The Effect of Minimum Wages on Rural Employment: Theory and Evidence from Colombia

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Resumen

Este artículo evalúa el efecto del largo período de convergencia entre 1974 y 1984 del salario mínimo urbano y rural en Colombia. Para ayudar en la interpretación de los hallazgos empíricos, se desarrolla un modelo simple de dos sectores para el mercado laboral rural que es capaz de explicar la presencia de un gran sector informal. Utilizando un diseño de diferencias en diferencias y datos de los censos de población, se estima el impacto del aumento del salario mínimo en el sector rural sobre el nivel de empleo. Los resultados empíricos muestran un aumento de entre 4% y 8% en la tasa de ocupación en los municipios afectados por la política, en relación con el grupo de control. Sin embargo, los resultados sugieren que el aumento de la demanda de mano de obra se concentró en empleo no calificado. Adicionalmente se presenta evidencia sobre efectos heterogéneos por subgrupos de población.

Abstract

This paper examines the effect of urban and rural minimum wage convergence from 1974 to 1984 in Colombia. To help in the interpretation of the empirical findings I develop a simple two-sector rural labor market model with a minimum wage that is able to explain the presence of a large informal sector and low unemployment in rural labor markets. Using a difference-in-differences design and Census data, I estimate the impact of the minimum wage increase on the entire rural labor force. Empirical results show an increase between 4% and 8% in the employment rate in policy-affected municipalities, relative to the control group, although it seems to have no effect on the unemployment rate. However, the evidence presented in the paper suggest that the increase in the demand for labor is driven by unskilled employment, associated with a large informal sector. In addition, I provide evidence regarding heterogeneous effects by population subgroups.

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El efecto del salario mínimo en el empleo rural: teoría y evidencia de Colombia

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I. Introduction

The effect of minimum wage policies on employment remains one of the most controversial issues in the labor economics literature. Whereas the empirical evidence on the impact of a wage floor on overall employment has been limited,[1] focusing on the effects on low-wage jobs (Maching and Manning, 1994; Clemens and Wither, 2019), youth employment (Wellington, 1991; Card, 1992b; Neumark and Wascher 1992; Currie and Fallick, 1996; Allegretto *et al*., 2017), and on specific economic sectors (Card and Krueger, 1994; Bell, 1997; Alatas and Cameron, 2008; Dube *et al*., 2010), the results presented in the literature have predominantly assessed employment effects in urbanized areas with low rates of informal employment. Yet, the effects of minimum wage policies in the informal sector and on rural labor markets are not negligible and are relevant for understanding labor markets in developing countries, particularly Latin American countries.

To help in the interpretation of the empirical findings, I first develop a two-sector rural labor market model with a minimum wage. The model assumes that employers have some degree of market power to choose the wage, especially for workers earning above the minimum wage. In this sense, the rural labor market consists of a covered sector (in terms of the minimum wage) in which firms face monopsonistic competition and a non-covered sector operating in a competitive market. This is consistent with the fact that rural labor markets in less developed economies consist largely of low-skilled and low-wage jobs, and that compliance levels of labor regulations are low-particularly due to the high amount of self-employment. I then use a difference-in-differences design to estimate the impact of a minimum wage increase on the entire labor force. The identification strategy uses the arbitrary variation in the legal minimum wage among workers who are geographically close but are located in different jurisdictions.

To identify the effect of the minimum wage on overall employment I use the case of urban and rural minimum wage convergence in Colombia from 1974 to 1984 that ended with the unification of minimum wages. By 1973, the rural nominal minimum wage was 59% of the urban wage. In 1974 the government increased by 91% the nominal minimum wage for the rural areas and the primary sector compared to a 44% increase for urban areas. This differential increase for rural areas over urban areas continued during the next decade until total unification in 1984. This policy change claimed the need to eliminate minimum wage discrimination on rural workers, and provides a window of opportunity for the study of the causal effects of

[1] For recent examples see Meer and West (2016) and Cengiz et al. (2019).

minimum wage reforms. A leveling of the rural and urban minimum wages would typically affect a fraction of workers in certain regions or sectors. Such variation leads to a natural experiment, where the treatment effect (an increase in the minimum wage) exists for individuals employed in municipalities considered as rural. The empirical approach therefore is able to provide evidence for heterogeneous effects on population subgroups, based on sex, age, skill-level, occupation, and economic sector.

Data used in this paper is drawn from both the 1973 and 1985 Population Census to estimate the effect of the minimum wage convergence. I find that convergence of minimum wages led to an increase between 1.6 and 3.1 percentage points (pps) of the employment rate in the rural areas (about 4% to 8% increase relative to the baseline in urban areas), but do not seem to have any effect on the unemployment rate at an aggregate level. These results are consistent with models of monopsonistic competition in the labor market. Furthermore, this paper presents additional evidence that the increase in demand for labor, potentially resulting from a higher participation rate in rural areas, responded mainly with unskilled employment, highly associated with an informal sector. This supports the argument for a segmented rural labor market. Finally, I find positive effects on the demand for male and youth labor, but no statistically significant effects for women. The differences-in-differences empirical approach used in the paper is complemented with a discussion of the plausibility of the parallel-trends assumption. However, as discussed later, the possibility of other causes driving the results cannot be excluded.

This paper contributes to the existing literature on minimum wages in several ways. First, it relates to the empirical literature that questions the long-accepted belief that a minimum wage increase reduces employment as implied by the standard competitive model of the labor market (Card, 1992a, 1992b; Card and Krueger, 1994; Dube *et al.*, 2010; Cengiz *et al.*, 2019). I present new evidence of the effect of a minimum wage increase on employment levels using a unification policy in a developing country. The results presented provide evidence for contexts with high levels of informality and low compliance of labor regulation. Second, this paper also contributes to the theoretical literature by developing a model of monopsonistic competition with free entry and exit to explain the effects of minim wages (Bhaskar and To, 1999; Dickens *et al.*, 1999). This literature assume that all firms potentially have some monopsony power given the fact that different jobs have different non-wage characteristics. In contrast, the two-sector model presented in this paper is able to explain the presence of a large informal sector and a low unemployment rate in rural labor markets.

Finally, this paper further contributes to the literature by using historical data, which was not

used before, to estimate the overall employment effects from an increase in the minimum wage. In this sense, this paper uses aggregate data at the local level, information that tends to be scarce in the empirical literature particularly in contexts of low- and middle-income countries.

The remainder of the paper is organized as follows: Section II provides a brief history of minimum wage policy changes in Colombia prior to the wage unification in 1984. Next, Section III outlines the theoretical model for the rural labor market. The data, empirical strategy, and results are then presented in Sections IV to VII. Section VIII concludes.

II. Brief history of the minimum wage in Colombia: from differentiation to unification

The monthly minimum wage in Colombia was legally established in 1945. Yet, it was not enforced until 1950. The initial minimum wage was set at 2 pesos per day (about 7,000 pesos worth in today's money and slightly over 20% of the current minimum wage), defined as the wage "every worker is entitled to receive to support their normal necessities and those of their household within material, moral, and cultural orders" (Article 146, Decree 2663/1950).

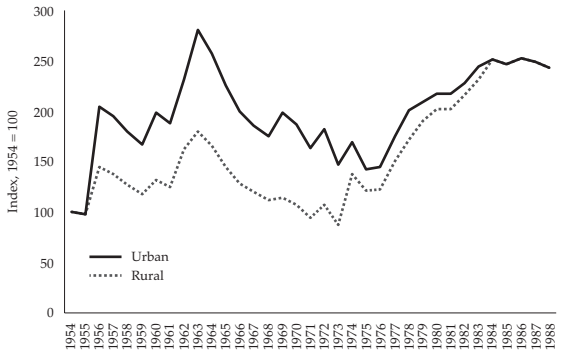
However, in 1956 the National government established differentiated minimum wages at the Department level,[2] using the rural-urban criteria. In the next years the minimum wage was not only different between Departments but within them. This led to changes in taxonomies, which ended up in a broader range of minimum wages. By the late 1960s, differentiated minimum wages by age (experience), municipality, sector, and firm size, among others, were established. Regardless of the different forms of differentiating the minimum wage, these maintained an urban-rural logic. For example, Arango *et al.* (2008) show that in 1963 minimum wages were differentiated by Department and firm size, and the minimum wage in the agricultural sector was readjusted as well as for workers age 16 or younger. By 1969, differentiated wages according to the economic sector (manufacturing, retail, services, transportation, construction, agriculture, etc.), the geographical location, and the firm size, were established. Nevertheless, the wage differentiation followed the urban-rural criteria at the municipal level.

While the habit of differentiating minimum wages ended in 1984, Figure 1 shows evidence of a policy change that led to wage convergence starting in 1974. The explanatory statements accompanying government decrees indicate that this policy change intended to close the income gap between rural areas and urban centers. Figure 1A shows the

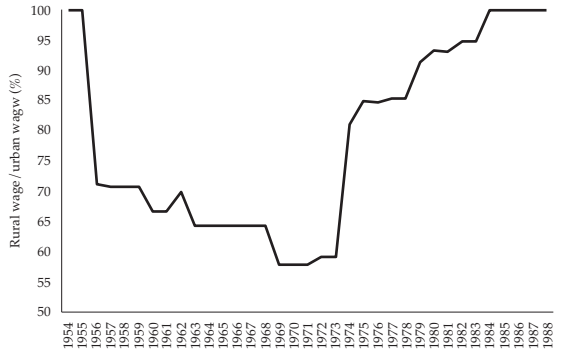
[2] Departments are the first-level territorial subdivision in Colombia.

Figure 1
REAL MINIMUM WAGES AND PAY GAP (1954-1988)

A. Real minimum wages



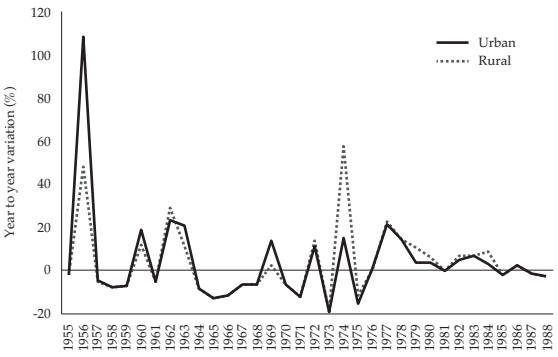
B. Pay gap



Notes. Figure A and B presents the evolution of urban and rural minim wages between 1954-1988. Figure A presents real minimum wages for urban and rural areas (indexing with respect to 1954). Figure B presents the pay gap, defined as the ratio of rural-to-urban wages. The wages were obtained from the yearly decrees. The information presented averages over a year when increased several times within a given year.
Source. Author's calculations using data from the Ministry of Labor and DANE.

evolution of the rural and urban real minimum wage from 1954 to 1988, while Figure 1B presents the rural-to-urban wage ratio. Furthermore, Figure 2 shows that the variation in real minimum wages was relatively similar for both groups over the same period, with a clear exception in 1974. This policy change could have also work as response to the international oil crisis (1973-1974), which resulted in an increase in the average level of prices,[3] and to the persistent decline in real wages in previous years. The evolution of nominal wages is presented in Figure A1 in the Appendix.

