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Economic and Fiscal Impacts of Venezuelan Refugees and Migrants in Brazil

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Abstract

As more and more Venezuelans leave their country, fleeing the economic and social crisis, the number of Venezuelans in Brazil has risen steadily since 2016, constituting about 18 percent of Brazil's 1.3 million refugee and migrant population as of October 2020. Although the economic gains of immigration are well-documented in the literature, the impacts of forced displacement on the labor market and government budget are mixed and have mainly focused on developed countries. This paper extends the previous literature by exploring the short-run fiscal impact of Venezuelan refugees and migrants on the public expenditure and revenue of Roraima, the state bordering the República Bolivariana de Venezuela at the north and the main gateway of the Venezuelan refugees and migrants entering Brazil, and by investigating their impact on its labor market. Using various administrative and survey data and a regression discontinuity framework, the paper finds that the population shock caused by the influx of forcibly displaced Venezuelans in the short-run did not have any statistically significant effect on the fiscal variables of Roraima. On the labor market, the paper finds that the population shock translated into an increase in unemployment among women and a decrease in employment among women and low skilled workers in the short-run. The effects on earnings are heterogenous across industries, but mainly positive for the high skilled and male workers, suggesting a need for cross-cutting policies that target the most vulnerable host population as well as the forcibly displaced.

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Economic and Fiscal Impacts of Venezuelan Refugees and Migrants in Brazil *

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1 Introduction

In a world, where 79.5 million of its 7.9 billion people are forcibly displaced due to persecution, conflicts, violence and human rights violations, the impact of forcibly displaced population[1] on the host countries is an issue of great significance. Past research finds mixed results on the effect of forced displacement on labor market outcomes, education, environment, crime and fiscal balance. This paper extends the present literature by studying the short-run impact of the influx of Venezuelan refugees and migrants on the overall labor market and the fiscal variables of Roraima, the state bordering the República Bolivariana de Venezuela at the north and the main gateway of the Venezuelan refugees and migrants entering Brazil.

Since 2013, the República Bolivariana de Venezuela, once one of the richest countries in Latin America, has been plunging in to one of the worst economic and social crises of the modern day. Economic activity has been contracting with GDP (PPP) shrinking at a rate of 35% in 2019 according to United Nations data. The inflation rate hit 929,797% in 2019 (IMF, 2019), while 89% of the population has been estimated to be living in poverty (ENCOVI, 2018). Health conditions have worsened with an average Venezuelan losing 10 kilos of body weight in 2017 and infant mortality rising to 26 per 1,000 live births in 2016 from 14.6 per 1,000 live births in 2010. An average of 89 homicides were reported per 100,000 inhabitants in 2019, which is almost three times that of countries that are at war (World Bank, 2019). This worsening economic and social condition generated an unprecedented exodus of about 5.6 million[2] Venezuelans in search of a better future and ability to avail basic human rights. Colombia and Peru have been the most significant hosts followed by Chile, Ecuador, the United States and Brazil. As of January 31, 2021, Colombia has about 1.7 millions of the Venezuelan refugees and migrants, which is after about 60,000 to 100,000 Venezuelans returned back to reunite with their families during the COVID-19 pandemic (Mazza, 2020). Peru stands second with about 1 million refugees and migrants, while Chile and Ecuador are the third and fourth significant hosts with about 0.47 million and 0.41 million Venezuelan refugees and migrants respectively. Brazil is hosting about 0.26 million Venezuelans (18% of all its total migrant and refugee population) as of the fourth quarter of 2020, 76 times the number of Venezuelan refugees and migrants in 2015, resulting in Brazil issuing a federal decree recognizing the situation as a humanitarian crisis.[3]

Although leaders of Latin American countries have been accommodative in welcoming and granting legal status to Venezuelan refugees and migrants (Selee and Bolter, 2020), the sheer size of the Venezuelan refugees and migrants means that addressing the humanitarian crisis and the population shock may affect the labor market outcomes and public resources of these countries. Research on Colombia (Bonilla-Mejia et al. (2020), Caruso et al. (2019) and Penaloza (2019)) finds short-term negative effects of the Venezuelan influx on informal wages and employment for the host population. However, the impact on the host communities depends on the rules governing the labor market and relative socio-economic characteristics of both the refugees and the host communities (Verme and Schuettler (2021) and Hennessey and Hagen-Zanker (2020)) and Brazil is one of the few countries in Latin America that has universal access to education, healthcare and social protection irrespective of documentation status and prohibits any kind of discrimination at work (Selee and

[1] Forced displacement population include refugees, returnees, expellees, escapees and internally displaced person. This paper uses forcibly displaced and refugees and migrants interchangeably.

[2] Dashboard of R4V as of 5th May 2021

[3] http://www.planalto.gov.br/ccivil$_0$3/$_{ato}$2015 − 2018/2018/$decreto/D$9285.htm

Bolter, 2020) and consequently it serves as a case study to see whether different legal constraints can lead to differential observed outcomes.

This paper assesses the short term consequences of the Venezuelan influx on the overall labor market and fiscal balance in the Brazilian state of Roraima, using a regression discontinuity framework, that exploits a sharp jump in population in Roraima in the first quarter of 2018, which witnessed an inflow of Venezuelans of about 19,497, which is 3.8% of Roraima's population in the first quarter, and an inflow of about 117,347, which is 18% of its population in the year of 2018. Using the Continuous National Household Sample Survey for population and labor market data and the National Treasury Secretariat data for the fiscal variables, this paper finds that the population shock of about 6.7% in the working age population of Roraima was accompanied by a spur in social assistance expenditure of about 1.6 million Brazilian reais, which is a 50% increase from its value in the sixth bi-month of 2017. However, total government expenditure and fiscal balance did not increase significantly in relation to the increase in migration. On the labor market, the 6.7% increase in working age population led to an increase in unemployment among females living in the state by about 22%, and employment among females decreased by about 12%, suggesting that females are suffering disproportionately more from the displacement crisis as Roraima tries to absorb the excess supply in the short-run with no sizable effect among males. Employment among those with an education below college degree plummeted down by about 5%, while monthly income went up for the high skilled. It should be noted here that due to unavailability of nationality information, this paper focuses on the impact on the overall market including migrants, not just on the native community. Overall the results suggest that although there are some winners and some losers of the population shock, the more vulnerable groups of the labor force bear a disproportionate burden of the displacement crisis.

This paper is divided into six sections. Section 2 gives a description of the migration trend in Brazil, focusing on the influx of Venezuelan refugees and migrants and a discussion on the overall economy of Roraima. Section 3 provides a brief survey of the past literature, while Section 4 discusses the time-series data and the main variables used. Section 5 discusses the identification strategy and Section 6 presents the results along with robustness check and falsification analysis, while Section 7 concludes with some policy implications and discusses venues for further research.

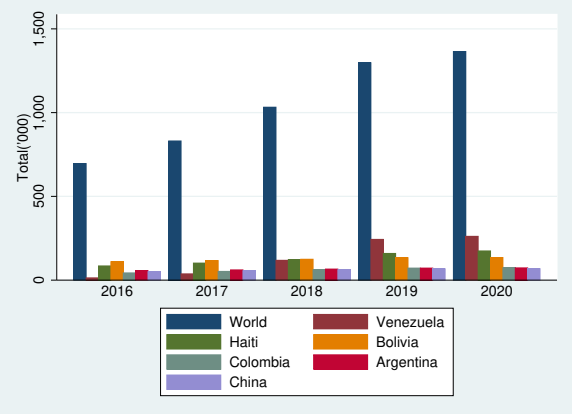
2 Venezuelan Migration in Brazil and the Economy of Roraima

The diaspora population in Brazil has been increasing rapidly from 2016 and the blue bar in Figure 1 shows that the total migrants and asylum seeker population increased from about 0.7 million in 2016 to about 1.4 million in July 2020. From being one of the lowest diaspora populations in 2016, among the Latin American countries, Venezuelans in Brazil (shown in brown) quickly became the largest migrant population by 2019. Brazil also has significant number of migrants[4] from Bolivia and Haiti, followed by Colombia, Argentina and China as the figure shows. During the period of July 2017 to October 2020, Brazil received about 126,256 migrants and 30,000 asylum

[4]Regular migrants and asylum seekers

seekers from Haiti, 38,232 migrants from Colombia, 9,063 asylum seekers from Cuba and 3,986 refugees from the Syrian Arab Republic.

Figure 1: Migration Trend in Brazil



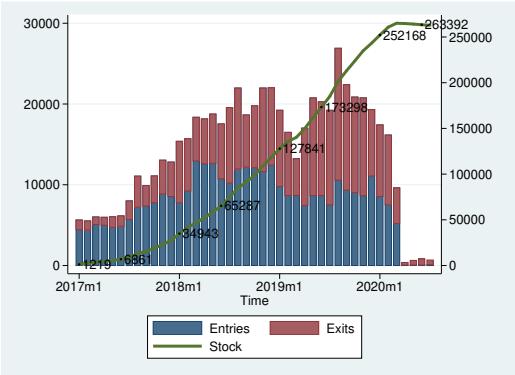
Source: Author's calculation from SISMIGRA and STIMAR.

Figure 2 shows the trend of Venezuelans migrants and asylum seekers in Brazil. Although the number of Venezuelans increased quickly from about 1100 in 2017 to 118,000 by the end of 2018 to about 265,000 in the first quarter of 2020, the stock started dwindling down after the onset of the COVID-19 pandemic. As of October 31, 2020, there were about a total of 261,441 Venezuelan refugees and migrants in Brazil. The figure shows that half of the Venezuelans, who entered Brazil, exited Brazil either to go back to the República Bolivariana de Venezuela or to remigrate to other countries. When the pandemic hit, the movement across borders was restricted and more Venezuelans were leaving than coming in and as a result the total number started falling. The Federal Police database reveals that half of the Venezuelan migrants and asylum seekers entered Brazil with regular visa, while the other half registered as asylum seekers. As of October 2020, there were 145,462 Venezuelan migrants, 96,556 Venezuelan asylum seekers and 46,647 Venezuelans refugees, who had migrated to Brazil since July 2017. Most Venezuelan migrants and asylum seekers enter through the municipality of Pacaraima in Roraima, which is not surprising given its proximity to the República Bolivariana de Venezuela at the North (FGVDAPP, 2020). Brazil went through a recession in 2015 and 2016, which saw the economy contracting by about 7%, but the economy grew at about 1.1% annually in 2017 and 2018.

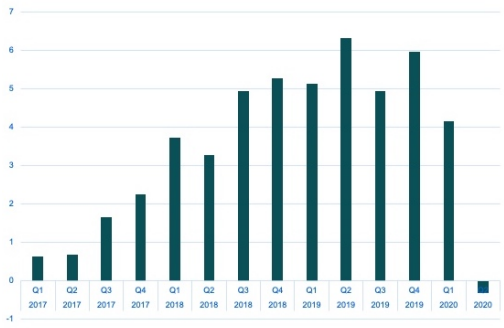
The total stock of registered Venezuelans in Roraima according to Federal Police was about 72,000 as of October 2020. Figure 2b shows that the net inflow of Venezuelans in the first quarter of 2018 was about 19,500, which is about 3.7% of the population in Roraima and increased consistently to reach a peak of 33,000 in the second quarter of 2019, which is about 6.3% the population of Roraima at the time. The population of Roraima in 2017 was about 0.5 million, the lowest among the states in Brazil and contributing only about 0.2% of the Brazilian GDP. Consequently, after the

massive Venezuelan inflow, the total Venezuelan migrants and asylum seekers quickly comprised of about a significant share of the population of Roraima and the state received help from the federal government, UN agencies, civil organizations, academia and the private sector to manage its response to the influx and provide humanitarian assistance. The initiative is called *"Operação Acolhida"*(Operation Welcome) and has three main programs: border control and documentation; provision of humanitarian assistance including shelter; and "Interiorization" which involves the voluntary relocation of Venezuelans from Roraima to other cities. The voluntary relocation program has relocated about 50,400[5] Venezuelans from Roraima to other Brazilian cities, where there are more opportunities for social and economic integration.

Figure 2: Refugee and Migration Trend of Venezuelans in Brazil



(a) Entry and Exit of Venezuelans in Brazil



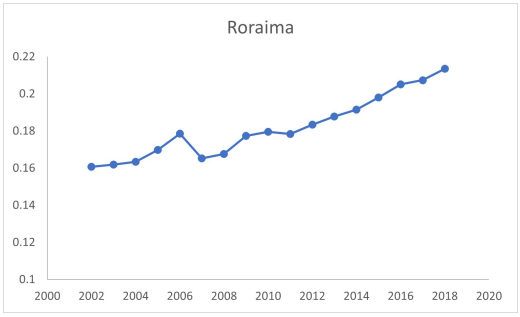
(b) Net inflow of Venezuelan as a percentage of population in Roraima

Source: Author's calculation from SISMIGRA and STIMAR.

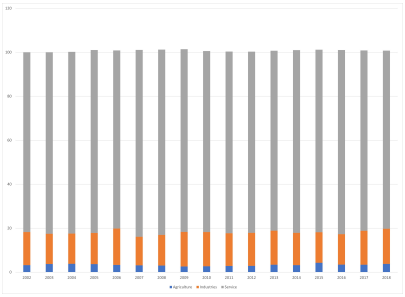
Figure 3a shows the trend in the real GDP of Roraima as a percentage of the national GDP of Brazil and shows that Roraima is one the smallest and least developed states in Brazil contributing only a small share of the total GDP in Brazil. Looking into the sector-wise breakdown in Roraima, Figure 3b reveals that service accounts for 84% of real GDP, while industry accounts for 16% and agriculture accounts for 3.8%. Within the service sector, public sector contributes 51%, followed by trade (13.5%) and real estate (13.3%). Within the industry sector, construction pitch in about 52%, followed by utility sector, whose share stands at about 37% of the industry sector. Overall, Figure 3 suggests that the economy of Roraima although very small compared to Brazil seems to be undergoing expansion in 2018 aided by the public sector and the utility sector.

[5]This number represents those relocated by April 2021.

Figure 3: Economic Activity in Roraima between 2002 and 2020



(a) GDP of Roraima as a percentage of national GDP of Brazil



(b) Sector wise real value addition (% of total) in Roraima

3 Past Research

Past literature on the effect of forced displacement on host country has found mixed results. For example, Verme and Schuettler (2021) finds that 6 in 10 results of studies on employment and wage are non-significant, but when they are significant, the results are more likely to point to decreases in employment and wages than increases, while Hennessey and Hagen-Zanker (2020) find that cost-benefit analysis suggests that in the short-run refugees can be a fiscal burden or they can have non-significant fiscal impact but in the long-run, they become fiscal contributors. This paper extends the literature on the impact of forced displacement on host country in two ways - (i) it empirically estimates the short-run fiscal impact on the host country taking into account of endogeneity and (ii) it utilizes regression discontinuity methods to study short-run labor market impacts of forced displacement. It should be noted here that although most of these studies concentrate on the effect on native labor market outcomes, this paper sheds light on the overall labor market and can not identiify the effect on the native workers due to data limitations.

