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ABSTRACT

The Labor Market Effects of Venezuelan Migration in Ecuador*

As of 2019, more than 1.2 million Venezuelans have passed through Ecuador and over 400,000 settled in, which amounts to almost 3% of Ecuador's population. This paper analyzes the location choices of Venezuelan migrants within Ecuador and the labor market consequences of these choices, using data from Ecuador's labor force survey (ENEMDU) and mobile phone records on the geographic distribution of Venezuelan migrants. Around half of these migrants live in 4 cantons (out of 221). Their location is primarily driven by local economic conditions, rather than point of entry. Overall, regions with the largest inflows of Venezuelans have not seen any effects on labor market participation or employment, compared to regions with fewer inflows. However, our difference-in-difference estimates clearly indicate that young, low-educated Ecuadorian workers in high-inflow regions have been adversely affected. Specifically, we estimate that these workers have experienced reductions in employment quality, a 5 percentage-point increase in the rate of informality, and a 13 percentage-point reduction in earnings, relative to workers with similar characteristics living in areas with very low or non-existing inflows of Venezuelans.

JEL Classification: O15, J61, D31
Keywords: migration Venezuela, labor market

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1 Introduction

According to the *United Nations Refugee Agency (UNHCR, 2019)*, 70.8 million people are currently forcibly displaced worldwide, due to a variety of reasons including armed conflict, economic deprivation and environmental disasters.[1] These events entail the loss of many lives and huge human suffering among those directly affected. In addition, neighboring countries are also affected because, willingly or not, they end up hosting a large part of the displaced populations.

It is important to study the economic consequences of receiving large inflows of forcibly displaced migrants. Identifying which groups in the hosting regions are bearing the largest economic burden, and adopting policies to alleviate it is crucial in order to avoid backlash and foster integration. Obtaining and analyzing data in a timely fashion poses an important challenge to researchers and policy makers because the typical sources, population censuses and labor force surveys, are ill-suited to collect information pertaining to recently arrived migrants that are still in the process of settling down. As a result, researchers have to develop new strategies to address these shortcomings by using new data sources.[2]

Our focus on this paper is on the Venezuelan exodus that started around year 2015. As of September 2019, it is estimated that over 4.3 million Venezuelans have left the country since in the last 5 years. About 80% of these migrants have settled in Latin America and the Caribbean, with Colombia (about 1.5 million) and Peru (about 1 million) as the main destinations.

Our analysis focuses on Ecuador, which started receiving significant inflows of Venezuelans around 2016 and is currently hosting over 400,000 Venezuelan migrants (as of 2019). More specifically, our main goals are to analyze the determinants of the location choices of Venezuelan migrants within Ecuador and how they might affect the labor markets of the host regions. Crucially, we employ novel data based on mobile phone records to measure the geographical distribution of Venezuelan migrants across Ecuador's regions (*cantons*), which we merge with Ecuador's household labor force survey (*ENEMDU*).

Methodologically, we create a wide range of regional labor market indicators, including participation and employment rates, along with measures of employment quality, informality and earnings. We also classify these regions (*cantons*) according to the den-

[1] In the years prior to 2017, about 2.4 million people fled South Sudan. Likewise, it is estimated that 6.3 million people were displaced from Syria between 2011 and 2017.

[2] For instance, Hausmann et al. (2018) used *Twitter* data to estimate that close to 3 million Venezuelans left the country in year 2017.

sity of Venezuelans in the corresponding population, and adopt a difference-in-difference estimation strategy that compares the evolution of our labor market indicators in regions that received immigrant inflows to regions that did not around the time of arrival of Venezuelan migrants. Our analysis of the migrants' location choices also makes use of data on their point of entry into the country and measures of aggregate income at the regional level.

Our paper contributes to the recent literature on the effects of forced migration on the host labor markets, which has focused on the exodus of Syrians primarily to Turkey (e.g. Ceritoglu et al. (2017), Tumen (2016), DelCarpio and Wagner (2015) and Loayza et al. (2018)) and Venezuelans to Colombia (Caruso et al. (2019) and Penaloza-Pacheco (2019)), which we review in detail below. Our contribution is twofold. First, we provide the first analysis of the labor-market effects of Venezuelan migration to Ecuador, one of the main receivers of Venezuelans over the last few years. Secondly, we make use of new data based on cell phone contracts and usage that allow us to measure with a high degree of accuracy the density of Venezuelan migrants across Ecuador's geography, and merge these data with the household labor force survey and administrative records on migrants' points of entry.[3]

The main findings of the study are the following. First, based on our data, 470,095 Venezuelans were living in Ecuador in the first quarter of 2019, which amounts to almost 3% of Ecuador's population. We also observe that four *cantons* (out of a total of 221) host 52% of Venezuelan migrants.[4] Secondly, Venezuelan migrants are highly geographically mobile, mainly choosing to locate in higher income regions, with the point of entry into Ecuador having very little explanatory power. Specifically, we estimate that *cantons* with 10% higher income receive 5% more Venezuelan migrants than otherwise similar regions.

Our difference-in-difference estimates do not uncover any effects on the workforce as a whole for the regions with the largest inflows of Venezuelans relative to their population, even when restricting to female workers. However, our estimates clearly indicate a reduction in the quality of employment and earnings among young, low-educated Ecuadorian workers. Compared to similar workers in regions with a small inflow of Venezuelans (relative to population), young, low-educated Ecuadorian workers in high-migration regions have experienced a 6 percentage-point drop in the rate of *adequate* employment,

[3]Beine et al. (2019) have also used cell phone records in the context of Syrian refugees in Turkey, but their analysis is limited to refugees' location choices and they do not analyze labor market outcomes.

[4]The cantons containing the cities of Quito and Guayaquil host over 85,000 Venezuelan migrants each.

accompanied by a 5-percentage point increase in the rate of informality, and a 13 percent reduction in hourly earnings.[5]

The rest of the paper is structures as follows. Section 2 reviews the recent literature on the labor market effects of forced migration. Section 3 describes the events that have led to the Venezuelan crisis and provides some context regarding the economic situation in Ecuador at the time of the arrival of the migrants. Section 4 discusses our main data sources. Section 5 presents the analysis of the location choices of Venezuelan migrants within Ecuador. Section 6 contains the difference-in-difference estimation of the labor market effects of Venezuelan migration along with several robustness checks. Lastly, Section 7 concludes with our final remarks.

2 Literature

Our paper contributes to the recent literature on the effects of forced migration on the host labor markets, which has focused on the exodus of Syrians primarily to Turkey (e.g. Ceritoglu et al. (2017), Tumen (2016), DelCarpio and Wagner (2015) and Loayza et al. (2018)) and Venezuelans to Colombia (Caruso et al. (2019) and Penaloza-Pacheco (2019)), which we review in detail below. Our contribution is twofold. First, we provide the first analysis of the labor-market effects of Venezuelan migration to Ecuador, one of the main receivers of Venezuelans over the last few years. Secondly, we make use of new data based on cell phone contracts and usage that allow us to measure with a high degree of accuracy the density of Venezuelan migrants across Ecuador's geography, and merge these data with the household labor force survey and administrative records on migrants' points of entry.[6]

Our study contributes to the growing literature on the economic consequences of forced migration for host countries (Becker and Ferrara (2019)). Despite its enormous policy interest, this topic has remained understudied due to the scarcity of high quality data. Another challenge in the estimation of the effects on receiving communities is that the average impact on host communities is mixed because some native workers win while others lose, as noted in the review by Ruiz and Vargas-Silva (2013),

In the last few years, the literature has concentrated heavily on the analysis of the

[5] *Adequate employment* refers to the full-time employed earning at least the minimum wage, and to workers with part-time jobs that do not wish to work more hours.