Figure 2
ANNUAL VARIATION IN REAL MINIMUM WAGES (1954-1988)



Notes. The Figure presents the year-to-year variation of rural and urban minimum wages between 1954-1988. The information presented averages over a year when increased several times within a given year.
Source. Author's calculations using data from the Ministry of Labor and DANE.

[3] A significant increase in oil prices induces an increase in fertilizer prices, which are used in agriculture. This shock results in a pass-through to food prices.

III. The Model

To help in the interpretation of the empirical findings I present a two-sector rural labor market model with a minimum wage. The formal sector consists of a relatively small number of firms that have some degree of monopsony power, while the informal sector functions in a competitive market. I follow Dickens *et al*. (1999) to model the formal sector as a monopsonistically competitive labor market.[4] For analytical purposes I distinguish between sectors from the point of view of workers being covered or not by the existing minimum wage.[5] I assume that the distribution of firms between sectors is the result of a profit-maximizing employer that in an earlier stage decided to comply or not with labor regulations.[6] In other words, I take the distribution of firms as given.

The assumption here is that employers are not able to choose to respond to an increase in the minimum wage by substituting formal workers towards informal workers or by moving to the informal sector once they decided on which sector to operate in the first place. While this assumption may seem restrictive, note that allowing firms in the formal sector to move to hiring in the informal sector after the raise in the minimum wage is equivalent to having firms leaving the formal sector while new firms enter the informal sector --which works as a perfectly competitive market.

Consider now the following formulation of the production function Y of firms in the formal and informal sectors, indexed with F and I respectively:

$$Y_F = f(Z_F, l_F, \bar{K}_F), \qquad f' > 0, \quad f'' < 0,$$

$$Y_I = q(Z_I, l_I, \bar{K}_I), \qquad q' > 0, \quad q'' < 0,$$

where Z is an idiosyncratic productivity shock, l is employment at the firm-level, $\bar{K}$ is the fixed

[4] As opposed to the single monopsonistic firm, this analysis emphasizes the differentiated effect a minimum wage can have on firms in the same market. In these types of models, the source of heterogeneity comes from firm-specific shocks.

[5] While one can think of firms in the informal market paying the minimum wage, those firms do not pay payroll taxes or severance payments, which at the end increase the perceived real wage for workers. Bhorat *et al.* (2015) propose a model of partial compliance in which firms choose between increasing wages to a level just below the legal minimum wage or paying the minimum wage to some of the workers and a wage below the legal minimum wage to the remaining workers.

[6] According to Ashenfelter and Smith (1979), for each combination of wage rate w, input prices r, and output price p, an employer will decide against compliance with probability λ of being caught and penalty D if:

$$E(\pi) - \pi(w, r, p) = (1 - \lambda)\,[\pi(w, r, p) - \pi(W^{min}, r, p)] - \lambda D > 0,$$

where π is the maximum profit level, W^{min} is the minimum wage, and $\partial\pi/\partial w = -L(w, r, p)$ is the negative of the demand for labor.

capital stock or available land, and q' and f' are the derivatives of the production functions with respect to labor, the only variable factor.

In the informal sector, labor productivity is low and therefore, workers are compensated with a salary below the minimum wage that is set in a competitive market. Firms that operate in the informal market face an elastic labor supply curve and therefore hire workers until the marginal product of labor q' equals the real wage

$$W_I = q'. \qquad (1)$$

The crucial assumption in the model is that the informal sector is the residual employer. In other words, workers will prefer to be employed in the formal sector as the expected wage is higher, however, only a fraction θ will be employed. Since the informal market is flexible, rural unemployment is considered to be frictional.

Now assume a firm in the formal sector has a marginal revenue product of labor (MRPL) curve given by

$$MRPL_F = \Phi(Z_F, l_F), \qquad (2)$$

where $\bar{K}$ is normalized to 1, $\partial\Phi/\partial Z > 0$ and $\partial\Phi/\partial l < 0$.

Suppose that workers with similar skills and abilities (*i.e.*, same expected productivity levels) have different preferences over non-wage characteristics at the firm-level (Bhaskar *et al.*, 2002) --over a social, economic or geographical space. One can think of a set of heterogeneous non-wage characteristics ζ as the distance to the workplace, type of job, workplace environment, etc. Then, the labor supply curve facing the representative firm in the formal sector is of the form:

$$l_F = \alpha(\Xi_F, W_F/\bar{W}, \zeta) \cdot L(\bar{W}), \qquad (3)$$

where the aggregate labor supply L is a function of the average wage $\bar{W}$ in the rural labor market. I assume labor supply and average wage are positively related and that there is no urban-rural migration.[7] I will consider the effect of allowing for rural-urban migration in the discussion of the model's results. The share of total labor supply α by a single firm depends on an exogenous labor supply shock Ξ_F, the relative wage, and the set of heterogeneous non-wage characteristics. Since the model assumes monopsonistic power in the formal sector, α is not infinitely elastic. On the contrary, because a monopsonistically competitive firm has control over a small share of the labor market, it faces a positively sloped supply curve. Note that the average wage makes the labor supply curve faced by the firm a function of other firms' wage rates, as firms compete for workers.

[7] For models of segmented labor markets concerning rural-urban migration refer to Lewis (1954) and Harris and Todaro (1970).

Let g be a function of wages in the interval $[W^{min}, W^{max}]$, with non-negative weights $w(W_F)$, then the average or *expected* rural wage is defined as

$$\bar{W} = \theta \cdot \frac{\int_{W^{min}}^{W^{max}} w(W_F) \cdot g(W_F)\, dW_F}{\int_{W^{min}}^{W^{max}} w(W_F)\, dW_F} + (1 - \theta)\, \rho W_I,$$

$$\theta = \frac{\Sigma l_F}{L} \leq 1,\ \rho \leq 1. \qquad (4)$$

Moreover, of all workers not employed in the formal sector $(1 - \theta)$ a fraction ρ seeks a job in the informal sector, with the rest leaving the labor force. Note that the wage in the formal sector is also a function of the existing minimum wage W^{min}.

Expressing *(3)* as a function of the wage that the firm must pay given the idiosyncratic shock, its own labor supply, the aggregate wage, and the level of the minimum wage, leads to the following expression:

$$W_F = \Omega(\Xi_F, l_F, \bar{W}, W^{min}). \qquad (5)$$

Note that the effect of the average wage in the firm's wage is ambiguous. Remember that workers in the formal sector are paid at least the minimum wage, therefore, if the wage a firm pay is below the average wage in the economy, an increase in the average wage creates a pressure on the firm to increase its own wage. However, a higher average wage may induce an increase in labor participation, possibly reducing the wage the firm needs to pay. As workers have heterogeneous preferences across firms, which endows firms with monopsony power, we cannot directly determine the supply response from changes in average wage.

If firms choose employment (or equivalently wages) to maximize profits, the equilibrium level is such that the MRPL equals the marginal cost of labor such that

$$\Phi(Z_F, l_F) = W_F + l_F \cdot \frac{\partial W_F}{\partial l_F} = (1 + \eta_{WL}) \cdot W_F, \qquad (6)$$

where η_{WL} is the wage elasticity with respect to employment from *(5)*, which depends on (Ξ_F, l_F, W, W^{min}). Note that the elasticity of labor supply determines the monopsony power of the individual firm. By substituting *(5)* in *(6)* we can solve for the employment level of a firm in the formal sector $l(Z_F, \Xi_F, W, W^{min})$ as

$$\Phi(Z_F, l_F) = (1 + \eta_{WL}) \cdot \Omega(\Xi_F, l_F, \bar{W}, W^{min}). \qquad (7)$$

Plugging the employment level back into *(5)* we solve for the wage:

$$W_F = \Omega(\Xi_F, \bar{W}, W^{min}, l(Z_F, \Xi_F, \bar{W}, W^{min})) \geq W^{min}. \qquad (8)$$

As in the formal sector the real wage is constrained to be greater than or equal to the existing minimum wage, there may be an excess demand for labor at the minimum wage, particularly firms for which the minimum wage is not binding.

Recall that only a fraction ρ of workers not employed in the formal sector represent the labor

supply of the informal sector. This fraction is thus a positive function of the expected wage differential with respect to workers' reservation wage R. We can write the equilibrium condition as

$$l_I = \chi(W_I - R),\ \chi' > 0,\ \chi(0) = 0. \qquad (9)$$

Clearly, unemployed workers seeking jobs in the informal sector will cease only when the expected wage differential is zero. Thus, the market wage must also equal the highest reservation wage of workers in the labor force. Therefore, an equilibrium is only achievable when we allow for unemployment. Given the production function in each sector, the distribution of firms, the reservation wage (or worker's utility function), and the fixed minimum wage, it is possible to solve for sectoral employment and, accordingly, for the equilibrium wage.

To assess the effect of an increase in the minimum wage I first assume, as in Dickens *et al.* (1999), that changes in the minimum wage, and thus in the average wage, do not change the distribution of firms in terms of wages. This is important as both equilibrium wages and employment depend on the joint distribution of Z and Ξ across firms. Therefore, when the minimum wage is increased to $W^{min'}$ firms in the formal sector could be sorted into three distinct groups (Dickens *et al.*, 1999): i) unconstrained firms, ii) supply-constrained firms, and iii) demand-constrained firms.[8] Let us conduct the thought experiment for a single firm i and assume for simplicity that changes in the average wage do not affect the labor supply a firm face--given the ambiguity of the effect of the average wage in the firm's own wage from *(5)*.[9] If firm i is in the unconstrained group, represented in Figure 3A as $MRLP_1$, the new minimum wage level is still not biding as its equilibrium wage is above, thus, we would not expect changes in employment. However, notice that some of the firms that were paying above the initial minimum wage are now supply-constrained ($MRLP_2$) as an increase in the minimum wage changes the factor supply and marginal factor cost of the firm. If this is the case for firm i, then the firm knows it can't reduce the wage by hiring fewer people, and also knows that by hiring a few more people it won't raise the wage. So, it is optimal for firm i to pay

[8] I refer to firms paying a wage above the new minimum wage as "unconstrained firms"; firms initially paying a wage above the minimum wage, but now having to set their wage equal to the minimum wage, as "supply-constrained"; and firms initially paying a wage equal to the minimum wage as "demand-constrained", since these firms don't find profitable to maintain their current level of employment after the increase in the minim wage.