The past research on fiscal impact of refugees has focused on advanced countries and have utilized a cost benefit approach in both static and dynamic settings. However, a forced displacement results not only in a population shock but can also lead to a public expenditure shock manifested by either an increase in government spending or an increase in international aid. This effect of forced displacement on public expenditure is largely ignored in the literature (Verme and Schuettler (2021)) and as a result may bias the net contribution calculation of migrants in a cost-benefit analysis. Another important caveat in the fiscal consequences literature is that most studies make some strong assumptions while calculating the revenue collected and the expenses of refugees and Hennessey and Hagen-Zanker (2020) points out that the results are susceptible to these assumptions. Overall, findings on Sweden suggest that refugees contribute less revenue than the expenses on them (Ruist (2015), Ruist (2019) and Alden and Hammarstedt (2016)). Holler and Schuster (2017) reports that refugees although in the medium term are a fiscal burden to Austria, they become fiscal contributors in the long-run as initial cost of hosting refugees fade out and they acquire skills and integrate in to the labor market. Bach et al. (2017) reports a similar transition for Germany and suggests that it takes refugees about 11 years to become net fiscal contributors. The net fiscal impact also becomes positive in the United States after 8 years (Evans and Fitzgerald, 2017) and in Australia

after 15 years (Access Economics, 2008). A dynamic study by Gal (2018) however, does not find any evidence of benefits from refugees being large enough to offset the high cost, while D'Albis et al. (2018) finds no significant effect on fiscal balances in the short run in Western Europe. Assuming that cost and revenue are proportional to population, Uscategui and Andrea (2019) estimates that Venezuelan in Peru will on average contribute to about 0.23% of GDP between 2019 and 2025.

A recent study (FGVDAPP, 2020) finds that the Brazilian public sector did not spend much more than it collected taxes from the Venezuelan refugees and migrants that Brazil was hosting in 2018, but they did a static analysis and made some strong assumptions.

Although previous literature on fiscal impact of forced displacement has been limited, studies on the economic impact and especially labor market impact have been growing incessantly but majority of the studies find negligible effects of refugees on host country's labor market outcomes with the detrimental effects on employment and wages being focused on the most vulnerable section of the labor force, mainly the young, women and informal workers (Clemens and Hunt (2017), Verme and Schuettler (2021)). When significant, both employment and wage loss tend to occur in the short-run and in middle-income countries (Verme and Schuettler, 2021). Bonilla-Mejia et al. (2020), Caruso et al. (2019) and Penaloza (2019) focus on the impact of the influx of Venezuelans on the labor market in Colombia and find that it reduces wages, especially for male workers in the informal sector. Caruso et al. (2019) finds that a percentage point increase in displaced Venezuelans reduces informal sector wages by ten percentage points in urban areas. Bahar et al. (2021) provides evidences of asymmetrical effects of a large scale amnesty program that granted work permits to undocumented Venezuelans in Colombia that helped labor market outcomes of Venezuelan at the cost of Colombian workers. Morales and Pierola (2020) also finds heterogeneity in the impacts of Venezuelan refugees and migrants on native labor market outcomes in Peru with increasing likelihood of tertiary educated workers being employed in non-service sector and decreasing wage for secondary educated workers working in service sector.

The sudden influx of Venezuelan in 2018 in Brazil and their concentration in Roraima allows this paper to utilize regression discontinuity design and to identify the impact of the Venezuelan forced displacement as population shock and study its implication on the fiscal scenario and labor market outcomes.

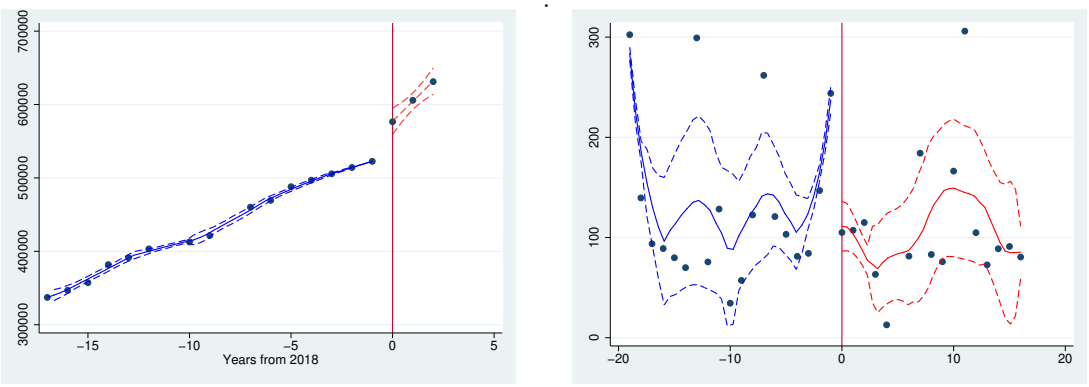
4 Theory and Data

The influx of displaced Venezuelans mainly through Roraima theoretically should create two types of shock - a population shock with a sudden increase in population of the state and an expenditure shock with host government or international community providing for housing, education and social assistance to the forcibly displaced. Annual data on population from IBGE (Brazilian Institute of Geography and Statistics) reveals that the population of Roraima jumped from about 522,636 in 2017 to about 576,668 in 2018, which amounts to about 10.3% increase in the population. Figure 4a, which shows the population in y-axis and the distance in years from 2018 as the x-axis, reveals that the growth rate of the population increased too, while population grew by about 5% between 2014

and 2017, it grew by about 21% between 2017 and 2020. Figure A1[6] shows that such significant discontinuity is not observed in the other northern states, providing evidence for Venezuelan influx to be behind the population shock.

However, total Roraima's government expenditure data, which includes both the federal and the state level expenditure, fails to show any expenditure increase shock in 2018. Figure 4b shows bimonthly expenditure data after adjusting inflation using national IPCA (Broad National Price Index) of the period 2015-2020 from SICONFI (National Treasury Secretariat), where the y-axis is in millions of Brazilian reais and the x-axis is the distance in 2 months from the second bimonth of 2018. There is no evidence of an increase in government expenditure and government expenditure does not seem to increase before June 2019. In 2018, there seems to be a decrease in total government expenditure in Roraima, which suggests that the influx of Venezuelan refugee and migrants was not accompanied by a positive public expenditure shock. Figure A2 also reveals that other states seem to have experienced no significant change in government expenditure in 2018. The fall in total expenditure in 2018 in Roraima is also evident in the yearly data in Figure A3, which may reflect partially the state's response to cutback expenditure as a response to the 2015/2016 crisis and shows that total expenditure was not significantly impacted by the Venezuelan influx.

Figure 4: Population and government expenditure time series of Roraima



(a) Population in Roraima (b) Public expenditure in Roraima

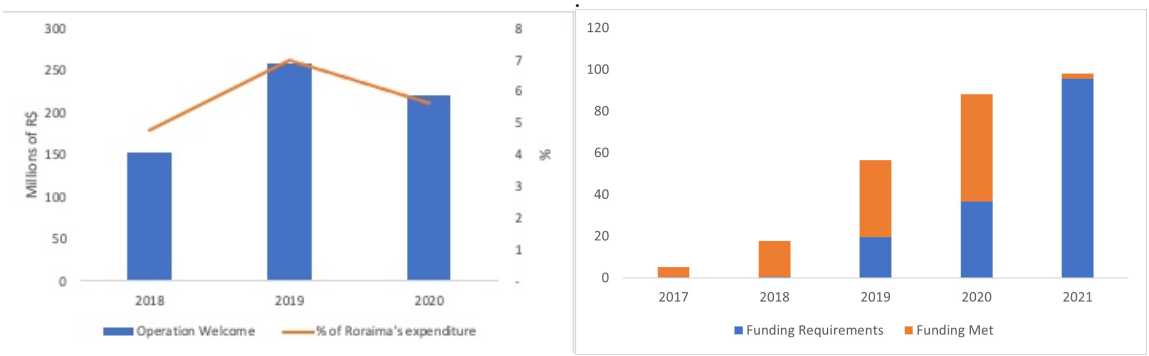
Note: Panel (a) shows the yearly data on population of Roraima from 2001 to 2020 and the x-axis shows the years from 2018, where 0 represents 2018. Panel (b) shows the bimonthly data on total government expenditure in Roraima from year 2015 to 2020 and the x-axis shows distance from the second bimonth of 2018 in units of 2 months with 0 representing April 2018 and y-axis is in millions of Brazilian reais and is adjusted for inflation using national IPCA. The solid line represents the predicted values of a local linear smoother estimated using raw data on each side of the threshold at zero. Outer dashed lines indicate 95 percent confidence intervals.

The humanitarian assistance provided to the forcibly displaced Venezuelans has been mainly conducted by the military in Brazil at the federal level. Operation Welcome, the flagship strategy of the Brazilian government in response to the influx of Venezuelans was initiated in February 2018 and incurred an expense of 152 million Brazilian reais in 2018, followed by an expense of 259 million Brazilian reais in 2019 and 219 million Brazilian reais in 2020, and amounts to about 732 million Brazilian reais till July 2021 (Figure 5a). This expenditure was not exclusively spent on Roraima and

[6]Due to unavailability of a good control, we compare Roraima with the other Northern states.

is spread across different states and thus total expenditure in Roraima only includes this expenditure partially. The international and private aid also provided some finance whose data is not available entirely but according to R4V, the regional platform for interagency coordination, established in April 2018 under the guidance of UN Secretary General to lead and coordinate the regional response to the influx of Venezuelan refugee and migrants, funding for provision of different services to the displaced Venezuelans increased from 6.2 million USD (32 million Brazilian reais) in 2017 to about 51.4 million USD (262 million Brazilian reais) in 2021. However, as figure 5b shows that the funding requirements in most of the year were higher than the funding met. It should be noted here that the lower amount of funding met in 2021 reflects the fact data on funding met is until April 2021.[7]

Figure 5: Funding for the humanitarian crisis



(a) Expenditure on Operation Welcome

(b) International Aid

Note: The data on expenditure on Operation Welcome is from SIGA Brasil. The data on international aid is from situation reports of R4V and is in millions of dollars. Funding met for 2021 is data till April.

4.1 Fiscal Scenario

The data on fiscal variables are bimonthly and come from SICONFI, covering the period 2015-2020. They are adjusted for inflation using the national IPCA from IBGE. Although there seems to be no public expenditure shock in 2018 overall, increase in public expenditure is mainly channeled through the increase in welfare programs and provision of public services and so this paper investigates the different categories of expenditure by functions. Figure 6 shows the expenditure in different categories, namely investment, personnel spending, education, health, social assistance and civil defense. The y-axis shows the expenditure in real Brazilian reais and the x-axis is the distance in 2 months from the second bimonth of 2018. The fall in personnel spending mirrors the fall in total expenditure, providing support to the fact the decrease is a response to government coping with the economic crisis of 2015/2016 and is unrelated with the Venezuelan influx. Investment seems to increase slightly while expenditure in education and health shows a small downtick. Expenditure in education and health do not increase till the end of 2019 while expenditure in

[7]Expenditure by UNHCR on Brazil increased by about three times from about 4 million USD (21 million Brazilian reais) in 2017 to about 12 million USD (62 million Brazilian reais) in 2018 and stood at about 21 million USD (109 million reais) in 2019.

social assistance jumps up in the second bimonth of 2018 in response to the Venezuelan influx and again in the fourth bimonth of 2020 as the response to the COVID-19 pandemic in addition to the influx of Venezuelan refugees and migrants. Civil defense (police) spending shows no change in 2018 and only increases in 2020. Figure 6 seems to suggest that the immediate consequence of the population shock is a temporary increase in social assistance expenditure as government of Roraima along with the Federal government spend more on welfare programs to accommodate the displaced Venezuelans but there seems to be no substantial impact on provision of public services.

Figure 6: Different categories of expenditure (Millions of Brazilian reais) by functions in Roraima.

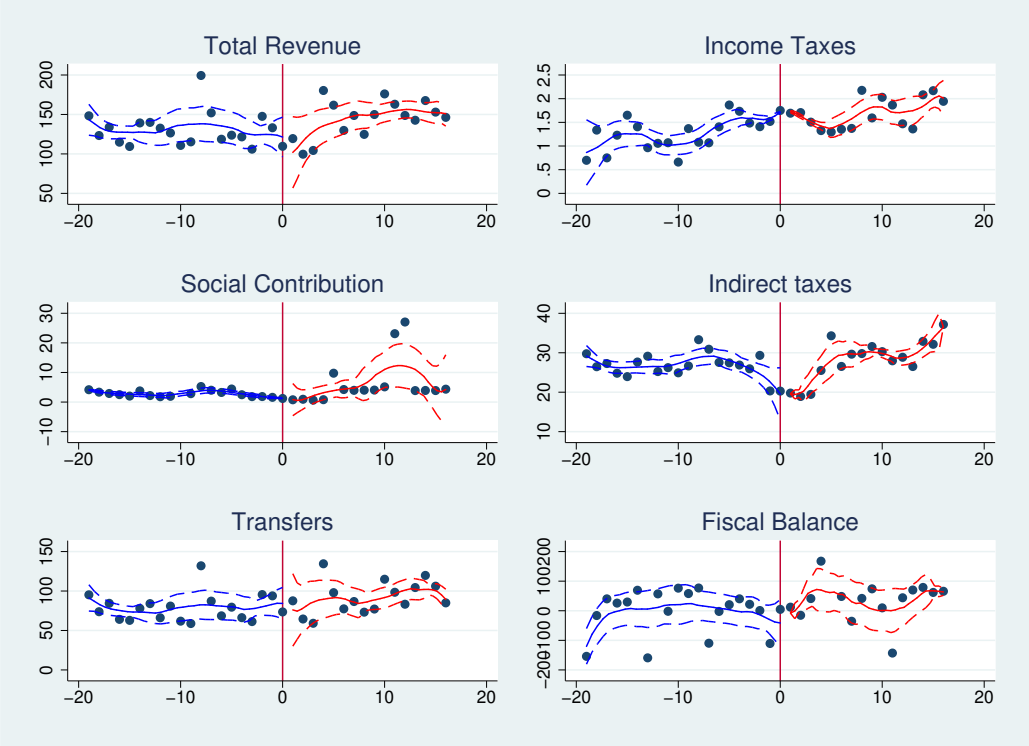
Note: The dots show the bimonthly data on government expenditure by functions or categories in Roraima from year 2015 to 2020 and the x-axis shows distance from the second bimonth of 2018 in units of 2 months with 0 representing April 2018 and y-axis is in millions of Brazilian reais and is adjusted for inflation using national IPCA. The solid line represents the predicted values of a local linear smoother estimated using raw data on each side of the threshold at zero. Outer dashed lines indicate 95 percent confidence intervals.

