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Living with the neighbors: The effect of Venezuelan forced migration on wages in Colombia

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Abstract

The aim of this paper is to estimate the causal effect of the migration of Venezuelans to Colombia on the Colombian real wage, since 2016. In the second semester of 2016, the borders between Colombia and Venezuela were reopened after a year of being closed due to a political crisis between the two countries; this re-opening is exploited as an identification strategy. Using data from the Unidad Administrativa Especial de Migración Colombia and the Registro Administrativo de Migrantes Venezolanos in Colombia, it is estimated that the migratory flow of Venezuelans to Colombia increased the Economically Active Population of the border areas of La Guajira and Norte de Santander by approximately 10% and 15%, since its reopening. Differences-in-differences methodology and Synthetic Control Method are implemented and the results show that the increase in labor supply in these regions that resulted from the migratory flow generated a decline in real hourly wages of approximately 6%-9% on average. This decrease in real wages appears to be greater for men as compared to women. There is also evidence of a greater drop in real wages among people with lower levels of qualification and in conditions of informal employment.

JEL Classification: J31, J61, F22.

Keywords: Migration, Wages, Colombia, Venezuela

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1. Introduction

One of the main issues of study for labor economists over the last three decades has been the economic impact of migration on the labor markets of recipient countries. Intense debate has arisen over whether an increase in labor supply, as product of migratory flows, has a significant impact on labor market variables, particularly on workers' real wages in regions that are marked by considerable increases in labor supply.

According to Borjas (2017) this type of analysis is relevant in that it can be used to inform economic policy decisions that might mitigate the negative effects of migration, if they do in fact exist. Most of the literature related to the analysis of the impact of migration on the labor market has taken as exogenous the variation in the arrival of migrants, generally refugees, as a consequence of a crisis or an extraordinary event in their countries or regions of origin (see for example Card, 1990; Hunt, 1992; Carrington and De Lima, 1994; Borjas, 2017; among others).

Much of the analysis centers on the idea that, following a supply-demand framework in the labor market and given a labor demand with a negative slope, ceteris paribus, a strong shock to the labor supply via a migratory flow, would generate a significant drop in real wages earned by workers.

In this paper an exogenous change in the Colombian labor market is exploited: the migration of Venezuelans to Colombia beginning in the second half of 2016. At that time, as will be explained below in more detail, there was a significant migratory influx of Venezuelans to Colombia when the borders between the two countries were reopened after about a year of being closed.

The wage variation in Colombia's border regions which were most affected will be analyzed, given this exogenous shock of labor supply. Differences-in-differences and synthetic control methodologies are applied in order to estimate the causal effect on aggregate wages, ensuring the robustness of the results with heterogeneous effects on population subgroups by sex, level of qualification, and labor formality.

This paper contributes to the growing literature of papers that analyze massive flows of forced migrants, mainly refugees, from developing to developing countries. In general, in the literature most of the papers have analyzed the flow of migrants from developing countries to developed countries (See for example Card, 1990; Hunt, 1992; Borjas, 2003 and 2007; Foged and Peri, 2016; among others). In addition, there are some other papers that analyze the migration from developed countries to developed

countries (See for instance Beerli, Ruffner, Siegenthaler and Peri, 2018).

In the cases of developing-developed migration, labor that enters the labor market of the receiving country is quite different from the workforce already settled there. In this paper, however, the impact of migratory flow is analyzed between two developing countries (Colombia and Venezuela) that, due to their history, are very similar in social and demographic terms. Given this, a greater substitutability between migrant labor and native workers would be expected, resulting in a significant negative effect on wage.

Considering the literature of migration from developing to developing countries, one of the most recent episode of this kind of massive forced migrations is the one generated because of the Syrian conflict. Some papers have analyzed this massive migration and the effect it could probably have on the borders labor market, specially in Jordan and Turkey.

Malaeb and Wahba (2018) analyze the effect of the flow of Syrian refugees to Jordan on the labor market, showing a decline in total wage post-migration of economic immigrants who were also more likely to work in the informal sector and to work less hours. However, Fallah, Krafft and Wahba (2019) show that the impact of the migratory flow of Syrians did not deteriorate the labor market outcomes of native people from Jordan because it affected mainly the wages of migrants workers. On the other hand, Tumen (2016) analyze the effects on the labor market of the massive flow of refugees from Syria towards Turkey finding no effect on wages but increases in the unemployment rate, informal employment and a drop in the labor force participation.

Additionally, Cengiz and Tekguc (2017) also analyze the effect of the massive migration of Syrian refugees towards Turkey considering the effects on the native-born Turkish workers. The authors do not find any aggregate negative impact on employment and wages; neither over those without high school degree. According to Cengiz and Tekguc (2017) the channels that may explain these findings are related with demand-side effects of migration that helped to mitigate the potential negative effects generated by the increasing in the labor supply. (For a more extensive review of the literature related with forced migration in developing economies see, for instance Alix-Garcia and Saah, 2009; Ruiz and Vargas-Silva, 2016, among others)

Perhaps one of the pioneer and most influential papers in the literature of forced migration in general is David Card's 1990 paper estimating the effect of the arrival of Marielitos[1] on the labor market of Miami in the United States. The migratory flow

[1]Marielitos was a term used to describe Cubans who migrated from the island to Florida in the United

increased labor supply, according to the author, by approximately 7%. According to Card (1990), the arrival of marielitos had no significant effect on the labor market in Miami; the economy of Miami, the author argued, was able to quickly absorb the labor supply and avoid a short-term adjustment in real wages.

Since Card (1990) was published, several works have emerged that have sought to refute—mainly in methodological terms—the results obtained through disaggregated analyses of the population affected by migration. Borjas (2003 and 2017) argues that workers with similar education but with different levels of experience are not perfect substitutes. Thus, his analysis is based on skill groups defined in terms of educational attainment and work experience.

Another lesson suggested by Borjas (2017) is related to the importance of the selection of control groups.[2] According to Borjas (2017) the analyst's selection of a control group can result in obtaining stronger or weaker results on the labor market variables, which, of course, would influence the measures taken by policymakers.

With regard to the differences among empirical results across the literature, Dustmann et al. (2016) postulate that all of the analyses, beginning with the canonical model, attempts to measure different effects. According to Dustmann et al. (2016), the varied empirical measurements estimate different and non-comparable parameters of the canonical model.

Based on these observations, Dustmann et al. (2016) divide the results of the literature into three different approaches. The first approach, which according to the authors is the same used by Borjas (2003), refers to the national analysis of the effect of migration on wages between groups with different educational and experience levels. A second approach, called the spatial approach, exploits differences in migratory flows between different regions (See, for example, Altonji and Card, 1991). Finally, a third approach is related to a combination of the previous two (See for example Card, 1991).

In this paper, the spatial approach will be used; the regions strongly affected by migration will be compared to regions less affected and the estimates of the effect of the migratory flow of Venezuelans on wages in Colombia will be presented. Additionally, since the effects will be differentiated by educational level groups, the third approach,

States in 1980 in what became known as the Mariel boatlift. The migratory flow from the port of Mariel came after special permission granted by Fidel Castro so that those who wished could then migrate from political tensions on the island occurred previously.

[2]The comment by Borjas (2017) mainly refers to the ad-hoc selection of the comparison group by Card (1990) to analyze the consequences in the labor market of the Exodus of Mariel.

which combines the spatial approach and education-level grouping approach, will be used.

The literature has also opted to estimate the effects of a migratory flow through different methodological alternatives[3]. Some papers[4], like Card (1990), for example, chose to select a control group ad-hoc, that is, discretionally, to compare the evolution of wages in the regions affected by migration with the evolution of the wages in those regions selected ad-hoc.

Additionally, there are papers that implement the Synthetic Control Method (SCM); in this method, a control group is constructed based on an analytical development that avoids arbitrariness in the selection of the comparison group and builds a synthetic group from differently-weighted regions or different groups not affected by migration (See, for example, Abadie and Gardeazabal, 2003; Abadie, Diamond and Hainmueller, 2010, 2015).

The SCM is an econometric technique implemented to analyze the impact of exogenous events on a particular region by comparison with the other regions that were not affected. Peri and Yasenov (2017) review the results obtained by Card (1990) by implementing the Synthetic Control Method, linking the analysis with the effect of migratory flows on real wages. The authors do not evidence the migratory flow of Marielitos as having any negative effect on the wages of low-skilled workers in Miami.

According to Peri and Yasenov (2017), the gain in empirical terms of the implementation of SCM for this type of analysis on the labor market stems from the fact that it allows one to identify an "optimal" control group. This control group permits us to minimize the differences in the variable of pre-treatment interest or migratory pre-shock between the regions more and less affected by migration. The control group is built from the linear combination of the rest of the available comparison groups, eliminating the arbitrariness in the estimates made.

In this paper the differences in differences approach used by Card (1990) will be implemented. To provide robustness to the results and to show that they do not depend on the selection of the control group the effect of migration on wages by implementing

[3] Dustmann et al. (2016) provides a compilation of the literature indicating the different methodologies implemented and the main results of the most important works. See also, for example, Lozano and Steinberger (2010).

