DOCUMENTOS DE TRABAJO

Cyclical wage premia in the informal labour market: Persistent and downwardly rigid

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Abstract

Using Colombian Household Survey (GEIH) data and Schmieder and von Wachter (2010) methodology, which builds upon Beaudry and DiNardo (1991) empirical approach, I found that informal workers obtain proportionally higher wage gains than formal workers when the labour market is tight. In turn, these wage premia are persistent in the informal sector, unlike the formal one. While these wage gains appear to increase around 20% the probability of layoffs when compared to the unconditional means across both sectors, the absolute increase for informal workers can be up to six-fold larger relative to their formal counterparts. The absence of regulation and employee benefits - such as written contracts, severance payments and social insurance-seems to have an amplifying effect on the informal workers' bargaining power during the most favourable periods of the labour market.

Resumen

Utilizando los datos de la Gran Encuesta Integrada de Hogares (GEIH) de Colombia y la metodología de Schmieder y von Wachter (2010), que amplía el enfoque empírico de Beaudry y DiNardo (1991), encuentro que los trabajadores informales obtienen ganancias salariales proporcionalmente mayores que los trabajadores formales cuando el mercado laboral es estrecho. A su vez, estas primas salariales son persistentes en el sector informal, a diferencia del formal. Aunque estas ganancias parecen aumentar la probabilidad de despido en torno al 20% cuando se compara con la media no condicionada en cada sector, el aumento absoluto para los trabajadores informales puede ser hasta seis veces mayor en relación con sus contrapartes formales. La ausencia de regulación y de beneficios laborales -como contratos escritos, indemnizaciones por despido y seguridad social- parece tener un efecto amplificador sobre el poder de negociación de los trabajadores informales durante los periodos más favorables del mercado laboral.

1 Introduction

In 1991, Beaudry and DiNardo proposed a statistical model that, driven by a theoretical approach of implicit contracts with risk-neutral entrepreneurs and risk-averse workers, allows them to show that wages are affected by labour market conditions in a manner consistent with a structure of downwardly rigid wage contracts. In this scenario, named by them as "Contracts with costless mobility," wages are negotiated at the beginning of the employment relationship. However, they are revised upward when market conditions are more favourable to prevent workers from accepting potential outside options. Their empirical methodology included the contemporaneous unemployment rate, the unemployment rate at the beginning of the employment relationship and the lowest unemployment rate since the beginning of the employment relationship as explanatory variables of workers' current wages. Their findings showed that the minimum unemployment rate outweighed the other two variables, with its coefficient being much larger and the only one significant once they were included simultaneously.

Subsequently, Schmieder and von Wachter (2010) extended this approach with two tests based on data from what they categorize as "displaced workers." Their first test assessed whether labour market conditions during an agent's prior job were related to her wage level once she changed employers. Their results revealed the non-persistence of wage gains related to past favourable labour market conditions, which they conclude would be expected if these wage premia were mainly explained by an increase in workers' re-bargaining power. Then, with a second test, they showed that experiencing more favourable labour market conditions increases workers' risk of being fired. This latter result reinforces their initial conclusion and, in turn, bolsters the theoretical framework of downwardly rigid wage contracts, given that in its absence, the downward adjustment of wages could limit the effect of workers' rent capture when economic conditions improve on the likelihood of being laid off.

In this paper, I leverage the Colombian Household Survey to examine the influence of market conditions on wages within distinct formal and informal labour sectors. Specifically, I seek to verify if the microdata aligns more closely with either of the analytical approaches proposed by Beaudry and DiNardo (1991). That is, whether the microdata is best explained by a standard spot market model where only current market conditions are related to wages, whether it is a contract approach with costly worker mobility that makes conditions at the beginning of the contract the most relevant, or whether, as shown for the U.S., contracts with workers having a low cost of mobility makes the most favourable labour market conditions since the beginning of the contract are the most relevant to explain wages. The empirical methodology I adopt follows the one laid out by Schmieder and von Wachter (2010). By doing so, I aim to provide a broader approximation to the original question posed by Beaudry and DiNardo (1991) by directly assessing how the potential wage gains associated with the higher bargaining power of workers compares among the formal and informal sectors. The adopted methodology also facilitates an analysis of the persistence characterizing these gains and a direct inquiry into the existence of downward wage rigidity in a deregulated market context such as informality.

Various studies have underscored the rise of informality in developing economies as a response to excessive labour market regulation and governmental constraints on enforcement (Barros and Corseuil (2004); Ulyssea (2010); Almeida and Carneiro (2012); Meghir et al. (2015); Rocha et al. (2018)). As noted by Ulyssea (2020), informality is a prominent feature of most developing economies; this sector encompasses between one-third and two-thirds of economic activity and 20-80% of the labour force in these economies. In the Colombian context, determining informality status based on parameters like partial or full firm-based payment of workers' social security indicates an informality rate exceeding 30%. When incorporating self-employment in this classification, the share of informality reaches 60%. In this sense, understanding the dynamics of the informal labour market is crucial. It can

provide fundamental elements for the guidance and execution of economic policies. In this paper, I utilize the analytical framework of Beaudry and DiNardo (1991) to understand phenomena such as the behaviour of wages in the informal sector over the business cycle and to make indirect approximations of the relationships between employers and workers in this large component of the economy. For instance, is the deregulation of this market equivalent to a total loss of bargaining power for workers? Or has the absence of legal contracts and a lower cost of mobility between employers an amplifying effect on workers' bargaining power during the most favourable periods of the labour market?

The results show that the Colombian labour market as a whole behaves in a manner consistent with the "Contracts with costless mobility" approach. Once workers are segmented into the informal and formal sectors, the results exhibit that the relevance of favourable market conditions in determining wages is more than double in the case of informal workers. Specifically, a drop of 1 percentage point in the minimum unemployment rate since the beginning of the labour relationship is associated with a wage increase of 1.6 percentage points in the formal sector, while this increase is 3.7 percentage points in the informal market. A potential explanation for this large and significant correlation between the most favourable labour market conditions and wages in the informal sector could be the absence of legal requirements such as prior notice and compensation for contract dissolution, and the non-loss of benefits such as severance payments and social benefits once the employment relationship ends, which could make the cost of mobility of informal workers lower than that of their counterparts in the formal sector. The closer approximation to costless mobility of informal workers could be working as an amplifier of their bargaining power during the most favourable periods of the market.

By applying the first test proposed by Schmieder and von Wachter (2010) to both markets separately, I found that in the formal sector, workers' current wages are not associated with labour market conditions during their previous job, which is consistent with findings for the

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U.S. data. In contrast, for informal workers, the lowest unemployment rate during their prior job continues to explain their wages in their current employment. To explore this empirical result further, I study two potential heterogeneous effects. Firstly, I found that this persistence is up to 70% higher when informal workers make job-to-job transitions. Interestingly, unlike the formal sector, in the absence of interaction with past labour market conditions, job-to-job transitions in the informal seem not to be directly associated with wage improvements. Second, I found that informal workers who leave their previous job when the minimum unemployment rate is in place have a premium of about 3 percentage points in their current wage. With more than half of the workers in the sample accomplishing job-to-job transitions, these findings show some effectiveness of informal workers in materializing their outside options. This apparent success could offer an answer for their higher re-bargaining power, a credible threat to their employers. Their relatively lower mobility costs remain a reasonable explanation for their significant cyclical wage gains.

Finally, I found that once workers obtain the wage gains associated with past labour market tightness, there is an increase in the probability of layoff in both markets. Specifically, in the formal sector, a one percentage point drop in the lowest unemployment rate experienced since the start of their job is associated with a 17 basis points rise in the probability of dismissal. In the case of the informal sector, this increase is around one percentage point. When compared to the unconditional means, the effect on the probability of being laid off is an increase of around 20% in both sectors.

