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MICROCON Research Working Paper 14
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June 2009

Correct citation: Calderón, V. and Ibáñez, A-M. 2009. *Labor Market Effects of Migration-Related Supply Shocks: Evidence from Internally Displaced Populations in Colombia.* MICROCON Research Working Paper 14, Brighton: MICROCON.

First published in 2009

ISBN: 13 978 185864 769 X

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SIXTH FRAMEWORK PROGRAMME

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Labor Market Effects of Migration-Related Supply Shocks: Evidence from Internally Displaced Populations in Colombia[1]

Valentina Calderón[2] and Ana María Ibáñez[3]

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Abstract: This paper studies the labor market effects of migration-related supply shocks. We exploit forced migration caused by the Colombian conflict as a natural experiment to examine the impact of exogenous labor supply shifts on labor outcomes. While migration flows are exogenously produced by conflict dynamics, location decisions might be positively correlated with demand shocks. An instrumental variables strategy allows us to correct for the possible attenuation bias generated by internally displaced populations locating in dynamic labor markets. Our results suggest that these immigration flows produce large negative impacts on the wages and employment opportunities of all workers, and are particularly large for low skill workers.

Keywords: Migration, Labor Markets, Developing Countries
JEL Classification: J22, J40, J41, J61

[1] We are grateful to Robert LaLonde, Jeffrey Grogger, Marcos Rangel, Amer Hasan, and participants of the 6th Midwest Development Conference, HICN and Universidad de los Andes workshops for useful comments; and Juan Carlos Muñoz for excellent research assistance. Valentina Calderón thanks Universidad de los Andes and MICROCON for financial support.
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I. Introduction

The perception that large inflows of unskilled migrants can deteriorate the labor conditions of a low-skilled native workforce in the host country has inspired a debate on the impact of migration. The evidence in the literature is mixed. Numerous studies have found that migration negatively affects wages and employment outcomes of natives, especially those least skilled, yet the magnitude of the effect is small (Altonji and Card, 1989; Card, 1989; LaLonde and Topel, 1991; Schoeni, 1997; Borjas and Katz, 2005; Carrasco et al, 2008; Kugler and Yuksel, 2008; Borjas, Freeman and Katz, 1997; Borjas, Grogger and Hanson 2006 and 2008). Some authors attribute the small effects to market adjustments, such as the outmigration of natives and the positive output of demand shocks, which conceal the large impact (Altonji and Card, 1989; Borjas, 1994).

Establishing causality between adjustments in labor markets and immigration flows is however difficult. Presumably, migrants locate in dynamic markets with a growing labor demand, biasing the estimate of the impact on the labor markets. In order to solve the endogeneity issue, inflows of migrants have been instrumented with earlier migration flows from the same country (Altonji and Card, 1989; LaLonde and Topel, 1991; Card, 1989, Schoeni, 1997), or natural experiments are exploited whereby exogenous migrant flows are used to estimate the impact on labor markets (Card, 1989; Hunt, 1992; Carrington and deLima, 1996; Friedberg, 2001; Angrist and Kugler, 2003; Kugler and Yuksel, 2008; Lemos and Portes, 2008).

The purpose of this paper is to determine the effects of large inflows of migrants on city wages, employment, unemployment, and labor force participation. In contrast to most of the literature that has focused on examining the effects of international economic immigration on labor markets of developed countries, this paper examines the impact of internal migration in a developing country. By examining labor markets of a developing country, this paper identifies the difficulties of labor market adjustments in rigid markets that are highly segmented between the informal and formal sector. Besides providing evidence for internal migration in a developing country, this paper uses a solid natural experiment, forced migration caused by the Colombian conflict, and an innovative instrumental variable, the massacres endured by the civil population in origin municipalities interacted with the

distance to destination sites. Because forced displacement is prompted by armed conflicts and chronic violence, the massive flows of migration generated is not responding to economic incentives, but instead migrants are fleeing rural areas in search of safety. This phenomenon creates an exogenous shift in labor supply, serving as a natural experiment to evaluate the effects of large labor supply shocks on cities. Despite being forced to flee from their origin cities, the decision to locate in a certain city might be associated with the economic opportunities the destination provides. For this purpose, we instrument the immigrant flows with an interaction between massacres at origin site and distance between origin and reception site. We believe this instrument corrects the bias generated by migrants locating in dynamic labor markets.

Our results suggest that these migration flows produce large negative impacts on wages, and employment opportunities of all workers, but are particularly large for low-skilled workers. Due to the rigidities of labor markets in Colombia and the minimum wage regulations, adjustments of labor markets are slow and seemingly incomplete, producing a particularly large negative effect on wages and an expansion of the informal sector. The distributive impact of forced displacement is considerable. Not only are welfare and assets losses stemming from forced displacement substantial (Ibáñez and Moya, 2008), the impact of displaced inflows falls heavily on the most vulnerable groups of the native population.

The remainder of the paper is organized in four sections. Section two describes the empirical strategy. In the third section, we describe in detail the data sources and variables constructed. Lastly, the results from the main analysis are discussed in section four with the conclusions presented in section five.

II. Empirical strategy

The purpose of this paper is to identify the impact of migrant flows on labor market outcomes. We examine labor markets adjustments after an exogenous shift in labor supply caused by forced displacement in Colombia. Because excessive regulation and a binding minimum wage introduce significant rigidities to the Colombian labor markets, we also examine whether the impact of migration on these labor outcomes of workers differs across the formal and informal sectors. In addition, we identify the impact of migrant shares on the probability of being employed in the

formal and informal sector. By examining the impact on these probabilities, we intend to establish whether migration contributes to the expansion of the informal sector.

The analysis draws on a two-sector model of labor markets. Minimum wage regulations, the large non-wage costs and the excessive regulation of the Colombian labor markets have contributed to a growing informal sector, and high unemployment rates (Kugler and Kugler, 2003; Maloney and Núñez, 2003; Bernal and Cárdenas, 2003). Presumably, labor adjustments to migrant shares differ for the informal and formal sector, therefore assuming one sector may conceal the impact of an outward shift of labor supply. We identify adjustments on natives' wages, labor participation, employment and unemployment, using an approach suggested in LaLonde and Topel (1991).

We assume workers in the two sectors are not homogeneous such that most low productivity workers self-select into the informal sector. When the minimum wage in the formal sector is above the equilibrium wage, labor markets produce an excess supply of workers. This excess supply of the formal sector pushes workers to the informal sector, to queue for a job in the formal sector, causing unemployment, or to reduce participation in labor markets when the wage falls below their reservation wage. This is the case in Colombia where unemployment rates are high, the average of the last seven years is about 12 percent, and the informal sector accounts for 60 percent of total employment.

Internally displaced persons (IDPs) exogenously shift labor supply and cause an increase in the share of migrants. This in turn induces a change in the equilibrium conditions of both sectors. For the formal sector, if wages are equal to the minimum wage, a shift in the labor supply expands the excess supply obliging some workers to work in the informal sector, as well as increasing unemployment and reducing labor participation. If wages are above the minimum wage, wages may fall to the floor established by regulation. For the informal sector, an exogenous shift outward in labor supply, decreases equilibrium wages, and expands the number of workers in the informal sector.