[4] In this paper those investigations that have implemented difference-in-difference methodologies will be focused. There is also a wide range of empirical studies that have estimated the effects of migration on the labor market by implementing OLS and Instrumental Variables, among others. (See Dustmann et al.,2016)

SCM will be estimated, as well as by calculating the same differences-in-differences estimations considering different combinations of departments of Colombia as control group.

In the presented estimations one can observe that the results do not differ significantly between one methodology and another; the data presented in this work illustrates that, without a doubt, the migratory flow of Venezuelans that began in the second semester of 2016 generated—in the short term—a significant drop in the real wage in the border regions of Colombia most affected by the migration. The decline in wages was approximately 6%-9% after the border was opened.

This effect was slightly higher for men compared to women and much stronger for informal workers. Additionally, the drop in the real wage is more intense the lower the qualification level of the individuals.

The rest of the paper is organized as follows: Section 2 presents information that allows us to understand and measure the Venezuelan migratory flow to Colombian territory, beginning in the second semester of 2016. In section 3, the identification strategy and methodology are proposed to be able to estimate the causal effect of the labor supply shock on real wages, then the aggregate results are presented, as well as some heterogeneous effects of the migratory flow on wages considering charasteristics of workers such as qualification level, labor formality and sex. In Section 4, robustness exercises are elaborated to guarantee the causal interpretation of the estimations made in this paper. Finally, section 5 concludes.

2. The Venezuelan Exodus towards Colombia

2.1. Political and border crisis between Colombia and Venezuela

In August of 2015, due to political and security tensions between Colombia and Venezuela, the Government of Nicolás Maduro ordered a state of emergency for 60 days in five municipalities of Estado Táchira in Venezuela: Bolívar, Ureña, Junín, Capacho-Libertad and Capacho-Independencia. Subsequently, more than 180 Colombian citizens were deported from Venezuela, deepening the political and humanitarian crisis and causing the borders between the two countries to gradually be closed. Eventually, closures encompassed the entire Colombian-Venezuelan border

territory. Subsequently, similar measures were taken in Ayacucho, García de Hevia, Lobatera and Panamericano in Estado Táchira.

At the beginning of September 2015, the borders were closed by orders of the Venezuelan government in Estado Zulia and Estado Apure; at the end of the month, similar measures were taken in the Estado Amazonas of Venezuela, which shares a border with Colombia.

After months of negotiations between Venezuelan president Nicolás Maduro and Colombian president Juan Manuel Santos, the borders were reopened. The border's reopening on August 13, 2016 together with an ongoing economic and social crisis in Venezuela, led to a massive exodus of Venezuelans to Colombia in the second half of 2016; the migration continued over the following semesters.

The following subsection will present information that will allow, on the one hand, to measure the magnitude of the Venezuelan migration to Colombia and, on the other hand, to observe the way in which the migratory flow clearly intensified since the second semester of 2016, our after period. This rupture was a fundamental factor in guaranteeing the validity of the identification strategy proposed in this paper.

2.2. Descriptives of the Venezuelan Migration to Colombia

To examine the impact of Venezuelan migration on local wages in the affected regions of Colombia, the analysis will use three sources of information: the first is labor and socioeconomic data for individuals surveyed as part of the Gran Encuesta Integrada de Hogares of Colombia's Departamento Administrativo Nacional de Estadística (DANE). The second is data on the migratory flows of Venezuelans in Colombia by department, obtained from the Unidad Administrativa Especial de Migración Colombia (UAEMC) as well as estimations made by the same organism about the number of Venezuelans settled in each department. The third and final set is a record of the number of Venezuelans living irregularly in Colombia, obtained from the Registro Administrativo de Migrantes Venezolanos (RAMV) which will allow us to be more confident about the number of Venezuelans in each department.[5]

The main advantage of the RAMV data as compared to that of UAEMC is that

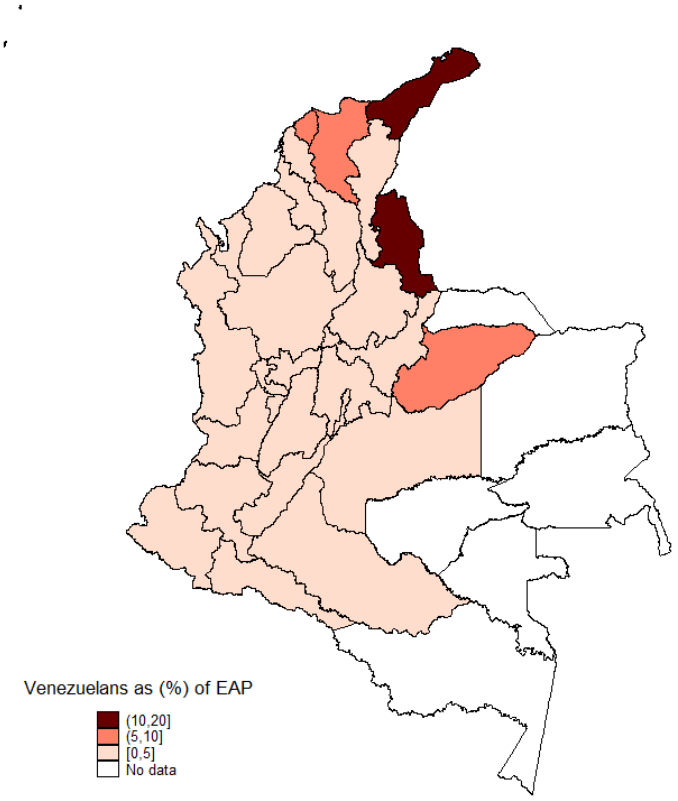
[5] As of the announcement of Decree 542 on March 21, 2018, the Registro Administrativo de Migrantes Venezolanos in Colombia (RAMV) began; this registration operation took place between April 6 and June 8 and was conducted by different organizations under the coordination of the Unidad Nacional de Gestión de Riesgos y Desastres (UNGRD). The RAMV was carried out in 1,019 authorized points in 30 departments and 413 municipalities of the country.

the former tells us the number of irregular Venezuelans actually located in each of the departments. Using this information, possible interdepartmental flows of Venezuelan migrants once they entered the country can be controlled and thus it will reinforce the identification strategy proposed. Departments in which a greater decline in real wages might be expected can also be identified. However, considering that Venezuelans registered in the RAMV are irregular Venezuelans, there might be some problems of selection and the charasteristics of the irregulars Venezuelans registered on the RAMV may not be the same charasteristics of the regular Venezuelans who did not have incentives to register in the RAMV.

The study examines the 2014-2018 period. The analysis was based on semi-annual data: the hourly wage income of the individuals in the months of June and December for each year were considered. These dates were used as representative of the first and second semester of each year, respectively.

As can be seen in Figure 1, the intensity of the number of settled migrants was much greater in the departments on the Colombian side of the border.

Figure 1. Venezuelans as Percentage of the Active Economic Population 2018



Notes. Own elaboration based on data from the Departamento Administrativo Nacional de Estadística (DANE) and estimates made by the Unidad Administrativa Especial Migración Colombia (UAEMC). As only aggregate numbers of migrants of each department are available the 75% of migrants of each department were considered, taking in count that, according to the distribution of ages estimated by UAEMC for the second half of 2018, the 75% of Venezuelans settled in Colombia are between 18 and 59 years old. The economically active population of 2016 was considered. Departments labeled as no data have no information in the households surveys, hence they are not considered in the analysis.

The number of Venezuelans living in the departments of La Guajira and Norte de Santander represent about a 15.7% and 11.6% of the Economically Active Population (EAP), respectively. For Atlántico and Magdalena, the Venezuelans settled in those departments represent among 5%-6% of the EAP.

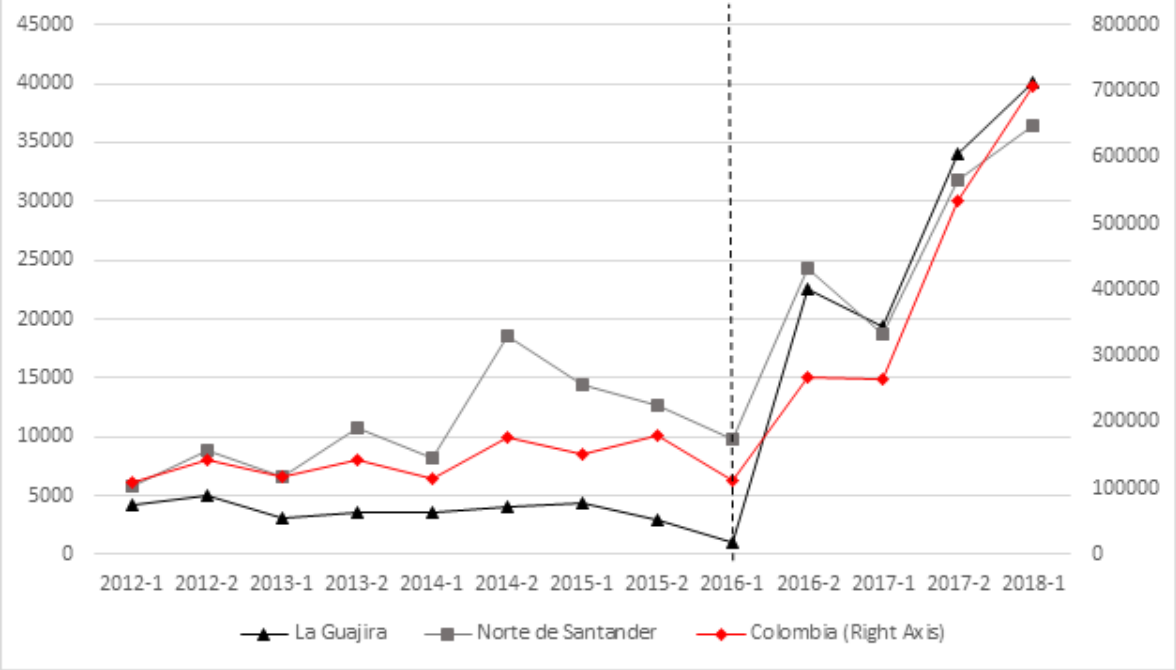
In the rest of the Colombian departments considered in the analysis, the number of Venezuelans settled, in most cases, represent less than 3 percentage points of the EAP. Hence, considering that the departments of La Guajira and Norte de Santander are the two departments most affected by the migration flow of Venezuelans, this analysis will focus on those departments.

