

Getting Over the Minimum Wage: Wage Gaps Between Cities in Colombia

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Abstract

We analyze if a national policy that lowered payroll taxes could also explain the decrease in wage gaps between cities in Colombia. We estimate the effect of this policy in the lower part of the income distribution and in a window around the minimum wage with a triple difference estimation. Preliminary results indicate that the wage gap between cities with lower levels of informal employment and hence higher wages, and the rest of the cities decreased substantially after the reform. The share of workers that earn a minimum wage or more increased noticeably in those cities with medium to high levels of informality before the reform. These effects can be driven by a better allocation of skills and wages at the secondary educational level in low wage cities and the creation of formal jobs in labor intensive industries.

Key words: City wage gaps, informality, economic development

JEL Codes: J24, J31, O17, R12, R23

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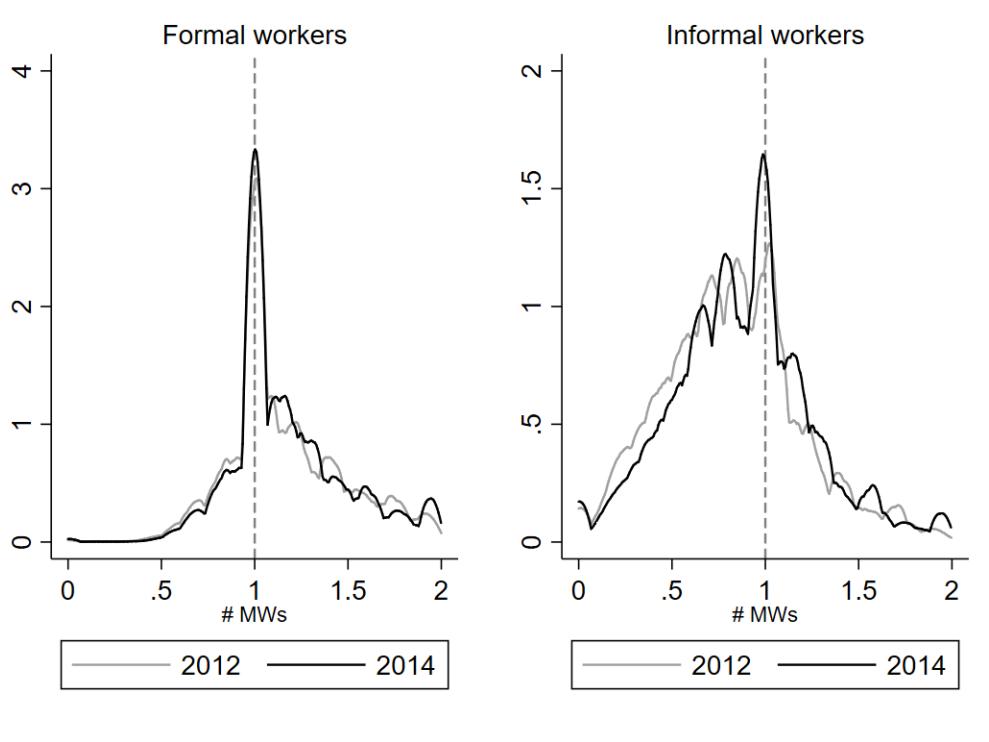
1. Introduction

In developed countries wage gaps are mainly explained by city size. Workers living in big cities earn considerably higher wages than those who live in small cities. This relationship has been the focus of several studies for developed countries. The traditional explanation for the observed spatial wage disparities have been agglomeration economies (Glaeser and Gottlieb, 2009; Puga, 2010), sorting (Combes, Duranton and Gobillion, 2008), knowledge spillovers (Glaeser et al., 1992), labor pooling (Andersson, Burgess and Lane, 2007) and learning by working in bigger cities (De la Roca and Puga, 2017) among others.

There are very few studies for developing countries. For Colombia, Duranton (2016) finds that a 10 percent increase in the population is associated with 0.54 percent higher wages. He also finds small agglomeration effect for workers with a written labor contract who are more prone to be employed in the formal sector. The author suggest that informal workers obtain larger benefits from urbanization than formal workers because their earnings are more tied to local markets. According to García (2019) the elasticity for informal workers is of around 0.02 while formal workers is negative though not statistical significant. Despite this positive result for informal workers, this kind of employment is a common concern in emerging and developing countries all over the world since it has been persistent throughout recent decades. It covers a broad part of the population, especially the poor and a considerable share of skilled workers, and it is characterized throughout low wages, unsatisfying working conditions, lack of coverage in health and pensions, and barriers to productivity. In recent years several Latin-American countries have implemented a series of policies aimed at reducing the informality of employment. They include the reduction of costs incurred by formalization, the creation of incentives for formalization and permanence in the formal sector, and, to a lesser degree, increasing the costs of informality. Most of these policies have yielded good results and informality has decreased substantially in some countries (OIT, 2018).

Finding a small agglomeration effect for the formal sector might be the result of not considering an important figure that affects wages in the formal sector but not in the informal: the minimum wage (MW). The MW in Colombia, set at the national level, is binding in the formal sector, meaning that a large fraction of formal workers earns a MW; in contrast, a large proportion of informal workers are paid a wage inferior to the minimum. Finding a weak association between wages and population for the formal sector, might be because most workers in this sector earn a MW. The wage distribution for formal workers is concentrated around the MW, while informal¹ labor earnings distribution displays two patterns: there is an important mass of informal workers that earn less than the MW and the distribution is more disperse below the minimum (Figure 1).