[6] Beine et al. (2019) have also used cell phone records in the context of Syrian refugees in Turkey, but their analysis is limited to refugees' location choices and they do not analyze labor market outcomes.

effects of Syrian refugees on Turkey's local labor markets. This research was pioneered by two related papers, Ceritoglu et al. (2017) and Tumen (2016). Using a difference-in-difference estimation strategy applied to labor market outcomes for natives, these studies find moderately negative effects on the employment rates of natives employed in the informal sector, though no effects on wages. Their analysis employs data from the Turkish Household Labor Force Survey (2010-2013). Specifically, they estimate a 2 percentage-point decline in the employment-to-population ratio in the informal sector tied to the inflow of refugees. Furthermore, they show that these adverse effects disproportionately affect women and lower educated workers.

The study by DelCarpio and Wagner (2015) extends the previous analyses by adopting an instrumental-variables estimation approach that controls for distance to the Syrian border, which helps purge confounding geographic factors. Their estimates suggests that the arrival of 10 refugees leads to a 6-native worker reduction in the informal sector, with a greater incidence on Turkish workers without formal education. In addition, the study also documents employment creation in the formal sector, by about 3 additional workers for every 10 refugees, mostly benefitting males with medium educational attainment (but less than a college degree). This study also provides an explanation for the lack of wage effects in Ceritoglu et al. (2017) and Tumen (2016). Namely, the arrivals of Syrian refugees affected the composition of employment in Turkey's labor market by inducing lower productivity workers to leave the labor force. The authors argue that, when these compositional changes are accounted for, wages indeed fell in the informal sector (for low-educated and female domestic workers).[7] Recent studies have also found evidence of effects on costs and prices: using price data, Balkan and Tumen (2016) find that consumer prices of goods typically associated with informal labor declined following the influx of Syrian workers in those regions. Likewise, Tumen (2018) documents that the wages for young workers in new low-skill jobs have also declined in those regions.

Adopting a more structural approach, Loayza et al. (2018) also analyze the labor market effect of Syrian refugee flows on Turkey's labor market. Their model considers both the location choices of refugees within Turkey and the decisions of companies to hire informal workers. Their analysis suggests that the inflow of refugees increases informal employment among low-skill native workers, but also increases the skilled-unskilled wage premium and induces regional migration of native workers to other regions.

[7]The negative effect on female workers is in line with the findings in Ruiz and Vargas-Silva (2018) and Ruiz and Vargas-Silva (2016). Using data for Tanzania, these authors showed that the arrival of refugees negatively affected the labor force participation of low-educated women.

Over the last year or two, some research has begun to analyze the economic effects of the exodus of Venezuelans on the surrounding countries. The existing work has so far focused on Colombia, the main receiever of Venezulean migrants. Caruso et al. (2019) analyze the effects of labor inflows from Venezuela on the Colombian labor market. Their instrumental-variables estimates suggest that wages in the informal sector in urban areas may have fallen by about 2 percent. Penaloza-Pacheco (2019) also finds evidence of large negative wage effects in Colombia's regions bordering Venezuela, with larger effects among low skilled workers and in the informal sector.

3 Context

3.1 The Venezuelan crisis

The progressive deterioration of Venezuela's institutions and democracy has triggered one of the most severe crisis in the western hemisphere in recent times. Between 2013 and 2018, Venezuela's GDP per capita fell by about 50% in real terms, comparable to the contractions experienced by Sierra Leone in 1991 and Rwanda in 1994. Venezuela has also been suffering from hyperinflation since the end of 2017. The IMF's world economic outlook estimates annual inflation in Venezuela for year 2019 at 200,000%.

As a result of these macroeconomic trends, poverty rates have skyrocketed: 9 out of 10 Venezuelans are below the poverty line in 2018 (Encovi 2018) and child mortality has risen to 26 per thousand live births. At the same time, Venezuela has become one of the countries in the world with the highest rates of crime and violence with 89 homicides per 100,000 inhabitants. The situation is even starker for women who face increased rates of violence and soaring death rates associated to childbirth.

Not surprisingly, Venezuela's economic and political collapse has given rise to a large exodus, mainly to other countries in Latin America and the Caribbean. It is estimated that, as of September 2019, approximately 4.3 million people have left Venezuela (i.e. about 13.6% of the country's population in 2016). The magnitude of this exodus is similar to the refugee crises in Syria, Afghanistan, Somalia and South Sudan (OEA (2019)).

As of 2018, about 80% of the Venezuelan migrants have resettled in Latin America. Colombia is the main receiving country, with an estimated 1.4 million Venezuelan migrants (WorldBank (2018)), followed by Peru (0.9 million, WorldBank (2019)) and

Ecuador (0.4 million) according to *Response for Venezuelans Platform*.[8] Due to its geographic location, bordering Colombia on the south-west, Ecuador is a natural destination for Venezuelan migrants that are unable to settle in Colombia. In addition, Ecuador's immigration laws are rather open to migration, in contrast to the adoption of increasingly restrictive immigration policies by other countries in Latin America.

At the beginning of the Venezuelan crisis, Ecuador provided a sort of *humanitarian corridor* for Venezuelan migrants in transit from Colombia to Peru and other countries in the Southern Cone. However, increasing numbers of Venezuelans have chosen to settle in Ecuador, particularly from 2017 onward. As a result, Ecuador is the third largest receiver of Venezuelan migrants, following Colombia and Peru. Most Venezuelans registered their entry into the country, but the Ecuadorian government estimates that more than half of the Venezuelans currently in Ecuador have *irregular status*.

3.2 Deteriorating economic conditions in Ecuador

The arrival of Venezuelan migrants has coincided with an unfavorable economic context in Ecuador. The sharp fall in oil prices since 2014 greatly reduced the rate of economic growth in the country. Lacking the ability to depreciate its currency and with limited access to external borrowing, the reduction in oil prices sharply decreased government revenue, forcing the government to cut its spending. As a result, GDP stagnated in 2015 and actually contracted by 1.2 percent in 2016.

In this context, labor market conditions worsened rapidly: the level and quality of employment fell and informality returned to its highest level in a decade. Between 2013 and 2018, the level of *adequate* employment fell by 66,000, reflecting job losses and the involuntary reduction in working hours.*Adequate employment* refers to the full-time employed earning at least the minimum wage, and to workers with part-time jobs that do not wish to work more hours. As we document later on, the worsening economic conditions since 2014 led to increases in the labor force participation rate, which is known to be countercyclical.

The economic downturn has also created challenging situations in the context of education and healthcare due to the clash between rising demand and reduced funding. Over the last decade, school enrollment rates have grown significantly in Ecuador but the resources allocated to the education system did not grow at the same rate and

[8]Curaao and Aruba have also received important inflows of Venezuelan migrants. As a result, the share of Venezuelan migrants in these countries' populations is now close to 15%. In comparison, the corresponding shares in Colombia, Peru and Ecuador are 2.8, 2.6 and 2.3 percent, respectively.

access and quality remain unequally distributed. These challenges are aggravated in the context of diminishing financing after 2014. Healthcare outcomes, such as maternal and child health, remain relatively low in comparison to other countries in the region. For instance, malnutrition rates remain higher than in Peru.[9]

4 Data

We merge data from two sources: Ecuador's Quarterly Labor Force Survey (known as ENEMDU), which provides the data for the labor market outcomes at the regional level, and novel data on the geographical distribution of the Venezuelan population in Ecuador based on mobile phone records by *Telefonica Ecuador*.

4.1 Household Survey Data: ENEMDU

ENEMDU is the official labor market survey for Ecuador.[10] It is a nationally representative household survey that collects information on individual characteristics, employment status and sources of income for individuals living in Ecuador.