When analyzed over time it can be observed that, after the opening of the borders (the second semester of 2016) and due to the Venezuelan economic crisis, the migratory flow intensified over the following semesters (See Figure 2). At a national level, the accumulated migration flow went from 150,000 people every six months to a little over 700,000 people in the first semester of 2018.

In the departments of La Guajira and Norte de Santander, the migratory flow also followed the same pattern presented at the national level, the number of migrants who entered these departments increased every six months following the border's opening.

If the flow of migrants in La Guajira and Norte de Santander through the second half of 2017 is calculated, the participation of migration in proportion to the EAP is 15.67% and 11.66% respectively (See Appendix Table A1). In other words, it can observed that migration is very high after the border's opening and increases during the following semester.

Figure 2. Evolution of the Migratory Inflow of Venezuelans. 2012 - 2018



Notes. Source: Own elaboration based on data from the UAEMC.

2.3. Characteristics of Venezuelan migrants

Analyzing the heterogeneities in the migratory flows in terms of sex and age for the two departments, Table 1 shows that, according to UAEMC data, the proportion of Venezuelan men and women who migrated to these regions between 2016 and 2017 is very similar; a slightly larger proportion of men and women arrived, but the difference would not ultimately very relevant in terms of the effects on the labor market.

This parity is also presented if data about nationally-registered irregular Venezuelans migrants in the lower panel of Table 1 are considered according to the RAMV data. In educational terms, 20.15% of the national population surveyed in the RAMV has completed primary school, 56.07% has completed secondary school, while 17.44% have completed a higher education degree (University, Technical or other higher education); only the 0.39% have a postgraduate degree.

Table 1. Descriptive Statistics
Migratory flow

Characteristics		La Guajira	Norte de Santander
Sex	Female	47.99%	45.76%
	Male	52.01%	54.24%
Age	18 - 29	40.02%	41.34%
	30 - 49	49.26%	44.73%
	50 - 69	10.72%	13.93%
National – RAMV			
Sex	Female	49.67%	
	Male	50.24%	
Age	0 - 11	20.02%	
	12-17	6.81%	
	18 or older	73.17%	
Education	Primary School	20.15%	
	Secondary School	56.07%	
	Other Higher Education	6.76%	
	University	10.67%	
	Postgraduate Degree	0.39%	
	N/A	5.97%	

Notes. Source: Own elaboration based on data from DANE, UAEMC and RAMV.

The data presented by the UAEMC and the RAMV are conclusive, and permit us to confirm that, indeed, following the opening of the border between Colombia and Venezuela in the second half of 2016 there has been a phenomenal flow of Venezuelan migrants to Colombia, and that they mostly settled in Colombian regions near the border.

In turn, the information provided suggests that the migratory flow has effectively translated into a significant increase in the labor supply in La Guajira and Norte de Santander. This rise in labor supply represents an exogenous shock in the Colombian labor market that could potentially have affected the real wage.

3. Effect of Venezuelan Migration on Wages

3.1. Identification Estrategy and Methodology

In order to identify the effect of the migratory exodus of venezuelans on real wages of Colombia in this paper the evolution of wages before and after the reopening of the borders between Colombia and Venezuela will be analyzed. Additionally, this evolution of wages between the most affected regions in Colombia by the migration flow and those regions that were not importantly affected will be compared in order to differentiate the effect of the increasing of labor supply from that originated from another macroeconomic shock that could probably affect all the country.

The ideal scenario for the analysis is one in which there is a counterfactual of the units affected by the migratory flow that allow one to compare what the evolution of the real wage would have been in the absence of the labor supply shock and, in this way, visualize the difference with the path of real wage as it happened overtime. However, given the practical impossibility of having a counterfactual, the literature offers different methodologies to approximate the causal impact of the shock under study.

One of the most common methodologies used in economic literature is to compare regions or units affected by the exogenous shock (Treatment Group) with a set of units operating as a control (Control Group) which must meet certain requirements to allow comparability.

A key assumption for determining causal impact on the treatment group is that, if there had been no shock, the trend in real wages for both the treatment group and control group would have been equal. Given that there is no counterfactual migratory post-shock, it must be ensured that the trend of the variable of interest for both groups before the migratory shock, are similar.

A critical problem thus arises: one must determine the form and composition of a control group that might permit comparison with the evolution of real wages in La Guajira and Norte de Santander.

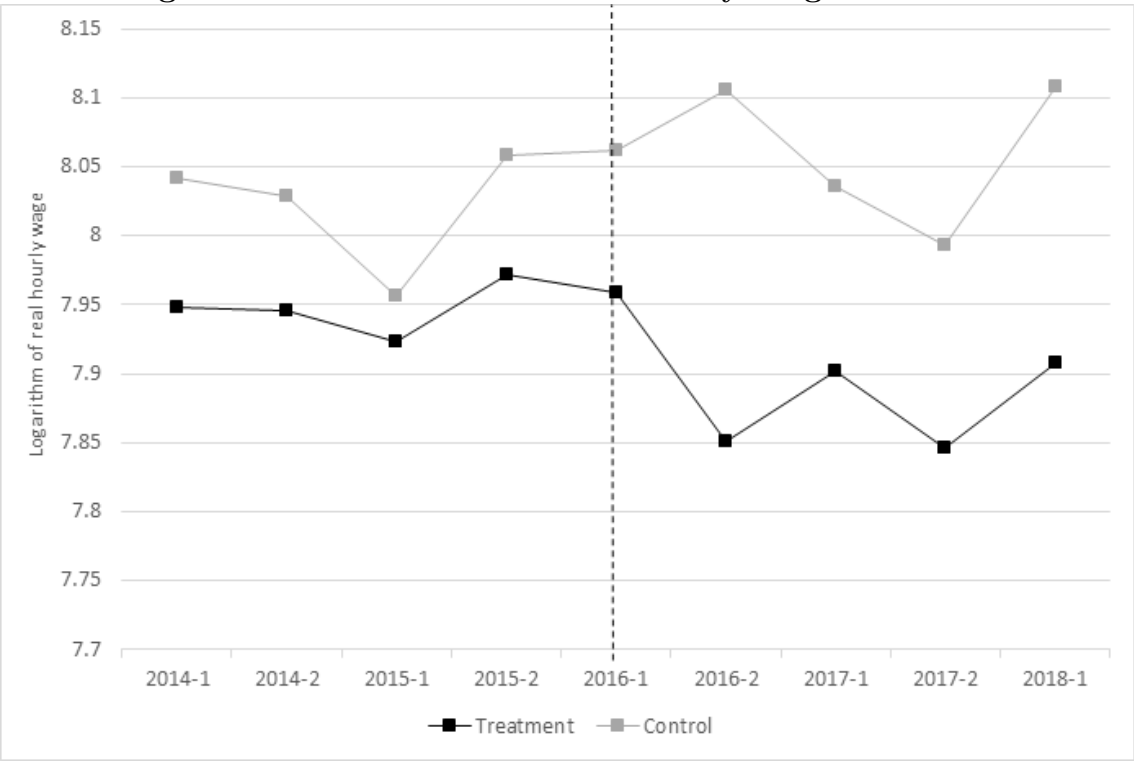
The alternative explored by this paper is to estimate the causal impact of the migratory flow on the real domestic wage in the treatment groups using the Differences in Differences methodology, taking as a control group the departments of Antioquia, Caquetá and Chocó. That is, estimates will be based on a selection of a control group that includes regions with trends in terms of wages that are as similar as possible to

that of the treatment group before the reopening of the borders.

The selection of Antioquia, Caquetá and Chocó as control group was mainly based on the fact that they are not on the border. As a result, it is expected that the opening of the Colombia-Venezuela border and the subsequent migratory flow did not significantly affect wages there. Moreover, as presented in Table A1, the accumulated migration for those regions in relation to the EAP was less than 2 percentage points and, according to the RAMV and UAEMC, Venezuelan residents represent less than 2 percentage point of the EAP.

Finally, according to Figure 4, trends in the hourly real wage of the proposed treatment and control groups, measured in logarithms, were similar prior to re-opening of the border, i.e. before the second semester of 2016. However, as can be seen in Figure 4, after the dotted line, the real hourly wage in the departments in the treatment group falls sharply beginning in the second semester of 2016, acquiring a very different tendency as compared to the control group. This evidence could initially support the conclusion that the increase in the labor supply had a negative effect on the real hourly wage.