Figure 1. Formal and informal wage distributions



Source: Own calculations based on GEIH household survey data.

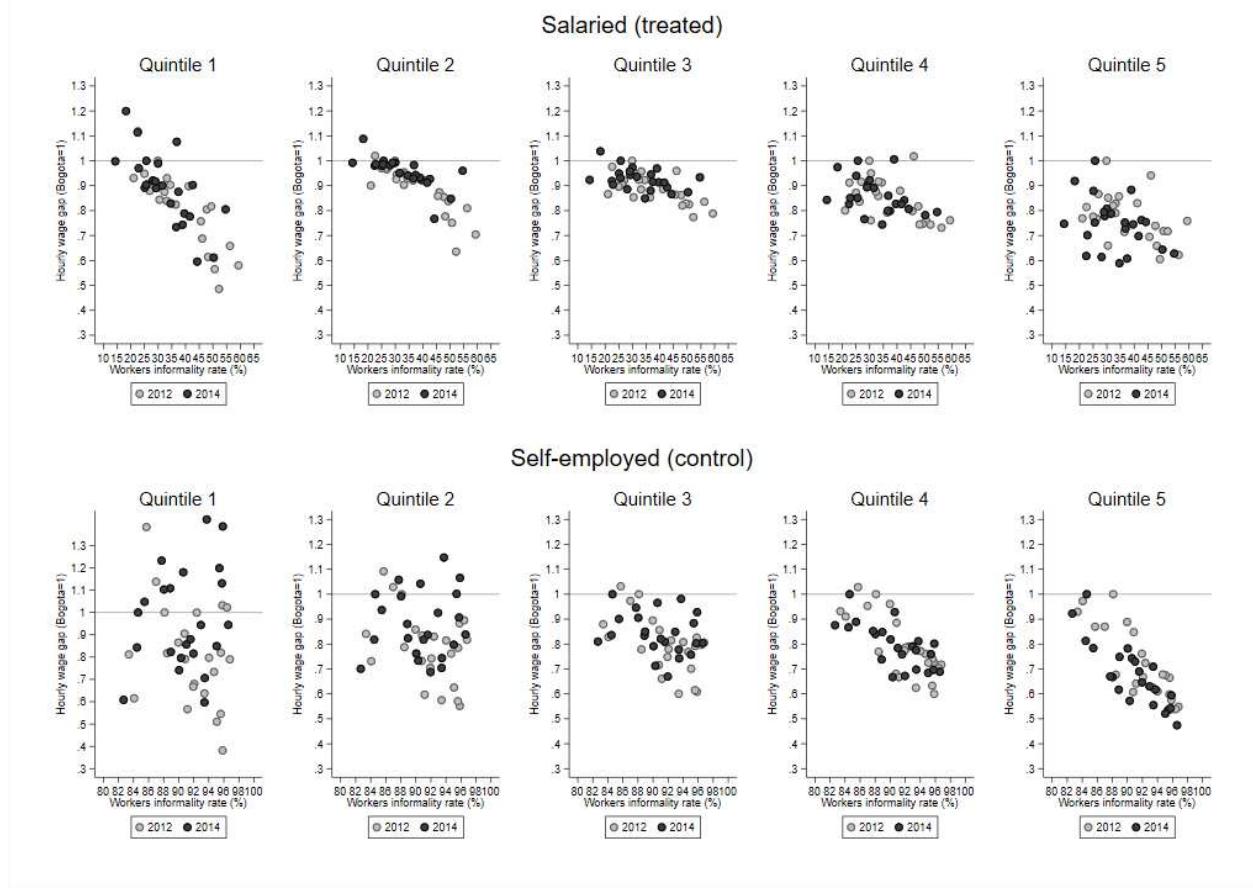
Notes: Hourly MW = monthly MW / 4 (weeks) / 48 (hours)

Another important feature of the Colombian labor market is that the share of informal workers varies largely across Colombian cities. In 2012 Quibdo had an informality rate of 85% while for Manizales it was 42%. Cities with a high proportion of formal workers tend to have higher wages compared to those with a high proportion of informal workers (Herrera-Idárraga, et al., 2016). Figure 2 plot the wage gap, measured as the ratio of the city average wage with respect to Bogota, and the percentage of informal workers separately for salaried and self-employed across different quintiles. There is a strong negative relationship between the wage gap and informality for salaried workers located in the lower part of the income distribution, in contrast for self-employed positioned in the first quartiles there is not such pattern. In fact, the R-square of regressing the wage gap against informality for salaried workers at the first and second quartiles is of 0.7, while for self-employed is lower than 0.1. One interesting fact is that while this high association for salaried workers acts in the lowest quintiles it disappears for the highest. For self-employed is the opposite, wage gaps and informality are highly correlated for quintiles in the top of the distribution. Figure 2 also displays this relationship for two different years, 2012 and 2014. As it can be seen, dots for 2014 seem more compact than those for 2012, especially for the first and second

¹ Informal if the worker does not make contributions to pensions or is in a subsidized health regime. Formal if makes contributions to pensions and is in the contributory health regime.

quantile of the wage distribution, indicating that wage gaps could have compressed between these two years where wages are closer to the MW.