Our analysis uses data for the fourth quarter of the ENEMDU for years 2008-2019, which we aggregate to the *canton* level.[11] But our regression analysis focuses on the period 2013-2018, which provides a tighter window around the onset of the arrival of Venezuelans into Ecuador.

Our analysis is based on the working-age population, defined as all individuals age 15 or above.[12] We analyze a wide range of canton-level labor market indicators: the participation rate, the employment-to-population ratio, and two indicators of the quality of employment (the rate of adequate employment and the rate of Informality). In addition, we also examine effects on monthly earnings and on hourly wages.[13]

[9]Likewise, social assistance in Ecuador remains below the 2012 level. To this date more than 50% of the population considered to be in extreme poverty lacks coverage by the system and social integration of the poor population is still very limited.

[10]*ENEMDU* stands for *Encuesta Nacional de Empleo, Desempleo y Subempleo*, that is, *National Survey on Employment, Unemployment and Underemployment*. For details on the methodology used in the ENEMDU survey, see ENEMDU Methodology.

[11]We eliminate the 21 smallest *cantons* in terms of population. Specifically, we drop cantons with fewer than 4,000 individual observations in the ENEMDU. As a result, our analysis is based on 200 of the 221 overall number of *cantons*. The data for 2019 corresponds to the second quarter, which was the most recent one available at the time of conducting the analysis.

[12]In constructing these indicators we use individual observations for all (working-age) individuals, regardless of nationality or country of birth.

[13]Our definition of the rates of adequate employment and informality use the working-age population

Since 2014, the data show increases in participation rate (Figure 1), which is known to be countercyclical, and employment to population ratios. The data also show a clear deterioration of the quality of employment. This can be seen in terms of a falling rate of *adequate* employment among the working-age population (Figure 2, top), and the sharp increase in informality (bottom). Last, the data also shows a reduction in monthly earnings since 2015 (Figure 3, top) and stagnating hourly wages in 2015-2017 followed by a sharp reduction in 2017-2019 (bottom).

4.2 Mobile phone records: *Telefonica Ecuador*

The main challenge to carry out the analysis was the need to obtain information on the size and geographic distribution of the Venezuelan immigrants in Ecuador. Prior to our study the existing information regarding the size of the Venezuelan population in Ecuador was mainly based on official records of net migration flows on a monthly basis. These data have two important limitations. First, what is being measured are the entries and exits, not the actual count of people. More importantly, the net migration estimates miss the foreign population that enters the country without registration at an official point of entry. Furthermore, no data were available at the time on the magnitude of unregistered entry.[14]

The knowledge of the geographic distribution of the Venezuelan migrant population was also severely limited. Characterizing this distribution is complicated by the high geographic mobility of this population and the lack of baseline information in the traditional datasets, such as the Population Census.

Our approach to address these challenges has been to rely on mobile phone records. More specifically, we contacted the two main cell phone providers in the country to request their collaboration. However, only *Telefonica Ecuador* had the technical capabilities to implement the data collection we proposed. In addition, this company was the only one with a large presence in the Venezuelan mobile phone market and, thus, could be expected to attract the majority of Venezuelans seeking to obtain cell phone service in Ecuador.

Telefonica Ecuador keeps millions of geocoded records of phone calls and data use

in the corresponding denominators. All canton-year aggregates have been computed using the survey weights.

[14]On July 25 2019, the government of Ecuador issued the Executive Decree 826 which establishes the implementation of a migration census and the requirements to access a humanitarian visa for migrants that entered legally but have overstayed their permits.

on a daily basis (known as CDRs). These data were the basis for the estimation of the number of cell phone lines pertaining to Venezuelan nationals along with their geographic distribution (at the level of Census tracts). This procedure had three separate stages:

1. **Activated mobile phones.** Specifically, a mobile phone was considered activated if it was used at least 60 times in 30 different days over the last 90 days. The uses considered were: turned on/off, received/initiated a call, received/sent a text message, or transferred data over the internet.

2. **Activated mobile phones belonging to Venezuelan nationals.** Activated mobile phones were considered as likely belonging to Venezuelan users if they were registered to a Venezuelan citizen or if was used at least 30 times over the previous 30 days to initiate/receive a call to/from Venezuela; to send/receive a text message to/from Venezuela; web searches or visits to websites considered of interest to the Venezuelan population (e.g. visa for Venezuelans, job opportunity, etc.).

3. **Assignment to a Census tract.** Each Activated Venezuelan mobile phone was assigned to the Census tract with the highest probability of containing the user's residence. This assignment was based on the events generated during the night time (8pm to 6am) since most users are likely to be in their homes during these hours.[15]

This method determines the number of *Telefonica Ecuador* users residing in each Census tract, together with how many of those are likely to be Venezuelan. These counts were later adjusted using canton-level weights on the basis of *Telefonica*'s market share in order to estimate the total counts of mobile phones pertaining to Venezuelans and to the overall population in the canton across all companies. We adjusted these figures further in order to account for the share of the population owning mobile phones on the basis of the overall number of households in the 2010 Population Census.[16]

[15]More specifically, each of the events listed earlier (phone calls, text messages, data transfer events) makes uses of one or several of the cell phone towers owned by *Telefonica Ecuador*. The cluster of geographic locations of the cell phone towers used more frequently during night time by each mobile phone was used to define the likely residence of the owner of the mobile phone device. In particular, the location of the residence was estimated to be the average of the centroids of the cell phone towers of the cluster, using as weights the number of events channeled through each of the towers. The coordinates of the residence are then mapped into the corresponding Census tract.

[16]Besides providing crucial information for our analysis here, these data were used to design a large survey known as EPEC. This has been designed to be representative of the Venezuelan migrant population in Ecuador as well as the Ecuadorian population residing in the host communities.

In the present study we utilize these data for two purposes. First, we empirically analyze the main factors determining the location of Venezuelan migrants across Ecuador's *cantons*.[17] Second, we use the data to classify *cantons* according to the estimated density of Venezuelan migrants in the cantons population. This allows us to compare the within-canton changes in labor market outcomes for *cantons* with varying densities of Venezuelans in their population.

At the country level, we estimate that about 470,095 Venezuelans were living in Ecuador in the first quarter of 2019. This amounts to about 3% of the population. Table 1 presents the top 10 *cantons* by the estimated number of Venezuelan migrants (top panel) and by the share in the working-age population in the canton (bottom panel). As shown in the top panel, there is high regional variation, ranging from *cantons* hosting almost 90,000 Venezuelan migrants (Guayaquil and Quito) to others having virtually none. In fact, four *cantons* concentrate 52% of the 470,095 Venezuelan migrants estimated in the *Telefonica* data: Guayaquil (87,505), Quito (86,386), Manta (32,405), and Santo Domingo de los Tsachilas (26,721).[18]

5 The Location Choices of Venezuelans in Ecuador

The goal of this section is to employ regression analysis to quantify the role played by a variety of geographic and economic factors in determining Venezuelans' choice of region (defined as a canton) in the vein of Beine et al. (2019).[19]

The geographic factors we consider are the distances from each canton to the main gateways into Ecuador for Venezuelans. According to the Ecuador's official entry records, the majority of Venezuelans entered Ecuador by land from Colombia, through the Rumichaca bridge in the Tulcan canton (82%). Other land points of entry were San Miguel (5%) and Huaquillas (7%). Almost all other Venezuelans arrived by air through the airports of Quito and Guayaquil (5%). In our analysis, we focus on 3 gateways: the Rumichaca bridge and the airports of Quito and Guayaquil.[20]

The second set of factors we consider measure economic conditions at the canton level.

[17] Ecuador is divided into 24 provinces, in turn subdivided into 221 *cantons*.