Figure 4. Evolution of the Real Hourly Wage. 2014-2018



Notes. Source: Own elaboration based on data from DANE. In the Treatment Group, the departments of La Guajira and Norte de Santander were considered; in the Control Group, the departments of Antioquia, Chocó and Caquetá were considered.

To verify that real hourly wage trends in logarithms are equal between the two groups in the pre-treatment periods, Table A2 of the Appendix shows the F Statistics and the P-Value of the corresponding pre-treatment common trend test for the treatment and control groups.

As observed in Table A2, the null hypothesis of the same trend in the variable of interest cannot be rejected, which suggests that the use of the control group formed by Antioquia, Caquetá and Chocó is adequate.

In order to estimate the effect of the increase in the labor supply on the real wage of the individuals that live in the departments of the treatment group, the difference in differences methodology is implemented by means of econometric estimations that allow the use of controls at the individual level, and aggregated by department.

The econometric model used for the estimate is the following:

$$log(w)_{idt} = \alpha + \delta X_{idt} + \theta Z_{idt} + \pi_D + \sigma_t + \mu_{idt} \quad (1)$$

The variable w_i denotes the real hourly wage of the observation i, the variable X_{idt} takes a value equal to 1 if the observation i belongs to the Treatment Group after the opening of borders and takes a value of 0 otherwise. The variables π_D and σ_t are fixed effects by department and by period, respectively; finally, the vector Z_{idt} controls for the heterogeneities of individuals that could bias the results of the estimates. The coefficient of interest that would reflect a causal effect on the salary of the migratory flow in the difference in differences methodology is δ.

Additionally, to allow for correlation between the individuals of the same departments it is important to cluster the standard errors. The main problem of this clustering is that there are only 5 departments under analysis when differences in differences methodology is implemented (2 of the treatment group and 3 of the control group). To solve this, more conservative errors are estimated by implementing the wild bootstrap-t method (Cameron et al. 2008, Webb 2013). In the results presented below the standard errors calculated by clustering at department level and the P values based on wild bootstrap-t standard errors are presented. However, there is no much difference in the results.

In the robustness checks section different additional analysis by choosing anothers control groups and by considering different methodologies will be presented. The results will show that, regardless of the methodology implemented for the construction of the control group, the estimates are robust; the estimated causal effect of the increase in labor supply over the real domestic wage is very similar for the different proposed estimations.

3.2. Results

The results of the estimates are presented below in Table 2. From the estimations presented, it is observed that, after controlling for individual characteristics and for temporal and regional elements, the estimated causal effect of the increase in the labor supply after the opening of the border on the real hourly wage of the individuals of La Guajira and Norte de Santander is negative and statistically significant, given the usual levels of statistical significance. In column 2 of Table 2 it can be observed that

the effect reflects an average decline of approximately 9.7% of the real hourly wage, ceteris paribus.

Table 2. Aggregate Estimates

Dependent Variable: Logarithm of Real Hourly Wage

	(1)	(2)
Migration Effect	-0.100***	-0.0966***
Clustered SE	(0.0117)	(0.0110)
P-Value wild bootstrap SE	[0.0250]**	[0.0215]**
Observations	35,576	35,576
R2	0.330	0.362
Individuals Controls	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes
Industry Fixed Effects	No	Yes

Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. Source: Own elaboration based on the GEIH.

3.3. Heterogeneous Effects

In this part of the paper, estimates of the effect of treatment on real hourly wages are presented, disaggregated by characteristics of the population analyzed. The variables considered relevant for analyzing the heterogeneity of causal effects in the departments of La Guajira and Norte de Santander are: level of qualification, labor formality and sex.

In the proceeding analysis, interactions of the treatment effect with the characteristics of heterogeneity proposed to analyze will be included, in order to determine if the treatment effect presents a statistically-significant difference among the subgroups analyzed. The equation used to estimate each of the effects is the following:

$$(2) \quad log(w)_{idt} = \alpha + \delta X_{idt} + (\sum_{d \in D} \tau_j \pi_d) H_{idt} + (\sum_{t \in T} \lambda_t \sigma_t) H_{idt} + \psi X_{idt} H_{idt} + \theta Z_{idt} + \pi_d + \sigma_t + \mu_{idt}$$

To examine the effect by qualification, variable H is equal to 1 if the individual is qualified (0 otherwise); to analyze salary variation by sex H is equal to 1 for women (0 otherwise) and, finally, to examine the effect by labor formality H is equal to 1 for individuals formally hired (0 otherwise).

The third component of the regression is the interaction between the fixed effects by department and the subgroups variable (H). This allows us to control for differentials between the subgroups that are constant over time but different across departments. The fourth element of the equation captures variable differentials in time among the subgroups analyzed, but that remain constant between departments. The rest of the variables are the same as those specified in equation (1).

The estimated coefficient δ would indicate the increase of labor supply's effect on the wages of the base subgroup; the coefficient ψ would indicate the difference in the migration's effect on wages between one of the previously mentioned subgroups and the corresponding base subgroup.

3.3.1. Effect by skill level

To estimate the disaggregated effect by qualification level, the population was divided into two groups: qualified and non-qualified. The non-qualified were defined as those individuals who had a lower educational level than completed secondary; qualified was defined as individuals who had completed secondary education or some higher education.

The literature suggests that in cases of migration, it is quite common that migrant workers take up jobs that are lower than the positions of resident workers with the same characteristics in terms of education and experience (Dustmann et al., 2016).

This phenomenon, known as downgrading, would imply that, regardless of the educational composition of the flows of migrants from one region to another, the largest relative increase in the labor supply would occur in jobs that require less-qualified workers, with which, ceteris paribus, the real wage of those types of jobs should decline much more in relative terms. (To see evidence of downgrading see for example Borjas, 1985, Dustmann, Frattini and Preston, 2013, Dustmann and Preston, 2012)

According to the information provided in Table 3, the decline in the real wage was greater for unskilled workers as compared to qualified ones. Low-skilled employees suffered a decline in real wages, on average, 7 percentage points greater than that experienced by skilled workers.

The results presented in Table 3 are consistent with other studies that confirm the phenomenon of downgrading. This suggests therefore that, although migrants may have high levels of qualification, they work in low-skilled jobs, generating a pressure on real wages in these segments of the labor market[6].

Table 3. Heterogeneous Effects by Qualification Level

Dependent Variable: Logarithm of Real Hourly Wage

	(1)	(2)
Migration Effect	-0.150***	-0.141***
Clustered SE	(0.00806)	(0.00597)
P-Value wild bootstrap SE	[0.0127]**	[0.0154]**
Migration Effect x High-Skilled Worker	0.0786***	0.0714***
Clustered SE	(0.00882)	(0.0110)
P-Value wild bootstrap SE	[0.0110]**	[0.0239]**
Observations	35,576	35,576
R2	0.335	0.365
Individual Controls	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes
Industry Fixed Effects	No	Yes

Notes.Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. Source: Own elaboration based on the GEIH.

[6]This analysis, however, is valid mainly in the short term, given that, as Dustmann et al (2016) suggest, over time an opposite phenomenon of upgrading would occur in which immigrant workers would have acquired enough experience to participate as labor in jobs of better qualification or more related to their educational characteristics and professional experience.

3.3.2. Effect by Informality

Following the analysis of heterogeneous effects of the decline in real wages after Colombia-Venezuela border's re-opening in the second half of 2016, this section estimates the treatment effect by dividing the population into two categories: informal and formal.

Workers were considered to be informal if they either did not contribute to a pension fund, if the total contribution made contributed by the employee, or if the employee was not affiliated with a contributory health plan. Thus, the definition of informality used in this paper emphasizes employee's labor rights.

After defining the categories of informal and formal labor, the differential effect on wages between the groups is estimated. The results are presented in the Table 4.

On average, wages fell by approximately 9 percentage points more for informal workers as compared to formal workers; the difference is statistically significant. The magnitude and direction of the coefficient is consistent with what would be expected given that the population of informal workers is more vulnerable to an increase in the labor supply and, as shown above, Venezuelan migrants would be participating mainly in the informal labor market.

Table 4. Heterogeneous Effects by Informality

Dependent Variable: Logarithm of Real Hourly Wage

	(1)	(2)
Migration Effect	-0.135***	-0.128***
Clustered SE	(0.0122)	(0.0103)
P-Value wild bootstrap SE	[0.0167]**	[0.0262]**
Migration EffectxFormal	0.0957***	0.0943***
Clustered SE	(0.00679)	(0.0133)
P-Value wild bootstrap SE	[0.0156]**	[0.0601]*
Observations	35,576	35,576
R2	0.333	0.363
Individual Controls	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes
Industry Fixed Effects	No	Yes

Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. Source: Own elaboration based on the GEIH.

3.3.3. Effect by Sex

The effect of migration by sex was estimated by following the same differences in differences methodology, with the analysis based on the same control group previously outlined. The results are presented in Table 5.

After controlling for observable characteristics the treatment effect between men and women indicates a stronger decline in the real hourly wage for men. The stronger decline for men would be consistent with a traditional role assignment within households: the male labor supply would increase at a greater rate as compared to women, thus producing a more important wage decline for male workers.