The findings of this paper could contribute to two complementary discussions in the literature. First, and from an empirical perspective, this paper enriches the pioneering effort of Kaur (2019) to study wage rigidity directly in the informal sector. Using rainfall in 600 villages in India as an exogenous variation to measure demand shocks, they found that transitory positive shocks increase the wage levels of agricultural workers. Nevertheless, this increase does not reverse when the shock is dissipated. To the best of my knowledge, the

present research is the first to provide empirical evidence of wage rigidities in the informal sector at a more comprehensive level, including multiple economic activities and considering urban and rural markets. Macroeconomic modelling of the informal labour market may also benefit from these results. Primarily, these models have abstracted from incorporating specific rigidities in determining wages in the informal sector by imposing a flexible Nash-bargaining wage setting structure with deteriorated workers' bargaining power (Ulyssea (2010);Alberola and Urrutia (2020)) or limiting it to be a self-employment sector (Alberola and Urrutia (2020)). The results found here could provide empirical evidence for incorporating rigidities to the wage settings in the informal sector and bargaining powers that move over the business cycle. Thus, potentially expand the ability of these models to replicate stylized facts on the data, such as the high volatility of this type of employment (Shimer (2005); Kennan (2010); Fernandez and Meza (2015)).

The paper is organized as follows. Section 2 describes the monthly repeated cross-sectional data from the Colombian Household Survey. In Section 3, I present the empirical strategy, discussing the details of the original proposal by Beaudry and DiNardo (1991) and the scope of the extension formulated by Schmieder and von Wachter (2010). In Section 4, I present and analyze the results. Finally, in Section 5, I summarize the results and conclude.

2 Data

2.1 Household Survey of Colombia

The primary data source for my analysis is the Household Survey of Colombia, known as the Gran Encuesta Integrada de Hogares (GEIH). This nationwide survey serves as the main reference for characterizing the labour market and measuring household incomes in Colombia since 2006. The GEIH provides a comprehensive set of repeated monthly cross-sectional data, which allows for the construction of representative statistics at the national level with

Table 1: Descriptive Statistics: Population regions of analysis

Total population	50407648
7 Major cities population	18874044
	[0.374]
13 Major cities population	23241000
	[0.461]
23 Major cities population	26284548
	[0.521]
Urban (no major cities) population	13401025
	[0.266]
Rural population	10722074
	[0.213]

Note: This table reports the total population of Colombia and a breakdown by those residing in the 7, 13 and 23 major cities. It also shows the number of inhabitants of smaller urban and rural areas. The proportion of the national population residing in these analyzed regions is indicated within brackets. Population data is sourced from the National Department of Statistics (DANE) at the municipality level for 2020, with metropolitan areas aligning with those included in the GEIH sample.

urban and rural differentiation, as well as for each of the 13 largest metropolitan areas and 11 midsize cities in the country. For the primary empirical results, I limit geographical disaggregation to the largest metropolitan areas, representing almost 50% of the country's total population. The remaining observations are grouped as either "other urban areas" or rural, resulting in a total of 15 regions of study. Table 1 displays the distribution of Colombia's total population across different regions. Specifically, it presents the number of individuals and the proportion of the national population residing in the country's 7, 13, and 23 largest cities and the corresponding percentages for smaller urban areas and rural zones.

The GEIH provides sufficient information dating back to 2007 for an exhaustive characterization of the overall labour market, encompassing both formal and informal sectors. The baseline analysis hinges on data collected from July 2017 to December 2019. This timeframe was deliberately chosen due to the National Administrative Department of Statistics (DANE) incorporating the inquiry into respondents' primary reasons for the termination of their preceding employment, a pivotal element for implementing the econometric strategy

Table 2: Descriptive Statistics: Type of employment, filtered sample and formality measures

	2009m1-2019m12	2017m7-2019m12
A. Distribution by type of employment		
Self employment	0.430	0.430
Wage earner	0.479	0.490
Business owner	0.044	0.039
B. Filtered sample		
Number of individuals		
	260643	75456
Alternative Measures of Formality		
Written contract	0.767	0.799
Written contract and health	0.742	0.780
Written contract and pension	0.734	0.775
Written contract, health and pension	0.730	0.772
DANE	0.685	0.707

Note: Section A of this table reports the proportion of the sample observations classified as self-employed, wage earners and business owners. Section B restricts the sample to individuals in the primary analysis. Wage earners in the private sector that are between 23 and 65 years old and have at least one year of tenure in their previous and current jobs. The first row of this section presents the number of individuals in this filtered sample. The second part of this section displays the proportion of individuals classified as formal according to the five criteria described in the main text. The statistics in Column 1 correspond to an extended sample of the GEIH that started in 2009 and ended in 2019. Column 2 shows the statistics for the sample of primary interest in this paper, with observations between July 2017 and December 2019.

proposed in this paper. Notably, this specific period predates the onset of the pandemic, during which data collection and questionnaires underwent alterations to align with public health policies established by the government. For completeness, in this section, descriptive statistics are presented for the primary dataset and an extended sample from January 2009 onwards.

Table 2, Section A, shows the distribution of the employed population in Colombia grouped into three main categories: wage earners, self-employed workers, and business owners. This research focuses on full-time workers in the private sector who earn wages, are aged between 23 and 65 years, and have tenures of at least one year at their current and prior jobs. As shown in Table 2, around 75.4 thousand workers meet these conditions for

the period of analysis.

In the empirical section of this paper, my objective is to replicate and expand upon the approach of Schmieder and von Wachter (2010) to examine the existence of wage premia due to past favourable labour market conditions and their degree of persistence and rigidity in the Colombian informal employment sector. Simultaneously, I conducted a comparative analysis with the formal sector to unravel insightful contrasts. The lower panel of Table 2 displays the fraction of workers in my filtered sample considered formal under five criteria: 1. having a written contract, 2. having a written contract with the employer partially or fully covering health insurance, 3. having a written contract with the employer partially or fully contributing to the worker's retirement fund, 4. having a written contract with the employer partially or fully covering both health insurance and pension contributions and finally, 5. considering DANE's definition, which deems a wage earner informal if employed by a company with fewer than ten workers. All five criteria are consistent in classifying between 20% and 30% of workers as informal. For this study's scope, the informal labour market analysis is conducted by using the fourth criterion, *written contract, health and pension*, which considers the broadest spectrum of social security coverage for workers.

My baseline sample is comprised of 58.3 thousand formal workers and 17.2 thousand informal workers. The richness of the GEIH allows for a thorough sociodemographic characterization of the individuals under study. Table 3 includes the mean and standard deviation of variables typically included in the literature for explaining wages, disaggregated by workers' formality status. Of particular note is the observation that the average worker does not significantly differ between sectors in terms of age, marital status, or the likelihood of being female. However, a disparity emerges when looking at their level of education, with formal workers having an average of 3.5 more years of education than informal ones. The fraction of formal workers with higher education is nearly 20%, in stark contrast to a modest 4% among informal workers. Panel (c) of Figure 1 provides a comprehensive illustration of the

Table 3: Descriptive Statistics: Demographics

|	2009m1-2019m12		2017m7-2019m12	
	Formal	Informal	Formal	Informal
Number of Individuals				
	190147	70496	58272	17184
Demographics				
Age	35.295	36.042	36.351	36.992
	(7.931)	(8.297)	(8.162)	(8.532)
Schooling	12.003	8.251	12.106	8.664
	(3.499)	(3.943)	(3.436)	(3.858)
Female (=1)	0.412	0.393	0.422	0.401
Married (=1)	0.575	0.574	0.582	0.577
Household head (=1)	0.503	0.556	0.510	0.559
Student (=1)	0.102	0.034	0.084	0.024
Bachelor degree (Schooling>=16)	0.198	0.036	0.207	0.040
13 Major cities (=1)	0.732	0.486	0.720	0.484
Rural (=1)	0.068	0.247	0.074	0.234

Note: The top of the table displays the number of observations after dividing the sample into formal and informal workers. The demographic variables' means and standard deviations are shown throughout the rest of the table (in parentheses for non-categorical variables). The statistics in Column 1 correspond to an extended sample of the GEIH that started in 2009 and ended in 2019. Column 2 shows the statistics for the sample of primary interest in this paper, containing observations between July 2017 and December 2019.

distribution of worker's years of schooling. This pattern is consistent with formal workers highly concentrated in the country's urban areas.