[18] The highest concentrations of Venezuelans, relative to the canton's population, are found in a few sparsely populated cantons. The ENEMDU survey cannot be representative of those populations. Accordingly, we omit them from our regression analysis.

[19] This exercise is in the spirit of gravity models of trade and migration flows, but considering a single origin and multiple destinations.

[20] More specifically, we compute the Euclidian distance between each of the points of entry and each canton's centroid.

Specifically, we use ENEMDU to estimate regional income using aggregate earnings at the canton level. In addition we also include the employment-to-population ratio (for natives) in the canton and the share of the native population with secondary and tertiary education.

The empirical model we estimate is the following: Vz_c denotes the number of Venezuelans that settled in canton c (though we will also consider a logarithmic transformation of this variable). The right-hand side contains the (logs) of the distance to the three gateways (denoted by a single regressor $\ln Dist_c$ for simplicity) and the economic indicators of the region (X_c) along with a disturbance term:

$$Vz_c = \alpha + \beta \ln Income_c + \gamma \ln Dist_c + \varepsilon_c. \tag{1}$$

We estimate this model using data on the geographic distribution of Venezuelans in 2019 and ENEMDU data for that same year. Table 2 collects the estimates. In columns 1-3 the dependent variable is the number of Venezuelans settled in the canton in 2019 (estimated using the $Telefonica$ data) in thousands. Column 1 includes only our measure of regional income, based on the wage bill in each canton.[21] The estimates show a positive and significant coefficient, suggesting that Venezuelans were attracted to higher-income cantons. Column 2 adds the logs of the distance from the canton to the three main gateways. We expected negative coefficients, indicating that migrants tend to remain close to the points of entry. However, this is only the case regarding the airports but the coefficients are not statistically significant at conventional levels. In both specifications, the coefficient for the log of the wage bill is around 3, implying that regions with 1% higher income receive about 3,000 Venezuelan migrants than otherwise similar cantons. In column 3, we decompose the wage bill into two components: employment and average wage per worker. In both cases the coefficients are highly significant and are close to 3. Thus Venezuelan migrants are equally attracted to regions with higher levels of employment and higher wages per worker.

Columns 4-6 estimate the elasticity of migration to regional income, by employing logarithmic transformations of both the dependent and the explanatory variables. In column 4 the transformation is simply the log of the corresponding variables. In columns 5 and 6 we use the inverse hyperbolic sine transformation, which is defined at zero and thus preserves the sample size. These estimates show that the elasticity is around 0.5,

[21] Recall that, in many contexts, overall GDP is close to proportional to the wage bill. From a theoretical viewpoint, this is exactly the case in a competitive economy when the aggregate production function is Cobb-Douglas.

that is, *cantons* with 10% higher income receive 5% more Venezuelan migrants than otherwise similar cantons. The estimated coefficients for the distance to the gateways are typically negative, as expected, but the magnitudes are small and imprecisely estimated.

In conclusion, the estimates show that Venezuelan migrants are highly geographically mobile and that their location choices are fundamentally driven by the economy of the receiving region. It is interesting to note that our findings differ from those reported in Beine et al. (2019), which analyzes the determinants of the location choices of Syrian refugees across provinces in Turkey using a similar estimation approach. Their analysis shows a large and highly significant effect of distance and local policy interventions (such as boycotts and availability of economic aid), but they do not find that economic activity at destination (measured by night-lights intensity) plays a role in shaping the migrants' locations decisions.

6 Labor Market Effects

We now turn to our main goal in this paper, the estimation of the effects of Venezuelan migration on Ecuador's regional labor markets. Our analysis relies on the comparison of the changes in local labor market conditions in areas that received large inflows of Venezuelans (relative to population), versus areas that did not, around the main period of arrival of the migrants. Importantly, we also examine whether the effects of immigration differ across different groups of workers, defined by education, age and gender.

6.1 Summary Statistics

We focus on the working-age population (age 15 and higher) and construct a variety of canton-year labor market outcomes: participation rate, employment-to-population ratio, the rate of adequate employment (relative to the working-age population), the rate of informality (defined as employment over working-age population), the log of earnings and the log of hourly wages.

Table 3 presents summary statistics. We use one quarterly survey per year for the period 2013-2019. The resulting number of canton-year observations is 1,413. The (simple) mean working-age population across years and *cantons* is almost 58,000 individuals, corresponding to a 68% participation rate. Mean employment across *cantons* and years is slightly over 36,000 individuals, entailing an employment-to-population ratio of 66%. In addition, for the average canton-year cell, 21% of the working-age population have

adequate employment and 44% are employed informally. Last, average monthly earnings were $331 and average hourly wages stood at $2.6 (at current prices).

The table also reports our estimates of the number of Venezuelan migrants in each canton as of the summer of 2019. The average across *cantons* is 2,312 individuals, with a wide range of variation. While it is estimated that some *cantons* had zero Venezuelan migrants, in Quito the estimated count is 87,505 individuals. As a percent of the population in the canton, the average across *cantons* is 3.8% but also displays large variability.[22] As a percent of the population in Ecuador, our mobile records data imply that Venezuelan migrants make up 2.8% of the overall population and 3.7% of the working-age population.

Our analysis relies on the comparison of the changes in labor market outcomes (for different socio-demographic groups) across *cantons* that differ in the *density* of Venezuelan migrants relative to the canton's population. More specifically, we classify all *cantons* into three groups: low density ($< 2.5\%$), medium density (between 2.5 and 5%) and high density of Venezuelans ($> 5\%$). Our regression analysis will compare the evolution of several labor market indicators in the medium and high density groups relative to the low-density group before and after 2016, which we take as the first year with important inflows of Venezuelan migrants.[23] The cantons of Quito and Guayaquil together make up 32% of the working-age population in Ecuador. The low-density group contains 96 cantons, the medium density contains 51 cantons and the high density contains 31 cantons. In terms of working-age population, the low, medium and high groups account for 33%, 53% and 14%, respectively.

6.2 Estimation Labor-Market Effects

Our main analysis is based on a difference-in-difference estimation approach, applied to canton-level labor market indicators defined for several groups of workers differing on their gender, age and educational attainment.

In all cases, our main specification is as follows:

[22] As seen in Table 3, the Venezuelan share in the population ranges from 0% to 78.3%. The latter figure corresponds to one of the *cantons* with very low population. Since the ENEMDU is not representative for these *cantons*, we exclude the canton-year cells with the lowest population from our estimation sample. For most years, our sample contains 200 out of the total of 221 cantons in Ecuador.

[23] It is worth noting that the two *cantons* with the largest numbers of Venezuelan migrants (Quito and Guayaquil) are in the medium-density group. We estimate the density of Venezuelan migrants in the working-age population of these two cantons at 4.3% (Table 1).

$$y_{c,t} = \alpha_c + \lambda_t + Post_t \times (\beta_1 T1_c + \beta_2 T2_c) + u_{c,t}, \tag{2}$$

where the dependent variable will be one of the labor market outcomes. The right-hand side of the model includes canton and year dummies. The latter account for aggregate economic fluctuations, such as the downturn affecting Ecuador in 2014 and the years that followed, which clearly impacted labor market outcomes at the national level.

The $Post_t$ is an indicator taking a value of one for years 2016-2019 and zero prior to that (2013-2015). The key explanatory variables are $T1_c$ and $T2_c$. These indicator variables identify *cantons* with, respectively, a medium ($2.5 - 5.0\%$) and high ($> 5\%$) density of Venezuelan migrants in the canton's population in year 2019. The omitted category are *cantons* with the lowest density of Venezuelans ($< 2.5\%$).