Providing social security to all irrespective of legal status is a constitutional obligation in Brazil. Social security in Brazil is organized in three main blocks, social welfare and pensions, which is contributory and social assistance and health, which is non-contributory. The social assistance programs are administered and implemented jointly by the federal, state and municipal governments. The two largest social assistance cash transfer programs are Bolsa Familia and the Continuous Benefit Provision (BPC). Social assistance programs are designed to target the vulnerable at each part of their life cycles. For example, Bolsa Familia (PBF), which is a conditional cash transfer for households living in poverty and extreme poverty, targets not only families but also pregnant mothers,

children and adolescents. BPC, Continuous Benefit Provision targets the elderly (those above 65 years) and the people with disabilities who cannot support themselves. Displaced Venezuelans benefitted from both the programs. For example, while 400 Venezuelans benefitted from PBF in February 2017, about 6,000 Venezuelans benefitted in December 2018 and about 48,000 in April 2020. In response to the Coronavirus pandemic, the federal government, initiated two main policies to alleviate the impact of the pandemic. They expanded the PBF to include eligible families and granted a financial benefit of R$ 600 (USD 117), Auxilio Emergencial, to those, whose occupations were seriously affected by the crisis, including informal workers, individual micro-entrepreneurs, self-employed and unemployed. Eligibility depends on having a per capita household income of less than R$ 522.5 (USD 101) monthly or a total household income of R$ 3,135 (USD 609). As long as one is registered in the Single Registry or receives Bolsa Familia benefit, the receipt of Auxilio Emergencial is automatic, but one can also register for the benefit online and a substantial number of Venezuelans benefited from the program between April and November 2020.

The influx of forcibly displaced may be followed by an increase in government revenue, which may be due to a jump in indirect taxes and consumption. Figure 7 reveals that the total public revenue in Roraima jumped down in the second bimonth of 2018 but then jumped up in the sixth bi-month of 2018. Income taxes seem have a declining trend in 2018 and then increase from the second bimonth of 2019. Social contribution revenue, which is contributed by employees on their Brazilian-source income and ranges between 7.5% to 14% depending on income and family composition in Brazil, also maintains its declining trend before spiking in the fifth bimonth of 2018. Indirect taxes increased from the fouth bimonth of 2018 and continued its increasing trend till the end of 2020. This is consistent with FGVDAPP (2020), who reports an increase in ICMS (tax on circulation of goods and services) about 25% and an increase in international trade of about 10% in Roraima. Part of this increase in indirect taxes may be contributed by Venezuelan refugees and migrants paying VAT while buying good and services for consumption and paying custom taxes for the goods that they are bringing into Roraima. The Federal transfers constitutes about 40% of municipal revenues and in the state of Roraima, transfer revenue consists of about 63% of all revenue between 2015 and 2020. They are allocated according to population thresholds and the overall increase in transfers, especially the jump seen in the last bi-month of 2018 may be stemming from the population increase in municipalities like Pacaraima, which is the main gateway for Venezuelan influx in to Brazil. In addition, the Supreme Court in Brazil ruled on October 2020 to reimburse half of the 180 million Brazilian reais that the Government of Roraima requested for the extra spending on the Venezuelan influx, which is not reflected in the data as it ends in 2020, when the transfer have not been made.

Figure 7: Different sources of revenue (Millions of Brazilian reais) by functions in Roraima.



Note: The dots show the bimonthly data on government revenue by functions or categories in Roraima from year 2015 to 2020 and the x-axis shows distance from the second bimonth of 2018 in units of 2 months with 0 representing April 2018 and y-axis is in millions of Brazilian reais and is adjusted for inflation using national IPCA. The solid line represents the predicted values of a local linear smoother estimated using raw data on each side of the threshold at zero. Outer dashed lines indicate 95 percent confidence intervals.

Figure 7 shows that the fiscal balance is improving since 2018 with a steep drop in the second bi-month of 2020 due the additional spending related to COVID pandemic, but the overall positive trend suggests that the Venezuelan influx did not have a drag on the fiscal balance and may have been contributing equal if not more revenue than the additional expenses on them incurred by the government of Roraima.

It should be noted that most spending in Brazil is directly tied to revenue by fiscal rules, making expenditures inflexible in the short-run and difficult to respond to the influx of displaced Venezuelans and their needs. In the longer term growing population can lead to higher transfers from the government and the larger tax bases will allow for an increase in spending. So, it is not surprising that the diagrams on the fiscal variables, which do not control for seasonality and unit roots, do not observe the sharp conspicuous jumps as most cross-sectional RD diagram exhibits and suggests that most fiscal variables did not respond to the population shock.

4.2 Labor Market Scenario

In theory, the influx of forcibly displaced lead to an increase in labor supply. The effect on the labor market depends not only on the degree of substitutability between the local and the displaced workers but also on the socio-economic characteristics of both the groups. Only if the displaced workers are substitute to local workers, local employment may fall leading to a rise in unemployment and/or a fall in wage. This detrimental effect may well be negated and even exceeded by the humanitarian agencies and the government recruiting local workers to provide and accommodate for the influx of forcibly displaced and the increase in consumer demand which generates a multiplier effect generating new employment opportunities across the economy. However, since this paper concentrates only on the short-term effects, it is not capturing the multiplier effects that takes time to ripple through the economy.

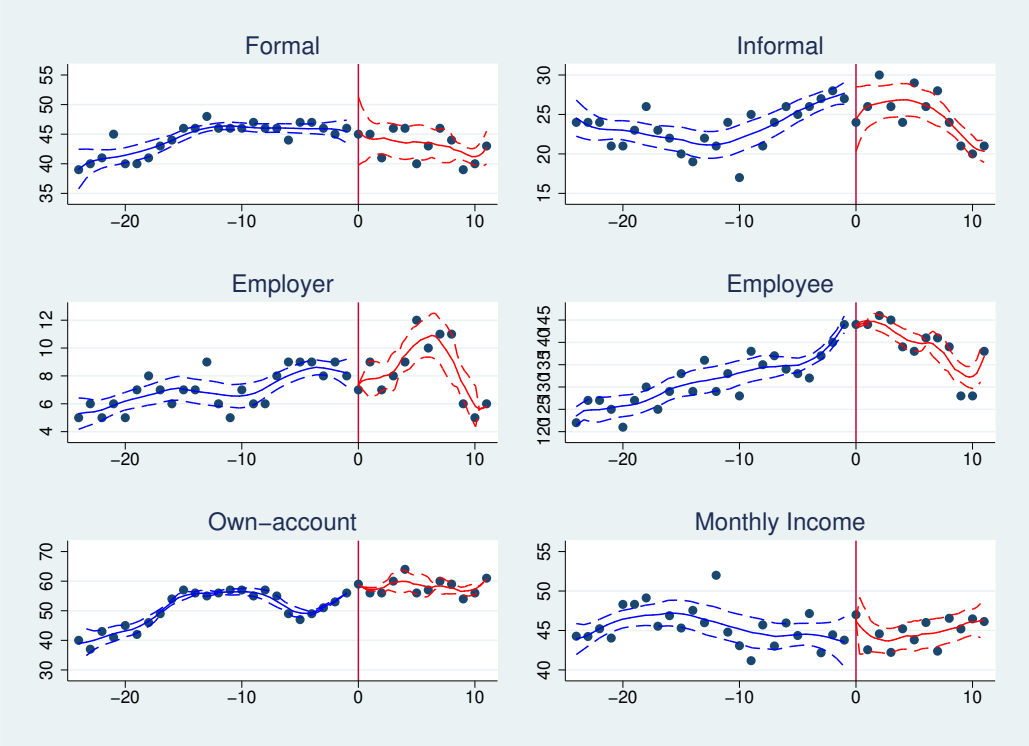
The quarterly data of PNADC (Continuous National Household Sample Survey) from 2012 to 2020 is used to look into the labor market consequences of the Venezuelan influx in Roraima. The survey sample of PNAD is representative of the states and the federal level of Brazil and aims to monitor dynamism in the labor force. Unfortunately, it does not collect information on nationality or immigration status and as a result, this paper focuses on the overall labor market variables and not solely on the impact on native community. Figure 8 shows that the working age population, defined as those above the age of 14 years, increased from 372,000 in last quarter of 2017 to 383,000 in the first quarter of 2018 – an increase of about 11,000, which is about a 3% increase, suggesting a labor supply shock in Roraima due to forcibly displaced Venezuelans. This shock in working age population of this magnitude in the first quarter of 2018 is only being witnessed in Roraima as Figure A5 reveals and most of the other northern states see a slight decline in the population in 2018, adding evidence that the influx of forcibly displaced Venezuelans are responsible for the population jump up in Roraima. It further shows a jump up in total number of unemployed from about 22,000 to about 25 thousand in the first quarter of 2018 to about 27,000 in the second quarter to about 33,000 in the third quarter of 2018. Underemployment increased from 10,500 to about 12,400 in the first quarter of 2018 to about 15,000 in the second quarter to 18,000 in the third quarter of 2018, suggesting that in the short-term, the labor market in Roraima is finding it hard to cope leading to higher unemployment and underemployment. Total employment also shows a downward trend for most of 2018 decreasing from 214,000 to about 213,000 in the second quarter to about 212,000 in the third quarter of 2018. The fall in the number of employed also seems precipitous in the second quarter of 2020 due to lockdown related to COVID-19 pandemic. The diagram also shows that pre 2018 while unemployment was increasing briskly, employment was rising, while underemployment was constant, suggesting that labor market experienced a shock in 2018 that lead to a change in trend.

Figure 8: Overall labor market scenario in Roraima.

Note: The y-axis is in thousand and the x-axis the distance in quarters from the first quarter of 2018. The data comes from PNADC and solid line shows the local linear fit while the dashed lines show the 95% confidence interval.

Formal employment and informal employment both seem to suggest a declining trend (Figure 9). Among the formally employed, there is a small declining trend for the number of employees, while the number of employer shows an increasing trend till the first quarter of 2020, and then both plummet down in the second quarter of 2020. Own-account workers shows an uptick in the first quarter of 2018 and so does gross income. Both the number of own-account workers and gross income falls during the second quarter of 2020 in response to COVID-19 pandemic.

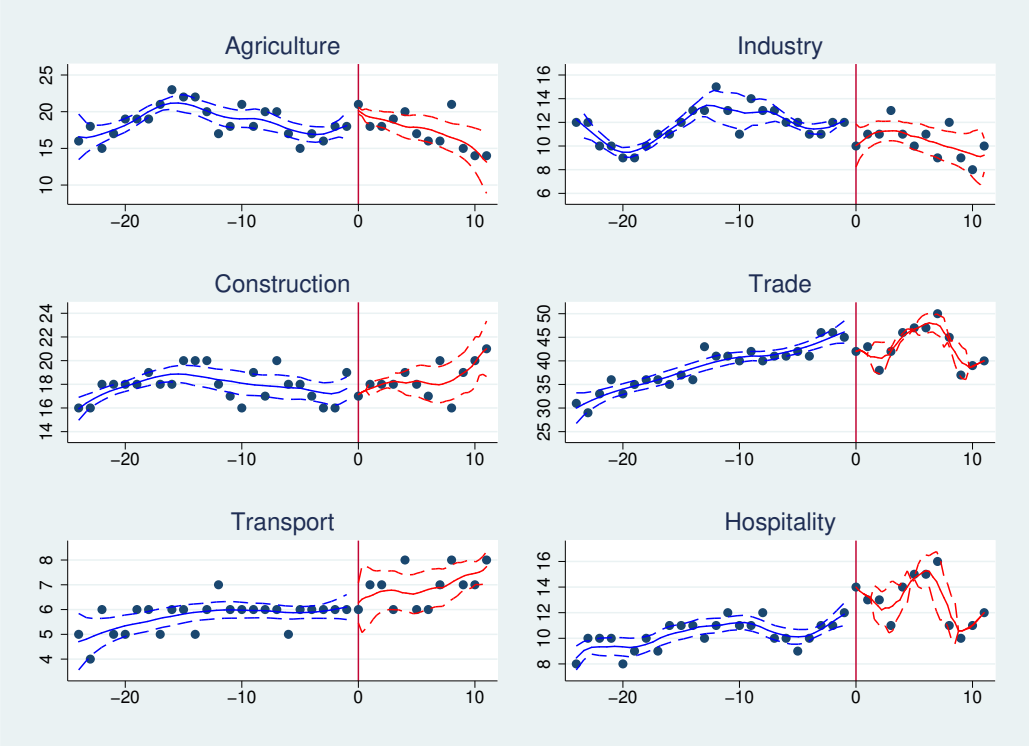
Figure 9: Different types of employment and income in Roraima.



Note: The y-axis is in thousand and the x-axis the distance in quarters from the first quarter of 2018. The data comes from PNADC and solid line shows the local linear fit while the dashed lines show the 95% confidence interval. The monthly gross income is in real Brazilian reais and is adjusted for inflation by IPCA.

Figure 10 reveals that the total employment in agriculture seems to have incurred an uptick in the first quarter of 2018, but has a downward trend after 2018. Total employment in industry fell sharply in the first quarter of 2018 and has remained lower than pre 2018 level. Total employment in construction and transport seems to have an increasing trend after 2018. Employment in hospitality exhibit a positive jump in the first quarter of 2018, however, hospitality seems to have incurred the highest loss in employment due the COVID-19 pandemic as the large drop in the second quarter of 2020 exhibits.

Figure 10: Employment by sector in Roraima.



Note: The y-axis is in thousand and the x-axis the distance in quarters from the first quarter of 2018. The data comes from PNADC and solid line shows the local linear fit while the dashed lines show the 95% confidence interval.

Overall, it seems that the labor market in Roraima, 27% of whose total employed is employed in the public sector, found it difficult to adjust to the population shock caused by the influx of displaced Venezuelans in the short-run and consequently unemployment rose along with a fall in employment.

Table A1 documents all the variables used in this study, their sources and their frequencies, while Table A2 shows the summary statistics of the different variables by pre-2018 and 2018 and after groups. In the labor market, all variables except formal employment and employment in agriculture and industry, are higher in 2018 and after than in pre-2018 period, suggesting an increasing trend overall. For the fiscal variables, expenditures in most categories declines, while revenues from most sources and fiscal balance show an uptick. Since the total number of observations are quite small (36), Table A3 and Table A4 shows the power calculations for one sample mean hypothesis test at different sample sizes and show that for most variables, the sample size have a power of more than 0.8, which adds support to the estimates that the paper displays.

5 Methodology

In order to quantify the impact of the influx of forcibly displaced on the fiscal and labor market outcomes of native workers, most studies use the share of population (or working age population) of the forcibly displaced as the independent variable and acknowledges that there exists a limitation in identifying the causal impact in this way because of the potential endogeneity arising from the sorting of forcibly displaced to areas with certain characteristics and other time varying factors, such as public expenditure, that may lead to spurious correlation. Many studies try to address these endogeneity issues by using instrument variable methods (Verme and Schuettler, 2021).