However, this increment in labor supply is not homogenous across all skill groups. The skill distribution of migrants, though diverse, usually diverges from the skill distribution of natives, implying that the skill group which increases

disproportionately is the most affected by the sudden expansion in labor supply (Altonji and Card, 1989). In our particular case, the skills of the displaced population are concentrated in the lower tail of the skill distribution, implying that an increasing share of forced migrants will impact mostly the informal sector. We expect displaced persons to be perfect substitutes for informal workers. Barriers to wage adjustments and the restricted ability of the Colombian markets to adjust to new conditions may strengthen the effect of the shock on participation rates and employment (Altonji and Card, 1989; Schoeni, 1997; Carrasco, 2008). Thus, we can expect large wage adjustments for individuals working in the informal sector as this sector is not obliged to comply with labor regulations, while quantity adjustments, such as a fall in labor participation and employment rates and an increase in unemployment, may emerge in the formal sector given that it is excessively regulated. However, as stressed by LaLonde and Topel (1991), IDPs are expected to assimilate to urban labor markets over time, entailing a greater degree of substitution as they assimilate, not only with informal workers, but also with formal workers.[4]

In order to identify the impact of the inflow of forced migrants on labor outcomes *y* for an individual *i* residing in locale *c* at period *t*, we use the following reduced form specification:

$$y_{ict} = \beta_0 + \beta_c + \beta_{ct} + X_{ict}\delta + \gamma \ln\left(\sum_{t=2001}^{t} M_{ct} \Big/ Pop_{12-65ct} \right) + \varepsilon_{ict} \quad (1)$$

where X_i are individual characteristics that influence labor outcomes such as potential experience, years of completed schooling, gender and marital status, $\ln\left(\sum_{t=2001}^{t} M_{ct} \Big/ Pop_{12-65ct} \right)$ is the share of forced migrants at period *t*, γ represents the impact of migration on labor outcomes, and β_c and β_{ct} are time invariant and time varying locale effects respectively. Labor outcomes (y_{ict}) are hourly wages, labor force participation, unemployment, employment, probability of working in the formal sector, and probability of working in the informal sector. For all labor outcomes, we

[4] Our data does not cover a large enough period to identify the long-term adjustments as the large inflows of displaced persons were fairly recent.

estimate the impact for the overall sample and for the formal and informal sector separately.

We include locale effects to control for demand shocks, transitory fluctuations in demand or local amenities. For example, immigrants may produce a demand shock on the output markets, increasing labor demand and mitigating the negative impact on labor markets. Two facts lead us to believe that a demand shock is unlikely in our case. Increased labor demand attributable to the rise in demand of locally produced goods generated by new IDPs might be small or negligible since on average they are close to subsistence levels. In addition, we are concentrating on the short-term impacts; thus, reactions from local labor markets are highly unlikely as firms do not have time to adjust (Altonji and Card, 1989). Despite expecting little reaction on the short-run, we include city fixed effects and city fixed effects interacted with years to control for any potential positive demand shocks (Altonji and Card, 1989; LaLonde and Topel; 1991; Schoeni, 1997; Kugler and Yuksel, 2008).

Besides positive demand shocks, some natives may decide to out-migrate as a response to migration flows, mitigating further the impact of the newly increased supply (Altonji and Card, 1989; Borjas, 1994). The evidence on this respect is not conclusive as some studies find no evidence of out-migration, while others find particular groups may out-migrate in small proportions (Altonji and Card, 1991; Card and DiNardo, 2001; Kugler and Yuksel, 2008). Given that we are examining the short-term impacts, we can assume that outmigration is an unlikely response by the native population.

The share of migrants is however an endogenous variable since migrants presumably select the city they migrate to based on the labor conditions that prevail. Most studies use geographical variation in the location of earlier migrants to instrument for the arrival of new migrants (Altonji and Card, 1989; LaLonde and Topel, 1991; Card, 1989, Schoeni, 1997). Other studies rely on natural experiments, such as the Mariel Boat lift, the repatriation of French citizens from Algeria or Hurricane Mitch, producing exogenous migrant flows (Card, 1989; Hunt, 1992; Carrington and deLima, 1996; Friedberg, 2001; Angrist and Kugler, 2003; Kugler and Yuksel, 2008; Lemos and Portes, 2008).

To instrument for migration flows, we also rely on a natural experiment: forced displacement caused by the internal conflict in Colombia, which has produced massive outmigration of populations from rural to urban areas. Intensification of the Colombian conflict during the 1990s heightened aggressions against the civilian population. Selective homicides, massacres, death threats, sexual violence, forced recruitment, and abductions perpetrated by illegal armed groups became frequent in rural areas. In order to prevent aggressions or after being the victim of one, the civilian population fled to seek refuge in urban areas. Although households migrate, these massive population movements are not a response to economic incentives (Engel and Ibáñez, 2008). Between 1998 and 2008, nearly 4.2 million persons, equivalent to 10% percent of the country's population, were forced to migrate (Ibáñez and Velásquez, 2008). More than half the displacements occurred in a time span of four years (2000-2004). Forced displacement originates in nearly 90 percent of the Colombian municipalities, and the final destination of this population is dispersed all over the territory, providing a wide geographical variation. In some medium-sized cities the displaced population was more than 20 percent of the native population. Despite being forced to leave, the selection of the destination site was completely voluntary. Different from other countries facing conflict, refugees were not required to locate to special camps, or to migrate to a particular city. Labor markets conditions could thus determine, at least partially, the decision to locate in a particular host city. This suggests that forced displacement is a natural experiment to understand how labor market adjusts to exogenous shifts in supply.

Even though the expulsion of this population is not related to labor conditions, the decision to locate in a particular city may depend, at least partially, on labor conditions. We instrument the displacement shock using the number of massacres of civilian population perpetrated by illegal armed groups in origin cities, which captures the decision to out-migrate, interacted with distance to the destination municipalities, which captures the decision to immigrate to a particular city. The instrument is in turn weighted by the proportions that arrive at locale c from origin x. Equation (1) describes the first part of our empirical analysis in which we use micro data for the period 2001 to 2005 to estimate the effects of an increase in the share of IDPs on city wages, labor participation, unemployment, and employment.

The instrument is constructed as the sum of massacre-related deaths divided by the distance from where these massacres occur to the destination city, divided by the working age population at each destination city.

$$\text{Instrument}_{ct} = \log\left(\frac{\sum_{\text{All origins}}^{\text{Destination city } c} \frac{\text{Number of victims from massacres}_{to}}{\text{Distance}_{oc}}}{Pop_{12-65ct}} \right)$$

o = *origin*

c = *destination city*

t = *month*

Note : Distance in kilometers from municipality of orgin to destination city

3. Data, Choice of Demographic Subgroups and Definition of Labor Market Outcomes

Three different sources of data are used for this study. The first is the National Household Survey 2001-2005 (ECH 2001-2005 from its Spanish Acronym), that is representative of the 13 largest metropolitan areas. The second source of data is the data on Internally Displaced Populations (RUPD from its Spanish Acronym) from *Acción Social*, the presidential agency in charge of collecting information on displaced populations.[5] Data on displacement is available at the individual level, and provides information on origin and destination site, age, as well as on exact date of migration. The third source of data is the data on violence by municipality constructed by CEDE (Center for Economic and Development Studies of the Universidad de los Andes), which provides historical information on terrorist activity by municipality in Colombia.

The National Household Survey is a repeated cross-section of household survey data collected quarterly by the National Statistics Department (DANE). It is representative of the 13 largest metropolitan areas. The surveys included in this paper cover the period January 2001 to September 2005. This particular period was chosen

[5] The objective of RUPD is to legally recognize displaced households and thus quantify the demand for humanitarian aid. RUPD is a demand-driven instrument, wherein displaced households must approach government offices to declare, under oath, the circumstances of their displacement. After making such a declaration, government officials validate whether it is truthful and, if so, the legal status to be granted to the members of the displaced household.

because in this time frame the conflict intensified and displacement soared. In addition, data on internal displacement is believed to be consistent only from 1998 onwards as the RUPD was launched in 1999, and only registered persons within one year of displacement. The National Household Survey collects information on household characteristics, education variables, and labor force information. Also, a special module on migration is included for the first quarter of every year. This module identifies economic migrants and IDPs. The key variables studied include labor participation, employment status, wage (wage from main and second occupation), probability of working in the formal/informal sector, in addition to socio-demographic characteristics such as age, sex, potential experience, and years of completed schooling.