Table 4 presents the estimates. The top panel estimates the models using the labor market indicators constructed using the whole working-age population. The estimates do not indicate any effects of Venezuelan migration on participation or employment rates, that is, we do not detect deviations in these labor market indicators of the high-Venezuelan-density regions in the post-2016 period relative to the low-density regions. However, the estimates do suggest a worsening in employment conditions, measured by the adequate employment and informality rates, along with reductions in monthly earnings and employment, in the regions receiving Venezuelan migrants. The magnitudes are relatively small but with a clear pattern of larger effects (in absolute value) in the regions with the highest density of Venezuelan migrants (identified by indicator $T2$).

Next, we turn to the labor-market indicators for the female population, which the literature has often shown to be adversely affected by inflows of refugees (e.g. Ceritoglu et al. (2017), Tumen (2016), DelCarpio and Wagner (2015), Ruiz and Vargas-Silva (2018)). The second panel in Table 4 presents estimates based on the indicators for the female working-age population. In this case the estimated coefficients are very small and none is statistically significant at conventional levels. Thus, it does not seem to be the case that the labor market conditions of Ecuadorian women are being affected by the arrival of Venezuelan migrants.

The third panel in Table 4 focuses on the labor market indicators referring to young workers (ages 15-40) with low educational attainment, defined as having completed at most primary education. Once again, we do not find evidence of effects on the participation or employment rates. However, a clear pattern emerges suggesting substantial worsening of the quality of employment and earnings for this group of workers in the

regions with a high density of Venezuelan migrants. More specifically, the estimates imply that the rate of adequate employment fell by 6 percentage points after 2016 in the regions with a high concentration of Venezuelan migrants relative to the regions with the lowest concentration. Likewise, the rate of informality would have increased by 5 percentage points, in line with the findings of the studies analyzing the effects of the inflows of Syrian refugees on regional labor markets in Turkey (Ceritoglu et al. (2017), Tumen (2016), DelCarpio and Wagner (2015)) and of the arrivals of Venezuelans to Colombia (Caruso et al. (2019)).

We also find evidence of a reduction in earnings, with monthly and hourly earnings falling by 20 and 13 log points, respectively, in the high Venezuelan density regions ($T2$) relative to the low density regions. While statistically significant, it is worth noting that the wage effects are estimated with limited precision. Therefore it is quite possible that the true effects may be of a substantially smaller magnitude. At any rate, our finding is consistent with the negative wage effects estimated by DelCarpio and Wagner (2015) in the case of Turkey. Last, we also note that the pattern of the estimated coefficients is similar for the regions with medium levels of Venezuelan migration relative to their population ($T1$), but the magnitudes are much smaller and we cannot reject the zero null hypothesis.

It is interesting to compare the effects on the indicators for low-educated workers to those for workers with tertiary education (and ages 15-40), presented in the bottom panel. The estimates suggest substantial reductions in participation and employment (of about 11 log points) for these workers in the regions with high concentrations of Venezuelans, but no evidence of worsening in the quality of employment or reductions in wages. In fact, the estimates show a large *reduction* in informality (relative to the working-age population) for these workers after 2016 in the regions with high density of Venezuelans. A plausible interpretation for these findings is that, in regions receiving large inflows of Venezuelans, young Ecuadorian workers with at least some college education may have responded to the inflows by extending their educational investments. Relative to other regions, they may have chosen to undergo more years of college education.

In sum, the above estimates suggest that high concentrations of Venezuelan migrants in terms of the population of a canton are associated to substantial worsening of the quality of employment and wages for young, low-educated workers. It is important to keep in mind that our labor market indicators were constructed using all individual observations, regardless of nationality or place of birth. Thus the labor market outcomes of the Venezuelan migrants are also reflected in the aggregate indicators, which could

introduce compositional effects. We return to this point in the robustness section below.

Before embracing a causal interpretation of the relationship between the concentration of Venezuelan migrants in a region and the worsening quality of employment for low-educated workers in that region, it is important to note that this relationship might be spurious. For instance, this would be the case if Venezuelans had chosen to settled in regions that were already experiencing a worsening of the economic conditions among low-educated workers. However, this seems implausible in light of our analysis of the determinants of the geographic distribution of Venezuelans. As we discussed earlier, Venezuelan migrants gravitated toward the higher-income regions in Ecuador. Hence, they probably chose to locate disproportionately in the regions with *faster* growing economies. Thus, if anything, our difference-in-difference estimates may understate the negative effects on the quality of employment and earnings of young, low-educated Ecuadorian workers.

6.3 Dynamic Effects

Next, we focus on earnings and hourly wages, and estimate more flexible models, in the spirit of event studies. The purpose of these models is twofold. First, they allow us to assess the *parallel trends assumption*, required to interpret difference-in-difference estimates causally. Secondly, the estimation of these models provides useful information regarding the evolution over time of the estimated effects of the inflows of Venezuelans.

Specifically, we restrict the analysis to low-educated workers (ages 15-40) and focus on their monthly and hourly earnings. The models we estimate for the (logs) of these dependent variables are as follows:

$$y_{c,t} = \alpha_c + \lambda_t + \beta_t^1 T1_c + \beta_t^2 T2_c + u_{c,t}, \tag{3}$$

where now the coefficients associated to the "treatment" indicators are allowed to vary on an annual basis.

We present the resulting estimates graphically. Figure 4 (top) plots the estimates for the log of monthly earnings. The Figure shows parallel trends up until 2016 for the low (solid blue line) and high (dashed green line) regions in terms of the concentration of Venezuelans in the canton population. After that year, we observe a dramatic divergence between these two groups: an upward trend for the low concentration *cantons* and a downward trend for the high concentration. The estimates for the group of cantons with the medium concentration of Venezuelans are less informative, although the figure

suggests an upward trend in earnings between 2014 and 2016, which seems to be reversed after 2016.

Similarly, Figure 4 (bottom) plots the estimates corresponding to the log hourly wage. The Figure shows parallel trends up to 2016 for the groups of cantons defined as having low (solid blue line) and high concentration of Venezuelans (dashed green line) *cantons*. Though less dramatic than in the case of monthly earnings, we again observe a divergence of the two series after year 2016. As before, the estimates for the cantons with medium concentration of Venezuelans are more erratic and less informative, but also consistent with a reversal in the upward wage trend after 2016.

Taken together, these two figures provide evidence in support of the parallel trends assumption, in the years prior to the arrival of Venezuelans, in *cantons* that would eventually receive the highest and the lowest arrivals of Venezuelans relative to the size of their populations. Thus, a causal interpretation is reasonably plausible.

6.4 Robustness

As noted earlier, our main estimation sample includes all individuals (age 15 or above) living in Ecuador, regardless of country of birth. It is thus possible that the worsening conditions for low-educated workers in the cantons with a high concentration of Venezuelans might be partly due to a compositional effect. That is, the recently arrived Venezuelan migrants are probably employed in low-quality employment with high rates of informality, as one would expect on the basis of the studies of the labor market effects of Syrian refugees in Turkey (Ceritoglu et al. (2017), Tumen (2016), DelCarpio and Wagner (2015)), which would adversely affect the composition of employment in terms of informality and earnings.

While entirely possible, these compositional effects are unlikely to be quantitatively important in the case of Ecuador. The reason is that new evidence from a new survey on the Venezuelan population in Ecuador indicates that the average education level of Venezuelan workers is substantially higher than for their Ecuadorian counterparts.[24] At any rate, here we address this concern by removing all foreign-born individuals from the ENEMDU micro data prior to creating our canton-level labor market indicators. Table 5 presents our difference-in-difference estimates based on the only-natives sample. As it turns out, the estimates that we obtain here are practically identical to the main

[24]EPEC is a survey conducted in the summer of 2019 that will soon become available. According to a preliminary version of these data, 35% of Venezuelans in Ecuador have tertiary education, compared to 15% among Ecuadorian nationals.

estimates we discussed earlier (Table 4).