Table 5. Heterogeneous Effects by Sex

Dependent Variable: Logarithm of Real Hourly Wage

	(1)	(2)
Migration Effect	-0.119***	-0.116***
Clustered SE	(0.0102)	(0.00724)
P-Value wild bootstrap SE	[0.0267]**	[0.0641]*
Migration EffectxWoman	0.0382**	0.0399**
Clustered SE	(0.0134)	(0.0109)
P-Value wild bootstrap SE	[0.0181]**	[0.0468]**
Observations	35,576	35,576
R2	0.331	0.363
Individual Controls	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes
Industry Fixed Effects	No	Yes

Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. Source: Own elaboration based on the GEIH.

4. Robustness Analysis

In order to add robustness to the estimates presented in this paper and to show that the results do not change independently of the selecion of the control group, in this section different analysis will be presented that will show that no matter how the control group is conformed, the estimated effect of migration on real wages on the border of Colombia is about 6%-9%.

4.1. Synthetic Control Method

First of all, estimates will be made by building a control group through the Synthetic Control Methodology as developed by Abadie and Gardeazabal (2003) and Abadie, Diamond and Hainmueller (2010). Under this strategy, a control group is built

from the departments of Colombia not significantly affected by the migratory flow.

The Synthetic Control Method looks to solve problems of arbitrariness that can result from selecting an ad-hoc control group, as was done in the previous section. The Synthetic Control Method is employed by determining an optimal linear combination of the control units (here, departments not strongly affected by Venezuelan migration) according to a determined weight. A synthetic control unit serves as a counterfactual from which comparisons can be made.

The key to this methodology is to determine the optimal weight to be attributed to each of the departments not affected by migration in order to perform the linear combination and obtain the unit of comparison. In line with Gardeazabal (2010) and Abadie, Diamond and Hainmueller (2010) the analytically-solved problem is based on selecting a vector W^* of weights that minimizes the expression given by:

$$W^* = \arg\min_{w} (X_1 - X_0 W)' V (X_1 - X_0 W) \tag{3}$$

Subject to:

$$w_j \geq 0 (j = 1, 2, ...J) \tag{3.1}$$

$$w_1 + w_2 + ... + w_j = 1 \tag{3.2}$$

where J denotes the number of control units available; in our analysis, these are the control departments that were not strongly affected by the migratory flow. $W = (w_1, \ldots, w_J)$ is a non-negative vector of weights for each of the available control units; the sum of which must be 1, according to the restrictions previously described. X_1 is a vector of dimensions $(K \times 1)$ where K refers to pre-treatment value of relevant characteristics of the unit treated and X_0 is a dimension matrix $(K \times J)$ that contains the same values for the same K variables but for the J units of control under analysis. Finally, V is a diagonal matrix with non-negative components in which the relative importance of each of the selected characteristics as determinants of the variable of interest is specified, in this case, the real hourly wage.

When the expression is minimized, subject to the restrictions of non-negativity and a sum equal to 1, the vector W^* of optimal weights will be determined, which, if multiplied by the matrix X_0, will permit one to find the values of the weighted specified variables for the counterfactual unit of comparison.

With Y_1 defined as a dimension vector $(T \times 1)$ that contains the values of the variable of interest for the treatment unit —in this case the real hourly wage— and Y_0 as a matrix of $(T \times J)$ with the values of the real hourly wage but for all control units considered, the value of the synthetic interest variable can be determined. This is the synthetic real hourly wage from the weights obtained and the matrix Y_0.

The vector of synthetic real hourly wages can be determined by Y_1^*=$Y_0 W^*$. By comparing Y_1, which is the actual value of the real hourly wage, with Y_1^*, the synthetic value that would take the role of counterfactua, the causal effect of the increase in labor supply on wages in La Guajira and Norte de Santander can be calculated.

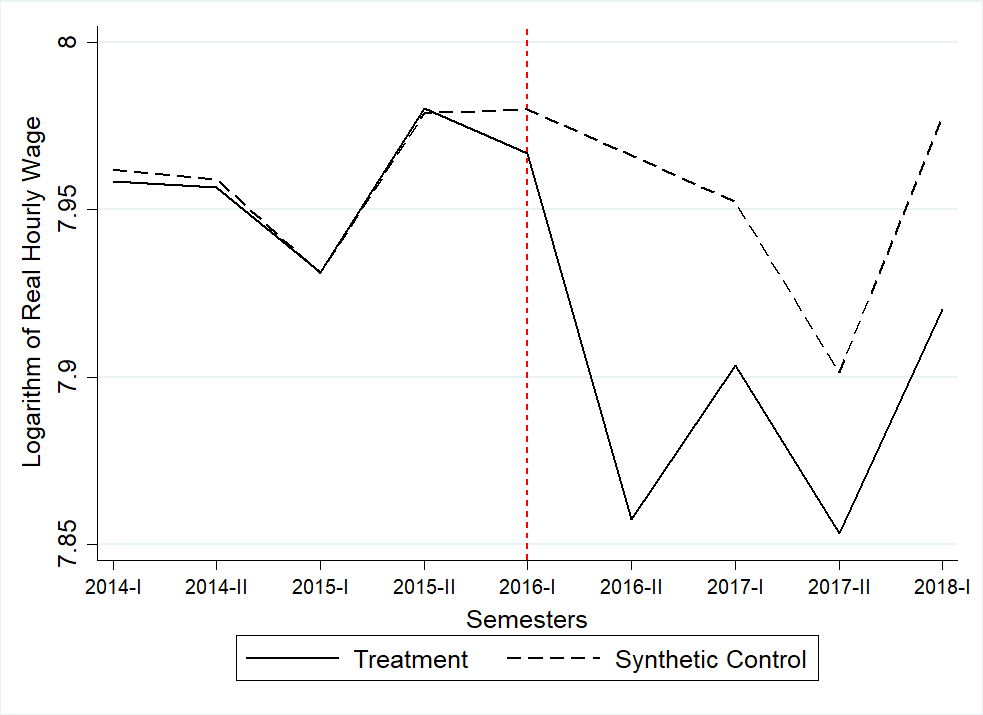
To estimate the weights, it was necessary to specify a set of variables that predict the real hourly wage. A limitation of the Synthetic Control Methodology is that the units of analysis are, in general, at the aggregate level, making it important to determine explanatory variables that permit one to determine the department wage levels at the aggregate level, rather than in terms of individual workers.

Given this, variables that could explain the real wage at the departmental level were selected: the proportion of workers in different sectors of the economy, the unemployment rate, the informality rate, average levels of education, the proportion of qualified individuals in each department, and the average real hourly wage of the control department in some specific pre-treatment periods. The weights corresponding to the vector W^* determined under this methodology are presented in Table A3 of the Appendix.

Of the three regions chosen in the differences in differences analysis presented in the previous section, the computation of W^* ascribed a non-zero weighting to Chocó, with a weighting of 17.7%. Other departments were also included that were not considered in the differences in differences analysis. Magdalena, Nariño and Tolima were ascribed weights of 27.5%, 5.7% and 49.1%, respectively.

Once the optimal weights have been calculated, the value of the synthetic variable of interest can be computed; the results are shown in Figure 5, below:

Figure 5. Evolution of Real Hourly Wage. Treatment and Synthetic Control. 2014-2017



Notes. Source: Own elaboration based on data from DANE. In the Treatment Group, the departments of La Guajira and Norte de Santander were considered.

From these estimates, one would find very similar trends and values between the treatment unit[7] and the synthetic control unit prior to the treatment. However, after the opening of the border, the real hourly wage of the treatment unit fell sharply while the real hourly wage of the control unit constructed by SCM did not, maintaining a post-treatment gap between the treatment and control values that did not exist in the pre-opening border period.

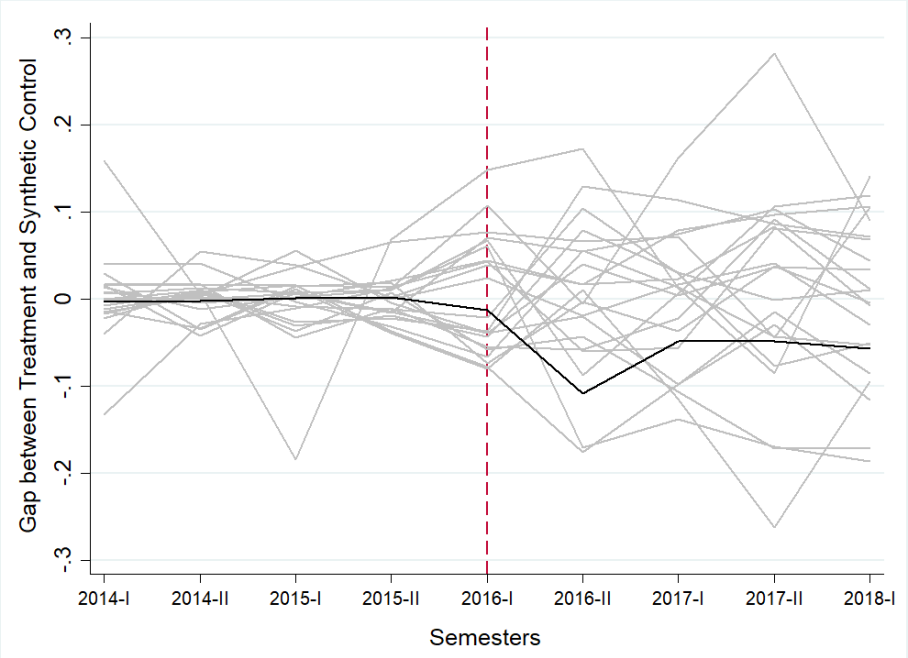
If the difference between the average pre-treatment and post-treatment wage is calculated for both groups and then the difference in differences between the two groups is computed, it is obtained that the average estimated causal effect was a fall in the real hourly wage for the treatment group of approximately 6.2%, a result that would be closely related to that obtained in the aggregate estimates of differences in differences in Table 2.