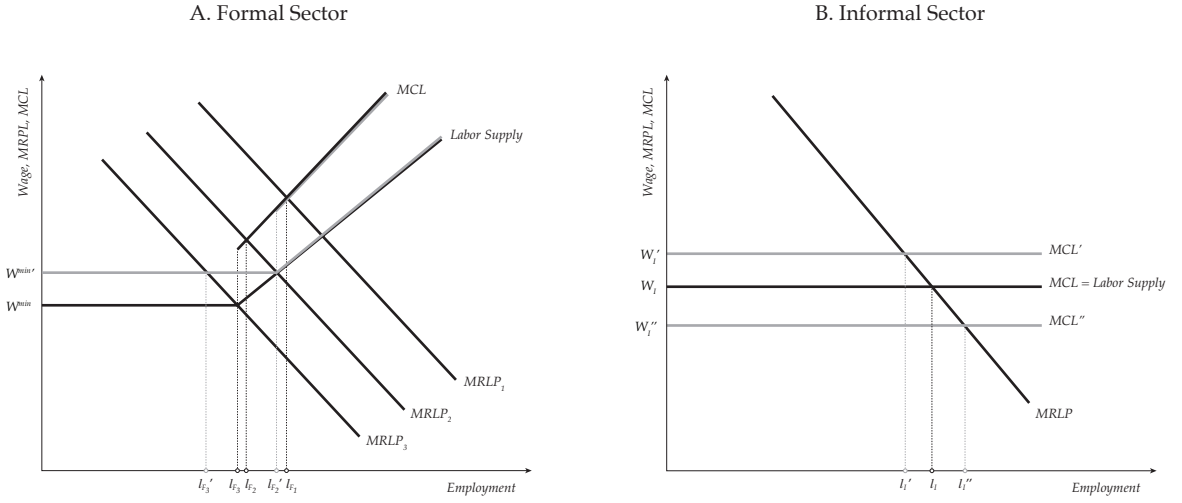
[9] Note that without this assumption, changes in the average wage triggered by the increase in the minimum wage imply that the group of firms paying above the initial minimum wage will not be likely the same to those paying above after the increase. Therefore, it would make it difficult to show the effect of an increase in the minimum wage on employment and wages.

$W^{min'}$ and accept all workers supplying their labor at this wage. Employment for the firm will be higher with the minimum wage increase, moving from l_{F_2} to l_{F_2}' in Figure 3A.

Now, if firm *i* was paying exactly the initial level of the minimum wage, it is now demand-constrained ($MRLP_3$) as it does not find profitable to keep the existing employment level due to the higher factor cost. Firms in this position will choose employment so that the $MRLP = W^{min'}$, which lies on the demand curve. The employment level of firms in this case will fall as a result of the increase in the minimum wage, moving from l_{F_3} to l_{F_3}'. Note also that since there is free entry and exit, firms that exit the market will have a negative effect on employment.

The new market equilibrium will depend on the absolute change in total employment from the last two scenarios. In other words, the overall impact of an increase in the minimum wage depends on which effect dominates: the *monopsony effect* (supply-constrained) or the *exit effect* (demand-constrained). Denote by ΔL_{F_2} the change in employment levels after the increase in the minimum wage for supply-constrained firms and ΔL_{F_3} the change in employment levels for demand-constrained

Figure 3
LABOR MARKET EQUILIBRIUM



Notes. Figures A and B presents a graphical representation of the labor market equilibrium for the two-sector model. Figure A shows the possible results after an increase in the minim wage for the formal sector assuming three types of firms: unconstrained firms ($MRLP_1$), supply-constrained firms ($MRLP_2$), and demand-constrained firms ($MRLP_3$). Figure B presents the results for the competitive informal sector.

firms. If $\Delta L_{F_2} > \Delta L_{F_3}$, then the aggregate employment increases and the level of employment in the informal sector goes down, moving from l_I to l_I' in Figure 3B. If $\Delta L_{F_2} < \Delta L_{F_3}$, the aggregate employment in the formal sector decreases but the total employment change in the market depends on the ability of the informal sector to absorb the excess supply coming from the fraction of workers ρ for which equation *(9)* is relevant. So, if the decline in employment in the formal sector ΔL_F is lower than the increase in employment in the informal sector ΔL_I, then employment in the aggregate will still be higher, but driven by an increase in informal employment, moving from l_I to l_I''.

As noted by Dickens *et al.* (1999), if the average wage affects employment in each firm, as suggested by the model, then it is important to look at the impact of raising the minimum wage by using the complete distribution of wages, unless one can confirm no effects on the upper part of the wage distribution. When the minimum wage increases, firms paying the minimum wage will rise wages, but also firms paying workers above the minimum may want to maintain the wage gap in order to keep more productive workers. Now, if wages in the informal sector increase as a result of the minimum wage increase, then changes in aggregate employment levels will depend on the effect the minimum wage policy has on the informal sector. Card and Krueger (1995) show that indexation of salaries to the minimum wage tends to be very high, creating a ripple effect.

Now, if we allow for migration between the urban and rural sector, in equilibrium workers move until the expected real earnings in the rural sector equal the urban real wage W_u. So, the wage in the informal rural sector can be described by the following relationship:

$$W_I = \frac{1}{1-\theta} W_u - \frac{\theta}{1-\theta} W_F^e, \qquad (10)$$

where W_F^e is the expected real wage in the rural formal sector as defined by the first term in equation *(4)*.

To simplify the analysis, assume that the rural sector is of size 1 and that all workers not employed in the formal sector are employed in the informal sector. This shifts the focus to the effect on wages and not on the size of sectors. Assume also, for the sake of argument, that the supply and demand of labor a firm in the formal sector face is not a function of the average wage in the rural sector. Note that a change in the minimum wage in the rural sector will affect directly the expected wage of the rural formal sector, with the size of the effect being mediated by the labor demand. Differentiating *(10)* with respect to changes in the rural minimum wage yields the following:

$$\frac{\partial W_l}{\partial W^{min}} = \lambda \eta_{LW} [(W_u - W_F^e) - kW_F'], \qquad (11)$$

where η_{LW} is the minimum wage elasticity of the demand for labor in the formal sector, W_F' is the partial derivative of the expected wage in the formal sector with respect to the minimum wage, $\lambda =$

$[\theta/(1-\theta)^2 W^{min}]$ and $k = \theta(1-\theta)$. From *(11)* we can see that a higher minimum wage will have an ambiguous effect on the wage in the informal rural sector. An increase in the minimum wage may increase the wage in the informal sector if i) $\eta_{LW} > 0$ and $(W_u - W_F^e) - kW_F' > 0$, or if ii) $\eta_{LW} < 0$ and $(W_u - W_F^e) - kW_F' < 0$.

Now, an increase in wages may make rural areas more attractive and cause migration from urban to rural areas, pushing the labor supply curve to the right. This increase in labor supply will reduce the marginal cost for some of the remaining firms in the formal sector paying above the minimum wage, which will increase employment. However, this increase in employment will come at a lower average wage. At this point, it is important to highlight a common feature in rural areas in developing countries. In these regions the informal wage set by the market is typically a fraction of the minimum wage plus the cost of payroll taxes and severances. Even as firms in the informal sector are more willing to avoid the payment of payroll taxes, an increase in the minim wage rate will likely induce a raise in wages in the informal sector.

Considering that the informal sector is price-adjusted, involuntary unemployment will be very low, contrary to what happens in the formal sector.[10] One explanation is the strong relationship that exists between the minimum wage and the average wage distribution in low-skilled jobs. If the minimum wage is relatively high within the wage distribution, *i.e.*, the minimum-to-average wage ratio is high,[11] the employment effects could be larger. Figure A2 in the Appendix shows the minimum-to-average wage ratio in Colombia since the introduction of the minimum wage. Closer to the policy change, minimum wages represented between 70-90% of the average wage in both urban and rural areas.[12] Likewise, the income distribution

[10] Involuntary unemployment occurs when a potential employee is willing to receive the equilibrium wage in exchange for his work but finds no job. Under voluntary unemployment, workers may choose not to work since their reservation wage is higher than the prevailing wage, which in the formal sector is the minimum wage restriction.

[11] Even though the minimum-to-average wage measurement is traditionally used due to data availability, it may not be the most accurate when understanding the wage distribution (Rutkowski, 2003). Since the average wage is highly influenced by variations in the tails of the wage distribution, it may not be a proper reference of labor market conditions for low-productivity workers. In such case, the median wage (being this the wage that represents the point from which half of the workers earn less and half earn a higher salary) can be a more accurate indicator to understand the population affected by the minimum wage. According to late '90s estimates in Colombia (Maloney and Núñez, 2004) the minimum-to-median wage ratio was higher than the ratio using the average wage, confirming the high incidence of the minimum wage in Colombia's labor market.

[12] It is important to make clear that these calculations may be subject to some measurement errors. Particularly, within the rural sector, a share of the employed population does not receive a wage, and within the urban sector, a large part of the workforce is non-wage-labor. Although these numbers are not considered stylized facts, they are useful when analyzing the prevalence of the minimum wage.

in Colombia has been concentrated to the left of the minimum wage, indicating noncompliance among certain groups. However, wages below the average wage in the rural labor market suggest a high supply of floating or part-time labor.

The essence of the argument conveyed by the model is that even when employment falls, it is possible to show that the employment effect will be smaller if we consider monopsonistic competition in the labor market over perfect competition. However, when a minimum wage is set or is increased, employment may even rise. As discussed by Dickens *et al*. (1999), models in which firms face some degree of monopsony power have important implications for empirical estimates of the effect of minimum wages. In particular, as suggested by Figure 3, one can expect negative employment effects in low-wage jobs relative to high-wage jobs, implying that the impact of a raise in the minimum wage is likely to be spread across the wage distribution unevenly. Therefore, empirical analysis that focus on the impact of minimum wages on the lower part of the wage distribution, assuming no employment effects in higher parts of the distribution, are likely not capturing the total effect. In contrast, the data and empirical strategy described in the next sections will allow me to estimate the total effect from the increase in the rural minimum wage.

IV. Data

This paper uses representative data at the national and local level that take into account geographic differences with respect to changes in minimum wage regulation. I use Census information to construct a dataset on labor market conditions for all municipalities in Colombia between 1973 and 1985. Census data is provided by Colombia's National Administrative Department of Statistics (commonly referred to as DANE in Spanish). In the 1973 Census, the employment questionnaire was applied to the entire population; but in 1985, it was applied only to a representative sample of the population, with national coverage.[13] The data includes different employment and socioeconomic characteristics by municipality. Unlike the information obtained through household surveys, census information does not report wages or income, limiting a deeper analysis for both the formal and informal sector.[14]

I include information on the total coffee area harvested for each municipality, obtained from the Coffee Census carried out by the National

[13] To assess possible coverage issues, I aggregate information using expansion factors provided in the data at the municipality level.