In light of these estimates and the event studies presented earlier, we believe that the most plausible interpretation of our findings is that increased competition from Venezuelan migrants adversely affected the quality of employment and earnings of young, low-educated Ecuadorian workers.

7 Conclusions

Using data from Ecuador's labor force survey (ENEMDU) merged with new data on the geographic distribution of Venezuelan migrants across Ecuador, this paper has analyzed the location choices of Venezuelans within Ecuador and the labor market consequences of these choices.

Our analysis has shown that Venezuelans' location choices have been fundamentally driven by the size of regional economies, measured by the wage bill at the canton level. We have also grouped Ecuador's cantons as a function of the size of the Venezuelan population living in the canton relative to its population size, and produced difference-in-difference estimates of the labor market effects of Venezuelan inflows. The estimates clearly indicate that young, low-educated Ecuadorian workers have been adversely affected. Specifically, they have experienced reductions in the quality of their employment, increases in informality, and declining earnings, relative to workers with similar characteristics living in cantons with very low or non-existing inflows of Venezuelans.[25]

Our findings are in line with recent studies analyzing the labor market effects of Syrian refugee inflows into Turkey that also find that the newly arrived migrant workers have found employment mainly in informal jobs, placing the burden of the adjustment disproportionately on the more vulnerable workers in the main host regions. These effects are also highly localized in a few regions, suggesting the use of targeted interventions to alleviate the economic burden falling on the vulnerable groups of workers in those regions.

Last, it is important to highlight that these adjustment costs can lead to an increase in economic prosperity, both for the migrants and the hosting regions. The inflow of migrant labor is likely to spur investment and the creation of new businesses, generating economic opportunities that can benefit both migrant and domestic workers. The Ecuadorian government could adopt policies to speed up this process and to help

[25]It is also worth noting that our identification strategy accounts for the general economic slowdown affecting Ecuador since 2014.

Venezuelan migrants access jobs that make use of their skills and educational credentials. More specifically, the government should consider granting formal labor market access, as advocated by Clemens et al. (2018), which will not also help shift the burden away from the most disadvantaged groups of workers, but also increase the productivity of Venezuelan migrants, both as workers and entrepreneurs.

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Table 1: Estimated Venezuelan Population (2019Q1) by *canton*

Canton	Canton Name	Province	Venezuelans	Venez/WAP %
Top 10 cantons				
901	GUAYAQUIL	GUAYAS	87,505	4.3
1701	QUITO	PICHINCHA	86,386	4.3
1308	MANTA	MANABI	32,405	3.6
2301	STO. DOMINGO TSACHILAS	STO. DOMINGO	26,721	7.0
101	CUENCA	AZUAY	14,055	3.1
701	MACHALA	EL ORO	11,344	5.2
1301	PORTOVIEJO	MANABI	9,663	4.5
801	ESMERALDAS	ESMERALDAS	7,805	3.5
1001	IBARRA	IMBABURA	7,524	7.8
2403	SALINAS	SANTA ELENA	7,460	24.4
All cantons				
Mean			2,103	3.7
Min			0	0
Max			87,505	78.3
Std. dev.			8,734	4.9

Notes: Data from *Telefonica Ecuador*, first quarter 2019. The last column is the ratio between the estimated number of Venezuelans in the canton and the working-age population in December 2018 (ENEMDU). The top panel reports on the top 10 cantons by overall number of Venezuelans living in the canton. The bottom panel of the table presents summary statistics on the 221 cantons in Ecuador.

Table 2: Geographic distribution Venezuelan population 2019 across *cantons* in Ecuador

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Vz2019	Vz2019	Vz2019	ln Vz2019	ln2 Vz2019	ln2 Vz2019
ln wage bill	3.17***	2.85***		0.67***	0.46***	
	[1.18]	[0.96]		[0.06]	[0.04]	
ln emp			2.84***			0.48***
			[1.00]			[0.05]
ln avg wage			2.85**			0.44***
			[1.19]			[0.09]
ln dist Rumichaca		0.93	0.93	-0.35***	-0.13	-0.14
		[2.81]	[2.83]	[0.13]	[0.10]	[0.10]
ln dist Airport Quito		-2.50	-2.50	0.04	-0.01	0.00
		[4.07]	[4.12]	[0.15]	[0.14]	[0.14]
ln dist Airport Guayaquil		-1.45	-1.45	-0.20*	-0.12	-0.11
		[2.40]	[2.38]	[0.10]	[0.08]	[0.08]
Constant	-53.38***	-32.34***	-5.65	-9.36***	-6.01***	-2.05**
	[20.40]	[9.85]	[8.89]	[1.62]	[1.12]	[0.95]
Observations	182	182	182	158	182	182
R-squared	0.26	0.28	0.28	0.58	0.60	0.61

Notes: The unit of observation are cantons. Out of the 221 *cantons* in Ecuador, 21 were discarded because of their small population size. Out of the remaining 200, only 182 could be matched both in ENEMDU and in *Telefonica* data. The canton aggregates (e.g. wage bill) are computed using the survey weights. In columns 1-3 the dependent variable is the count of Venezuelans in the canton in 2019 (in thousands). In column 4 the dependent variable is the log of the number of Venezuelans in 2019. Because some *cantons* have zero Venezuelan migrants the number of observations is lower. In columns 5-6 we employ a different logarithmic transformation, the inverse hyperbolic transformation, which has the advantage of being well defined at zero. The interpretation of the coefficient as an elasticity is the same as in the usual log transformation. In columns 4-5 the explanatory variables are also transformed in the same way as the corresponding dependent variable. The inverse hyperbolic transformation is defined by $f(x) = \ln(x + \sqrt{1 + x^2})$ and we denote it by *ln2*. Standard errors are heteroskedasticity-robust. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Summary statistics ENEMDU 2013-2019

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	1,413	2016.006	1.987	2013	2019
Working-age population (WAP)	1,413	57885.42	187275.8	234.465	2028898
Labor-market participants	1,413	38051.45	120467.4	174.699	1289999
Employment	1,413	36377.61	114060.5	174.699	1248643
Employment - Adequate	1,413	16547.62	69000.53	0	783017.6
Employment -Informal	1,413	20555.01	54680.81	124.128	673030.9
Venezuelans 2019	1,413	2311.8	9160.554	0	87505
Vz2019/WAP	1,413	.038	.054	0	.783
Earnings - monthly	1,413	331.58	169.28	35.2	2576.43
Earnings - hourly	1,413	2.59	.988	.304	16.538
Participation rate	1,413	.685	.106	.36	1
Employment rate	1,413	.664	.111	.36	1
Emp. Adequate / WAP	1,413	.213	.108	0	.711
Emp. Informal / WAP	1,413	.444	.164	.065	1

Notes: ENEMDU 2013-2019, for all the 221 cantons. Participation rate = Participants/WAP, Employment rate = Employment/WAP. Earnings are in USD.

Table 4: Difference-in-Difference Estimates, 2013-2019.