Figure 2: Hourly wage gaps and city informality rates by quintile



Source: Own calculations based on GEIH data.

We intent to complement the studies that have been done in the past for developing countries and try to shed more light about city wages gaps. We put into the picture a relationship not directly explored before, the one between city wage gaps and informality. Duranton (2016) and García (2019) highlight the difference in agglomeration effects between formal and informal workers, however they do not address the role informality play in explaining wages across cities. We analyze the unintended effects of a national policy that sought to reduce informal employment in Colombia by lowering payroll taxes. Using monthly data at the city level between 2011 and 2014 we estimate the effects of this policy in reducing wage gaps between cities. Evaluations of the reform have found that lowering payroll taxes reduced informality (Garlati-Bertoldi, 2019) with a larger impact in the less educated and salaried workers (Fernández and Villar, 2017). Our study will be focus on the effect on wages rather than in employment. In fact, previous literature has found that reduction in taxes benefit workers not only in terms of employment but they also receive higher wages. Antón (2014) also found that the reform increased formal wages by 4.9% and Bernal et. al (2017) found an increase in wage of 2.7%. Then, if these policies intended to increase formal employment had dissimilar effects throughout the territory, favoring low wage cities more than high wage cities, the wage gaps between cities should have been reduced, particularly in the lower part of the income distribution were the MW is relevant.

The identification strategy consists in a difference in difference estimation similar to the one used by Fernández and Villar (2017). However, our contribution consists in identifying differential effects across cities in wages and in the proportion of individuals who earn more than an hourly MW. We use self-employed workers as a control group –since payroll taxes

are accounted only for employers– and salaried workers as the treatment group. Also, as it can be seen in Figure 2 the relationship between wage gaps and informality for self-employed is weak for lower quantiles. Our pre-period runs from January 2012 to April 2013 while our post-period begins in May 2013, when the first tax waiver was implemented, and extends to December 2014.

Preliminary results indicate that the reform increased wages of salaried workers in cities with medium levels of informality. In addition, the proportion of workers earning at least a MW for cities with medium and large levels of informality increased substantially. We find that this can be driven by a better allocation of skills and wages at the secondary educational level in low wage cities. Moreover, we gather evidence regarding better paying jobs -with earnings above the minimum wage- in labor intensive industries. This could be showing that policies aimed to reduce informal employment can also be successful in reducing the wage gaps between cities in Colombia, especially in the lower part of the income distribution.

The paper is organized as follows. Section 2 presents the data used and some descriptive statistics and section 3 presents the methodology applied. Section 4 presents some preliminary results. Section 5 digs inside possible mechanisms. Finally, conclusions are presented in section 6.

2. Context, Data and Descriptive Statistics

We use data from the *Gran Encuesta Integrada de Hogares* (Major Integrated Household Survey, GEIH) provided by the National Statistics Department of Colombia (DANE). This survey supplies labor market micro-data. Our data consist of observations between 2011 and 2014, we obtain about 200,000 data on workers per year in a repeated cross section including 23 cities: Armenia, Barranquilla, Bogota, Bucaramanga, Cali, Cartagena, Cucuta, Florencia, Ibagué, Manizales, Medellín, Montería, Neiva, Pasto, Pereira, Popayán, Quibdó, Riohacha, Santa Marta, Sincelejo, Tunja, Valledupar and Villavicencio.

The tax reform we consider is the 1607/2012 Act, passed on December 2012. It was aimed to promote formal employment. It lowered the hiring costs for firms, thus, reducing the employer's contributions by 13.5 percent points (pp) for workers earning less than 10 monthly MW: 5 pp destined to public institutes² and 8.5 pp to the health care system. Public institutes' contributions took effect on May 1st, 2013 and health on January 1st, 2014. With this, the total tax on labor in Colombia was reduced from 60.3% to 46.8%—a 22.4% reduction (Antón, 2014).

It is difficult to find and compare two similar groups, one affected and another not affected by the reform. Furthermore, identifying the before and after of the reform could bias results because of the many events that may be happening during our scope of time. We assume that the reform mostly affected salaried workers who earn less than ten MWs -as specified by the law- and it did not affect self-employed workers. The reform reduced payroll taxes payed by employers. Thus, salaried workers were indirectly affected by this policy since it gave incentives to firms to hire and/or formalize workers. Meanwhile, self-employed workers did not have these incentives because they are not obliged to pay payroll taxes. Moreover, self-employed's income is a combination of labor, capital and have different valuations and motivations upon their type of job (Herrera-Idárraga et al., 2016; Bargain & Kwenda, 2014; Maloney, 2004, Günter & Launov, 2012). So, we use self-employed workers as a control group and salaried workers as the treatment group.

We classify as salaried (treated) all employees private, domestic and laborer or farmhand, with wages between 1 and 10 monthly MW. Self-employed have a different tax legal framework than employees and are not subject to payroll taxes. So self-employed workers, with any level of earnings, are used as control. Certain workers are excluded from the analysis: (i) employees earning 10 monthly MW or more, (ii) employers, (iii) government workers and (iv) workers with zero labor earnings. We combine information from gross monthly wage earnings and worked hours to obtain gross hourly wages.