As the primary source of information for monitoring the labour market in Colombia, the GEIH offers an extensive set of features and analytical dimensions for the characterization of workers' labour relations. As the focus of this paper, I consider the most recurrent ones within the branch of literature grounded in Mincerian equations (Lemieux (2006)). To begin, Table 4 shows that informal workers, on average, report working 3 hours more than their formal counterparts. This description is further clarified in Panel (b) of Figure 1, illustrating that individuals generally report working the legally mandated hours of 40 or 48 per week. Nevertheless, there is a primary concentration of formal workers at the second threshold and a substantial mass of informal workers reporting more than 48 hours of work per week.

Figure 1: Descriptive Statistics: Distributions non-categorical variables
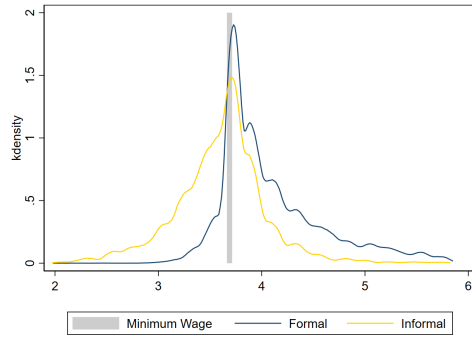
(a) Log hourly real wage
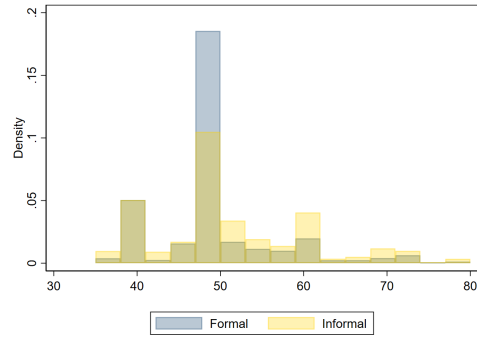
(b) Work hours at current job
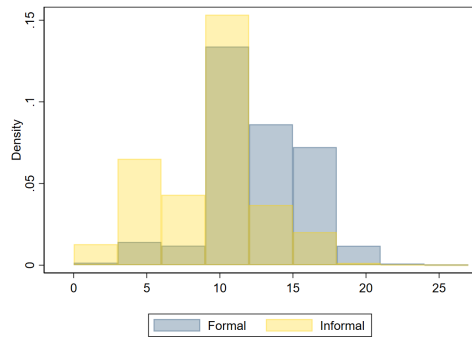
(c) Schooling
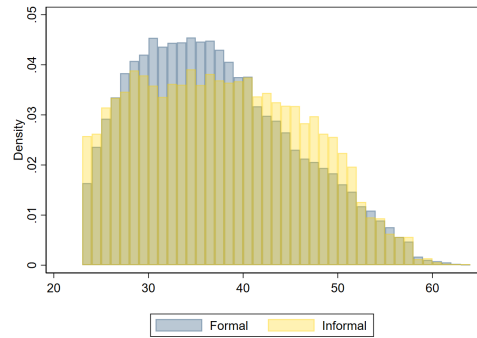
(d) Age
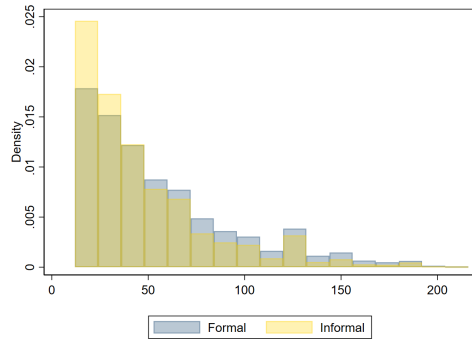
(e) Current job tenure
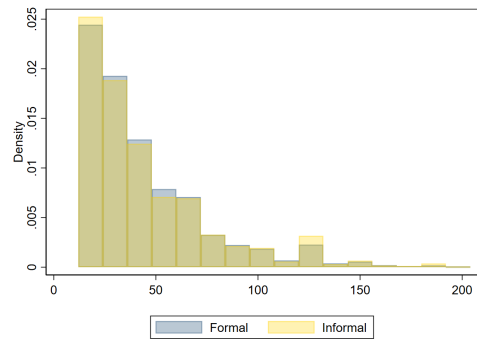
(f) Previous job tenure

Note: This figure displays the distributions of the most relevant continuous variables that were used to implement the empirical strategy. The data used in the figure corresponds to the primary sample, wage earners' observations from July 2017 to December 2019. In each panel, the distribution of the variable of interest is presented in blue for formal workers and yellow for informal workers. Panel (a) presents the workers' log of real hourly wage distribution. The gray band corresponds to the range in which the minimum hourly wage was established in Colombia during the analysis period. Panels (b), (c), (d), (e) and (f) show the distribution of the variables: hours worked in the current job, schooling, age, tenure at the current job, and tenure at the previous job, respectively.

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Unfolding these insights, it becomes apparent that informal workers possess a more extensive potential experience (calculated as age minus years of education minus six). This observation can be traced back to two distinct strands: the fewer years of education among informal workers, which could imply an earlier entry into the labour market, and their reduced coverage of social security, which compels them to remain active for more years than formal workers. The distribution of years of schooling and age presented in Panels (c) and (d) of Figure 1, respectively, support these two factors as possible explanations. As evident from Table 4, unionization is quite limited in Colombia, across both sectors, with only 3% of formal workers reporting a union at their workplace. Regarding the size of employers, as expected, informal workers are concentrated in small firms, with over 80% of them reporting to work in firms with less than 10 individuals. In contrast, almost 60% of formal workers responded that they were part of firms with more than 100 workers.

The survey data offers valuable information about the work histories of those currently employed, including their previous jobs and the exact tenure in each position. In Figure 2, I illustrated the specific dates provided by respondents. In particular, the survey poses three key questions to presently employed individuals: "How long have you been working at your current job," "How long were you unemployed between your current job and your previous job?" and "How long did you work on your previous job?." These responses, which are recorded in months, enable me to link each person to the relevant labour market conditions for each job spell, a pivotal aspect of this paper's empirical approach.