Hourly wages are constructed using the national household surveys, for the working age population (12-65 years of age) that have a complete report on all earnings, and are not currently attending school. For the purpose of the analysis, we perform estimations of the overall labor market and separately for formal and informal workers. Individuals that report working more than 100 hours per week were eliminated from the estimation sample.

To define skill groups, we rely on the official definition of formal and informal workers. Such definition classifies as informal employees and employers those who work for firms with ten or less workers, independent workers except professionals and technicians, domestic workers, and household workers with no remuneration.

Also, we cannot distinguish between migrants and IDPs. In contrast to LaLonde and Topel (1991) and Card (1989), new IDPs are not only a substitute for earlier cohorts of IDPs or migrants, but rather we believe they are substitutes for other low skill natives. First, we concentrate on short-term impacts of IDPs as the large inflows of displaced persons were fairly recent. Thus, we cannot examine the impact on earlier cohorts of IDPs. Second, the skill-profile of migrants and IDPs diverges significantly. The skill distribution for migrants is above that of informal workers, whereas IDPs' skill distribution is below that of informal workers.

Wages were deflated by consumer price index March 1998=100 for each metropolitan area, and we control for cost of living across areas. Schoeni (1997)

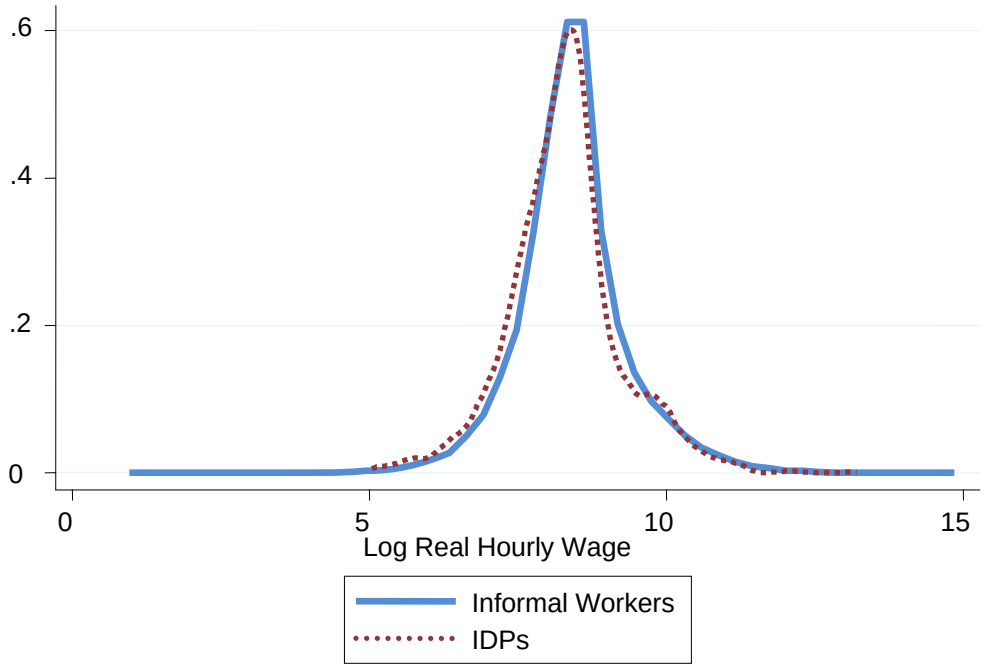
suggests that regional price differences are strongly positively correlated with migration intensity, thus adjusting for these differences should eliminate any positive bias. Information on the monthly consumer price index by MSA is available from DANE, and used to deflate wages. Precise definitions of local labor markets are presented on Appendix A.

Data from *Acción Social* is used to construct monthly migration shocks, as well as weights for our instrument. The IDP shock is constructed for individuals in working age (12-65 years of age), where the numerator is the cumulative number of IDPs in working age that arrived to each city and the denominator is the number of natives in working age.

Finally, the data on violence is used to create the instrument which is the sum over time and destination of the total number of massacre related killings at the origin municipality divided by the distance from origin to destination city. While massacres explain why people flee from a certain municipality, the variable distance is interacted with massacres at origin site as we believe that closeness to any of these 13 MSAs, rather than economic conditions explain, settling patterns. The following section describes our results.

We expect the labor market responses to the displacement of both informal and formal workers to be different. Because the earnings distribution of the displaced population is similar to that of informal workers, we believe informal workers will be the group most severely affected by such migration flows, as the more directly competing for jobs. Graph 1 depicts the distribution of hourly wages for informal workers and IDPs for the period of study (2001-2005). The distribution for IDPs and informal workers is similar with the distribution for informal workers slightly tilted to the right. The Kolmogorov-Smirnov test shows the distributions are not statistically different.

Graph 1.Kernel Density for Real Wages – IDP and Informal Workers



Source: Authors' calculations based on ECH 2001-2005

We decided not to divide groups by education-experience profiles. Given that a great bulk of the Colombian labor force classifies as informal workers, between 40 and 60 percent of the labor force, neither potential experience nor education appear to explain why people sort in certain occupations, and therefore we concentrate our analysis on formal and informal workers. We also expect those at the bottom of the income distribution to be most likely affected by the effects of this migration.

We group workers by gender. Female IDPs are better suited to compete in urban labor markets because their skills, such as cleaning, cooking or taking care of children, are more akin to some urban occupations. In addition, many females are obliged to become the main breadwinners of the household because their husbands were killed or abducted. Their household dependency ratio is large as a consequence, and reservation wages may be low. We expect the impact of the IDP shock to be larger for female informal workers.

IV. Results

The impact of migrant inflows on the different labor outcomes are presented in this section. We estimate impacts for wages, labor force participation, employment, unemployment, and type of occupation (formal and informal). All labor outcomes are estimated for the overall sample, and by gender. The impact on wages is estimated for the overall sample and for type of occupation. Our results suggest that inflows of forced migrants have negative statistically significant effects on city wages, and a positive and statistically significant effect on employment of the informal sector. The impact is particular large for informal workers who face drops in salaries between 1% and 2.4% for a 10% increase in the migrant share. In addition, immigration seems to be contributing to the expansion of the informal sector.

In the past 10 years, unemployment rates in Colombia's 13 largest metropolitan areas have severely increased. This has been usually attributed to labor market rigidities that were exacerbated by economic recession at the beginning of the decade. As shown in Table 1, the unemployment rate for the period of study (2001-2005) was about 17 percent for the 13 largest metropolitan areas. The purpose of our paper is to determine if supply shocks were a contributing factor to the deteriorating labor market conditions in Colombian cities. The 13 largest metropolitan areas in Colombia received about three percent of their labor force in a period of eight years, with some cities receiving more than five percent in the same time frame. The flows appear to be especially large for medium size metropolitan areas.