² The *Servicio Nacional de Aprendizaje* (National Service of Learning, SENA), a public institution focused in the development of professional education programs, and the *Instituto Colombiano de Bienestar Familiar* (Colombian Institute of Family Welfare, ICBF), a public institution in charge of the development and protection of children and families.

We also control for prices differences across cities adjusting nominal hourly wages using the deflator from the consumer price index for each city.

We consider a period around the reform between 2012 and 2014. The reform was announced in December 2012 but only in June 2013 was the first waiver implemented. Thus, the after period starts in June 2013 and extends to December 2014 while the pretreatment period goes back up to January 2012. As a result, we present short run effects of the reform.

To simplify the analysis, we group the 23 cities into low, medium and high levels of informality according to Table 1, and we use Bogota as the reference city for calculating the wage gaps. As it can be seen, there are cities such as Quibdo, Sincelejo and Rioacha with informality rates of about 80% and they also exhibit the largest wage gaps, workers in these cities earn 60-70% less than in Bogota. While other cities with lower levels of informality such as Manizales and Medellin the wage differential is smaller.

Table 1. Wages, wage gaps and informality rates (2012)

	Ave. Hourly wage (2008 COP)	Wage gap	Informality rate (%)	Informality level
<i>Manizales</i>	3656.2	0.85	46.2	
<i>Medellin</i>	3853.0	0.90	46.7	
<i>Bogota</i>	4296.4	1.00	51.6	Low
<i>Pereira</i>	3199.0	0.74	55.9	
<i>Cali</i>	3472.8	0.81	59.0	
<i>Tunja</i>	3883.1	0.90	60.2	
<i>Bucaramanga</i>	3842.3	0.89	60.9	
<i>Armenia</i>	3026.4	0.70	64.6	
<i>Neiva</i>	3775.9	0.88	64.9	
<i>Cartagena</i>	3167.8	0.74	66.2	Medium
<i>Ibague</i>	3083.6	0.72	68.2	
<i>Villavicencio</i>	3498.9	0.81	68.6	
<i>Barranquilla</i>	3000.2	0.70	69.1	
<i>Santa Marta</i>	3135.2	0.73	69.6	
<i>Popayan</i>	3087.3	0.72	71.1	
<i>Pasto</i>	2740.5	0.64	72.1	
<i>Monteria</i>	2729.7	0.64	76.4	
<i>Florencia</i>	3091.9	0.72	77.4	
<i>Valledupar</i>	3120.1	0.73	77.5	High
<i>Cucuta</i>	2882.2	0.67	78.0	
<i>Riochacha</i>	3046.9	0.71	80.3	
<i>Sincelejo</i>	2805.4	0.65	80.5	
<i>Quibdo</i>	2585.1	0.60	85.4	

Source: Own calculations based on GEIH data.

Notes: Figures are obtained using population weights as provided on GEIH microdata. Wage gap is calculated as the ratio between the average hourly wage in city i and the average hourly wage in Bogota.

Table 2 show descriptive statistics that are important for the analysis. Panel A display the informality rates for salaried and self-employed workers before and after the reform³. Among salaried workers, informality rates before the reform were 27%, 33% and 50% for low, medium and high cities respectively. Informality rates were significantly reduced from 1.6 pp to 5 pp among salaried workers. This was not the case among self-employed, from whom initial informality rates were high (95-87%) and remained high in most cities. Panel B shows that there are large differences across cities in the proportion of workers that earn a MW or more. Cities with low levels of informality tend to have a higher proportion of workers that earn a MW or more. While 70% of salaried workers in cities with low levels of informality earn a MW or more in cities with high levels the proportion is 50%. A decrease in informality should have move workers to earn a MW or more after the reform. Among salaried workers, in cities with high and medium levels of informality the proportion increased in 6pp and 3pp respectively while in cities with low levels of informality it increased only 2.4pp. For self-employed this proportion is quite low for all cities, before the reform it ranges from 29-43% and it remained fairly the same after the reform (30-44%).

Finding a larger proportion of workers earning a minimum wage or more could be the result of an increase in the proportion on workers in high wage sectors or that workers were switching between low to high wage sectors. If this was the case, then workers should have moved from labor intensive sectors with low wages, such as service sector, to capital intensive sectors with high wages, such as manufacture. Panels C and D of table 2 show the proportion of workers in the manufacture and service sectors before and after the reform, it can be see that there was an increase in the proportion of workers in the service sector for medium and high cities after the reform. These figures suggest that workers were moving from the manufacture to the service sector or a higher inflow of workers in the service sector. It is important to notice that Bernal et. al. (2017) find that the reform had larger effects for labor intensive firms, these firms tend to be concentrated in the service sector. The reform could generate incentives for the creation of employment in the most labor-intensive sectors.