The third panel in Section A of Table 4 presents the descriptive statistics for these job spells. An intriguing initial observation lies in the unexpectedly lengthier average duration of current employment compared to previous jobs, given the inherent right censored data for the former[1]. Some differences in the length of unemployment spells between formal and informal workers can be observed. Formal workers exhibit shorter periods of job search,

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[1]Appendix A.2.1 presents a short discussion on this result

Table 4: Descriptive Statistics: Labor-related variables

	2009m1-2019m12		2017m7-2019m12	
	Formal	Informal	Formal	Informal
A. Labor Variables				
Work hours per week at current job	50.568	53.860	49.664	52.504
	(9.833)	(12.518)	(8.528)	(11.489)
Potential work experience (years)	17.292	21.791	18.245	22.327
	(9.133)	(9.645)	(9.271)	(9.792)
Union at current job (=1)	0.028	0.009	0.026	0.007
Firm Size				
Number of workers == 1	0.008	0.138	0.010	0.121
1 < Number of workers <= 5	0.064	0.512	0.066	0.539
5 < Number of workers <= 10	0.065	0.156	0.070	0.163
10 < Number of workers <= 100	0.267	0.145	0.267	0.140
100 < Number of workers	0.595	0.049	0.587	0.037
Employment History				
Current job tenure (months)	44.763	37.724	50.910	42.244
	(31.892)	(27.979)	(38.116)	(33.583)
Previous job tenure (months)	35.740	35.944	38.899	40.269
	(26.023)	(26.719)	(30.069)	(32.442)
Unemployment spell (months)	3.169	3.749	3.343	4.031
	(7.787)	(9.815)	(8.468)	(11.311)
Job-to-job transition unemployment spell = 0 month	0.538	0.538	0.531	0.549
B. Dependent Variables				
Log hourly real wage	4.050	3.531	4.081	3.606
	(0.530)	(0.480)	(0.507)	(0.440)
Layoff or fired at previous job	0.051	0.064	0.051	0.064
Resignation at previous job	0.439	0.401	0.439	0.401
Want to change job (=1)	0.191	0.305	0.150	0.252

Note: This table reports the descriptive statistics of the labour-related variables relevant to implementing the empirical strategy. The sample means, and standard deviations (in parentheses for non-categorical variables) are presented separately for both formal and informal workers. The statistics in Column 1 correspond to an extended sample of the GEIH that started in 2009 and ended in 2019. Column 2 shows the statistics for the sample of primary interest in this paper, with observations between July 2017 and December 2019.

Figure 2: Data description: Timeline worker's employment history
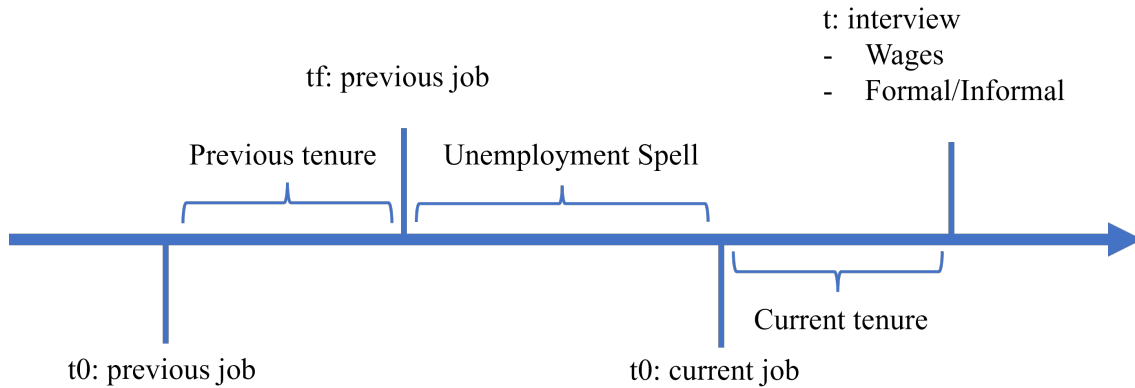
Note: This figure shows a timeline illustrating workers' employment history in Colombia based on the questions asked in the Colombian Household Survey (GEIH). The relevant questions are the following: "How long have you been working at your current job," "How long were you unemployed between your current job and your previous job?" and "How long did you work at your previous job?." The answers to these questions are recorded in months.

underscoring a possible reluctance among workers to accept informal sector positions, which, in turn, might protract their pursuit of a formal position. Regarding the fraction of workers who make job-to-job transitions, i.e. who report unemployment spells of 0 months, in both market segments, it corresponds to slightly more than half.

In section B of Table 4, four potential variables are outlined for analysis within the empirical framework proposed in this study. The contrast in average real hourly wages between formal and informal workers is observed at the forefront. Notably, formal workers consistently exhibit a wage premium hovering around 13%. The complete distribution of wages is presented in Panel (a) of Figure 1. This figure representation shows a clustering of wages within both, the formal and informal sectors, around the legal minimum wage. While this phenomenon is expected in the former due to regulatory compliance, it is intriguing that informal wages also cluster around this minimum wage. However, the mass of workers in this sector below this legal threshold is not negligible. At the end of Table 4, I show that the likelihood of facing dismissal is higher among informal workers. Meanwhile, resignation seems more prevalent in the formal sector. Notably, the percentage of workers seeking a change in

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employment within the informal sector surpasses that of formal workers by approximately ten percentage points.

I conclude this data description section by presenting in table 5 the leading ten economic activities encompassing formal and informal wage earners in each market segment. In the formal sector, activities that typically fall under stricter regulations, such as the healthcare sector, along with traditionally education-intensive professions like lawyers and accountants grouped under "Other business activities," are at the top of the table. As for the informal sector, the agricultural sector accounts for nearly 20% of workers. Once we consider the retail trade, hotels and restaurants, and domestic service sectors, they encompass over 60% of informality. Interestingly, the retail sector is distinctive, being relevant in both labour market segments.

2.2 Unemployment Rates

The empirical strategy employed in this paper is grounded in accurately representing the labour market conditions each worker faces during their current and prior employment. Both Beaudry and DiNardo (1991), as well as Schmieder and von Wachter (2010), approximated these conditions using observed unemployment rates during these tenures. While the former used nationally aggregated rates, the latter gathered state-level data for the United States, arguing that these could better proxy for local market dynamics workers face. Following this rationale, my paper seeks to assign to each worker the rates most relevant for describing their local labour markets.

The first consolidated quarterly unemployment series available for the Colombian market started in 1990. From this year until 2000, the Colombian National Department of Statistics (DANE) collected data and constructed labour market statistics for the seven main cities of the country. Only in 2001 did DANE extend data representativeness, providing quarterly disaggregated unemployment rates for the thirteen main metropolitan areas alongside a rate

Table 5: Descriptive Statistics: Share Economic Activity

	2017m7-2019m12
Formal	
Retail trade	0.113
Health and social work	0.086
Other business activities	0.071
Manufacture of food products and beverages	0.052
Construction	0.048
Agriculture, hunting and related service activities	0.044
Real estate activities	0.048
Land transport; transport via pipelines	0.045
Wholesale trade and commission trades	0.046
Hotels and restaurants	0.039
Informal	
Agriculture, hunting and related service activities	0.190
Retail trade	0.161
Hotels and restaurants	0.123
Domestic staff	0.127
Construction	0.066
Manufacture of food products and beverages	0.042
Sale, maintenance and repair of motors; retail sale of fuel	0.032
Land transport; transport via pipelines	0.035
Manufacture of wearing apparel; dressing and dyeing of fur	0.025
Manufacture of furniture; manufacturing n.e.c.	0.019

Note: This table shows the ten economic activities with the highest fraction of wage earners in the formal and informal sectors. The economic activities are based on the two-digit disaggregation of ISIC Rev. 3. These shares are calculated based on this paper's primary sample corresponding to July 2017-December 2019.

for urban and rural zones. In a subsequent and more recent effort to delineate local markets in Colombia, the DANE included an additional ten midsize areas. As mentioned before, this paper will focus on the group of fifteen regions composed of thirteen metropolitan areas, other urban zones, and rural areas. This approach maximizes geographical granularity while considering the long enough time series for unemployment rates. Concerning the latter, workers interviewed in July 2017 will possess past unemployment rate time series spanning up to 16 years.