This paper tries to evaluate the effect of the forcibly displaced by using the discontinuity that is observed in the population data, mainly the working age population, in the first quarter of 2018, in a regression discontinuity (RD) design to evaluate the fiscal and the labor market effects.[8] In the RD design, this paper uses a transformed variable (X) of the time quarters as the running or score variable. X is the distance between any time in quarter and the the first quarter of 2018. Since the PNADC data is from 2012-2020, there are 36 observations for X, with X being equal to zero in the first quarter of 2018, which is defined as the cutoff. The treatment is defined as when $X >= 0$ and is denoted by $D_i = I(X_i > 0)$, where $I(.)$ is the indicator function. Since the fiscal data is monthly, the cutoff variable is the second bimonth of 2018 and X is defined as the distance in 2 months from the second bimonth of 2018. It should be noted here that assigning to the treatment condition does not mean receiving the treatment. For example, in this case, the Venezuelan refugees and migrants started coming in to Brazil in 2017, but the net influx did not become substantial till the first quarter of 2018, which witnessed a net inflow of about 20,000 that is 50% of the total Venezuelan influx in Brazil at that point in time (derived from Figure 2), which translated into 11000 increase in working age population that is observed in Figure 8. The sharp rise in both the population (Figure 8) and the working age population in Roraima in 2018 (Figure 8) add evidence for a sharp RD design, where it is assumed that the treatment condition assigned is identical to the treatment condition received. The results of the fuzzy RD design[9], where there is noncompliance, or where the treatment condition assigned is not equal to treatment condition received is also estimated for robustness checks and the results are given in the appendix. This rest of this section focuses on sharp RD design.[10].

Just like the fundamental problem in any causal inference, in RD design, one only observes the outcome under control, $Y_i(0)$ for those units or quarters whose running variable or score is below the cutoff and the outcome under treatment, $Y_i(1)$, for those units or quarters whose score is above the cutoff. The average potential outcome given the score, $E[Y_i|X_i]$ is observed for only $E[Y_i(1)|X_i >= c]$ for values where c is the cutoff and for $E[Y_i(0)|X_i < c]$. $E[Y_i(1)|X_i < c]$ and $E[Y_i(0)|X_i > c]$ are unobserved. Consequently, the sharp RD design exhibits an extreme case of lack of common support, as units in the control ($D_i = I(X_i \geq c) = 0$) and treatment ($D_i = I(X_i \geq c) = 1$) groups cannot have the same value of the running variable (X_i). Thus, RD performs a local extrapolation in order to compare the control and the treatment units.

[8] It should be noted here that a bigger jump in total population is observed in the annual data series published by IBGE, but due to limited observations, the jump cannot be estimated by RD.

[9] The fuzzy RD involves a two stage estimation, where the first stage estimates the probability of treatment, while the second stage uses this estimated probability to find its effect on the outcome variable.

[10] Some evidences in support of the sharp RD design is given in the later sections of the paper.

The average treatment effect at a score is the vertical distance between the two regression curves at the value. This distance cannot be directly estimated because one never observes both curves for the same value of X. Thus the treatment effect is defined as:

$$\pi_{SRD} = [Y_i(1) - Y_i(0)|X_i = c] = \lim_{x \downarrow c}[Y_i|X_i = x] - \lim_{x \uparrow c}[Y_i|X_i = x] \tag{1}$$

where the parameter captures the reduced form treatment effect for units with score values equal to c. It shows the average outcome change for units at the cutoff if their status is switched from control to treated. This treatment effect is local in nature and without further assumptions can not be used to deduce the treatment effects at the other levels of the running variable. A fundamental assumption of the above equation is the comparability of the units with very similar values of the running variable but on opposite sides of the cutoff, which is reflected as a continuity assumption in the above equation. Continuity means that as the score X_i gets closer and closer to the cutoff c, the average potential outcome function $E[Y_i(0)|X_i = x]$ and $E[Y_i(1)|X_i = x]$ get closer and closer to its value at the cutoff, $E[Y_i(0)|X_i = c]$ and $E[Y_i(1)|X_i = c]$ respectively. Thus, continuity gives a formal justification for estimating the Sharp RD effect by focusing on observations above and below the cutoff in a very small neighborhood around it. By virtue of being very close to the cutoff, the observations in this neighborhood will have very similar score values; and by virtue of continuity, their average potential outcomes will also be similar.

This suggests that in order to conduct RD, this paper needs to estimate $E[Y_i(0)|X_i = x]$ and $E[Y_i(1)|X_i = x]$ and this requires choosing the functional form of these regression functions and the neighborhood of the score that will be used for estimation. Cattaneo et al. (2019) and Gelman and Imbens (2017) suggest using a local linear approximations as higher order polynomial leads to overfitting problems. Thus, this paper focuses on the local linear regression for all estimations. The estimations are conducted using uniform kernel and triangular kernel to test sensitivity as suggested by Cattaneo et al. (2019). For the neighborhood estimations, which is formally called the bandwidth, this paper uses both the optimum bandwidth method suggested by Imbens and Kalyanaraman (2012) and the robust biased corrected bandwidth suggested by Calonico et al. (2014). The optimum bandwidth seeks to minimize the mean square error of the local linear RD point estimator, while the robust biased corrected bandwidth includes a regularization term in the bandwidth to control fo small sample size (Calonico et al., 2014). Cattaneo et al. (2019) also suggests adjusting the RD estimate and the standard errors for the biases caused by small sample and as a result, this paper estimates three estimates using the bandwidths suggested by Calonico et al. (2020), the conventional estimate suggested by the equation above, and the bias-corrected estimate which accounts for the bias in the estimate and the robust estimate which controls for the bias in the estimate and the standard error. The standard are also clustered at the score value as prescribed by Cattaneo et al. (2021).

For the fiscal impact estimates, the outcome variable or Y_i takes the form of total bimonthly government expenditure and expenditures in different functions, total bimonthly government revenue and different sources of revenue to study the effect of the population shock brought by the influx of the Venezuelan refugees and migrants on the fiscal budget of Roraima. Y_i also takes the form of labor market outcomes, including the working age population, total number employed, unemployed, working in different sectors and types of employment and average income received and the gross income received to explore how the population shock impacted the labor market in Roraima. All

the fiscal variables and the monthly income variables are adjusted for inflation using the national IPCA (Broad National Price Index). The covariates include fixed effects for each bimonth (quarters) to control for seasonality in the time series data as advocated by Hausman and Rapson (2018). Additional covariates included for the fiscal effects are trade volume index, cost of making per square meter and depreciation rate and for the labor market effect, additional variables include gender ratio, average age, fraction of whites and household size. So, the π_{SRD} estimated are interpreted as the reduced form RD effect or the reduced form local average treatment effect on the treated quarters. The assumptions that are needed for the identification are that the score variable can not be caused or influenced by the treatment, cutoff is exogenous and that nothing other than the treatment is discontinuous at the cutoff. In the result section, this paper presents support for the assumptions along with the falsification analysis.

A problem with the identification strategy used so far is that the running variable or the distance from the first quarter (second bimonth) of 2018 is not a continuous random variable as it only takes finite number of values between -24 to 12 (-19 to 17) and as result, as suggested by Cattaneo et al. (2021), this paper uses the local randomization RD method to test the sensitivity of the results. For the local randomization method, it is assumed that there is a small window around the cutoff, W_0, such that for all units whose scores fall in that window their placement above or below the cutoff is assigned as in a randomized experiment. Adopting a local randomization approach to RD analysis implies assuming that the assignment of units above or below the cutoff was random inside the window, and that in this window the potential outcomes are unrelated to the score or can be somehow transformed to be unrelated to the score. Since in the case of this paper the number of observations are very low, a Fisherian inference approach is used as suggested by Cattaneo et al. (2021) and the test statistic used is the difference-in-means and the randomization mechanism used is fixed margins.[11] The results appear in the appendix.

6 Results and Discussion

This section reports the sharp RD estimates of the impact of the influx of Venezuelan refugees and migrants on the fiscal variable and the labor market outcomes in Roraima. The results from fuzzy RD and local randomization estimates are reported in the appendix. It should be stressed here that the magnitude of the estimates should vary between the different models as there are different assumptions involved as described in the methodology section. However, the similarity of signs provide support for the overall impact. This section also discusses some falsification analysis in support of the sharp RD identification strategy.

6.1 Fiscal Scenario

Table 1 reports the reduced form sharp RD estimates of the impact on total expenditure and its different categories. The estimation uses a triangular kernel and the bandwidth suggested by Calonico et al. (2020), with the first row displaying the difference in regression function (conventional method) to measure RD estimate, while the second and the third row display the RD estimates

[11] The details of the local randomization methodology can be found in Cattaneo et al. (2021).

after controlling for the bias in the estimates in the conventional way. The difference in row two and three comes from row two reporting the standard errors with out bias correction, while row three controls for the bias in both the standard errors and the RD estimates. All standard errors are clustered at the score variable and all the variables are adjusted for inflation using IPCA and are in millions of Brazilian reais. The covariates that are controlled for in the estimations include dummies for each bimonth to control for seasonality, previous bimonth's outcome variable to control for unit root, previous month's changes in service sector volume index to control for economic growth and depreciation rate to control for trade policy. The table reveals that total expenditure fell by about 81 million Brazilian reais in the second bimonth of 2018. This decrease is mainly due to a fall in personnel spending of 129 million Brazilian reais, suggesting that the personnel spending and total expenditure was mainly responding to the economic crisis that Brazil was coming out from and is unrelated to the influx of about 20,000 displaced Venezuelans. Investment rose about 9 million Brazilian reais, as expected from an economy that was coming out from an economic crisis. Looking into expenditure by functions, it seems that both education and health spending fell, while social assistance, social security and expenditure on civil defence increased. Table A5 shows that using uniform kernel and different bandwidths, the results on total expenditure, personnel spending and social assistance remain robust, suggesting that with the advent of forcibly displaced Venezuelans, social assistance spending did cater to the increase in population and its short-run needs, although total expenditure, specially spending in education and health did not adjust for the higher demand. This is not surprising given that personnel spending is the main driver of total expenditure and that education and health spending are tied to revenues and can only increase when revenue increases, which takes time. The 2.1 million Brazilian reais increase that we observe in the second bimonth is due to the influx of displaced Venezuelans as there is universal access to social assistance programs in Brazil, irrespective of immigration status and Cadastro Unico shows that there is jump from 1,100 registered Venezuelans in December 2017 to about 2,800 registered Venezuelans in April 2018, which corresponds to the second bimonth of 2018.

Table 1: Regression discontinuity estimates of expenditure by categories of functions in Roraima

	(1) Total expenditure	(2) Investment	(3) Personnel Spending	(4) Education	(5) Health	(6) Social assistance	(7) Social security	(8) Police
Conventional	-73.88*	6.689*	-118.4*	-2.397	-12.24*	1.725*	0.457*	1.285*
	(16.34)	(2.132)	(4.460)	(2.510)	(3.748)	(0.0635)	(0.0726)	(0.413)
Bias-corrected	-81.67*	9.082*	-129.1*	-6.347*	-15.60*	2.101*	1.095*	1.539*
	(16.34)	(2.132)	(4.460)	(2.510)	(3.748)	(0.0635)	(0.0726)	(0.413)
Robust	-81.67*	9.082*	-129.1*	-6.347	-15.60*	2.101*	1.095*	1.539*
	(25.00)	(3.156)	(13.67)	(8.673)	(4.983)	(0.218)	(0.394)	(0.696)
Bandwidths	2.857	8.859	7.085	3.267	4.141	17.001	5.841	3.095
Mean	127.50	7.49	67.65	22.06	23.60	1.292	1.749	5.676
N	33	33	33	31	31	30	31	33

The standard error are in parentheses and are clustered at the score variable. $+ p < 0.10$, $* p < 0.05$. All data is in millions of Brazilian reais and adjusted for inflation by IPCA. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). Covariates include dummies for each bimonth, value of the outcome variables in the previous bimonth and depreciation rate.

Table 2 reports the sharp RD estimates of the impact on total revenue and its different sources. The structure of table is same as Table 1 and using the robust estimates, total revenue is found to have jump up by 15 million Brazilian reais, which seems to be mainly driven by jump in indirect

taxes by an amount of about 81.2 million Brazilian reais, suggesting the increased demand in the economy and higher consumption that Roraima experiences with the influx of displaced Venezuelans. Transfers are also found to have increased by about 33 million Brazilian reais and fiscal balance seems to improve by 81 million Brazilian reais but Table A6 shows that this result is sensitive to the kernel and the bandwidth used. The only results that is robust across the different specifications is the improvement in indirect tax revenue.

The local and fuzzy estimations in Tables A9 and A10 provides support of the results that total expenditure is mainly affected by personnel spending and is not impacted substantially by the influx of Venezuelan migrants and refugees, but social assistance expenditure increased as vulnerable population increased. The estimates in Table A10 take into account that there might be some non-compliance and the last four bi-months of 2017 might have also experienced some population shock leading to abrupt changes in fiscal indicators. Table A9 assumes that there is a small window around the cutoff such that for all units whose scores fall in that window their placement above or below the cutoff is assigned as in a randomized experiment and this paper assumes that the small window is four bi-months to the left and right of the cutoff. Since the sample size in this study is small, the sharp null hypothesis that is assumed is that the difference in means of the outcome variable between the left and right side of the cutoff is zero. So, the parentheses in table A9 shows the p-value of the test for the sharp null hypothesis. Table A10 points out that the effect on indirect taxes and social assistance spending are positive, suggesting that the influx of Venezuelans was accompanied by jump in indirect taxes, which are mainly taxes on consumption and imports and an increase in social assistance spending as government tries to accommodate for the influx of vulnerables and help them adapt to the new environment. Table A9 points to a positive difference in means but the high p-value suggests that failures to reject the null hypothesis of no difference.

Table 2: Regression discontinuity estimates of revenue by sources in Roraima

	(1) Total revenue	(2) Income taxes	(3) Social security	(4) Indirect taxes	(5) Transfer	(6) Fiscal balance
Conventional	9.200*	-0.111^{+}	2.647*	65.52*	21.48*	58.38*
	(4.607)	(0.0612)	(0.499)	(1.860)	(4.512)	(26.44)
Bias-corrected	15.05*	-0.0146	5.400*	81.20*	33.06*	80.59*
	(4.607)	(0.0612)	(0.499)	(1.860)	(4.512)	(26.44)
Robust	15.05*	-0.0146	5.400*	81.20*	33.06*	80.59^{+}
	(6.716)	(0.0876)	(0.904)	(6.388)	(11.96)	(45.81)
Bandwidths	6.447	5.112	10.192	5.552	5.434	9.508
Mean	137.1	1.502	4.312	25.82	85.45	9.576
N	35	35	33	35	35	33

The standard errors are in parentheses and are clustered at the score variable. $^{+}$ $p < 0.10$, * $p < 0.05$. All data is in millions of Brazilian reais and adjusted for inflation by IPCA. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). Covariates include dummies for each bimonth, value of the outcome variables in the pprevious bimonth and depreciation rate.