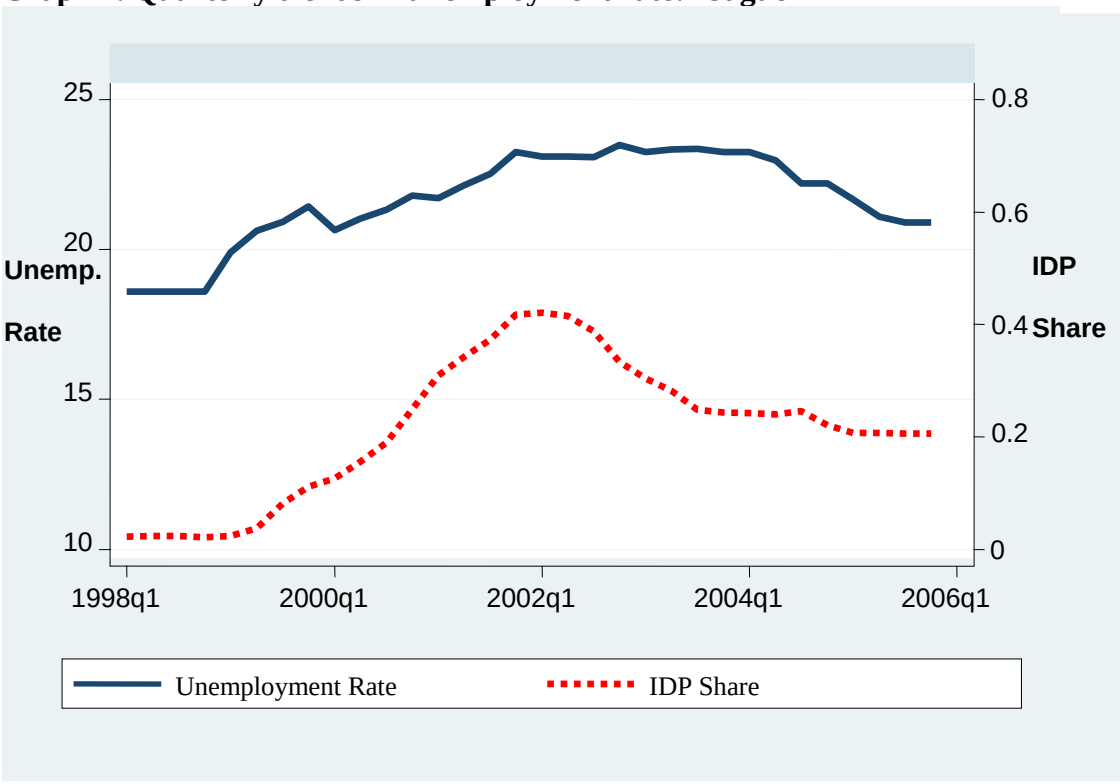
Table 1. Descriptive Statistics 13 Largest Metropolitan Areas in Colombia

Variable	Mean	Standard Deviation	Minimum	Maximum
Share of forced migrants	2.99	2.13	0.03	13.21
Employment Rate	52.78	3.78	42.58	59.78
Unemployment Rate	16.97	2.70	11.06	25.90
Labor Force Participation	63.63	4.79	50.44	72.37

Source: Authors' calculations based on ECH 2001-2005, DANE and RUPD.

Our analysis indicates that in some metropolitan areas, the contribution of IDPs to the labor force follows the trend of the unemployment rate. Such is the case for cities like Ibague that is depicted in Graph 2. The growing number of unskilled workers in cities appears to be a contributing force in the increase in unemployment, especially in smaller metropolitan areas. Despite the appealing evidence in this graph, we need to control for other factors that may be determining the trend as well the behavior of labor markets, and correct for potential endogeneity bias. For example, although displacement and unemployment reached a peak in 2002, the deep recession the country faced in 1999 has been identified as the main driving force of increasing unemployment rates. However, after the one year recession, economic growth rates recuperated significantly, and labor reforms were put in place to lessen market rigidities. Forced displacement, however, continued, and unemployment rates decreased, but persisted at high levels. The results, which are presented in the next paragraphs, reveal that unemployment rates in Ibague, a medium-sized city, follow the same trend as the share of migrants, which may imply that an increasing share of migrants contributes to deteriorating labor conditions.

Graph 2. Quarterly trends in unemployment rate: Ibague



Source: Authors' calculations based on ECH 2001-2005, DANE and RUPD, Double scales in percentages.

Table 2 shows the unemployment trend in each metropolitan area for the period of study. It is noticeable that for the year 2002 unemployment was particularly high in all 13 metropolitan areas, year in which displacement flows were largest. Unemployment rates during this year ranged from 14.8% in Cartagena to 23% in Ibague. Displacement shares are larger in medium and small size cities such as Ibagué (6.1%), Monteria (6.61%), Pasto (6.63%), and Villavicencio (12.71%). However, the capacity to absorb migration flows seems to differ across cities. While unemployment and migration flows grew *pari passu* in Ibagué, in Villavicencio unemployment dropped and displacement increased significantly. Controlling for city specific effects is thus important.

Table 2. Unemployment and IDP Shock by Metropolitan Area

	2001	2002	2003	2004	2005
Four largest cities					
Bogotá					
Unemployment Rate	18.65	17.91	16.69	14.64	13.26
IDP Share	0.34	0.87	1.23	1.60	1.99
Medellín					
Unemployment Rate	18.06	16.99	16.14	15.21	14.65
IDP Share	1.18	1.93	2.18	2.55	2.96
Calí					
Unemployment Rate	17.87	15.91	15.28	14.18	13.11
IDP Share	0.53	1.12	1.42	1.68	1.87
Barranquilla					
Unemployment Rate	16.02	16.62	16.31	14.95	13.56
IDP Share	1.35	2.67	3.16	3.93	4.46
Other cities					
Bucaramanga					
Unemployment Rate	18.22	20.04	17.87	16.69	15.19
IDP Share	1.51	2.74	3.20	3.82	4.37
Cartagena					
Unemployment Rate	17.43	14.83	15.50	14.81	16.00
IDP Share	2.18	4.01	4.70	5.45	5.61
Cucutá					
Unemployment Rate	15.37	17.17	17.49	15.79	14.62
IDP Share	1.31	2.94	3.55	4.09	4.56
Ibagué					
Unemployment Rate	23.19	23.22	23.38	22.21	20.69
IDP Share	1.53	3.19	4.14	5.20	6.09
Manizales					
Unemployment Rate	18.58	19.06	18.67	18.75	17.09
IDP Share	0.38	1.63	2.01	2.41	2.73
Montería					
Unemployment Rate	17.59	17.02	16.08	16.70	14.46
IDP Share	2.71	4.78	5.39	5.91	6.61
Pasto					
Unemployment Rate	19.82	17.79	18.45	17.96	15.09
IDP Share	1.94	4.54	5.49	6.17	6.63
Pereira					
Unemployment Rate	18.50	17.72	18.09	17.11	16.07
IDP Share	0.92	1.95	2.83	3.65	4.09
Villavicencio					
Unemployment Rate	16.17	15.56	14.13	12.58	12.17
IDP Share	2.10	5.62	7.52	9.49	12.71

Source: Authors' calculations based on ECH 2001-2005.

As opposed to international migration patterns to the US, the displaced appear to be a low skill homogenous group, and thus we believe they disproportionally affect the most vulnerable. The characteristics of the displaced population are shown in Table 3. IDPs are more similar to informal workers. However, they have on average less human capital, and appear to have different experience profiles from both the average informal worker and the average native. They are also younger, have larger families, and the head of the household appears to have more economic dependants. In addition, they work a larger number of hours and earn on average about 80 percent of a minimum wage. The poverty conditions of these populations are such that we believe that their reservation wage is low, and they would be willing to accept any job offer. The fact that they are willing to take any job offer entails a greater competition for unskilled workers, implying more substitutability with other unskilled workers at destination sites.

Table 3. Descriptive statistics comparing all workers, informal workers, IDPs.