Table 2. Changes in informality, wages and sector for salaried and self-employed workers before and after the reform

Panel A: Informality rate						Panel B: Earning at least 1 hourly MW						
Salaried (treated)			Self-employed (control)			Salaried (treated)			Self-employed (control)			
Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	
Total	0.359	0.325	-0.034***	0.919	0.913	-0.006***	0.654	0.697	0.043***	0.386	0.396	0.010***
Low	0.288	0.272	-0.016***	0.872	0.865	-0.007***	0.708	0.732	0.024***	0.428	0.437	0.009**
Medium	0.352	0.327	-0.025***	0.920	0.916	-0.004**	0.669	0.699	0.030***	0.417	0.407	-0.010***
High	0.543	0.491	-0.051***	0.952	0.948	-0.005***	0.493	0.556	0.063***	0.282	0.297	0.015***
Panel C: Share of workers in manufacturing												
Salaried (treated)			Self-employed (control)			Salaried (treated)			Self-employed (control)			
Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	
Total	0.275	0.262	-0.013***	0.197	0.195	-0.002	0.712	0.726	0.014***	0.791	0.793	0.002
Low	0.326	0.320	-0.007**	0.181	0.178	-0.002	0.662	0.670	0.008***	0.813	0.814	0.001
Medium	0.263	0.247	-0.017***	0.202	0.192	-0.010***	0.720	0.738	0.017***	0.786	0.795	0.009***
High	0.219	0.207	-0.011***	0.180	0.179	-0.001	0.609	0.638	0.029***	0.643	0.643	0.000
Panel D: Share of workers in services												
Salaried (treated)			Self-employed (control)			Salaried (treated)			Self-employed (control)			
Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	Be- fore	After	Diff	

³ To measure informality, we use the legalistic definition. Workers are employed informally if they don't contribute to social security and/or health systems, definition quite correlated with the rest of informal definitions (Mondragon et al, 2010). In fact, the noncompliance with legal and administrative norms is the most important characteristic of the informal sector (Tansel et al., 1999). Moreover, this definition has a bigger scope, allowing for informality in large firms. In fact, it is more likely for the productive definition, which only considers the firm size, to underestimate informality (García, 2017).

Source: Own calculations based on GEIH data.

Notes: Before if between January 2012 and Abril 2013 and After if between May 2013 and December 2014.

Agriculture if working in agriculture, hunting, forestry and fishing. Manufacturing if in manufacturing, electricity, gas, water supply and construction. Services includes all other sectors.

Hourly MW = monthly MW / 4 (weeks) / 48 (hours)

* p<0.1 ** p<0.05 *** p<0.01

Table 3 reports the share of salaried workers before and after. Only for those cities with low levels of informality there is a slightly increase in the share of salaried workers, these figures could be indicating that workers were not switching from self-employment to salaried work, which could be the case if the reform had made salaried jobs more attractive.