[14] Available household surveys in Colombia before 2000 are not representative at the national level. The first measurement of rural areas was carried out in 1978, which was repeated again in 1988. However, there is no record of the 1978 household survey data for rural areas.

Federation of Coffee Growers in 1970 and 1980.[15] In addition, I include information on the level of economic activity for each municipality (GDP per capita), which was estimated following the methodology used by Sánchez and Núñez (2000).[16]

Table 1 shows the difference in means of the variables included in the analysis for the baseline year. Municipalities affected by the change in the policy instrument, *i.e.*, treated municipalities where the minimum wage increased to the level of

Table 1
DESCRIPTIVE STATISTICS
(1973)

Characteristics	Controls	Treated	Difference
Participation Rate	49.2	48.9	-0.2
Employment Rate	42.6	42.9	0.3
Unemployment Rate	13.4	12.3	-1.0
Percent Male	47.6	50.4	2.8
Percent Age 18-65	47.2	42	-5.2
Percent Age 14-28	30.7	25.2	-5.5
Years of schooling	4.2	2.6	-1.6
Class of Worker (%)			
Wage workers, Agriculture	28.5	45.2	16.7
Other Wage and Salary Workers	31.2	8.3	-22.9
Self-Employed, Incorporated	5.6	7.4	1.8
Self-Employed, Unincorporated	15.1	18.9	3.8
Domestic Worker	9.6	4	-5.6
Unpaid Family Workers	1.9	7.9	5.5
Literacy Rate	80.6	65.1	-15.6
GDP per capita (thousand)	255.6	98.2	-157.4
Coffee. Avg. Harvested Area (ha)	2,150.90	978.9	-1,172.0
Rurality Index (0-1)	0.2	0.7	0.5

Notes. The Table presents descriptive statistics for control and treated municipalities in 1973. The employment rate is defined as the ratio of the employed to the working age population (aged 12 or over). To estimate average years of schooling I use average enrolment and retention rates in each level since the questionnaire only asks about the last grade approved--not the level.
Source: Author's calculations using data from the 1973 Census.

[15] Identifying coffee-growing municipalities is important because this sector was one of the main contributors to economic growth during the XX century and the improvements in socioeconomic conditions in coffee regions. Traditionally it has also been an important source of employment, especially during periods of economic boom associated with a sustained increase in coffee prices. Controlling for agricultural-price booms is essential because a strong rise in prices reduces the labor mobility to urban areas. It can even create a migration process of low-skilled labor from the urban centers towards the rural areas (integration of labor markets).

[16] This methodology uses municipal tax revenues (property taxation, industrial tax, and trade tax, among other smaller contributions) to assess the share of each municipality in the Department's total tax revenues. I use these shares, the GDP for each Department and the total municipal population, in order to estimate a measure of per capita income by municipality.

the urban areas, are significantly different in their observable characteristics from those municipalities considered as urban. These differences are not a threat for the empirical approach. In fact, the empirical approach deals with differences in levels between the treatment units and the control units, as well as any temporal trend in the outcome variable as long as it is similar between both groups.

On the other hand, Table 2 describes the changes between 1973 and 1985 in the total population, the working-age population, and the employed and unemployed population by group. The Table shows that the total population in the treated (rural) municipalities increased by 14.3% while that of the control (urban) municipalities increased by 45.3%. This seems to be in line with migration trends resulting from the process of structural change in the economy.

The latter takes on a new meaning if we look at the evolution of the working-age population and the employed population. For rural municipalities, these indicators increased by 29.3% and by 52.2%, respectively, between 1973 and 1985. In the case of the control group, the working-age population and the employed population increased by 58.9% and by 80.8%, respectively. Although variations are greater in the control municipalities in both cases, a comparison between both groups shows that the growth rate in the number of employed workers in the treated municipalities is twice the growth rate evidenced in the working-age population. Higher than the control group.

Finally, the number of unemployed people decreased considerably in both groups. According to this, there is evidence of greater labor absorption in rural municipalities, which is consistent with the process of structural change. Although these statistics give some clues to think about the existence of a segmented labor market, it is necessary to evaluate the effect of the reform by comparing year-to-year changes between both groups.

Table 2
DESCRIPTIVE STATISTICS BY GROUP
(1973-1985)

	Controls (raw data)			Treated		
Characteristics	**1973**	**1985**	**Change (%)**	**1973**	**1985**	**Change (%)**
Population	12,321,399	17,905,687	45.3	6,569,365	7,510,773	14.3
Working-Age Population	8,119,472	12,900,000	58.9	3,966,011	5,129,219	29.3
Employed	3,457,952	6,253,572	80.8	1,701,582	2,592,255	52.3
Unemployed	533,793	343,416	-35.7	239,315	52,036	-78.3

Notes. The Table presents the total population, the working-age population, and the employed and unemployed population by group between 1973 and 1985. The working age population is defined as all aged 12 or over.
Source: Author's calculations using data from the 1973 and 1985 Census.

V. Empirical Strategy

$$y_{mt} = \alpha_m + \gamma_t + \delta(MW_m \; x \; Period_t) + \mathbb{X}_{mt} + \varepsilon_{mt}, \qquad (12)$$

Using a *differences-in-differences* approach I estimate the differential effect on employment experienced in treated municipalities, those municipalities considered as rural, in which the minimum wage was adjusted upwards, relative to municipalities--those that did not experienced an adjustment and where considered as urban. In this sense, I exploit the exogenous variation that results from the increase in the legal minimum wage in some municipalities, but not in others. This considers the wage adjustment as a function of the pre-existing minimum wage of a given municipality. Consequently, the empirical approach accounts for any pre-treatment difference in levels in both groups.

This paper focuses on the effect of changes in the minimum wage on total employment, which captures the change in the demand for labor, and not on unemployment since, as was pointed out by Mincer (1976), the latter tends to be ambiguous.[17] Given the above, this paper estimates the following regression:

in which y_{mt} stands for the employment rate in municipality m at time t. MW_m is a *dummy* variable for the treated municipalities (rural), and it is an indicator of the municipalities affected by the increase in the minimum wage. $Period_t$ is a time-dummy that captures the period after the increase in the minimum wage. Thus, it is equal to 1 in 1985 and 0 in 1973. The coefficient of interest, δ captures the employment rate differential change after the increase in the minimum wage in the treated municipalities, with respect to those where there was no distinct change. Municipality and year fixed effects (respectively α_m and γ_t) are added to control for any specific heterogeneous shocks municipalities might have faced that did not change over time, but that might have been correlated with changes in employment levels, and by aggregated shocks that could have affected all municipalities at a specific moment in time. In addition, $\mathbb{X}_{mt}$ is a vector of observable covariates that vary over time and are deemed to be not affected by the treatment.[18] Finally, ε is the error term.

[17] The distinction between the effect of the minimum wage on employment and unemployment is due to one or both of the following cases, as Mincer (1976) points out: i) when only a portion of the economy is "covered" by the minimum wage legislation (*i.e.*, complies with the regulation), and ii) when the labor supply is not perfectly inelastic. Clearly, when the entire economy is "covered" and the workforce is fixed, there is no distinction between the changes in employment and the changes in unemployment. In an opposite case, as the one presented in this paper, the conditions that create this distinction are important and must be treated separately.

[18] This includes the real GDP per capita in order to account for the economic performance of the municipality, as well as sociodemographic characteristics (population structure, sex, education, literacy).

Now, in equation *(12)* some covariates could potentially be endogenous to the treatment. For example, if the wage has effects on employment, it should in turn be affecting the municipal GDP since it is a function of employment and capital. According to this, I estimate a second regression controlling by differential trends parameterized by the controls; that means, interacting the economic activity covariates with a dummy for 1985.

$$y_{mt} = \alpha_m + \gamma_t + \delta(MW_m \; x \; Period_t) + \mathbb{X}_{mt} + (GDP_{mt} \; x \; 1985) + (Coffee_{mt} \; x \; 1985) + \varepsilon_{mt}. \quad (13)$$

As in a non-experimental conventional evaluation, the main assumption behind is that employment would have followed a similar trend in the urban and rural municipalities in the absence of changes in minimum wage. This means that the behavior of municipalities with an urban minimum wage is a good counterfactual for the rest of municipalities. In order to build a case for credible identification I rely on sample extracts of the 1964, 1973 and 1985 Census published by DANE. The data contains representative randomly selected samples of individuals which are grouped in recoded municipalities (smaller rural areas where grouped). This is a product of joint work between DANE, IPUMS and the University of Minnesota.

I conducted a formal test by interacting the treatment variable with time dummies.[19] Table A1 in the Appendix shows that the trends between treatment and control municipalities are significantly different between the two groups in the pre-treatment period if we use the raw sample. However, the pre-trends are not significantly different between the two groups when we exclude capital cities or the more restrictive one in which, apart from excluding capital cities, I excluded those municipalities that switched to the control group between 1974-1984. In other words, municipalities that experienced an increase in the minimum wage before all others in the treatment group. These results are also presented in Figure A3 in the Appendix. Looking at Figure A3D we can see that if we fail to account for an underlying trend (using all municipalities in the dataset), it will produce particularly larger treatment effects [see Rambachan and Roth (2019)].

While testing for a common pre-trend is a step necessary to validate the parallel trends assumption underlying differences-in-differences, it is not a sufficient condition. Failing to reject the hypothesis that the employment rate in years prior to treatment exhibit parallel trends does not corroborate the parallel trends assumption *per se*. The very large gap between the pre-treatment years and the

[19] The equation estimated is as follows: $y_{mt} = \lambda_m + \delta_t + \beta_{1964} D_{mt} + \beta_{1985} D_{mt} + \varepsilon_{mt}$, where y is the outcome for municipality m at time t, λ and δ are municipality and time fixed effects. D_{mt} is the interaction of the treatment variable with time dummies. If the outcome trends between treatment and control group are the same, then β_{1964} (the "lead") should be insignificant.

post-treatment period makes the parallel assumption very restrictive. While there is no additional evidence of important changes at the municipal level between those years that could have affected employment distinctively between groups, unfortunately, data limitations do not allow to look more closely between periods. Nonetheless, in Section VII I use additional econometric tools to corroborate the results presented.

VI. Results

In what follows I present the results of equations *(12)* and *(13)* using as dependent variables both the employment rate and unemployment rate and comparing between different samples. I then focus on the employment rate and estimate the impact of the minimum wage increase on a subgroup of municipalities and conditioning on key individual characteristics.

