findings we estimate the baseline Equation 2 separately by sex of the victim, nationality, and types of violent crime. Table A.2 shows that the positive effect of increased migration exposure is driven by violent crimes involving male victims. This result finds support in the theoretical framework and previous empirical studies within the literature on crime.

However, our main finding comes from Table 4 which presents the results dividing the violent crime rate

Table 2: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima

Dependent Variable:	Violent Crime Rate (per 100,000 people)				
	(1)	(2)	(3)	(4)	(5)
Crisis × Migration Exposure	4.177**	0.6054**	1.593**	1.825**	2.020*
	(2.100)	(0.2440)	(0.6485)	(0.6744)	(1.143)
Controls					
Municipality FE	-	Yes	Yes	Yes	Yes
Month-Year FE	-	-	Yes	Yes	Yes
Municipality Time Trend	-	-	-	Yes	Yes
Static Controls x Year	-	-	-	-	Yes
Statistics					
Observations	1,155	1,155	1,155	1,155	1,155
R^2	0.00727	0.16560	0.24584	0.26930	0.30314
Within R^2		0.00270	0.00092	0.03200	0.03336

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

Table 3: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima - Lagged Models

Dependent Variable:	Violent Crime Rate (per 100,000 people)				
	(1)	(2)	(3)	(4)	(5)
Lagged Effects (1 month)					
Crisis × Migration Exposure (t-1)	4.242*	0.748**	0.749	0.957**	0.668
	(2.200)	(0.2605)	(0.4424)	(0.4355)	(0.7815)
Observations	1,140	1,140	1,140	1,140	1,140
Lagged Effects (2 months)					
Crisis × Migration Exposure (t-2)	4.318*	0.2546	1.503**	1.541**	2.460*
	(2.235)	(0.2682)	(0.6532)	(0.6565)	(1.162)
Observations	1,125	1,125	1,125	1,125	1,125
Lagged Effects (3 months)					
Crisis × Migration Exposure (t-3)	4.237*	0.5134*	2.076**	2.157**	2.811*
	(2.309)	(0.2696)	(0.8640)	(0.8717)	(1.340)
Observations	1,110	1,110	1,110	1,110	1,110
Controls					
Municipality FE	-	Yes	Yes	Yes	Yes
Month-Year FE	-	-	Yes	Yes	Yes
Municipality Time Trend	-	-	-	Yes	Yes
Static Controls x Year	-	-	-	-	Yes

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

by the nationality of the victim. An increase in migration exposure, following the escalation of the crisis in 2017, only had significant and positive effects on violent crime involving Venezuelan victims. Precisely, we find that an increase in one standard deviation in migration exposure results in 0.15 additional cases of violent crimes with Venezuelan victims per 100,000 people. Although the magnitude seems negligible, it represents a 5% increase from the mean rate. When estimating the effects on Brazilian victims or other nationalities we find no significant effect. Nonetheless, this result may suggest that the effects presented in Table 2 and 3 are not being driven by the dispute between local criminal organizations that coincided with the arrival of Venezuelans in Roraima (see Section 3 for more details on the context of our setting).

Table A.3 presents the results of our estimates when dividing total violent crime between homicides and violent deaths resulting from undetermined cause. Findings, strongly suggest that the overall increase in violent crimes due to higher migration exposure is associated with homicides.

Table 4: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima - By Nationality of Victim

Dependent Variables:	Violent Crime Rate (per 100,000 people)			
	Total	Brazilian	Venezuelan	Other
Crisis × Migration Exposure	2.020*	1.762	0.154***	0.103
	(1.143)	(1.105)	(0.0090)	(0.1097)
Controls				
Municipality FE	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes
Municipality Time Trend	Yes	Yes	Yes	Yes
Static Controls x Year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	1,155	1,155	1,155	1,155
R^2	0.30314	0.31710	0.16230	0.12708
Within R^2	0.03336	0.02799	0.03324	0.01432