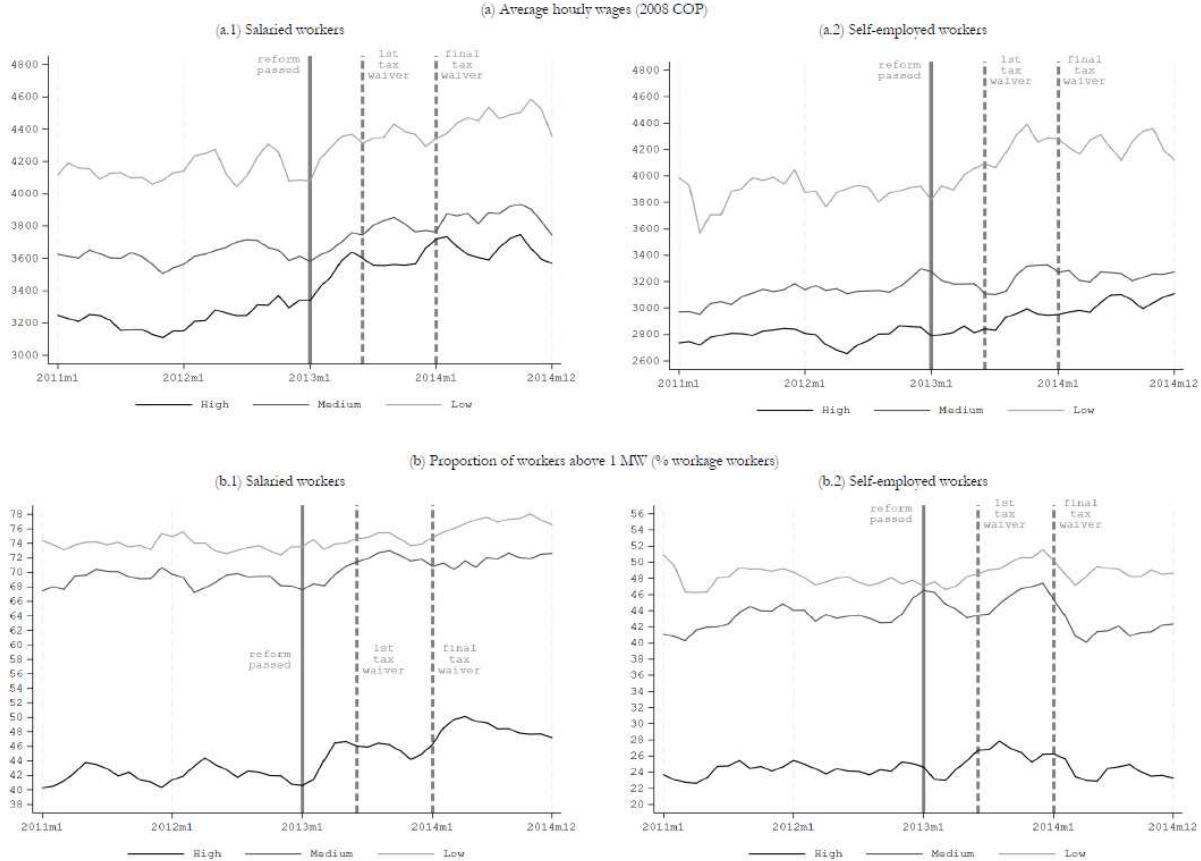
Table 3. Share of salaried workers

	Before	After	Diff
<i>Total</i>	0.465	0.477	0.012***
<i>Low</i>	0.606	0.620	0.014***
<i>Medium</i>	0.453	0.463	0.009***
<i>High</i>	0.365	0.371	0.006***

Figure 3 show the development of average hourly wages and the proportion of workers above 1 MW by city informality levels over time. While wages and the proportion of workers above one MW obviously differ for cities with different levels of informality, the pretreatment trends from 2011 to 2012 are nearly identical across the three groups of cities for salaried and self-employed workers. In 2013 the series started to change, this year was a transition period. After 2014, we observe a similar increase in wages and in the proportion of workers above one MW for all cities. However, the rise in wages and particularly the increase in the proportion of salaried workers above one MW for cities with high levels of informality is considerably larger, after the reform these cities display average wages similar to cities with medium levels of informality. We assume that the pretreatment difference in the two variables of interest between low level and medium/high level cities would have been stable in subsequent years in absence of the reform. We clearly observe that the increase in the two outcome variables was more pronounced for cities with high levels of informality which gives graphical evidence of an effect of the reform in wage gaps between cities.

These simple descriptive statistics show that (i) those cities with lower levels of informality display a large proportion of workers that earn more than a real hourly MW, (ii) cities differ substantially in the rate of informality for salaried workers but they do not as much for self-employed, (iii) the proportion of workers that earn a MW or more increased substantially for salaried workers in some cities after the reform, especially in those with high levels of informality.

Figure 3. Trends in average wages and proportion of workers above 1 MW by city informality levels (quarterly moving average series)



3. Empirical strategy

We considered an identification strategy for both dependent variables: real hourly wages and probability that the worker earns more than an hourly MW. The strategy is a triple difference approach. We control for years of education, education, age, month, gender, marital status and relationship with head of household. In this sense, our strategy is presented in the following equation:

$$Y_{it} = \beta_0 + \boldsymbol{\beta}(\text{salaried} \times \text{post} \times IL) + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

Where Y_{it} represents two possible outcomes, log of real hourly wages or a dummy equal to one if the worker earns at least an hourly MW, *salaried* represents salaried workers, *IL* are dummy indicators of city informality level (low, medium or high), *post* the after period and X_{it} the vector of controls.⁴ Our interest resides on the vector of coefficients $\boldsymbol{\beta}$, especially on those that accompanies the triple difference *Salaried * Post * IL*. This approach assumes that the reform had larger

⁴ The notation ** indicates that we include each variable individually, interacted in pairs and altogether.

effects in medium and high informality cities. Thus, we find difference in difference estimators for the two group of cities in comparison to cities with low informality and higher wages.

We estimate equation (1) for all workers and for manufacture and service sector separately. We want to address if labor intensive firms were more affected by the reform in cities with medium and high levels of informality.

4. Results

Table 4 reports the triple difference results for wages and for the likelihood a worker earns at least a MW for the whole sample and for different windows around the MW. All specifications include individual characteristics as control variables. Focusing on the triple difference estimates, we observe that wages increased for all workers at cities with a medium level of informality by 2.9%. On columns (2) to (4) we ran the same specifications for workers with labor earnings around 1 MW. For workers very close to the MW, around 0.9-1.1 and 0.8-1.2, we see that wages increased for cities with medium and large informality levels. Once the interval is increased to 0.7-1.3, we find no significant increases in wages by city informality level. Point estimates are large compared to the elasticity of the population over wages estimated by Duranton (2016), whose results indicate that an increase in the population of 10 percent over 16 years (1996-2012) increase wages by 0.54 percent. We obtain an increase of 1 to 3 percent for workers in cities with medium informality in just 3 years. We also find a substantial increase in the proportion of workers that that earned at least a MW after the reform. This increased by 2.5pp in cities with medium informality, 4.1pp at cities with high informality, with even bigger estimates for workers closer to the MW. These very preliminary results show that the effect of the reform had dissimilar effects across the territory.