Overall, the results on the fiscal scenario suggests that the influx of Venezuelan refugees and migrants lead to a surge in social assistance expenditure. There is some positive impact on fiscal balance and indirect taxes, providing some (albeit statistically weak) evidence of benign short-term impact of the Venezuelan influx on the fiscal balance of Roraima. It should be emphasized here that this paper has focused solely on the fiscal scenario of Roraima and consequently does not analyze

expenditure on the Operation Welcome program as the data does not allow us to disaggregate the spending on Roraima.

6.2 Labor Market Scenario

Table 3 reports the reduced form sharp RD estimates of the impact of forcibly displaced Venezuelans on the overall labor market in Roraima. Just like the previous tables, the tables in this section use a triangular kernel and the bandwidth suggested by Calonico et al. (2020), with the first row displaying the difference in regression function (conventional method) to measure RD estimate, while the second and the third row display the RD estimates after controlling for the bias in the estimates in the conventional method. The difference in row two and three comes from row two reporting the standard errors with out bias correction, while row three controls for the bias in both the standard errors and the RD estimates. All standard errors are clustered at the score variable and the covariates that are controlled for in the estimations include dummies for each quarter to control for seasonality, previous quarter's outcome variable to control for unit root, gender ratio, average age, household size and fraction of whites in the population.The robust estimates in the third row suggest that working age population increased by about 24 thousand, which is about a 6.7% increase from its value in the last quarter of 2017, while employment decreased about 20 thousand and unemployment increased by 2.5 thousand and underemployment increased by about 4 thousand in the first quarter of 2018. It should be noted here that the impact is on the overall labor market and the data does not allow to disentangle the impact on the host community. So, it is possible that the displaced Venezuelans are contributing to the increase in unemployment and underemployment, but the fall in employment does support the fact that the small economy of Roraima is finding it to absorb the excess labor supply. The overall fall in employment happens despite the 1410 increase in public employment, which is restricted to the native workers, suggesting that although government is hiring more, private sector employment for both natives and Venezuelans are going down. However, the result on employment is sensitive to the kernel and bandwidth used as Table A7 shows. The results that are robust across all the specification is the increase in working age population and the increase in overall unemployment and underemployment.

Table 3: Regression discontinuity estimates of the impact on labor market participation

	(1) Working Age	(2) Employed	(3) Unemployed	(4) Underemployed	(5) Hours Worked	(6) Public Employment
Conventional	4.881*	-9.939*	4.044^{+}	3.770*	-0.129	4.470*
	(1.800)	(0.765)	(2.161)	(0.277)	(0.312)	(1.253)
Bias-corrected	24.67*	-20.61*	2.492^{+}	3.943*	-0.768*	1.410
	(1.800)	(0.765)	(1.111)	(0.277)	(0.312)	(1.253)
Robust	24.67*	-20.61*	2.492^{+}	3.943*	-0.768	1.410^{+}
	(9.481)	(4.514)	(1.218)	(0.519)	(0.522)	(0.782)
Bandwidth	16.044	4.894	12.742	3.792	6.892	6.862
Mean	356.8	199.5	23.39	12.69	37.39	53.78
N	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). All variables are clustered at the score variable level (x) and all the numbers, except hours worked are in thousands. The covariates used are quarter dummies, past quarter's value of the outcomes, average age, gender ratio, household size and fraction of whites in the population.

Table 4 follows the same structure as Table 3 and breaks down the impact on employment by types of employment and also reports the impact on average monthly income received and the total income in Roraima. It reports a fall in formal employment of about 2.5 thousand, a fall in informal employment of about 4.5 thousand and a fall in own account worker of about 16.7 thousand while monthly average income seems to have increased by about 3.5 Brazilian reais in real terms. The increase in income suggests that Venezuelan refugees and migrants may be complementing Brazilian workers in Roraima in some way, improving their productivity.

Table 4: Regression discontinuity estimates of the impact on employment by different types and on labor income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Formal	Informal	Employer	Employee	Own-account	Monthly Income	Gross income
Conventional	-2.254*	-3.951*	-0.315	2.173*	-13.01*	2.360*	0.470*
	(0.434)	(0.190)	(0.222)	(0.0198)	(0.0000170)	(2.42e-08)	(0.0614)
Bias-corrected	-2.476*	-4.537*	-0.477*	0.905*	-16.73*	3.536*	0.457*
	(0.434)	(0.190)	(0.222)	(0.0198)	(0.0000170)	(2.42e-08)	(0.0614)
Robust	-2.476*	-4.537*	-0.477	0.905	-16.73*	3.536*	0.457*
	(0.727)	(1.597)	(0.352)	(0.980)	(3.031)	(0.520)	(0.0696)
Bandwidth	9.955	6.233	11.073	6.396	4.216	5.230	7.895
Mean	43.97	23.86	7.47	133.9	52.92	45.02	398.47
N	35	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). All variables are clustered at the score variable level (x) and all the numbers, except average monthly income are in thousands. The covariates used are quarter dummies, past quarter's value of the outcomes, average age, gender ratio, household size and fraction of whites in the population.

Table 5 shows the effect on employment by sector and offers some evidence suggesting that employment in agriculture, transport and trade fell, while employment in hospitality increased. It suggests controlling for seasonality, agricultural employment fell by about 10 thousand, while trade and transport employment fell by 3.8 thousand and 2.2 thousand respectively while employment in hospitality increases by about 1.7 thousand. These results are sensitive to the bandwidth and kernel used as Table A8 reveals. Using uniform kernel and different bandwidths, most of the results are statistically insignificant or changes sign.

Table 5: Regression discontinuity estimates of the impact on employment by different industries

	(1) Agriculture	(2) Industry	(3) Construction	(4) Trade	(5) Transport	(6) Hospitality
Conventional	-5.560*	-1.082*	0.601	-3.956*	-1.856*	1.294*
	(0.0000185)	(0.354)	(0.656)	(0.727)	(0.153)	(0.493)
Bias-corrected	-10.07*	-0.922*	0.903	-3.830*	-2.188*	1.657*
	(0.0000185)	(0.354)	(0.656)	(0.727)	(0.153)	(0.493)
Robust	-10.07*	-0.922	0.903	-3.830*	-2.188*	1.657*
	(1.761)	(0.609)	(0.968)	(1.606)	(0.406)	(0.679)
Bandwidth	4.911	11.948	13.166	8.030	8.989	11.813
Mean	18.19	11.28	18.08	40.06	6.11	11.17
N	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). All variables are clustered at the score variable level (x) and all the numbers are in thousands. The covariates used are quarter dummies, past quarter's value of the outcomes, average age, gender ratio, household size and fraction of whites in the population.

Table A11 and Table A12 show the local and fuzzy RD estimates of the labor market outcomes which is reported here to show robustness of the results found under the sharp RD design. The estimates in Table A12 take into account that there might be some non-compliance and the four quarters in 2017 might have also experienced some population shock impacting the labor market outcome. Table A11 assumes that there is a small window around the cutoff such that for all units whose scores fall in that window their placement above or below the cutoff is assigned as in a randomized experiment and this paper assumes that the small window is four quarters to the left and right of the cutoff. Since the sample size in this study is small, the sharp null hypothesis that is assumed is that the difference in means of the outcome variable between the left and right side of the cutoff is zero. So, the parentheses in table A11 shows the p-value of the test for the sharp null hypothesis. Overall, the two results that are robust in all specification is that the influx of Venezuelan lead to a working age population shock, which lead to an increase in overall unemployment in Roraima.

The estimates on the labor market suggest that the influx of Venezuelan refugee and migrants lead to an increase in overall unemployment in the short run. Less robust results include a fall in employment and a rise in average monthly income, suggesting that the Venezuelan refugees and migrants may complement the workers in Roraima increasing their productivity. There may also be some heterogenous effect by socio-economic characteristics of the Venezuelan and native workers and so next this paper explores the heterogeneity on the outcomes by gender and education.

6.2.1 Heterogeneous Effect on the Labor Market

This section analyzes the distributional effects of the Venezuelan influx in Roraima. Table 6 and Table 7 show that there are important differential impacts on the labor market depending on education level and gender and that the detrimental impacts are mainly focused on low skilled workers and females while the benign impacts are mainly focused on the high- skilled workers. This heterogenous results are also supported by the other studies on refugees discussed in Verme and Schuettler (2021). Table 6 shows that employment fell by about 8,453 people among the below college educated, while the employment among the college educated fell by about 1,656, while the

population shock was about 6,695 college educated and 11,250 below college educated workers. The impact on unemployment seems to be statistically insignificant but positive for both the groups. Hours worked increased for the low skilled by about 1.7 hours and is significant, while hours worked among the college educated increased by only 0.18 hours and is insignificant, suggesting that the low skilled are penalized both at the intensive and extensive margins. While the number of own-account workers went up among the college educated, it went down among those with below college degree. Among the low-skilled or those with education below college degree, employment in the construction sectors and hospitality sectors have decreased while employment in agriculture have increased suggesting a move to agriculture from more advanced jobs. Employment among those with college education seems to have increased in the hospitality and construction sector, suggesting that in the short-run higher demand for accommodations and service oriented activities from the influx of Venezuelans lead to jobs for the high skilled while the employment among the low skilled in the hospitality and construction went down as there seems to be some substitution between the low skilled host workers and the forcibly displaced Venezuelans.

Table 6: The effect on labor market outcomes in Roraima by education level

	College	Below College	College	Below College	College	Below College	College	Below College	College	Below College
	Working Age	Working Age	Employed	Employed	Unemployed	Unemployed	Underemployed	Underemployed	Hours Worked	Hours Worked
Conventional	6.045*	8.435*	-0.331	-4.717*	0.656	1.187	0.378+	0.157	0.233	0.723*
	(0.219)	(1.241)	(0.376)	(1.230)	(0.627)	(1.069)	(0.224)	(0.341)	(0.195)	(0.274)
Bias-corrected	6.695*	11.25*	-1.656*	-8.453*	0.351	0.185	0.556*	-0.166	0.176	1.699*
	(0.219)	(1.241)	(0.376)	(1.230)	(0.627)	(1.069)	(0.224)	(0.341)	(0.195)	(0.274)
Robust	6.695*	11.25*	-1.656+	-8.453*	0.351	0.185	0.556	-0.166	0.176	1.699*
	(0.358)	(1.208)	(0.871)	(3.396)	(0.721)	(1.339)	(0.400)	(0.918)	(0.286)	(0.713)
N	35	35	35	35	35	35	35	35	35	35
	Formal	Formal	Informal	Informal	Employer	Employer	Employee	Employee	Own-account	Own-account
Conventional	-0.611+	-1.138	-1.509*	-1.062	-0.475	-0.401	-2.200*	2.788*	0.649*	-3.245*
	(0.353)	(0.900)	(6.05e-09)	(1.054)	(0.426)	(0.500)	(0.492)	(0.698)	(0.0000132)	(0.234)
Bias-corrected	-0.512	1.847*	-1.240*	0.844	-0.785+	-0.665	-5.363*	-0.528	1.294*	-5.310*
	(0.353)	(0.900)	(6.05e-09)	(1.054)	(0.426)	(0.500)	(0.492)	(0.698)	(0.0000132)	(0.234)
Robust	-0.512	1.847	-1.240	0.844	-0.785+	-0.665	-5.363*	-0.528	1.294*	-5.310*
	(0.542)	(2.417)	(0.824)	(5.257)	(0.404)	(0.753)	(0.873)	(1.446)	(0.292)	(1.497)
N	35	35	35	35	35	35	35	35	35	35
	Agriculture	Agriculture	Industry	Industry	Construction	Construction	Transport	Transport	Hospitality	Hospitality
Conventional	-0.0716	2.809*	-0.376*	-0.141	0.856*	-0.296	-0.489*	-0.105	1.124*	-1.888*
	(0.0485)	(0.829)	(0.0490)	(0.506)	(0.127)	(0.723)	(0.157)	(0.407)	(5.51e-10)	(0.489)
Bias-corrected	-0.0711	2.550*	-0.604*	0.313	0.996*	-1.721*	-0.899*	0.241	1.237*	-2.994*
	(0.0485)	(0.829)	(0.0490)	(0.506)	(0.127)	(0.723)	(0.157)	(0.407)	(5.51e-10)	(0.489)
Robust	-0.0711	2.550*	-0.604*	0.313	0.996*	-1.721*	-0.899*	0.241	1.237*	-2.994*
	(0.0949)	(1.015)	(0.148)	(0.577)	(0.241)	(0.593)	(0.124)	(0.446)	(0.0518)	(0.564)
N	35	35	35	35	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). The data is segregated by education level. College refers to those with some higher education and Below college refers to those with high school, fundamental level and basic level education. All variables are clustered at the score variable level (x) and all the numbers are in thousands. The covariates used are quarter dummies and past quarter's value of the outcomes.

Table 7 shows that in the short-run the women are facing the adverse effect of the excess supply in the labor market. The increase in unemployment and the decrease in employment are concentrated among female workers while the effect on the male worker is smaller and insignificant. Female employment went down by about 11,270 people as the female working age population increased by about 4,562 workers. Female unemployment jumped up by 2,703 while the change in male unemployment is insignificant. While underemployment and hours worked among male have jumped up by about 1,587 people and 1.4 hours respectively, among female, underemployment increased by 3,033 people and hours worked decreased by 0.9 hours, suggesting that while the impact on female workers is at both the extensive and intensive margin, the impact on male workers is more at the intensive margin. While formal employment fell among men, informal employment fell among women.