Dep. Var.	(1) PR LF/WAP	(2) ER Emp/WAP	(3) AER AdeEmp/WAP	(4) InformR Inf/WAP	(5) Ln Earnings	(6) Ln wh Ln Earnings/Hours
All workers						
Post × T1	0.01	0.01	-0.00	0.02**	-0.01	-0.02
	[0.008]	[0.008]	[0.007]	[0.011]	[0.032]	[0.030]
Post × T2	0.00	0.00	-0.02**	0.03**	-0.04	-0.05
	[0.009]	[0.009]	[0.008]	[0.012]	[0.037]	[0.034]
Female workers						
Post × T1	-0.02	-0.02	-0.01	-0.00	-0.04	-0.02
	[0.014]	[0.015]	[0.008]	[0.015]	[0.068]	[0.049]
Post × T2	-0.01	-0.01	-0.01*	0.02	0.01	-0.01
	[0.014]	[0.014]	[0.008]	[0.015]	[0.065]	[0.047]
Primary1540						
Post × T1	-0.02	-0.02	-0.02	0.02	-0.04	0.01
	[0.030]	[0.031]	[0.027]	[0.039]	[0.097]	[0.076]
Post × T2	0.00	-0.01	-0.06***	0.06**	-0.20***	-0.13**
	[0.021]	[0.022]	[0.019]	[0.028]	[0.068]	[0.053]
Tertiary1540						
Post × T1	0.05	-0.06	0.01	-0.11	-0.03	-0.08
	[0.101]	[0.107]	[0.110]	[0.102]	[0.248]	[0.198]
Post × T2	-0.12***	-0.11***	-0.01	-0.11***	0.03	-0.01
	[0.038]	[0.041]	[0.042]	[0.039]	[0.099]	[0.079]
Obs.	1,292	1,292	1,292	1,292	1,292	1,292
N. cantons	200	200	200	200	200	200

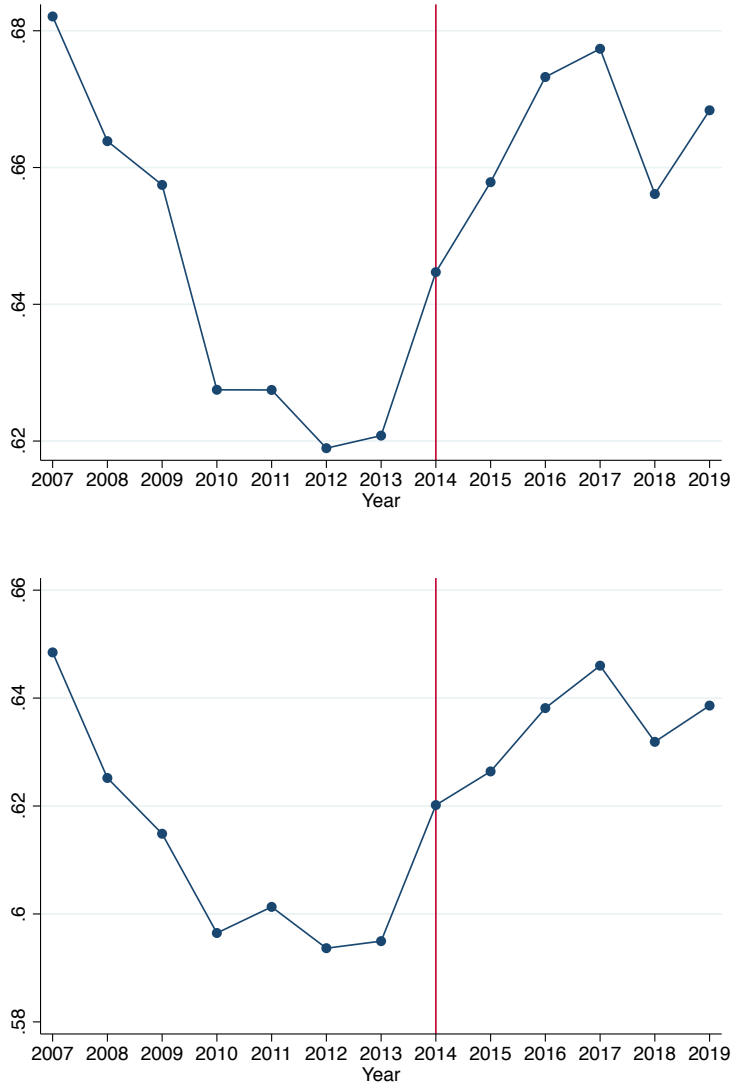
Notes: The data source is ENEMDU 2013-2019 (population age 15 or above) merged with the canton-level density of Venezuelans in 2019. *Post* indicator takes value of one for years 2016-2019. We have excluded the bottom 10% of *cantons* with the lowest population. Standard errors are heteroskedasticity-robust. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Difference-in-Difference Estimates, 2013-2019. Only Natives

Dep. Var.	(1) PR LF/WAP	(2) ER Emp/WAP	(3) AER AdeEmp/WAP	(4) InformR Inf/WAP	(5) Ln Earnings	(6) Ln wh Ln Earnings/Hours
All workers						
$Post \times T1$	0.01	0.01	-0.01	0.02**	-0.02	-0.02
	[0.008]	[0.008]	[0.007]	[0.011]	[0.032]	[0.030]
$Post \times T2$	0.00	0.00	-0.02**	0.03**	-0.04	-0.05
	[0.009]	[0.009]	[0.008]	[0.012]	[0.037]	[0.034]
Female workers						
$Post \times T1$	-0.01	-0.02	-0.01	0.00	-0.03	0.01
	[0.015]	[0.015]	[0.008]	[0.015]	[0.069]	[0.050]
$Post \times T2$	-0.01	-0.01	-0.01	0.02	0.01	0.00
	[0.014]	[0.014]	[0.008]	[0.015]	[0.066]	[0.047]
Primary1540						
$Post \times T1$	-0.02	-0.02	-0.03	0.02	-0.04	0.01
	[0.030]	[0.031]	[0.028]	[0.040]	[0.102]	[0.079]
$Post \times T2$	0.01	-0.01	-0.06***	0.06**	-0.21***	-0.14***
	[0.021]	[0.022]	[0.019]	[0.028]	[0.070]	[0.054]
Tertiary1540						
$Post \times T1$	0.04	-0.06	0.03	-0.12	-0.02	-0.08
	[0.101]	[0.107]	[0.110]	[0.102]	[0.248]	[0.199]
$Post \times T2$	-0.12***	-0.11***	-0.01	-0.11***	0.04	-0.00
	[0.038]	[0.041]	[0.042]	[0.039]	[0.099]	[0.079]
Observations	1,292	1,292	1,292	1,292	1,292	1,292
Number of canton	200	200	200	200	200	200

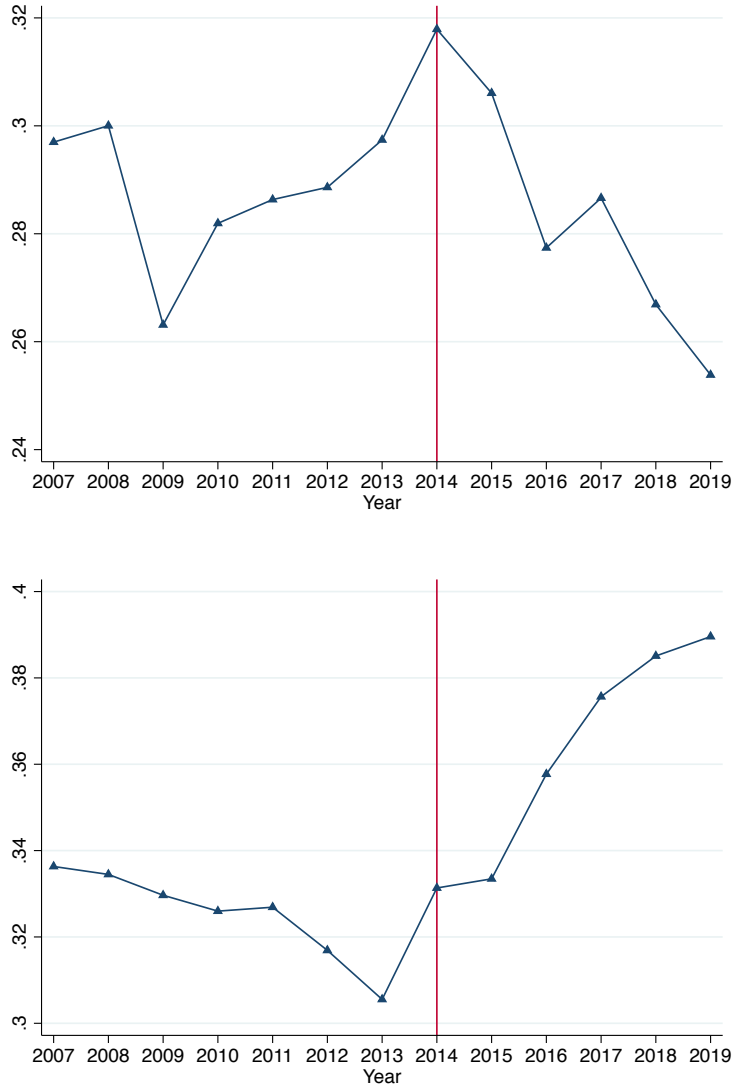
Notes: The data source is ENEMDU 2013-2019 (population age 15 or above and born in Ecuador) merged with the canton-level density of Venezuelans in 2019. *Post* indicator takes value of one for years 2016-2019. We have excluded the bottom 10% of *cantons* with the lowest population. Standard errors are heteroskedasticity-robust. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 1: Participation rate (top) and Employment-to-Population ratio (bottom)