Table 4. Triple difference results

	Log(hourly real wage)				Above 1 hourly MW			
	All workers	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]	All workers	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Salaried*Post</i>	-0.005 (0.010)	0.002 (0.002)	-0.011*** (0.003)	-0.002 (0.003)	0.016*** (0.005)	0.073*** (0.019)	0.001 (0.014)	0.026** (0.010)
<i>Salaried*Post*Medium</i>	0.029** (0.012)	0.011*** (0.002)	0.011*** (0.004)	-0.001 (0.004)	0.021*** (0.007)	0.054** (0.024)	0.037** (0.016)	0.009 (0.012)
<i>Salaried*Post*High</i>	-0.006 (0.016)	0.006** (0.003)	0.015*** (0.004)	0.007 (0.004)	0.041*** (0.008)	0.058*** (0.021)	0.065*** (0.018)	0.042*** (0.013)
R-sq	0.283	0.107	0.064	0.076	0.201	0.076	0.061	0.073
Obs.	620662	119060	203086	274920	630632	119060	203086	274920

Table 6 reports the same triple difference results from Table 5 but considering 2011 as pre period and 2012 as post parallel trend time placebo test. In this sense, we want to check if our results are robust to the specification and correspond to the real period in which the reform was implemented. We would expect that the results of interest shown in Table 5 are not significant. In columns 3, 4, 6, 7 and 8 we have no significant estimates for all cities. On column 2 we found a significant positive point estimate for wages at cities with medium informality for all workers and only for the bracket of 0.7-1.3MW. This positive and significant coefficient cast some doubts about the parallel trend assumption for wages in cities with medium levels of informality. In columns 6 and 7 we obtain significant effects but negative suggesting that before the reform the probability that a worker was earning more than a MW was decreasing. These results could be indicating that, our original results could be underestimating the total effect of the reform for the proportion of workers earing above a minimum wage.

Table 6. Placebo triple difference, pre = 2011, post = 2012

	Log(hourly real wage)				Above 1 hourly MW			
	All workers	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]	
		(1)	(2)	(3)			(4)	
Salaried*Post*Medium	-0.001 (0.014)	-0.015*** (0.006)	-0.003 (0.005)	0.009 (0.006)	-0.015 (0.010)	-0.171*** (0.037)	-0.063*** (0.020)	-0.025 (0.017)
Salaried*Post*High	0.028** (0.013)	-0.002 (0.004)	0.005 (0.004)	0.013** (0.006)	-0.002 (0.011)	-0.099*** (0.032)	-0.026 (0.021)	-0.002 (0.018)
R-sq	0.285	0.144	0.037	0.059	0.199	0.057	0.057	0.069
Obs.	422589	73052	134862	183153	428486	73052	134862	183153

5. Mechanisms

In this section we explore two mechanisms to explain how the reform affected the wage gaps between high and low wage cities in Colombia. On the one hand, we explore the *misallocation* channel proposed by Levy and López-Calva (2016), in which informality reduces the returns to education because informal firms become intensive in low skilled workers in a context in which people are better educated. We consider that this phenomenon is more persistent in poorer cities. Thus, if a national policy -such as the 2012 tax reform- incentivizes firms to become formal they would tend to hire more skilled workers and pay them higher wages according to their higher marginal labor productivity. Because the marginal increase in productivity due to an additional skilled worker is higher in a low wage city -relative to Bogota-, this could be driving the reduction in wage gaps. In this sense, we would expect higher effects of the reform in skilled workers of lower wage cities.

Another possible mechanism is that the reform, by incentivizing formal work, had larger effects in labor intensive industries, such as services sectors. In these industries, higher nonwage costs may raise a barrier to hire formal workers and pay them higher wages. In this sense, lower barriers to formal work may shift its incidence to labor intensive industries.

Table 7 presents our triple difference specification disaggregated by educational attainment. We observe that the *misallocation* channel -partially- drives the effects of the reform, specially at the secondary educational level, in low wage cities. We find this intuitive since, in low wage cities, secondary educational attainment is more prevalent than tertiary. Thus, due to the reform, firms are hiring formal mid-skilled workers and paying them corresponding higher wages above the minimum wage. These higher wages relate to the workers' higher marginal productivity, which exhibits larger returns in low wage cities.

Table 7. Triple difference results by education level

	Log(hourly real wage)				Above 1 hourly MW			
	All workers	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]	All workers	#MW [0.9-1.1]	#MW [0.8-1.2]	#MW [0.7-1.3]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No education								
<i>Salaried*Post*Medium</i>	-0.039 (0.056)	0.019* (0.011)	0.016 (0.012)	0.016 (0.017)	-0.024 (0.036)	0.091 (0.096)	0.058 (0.058)	0.046 (0.048)
<i>Salaried*Post*High</i>	-0.077 (0.053)	0.029** (0.012)	0.038*** (0.013)	0.052** (0.021)	0.005 (0.040)	0.119* (0.066)	0.147** (0.058)	0.137** (0.067)
R-sq	0.117	0.290	0.115	0.090	0.087	0.079	0.054	0.060
Obs.	49385	5679	11021	15951	57376	6350	12346	17851
Primary								
<i>Salaried*Post*Medium</i>	0.024 (0.017)	0.007** (0.003)	0.005 (0.004)	0.003 (0.005)	0.002 (0.012)	-0.005 (0.021)	0.000 (0.016)	0.001 (0.014)
<i>Salaried*Post*High</i>	0.023 (0.020)	0.016*** (0.003)	0.022*** (0.004)	0.024*** (0.009)	0.014 (0.028)	0.012 (0.041)	0.003 (0.031)	0.006 (0.032)
R-sq	0.118	0.296	0.112	0.085	0.107	0.068	0.052	0.058
Obs.	402795	70146	126097	174077	464423	78493	141456	194851
Secondary								
<i>Salaried*Post*Medium</i>	0.010 (0.015)	0.007*** (0.003)	0.004 (0.003)	-0.003 (0.004)	-0.012 (0.010)	-0.002 (0.017)	-0.011 (0.012)	-0.021* (0.011)
<i>Salaried*Post*High</i>	0.034** (0.016)	0.014*** (0.003)	0.016*** (0.004)	0.013** (0.006)	0.042*** (0.013)	0.092*** (0.025)	0.048*** (0.018)	0.044** (0.018)
R-sq	0.112	0.324	0.126	0.100	0.129	0.082	0.070	0.078
Obs.	984236	235195	385687	508641	1110857	258221	424367	558164
Tertiary or more								
<i>Salaried*Post*Medium</i>	0.018 (0.017)	0.001 (0.004)	-0.002 (0.005)	-0.010* (0.006)	-0.001 (0.009)	-0.039* (0.023)	-0.028 (0.019)	-0.032* (0.017)
<i>Salaried*Post*High</i>	0.045** (0.021)	0.008** (0.004)	0.006 (0.004)	0.006 (0.008)	0.014 (0.013)	0.079** (0.032)	0.039 (0.024)	0.012 (0.022)
R-sq	0.277	0.301	0.117	0.100	0.111	0.070	0.065	0.073
Obs.	604298	99072	157552	211727	666060	106133	168984	226225