A. Aggregate employment effects

According to panel A in Table 3, the employment rate increased in rural municipalities (treated), relative to those considered as urban (controls), between 1.9 and 2.8 pps when estimating equation *(12)*. As describe in Section V, when we do not account for the underlying trend, results presented using the complete sample are larger, suggesting an upward bias. Now, when controlling by differential trends (panel B), the results are similar, with effects between 1.6 pps and 3.1 pps. This is equivalent to an increase of about 4% to 8% relative to the average of the employment rate of the control group before the treatment. These results imply a greater contribution from the change in the number of employed workers with respect to the working-age population. Yet, there is no clear and systematic effect on the unemployment rate (Table 4). In the case of the unemployment rate, the results show a change in sign depending on the sample used, although the coefficients are not statistically significant. This variability in the results is consistent with the evidence found in the literature and, for this reason, in the remainder of the paper I will focus only on the employment rate.

The positive effects the increase in the minimum wage has on the employment rate contradicts the idea that a rise in the cost of employment generates a lower demand for labor, affecting job creation --as the classical model predicts. Thus, these results suggest that the employment structure in rural areas at the time was associated with some degree of market power on the employer's side, as discussed in Section III. In addition, compliance with labor regulation in Colombia has been low, and is contingent to the contractual relation of agents. Likewise, these results are in line with the "new economy" of the minimum wage, as argued by Card and Krueger (1995).

In spite of what has been discussed, one of the problems with using Census data to evaluate the effects of changes in the minimum wage is the large

period in between, which in this case presents a 12-year lag. The argument conveyed in the paper is based on the premise that while there were changes in the minimum wage for both groups during that period, there were no other significant changes that affected employment levels. As I have discussed,

Table 3
EFFECT OF MINIMUM WAGE UNIFICATION ON THE EMPLOYMENT RATE

	Panel A: Without interacted controls					
	All sample		**W/o capitals**		**Restricted sample**	
Differences-in-Differences	2.193 ***	2.844 ***	1.903 ***	2.713 ***	2.194 ***	2.657 ***
	(0.419)	(0.496)	(0.614)	(0.546)	(0.763)	(0.738)
Adj. R-squared	0.686	0.741	0.612	0.681	0.621	0.643
Number of Municipalities	847	847	822	822	712	712
Mean Control 1973	42.6		40.6		39.3	
Mean Treatment 1973	42.9		42.9		42.9	
Socio-demographic controls		✓		✓		✓
Economic activity controls		✓		✓		✓
FE Municipality	✓	✓	✓	✓	✓	✓
FE Year	✓	✓	✓	✓	✓	✓
	Panel B: Economic activity controls interacted					
	All sample		**W/o capitals**		**Restricted sample**	
Differences-in-Differences	2.811 ***	3.059 ***	2.650 ***	3.080 ***	2.585 ***	1.645 *
	(0.493)	(0.502)	(0.544)	(0.534)	(0.731)	(0.899)
Adj. R-squared	0.742	0.748	0.681	0.695	0.644	0.655
Number of Municipalities	847	847	822	822	712	712
Mean Control 1973	42.6		40.6		39.3	
Mean Treatment 1973	42.9		42.9		42.9	
Socio-demographic controls	✓	✓	✓	✓	✓	✓
Economic activity controls		✓		✓		✓
(GDP per capita x 1985)		✓		✓		✓
(Coffee x 1985)		✓		✓		✓
FE Municipality	✓	✓	✓	✓	✓	✓
FE Year	✓	✓	✓	✓	✓	✓

Notes. The Table presents the effect of minimum wage unification on the employment rate. Panel A estimates regression *(12)*, *i.e.*, without interacted controls. Panel B estimates regression *(13)*, *i.e.*, using interacted controls. Socio-demographic controls include population structure, sex, schooling, and literacy. Economic activity controls include the real GDP per capita and the harvested area for coffee. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

between 1973 and 1985 there is evidence of convergence in minimum wages among the two groups, ending with the differentiation scheme. For that reason, estimates presented here are capturing the effect of the large process of convergence between minimum wages.

Table 4
EFFECT OF MINIMUM WAGE UNIFICATION ON THE UNEMPLOYMENT RATE

	Panel A: Without interacted controls					
	All sample		**W/o capitals**		**Restricted sample**	
Differences-in-Differences	-2.238 ***	-0.431	0.139	0.486	-0.681	-0.443
	(0.686)	(0.431)	(0.457)	(0.432)	(0.921)	(1.058)
Adj. R-squared	0.762	0.793	0.773	0.793	0.759	0.773
Number of Municipalities	847	847	822	822	712	712
Mean Control 1973	13.4		14.5		15	
Mean Treatment 1973	12.3		12.4		12.4	
Socio-demographic controls		✓		✓		✓
Economic activity controls		✓		✓		✓
FE Municipality	✓	✓	✓	✓	✓	✓
FE Year	✓	✓	✓	✓	✓	✓
	Panel B: Economic activity controls interacted					
	All sample		**W/o capitals**		**Restricted sample**	
Differences-in-Differences	-0.488	0.358	0.328	0.65	-0.646	-0.816
	(0.423)	(0.453)	(0.434)	(0.443)	(0.995)	(1.065)
Adj. R-squared	0.792	0.802	0.785	0.796	0.771	0.777
Number of Municipalities	847	847	822	822	712	712
Mean Control 1973	13.4		14.5		15	
Mean Treatment 1973	12.3		12.4		12.4	
Socio-demographic controls	✓	✓	✓	✓	✓	✓
Economic activity controls		✓		✓		✓
(GDP per capita x 1985)		✓		✓		✓
(Coffee x 1985)		✓		✓		✓
FE Municipality	✓	✓	✓	✓	✓	✓
FE Year	✓	✓	✓	✓	✓	✓

Notes. The Table presents the effect of minimum wage unification on the unemployment rate. Panel A estimates regression *(12)*, *i.e.*, without interacted controls. Panel B estimates regression *(13)*, *i.e.*, using interacted controls. Socio-demographic controls include population structure, sex, schooling, and literacy. Economic activity controls include the real GDP per capita and the harvested area for coffee. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

However, during this period both the employment rate and labor participation could have been influenced by other facts not being controlled for, affecting differently rural or urban municipalities. In particular, we might expect a reallocation of labor as part of the process of structural transformation that the economy experienced during those years. In this sense, while changes in labor composition do not only affect treated municipalities, a greater share of the population living in rural areas before the policy change could have reallocated to other sectors, for example, by migrating to urban centers (see Table 2).

Although I presented some evidence to support the validity of the parallel trends' assumption, one should ensure that the control municipalities are as similar as possible to the treatment municipalities, specifically in their covariates. Therefore, I estimate again equation *(12)* using a Kernel Propensity Score Matching (PSM) as a weighted average of the non-treated units in which the weight given to the non-treated unit is proportional to the proximity of the observable variables. The balancing tests for both the employment rate and the unemployment rate can be seen in Table A2 and Figure A4 in the Appendix. Similar to the results presented in Tables 3 and 4, estimates in Table 5 show positive and significant effects for the employment rate--between 1.9 and 2.4 pps, but no effects for the unemployment rate.

B. Employment effects by subgroups

In this section, I examine the employment effects across different groups of municipalities and key population subgroups, relying particularly on the PSM sample for the latter.

Table 6 presents employment estimates for different groups of municipalities. For example, disaggregating by coffee-growing and non-coffee-growing municipalities, results show positive effects for the first group, while no significant effects for the latter. These results seem to be consistent with the fact that coffee-growing municipalities tend to have a larger share of part-time workers. Therefore, as labor supply in these municipalities is usually less skilled and depends on a high seasonality (related to day labor), changes in minimum wage policy might have been an incentive for an increase in labor participation.

On the other hand, Table 7 shows evidence of heterogeneous effects on population subgroups. Particularly, results show evidence that minimum wage leveling benefited men in the treated municipalities, while it doesn't seem to have had an effect on women's employment rate. The latter is somewhat unexpected. For example, gender role convergence could have affected more gender traditional jobs which are likely to be concentrated in rural areas. This would have induced more

Table 5
EFFECT OF MINIMUM WAGE UNIFICATION - KERNEL MATCHING

	Panel A: Epanechnikov Kernel			
	Employment Rate		**Unemployment Rate**	
	(1)	**(2)**	**(3)**	**(4)**
Differences-in-Differences	2.364 **	1.976 ***	0.429	0.251
	(0.693)	(0.697)	(0.614)	(0.547)
Adj. R-squared	0.709	0.739	0.798	0.84
Number of Municipalities	416	416	416	416
Mean Control 1973	42.3		14.7	
Mean Treatment 1973	42.9		13.4	
Socio-demographic controls		✓		✓
Economic activity controls		✓		✓
FE Municipality	✓	✓	✓	✓
FE Year	✓	✓	✓	✓
	Panel B: Gaussian Kernel			
	Employment Rate		**Unemployment Rate**	
	(5)	**(6)**	**(7)**	**(8)**
Differences-in-Differences	2.349 ***	1.936 ***	0.277	0.226
	(0.728)	(0.706)	(0.627)	(0.538)
Adj. R-squared	0.692	0.728	0.789	0.836
Number of Municipalities	416	416	416	416
Mean Control 1973	42.4		14.7	
Mean Treatment 1973	42.9		13.4	
Socio-demographic controls		✓		✓
Economic activity controls		✓		✓
FE Municipality	✓	✓	✓	✓
FE Year	✓	✓	✓	✓

Notes. The Table presents the effect of minimum wage unification on the employment and unemployment rate using the Kernel Propensity Score Matching (PSM). Panel A estimate the models using an Epanechnikov Kernel. Panel B estimate the models using a Gaussian Kernel. Socio-demographic controls include population structure, sex, schooling, and literacy. Economic activity controls include the real GDP per capita and the harvested area for coffee. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

women to participate in the labor market in rural areas resulting in a positive or "catch up" effect. Therefore, one needs to account for the positive bias in the estimated effect on women's employment. The second column in Table 7 deals with this issue. Results also show a positive effect for individuals between the ages of 14 and 28 years, and for those workers who only finished primary

Table 6
EMPLOYMENT EFFECTS BY SUBGROUPS OF MUNICIPALITIES

	Coffee producers	Non-Coffee producers	Pop > 10k and ≤ 50k
Differences-in-Differences	4.016 ***	-0.294	2.729 ***
	(0.535)	(0.790)	(0.720)
Adj. R-squared	0.77	0.805	0.744
Number of Municipalities	565	282	333
Socio-demographic controls	✓	✓	✓
Economic activity controls	✓	✓	✓
FE Municipality	✓	✓	✓
FE Year	✓	✓	✓

Notes. The Table presents employment effects by subgroups of municipalities. Socio-demographic controls include population structure, sex, schooling, and literacy. Economic activity controls include the real GDP per capita and the harvested area for coffee. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table 7
EMPLOYMENT EFFECTS IN DIFFERENT POPULATION SUBGROUPS

	Employment rate						Share of employment	
	Men	Women	Youth	W/o Wage Workers, Ag.	Basic Education	W/o Migrants	Wage Labor	Non-Wage Labor
Differences-in-Differences	2.828 ***	-0.087	2.060 **	1.887 **	2.890 ***	1.948 ***	-1.332	1.612
	(1.02)	(0.279)	(0.832)	(0.808)	(0.859)	(0.699)	(1.007)	(1.066)
Adj. R-squared	0.727	0.983	0.718	0.778	0.811	0.746	0.836	0.806
Number of Municipalities	416	416	416	416	416	416	416	416
Observable covariates	✓	✓	✓	✓	✓	✓	✓	✓
FE Municipality	✓	✓	✓	✓	✓	✓	✓	✓
FE Year	✓	✓	✓	✓	✓	✓	✓	✓

Notes. The Table presents employment effects by subgroups of municipalities using the Kernel Propensity Score Matching sample from Table 5. Youth is defined as all individuals age 14 to 28. Wage labor correspond to all wage and salary workers. Observable covariates include socio-demographic and economic activity variables. In the second column I additionally control for women's participation rate. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

education. If the monopsony model is satisfied, then we should expect the effect on employment for low-skilled workers to be larger, considering that they are associated with lower relative wages. The results suggest this is the case.