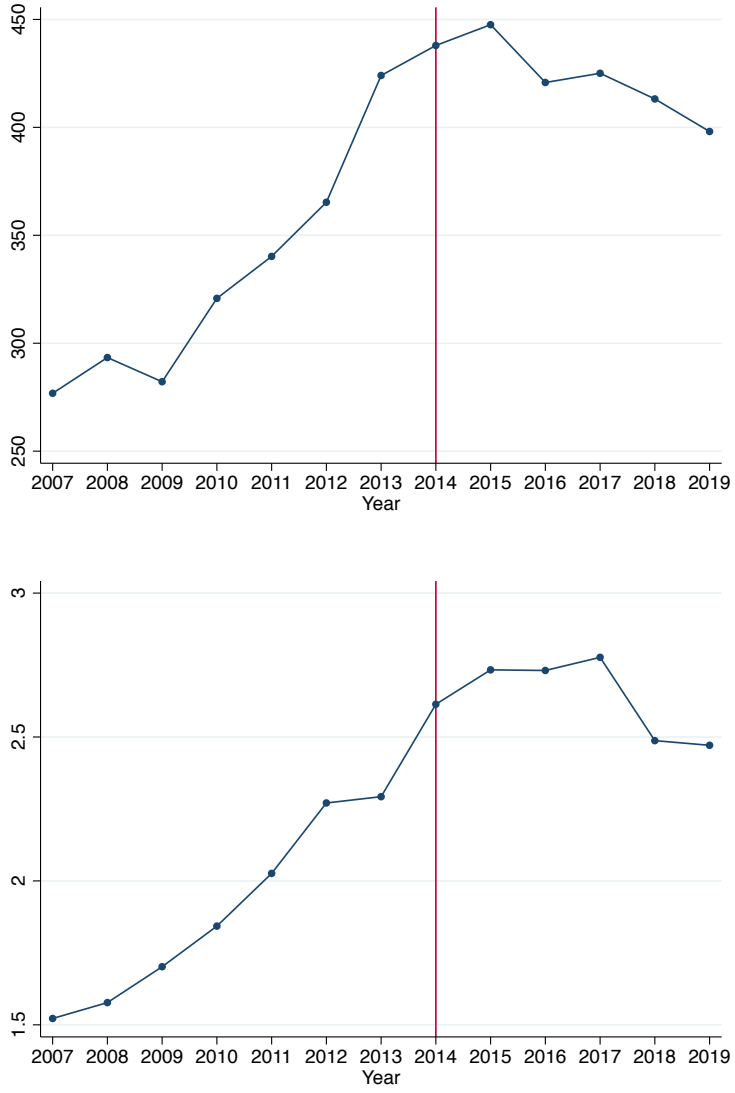
Notes: The figures plot the participation rate (top) and employment-to-population rate for Ecuador as a whole. In both cases, the denominator is the working-age population. The data is ENEMDU 2007-2019.

Figure 2: Adequate Employment rate (top) and Informality rate (bottom)



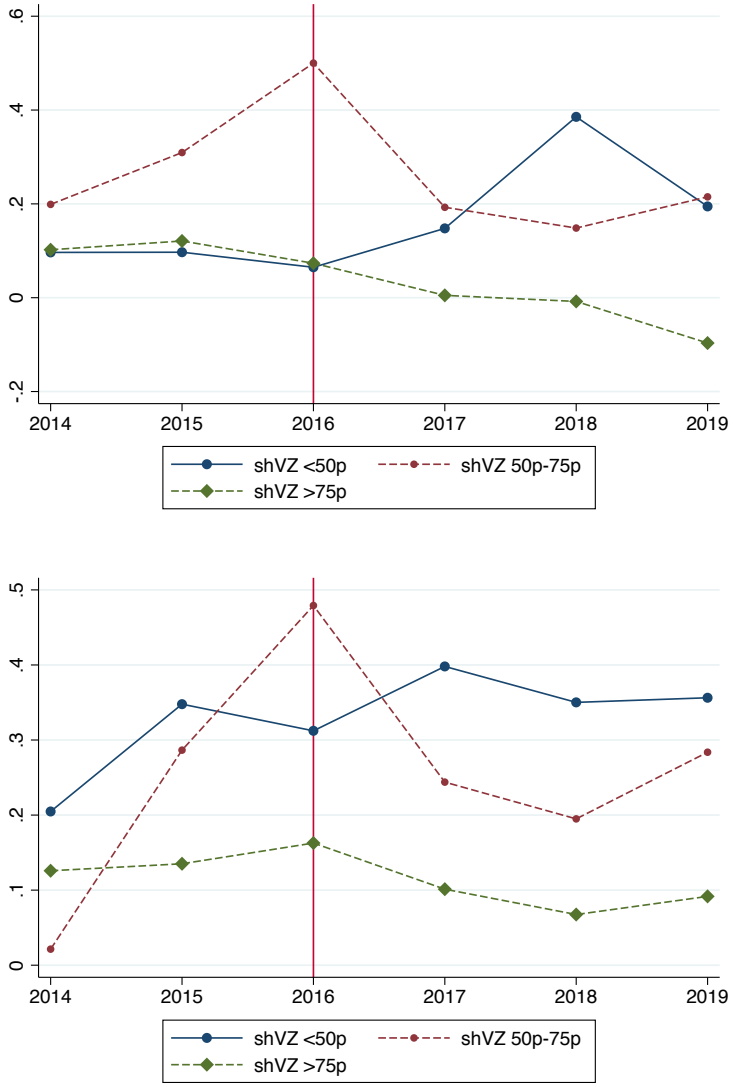
Notes: The figures plot the ratio of adequate employment to working-age population (top) and the ratio of informal employment to working-age population (bottom) for Ecuador as a whole. In both cases, the denominator is the working-age population. The data is ENEMDU 2007-2019.

Figure 3: Monthly earnings (top) and Hourly wages (bottom) in US $



Notes: The figures plot the average monthly earnings (top) and the average hourly wage (bottom) for Ecuador as a whole. The data is ENEMDU 2007-2019.

Figure 4: Event Studies: Log Earnings (top) and Log Wages (bottom)



Notes: The figures plot the estimated coefficients corresponding to Equation (3) for the log of monthly earnings (top figure) and for the log of hourly wages (bottom figure). The dependent variables are constructed as canton-level means for the sample of young workers (age 15-40) with low education levels (i.e. at most primary education completed).