However, we also follow that the reform raised the number of low skilled workers -with no educational attainment- in low wage cities that earned wages above the minimum wage; but just above, since overall wages didn't perceive a significant improvement. This result challenges our *misallocation* channel and it is more in accordance with our *labor intensity* mechanism which is verified in Table 8. Thus, in a context of lower nonwage costs, labor intensive firms hired more low skilled workers in low wage cities, particularly in the services sectors. Accordingly, they formalized them paying wages just above the minimum wage.

Table 8. Triple difference results on manufacturing and services

	Log(hourly real wage)				Above 1 hourly MW			
	All wor-	#MW	#MW	#MW	All wor-	#MW	#MW	#MW
	kers	[0.9-1.1]	[0.8-1.2]	[0.7-1.3]	kers	[0.9-1.1]	[0.8-1.2]	[0.7-1.3]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Manufacturing								
<i>Salaried*Post*Medium</i>	-0.004 (0.024)	0.013*** (0.004)	0.003 (0.006)	-0.003 (0.008)	-0.011 (0.010)	0.012 (0.022)	-0.008 (0.020)	-0.020 (0.016)
<i>Salaried*Post*High</i>	-0.004 (0.038)	0.024*** (0.003)	0.022*** (0.005)	0.022* (0.013)	0.020 (0.022)	0.097*** (0.034)	0.036 (0.029)	0.021 (0.031)
R-sq	0.262	0.326	0.136	0.121	0.201	0.074	0.074	0.086
Obs.	463713	112824	181326	234510	525663	124528	200328	258117
Services								
<i>Salaried*Post*Medium</i>	0.020 (0.014)	0.006*** (0.002)	0.003 (0.002)	-0.002 (0.003)	-0.006 (0.009)	-0.016 (0.013)	-0.015 (0.010)	-0.020** (0.009)
<i>Salaried*Post*High</i>	0.034* (0.018)	0.008*** (0.002)	0.013*** (0.004)	0.012** (0.005)	0.060*** (0.012)	0.062*** (0.019)	0.048*** (0.013)	0.044*** (0.012)
R-sq	0.297	0.315	0.133	0.118	0.223	0.090	0.079	0.093
Obs.	1551384	292586	491133	665146	1739796	319065	537281	726037

6. Conclusions

In Colombia those cities with a high proportion of formal workers tend to have higher wages compared to those cities with a high proportion of informal workers. The reasons behind this fact are the following: first, the national MW is binding in the formal sector, meaning that a large proportion of formal workers earn a MW; in contrast, a large proportion of informal workers are paid a wage inferior to the MW. Second the share of workers in the informal sector varies largely across Colombian cities. For example, by 2012 some cities had informality rates of around 85% (Cucuta) while others have rates of about 52% (Bogota). Then, if these policies intended to increase formal employment had dissimilar effects throughout the territory, favoring low wage cities more than high wage cities, the wage gaps between cities should have been reduced, particularly in the lower part of the income distribution.

In this paper we analyze the unintended effects of a national policy that sought to reduce informal employment in Colombia by lowering non-wage costs. Using monthly household survey microdata between 2011 and 2014 we estimate the effects of this policy in reducing wage gaps between cities, especially in the lower part of the income distribution. Preliminary results indicate that the reform had larger effects in those cities with a medium proportion of informal workers. Particularly, wages increased for workers earning close to the MWs. In cities with medium levels of informality wages

increased by 3.4%. On the other hand, the share of workers that earn a MW or more increased substantially in cities with medium and high levels of informality. We find that these results may be driven by a better allocation of skills and wages at the secondary educational level and the creation of formal jobs at labor intensive industries that may be hiring low skilled workers.

These very preliminary results indicate that policies aimed to reduce informal employment can be successful in reducing the wage gaps between high and low wage cities in Colombia and give some reason to suspect that the MW may play an important role in reducing these gaps.

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