Although the existence of confounders (factors that could be influencing the estimates and that cannot be controlled for) is a concern that arises from the data itself, the heterogeneous effects help reduce the uncertainty created by the large period in between Census. For example, since there was a coffee boom in the late 1970s, creating more employment in the coffee sector, this could be partially explaining the large effects on employment when conditioning on municipalities characterized as coffee-growers. In line with this, given that the coffee sector is composed mainly of day laborers, concerns pointing at results being explained exclusively by the effects of the coffee boom of the late '70s are somewhat reduced as there is evidence of positive and significant effects when excluding wage workers in the agricultural sector (Table 7, fourth colum).

Similarly, the coffee boom might have influenced positively the economic activity of rural municipalities, increasing the demand for labor and the participation rate as it could have induced migration towards municipalities with higher economic activity. Nonetheless, when looking only at the population that did not migrate during that period, one can see that there is still a positive effect (Table 7, sixth colum). These estimates suggest that the results are not exclusively driven by the coffee boom or by the expansion of the economic activity at the municipal level. Now, positive effects found for coffee-growing municipalities could be associated with the harvesting cycle which induces positive shocks on labor participation and a high demand for day labor. It is worth mentioning that the geographic dimension of the municipality consists of the population living in the urban centers, but also the ones living in the periphery where agriculture may exist. This means that coffee-growing municipalities are only measured in the extensive margin (the municipality grows, or it does not grow coffee according to Colombia's Coffee Census), and not in the intensive margin (production volume).

It is also important to consider the effects that the policy change has on the quality of employment. In other words, the impact it has on the employment levels of wage-labor (those who earn a salary as compensation for their work) and non-wage labor --those who do not earn a salary.[20] Results from the last two columns in Table 7 show that the increase in the minimum wages did not significantly change the share of wage-labor and non-wage labor.

[20] Day laborers, employees, and domestic employees compose wage-labor. The non-wage labor corresponds to self-employed workers, employers (or business owners), and unpaid family workers.

Compiling all that has been presented so far suggests that the growth in the overall demand for labor in the rural areas, potentially resulting from a higher participation rate, could have been related with a growth rate of similar magnitude in employment in the informal sector. These results are in line with a segmented rural labor market.

C. Accounting for spatial spillovers

The existence of externalities created by the integration between rural and urban labor markets might have had a significant impact on the employment structure (Botello, 2010), which could potentially lead to bias in the estimates presented so far. In particular, one could expect that differentiated minimum wages induce spatial effects or spillovers. On the one hand, it is reasonable to think of temporary workforce reallocation from treated municipalities (with a low minimum wage) to control municipalities (with a high minimum wage) within small distances. This could be a rational decision as workers would want to perceive a higher income but living in municipalities that seem to have a lower cost of living--lower average wage, lower prices. Or vice versa, from control municipalities to treated municipalities as some workers that lost their job in the urban sector fall temporarily into the rural labor market. The existence of a differentiation in activities within the rural sector, for example, between activities carried out during the entire year–of a continuing nature–and those of a temporary nature, which are essentially demanded during seasonal times (*e.g.* during harvest times), supports the argument for integrated markets.

Using a neighborhood approach with a queen contiguity matrix I exclude treated adjacent municipalities from neighboring controls. Adjacent municipalities are those that share a same border or vertex. Equations *(12)* and *(13)* are re-estimated for the employment rate. The results on Table 8 suggest positive effects on treated municipalities, which are not far from the ones that were presented in subsection VI.A.

VII. Robustness

The results presented so far suggest that differences between the treatment group (rural municipalities) and the control group (urban municipalities) can be captured by differences in the employment rate controlling by observables. However, municipalities facing a rural minimum wage and those facing an urban minimum wage could be different in other ways, which can bias the results--at least partially. While the evidence presented is suggestive of the parallel trends' assumption, control units that may not be adequate counterfactuals are being included in the different samples. These issues could create suspicion about the control group's ability to reproduce the course of the counterfactual result. Therefore, the standard method of differences-in-differences could lead to biased estimates.

Table 8
EFFECT ON THE EMPLOYMENT RATE CONTROLLING FOR SPILLOVERS: SPATIAL ANALYSIS ELIMINATING NEAREST NEIGHBORS

	All Sample	W/o capitals	All Sample	W/o capitals
Differences-in-Differences	3.237 ***	3.135 ***	3.730 ***	3.841 ***
	(0.763)	(0.814)	(0.753)	(0.794)
Adj. R-squared	0.781	0.698	0.788	0.714
Number of Municipalities	481	456	481	456
Controls	✓	✓	✓	✓
(GDP per capita x 1985)			✓	✓
(Coffee x 1985)			✓	✓
FE Municipality	✓	✓	✓	✓
FE Year	✓	✓	✓	✓

Notes. The Table presents employment effects controlling for spatial spillovers using the complete sample and excluding capital cities. Observable covariates include socio-demographic and economic activity variables. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

A. Synthetic Control Method and Monte Carlo simulations

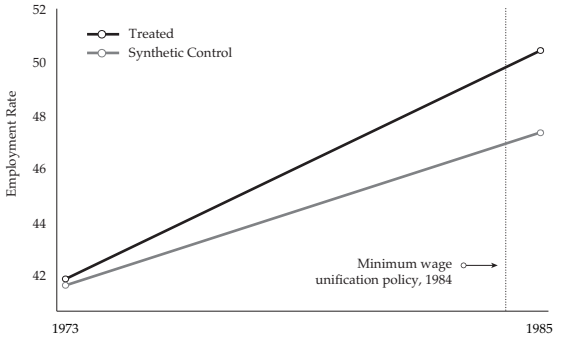
As a complementary approach to address these concerns, I use the synthetic control method (Abadie & Gardeazabal, 2003; Abadie *et al.*, 2010; Abadie *et al.*, 2015). This method is at the cutting-edge of the empirical literature in labor economics. The basic idea is that a combination of units often offers a better comparison for the unit exposed to the intervention than a single unit. The difference between this method and the PSM method is that the former assigns differentiated weights to the units in the control group (counterfactual), so that the synthetic group resembles more the treated unit-or units-before the intervention, at least in the variable of interest.

The traditional synthetic control method (SCM) allows one to estimate policy effects in contexts where a single unit is exposed to an intervention. The SCM provides a data-driven procedure for building synthetic control units, based on a combination of all comparison units that are close to the characteristics of the unit that is being exposed to the intervention.[21] It is a less arbitrary way of

[21] The SCM does not give the same weight to the non-treated units in the comparison. On the contrary, it creates a weighted average of the non-treated units that matches the treated unit during the pre-treatment period and uses it as a counterfactual.

determining a control group that resembles the behavior that treated units would have had if they had not received the treatment. Cavallo *et al*. (2013) expanded the SCM allowing for more than one unit to experience the treatment, even at different times.

Figure 4
ESTIMATION OF THE TREATMENT EFFECT ON THE EMPLOYMENT RATE USING THE SYNTHETIC CONTROL METHOD (SCM)



Notes. The Figure presents estimates of the treatment effect on the employment rate using the Synthetic Control Method (SCM). The Synthetic Control is the counterfactual estimation for the treatment group. Given that there are only two periods of analysis (pre and post-treatment), the lines between 1973 and the result of the estimate in 1985 are reflection of the union of two points for the employment rate. The graph does not represent a change in trends before treatment. In contrast, the SCM equates trends in the pre-treatment period. Likewise, the units for which there is no approximate match are excluded for inference, that is, for which the RMSPE (Root Mean Square Prediction Error) before the treatment is greater or equal to √3*Avg. RMSPE for the treatment group (see Acemoglu *et al*., 2016).

Figure 4 presents the results of the estimated counterfactual for the treated municipalities (rural) allowing for multiple treated units.[22] It is evident that the synthetic estimate of the counterfactual matches the average employment rate of the treated units before the treatment. Consequently, the estimated effect on the employment rate is the difference between the treated unit and its synthetic control during the period after the treatment, which shows an increase of 3.0 pps in the employment rate.

In addition, the SCM carries out a series of placebo trials *in situ*. For each control unit, we temporarily assumed that it receives the treatment at the same time and construct a synthetic control using the rest of the non-treated units. Then, a distribution of these placebo effects is estimated as a measure of the relative size of the main effect, using the differences between the placebo units and their synthetic controls. If a large share of placebo results is as big as the main effect, then it is likely that the main effect has been coincidentally observed. The placebo results estimated using the SCM--which are not presented here--indicate that the probability of estimating a similar effect in magnitude to the one presented in Figure 4 is less than 0.01%.[23] This is well below the 5% rejection level typically used in conventional tests of statistical significance. There-

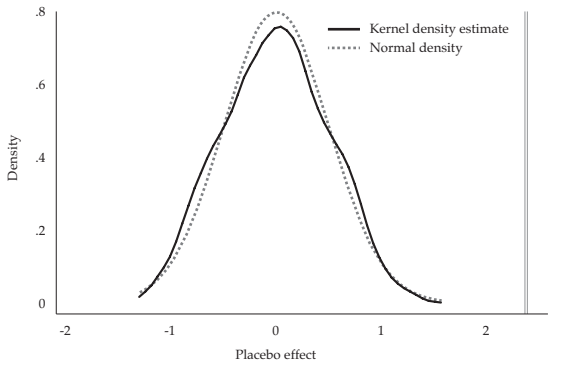
[22] For the inference, municipalities that did not obtain a good synthetic combination were removed.