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

6.2 Robustness tests

To gauge the robustness of our results we perform several tests. First, we test time trends in the pre-crisis period to confirm the validity of the parallel trend assumption. Recall, that our identifying assumption is only valid if before the inflow of Venezuelan migrants trends of violent crime rates for municipalities less and more exposed to migration were similar. If they were different, our results could be capturing pre-existing differences among them and not the effect of the forced migration inflow, following the escalation of the crisis. Table A.4 presents the parameters estimated from the following equation using data from before December 2016 (i.e. the escalation of the crisis):

$$Y_{i,t} = \beta_1 Time_t * Treated_i + \beta_2 Time_t + \beta_3 Treated_i + \epsilon_{i,t} \tag{3}$$

where $Y_{i,t}$ is the violent crime rate in month-year t for group i; $Time_t$ indicates month-year t; and $Treated_i$ is a dummy variable indicating the group of municipalities with an average standardized exposure to migration above the median of our sample. The interaction between $Time_t$ and $Treated_i$ allows the time trend to be different between the two groups of municipalities. We find that β_1 is statistically insignificant, thus suggesting that violent crime rate trends were similar in the two different groups before the Venezuelan exodus.

Second, we build another migration exposure measure to account for a possible measurement error in our original construction. We change $Venezuelan\ Net\ Inflow_t$ in Equation 1 to the $Number\ of\ Asylum\ Requests_t$ by the reported date of entrance in Roraima's port of entry. Table A.6 reveals that the direction of the results remains unchanged. However, the magnitude of the effect was slightly higher than with the baseline specification and at a lower significance threshold.

Third, we perform a placebo test for the period before the intensification of the forced migration flow (i.e. 2013-2016) by running our baseline specification with a fake crisis dummy randomly assigned to January 2015. As expected, Table A.5 presents the results and no significant effects were found.

Fourth, we perform a falsification test using suicide rates as our dependent variable in Equation 1. Despite evidence of mental health issues in the context of refugee crises (see Bogic et al., 2015), we are not aware of this being documented in Roraima. Thus, we should not expect a positive relationship between Venezuelan forced migration and overall suicide rates in our setting. Table 5 confirms our hypothesizes. In

addition, when dividing the suicide rate by the nationality of the victim we actually find a decrease in suicide rates among Venezuelans, following the escalation of the crisis. Since both violent crime and suicide data come from the Mortality Information System (SIM), this result also relieves our concern with over-reported deaths attributed to Venezuelans which may be driving our violent crime results.

Table 5: Impacts of Venezuelan Forced Migration on Suicide in Roraima, Brazil - By Nationality of Victim

Dependent Variables:	Suicide Rate (per 100,000 people)			
	Total	Brazilian	Venezuelan	Other
Crisis × Migration Exposure	-0.2145	-0.2574	-0.0737***	-0.0204
	(0.6051)	(0.5981)	(0.0045)	(0.0267)
Controls				
Municipality FE	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes
Municipality Time Trend	Yes	Yes	Yes	Yes
Static Controls x Year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	1,155	1,155	1,155	1,155
R^2	0.20721	0.20420	0.18070	0.11930
Within R^2	0.01215	0.02140	0.04448	0.00350

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

7 Discussion and Concluding Remarks

This paper provides novel evidence on the short-term impact of forced migration on crime in a developing country by exploiting the unprecedented inflow of Venezuelan forced migrants as an exogenous shock to the dynamics of crime in the state of Roraima, Brazil. Using rich monthly administrative data for 2013-2019 combined with complementary datasets we are able to disentangle the drivers of our findings. Two meaningful sources of variation allow us to identify causal effects. First, we leverage a closing and re-opening of the border between Venezuela and Brazil which was followed by an increase in migration flows. Second, we rely on differentiated exposure to migration based on the interaction of net monthly inflows of Venezuelan forced migrants and the distance of each municipality to the main entry point.

We find suggestive evidence that increased exposure to forced migration, following the escalation of the migratory flow, is associated with higher violent crime rates when compared to the pre-crisis period. Our results are very significant in terms of magnitude and seem not only to persist, but increase two and three months following the increased exposure. The decomposed estimates suggest that forced migration is associated with an increase in violent crime, particularly homicides, involving victims of the nationality that have been forcibly displaced. Unfortunately, we are unable to match the data of the victims to the perpetrator of each crime to further explore this relationship.