Table 7: The effect on labor market outcomes in Roraima by sex

	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	Working Age	Working Age	Employed	Employed	Unemployed	Unemployed	Underemployed	Underemployed	Hours Worked	Hours Worked
Conventional	5.512*	3.314*	-1.316*	-5.914*	1.550*	3.046*	1.829*	1.700*	0.610*	-0.630*
	(0.878)	(0.972)	(0.472)	(0.630)	(0.772)	(1.302)	(0.433)	(0.813)	(0.239)	(0.258)
Bias-corrected	6.545*	4.562*	-2.791*	-11.27*	-0.278	2.703*	1.587*	3.033*	1.366*	-0.871*
	(0.878)	(0.972)	(0.472)	(0.630)	(0.772)	(1.302)	(0.433)	(0.813)	(0.239)	(0.258)
Robust	6.545*	4.562*	-2.791*	-11.27*	-0.278	2.703*	1.587	3.033*	1.366*	-0.871*
	(0.881)	(1.742)	(1.390)	(2.609)	(1.383)	(1.217)	(1.597)	(0.786)	(0.560)	(0.435)
N	35	35	35	35	35	35	35	35	35	35
	Formal	Formal	Informal	Informal	Employer	Employer	Employee	Employee	Own-account	Own-account
Conventional	-2.988*	-0.0563	-0.978	-0.516	-0.234	-0.166	1.022	2.212*	1.626*	-3.390*
	(0.621)	(0.493)	(0.767)	(0.449)	(0.310)	(0.347)	(0.981)	(0.980)	(0.727)	(0.960)
Bias-corrected	-3.868*	0.537	0.375	-1.567*	-1.003*	0.164	-0.0458	0.215	1.341+	-1.123
	(0.621)	(0.493)	(0.767)	(0.449)	(0.310)	(0.347)	(0.981)	(0.980)	(0.727)	(0.960)
Robust	-3.868*	0.537	0.375	-1.567*	-1.003+	0.164	-0.0458	0.215	1.341	-1.123
	(0.962)	(0.812)	(0.806)	(0.596)	(0.525)	(0.438)	(0.904)	(1.179)	(1.687)	(0.854)
N	35	35	35	35	35	35	35	35	35	35
	Agriculture	Agriculture	Industry	Industry	Construction	Construction	Transport	Transport	Hospitality	Hospitality
Conventional	-0.165	0.224*	-1.941*	-0.0989	-5.520*	0.173*	0.206	0.720*	0.308	-0.444+
	(0.490)	(0.0922)	(0.232)	(0.104)	(0.640)	(0.0773)	(0.453)	(0.0609)	(0.558)	(0.262)
Bias-corrected	-1.337*	-0.169+	-2.560*	-0.131	-7.891*	0.123	0.0936	0.246*	-0.138	-1.024*
	(0.490)	(0.0922)	(0.232)	(0.104)	(0.640)	(0.0773)	(0.453)	(0.0609)	(0.558)	(0.262)
Robust	-1.337+	-0.169	-2.560*	-0.131	-7.891*	0.123	0.0936	0.246	-0.138	-1.024*
	(0.783)	(0.350)	(0.432)	(0.225)	(1.009)	(0.333)	(0.609)	(0.220)	(1.055)	(0.387)
N	35	35	35	35	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014) All standard errors are clustered at score variable. The data is segregated by gender. The covariates included are quarterly dummies and previous quarter's value of the outcome variables.

Average monthly income among the college educated and male workers seem to have increased in face of higher labor supply as table 8 reveals, suggesting some complementarity between the Venezuelan and native workers. Average monthly income increased by about BR$ 4.519 for men, while change in income among female was insignificant. Among the college educated, average monthly income increased by about BR$1.218.

Table 8: The effect on average monthly income in Roraima by education and sex

	(1)	(2)	(3)	(4)
	College	Below College	Male	Female
Conventional	0.932*	0.177	3.852*	1.121
	(0.451)	(0.263)	(1.103)	(0.816)
Bias-corrected	1.218*	-0.102	4.519*	0.196
	(0.451)	(0.263)	(1.103)	(0.816)
Robust	1.218	-0.102	4.519*	0.196
	(0.829)	(0.434)	(1.561)	(1.620)
N	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014) All standard errors are clustered at score variable. The data is segregated by education level and gender respectively. College refers to those with some higher education and Below college refers to those with high school, fundamental level and basic level education. The monthly income is in Brazilian reais adjusted for inflation by IPCA. The covariates included are quarterly dummies and previous quarter's value of the outcome variables.

Overall, the results on the labor market outcomes find that in the short-run the labor market in Roraima is finding it hard to absorb the excess supply of Venezuelan influx. This is not surprising as the labor market in Roraima is small with significant presence of the public sector. The public sector in Roraima hired about 57 thousand of the 213 thousand total employed in the last quarter

of 2017, which is about 27% of the total employed and the public sector does not hire any foreigner. As a result, the 6.7% increase in the working age population led to an increase in unemployment among females by about 22%. Employment among females also decrease by about 12%, suggesting that females are suffering more from the displacement crisis. This finding are in line with findings discussed in Bedaso (2021) and many others who find women, specially women refugees are disadvantaged in the labor market, and native women are more likely to bear the adverse effects of refugee influx. Another group that is also suffering disproportionately is the low skilled or those with an education below college degree. Employment among those with an education below college degree plummeted down by about 5%. On the positive side, there is an increase in monthly income among the males and the college educated, suggesting that complementarity of native's skills with the Venezuelan forcibly displaced is improving the productivity of the high skilled male workers.

Table 9 and table 10 explore the effects on monthly income by different industries, gender and education and this paper find that there are some sectors, which experienced loss in earnings while others that experienced gain in earnings in response to the influx of displaced Venezuelans. For example, male and female earnings went up in the IT and real estate sector while the increase is concentrated among the high skilled. It should be reiterated here that the data does not disaggregate by nationality and consequently all the results are on the overall labor market. The female earnings declined in the construction and trade sector, while the changes in male earnings in these sectors were statistically insignificant. Earnings in the construction sector seemed to have gone down among the low skilled, but increased among the high skilled, while earnings among the low skilled increased in the education and health sector while it decreased among the college educated. The results point to the fact that the displaced Venezuelans may be complementing the high skilled workers in the host community in construction and information technology increasing their productivity while they are partially substituting the low skilled workers and leading to a fall in their earnings, suggesting that some groups gain while others lose in a displacement crisis in the short-run.

Table 9: The effect on gross income in Roraima by sex and industry

	Agriculture	Industry	Construction	Trade	Transport	Hospitality	IT& Real Estate	Public	Education & Health
Male									
Conventional	0.0466*	-0.214*	0.234+	-0.0000765	0.149	0.000552	0.0705*	-0.0134	-0.0488*
	(0.0117)	(0.0437)	(0.126)	(0.0118)	(0.113)	(0.0100)	(0.0263)	(0.0570)	(0.0189)
Bias-corrected	0.0264*	-0.219*	-0.365*	0.0101	0.0354	-0.00591	0.0858*	0.00180	-0.171*
	(0.0117)	(0.0437)	(0.126)	(0.0118)	(0.113)	(0.0100)	(0.0263)	(0.0570)	(0.0189)
Robust	0.0264	-0.219*	-0.365	0.0101	0.0354	-0.00591	0.0858+	0.00180	-0.171*
	(0.0187)	(0.0798)	(0.627)	(0.0193)	(0.0999)	(0.0125)	(0.0520)	(0.143)	(0.0497)
Female									
Conventional	0.00407	-0.0552*	-0.0517*	-0.0414*	0.0232+	0.0262	0.0259*	-0.0343	0.0412
	(0.0134)	(0.0223)	(0.00900)	(0.00728)	(0.0127)	(0.0195)	(0.00691)	(0.0438)	(0.0648)
Bias-corrected	-0.0549*	-0.0543*	-0.0643*	-0.0497*	-0.00177	0.00805	0.0926*	0.00721	-0.380*
	(0.0134)	(0.0223)	(0.00900)	(0.00728)	(0.0127)	(0.0195)	(0.00691)	(0.0438)	(0.0648)
Robust	-0.0549	-0.0543	-0.0643*	-0.0497*	-0.00177	0.00805	0.0926*	0.00721	-0.380
	(0.0343)	(0.0450)	(0.0148)	(0.0106)	(0.0119)	(0.0394)	(0.0366)	(0.0790)	(0.337)

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). All standard errors are clustered at score variable. The data is segregated by gender and industry.The monthly income is in Brazilian reais adjusted for inflation by IPCA.The covariates included are quarterly dummies and previous quarter's value of the outcome variables.

Table 10: The effect on gross income in Roraima by education and industry

	Agriculture	Industry	Construction	Trade	Transport	Hospitality	IT& Real Estate	Public	Education & Health
College									
Conventional	0.943*	-0.470+	0.461*	-0.146*	-0.0841	-0.0431	0.218*	0.168*	-0.117*
	(0.0852)	(0.259)	(4.11e-09)	(0.0176)	(0.101)	(0.0715)	(0.0106)	(0.0448)	(0.0397)
Bias-corrected	0.992*	-0.302	0.594*	-0.210*	-0.231*	-0.0928	0.289*	0.244*	-0.192*
	(0.0852)	(0.259)	(4.11e-09)	(0.0176)	(0.101)	(0.0715)	(0.0106)	(0.0448)	(0.0397)
Robust	0.992*	-0.302	0.594*	-0.210*	-0.231	-0.0928	0.289*	0.244*	-0.192*
	(0.142)	(0.277)	(0.0856)	(0.0569)	(0.161)	(0.0665)	(0.0369)	(0.106)	(0.0232)
Below College									
Conventional	0.0137	0.000639	-0.0299*	-0.00774	0.0677*	0.0148	-0.0134	-0.0637*	0.0856*
	(0.0134)	(0.0234)	(4.22e-10)	(0.00900)	(1.16e-09)	(0.0111)	(0.0171)	(0.0173)	(0.00985)
Bias-corrected	0.0194	0.0176	-0.0344*	-0.00197	0.0664*	0.0183+	-0.00612	-0.0479*	0.116*
	(0.0134)	(0.0234)	(4.22e-10)	(0.00900)	(1.16e-09)	(0.0111)	(0.0171)	(0.0173)	(0.00985)
Robust	0.0194	0.0176	-0.0344*	-0.00197	0.0664*	0.0183	-0.00612	-0.0479*	0.116*
	(0.0194)	(0.0367)	(0.00705)	(0.0106)	(0.0325)	(0.0130)	(0.0192)	(0.0168)	(0.0110)

$^{+}$ $p < 0.10$, * $p < 0.05$. The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. The bandwidths and the estimates are calculated using the regression discontinuity model proposed by Calonico et al. (2020) and Calonico et al. (2014). All standard errors are clustered at score variable. The data is segregated by education and industry. College refers to those with some higher education and Below college refers to those with high school, fundamental level and basic level education. The monthly income is in Brazilian reais adjusted for inflation by IPCA. The covariates included are quarterly dummies and previous quarter's value of the outcome variables.

6.2.2 Falsification Tests

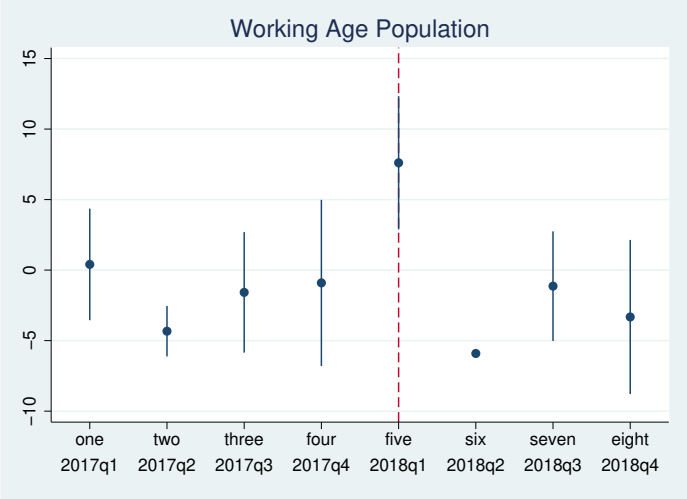
Since this paper focuses on the sharp RD design, this section tries to provide some empirical evidence supporting the validity of the design. This section also provides further evidence in support of the results discussed above using an alternate methodology, namely the synthetic control matching advocated by Abadie et al. (2010).

The continuity of the score density at the cutoff is assumed in estimating the sharp RD effects and so this section starts by examining whether in a local neighborhood near the cutoff, the number of observations below the cutoff is significantly different from the number of observations above it. By the structure of the setup of the estimation method, there is only one observation per quarter or per score variable and consequently units do not have the ability to precisely manipulate the value of the score that they receive. The McCrary density test is conducted and the discontinuity takes the value of 0.28 with a standard error of 1.56 and is non-significant, suggesting no evidence of sorting around the cutoff.

Since the choice of cutoff at the first quarter of 2018 is by observing the population jump in Roraima and some Venezuelan refugees and migrants have entered Roraima in 2017, albeit in smaller number, the next validity test tries to examine whether there was any significant increase in population in Roraima in the four quarters of 2017. The cutoff at the first quarter of 2018 is replaced by each of the quarters of 2017 and the rest of the quarters in 2018. Figure 11 shows that the positive population shock only happens in the first quarter of 2018. The changes in the working age population in the artificial cutoff are mostly negative and non-significant, which provides evidence for the appropriateness of using the first quarter of 2018 as the cutoff to estimate the population shock and its subsequent impact on fiscal and labor market variables. All the estimations use uniform kernel and the optimum bandwidth and covariates include quarter fixed effects and previous quarter's working age population.

Next, this paper tries to validate that the population shock that is observed in Roraima in the

Figure 11: Testing with alternate cutoffs



first quarter of 2018 is in fact a result of the influx of Venezuelans. In absence of perfect control state for Roraima, this paper estimates placebo effect on the working age population of all the states in the north of Brazil, as Roraima is in the north and the northern region lags behind many socio-economic indicators in Brazil. Table 11 shows that the only two states that experienced a significant increase in working age population are Roraima and Amazonas, the two states bordering Venezuela at the north. While Roraima sees a 1.7%-6.7% increase working age population, Amazonas sees a mere 0.3% or 11550 people increase in the working age population in the first quarter of 2018, providing evidence that it is indeed the influx of Venezuelans which led to the population shock that may affect the labor market and the fiscal outcomes of Roraima.

Table 11: Testing for placebo outcome

	(1) AC	(2) AP	(3) AM	(4) PA	(5) RO	(6) RR	(7) TO
RD Estimate	4.028	-3.022	11.55**	-31.88**	-9.395**	6.454**	-1.218
	(1.94)	(-0.87)	(2.81)	(-3.05)	(-3.16)	(2.366)	(-0.27)
N	36	36	36	36	36	36	36

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) and assuming uniform kernel. Covariates include dummies for each quarter and value of the outcome variables in the previous quarter.

Further evidence of the increase in working age population being driven by the influx of displaced Venezuelans come from the demographics of the working age population from other sources. For example, Chaves and Echeverria (2020) sketches profiles of Venezuelan migrants and refugees across countries in Latin America and reports that 58% of the displaced Venezuelans are male and 41% are female, while 71% have below college education and 29% have college education and above. It also reports that within the working age population, 22% are between the age of 15 and 24 years, 71% are between the age of 25 and 49 years and 7% are above 50 years. Table 7 provides evidence that the gender balance in the increase in working age population observed is similar, with 59% (6,545) male and 41% (4,562) female. Similarly, table 6 reports that about 64% (11,250) has below college

education while 36% (6,695) have above college education. Segregating the increase in working age population, this paper finds that 25% of the increase is working age population are between the ages of 15 to 24 years, 70% of the working age population is between the ages of 25 and 49 years and 5% are above 50 years.

To test that the jumps in the labor market outcomes are due to the discontinuity observed in population and not the other covariates, Table 12 reveals the sharp RD estimates on the usual covariates of the labor market like average household size, fraction of working age population who are white, gender ratio and average age of Roraima. All the estimates are small in magnitude and insignificant suggesting that there is no discontinuity in these covariates. The macro variables used as covariates for the fiscal analysis also do not exhibit any discontinuity.