For the primary set of empirical exercises, deseasonalized quarterly series are used. This seasonal adjustment facilitates the identification of general conditions impacting workers' labour market. The adjustment involves extracting residuals from a regression of the unemployment time series on fixed effects for each quarter of the year [2]. In Figure 3, I present the dynamics of these residuals for the 15 regions of interest along with the national unemployment rate. The series runs from the first quarter of 2001 to the fourth quarter of 2019. In Panel (a), it is possible to observe the series corresponding to the urban areas and the one corresponding to the rural areas. The other panels, (b), (c), (d), (e), and (f), show the market dynamics of the 13 major metropolitan areas. In all cases, the disaggregation of the labour market into these geographic units provides higher variability and potentially offers a better understanding of local market dynamics.

3 Empirical Strategy

Beaudry and DiNardo (1991) address the question of whether "wages are affected by market conditions in a manner more consistent with a contract-based approach or a standard spot market model." They test two implicit contract-based market structures in their analysis. First, they explore the "Contracts with costly mobility" scenario, where workers cannot easily switch between firms, which implies that wages are primarily linked to market conditions at the time of hiring. Second, they introduce the "Contracts with costless mobility" situation. In this case, contract adjustments prevent workers from leaving for better opportunities elsewhere when economic conditions improve, tying wages to the most favourable market conditions during employment relationships. Beyond contract theory, they bring down a standard spot market that would predict that only current conditions relate to wages. Schmieder and von Wachter (2010) expand on this statistical model by implementing

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[2]See Figure 5 in Appendix A.1.2 as an example of this procedure applied to the national unemployment time series.

Figure 3: Unemployment Rates by Regions

(a)

(b)

(c)

(d)

(e)

(f)

Note: This figure displays the quarterly time series of unemployment rates for different regions in Colombia from the first quarter of 2001 until the fourth quarter of 2019. The series are seasonally adjusted residuals obtained by regressing the unemployment rates (in percentages) on fixed effects for each quarter. Each panel shows a subset of the 15 regions of study. For instance, Panel (b) displays the unemployment dynamics for Colombia's three major metropolitan areas. The national unemployment rate series is included in all panels.

a "three-step" process. They begin by replicating Beaudry and DiNardo (1991)'s original approach and then incorporate two additional tests to explore wage persistence and downward rigidity.

In the first step -and based on the empirical strategy of Beaudry and DiNardo (1991)- they propose to estimate the following equation:

$$ln(w_{i,r,t}) = U_{r,t}\beta_1 + U_{r,t_0}\beta_2 + \min_{h:t_0,\dots,t}\{U_{r,h}\}\beta_3 + X_i\Omega + \text{FE} + \epsilon_{i,r,t} \tag{1}$$

Where $w_{i,r,t}$ is the real hourly wage of individual i who is located in the region r in month t, $U_{r,t}$ is the current unemployment rate[3], U_{r,t_0} is the unemployment at the start of the current job spell, and $\min_{h:t_0,\dots,t}\{U_{r,h}\}$ is the lowest unemployment rate since the start of the job. The vector of controls X_i encompasses schooling (quadratic polynomial), experience (quartic polynomial), dummies for female, marriage, union status, rural, household head, industry, occupation, firm size, current job tenure, prior job tenure, unemployment spell[4], and the main reason for leaving the prior job (e.g. firm closed, resignation, or layoff). The model includes a set of fixed effects for the survey's year and state. Schmieder and von Wachter (2010) argue that obtaining $\beta_1 = 0$, $\beta_2 = 0$, and $\beta_3 < 0$ in this first regression implies a labour market with partially-enforceable contracts, where workers can re-bargain during periods of higher tightness of the labour market and as a result, they obtain wage premia. More broadly, the empirical specification, based on Equation 1, enables the differentiation of three distinct labour market models:

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[3]Since I am using quarterly region-level unemployment rates, there exists a mismatch between the survey frequency and the proxy for labour market conditions. This discrepancy has been common in the studies that guide this empirical strategy. However, this paper makes an additional effort to represent market conditions with a higher frequency while controlled by the expected seasonality of the unemployment rate time series.

[4]Details about tenures and unemployment spell categories are provided in Appendix A.1.1

$$\text{Labor market model} \begin{cases} \beta_1 < 0, \ \beta_2 = 0, \text{ and } \beta_3 = 0: \text{Spot market} \\ \beta_1 = 0, \ \beta_2 < 0, \text{ and } \beta_3 = 0: \text{Contracts with costly mobility} \\ \beta_1 = 0, \ \beta_2 = 0, \text{ and } \beta_3 < 0: \text{Contracts with costless mobility} \end{cases}$$

In the second step of their methodology, Schmieder and von Wachter (2010) tackle the question: "Do wage premiums associated with past tight market conditions disappear if the employment relationship ends?" Conditional in obtaining a market structure more consistent with "Contracts with costless mobility," they introduce an initial test designed to eliminate alternative causes for these wage premia. By estimating the following equation,

$$\begin{aligned} ln(w_{i,r,t}) = U_{r,t}\beta_1 + U_{r,t_0}\beta_2 + \min_{h:t_0,\dots,t} \{U_{r,h}\}\beta_3 \\ + U_{r,t_{fp}}\alpha_1 + U_{r,t_{0p}}\alpha_2 + \min_{h:t_{0p},\dots,t_{fp}} \{U_{r,h}\}\alpha_3 \\ + X_i\Omega + FE + \epsilon_{i,r,t} \end{aligned} \quad (2)$$

where $w_{i,r,t}$ is the hourly real wage at the current job of individual i who is located in the region r in month t, and t_{0p} and t_{fp} indicates the initial and final period of worker's prior job, respectively. They evaluate that factors beyond workers' re-bargaining power, which implies a larger share of the job-specific rents, are accounted for. For instance, they try to rule out that these wage premia are associated with accelerated human capital accumulation during periods of labour market tightness, a result consistent with Gibbons and Waldman (2006) theoretical approach, which would imply some persistency ($\alpha_3 \neq 0$). The equation 2 was slightly modified to include all the proxies for labour market conditions during the current job instead of only the contemporaneous unemployment rate as posed in their original approach. This modification responds to the fact that the Colombian Household Survey

collects information about contemporaneous wages and not those corresponding to the beginning of the current employment relationships. Therefore, it is necessary to consider these additional relationships between wages and labour market dynamics studied in the first step of the empirical strategy.

Lastly, their approach allows testing the presence of wage rigidities through a second test that shows whether the attainment of these wage premia is associated with an increase in the probability of being laid off or fired by the firm. In equation (3), where $P(JobLoss_{i,r,t-4q,t})$ is the probability of job loss of individual i during the last year (4 quarters ago and t). Obtaining $\gamma_3 < 0$ would indicate that wage gains -reflecting a raise on a worker's share of rents associated with favourable labour market conditions- contribute to an increase in the probability of layoffs or dismissals.

$$P(JobLoss_{i,r,t-4q:t}) = U_{r,t-4q}\gamma_1 + U_{r,t_0}\gamma_2 + \min_{t_0,...,t-4q}\{U_{r,h}\}\gamma_3 + X_i\Omega + FE + \epsilon_{i,r,t} \qquad (3)$$

Figure 4 illustrates the sample construction underpinning the empirical model proposed in Equation 3. It is crucial to highlight that information about the prior job spell is only available for currently employed individuals. The zeros in this regression denote individuals who are presently employed and whose start date for their current job is before t-4q (one year prior). Conversely, the ones represent currently employed individuals who reported termination from their previous job within the last year and had a start date before t-4q. The initial period for each individual job spell corresponds to their current or prior job, depending on the group to which they are assigned.