Variable	IDPs		Informal Workers		All Workers	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Years of residence in locale 0-5	1.71	1.37				
Age	28.16	17.6	40.02	13.7	36.07	17.53
Age Head of Household	44.3	13.08	48.6	14.13	49.16	14.48
Sex (Males==1)	50	50	49	50	54	50
Married	33	47	57	49	46	50
Cohabitation	18	39	28	45	19	39
Number of People per Household	5.79	2.51	4.78	2.37	4.84	2.26
Average Years of Completed Schooling	5.34	4	7.56	4.19	8.5	4.24
Literacy Rate	88	32	96	2	96	2
Years of Completed Education of the Head of the Household	5.96	4.03	7.42	4.28	7.91	4.32
Years of Completed Education of the Spouse of the Head of the Household	5.69	4.26	7.14	4.55	7.77	4.68
Hours worked in first job per week	51.1	23.74	45.66	21.59	47.4	19.25
Hours worked in second job per week	0.12	1.69	0.37	2.93	0.25	2.34
Real Monthly Wage (COP)	232,594	242,296	245,440	384,606	334,610	562,647
Wage in terms of the Minimum Wage	0.81	0.85	0.86	1.34	1.17	1.97

Source: Authors' calculations based on ECH 2001-2005.

The first group of regressions will show the effect of the migration share on the real wages for the individuals located in each MSA. We defined the share as the cumulative population in working ages (12 to 65 years of age) received in a certain MSA since 2001 divided by the MSA population in working ages. We will proceed by showing the effect of the aggregate migrants' share over the whole native workforce, in addition to the effects of the share of migrant on wages of both females and males, followed by the results on informal workers and formal workers that are in turn presented disaggregated by gender. All regressions are clustered by MSA.

The first stage for the instrument is presented in Table A1 of the Appendix. The first stage shows a good fit of the instrument. We corroborate that by estimating the first stage only including the instrument. Results are presented in Table A2. The R-square for this regression is 0.40, showing the instrument indeed explains a large proportion of the variation in the share of migrants. Table A3 shows changes in the predicted share of migrants, evaluated at the mean, as the instrument increases by one standard deviation. As expected, an increase in the number of massacres by one standard deviation causes an increment of 6.72 percent in the share of migrants. Map 1 depicts the distribution of massacres along the Colombian Territory. Although massacres are distributed all over the Colombian territory, occurrence is mainly concentrated in rural areas located near the economic centers, and the 13 largest metropolitan areas, which corresponds to the cities examined in this paper.

Table 4 shows the effects of the share of forced migrants on the overall workforce. The first column shows an OLS regression with no year or city controls, the second column includes fixed effects for the city and the city interacted by the year, and the third column shows the result after instrumenting for the share of migrants. The results suggest a negative and statistically significant effect of the migrant inflows on wages. The effect is robust to the different specifications, and our instrument is correctly addressing the attenuation bias generated by IDPs locating in dynamic labor markets. The other variables have the expected signs, and are robust as well to the different specifications. The results suggest that a 10 percent increase in the share of migrants reduce wages by 1.4 percent.

Table 4. Log Real Hourly Wage All Workforce

Variables	OLS (I)	Fixed Effects (II)	IV-Fixed Effects (III)
Years of Completed Education	0.030*	0.030*	0.030*
	[0.001]	[0.001]	[0.001]
Experience	-0.000*	-0.000*	-0.000*
	[0.000]	[0.000]	[0.000]
Experience Squared	0.132*	0.131*	0.131*
	[0.004]	[0.004]	[0.004]
Dummy Married	0.032*	0.036*	0.037*
	[0.007]	[0.005]	[0.004]
Sex (Female=1)	-0.082*	-0.085*	-0.085*
	[0.010]	[0.010]	[0.010]
Log Share of Forced Migrants	**-0.074***	**-0.095***	**-0.142****
	[0.017]	**[0.018]**	**[0.057]**
Constant	5.267*	5.067*	4.875*
	[0.080]	[0.071]	[0.200]
Observartions	741,562	741,562	741,562
R-Squared	0.357	0.363	0.364

Clustered robust standard errors in parentheses
+significant at 10%, ** significant at 5%; *** significant at 1%
The dependent variable is the hourly wage of individuals not currently enrolled in school. (II) and (III) include city dummies and a time trend interacted with city dummies.

As a robustness check, we estimate the regressions using the first quarter of every year and eliminating both economic migrants and IDPs. We believe that economic migrants might observe the flows of migration, and select not to migrate, if they believe they will face high competition in a certain reception site, or they might decide to locate in other cities where IDPs represent a smaller share of the workforce. However, we know that economic migrants and IDPs differ substantially in their characteristics. Economic migrants tend to be younger and more educated, have smaller families and most have urban labor market experience. Thus, migrants will not directly compete with IDPs for jobs. Even if migrants could observe or anticipate IDP shocks, we expect the effects on their wages to be small, as they do not appear to be good substitutes. On the other hand, since IDPs fare poorly in labor markets, not eliminating them from the sample might reinforce the negative impact of migration. The results of the effects of the shock for the overall native workforce excluding economic migrants and IDPs are presented below (Table 5). The results, while smaller than those reported using the whole sample, are similar in magnitude to those reported on Table 4. In addition, the IV appears again to be solving the attenuation bias generated by IDPs locating in dynamic labor markets.

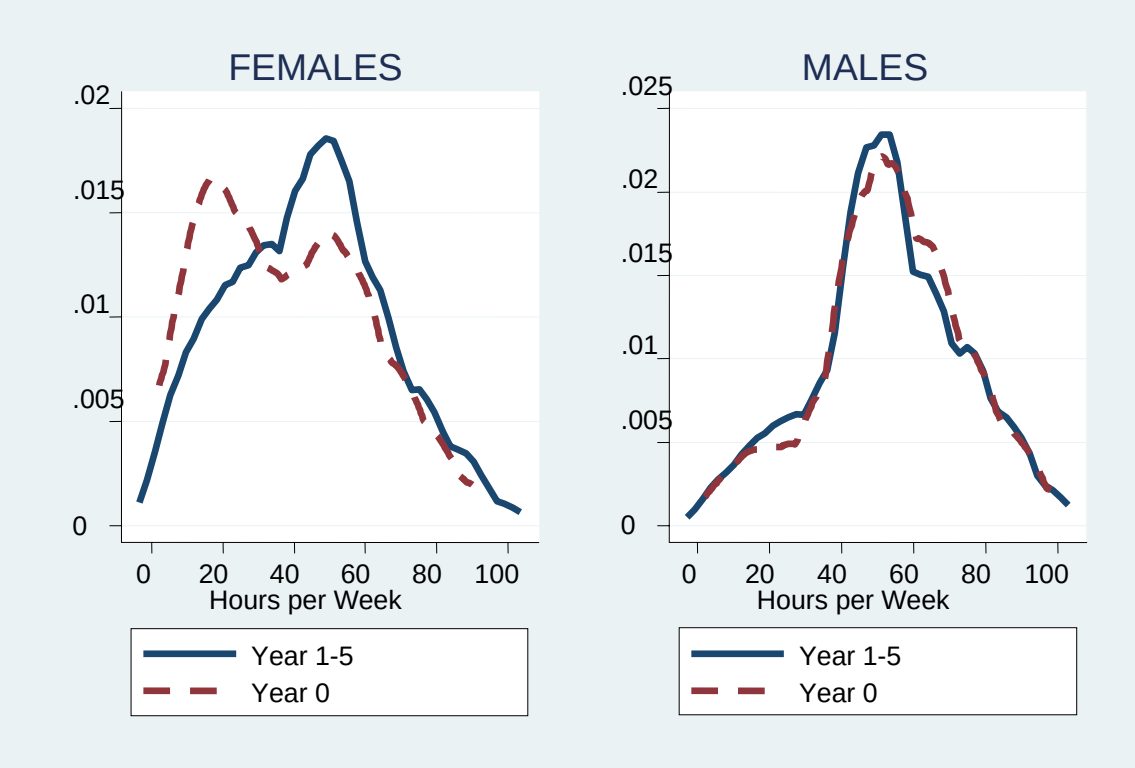
Table 5. Log Hourly Wage - All Native Workforce