Table 12: Testing for placebo effect on covariates

	(1) Household size	(2) Fraction of white	(3) Gender ratio	(4) Age	(5) IPCA	(6) Depreciation rate	(7) Service Index
Conventional	-0.00358	0.00701	-0.00413	0.0123	-20.704	-0.02252	-5.3427
	(-0.11)	(1.58)	(-0.42)	(0.79)	(78.438)	(0.02162)	(8.8929)
Bias-corrected	0.0170	0.00315	-0.0130	0.0145	-43.029	-0.02392	2.9559
	(0.51)	(0.71)	(-1.32)	(0.66)	(78.438)	(0.02162)	(8.8929)
Robust	0.0170	0.00315	-0.0130	0.0145	-43.029	-0.02392	2.9559
	(0.29)	(0.67)	(-0.80)	(0.43)	(99.235)	(0.02574)	(12.778)
N	35	35	35	35	35	35	35

The standard errors are given in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) and assuming uniform kernel. Covariates include dummies for each quarter (bimonth) and value of the outcome variables in the previous quarter (bimonth).

Another confounding variable that can explain the discontinuity observed is extreme weather. Roraima is prone to flooding due to heavy rainfall and rising river level. However, floods in Roraima usually occur in the second and third quarter and not in the first quarter, where the discontinuity is observed. There is also no indication of major catastrophic flood reported in Roraima in 2018 and even if there was minor seasonal flooding which happens regularly in Roraima, the quarter (bimonth) fixed dummies control for this regular weather variation.

6.2.3 Results from Alternative Methodologies

In order to compare the RD estimates with changes in the other states, this paper then extends the analysis to control for the other states and their trends by estimating the RD model parametrically in a difference in difference framework. The problem here arises due to the absence of a state that can serve as a control for Roraima and consequently this paper uses synthetic matching methods (Abadie et al., 2010) to find appropriate weights for all the northern states in Brazil.[12] The model that is estimated takes the form of the following:

$$Y_i = \beta + \alpha D_i * + e_i \tag{2}$$

where Y_i is the difference in outcome variable between the outcome in Roraima and outcome in the synthetic control, D_i is the indicator for treatment status, that takes the value of 1 if the time period

[12]The details are given in the appendix

is the second bimonth of 2018 and afterwards for the fiscal variables or the first quarter of 2018 and afterwards for the labor market variables. Table A13 and table A14 show the estimates of α along with the weights that each of the northern states receive in forming synthetic control state. The covariates used to match for the fiscal variables include index for the service sector from IBGE and the cost of making per square feet, while the covariates used for the labor market includes gender ratio, youth dependency, household size, average age and fraction of white and college educated from the pre-2018 time period. Results that remain consistent are that there is a social assistance spending shock due to the inflow of Venezuelan refugees and migrants in Roraima but revenue collected from indirect taxes also increased, while the population shock led to an increase in unemployment, suggesting the in the short-run, the labor market in Roraima may be finding it difficult to absorb the excess labor supply. The estimates can be interpreted as the average treatment effects as explained in Abadie et al. (2010).

7 Conclusion

The inflow of forcibly displaced Venezuelans into Brazil is a humanitarian crisis but has created a development challenge since most of them have entered through Roraima, the state of Brazil bordering the República Bolivariana de Venezuela at the north. The economy of Roraima is small and is mainly dependent on the public sector and although it is relatively easy for forcibly displaced Venezuelans in Brazil to get labor cards and work in the private sector, jobs in the public sector are out of their bounds. This paper uses a regression discontinuity design to study the impact of the population shock caused by the influx of the forcibly displaced Venezuelans on Roraima and finds that although in the short-run they have a negligible effect on Roraima's fiscal balance and is not only incurring additional social assistance expenditure but also may be contributing through indirect taxation, the labor market is finding it challenging to absorb the excess supply. It finds that in the immediate short-run, the influx of Venezuelans has led to an increase in unemployment and decrease in employment among female and low skilled workers, and the effect on earnings seems to vary by sectors, with the highly skilled male workers are experiencing an increase in income in construction and information technology, while the low skilled worker are experiencing an increase in earnings in education, health and transport, suggesting heterogenous impacts of the displaced Venezuelans on the labor market. These asymmetrical impacts on earnings are in line with previous literature, which finds that low-skilled and female workers tend to experience negative impacts, while more-educated workers benefit from increased immigration. It should be noted here that this paper focuses on short-run effects and previous literature like Card (1990) finds that the initial effects of "boatlift" or influx of about 125,000 Cubans in Miami were decline in employment rates and wages, but about three years after the huge influx, wages and employment rates in Miami showed no effect.

The main caveats in the analysis are the unavailability of nationality information in PNADC and consequently, the results discussed in the paper show the effect on the overall market. Another point to emphasize here is that RD estimates are local treatment effects and cannot be generalized. As a result further research needs to be conducted to identify the actual effect on the host community.

However, results of this paper suggest certain policy implications that may mitigate the negative impacts of the influx of the displaced Venezuelan on the labor market and facilitate their fiscal contribution. Policies may focus on supporting the most vulnerable host populations like women

and low skilled native workers through vocational training, retraining schemes, transportation support, better job matching services and easier access to credit, jointly targeting the vulnerable host population and the forcibly displaced Venezuelans, recognizing the skill of the displaced Venezuelans, which may subdue the effect of them substituting the low skilled native workers and lead to productivity gains, strengthening voluntary relocation to areas within Brazil that have more job opportunities and the effectiveness of fiscal policy by making government expenditure more responsive to shock.

8 Appendix

8.1 Additional Figures

Figure A1: Placebo Effect on Total Population in other Northern States

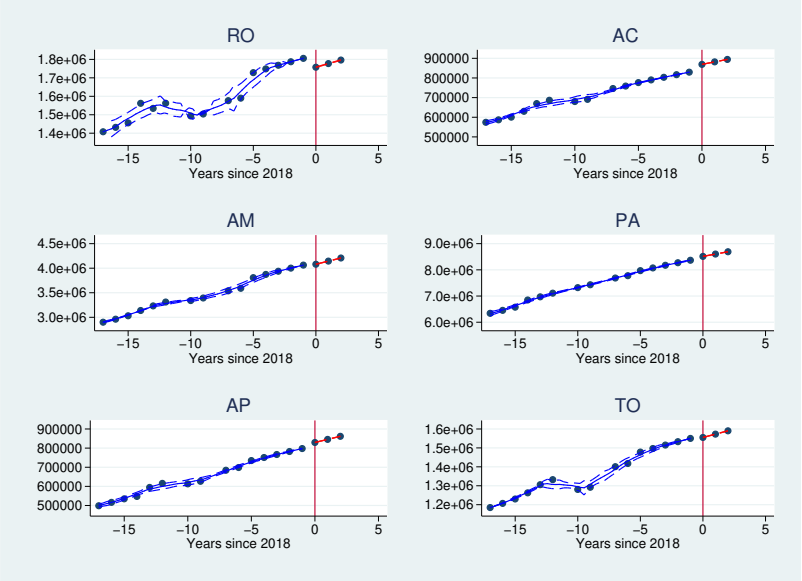


Figure A2: Placebo Effect on Total Expenditure in other Northern States

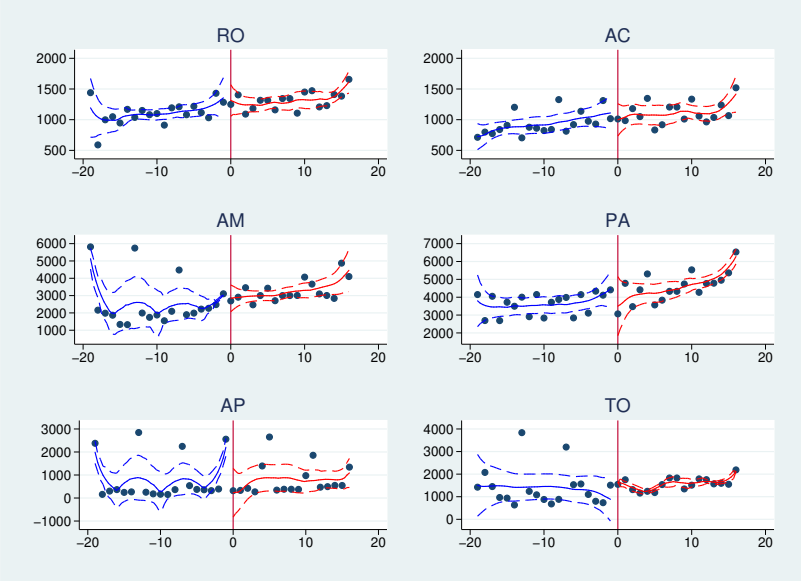
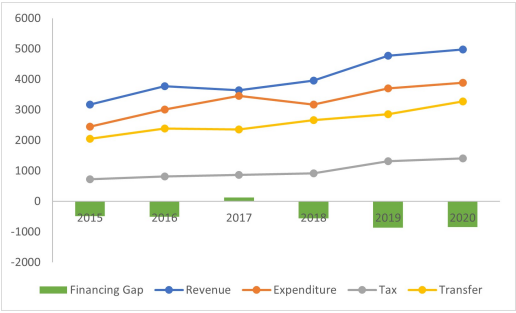
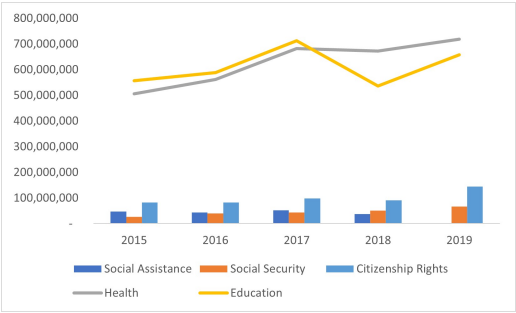


Figure A3: Yearly Fiscal Scenario in Roraima



(a) Different components of fiscal balance



(b) Expenditure by functions

Figure A4: Placebo Effect on Total Revenue in other Northern States

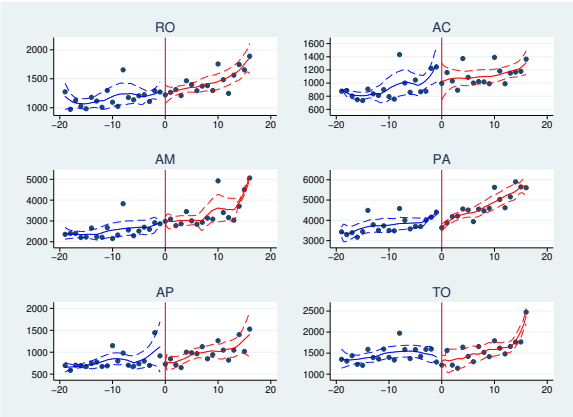


Figure A5: Placebo Effect on Working Age Population in other Northern States

8.2 Summary Statistics

Table A1: Variables Used, their frequencies and sources

Variables	Frequency	Source	Transformed Variable
Total expenditure (federal & state, within budget & outside budget)	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Investment	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Personnel Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Education Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Health Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Social Assistance Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Social Security Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Civil Defence Expenditure	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Total revenue	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Income Taxes	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Social Contribution	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Transfer	Bimonthly	SICONFI	Adjusted for inflation using IPCA
Fiscal Balance	Bimonthly	SICONFI	Total Revenue - Total Expenditure after adjusting for inflation by IPCA
Service Volume	Monthly	Cider/IBGE	Average at bimonthly
Trade Volume	Monthly	Cider/IBGE	Average at bimonthly
IPCA	Monthly	Cider/IBGE	Average at bimonthly
Depreciation rate	Monthly	International Financial Statistics	Changes in Effective exchange rate index
Population	Annual	IBGE	Estimates Provided by IBGE
Working Age Population	Quarterly	PNADC/IBGE	Weighted number
Total Number Employed	Quarterly	PNADC/IBGE	Weighted number
Total Number Unemployed	Quarterly	PNADC/IBGE	Weighted number
Total Actual Hours Worked	Quarterly	PNADC/IBGE	Weighted number
Total Formal Employment	Quarterly	PNADC/IBGE	Weighted number
Total Informal Employment	Quarterly	PNADC/IBGE	Weighted number
Total Private Employer	Quarterly	PNADC/IBGE	Weighted number
Total Private Employee	Quarterly	PNADC/IBGE	Weighted number
Total Private Own-account Workers	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Agriculture	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Industry	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Construction	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Transport	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Trade	Quarterly	PNADC/IBGE	Weighted number
Total Employment in Hospitality	Quarterly	PNADC/IBGE	Weighted number
Average Monthly Earnings	Quarterly	PNADC/IBGE	Weighted average of monthly income
Gross Earnings	Quarterly	PNADC/IBGE	Weighted sum of earnings earnings at state level
Gender ratio	Quarterly	PNADC/IBGE	Weighted number of male and females
Education	Quarterly	PNADC/IBGE	Weighted number of atleast college educated, number of below college educated
Household Size	Quarterly	PNADC/IBGE	Weighted average from individual data
Race	Quarterly	PNADC/IBGE	Fraction of Whites from individual data
Age	Quarterly	PNADC/IBGE	Weighted average from individual data

Table A2: Summary statistics of variables

	Before 2018	2018 & After	Total
Labor Market			
Working Age Population	336.4	403.1	356.8
	(25.84)	(11.86)	(38.34)
Employed	194.8	210	199.5
	(12.37)	(9.044)	(13.36)
Unemployed	17.48	36.82	23.39
	(3.698)	(4.513)	(9.840)
Underemployed	10.96	16.64	12.69
	(2.423)	(2.580)	(3.600)
Formal	44.40	43	43.97
	(2.661)	(2.646)	(2.699)
Informal	23.36	25	23.86
	(2.691)	(3.347)	(2.958)
Employer	7.00	8.545	7.472
	(1.384)	(2.339)	(1.844)
Employee	131.8	138.8	133.9
	(6.158)	(6.014)	(6.862)
Own Account	50.64	58.09	52.92
	(6.428)	(2.948)	(6.553)
Agriculture	18.68	17.09	18.19
	(2.212)	(2.343)	(2.340)
Industry	11.64	10.45	11.28
	(1.497)	(1.440)	(1.560)
Construction	17.88	18.55	18.08
	(1.333)	(1.440)	(1.381)
Transport	5.720	7	6.111
	(0.614)	(0.775)	(0.887)
Hospitality	10.44	12.82	11.17
	(1.325)	(1.991)	(1.890)
Monthly income	44.44	45.96	45.02
	(62.69)	(25.19)	(76.27)
Fiscal Scenario			
Total Revenue	131.3	144.6	137.1
	(22.08)	(24.71)	(23.85)
Income Taxes	1.322	1.735	1.502
	(0.333)	(0.308)	(0.380)
Social Contribution	2.862	6.177	4.312
	(1.110)	(8.193)	(5.623)
Indirect Taxes	25.56	26.16	25.82
	(3.436)	(5.285)	(4.276)
Transfer	79.98	92.48	85.45
	(17.50)	(21.63)	(20.10)
Total Expenditure	140.5	110.8	127.5
	(79.51)	(70.01)	(75.80)
Education	23.13	20.69	22.06
	(5.123)	(6.398)	(5.751)
Investment	8.724	5.904	7.490
	(9.682)	(4.789)	(7.940)
Personnel Spending	69.27	65.58	67.65
	(41.42)	(39.23)	(39.87)
Health	25.10	21.68	23.60
	(22.61)	(18.01)	(20.48)
Social Assistance	1.618	0.873	1.292
	(0.866)	(1.100)	(1.029)
Social Security	1.725	1.780	1.749
	(2.598)	(3.415)	(2.931)
Policing	4.768	6.843	5.676
	(1.601)	(4.292)	(3.197)
Fiscal Balance	-9.254	33.78	9.576
	(73.55)	(70.39)	(74.26)