The results from Schmieder and von Wachter (2010) suggest that market conditions interact with wages in a framework akin to partially-enforceable contracts. Their tests outlined in steps two and three also provide evidence that wage gains associated with favourable past

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Figure 4: Ones and Zeros for Schmieder and von Wachter (2010)'s Test 2 (Equation 3)
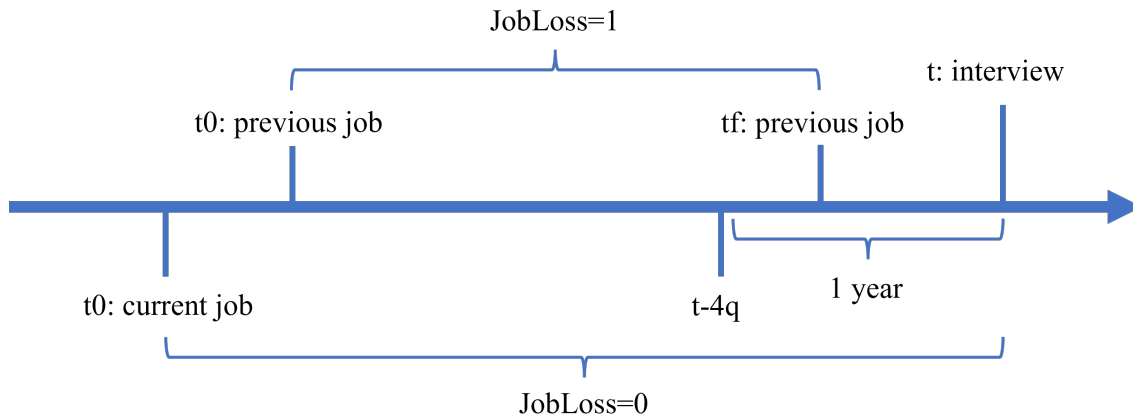
Note: This figure illustrates the procedure for constructing the sample to estimate equation 3. Due to the lack of information about the main reason for the termination of workers' previous employment relationship before July 2017, the same timeframe as the primary analysis was used for this case. The dependent variable in this regression is a dummy (JobLoss) that takes the value of 0 (Zeros) if the currently employed individuals started their job before the reference period, in this case, t minus four quarters (t-4q). Workers for whom JobLoss is equal to 1 (Ones) correspond to those who started their previous job before the reference period and were laid off during the subsequent year. All workers in the sample were required to have tenures of at least one year by t-4q.

labour market conditions are mainly explained by augmented re-bargaining power that allows workers to capture a larger share of job-specific rents. In particular, that conclusion seems consistent with these gains vanishing once an employee loses their job and initiates a new employment relationship. Furthermore, their findings suggest that these wage gains are associated with an increased probability of job loss compared to individuals who do not benefit from these favourable market conditions. This last result indicates some downward wage rigidity. Specifically, when the firm´s outside option worsens, wages are not adjusted but lead to layoffs.

My objective encompasses estimations of equations 1, 2, and 3 for individuals working in the formal and informal markets. Comparing the magnitudes and significance of coefficients between the two markets will enable a characterization of the type of market each represents and assess the need for a new theoretical framework to explain these potential differences.

4   Results and Discussion

As a starting point, Table 6, columns (1)-(4), presents the results of replicating the statistical model proposed by Beaudry and DiNardo (1991), using the complete sample that combines both formal and informal workers in a single dataset. This analysis follows Equation 1. The coefficients of the labour market conditions variables, contemporaneous unemployment, unemployment at the beginning of the current job, and minimum unemployment during current job tenure, display negative and statistically significant coefficients when they are included separately, congruent with Beaudry and DiNardo (1991)'s theoretical framework. Moreover, upon simultaneous inclusion of all three variables, the coefficient corresponding to the minimum level of unemployment is the only one that remains significant, and its magnitude notably surpasses that of the other two variables. This result suggests that when analyzing the labour market as a whole, the contract model with costless mobility fits the data better.

With a baseline replicating the findings of Beaudry and DiNardo (1991), I advance into estimating Equation 1 while disaggregating the workers' sample into formal and informal sectors. Results are presented in table 6, columns (5) and (6), respectively. The controls included in this estimation remain consistent with the methodology outlined, and the unemployment rate time series used to proxy labour market conditions are common to formal and informal workers. The first noteworthy result underscores the ability of the model of "Contracts with costless mobility" to explain the dynamics of the informal labour market. While both market segments exhibit the pattern of the lowest unemployment rate being negatively correlated to wages, the corresponding coefficient exceeds twofold for informal workers relative to their formal counterparts. Specifically, a drop of 1 percentage point in the minimum unemployment rate since the beginning of the labour relationship is associated with a wage increase of 1.6 percentage points in the formal sector. This increase is 3.7 per-

Table 6: Equation 1 estimation: Replication of Beaudry and DiNardo (1991) -Colombian labour market-

	Full Sample				Formal	Informal
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous unemployment, β_1	-0.0080			-0.0009	0.0020	-0.0070
	(0.0033)**			(0.0036)	(0.0022)	(0.0095)
Unemployment at t0 of current job, β_2		-0.0042		0.0014	0.0006	0.0013
		(0.0010)***		(0.0015)	(0.0009)	(0.0038)
Min unemployment during current job, β_3			-0.0234	-0.0238	-0.0161	-0.0367
			(0.0040)***	(0.0039)***	(0.0030)***	(0.0129)***
Constant	3.5912	3.5990	3.5226	3.5223	3.7441	3.2977
	(0.0261)***	(0.0242)***	(0.0331)***	(0.0327)***	(0.0400)***	(0.0617)***
Observations	75,454	75,454	75,454	75,454	58,271	17,177
R-squared	0.5801	0.5800	0.5808	0.5808	0.5635	0.3687
Controls	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

centage points in the informal market[56]. A potential explanation for this result that complies with Beaudry and DiNardo (1991)'s framework is that the mobility cost for workers varies between the two markets. For the informal workers, the absence of regulatory costs, such as advance notice of contract termination and the limited loss of benefits -such as severance payment or compensation of social security- appears to have an amplifying effect on workers' bargaining power during the most favourable periods of the labour market. The variation in bargaining power between the formal and informal labour market segments could be further exacerbated by the possibility that formal workers are concerned about transitioning to the informal sector, which might diminish their motivation to engage in wage renegotiations and worsen their bargaining position (Robayo (2015)).

Table 7, columns (1)-(3), displays the results of estimating Equation 2 for the entire sample as well as separately for formal and informal workers. The results for formal workers align with the findings of Schmieder and von Wachter (2010), which indicate that the lowest unemployment rate observed during a worker's prior job tenure does not seem to be related to the current wage level. This indirect test suggests the disappearance of the wage premia, discussed in the first step of the methodology, once a job is terminated. The fact that this pattern found in the U.S. labour market is replicated exclusively in the formal segment of the Colombian one seems reasonable. According to Schmieder and von Wachter (2010), this finding is anticipated if one considers that these wage gains are the result of temporary rents associated with the increased re-bargaining power of workers during more favourable labour market periods and rules out that cyclical improvements in human capital accumulation can explain the relationship between the minimum unemployment rate and wages.

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[5]In the appendix B.1, I show that the estimated coefficient resulting from including the interaction of the minimum unemployment rate and formality status is statistically significant when equation 1 is run on the entire sample. The same exercise is replicated and presented in this appendix for the other two steps of the empirical strategy.

[6]In the appendix B.3, I show that this result is not driven by the fact that the informal sector is mainly composed of small firms.