[7]For this analysis, and given that the Synthetic Control methodology allows only one unit to be considered as treatment, La Guajira and Norte de Santander were considered as a single region, estimating the average real hourly wage for the population of the two departments as if they were the same.

Given the assumptions made regarding the creation of the control groups to estimate the causal effect of the increase in the labor supply after the opening of the border, results of various robustness exercises to verify causality will be presented.

Figure 6 shows the results of estimating changes in the gap between the treatment group and its respective synthetic control group by changing the treatment group and considering different departments of Colombia other than La Guajira and Norte de Santander, as if they had been strongly affected by migration. This test follows strategies suggested by Abadie and Gardeazabal (2003) and Abadie, Diamond and Hainmueller (2010)—that is, running placebo exercises.

Figure 6. Evolution of the Gap between the Logarithm of Real Wage of the Treatment and Synthetic Control Group. Placebo Test. 2014-2017



Notes. Source: Own elaboration based on data from DANE. The black line denotes the gap when the departments of La Guajira and Norte de Santander were considered as Treatment Group. The gray lines denote the gap of alternative exercises considering as Treatment Groups the rest of the departments not affected by the migration.

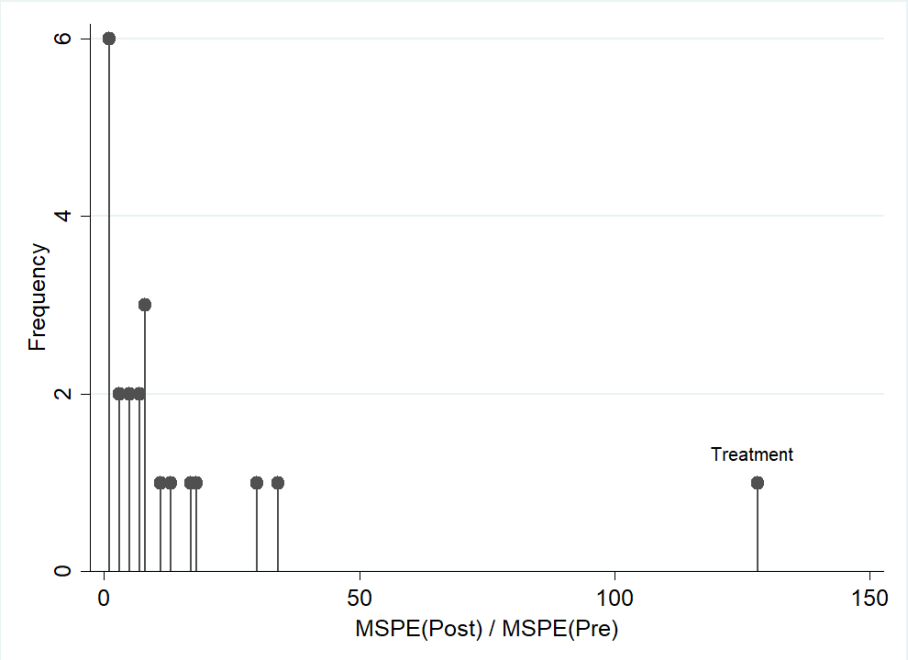
As shown in Figure 6, the evolution of the pre-treatment and post-treatment gap of the false experiments does not follow a path similar to the actual treatment group, La Guajira and Norte de Santander, putting in evidence that there was no causal effect of the opening of the border on real wages for just any region.

Additionally, Figure 7 shows the distribution of the ratio between the Mean Square

Predicted Error (MSPE)[8] post-treatment and pre-treatment, considering La Guajira and Norte de Santander as treatment groups and, additionally, to the different placebos previously estimated. This serves as a measure of the reliability of the SCM estimate.

As can be observed, the ratio when La Guajira and Norte de Santander are considered is much larger than any of the other ratios calculated as placebos. This indicates that, regardless of what other departments are considered, the only ones with which a significantly high effect on the real wage is obtained are for these two departments. That is, the two departments with a significant increase in the labor supply due to the Venezuelan migratory exodus.

Figure 7. MSPE Ratio



Notes. Source: Own elaboration based on data from DANE.

4.2. Changing the Control Group

Regardless that the aggregate effects of migration on wages did not change when the effect of migration on wages estimated by a methodology free of arbitrariness like SCM was presented, a valid criticism of the results estimated by differences-in-differences methodology is that the results that indicate a drop in the

[8]The Mean Square Prediction Error (MSPE) is defined as the square difference between the outcome of the treatment group and the synthetic control group. This calculation is made for both periods (pre- and post-opening of borders) and subsequently the ratio between the post-opening MSPE and the pre-opening MSPE is calculated.

real hourly wage rely on the arbitrary selection of the control group conformed by Antioquia, Caquetá and Chocó.

Considering the discussion of Borjas (2017) about the importance of a control group choice, an alternative way to determine if the results presented above depend exclusively to the choice of a control group is by running the same difference-in-difference estimation for every potential control group resulting from the combination of three differents cities of Colombia as Borjas (2017) did for the analysis of the Mariel boatlift.

First of all, it is important to consider the criteria of elegibility presented in the metholodogy section. Considering these criteria only the cities with a low level of migration as a percentage of the local labor force and that are not in the border between Colombia and Venezuela will be included in the analysis. According to this criteria there are 560 different potential control groups to estimate the differences in differences.

The distribution of the effects estimated are presented in the figure A1 for the aggregate estimates and in the figures A2, A3 and A4 for the heterogenous effects. As can be seen, the distribtions of the effects are consistent with what was presented above considering a control group constructed by Synthetic Control Methodology or considering the Control Group conformed by Antioquia, Caquetá and Chocó. According to all the evidence presented in this paper, no matter how the control group is constructed, it can be confirmed that the migration of venezuelans towards Colombia in the last years has had a negative effect on wages of about 6% and 9% in the border departments. Additionally, according to the presented estimates, this negative effect is higher for informal and low-skilled workers.

4.3. Placebo Tests

Additionally, the possibility that the decline in real wages in La Guajira and Norte de Santander was the result of macroeconomic crisis in Venezuela rather than migration must be considered: given that the absorption capacity of the Venezuelan economy fell, international trade with Colombia has probably also fallen; this would primarily affect the border economies of La Guajira and Norte de Santander.

However, as ECLAC (2017) states, the GDP of Venezuela has fallen for four consecutive years from 2013 to 2017, accumulating a contraction of real GDP of

approximately 31.9% during that period. Therefore, if the decline in real wages analyzed in this paper after the opening of the border had been generated from a drop in demand by the Venezuelan economy, then the real wage would have also fallen during these years, which are beyond the scope of the treatment period.

As shown in Figure 4, for the pre-treatment periods considered, the real wage did not maintain a declining trend and the only period in which a significant fall occurred was in the first semester of 2015, a decline that was seen in other non-border departments, such as those considered in the control group. Given this, the economic crisis would not seem to be the main driver of the decline in real wages in La Guajira and Norte de Santander during the second half of 2016.

Another way to estimate the robustness of the results is by supposing that the intervention, in this case the opening of the border, was carried out during another semester; in other words, to carry out a false experiment.

If one pretends that the opening of the border was carried out in a different period, there should be no statistically-significant effect on the real wage since, in reality, there was no increase in the labor supply. If a significant effect was found, then one could assume that the correlation was linked to the decline in the aggregate demand of Venezuela as a result of the economic crisis, rather than by the increase in labor supply. Tables A4 to A7 in the Appendix present the results for each of the differences in differences estimates presented, as if the border's opening occurred in the periods 2015-II, 2015-I and 2014-II.

The results of the false experiments effectively suggest the absence of a statistically significant effect when a period of migratory shock other than the real one is assumed. This supports the validity of the hypothesis proposed in this paper and the causality of the previously estimated effects of the increase in labor supply on the decline in real wages. The results allow us to infer that the decline in the real wage after the opening of the borders between Colombia and Venezuela was a result of an increase in labor supply in the border regions rather than due to the decline of Venezuela's GDP amid economic crisis.

Finally, according to data from DANE, the economic activity of these departmanets measured considering the regional GDP as well as the added value of the commerce sector did not fall after the reopening of the borders. So, assuming an stable labor demand during this period appears to be a reasonable assumption which reinforce the causal estimations presented in this paper.