Similar findings in the context of the Venezuelan influx to Colombia reveal the urgency of providing support to vulnerable migrant populations in developing host regions (Knight & Tribin, 2021). As hypothesized in Section 2, we believe that an already weak formal labor market and the pre-existing institutional and socioeconomic context in Roraima are the strongest channels driving the positive relationship between forced migration and crime in our setting. Nonetheless, the geographical remoteness of Roraima may put further pressure on these channels, as moving to other regions of Brazil involves high costs and long travel distances. This reinforces the importance of support from federal governments in contexts of forced migration to poorer regions. Relocation policies such as the *Estratégia de Interiorização* are key to providing safer

and lasting integration to victims of forced displacement. They also relieve pressures on host communities that are disproportionately exposed to large influxes.

An interesting possibility for future research is to investigate if these particular policies change the direction of the effect found in our study in the long-term. It may bring valuable evidence to confirm or reject the hypothesized mechanisms. Moreover, understanding the implications of the increased presence of humanitarian organizations and armed forces in regions close to the border may also shed light on possible mechanisms that might be driving the relationship between crime and forced migration before their arrival.

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A Appendix

A.1 Tables

Table A.1: Correlation between Distance to Point of Entry and Previous Venezuelan Settlements in Roraima

Dependent Variable:	Venezuelan Settlements in 2010
	(1)
Distance	-0.1389***
	(0.0085)
Fit statistics	
Observations	15
R^2	0.13056
Adjusted R^2	0.13008

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*
IID standard-errors in parentheses

Table A.2: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima - By Sex of the Victim

Dependent Variable:	Violent Crime Rate (per 100,000 people)		
	Total	Male	Female
Crisis × Migration Exposure	2.020*	2.020*	0.020
	(1.143)	(0.9431)	(0.3644)
Controls			
Municipality FE	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes
Municipality Time Trend	Yes	Yes	Yes
Static Controls x Year	Yes	Yes	Yes
Fit statistics			
Observations	1,155	1,155	1,155
R^2	0.30314	0.24701	0.27182
Within R^2	0.03336	0.03510	0.00668

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*
Clustered standard errors at the municipality level are reported in parentheses

Table A.3: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima - By Type of Violent Crime

Dependent Variables:	Violent Crime Rates (per 100,000 people)		
	Total	Homicide	Undetermined Cause
Crisis × Migration Exposure	2.020*	2.002*	0.018
	(1.112)	(1.045)	(0.1703)
Controls			
Municipality FE	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes
Municipality Time Trend	Yes	Yes	Yes
Static Controls x Year	Yes	Yes	Yes
Fit statistics			
Observations	1,155	1,155	1,155
R^2	0.30314	0.30467	0.14309
Within R^2	0.03336	0.02997	0.01639

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

Table A.4: Trends on Violent Crime prior to the Venezuelan Exodus - Treatment: Municipalities with above median Migration Exposure

Dependent Variable:	Violent Crime Rate (per 100,000 people)
Time × Treated	0.001
	(0.0011)
Time	0.0004
	(0.0007)
Treated	-21.84
	(18.02)
Fit statistics	
Observations	630
R^2	0.01015
Adjusted R^2	0.00540

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Robust standard-errors in parentheses

Table A.5: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima - Placebo Crisis during period prior to the Venezuelan Exodus

Dependent Variable:	Violent Crime Rate (per 100,000 people)
Placebo Crisis × Migration Exposure	3.848
	(3.782)
Controls	
Municipality FE	Yes
Month-Year FE	Yes
Municipality Time Trend	Yes
Static Controls x Year	Yes
Fit statistics	
Observations	630
R^2	0.34591
Within R^2	0.01122

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses

Table A.6: Impacts of Venezuelan Forced Migration on Violent Crime in Roraima, Brazil - Alternative Migration Exposure Measure

Dependent Variable:	Violent Crime Rate (per 100,000 people)				
	(1)	(2)	(3)	(4)	(5)
Crisis × Migration Exposure	2.898	0.333**	1.977**	2.879***	2.570**
	(2.129)	(0.1390)	(0.7355)	(0.7966)	(1.079)
Controls					
Municipality FE	-	Yes	Yes	Yes	Yes
Month-Year FE	-	-	Yes	Yes	Yes
Municipality Time Trend	-	-	-	Yes	Yes
Static Controls x Year	-	-	-	-	Yes
Fit statistics					
Observations	1,155	1,155	1,155	1,155	1,155
R^2	0.00576	0.16574	0.24589	0.27036	0.30377
Within R^2		0.00286	0.00099	0.03341	0.03424

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Clustered standard errors at the municipality level are reported in parentheses