Table 7: Equation 2 estimation: Schmieder and von Wachter (2010)'s Test 1 -Formal and Informal-

	(1) Full Sample	(2) Formal	(3) Informal	(4) Formal	(5) Informal	(6) Formal	(7) Informal
Contemporaneous unemployment, β_1	-0.0010	0.0021	-0.0079	0.0020	-0.0083	0.0020	-0.0073
	(0.0036)	(0.0022)	(0.0094)	(0.0021)	(0.0095)	(0.0022)	(0.0091)
Unemployment at t0 of current job, β_2	0.0020	0.0011	0.0035	0.0031	0.0053	0.0012	0.0029
	(0.0019)	(0.0035)	(0.0069)	(0.0035)	(0.0074)	(0.0034)	(0.0067)
Min unemployment during current job, β_3	-0.0228	-0.0162	-0.0313	-0.0159	-0.0307	-0.0165	-0.0321
	(0.0036)***	(0.0029)***	(0.0123)**	(0.0029)***	(0.0125)**	(0.0028)***	(0.0120)**
Unemployment at tf of previous job, α_1	0.0010	-0.0009	0.0039	-0.0028	0.0022	-0.0023	0.0080
	(0.0028)	(0.0040)	(0.0062)	(0.0042)	(0.0067)	(0.0035)	(0.0058)
Unemployment at t0 of previous job, α_2	0.0009	0.0004	0.0022	0.0005	0.0021	0.0004	0.0008
	(0.0006)	(0.0006)	(0.0026)	(0.0006)	(0.0026)	(0.0007)	(0.0026)
Min unemployment during previous job, α_3	-0.0042	0.0007	-0.0172	0.0052	-0.0128	0.0001	-0.0210
	(0.0019)**	(0.0021)	(0.0054)***	(0.0033)	(0.0053)**	(0.0030)	(0.0058)***
Job-to-job transition				0.0754	0.0466		
				(0.0332)**	(0.0556)		
Min unemployment during previous job * job-to-job transition				-0.0082	-0.0088		
				(0.0032)**	(0.0038)**		
tf <= 1 quarter after t min unemployment						0.0056	0.0321
						(0.0091)	(0.0135)**
Min unemployment during previous job * tf <= 1 quarter after t min unemployment						0.0033	0.0041
						(0.0027)	(0.0054)
Constant	3.5171	3.7456	3.2796	3.6762	3.2363	3.7417	3.2640
	(0.0330)***	(0.0407)***	(0.0595)***	(0.0444)***	(0.0829)***	(0.0435)***	(0.0615)***
Observations	75,454	58,271	17,177	58,271	17,177	58,271	17,177
R-squared	0.5808	0.5635	0.3692	0.5636	0.3693	0.5635	0.3695
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

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Conversely, in the informal sector, these favourable labour market conditions during a worker's prior job tenure indeed exert an influence on their current wage. To explore this persistence further, I study two potential heterogeneous effects. First, in columns (4) and (5) of Table 7, I show this persistence is accentuated for those individuals who experienced job-to-job transitions. Specifically, a one percentage point drop in the lowest unemployment rate during an informal worker's prior employment relationship is associated with a contemporaneous wage of 2.2 percentage points higher. This correlation is 70% higher than the one in the base group, estimated at 1.3 percentage points. It is also worth noting that, unlike informal workers, the formal ones have a wage premium of about 7.5 percentage points on average when making job-to-job transitions. The results of the second heterogeneous effect I evaluated are presented in columns (6) and (7). These show that informal workers who leave their prior job when the minimum unemployment rate is in place have a premium of about 3 percentage points in their current wage. This result suggests some effectiveness of informal workers in materializing their outside options and, therefore, offers an answer for their higher re-bargaining power during favourable labour market conditions.

Table 8 shows that wage gains associated with favourable labour market conditions seem primarily confined to a larger capture of rents by employees when outside options emerge. This observation consistently aligns with a higher risk of job loss for workers who experienced potential re-bargaining opportunities compared to those who did not. Precisely, by estimating equation 3, I found a one percentage point reduction in the minimum unemployment rate during the job spell corresponds to an increase of 17 basic points in the probability of being laid off for formal workers and roughly one percentage point increase for informal workers. Notably, the increased probability of being fired is more accentuated in the informal sector, consistent with an apparently higher capacity of informal workers to capture the rents during favourable labour market conditions. This outcome introduces an additional element to the potential theoretical framework rationalizing the empirical results: wage rigidity in both

markets [7]. This contribution enhances the literature by shedding light on the presence of wage rigidity within the framework of a deregulated labour market. These findings support the conclusions of Kaur (2019) and expand the scope of analysis to the informal sector as a whole, beyond the agricultural sector.

Developing a theoretical framework for labour markets where informality is a major component seems crucial for comprehensively explaining this paper's empirical findings. While the analytical approach used here offered interesting insights into how lower mobility costs for informal workers can result in cyclical wage improvements, it falls short of explaining why informal workers who do not make job-to-job transitions also exhibit persistence in their wages premia. In this scenario, traditional explanations, such as job-specific human capital accumulation, seem insufficient to support this pattern since the results also show that experiencing favourable labour market conditions increases the risk of being laid off. An extension of the theoretical framework becomes imperative to understand the channels involved more precisely.

5   Conclusions

Using data from the Colombian Household Survey, I found evidence suggesting that wages in informal labour markets fit the theoretical approach of "Contracts with costless mobility" proposed by Beaudry and DiNardo (1991). The absence of regulation in the informal market, associated with lower mobility costs for workers, could explain the relatively higher re-bargaining power of informal workers during favourable market conditions compared to their formal counterparts. Additionally, evidence indicates that past market conditions have

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[7]To further explore these downward wage rigidities, in Appendix B.2, I present the results of including the maximum unemployment rate as an additional explanatory variable in Equation 1. The coefficient associated with this maximum is never significant, neither when this is included separately or jointly with the other labour market proxies. This statistically zero correlation between wages and the least favourable labour market conditions is observed in the entire sample and for the formal and informal segments when these are studied separately.

Table 8: Equation 3 estimation: Schmieder and von Wachter (2010)'s Test 2 for layoff and fired -Formal and Informal-

	(1) Full Sample	(2) Formal	(3) Informal
Unemployment at T-4q, γ_1	-0.0001	-0.0001	0.0012
	(0.0010)	(0.0005)	(0.0033)
Unemployment at t0, γ_2	0.0006	0.0004	0.0012
	(0.0005)	(0.0004)	(0.0014)
Min unemployment between t0 and T-4q, γ_3	-0.0049	-0.0017	-0.0110
	(0.0011)***	(0.0009)*	(0.0020)***
Constant	0.0144	0.0015	-0.0415
	(0.0084)*	(0.0068)	(0.0271)
Observations	144,779	106,382	38,397
R-squared	0.0249	0.0073	0.0275
Controls	Yes	Yes	Yes
FE	Yes	Yes	Yes
Clustered	Yes	Yes	Yes
Mean of Dependent Variable	2.05	0.93	5.16

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

persistent effects on the wage levels of informal workers when they change employers, while such persistence is not observed for formal workers. The empirical evidence suggests that this result is supported by the success of informal workers in materializing their outside options, which is potentially linked to their lower mobility costs. Finally, this paper presents novel evidence of downwardly rigid wages in the informal sector. This rigidity is underscored in the notable increase in the likelihood of layoffs among informal workers after experiencing the effect of past favourable market conditions on their wages.

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A   Data

A.1   Construction of datasets

A.1.1   Tenure and Unemployment Spell Categories

Tenures and unemployment spells are included as controls in the empirical strategy as dummy variables for each of the following categories:

- Tenures categories: **1** if < 6 months; **2** if $>= 6$ months and < 12 months; **3** if $>= 12$ months and < 18 months; **4** if $>= 18$ months and < 24 months; **5** if $>= 24$ months and < 36 months; **6** if $>= 36$ months and < 48 months, ..., ; **12** if $>= 108$ months and < 120 months; **13** if $>= 120$ months and < 180 months; **15** if $>= 180$ months and < 240 months; and **14** if $>= 240$ months.