5. Conclusions

One of the questions that has generated the most debate in the field of labor economics over the last several decades is how labor markets react over the short term to significant increases in the labor supply due to exogenous migratory flows. The results obtained in the literature utilize different methodologies and conceptual frameworks but, despite decades of study, are nonetheless ambiguous and lacking in consensus.

In this paper, estimates of the potential causal impact of the migratory flow of Venezuelans to Colombia since the reopening of the border between the two countries in 2016 on real wages were presented. The results show a significant fall in the real hourly wage (approximately 6%-9%) in those regions where the migratory flow was very important in relation to the economically active population.

The results would seem to indicate a stronger decline in real wages for men and workers in conditions of labor informality. Additionally, the causal effect generated by migration on the real wage would be stronger for low-skilled workers. The estimates presented in this paper are robust to different specifications and to multiple analyses that tested the causal mechanism between the migratory flow as a labor supply shock and the decline in real wages.

Considering the results presented in this paper and the social and economic vulnerability of the regions that have been most affected by the decline in real wages as a result of the migratory flow of Venezuelans, it is important to implement public policies that, in a coordinated manner, mitigate the effect of labor supply shock on real wages.

Under a supply-demand framework in the labor market, the decline in the real wage after the labor supply shock is a partial equilibrium result that presupposes that other labor market variables remain constant. Given the results, it can be considered then that the labor demand in these regions has a negative slope, and, given a labor supply that is not infinitely elastic, public policies that promote greater demand for labor would help ensure that real wage either do not decline, or that they decline in smaller proportion following increases in migrant labor supply.

For instance, as Fallah et al. (2019) argue that, considering the effect of massive migration of Syrian refugees towards Jordan, the foreign aid that Jordan has received has been really important in order to increase the labor demand and to mitigate the potential negative effects of migration on labor market outcomes. According to the

authors, the Government of Jordan has received multiple foreign aids to avoid the budget deficit and to help financing public projects and services that may increase the labor demand in that region and to try to guarantee the work opportunities for the people living in the most affected regions by the migration.

A positive scenario for the border population on the Colombian side would be one in which, as Card (1990) argued preliminarily for Miami, the regions of Colombia that received Venezuelan labor force had the capacity to absorb employment in such a way that the real wage does not fall, and the economy is strengthened. However, given the poor economic situation of these regions and the inability of the labor market to absorb labor, state intervention is required: a program to generate employment and/or boost aggregate demand may mitigate the economic consequences of migration.

If the trend in the decline of the real wage among informal and / or less qualified workers continues, it would be expected that, in the medium term, the effects on inequality will be significant, deepening social deterioration and increasing inequality and poverty both intra-regionally and at the national level.

Assuming that the population is composed of highly-skilled and unskilled labor and the estimated trends continue, the relative labor income of highly skilled in relation to the unskilled can be expected to increase considerably, generating a social gap that could be difficult to reverse. This type of analysis, however, exceeds the scope of this paper and should be the subject of future research.

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7. Appendix

Table A1. Migratory Flow in Colombia as a share of Economically Active Population (2016-2017)

Department	2017-I	2017-II	2018-I RAMV	UAEMC- 2018
Amazonas	0.65%	1.03%	0.03%	15.06%
Antioquia	0.99%	1.86%	0.53%	1.50%
Arauca	66.80%	69.75%	63.65%	65.26%
Atlántico	3.35%	6.16%	2.72%	5.03%
Bogotá D.C.	4.18%	8.60%	0.75%	3.32%
Bolívar	1.81%	2.71%	2.00%	2.80%
Boyacá	0.18%	0.34%	0.50%	0.74%
Caldas	0.10%	0.21%	0.22%	0.43%
Caquetá	0.01%	0.02%	0.01%	0.34%
Casanare	0.85%	1.63%	5.27%	5.67%
Cauca	0.02%	0.04%	0.13%	0.11%
Cesar	1.40%	2.01%	3.61%	4.23%
Choco	0.04%	0.07%	0.09%	0.39%
Córdoba	0.16%	0.22%	0.61%	0.72%
Cundinamarca	0.19%	0.32%	0.60%	1.15%
Guainía	19.78%	22.24%	16.67%	14.68%
Guaviare	0.12%	0.25%	0.26%	3.19%
Huila	0.04%	0.07%	0.21%	0.22%
La Guajira	8.65%	15.67%	12.35%	15.74%
Magdalena	1.57%	2.50%	4.48%	5.35%
Meta	0.23%	0.39%	0.51%	0.81%
Nariño	6.45%	21.22%	0.09%	3.07%
Norte de Santander	6.70%	11.66%	10.26%	11.60%
Putumayo	0.49%	0.81%	4.19%	4.32%
Quindío	0.22%	0.45%	0.31%	0.65%
Risaralda	0.28%	0.54%	0.41%	0.91%
Santander	1.19%	2.43%	0.74%	1.96
Sucre	0.27%	0.38%	1.01%	1.13%
Tolima	0.08%	0.16%	0.18%	0.34%
Valle del Cauca	0.45%	0.84%	0.52%	0.98%
Vaupés	0.02%	0.07%	-	12.24%
Vichada	276.75%	281.10%	18.88%	12.24%

Notes. Source: Own elaboration based on data from DANE, UAEMC and RAMV. The economically active population of Amazonas and Casanare correspond to that of 2015. For the rest of the departments, the EAP of 2016 was considered. For the case of RAMV data, only the population over 12 years old was considered.

Table A2. Pre-Treatment Trend Tests

	F Statistics	P-Value
Clustered SE	0.06	0.9776
Wild bootstrap SE	0.05	0.9280

Notes. Source: Own elaboration based on data from the GEIH of DANE. P Values and Statistics F associated with the estimates obtained from a dependent variable model equal to the logarithm of the real hourly wage, a constant, a treatment dummy, dummies per period and the interaction between period and treatment dummies. Only the pretreatment periods were considered. An F test was applied in which, under the null hypothesis, the interactions of the regressions are equal to 0.

Table A3. Weightings of the Departments by Synthetic Control Method

Department	**Weighing**
Antioquia	0.00%
Atlántico	0.00%
Bogotá	0.00%
Bolívar	0.00%
Boyacá	0.00%
Caldas	0.00%
Caquetá	0.00%
Cauca	0.00%
Cesar	0.00%
Córdoba	0.00%
Chocó	17.70%
Huila	0.00%
Magdalena	27.50%
Meta	0.00%
Nariño	5.70%
Quindío	0.00%
Risaralda	0.00%
Santander	0.00%
Sucre	0.00%
Tolima	49.10%
Valle del Cauca	0.00%

Notes. Source: Own elaboration based on DANE data. The explanatory variables that were used for the Synthetic Control method are the proportion of employees by economic activity, the rate of informality at work, the average number of years of education in the department, the rate of unemployment and the logarithm of the hourly wage of the first semester of 2014, 2015 and 2016.

Table A4. Aggregate Placebo Estimates
Dependent Variable: Logarithm of Real Hourly Wage

	2015-II	2015-I	2014-II
Migration Effect	0.0111	0.00860	0.000738
Clustered SE	(0.0256)	(0.0185)	(0.0333)
P-Value wild bootstrap SE	[0.6980]	[0.7021]	[0.9833]
Observations	20,400	20,400	20,400
R2	0.356	0.356	0.356
Individual Controls	Yes	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes

Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. The sample was restricted for periods before June 2016 inclusive. Source: Own elaboration based on the GEIH.

Table A5. Placebo Estimates by Qualification Level. Dependent Variable: Logarithm of Real Hourly Wage

	2015-II	2015-I	2014-II
Migration Effect	-0.0112	-0.00950	0.0196
Clustered SE	(0.0468)	(0.0329)	(0.0538)
P-Value wild bootstrap SE	[0.8400]	[0.8161]	[0.7453]
Migration EffectxHigh-Skilled Worker	0.0389	0.0327	-0.0249
Clustered SE	(0.0419)	(0.0299)	(0.0355)
P-Value wild bootstrap SE	[0.4943]	[0.4451]	[0.5483]
Observations	20,400	20,400	20,400
R2	0.358	0.358	0.358
Individual Controls	Yes	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes

Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. The sample was restricted for periods before June 2016 inclusive. Source: Own elaboration based on the GEIH.