Variables	OLS (I)	Fixed Effects (II)	IV-Fixed Effects (III)
Years of Completed Education	0.032*	0.031*	0.031*
	[0.001]	[0.001]	[0.001]
Experience	-0.000*	-0.000*	-0.000*
	[0.000]	[0.000]	[0.000]
Experience Squared	0.132*	0.131*	0.132*
	[0.004]	[0.004]	[0.004]
Dummy Married	0.039*	0.043*	0.044*
	[0.008]	[0.005]	[0.005]
Sex (Female=1)	-0.077*	-0.080*	-0.080*
	[0.013]	[0.013]	[0.013]
Log Share of Forced Migrants	**-0.063***	**-0.083***	**-0.109***
	[0.015]	**[0.008]**	**[0.034]**
Constant	5.296*	5.115*	5.004*
	[0.080]	[0.019]	[0.127]
Observartions	190,870	190,870	189,388
R-Squared	0.366	0.373	0.374

Clustered robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable is the hourly wage of individuals not currently enrolled in school. (II) and (III) include city dummies and a time trend.

Table 6 shows the estimations by gender. As stated before, displaced women are better suited to compete in urban labor markets as their labor experience is more akin to some urban low skilled occupations. Upon arrival to cities, the participation of female IDPs in the labor market may be larger. Graph 3 shows that, in addition, the assimilation of female IDPs, in contrast to male IDPs, is greater. Since time of arrival, there is a sharp increase in the hours worked for female, while for men the hours worked remain constant. The difference in the two distributions of hours worked is statistically significant for female IDPs, implying larger degree of substitutability with other unskilled females in urban labor markets.

Graph 3. Hours worked per week by gender – recent and earlier migrants



Source: Authors' calculations based on ECH 2001-2005.

The results corroborate this by suggesting a larger effect on female wages, which presumably is a consequence of a greater degree of assimilation of females to cities. The effect on wages appears to be larger for females as for males: a 10 percent increase in the IDP shock reduces female wages by 1.63 percent, and male wages by 1.24 percent. We believe this is evidence of a greater degree of assimilation of female IDPs to urban labor markets, and of a female competitive advantage in urban labor market jobs.

Table 6. Log Real Hourly Wage: Females and Males

	OLS (I)	Fixed Effects (II)	IV-Fixed Effects (III)
Females Log share of forced migrants	**-0.100***	**-0.162***	**-0,163**
	[0.020]	**[0.018]**	**[0.104]**
Observations	329,251	329,251	329,251
R-Squared	0.317	0.324	0.325
Males Log share of forced migrants	**-0.061***	**-0.073***	**-0.124***
	[0.018]	**[0.021]**	**[0.036]**
Observations	412,311	412,311	412,311
R-Squared	0.391	0.397	0.399

Clustered robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable is the hourly wage of individuals not currently enrolled in school. (I), (II) and (III) control for potential experience, potential experience squared, years of completed schooling, and a marital status dummy. (II) and (III) include city dummies and a time trend interacted with city dummies.

Because IDPs have low human capital, an inadequate experience for urban markets, and are similar to informal workers, they will most likely join the informal sector upon arrival. This implies that they will disproportionally affect the informal workforce, as they will be competing more directly with them for jobs. The results for only informal workers, and informal workers differentiated by gender are presented in Table 7. For purposes of estimating consistently the number of informal workers, we restrict the sample to the second quarter of every year for the ECH as information on informality is only collected for these periods.

Our results indicate that the effect of the IDP shock falls disproportionately on informal workers. An increment of 10 percent in the share of IDPs over the working age population will generate a real wage decline of 3.02 percent. As expected, since IDPs are better substitutes of informal workers, the impact will be greater than for other workers. This is exacerbated by the fact that the informal sector is not constrained by the minimum wage legislation; thus, an inflow of less skilled workers, with presumably a low reservation wage, will exert a high impact on wages as the results show.

This impact is larger for female informal workers, who appear to carry most of the burden from the migrant inflows. While a 10 percent increase in the share of displaced cause a 2.63 percent fall in wages for male informal workers, for female informal workers this fall is 3.06 percent. These results further support our hypothesis: the best substitutes for IDPs are informal workers, and thus this will be the sector most severely affected by the forced migration flows.

Table 7. Log Real Hourly Wage - Informal Workers: overall sample and differentiated by gender
(Second Quarter 2001-2005)

	OLS	**Fixed Effects**	**IV-Fixed Effects**
	(I)	(II)	(III)
Log share of migrants	**-0.077***	**-0.147***	**-0.302***
	[0.018]	**[0.023]**	**[0.095]**
Observations	120,756	120,756	120,756
R-Squared	0.167	0.176	0.177
Females Log share of migrants	**-0.100***	**-0.162***	**-0.306****
	[0.018]	**[0.010]**	**[0.104]**
Observations	55,026	55,026	54,663
R-Squared	0.108	0.12	0.12
Males Log share of migrants	**-0.053****	**-0.136***	**-0.263*****
	[0.021]	**[0.037]**	**[0.137]**
Observations	66,522	66,522	66,076
R-Squared	0.229	0.24	0.241

Clustered robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable is the hourly wage of individuals not currently enrolled in school. (I), (II) and (III) control for potential experience, potential experience squared, years of completed schooling, and a marital status dummy. (II) and (III) include city dummies and a time trend interacted by city dummies.

In the formal sector the effects of the migration shock on wages are zero, this is due to the fact that wages cannot drop below the minimum wage and therefore the adjustment may be in quantities rather than in prices. As shown in Table 8, the effect of forced migrants inflows is not statistically different from zero when we use IV. The effect of the shock was also evaluated by gender; however the results suggest that the shock will have no effect on wages of both males and females that work for the formal sector. The results are shown in the following table.

Table 8. Log Real Hourly Wage - Formal Workers: overall sample and differentiated by gender (Second Quarter 2001-2005)

	OLS (I)	Fixed Effects (II)	IV-Fixed Effects (III)
Log share of migrants	**-0.082***	**-0.093***	**-0.143**
	[0.014]	**[0.007]**	**[0.101]**
Observations	45,350	45,350	45,350
R-Squared	0.506	0.513	0.514
Females Log share of migrants	**-0.069***	**-0.134***	**-0.183**
	[0.016]	**[0.012]**	**[0.113]**
Observations	27,221	27,221	27,221
R-Squared	0.44	0.448	0.449
Males Log share of migrants	**-0.079***	**-0.071***	**-0.164**
	[0.014]	**[0.011]**	**[0.103]**
Observations	25,566	25,566	25,566
R-Squared	0.506	0.513	0.514

Clustered robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable is the hourly wage of individuals not currently enrolled in school. (I), (II) and (III) control for potential experience, potential experience squared, years of completed schooling, and a marital status dummy. (II) and (III) include city dummies and a time trend interacted by city dummies.

In order to estimate the effect of the IDP shock on labor quantities, we estimate regressions for the probability of participating in the labor force, of being employed, and of being unemployed. The first stage for the quantity regressions are presented in Table A4. Table 9 shows the results. Besides reducing wages, the share of migrants decreases labor force participation and unemployment, while employment increases. However, the impact is not statistically significant for any of the three labor outcomes. As displaced persons are substitutes of informal workers, the impact on quantities may only emerge in informal markets. Thus, the aggregated impact on quantities may be concealing this fact.