[23] This is true also after scaling each post-treatment effect by a measure of pre-treatment match quality (the pre-treatment RMSPE).

fore, we can confirm the significance of the result using the SCM.

Finally, I carried out a placebo test for differences-in-differences. Figure 5 shows a Monte Carlo permutation test using equation *(12)*. These placebo trials assign randomly the treatment status to municipalities drawn from a sample of the data and determine the probability of observing an average employment effect similar to the results estimated in Table 3. The results in Figure 5 show that is highly unlikely that the coefficients presented in Table 3 were estimated by chance. If this was the case, the distribution of the effects using the multiple placebo permutations should be centered at zero, as it is shown in the figure. Under a true effect from the policy, a random assignment of the treatment will not correspond to the reality of the policy, therefore, it should not generate systematic effects. In this sense, the evidence seems to indicate that the results estimated with equation (12) are consistent with significant effects on the treatment group.

Figure 5
PERMUTATION TEST FOR DIFFERENCES-IN-DIFFERENCES, EMPLOYMENT RATE



Notes. The Figure shows a distribution of 1.000 placebo estimates by Monte Carlo simulations of the effects of changes in the minimum wage policy. The solid line shows the distribution that result from randomizing the treatment variable at the municipality level. The dash line corresponds to a normal distribution. Each permutation regression introduces time and municipality fixed effects. The grey vertical lines display the point estimates from equation (12).

B. Using Household Survey data for a Metropolitan Area

The differences-in-differences approach compares employment in urban and rural municipalities in 1973 and 1985. As it has been discussed, this period is very long and clearly some changes that might have affected rural and urban areas asymmetrically, apart from the minimum wage policy, could have taken place. Particularly, the process of structural change could have affected employment and skill composition differently in rural and urban areas; gender role convergence could have also affected more gender traditional jobs which are likely to be concentrated in rural areas. Thus, the tremendous gap between the Census data can raise doubt on the fact that the changes we see between 1973 and 1985 are due solely to changes in minimum wage policy.

In order to address some of these concerns I estimate a fixed effect model similar to equation (12) using data from the National Household

Survey for Cúcuta and its metropolitan area (Villa del Rosario, El Zulia, Los Patios). The National Household Survey was in place from 1976 until 2000, but there is only available information from 1984 for a small number of municipalities, most of which were not affected by the policy-except for El Zulia and Los Patios. Cúcuta, along with its metropolitan area, was included in the sample in June 1982 (EH-38) and then, each semester, from June 1983 (EH-40). For the purpose of this paper I rely on data from the 1984 (EH-44) and 1986 (EH-52) waves for all urban population. In December of 1983, the National government determined that the final increase on the minimum wage for treated municipalities was going to be gradual. An initial raise staring in January of the following year, then a second raise in April, and a third and final adjustment in July.

Table A3 in the Appendix presents demographic information for Cúcuta's metropolitan area in the quarter before the final hike in the minimum wage. In 1984, 27.3% of treated workers in El Zulia and Los Patios (treated) earned less than the prevailing minimum wage ($46.17 pesos per hour), against 29.9% in Cúcuta and Villa del Rosario (controls). However, the treated sample had a higher share of workers earning between one and two times the minimum wage, with a higher share concentrated in agriculture and construction industries. Now, the two samples had fairly similar demographic characteristics but those in the treated group had lower employment rate, lower schooling and mean wage. Despite these differences, the proportion of wage and salary workers and self-employed was similar. However, these differences are greater if we only use Villa del Rosario as the control group.

A first indication of the employment effects of the rise in the minimum wage comes from Table A4 in the Appendix. The first two columns show the changes in the employment rate between 1984 and 1986 in treated municipalities relative to the corresponding changes in Cúcuta and Villa del Rosario combined. Results show an employment growth of about 12%, relative to the baseline for the control group. Now, since descriptive statistics for 1984 are quite different in many aspects, the last two columns perform a Kernel Propensity Score Matching. The results suggest that the rise in the minimum wage did more than simply "catch up" in the employment rate, with an increase of 8% relative to the mean employment rate for the control group.

In light of these findings, in Table A5 I present a more detailed analysis of the change in mean wages and employment rate for different groups. The first column in the table presents the fraction of workers in each group that received an hourly wage between $46.17 and $47.07 pesos in the second quarter of 1984. This measure of the "potential" group directly affected from the rise in the minimum wage ranges from 5.8% for workers without a high school degree to 14.6% for those with at least a high school degree. The next columns contain the means for the hourly wage and employment rate

in 1984. Finally, the last two columns present the differences-in-differences for these labor market outcomes. We see a negative impact in the average wage for female workers and for those with at least high school. However, we see an increase in the employment rate for three groups: male workers, those age 14 to 28 and high-skilled workers. In contrast to conventional expectations, groups with a higher fraction of low-wage workers do not appear to have suffered any relative losses in employment. These results are in line with those presented in Sections VI and VII.

VIII. Discussion

This paper examines the effect of urban and rural minimum wage convergence from 1974 to 1984 in Colombia. Taking advantage of a "natural experiment" framework and using Census data, I estimate the effect of changes in the minimum wage on employment in the rural labor market. Results, contrary to what has been found in the literature in the case of Colombia, show evidence of an increase between 4% and 8% in the employment rate in policy-affected municipalities, relative to the control group, but do not seem to have any effect on the unemployment rate. These results are consistent with the "new economy" of the minimum wage (Card and Krueger, 1995), which shows evidence that is contradictory to the implications of the standard competitive model for the labor market. In addition, the results show evidence of heterogeneous effects by population subgroups.

Robustness checks using alternative econometric approaches and relying on additional survey data for smaller samples helps reduce the uncertainty created by Census data limitations. The additional evidence suggests that there are effects beyond the exogenous shocks that could have affected the structure and the dynamics of the labor market between 1973 and 1985. In particular, shocks coming from the coffee boom, which might have affected the economic activity of municipalities, and the process of structural change. The results consistently show positive effects on the employment rate, a symptom that suggests there was a narrowing in the gap between urban and rural municipalities. The increase in the demand for labor, potentially resulting from a higher participation rate in rural areas, is highly consisting of low-skilled employment, associated with a large informal sector. However, as it has been discussed in the paper, the possibility of other causes driving the results cannot be necessarily excluded, particularly as I can only test weakly for the plausibility of the parallel-trends assumption.

In this paper I have also presented a model of a segmented rural labor market. I argued that this simple model is useful for interpreting the empirical results and thinking about the likely effects of the minimum wage in developing countries.

Now, most of the previous studies looking at the impact of the minimum wage on the employment level in Colombia have documented a negative

elasticity. In particular, Bell (1997) finds a very pronounced impact of the minimum wage on the wage distribution and employment level in Colombia. While these results contradict those presented in this paper, Bell used the manufacturing sector as a representative sector of the Colombian labor market. This has come at the expense of focusing on the formal urban sector with a low incidence of wage levels below the legal minimum wage, and a growing outsourcing of jobs. In this sense, this paper uses new information on the supply side of the labor market to evaluate the effects of an increase in the minimum wage on the demand for labor. Information that is representative at the local and national level.

Finally, the results presented may contribute to the ongoing discussion about the possibility and the convenience of returning to a differentiated minimum wage scheme in Colombia. As each region's capacity to absorb a specified minimum wage rate is different, there are arguments in favor of a differentiated minimum wage (*e.g.*, by region, age, industry, or occupation) as it can play an important role by mitigating the trade-offs implicit in a one-size-fits-all minimum wage. However, arguments against a differentiated minimum wage suggest that we could expect an increase in migration of qualified labor from less developed areas to those with higher productivity, widening regional gaps. In any case, the results presented need to be taken with caution as they reflect changes from a particular policy and refer to a specific context.

List of abbreviations

DANE: Departamento Administrativo Nacional de Estadística
GDP: Gross Domestic Product
MRLP: Marginal Revenue Product of Labor
PSM: Propensity Score Matching
SCM: Synthetic Control Method
NHS: National Household Survey

Declarations

Data and materials
The dataset used and analyzed during the current study is available from the corresponding author on reasonable request.

Competing interest
The author declares that he has no competing interests.

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Contributions
Not applicable.

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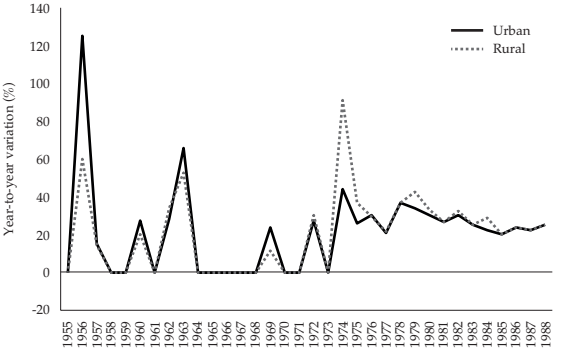
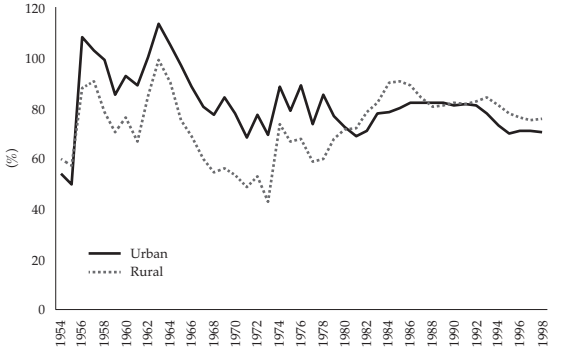
Appendix A
FIGURES AND TABLES