Table A6. Placebo Estimates by Labor Formality.
Dependent Variable: Logarithm of Real Hourly Wage

	2015-II	2015-I	2014-II
Migration Effect	-0.00174	-0.0140	0.0102
Clustered SE	(0.0341)	(0.0413)	(0.0546)
P-Value wild bootstrap SE	[0.9490]	[0.6287]	[0.8602]
Migration EffectxFormal	0.0491	0.0568	-0.0112
Clustered SE	(0.0288)	(0.0493)	(0.0665)
P-Value wild bootstrap SE	[0.2843]	[0.4774]	[0.8757]
Observations	20,400	20,400	20,400
R2	0.357	0.357	0.357
Individual Controls	Yes	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes

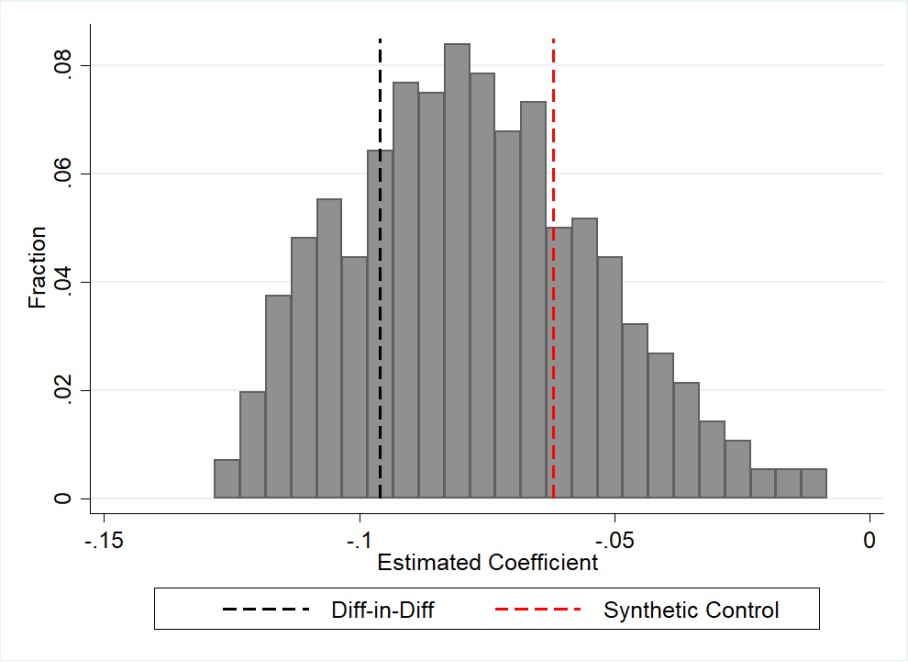
Notes. Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. The sample was restricted for periods before June 2016 inclusive. Source: Own elaboration based on the GEIH.

Table A7. Placebo Estimates by Sex.
Dependent Variable: Logarithm of Real Hourly Wage

	2015-II	2015-I	2014-II
Migration Effect	-0.00324	0.00825	-0.0152
Clustered SE	(0.0323)	(0.0348)	(0.0499)
P-Value wild bootstrap SE	[0.9212]	[0.8363]	[0.8274]
Migration EffectxWoman	0.0297	0.000802	0.0340
Clustered SE	(0.0268)	(0.0516)	(0.0450)
P-Value wild bootstrap SE	[0.4205]	[0.9803]	[0.6201]
Observations	20,400	20,400	20,400
R2	0.357	0.357	0.357
Individual Controls	Yes	Yes	Yes
Aggregate and Temporary Controls	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes

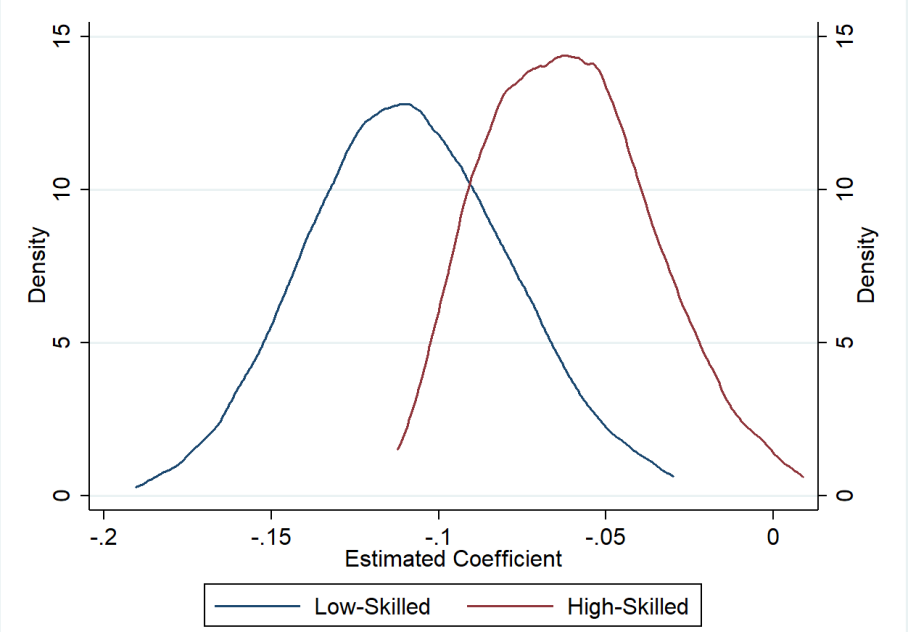
Notes.Robust and clustered standard errors at department level in parentheses and P-value based on wild bootstrap-t standard errors with a 6-point distribution as in Webb (2014) are in square brackets. Stars *, ** and *** denote significance at 10, 5 and 1 percent. The observations correspond to the period 2014-2018 with data for June and December of each year, until the first half of 2018. The individual controls include characteristics related to the sex of the individual, their level of education, the linear and squared age, whether they have a formal employment or not and marital status. Aggregate and temporary controls are related with regional dummies and temporary dummies. The sample was restricted for periods before June 2016 inclusive. Source: Own elaboration based on the GEIH.

Figure A1. Robustness Estimations - Aggregate



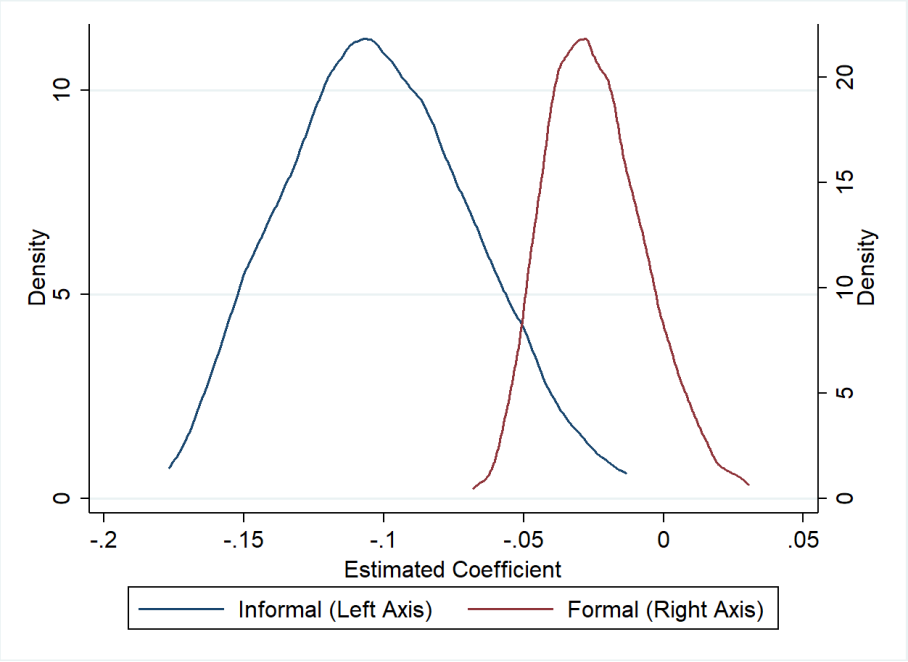
Notes. Source: Own elaboration based on data from DANE.

Figure A2. Robustness Estimations by Qualification Level



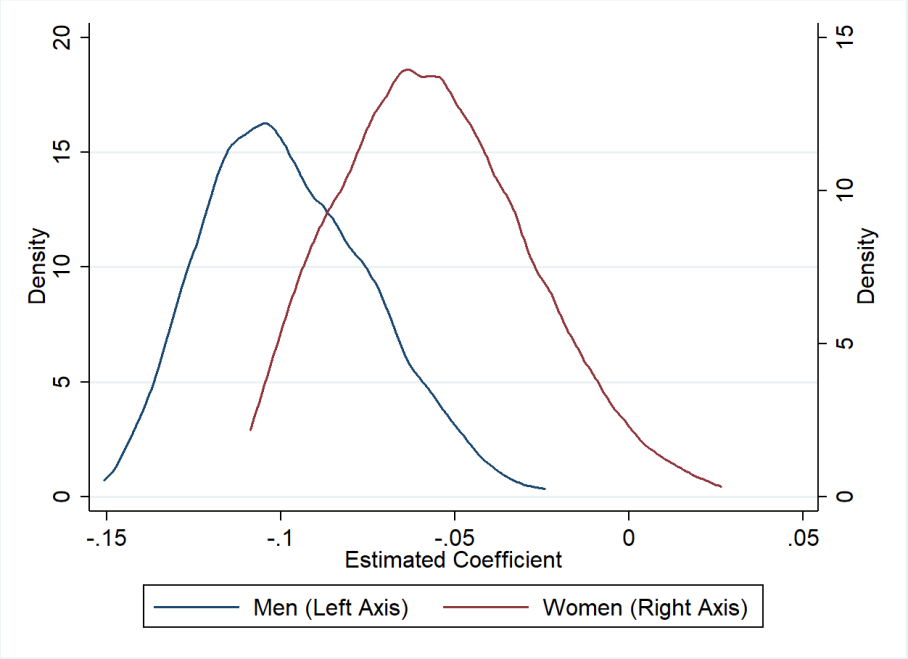
Notes. Source: Own elaboration based on data from DANE.

Figure A3. Robustness Estimations by Labor Formality



Notes. Source: Own elaboration based on data from DANE.

Figure A4. Robustness Estimations by Sex



Notes. Source: Own elaboration based on data from DANE.