Table 9. Instrumental variable estimations – Probability of participating in the labor force, being employed and being unemployed

Variables	IV-LPM Labor Force Participation	IV-LPM Employment	IV-LPM Unemployment
Log share of migrants	**-0.010**	**0.003**	**-0.022**
	[0.032]	**[0.033]**	**[0.013]**
Observations	1,495,603	1,487,965	984,645
R-Squared	0.289	0.221	0.024
Females Log share of migrants	**-0.024**	**0.002**	**-0.012**
	[0.024]	**[0.042]**	**[0.024]**
Observations	834,858	806,810	459,752
R-Squared	0.205	0.157	0.028
Males Log share of migrants	**0.014**	**0.004**	**-0.026****
	[0.044]	**[0.024]**	**[0.009]**
Observations	660,745	681,155	524,893
R-Squared	0.439	0.305	0.028

Robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable are a dummy variable indicating if the individual participates in the labor force, is employed, or is unemployed. (I), (II) and (III) control for potential experience, potential experience squared, years of completed schooling, and a marital status dummy. We include city dummies and a time trend interacted with city dummies for (II) and (III).

The exogenous supply shift produced by the IDPs also contributed to an expansion in the informal sector. The results for employment rates presented in Table 10 reveal that the shock not only produced a significant drop in wages, but also quantity adjustments. As expected, employment increases in both the informal and the formal sector. However, the expansion in the informal sector is much larger than in the formal sector: a 10 percent increase in the share of IDPs over the workforce, increases the probability of being employed in the formal sector by 0.18 percent and in the informal sector by 0.27 percent. The impact diverges for female and male workers. While employment in the formal sector increases for females, employment in the informal sector increases significantly for males. .

Table 10. Employment in the formal and informal sector - by gender

	Formal sector	Informal sector
Log share of migrants	**0.018***	**0.027***
	[0.004]	**[0.005]**
Observations	241,416	255,719
R-Squared	0.195	0.142
Females Log share of migrants	**0.017***	**0.007**
	[0.003]	**[0.004]**
Observations	112,699	118,845
R-Squared	0.225	0.166
Males Log share of migrants	**0.010**	**0.042***
	[0.006]	**[0.007]**
Observations	128,717	136,874
R-Squared	0.178	0.125

Robust standard errors in parentheses
*** significant at 10%; ** significant at 5%; * significant at 1%
The dependent variable is a dummy variable indicating if the individual works in the formal/informal sector. (I), (II) and (III) control for potential experience, potential experience squared, years of completed schooling, and a marital status dummy. We include city dummies and a time trend interacted with city dummies for (II) and (III).

The total effects of forced migration are sizeable. Between 2001 and 2005, displacement inflows increased by 200%. The total effects on wages are quantities from such increase, for the point estimates statistically significant, are presented in Table 11. As a consequence of forced displacement, overall wages fall by 28.4 percent, with wages for male workers decreasing by 24.8%. The impact on wages is driven by a sharp drop of informal wages equivalent to about 60 percent, with a sharper fall for female workers (61.2%) than for male (52.6%). The effect on employment and the expansion of the informal sector seems less substantial. As a result of an expansion in the labor supply, formal employment for female workers increases by 3.4 percent in a period of 5 years. Displacement flows contributed by 5.4 percent on the expansion of the informal sector in Colombia.

Table 11. Aggregated effects of forced displacement

Impact	Coefficient	Aggregated Effect
Hourly wages - total workforce	-0.142	-28.4%
Hourly wages - male workers	-0.124	-24.8%
Hourly wages - informal workers	-0.302	-60.4%
Hourly wages - female informal workers	-0.306	-61.2%
Hourly wages - male informal workers	-0.263	-52.6%
Formal employment - female workers	0.017	3.4%
Informal employment	0.027	5.4%
Informal employment - male workers	0.042	8.4%

The results show the supply shock produce a large effect on labor outcomes. Given the market segmentation, adjustments to the exogenous labor supply shock arise for wages and quantities. Wages fall about 1.4 percent for the native workforce for a 10 percent increase in the IDP share; wages for the informal sector drop by 3.06 percent; and employment increases by 2.6 percentage points. These estimates are larger than other papers that estimate the impact for labor markets in developed countries, where markets adjust rapidly to the shock and thus mitigate the effect. In contrast to labor markets in developed countries, the Colombian markets are plagued with rigidities that accentuate the negative impact of the shock. In addition, the effect of the shock falls disproportionately upon the most vulnerable groups of the population: informal and female workers. The large inflows of IDPs are producing a large negative distributive impact, which is exacerbating the effect stemming from the conflict.

V. Conclusion

This paper presents evidence on the effect of large exogenous supply shocks on labor market outcomes. The paper builds on a large group of papers that undertake similar approaches. However, we contribute in three respects. First, we use forced displacement produced by the civil conflict in Colombia as a natural experiment. The large immigration flows generated by forced migration are not related to labor conditions in the host city, but are the result of heightened attacks against the civilian population in the origin city. Second, we use a robust instrument: the massacres perpetuated by armed groups in each municipality weighted by distance to the destination site. While massacres explain the outflows of population from rural areas, distance to destination municipalities determine which city is selected by the displaced population for the final destination. Third, this is the first paper that

examines the impact of immigration on local labor markets of a developing country. Contrary to labor markets in developed countries, the excessive regulations produce inflexibility in labor markets, impeding a smooth adjustment when a shock arises. Our results suggest that the effect of a large inflow of less skilled workers is large. Not only do wages decline significantly, but quantity adjustments accentuate the effect. The point estimate from a 10 percent increase in the share of IDP migrants ranges from one to a little more than three percent.

We find that low skilled workers appear to be the most severely affected by the shift in the supply of labor, As the burden of the shock falls disproportionately on informal workers, which are directly competing for jobs with IDPs. In particular, informal female workers face the largest impact. Other papers in the literature of migration, suggest that particular groups are at a disadvantage, as they appear to be closer substitutes for migrants. Borjas, Grogger and Hanson (2006) findings suggest that the bulk of the effects of increasing immigration are borne by African Americans, as increased immigration has reduced not only their wages, but also the employment opportunities in the legal economy. Similarly, our results suggest a great expansion of the informal economy, accompanied by a large decline in wages in this sector.

The distributive impact of the displacement is considerable. On the one hand, forced migrants faced large welfare losses stemming for the displacement process. On the other, the large inflows of these displaced population is affecting mostly vulnerable groups of the population. Besides contributing by further providing evidence on the impact of exogenous labor supply shifts, this paper shows the detrimental impact of civil conflict on its victims and on labor markets.

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2. Definition of Local Labor Markets

For the purpose of our analysis we consider the 13 largest metropolitan areas. Each metropolitan area is comprised of the following municipalities:

Medellín MSA: Medellín, Bello, Barbosa, Copacabana, La Estrella, Girardota, Itagüí, Caldas and Sabaneta.

Bucaramanga MSA: Bucaramanga, Floridablanca, Girón, and Piedecuesta.

Barranquilla MSA: Barranquilla, Puerto Colombia, Soledad , Malambo and Galapa.

Cúcuta MSA: Cúcuta, Villa del Rosario, Los Patios and El Zulia.

Pereira MSA: Pereira, Dosquebradas, and La Virginia.

Bogotá MSA: Bogotá, Soacha, Mosquera, Funza, Madrid, Chía, Cajicá, Cota, La Calera, Tenjo, Tabio, Sibaté, Zipaquira, and Facatativa.