Figure A1
NOMINAL INCREASE IN MINIMUM WAGES BY AREA



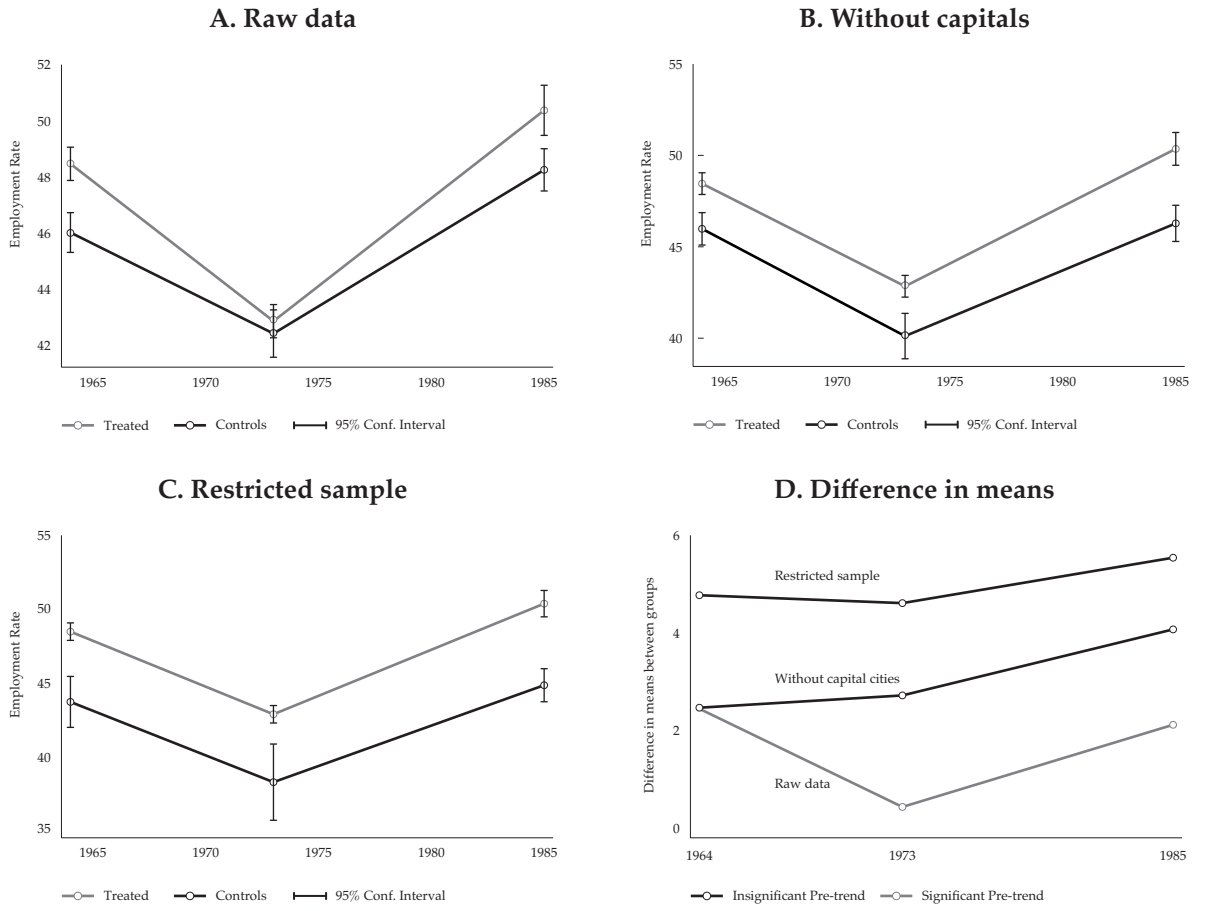
Notes. The Figure presents the annual change in nominal minimum wages by area between 1954-1988. The information presented averages over a year when increased several times within a given year. Source. Author's calculations using data from the Ministry of Labor and DANE.

Figure A2
MINIMUM-TO-AVERAGE WAGE RATIO BY AREAS



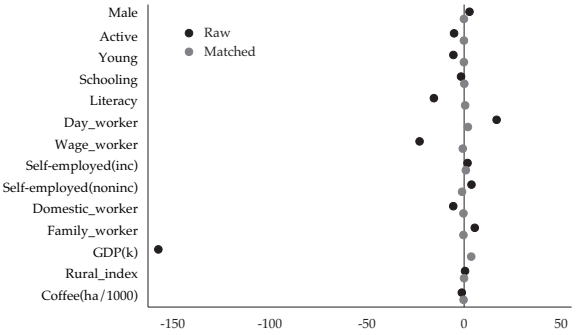
Notes. The Figure presents the minimum-to-average wage ratio by areas a between 1954-1988. Source. Author's calculations using data from Jaramillo *et al.* (2001), the Ministry of Labor, and DANE.

Figure A3
PARALLEL TRENDS FOR DIFFERENT SAMPLES



Notes. Figures A through C present the evolution of employment rates for treated and control municipalities for different samples Figure D present the estimates of difference in means. Restricted sample excludes capital cities and those municipalities that switched to control group between 1974-1984. In other words, excludes those municipalities that experienced an increase in the minimum wage before all others in the treatment group. Significant pre-trend corresponds to those in which the t-statistic is greater than 1 in absolute value.
Source. Author's calculations using data from 1964, 1973 and 1985 Census samples published by DANE.

Figure A4
BALANCE PLOT AFTER KERNEL MARCHING, PRE-TREATMENT



Notes. The Figure presents the balance plot after kernel marching for the pre-treatment period using the Epanechnikov function.

Table A1
TEST FOR PRE-TRENDS USING CENSUS SAMPLES

	All Sample	W/o capitals	Restricted sample
Pre-trend difference	1.620 ***	-0.531	0.206
t-statistic	(2.64)	(0.73)	(0.15)
Adj. R-squared	0.67	0.607	0.604
Number of Municipalities	473	440	340

Notes. The Table shows the test for pre-trends using different Census samples. The restricted sample excludes capital cities and those municipalities that switched to control group between 1974-1984. Estimates are weighted by the number of observations in the cell. t-statistics in parentheses.
*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table A2
BALANCE AFTER KERNEL MATCHING, PRE-TREATMENT

Characteristics	Controls	Treated	t-stat
Employment Rate	42.4	42.9	0.94
Unemployment Rate	14.7	13.4	2.9
Participation Rate	49.7	49.5	0.23
Percent Male	50.4	50.2	0.95
Percent Age 18–65	42.2	42.2	0.12
Percent Age 14–28	26.4	26.3	0.38
Years of schooling	2.7	2.7	0.06
Class of Worker (%)			
Wage workers. Agriculture	44.8	44.7	0.07
Other Wage and Salary Workers	10.8	10.5	0.51
Self-Employed. Incorporated	5.4	5.6	0.58
Self-Employed. Unincorporated	18.1	18.1	0.02
Domestic Worker	4.7	4.7	0.16
Unpaid Family Workers	5.7	5.7	0.41
Literacy Rate	65.1	65.1	0.02
GDP per capita (thousand)	110	110	0.25
Coffee. Avg. Harvested Area (ha)	1,374.30	1,537.90	0.74
Rurality Index (0-1)	0.6	0.6	0.02

Notes. The Table presents the balance statistics after kernel marching for the pre-treatment period using the Epanechnikov function. Means and t-test are estimated by linear regression.

Table A3
CHARACTERISTICS OF TREATED AND COMPARISON SAMPLES, CÚCUTA METROPOLITAN AREA 1984

Group	Treated	All Controls	Villa del Rosario
Employment Rate	36.5	42.7	45.4
Unempoyment Rate	14.4	12	6.5
Mean Age	31.6	31.8	32.1
Percent Female	53.6	54	51.9
Percent Age 14-28	44.4	46.9	44.7
Average Education (Years)	4	5.7	4.5
Percent High School or higher	5.7	13.7	4.8
Percent Married	44.4	44.8	46
Percent Wage and Salary Workers	53	54.8	50
Percent Self-Employed	43.1	40.1	44.4
Percent earning below min. wage	27.3	29.9	51.3
Percent earning between 1 & 2 min. wage	46.5	40.1	34.3
Mean Wage ($/Day)	452.7	567	381.7
Mean Wage ($/Day). cens(a)	453.8	508.6	381.7
Mean Log Wage ($/Day)	6	6.1	5.7
Industrial Distribution:			
Agriculture	18.4	2.2	7.7
Construction	10.3	5.1	3.1
Manufacturing	18.1	17	28.9
Transportation. Communication. Utilities	10.4	7.5	6
Trade	21.7	32.8	27.6
Finance. Insurance. Real State	0.3	2.6	2.2
Services	20.8	32.7	24.5
Sample Size	702	9,134	511

Notes. The Table presents descriptive statistics for control and treated municipalities in Cúcuta's metropolitan area in 1984. Descriptive statistics are estimated using all individuals age 12 or above. To estimate censored mean daily wage, I dropped wages for those with daily wage less than 1/8 of daily minimum wage and top-censored observations with daily wage above 3 times the interquartile range. Means are weighted by National Household Survey sample weights. Source. Author's calculations using data from the 1984 National Household Survey.

Table A4
EFFECT ON THE EMPLOYMENT RATE, CÚCUTA METROPOLITAN AREA
1984-1986

	Full sample		Kernel PSM	
Differences-in-Differences	5.294 ***	5.109 *	3.502 *	3.593 **
	(0.37)	(1.854)	(1.478)	(0.903)
Adj. R-squared	0.002	0.145	0.011	0.06
Number of Observations	17,680	17,680	15,953	15,953
Mean Control 1984	42.7		40.9	
Mean Treatment 1984	36.5		39.4	
Observable covariates		✓		✓
FE Municipality	✓	✓	✓	✓
FE Year	✓	✓	✓	✓

Notes. The Table shows the employment effect from the increase in the minim wage in Cúcuta's metropolitan area. The first panel presents results using the full sample while the second panel uses the Kernel PSM. Results are estimated using data from 1984 (EH-44) and 1986 (EH-52) waves of the National Household Survey. Observable covariates include age, sex and schooling. Kernel bandwidth used is 0.01. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses. *** Denotes significance at 1%, ** significance at 5% and * significance at 10%.

Table A5
WAGES AND EMPLOYMENT RATES FOR GROUPS, CÚCUTA METROPOLITAN AREA

Group	Treated group, 1984			Differences-in-Differences	
	Percent $46.17-$47.07	Mean Wage	Employm. Rate	Mean Wage	Employm. Rate
All	7.4	73.91	36.59	-11.27	3.41
		(3.90)	(1.95)	(17.46)	(2.87)
Male	6.3	78.10	54.48	-6.50	10.85
		(4.43)	(2.82)	(22.63)	(1.81)
Female	9.8	64.36	20.01	-16.97	-4.63
		(7.81)	(2.31)	(1.41)	(4.32)
Age 14-28	6.2	69.93	30.46	-14.82	9.66
		(4.53)	(2.61)	(22.18)	(3.24)
High School or higher	14.6	95.77	63.78	-27.21	14.39
		(12.07)	(7.42)	(7.70)	(5.00)
Non-HS degree	5.8	69.00	34.81	-9.19	2.63
		(3.84)	(2.00)	(22.64)	(2.10)

Notes. The Table shows wage and employment effects using the Kernel Propensity Score Matching. The differences-in-differences of mean wages represents the difference in percentage changes of hourly mean wages. Regressions include year and municipality fixed effects controlling for observable covariates. Estimates are weighted by the number of observations in the cell. Robust standard errors in parentheses.

*** Denotes significance at 1%, ** significance at 5% and * significance at 10%.