Table A3: The power of the test that there is no change in mean in the fiscal variables after 2018 for sample sizes 30, 50, and 100, using a significance level of 5%

Variable	Power	Sample Size
Total revenue	0.86	30
	0.98	50
	0.99	100
Income taxes	0.99	30
	1	50
	1	100
Social contribution	0.88	30
	0.98	50
	0.99	100
Indirect taxes	1	30
	1	50
	1	100
Transfer	0.91	30
	0.99	50
	1	100
Total expenditure	0.56	30
	0.77	50
	0.97	100
Education	0.61	30
	0.84	50
	0.99	100
Investment	0.47	30
	0.7	50
	0.94	100
Personnel Spending	0.08	30
	0.1	50
	0.15	100
Health	0.14	30
	0.21	50
	0.38	100
Social Assistance	0.97	30
	0.99	50
	1	100
Social Security	0.05	30
	0.05	50
	0.05	100
Policing	0.93	30
	0.99	50
	1	100
Fiscal Balance	0.87	30
	0.98	50
	1	100

Table A4: The power of the test that there is no change in mean in the labor market outcomes after 2018 for sample sizes 30, 50, and 100, using a significance level of 5%

Variable	Power	Sample Size
Working Age Population	1	30
	1	50
	1	100
Employed	1	30
	1	50
	1	100
Unemployed	1	30
	1	50
	1	100
Underemployed	1	30
	1	50
	1	100
Hours Worked	1	30
	1	50
	1	100
Public Employment	0.99	30
	1	50
	1	100
Formal Employment	0.79	30
	0.95	50
	0.99	100
Informal Employment	0.83	30
	0.97	50
	0.99	100
Employer	0.99	30
	0.99	50
	1	100
Employee	0.99	30
	1	50
	1	100
Own-Account Workers	1	30
	1	50
	1	100
Income	0.6	30
	0.82	50
	0.98	100
Agriculture	0.94	30
	0.95	50
	1	100
Industry	0.98	30
	0.99	50
	1	100
Construction	0.73	30
	0.91	50
	0.99	100
Trade	0.99	30
	1	50
	1	100
Transport	1	30
	1	50
	1	100
Hospitality	1	30
	1	50
	1	100

8.3 Additional Sharp RD Results

Table A5: Regression discontinuity estimates of public expenditure in Roraima using uniform kernel and alternate bandwidth

	(1) Total expenditure	(2) Investment	(3) Personnel Spending	(4) Education	(5) Health	(6) Social assistance	(7) Social security	(8) Police
Bandwidth	-78.78	6.662	-75.45*	-4.221	-21.85	2.041*	-5.435	0.233
	(52.64)	(4.584)	(32.97)	(5.705)	(18.64)	(0.350)	(3.915)	(2.075)
Half Bandwidth	-93.68	8.274	-142.8*	-12.60*	-52.11*	2.423*	-12.00*	2.553
	(58.70)	(5.711)	(11.67)	(5.667)	(11.84)	(0.156)	(2.080)	(1.688)
Double Bandwidth	-66.96+	4.772	-48.73+	-4.662	-18.22	1.107*	-3.157	-0.495
	(39.32)	(3.325)	(24.86)	(4.118)	(12.66)	(0.484)	(2.565)	(1.347)
Bandwidth	18	18	18	18	18	18	18	18

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) and assuming uniform kernel. Covariates include dummies for each bimonth, value of the outcome variables in the previous bimonth and depreciation rate. All variables are in millions of Brazilian reais

Table A6: Regression discontinuity estimates of public revenue in Roraima using uniform kernel and alternate bandwidth

	(1) Total revenue	(2) Income Tax	(3) Social contribution	(4) Indirect taxes	(5) Transfer	(6) Fiscal Balance
Bandwidth	-16.57	0.308*	0.134	3.924	-32.34*	78.54
	(16.03)	(0.101)	(0.312)	(3.349)	(10.81)	(51.91)
Half-Bandwidth	-39.32*	0.116*	-0.333*	0.983	-15.20+	101.0+
	(14.27)	(0.00979)	(0.158)	(4.055)	(8.820)	(51.65)
Double Bandwidth	-18.18	0.149	-2.532+	6.938*	-6.714	49.69
	(13.54)	(0.123)	(1.299)	(2.364)	(15.11)	(42.15)
Bandwidth	18	18	18	18	18	18

The finite sample p-value is in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021). All standard errors are clustered at score variable. Covariates include dummies for each bimonth, value of the outcome variables in the previous bimonth and depreciation rate. All variables are in millions of Brazilian reais

Table A7: Regression discontinuity estimates of labor market outcomes in Roraima using uniform kernel and alternate bandwidth

	(1) Working Age Population	(2) Employed	(3) Unemployed	(4) Underemployed	(5) Hours Worked	(6) Public Employment	(7) Monthly Income
Bandwidth	6.454*	0.193	4.310*	2.076*	0.454	4.436*	1.742
	(2.366)	(3.422)	(2.018)	(1.020)	(0.320)	(1.935)	(1.879)
Half Bandwidth	9.700*	-6.867*	4.600+	2.667*	0.0550	2.433	2.818
	(1.683)	(1.546)	(2.644)	(0.805)	(0.0384)	(1.601)	(2.601)
Double Bandwidth	4.573*	15.79*	7.063*	4.435*	-0.426	5.825*	-0.599
	(2.042)	(5.722)	(2.484)	(1.460)	(0.805)	(1.968)	(1.547)
Bandwidth	9.194	6.587	5.591	4.767	6.228	5.599	6.223

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) and assuming uniform kernel. Covariates include dummies for each quarter and value of the outcome variables in the previous quarter. All variables are in thousand. Monthly income is adjusted for inflation by national IPCA.

Table A8: Regression discontinuity estimates of different types and sectors of employment in Roraima using uniform kernel and alternate bandwidth

	(1) Formal	(2) Informal	(3) Agriculture	(4) Industry	(5) Construction	(6) Trade	(7) Transport	(8) Hospitality
Bandwidth	-1.240	-2.971+	0.900	-2.100*	-2.700*	-7.014*	0.200	0.900
	(1.389)	(1.794)	(1.596)	(0.503)	(1.312)	(2.421)	(0.356)	(0.670)
Half Bandwidth	-1.267	-2.333*	2.500*	-1.833*	-2	-1.000	0.167	0.833*
	(1.364)	(0.805)	(1.208)	(0.403)	(0.734)	(2.415)	(0.403)	(0.403)
Double Bandwidth	-0.679	-0.870	3.100*	-0.187	0.988	-1.760	0.446	2.115+
	(1.197)	(1.930)	(1.338)	(0.854)	(1.766)	(1.997)	(0.369)	(1.156)
Bandwidth	6.517	5.608	4.960	4.465	5.679	4.674	4.322	

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) and assuming uniform kernel. Covariates include dummies for each quarter and value of the outcome variables in the previous quarter. All variables are in thousands.

8.4 Additional RD Methodologies

Table A9: Local Randomization Regression discontinuity estimates of fiscal variables in Roraima

	(1) Total expenditure	(2) Investment	(3) Personnel Spending	(4) Education	(5) Health	(6) Social assistance
Difference in means	-57.641*	2.642 +	-34.578 *	-4.124*	-17.198*	1.456*
	(0.023)	(0.078)	(0.012)	(0.043)	(0.020)	(0.002)
	Total revenue	Income taxes	Social Contribution	Indirect taxes	Transfer	Fiscal Balance
Difference in means	-12.964 +	0.102	-1.217	8.861	-8.819	41.200+
	(0.071)	(0.303).	(0.498)	(0.341)	(0.302)	(0.082)

The finite sample p-value is in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021). All standard errors are clustered at score variable. Covariates include dummies for each bimonth, value of the outcome variables in the previous bimonth and depreciation rate. All variables are in millions of Brazilian reais

Table A10: Fuzzy Regression discontinuity estimates of fiscal variables in Roraima

	(1) Total expenditure	(2) Personnel Spending	(3) Education	(4) Health	(5) Social Assistance	(6) Police
RD_Estimate	-1.709*	-4.859*	-1.634*	-1.491*	1.096*	0.170*
	(0.082)	(0.097)	(0.129)	(0.451)	(0.014)	(0.002)
N	32	32	31	31	30	32
	Total Revenue	Income Tax	Social Contribution	Indirect taxes	Transfer	Fiscal Balance
RD_Estimate	-6.902*	1.787*	7.677*	289.0*	2.581*	1.530*
	(1.753)	(0.283)	(0.605)	(0.007)	(0.391)	(0.309)
N	33	33	31	33	33	32

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) assuming that the inflow of Venezuelans started in 2017 rather 2018. All standard errors are clustered at score variable. Covariates include dummies for each bimonth, value of the outcome variables in the previous bimonth and depreciation rate. All variables are in millions of Brazilian reais

Table A11: Local Randomization Regression discontinuity estimates of labor market outcomes in Roraima

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Working Age Population	Employed	Unemployed	Underemployed	Hours Worked	Public Employment	Monthly Income
Difference in means	4.661*	8.279 *	7.617*	3.973*	-0.532	6.135*	0.164
	(0.000)	(0.005)	(0.000)	(0.000)	(0.163)	(0.000)	(0.829)
	Formal	Informal	Agriculture	Industry	Construction	Trade	Hospitality
Difference in means	-2.673 *	1.911+	2.311*	-1.603	-0.198	-2.009+	2.741*
	(0.001)	(0.050).	(0.001)	(0.000)	(0.654)	(0.063)	(0.000)

The finite sample p-value is in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021). All standard errors are clustered at score variable. Covariates include dummies for each quarter and value of the outcome variables in the previous quarter. All variables are in thousands. Monthly Income is adjusted for inflation by national IPCA.

Table A12: Fuzzy Regression discontinuity estimates of labor market variables in Roraima

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Working Age Population	Employed	Unemployed	Underemployed	Hours Worked	Public Employment	Monthly Income
RD_Estimate	1.364*	-6.301*	1.528+	7.582*	-8.203	-1.744*	8.987*
	(0.121)	(0.462)	(0.891)	(0.824)	(8.482)	(0.481)	(0.655)
N	35	35	35	35	35	35	35
	Formal	Informal	Agriculture	Industry	Construction	Trade	Hospitality
RD_Estimate	-9.192*	1.330*	-2.057*	-7.75*	-3.421*	-1.936*	3.386*
	(2.534)	(0.535)	(0.933)	(0.984)	(0.310)	(0.897)	(1.058)
N	35	35	35	35	35	35	35

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. All estimations use the bandwidths proposed by Cattaneo et al. (2021) assuming that the inflow of Venezuelans started in 2017 rather 2018. All standard errors are clustered at score variable. Covariates include dummies for each quarter and value of the outcome variables in the previous quarter. All variables are in thousands. Monthly Income is adjusted for inflation by national IPCA.

8.5 Alternate Specifications

Table A13: Difference-in-difference estimates of fiscal variables in Roraima using synthetic cohort matching

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total expenditure	Education	Health	Social Assistance	Investment	Personnel Spending	Total Revenue	Indirect taxes	Transfer	Fiscal Balance
DID	-39.75+	-8.582+	-11.38	1.282*	-1.504	-13.94	-11.83	7.009+	-16.48*	28.02
	(23.09)	(4.366)	(7.189)	(0.436)	(3.983)	(13.61)	(8.175)	(3.761)	(5.172)	(22.94)
N	36	36	36	36	36	36	36	36	36	36
States						Weights				
RO	0.925	0.924	0.925	0.923	0.923	0.923	0.926	0.926	0.925	0.918
AC	0.039	0.039	0.039	0.039	0.039	0.039	0.038	0.038	0.039	0.041
AM	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
PA	0.01	0.01	0.01	0.011	0.01	0.01	0.01	0.01	0.01	0.012
AP	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004	0.003
TO	0.017	0.017	0.017	0.018	0.018	0.018	0.017	0.017	0.017	0.021
RMSPE	131.227	19.398	26.032	1.234	17.927	79.303	127.363	79.811	21.821	68.359

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. DID refers to the difference-in-difference estimates assuming 2018 and after as the treatment period and using the other northern states (RO, AC, AM, PA, AP and TO) to create the synthetic control unit. The weight that each state receives is given in the table. All standard errors are clustered at the time variable and the methodology used to create the synthetic cohort is the one explained in Abadie et al. (2010). Covariates include index for service sector in each state and cost of making per square foot at the bimonth level. All variables are in millions of Brazilian reais and adjusted for inflation.

Table A14: Difference-in-difference estimates of labor market variables in Roraima using synthetic cohort matching

	(1) Working Age Population	(2) Employed	(3) Unemployed	(4) Employee	(5) Employer	(6) Own Account	(7) Formal	(8) Informal	(9) Income
DID	0.0169*	0.00430	0.0116*	0.00926*	0.00144*	-0.00187	0.000537	0.000551	30.70*
	(0.00230)	(0.00363)	(0.00165)	(0.00232)	(0.000701)	(0.00246)	(0.00110)	(0.000907)	(7.871)
N	36	36	36	36	36	36	36	36	36
States	Weights								
RO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC	0.000	0.000	0.819	0.000	0.375	0.226	0.667	0.314	0.832
AM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AP	1.000	1.000	0.181	1.000	0.625	0.774	0.333	0.686	0.168
TO	0.000	0.000	0.000	0.0.000	0.000	0.000	0.000	0.000	0.000
RMSPE	218.92	103.74	18.93	59.655	1.742	38.806	24.181	6.883	847.928

The standard errors are given in parentheses. + $p < 0.10$, * $p < 0.05$. DID refers to the difference-in-difference estimates assuming 2018 and after as the treatment period and using the other northern states (RO, AC, AM, PA, AP and TO) to create the synthetic control unit. The weight that each state receives is given in the table. All standard errors are clustered at the time variable and the methodology used to create the synthetic cohort is the one explained in Abadie et al. (2010). Covariates include gender ratio, young age dependency, fraction college educated, household size, fraction white. Monthly income is in Brazilian reais and adjusted for inflation using IPCA. All variables in thousands.

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