Cali MSA: Cali, Palmira, Yumbo, Jamundí, Candelaria, La Cumbre Vijes and Florida.

Villavicencio MSA: Villavicencio, Apiay, Acacías, Guamal, Restrepo and Cumaral.

Cartagena MSA: Cartagena, Arjona, Clemencia, Mahates, María la Baja, San Estanislao, Santa Catalina, Santa Rosa, Turbaco and Villanueva.

Manizales MSA: Manizales, Neira, Chinchiná and Villamaría.

Ibagué MSA: Ibagué, el Salado, Buenos Aires, Cajamarca, Alvarado, Venadillo, Villa Restrepo, Piedras and Doima.

Montería MSA: Montería

Pasto MSA: Pasto

Table A1: First Stage Regressions

	All Workers		Males		Females	
LOG(SUM(Massacre Victims/Distance)/POB12-65)		0.05		0.06		0.05
SE		[0.0003861]***		[0.000524]***		[0.0005709]***
F-Test	F(66,741804) =	6060.24	F(65,431619) =	3842.99	F(65,341462) =	2418.38
Prob > F =		0		0		0
R2		0.94		0.94		0.94
	All Formal		**Formal Males**		**Formal Females**	
LOG(SUM(Massacre Victims/Distance)/POB12-65)		0.12		0.12		0.12
SE		[0.0029451]***		[0.0038895]***		[0.003647]***
F-Test	F(186, 45295) =	51906.81	F(185, 25512) =	28830.99	F(185, 27167) =	31774.31
Prob > F =		0		0		0
R2		0.97		0.97		0.97
	All Informal		**Informal Males**		**Informal Females**	
LOG(SUM(Massacre Victims/Distance)/POB12-65)		0.16		0.17		0.16
SE		[0.0012815]***		[0.001753]***		[0.0018796]***
F-Test	F(186,131483) =	40148.86	F(185, 71835) =	19635.26	F(185, 59463) =	21408.24
Prob > F =		0		0		0
R2		0.98		0.98		0.98
	Participation		**Employment**		**Unemployment**	
LOG(SUM(Massacre Victims/Distance)/POB12-65)		0.05		0.05		0.05
SE		[0.0002719]***		[0.0003321]***		[.0003321]***
F-Test	F(66,1495536) =		F(66,984578) =		F(66,984578) =	
Prob > F =		0		0		0
R2		0.94		0.94		0.94

Note: For all regressions we do a Hausmann-Wu test comparing the IV estimates to the OLS estimates, to test for the validity of the instrument.

Table A2: First Stage Regression for all native workforce – only instrument

	All Workers
Instrument	0.420*
	[0.056]
Constant	3.729*
	[1.087]
Observations	741,562
R-squared	0.446

Robust standard errors in brackets

"*** significant at 10%; ** significant at 5%; * significant at 1%

Table A3.A: Descriptive statistics – Instrument and Share of Migrants
Effect on an increase of one standard deviation of the instrument on the log share of forced migrants

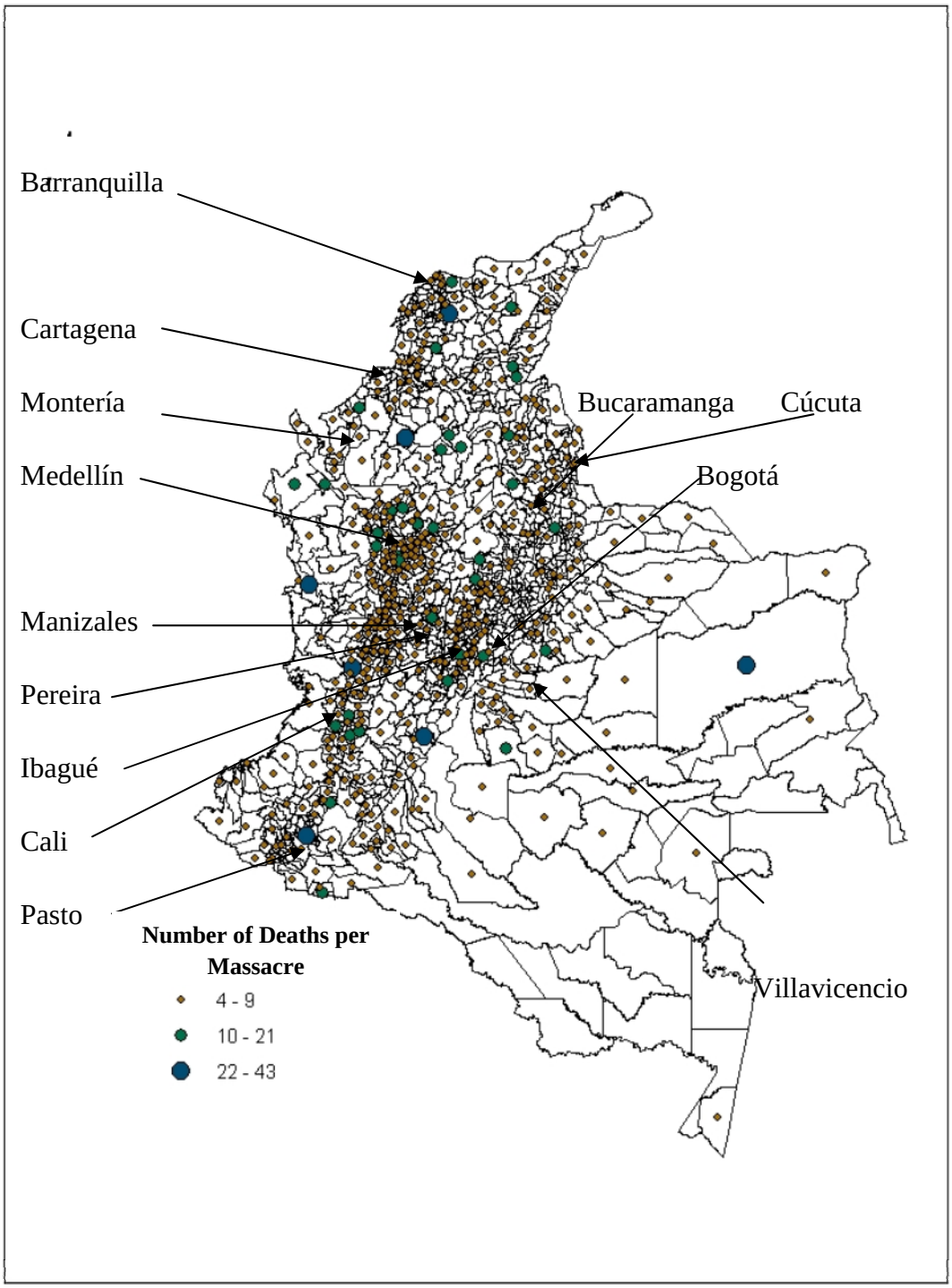
Variable	Mean	Standard Deviation
Migrant share	0.0232146	0.0166387
Instrument (in Logs)	-18.63355	1.25241
Massacres per month	1.142623	0.4523099
Massacre deaths	6.936066	5.899613

Authors' calculations, criminality dataset (CEDE)

Table A3.B: Effect of an Increase of 1 Standard Deviation of the Instrument on the Share of Migrants

	Log Share Migrants	Share Migrants
1 S.D	-4.03	0.018
2 S.D	-3.97	0.019
3 S.D	-3.90	0.020
4 S.D	-3.84	0.022

Map 1. Deaths per Massacre (1988-2008)



Source: Authors' calculations base on CEDE database (1988-2008).

Note: For the period of study (2001-2005) there is on average a massacre per day.