- Unemployment spell categories: **1** if $== 0$ months; **2** if $== 1$ months; **3** if $== 2$ months; **4** if $== 3$ months; **5** if $>= 3$ months and < 6 months; **6** if $>= 6$ months and < 12 months; **7** if $>= 24$ months and < 36 months; **8** if $>= 36$ months and < 48 months; **9** if $>= 48$ months and < 60 months; and **0** if $>= 60$ months.

A.1.2   National Unemployment Rate: Seasonally Adjusted

In Figure 5, I present the actual time series of Colombia's national unemployment rate and its corresponding seasonally adjusted version. The adjustment for seasonality involves extracting residuals from a regression of the unemployment time series on fixed effects for each quarter of the year.

Figure 5: Unemployment Rate: National - Actual and Seasonal Adjusted

Actual Unemployment Rate
Seasonally Adjusted Uemployment Rate
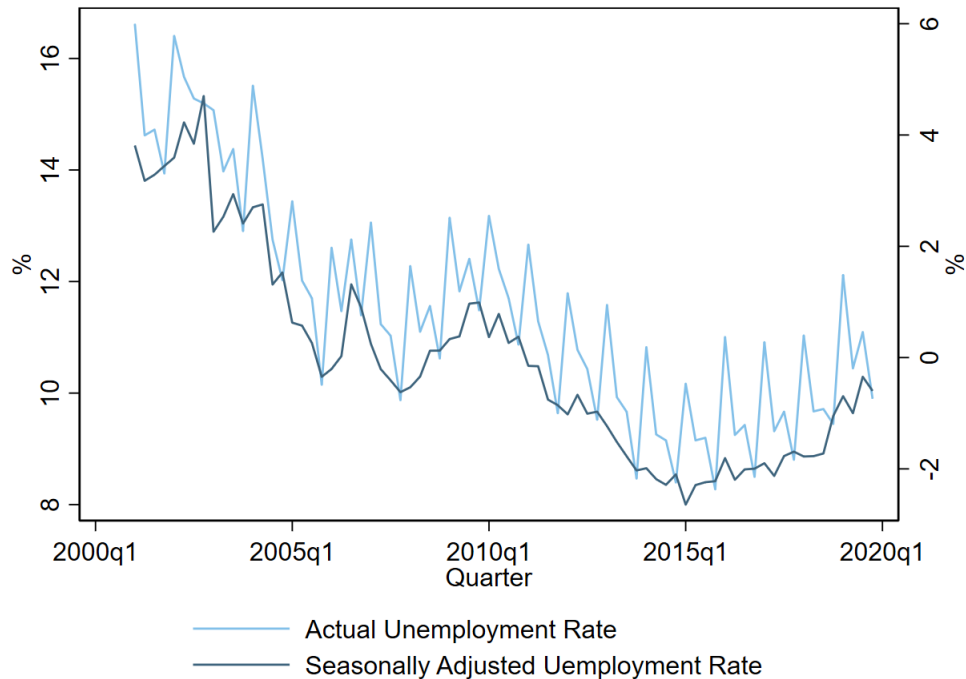
Note: This figure presents the time series of Colombia's national unemployment rate with and without seasonal adjustment. The seasonally adjusted time series correspond to the residuals resulting from regressing the unemployment rates (in percentages) on fixed effects for each quarter of the year.

A.2   Data Description

A.2.1   Average tenure length

Despite current job spells being right censored, their average length is higher than that corresponding to previous jobs. I attributed this phenomenon to the following two factors. Firstly, there is a positive correlation between age and tenure. I present evidence of this correlation in Figure 6. This factor could push down the average tenure of past positions due to the relatively young ages during those employments. Secondly, the focus of this paper on individuals with prior employment excludes new entrants, potentially leading to an overrepresentation of longer tenure, as suggested by Kugler (2004). In contrast, previous job positions can include new entrants.

Figure 6: Data description: Average tenures as a function of age
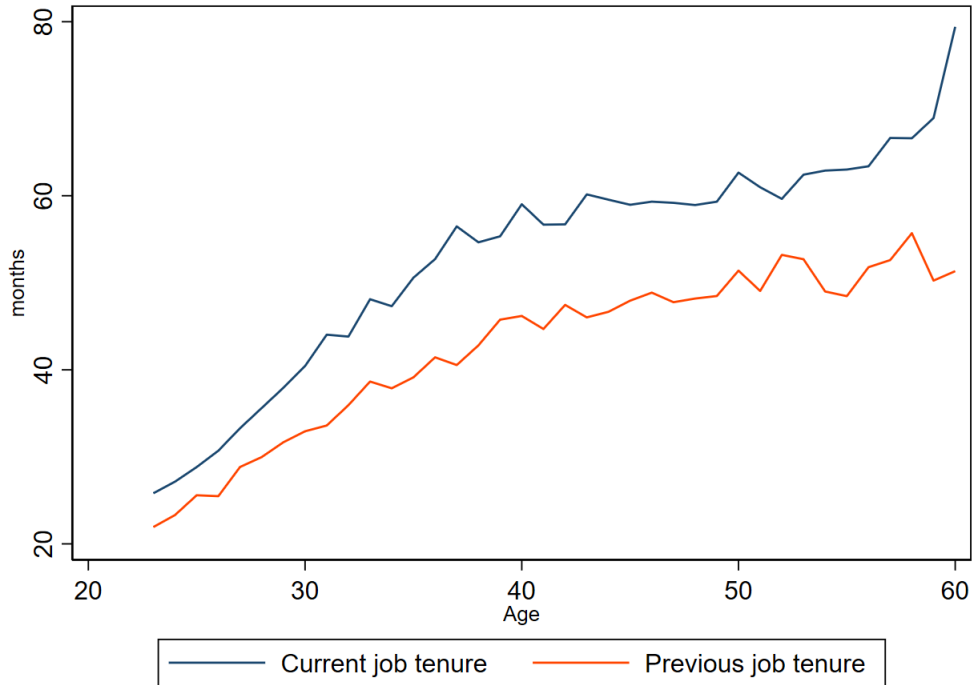
Note: This figure shows the average length of tenures at the current job and the previous job as a function of age.

B   Additional Empirical Results

B.1   Formal status interaction

In Table 9, I show that the 2 percentage points difference between formal and informal sectors in the correlation between the minimum unemployment rate and wages is statistically significant. In Tables 10 and 11, I expand on this analysis to show that the relevant coefficients estimated from the implementation of Schmieder and von Wachter (2010) tests 1 and 2 for the formal and informal sectors are statistically different.

Table 9: Equation 1 estimation: Minimum unemployment rate and formal interaction

VARIABLES	(1) Full Sample
Contemporaneous unemployment, β_1	-0.0006
	(0.0036)
Unemployment at t0 of current job, β_2	0.0015
	(0.0014)
Min unemployment during current job, β_3	-0.0388
	(0.0061)***
Formal==1	0.1589
	(0.0343)***
Min unemployment during current job * Formal==1	0.0191
	(0.0061)***
Constant	3.4683
	(0.0367)***
Observations	75,454
R-squared	0.5810

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

B.2 Maximum unemployment rate

Table 12 presents the results of including in Equation 1 the maximum unemployment rate as an additional proxy to labour market conditions. The coefficient associated with this maximum is never significant, neither when this is included separately or jointly with the other labour market proxies. This result has traditionally been interpreted as the presence of a firm's assurance to workers during periods of worsening economic conditions that imply some downward wage rigidities.

Table 10: Equation 2 estimation: Minimum unemployment rate and formal interaction

	(1) Full Sample
Min unemployment during current job, β_3	-0.0220
	(0.0038)***
Unemployment at tf of previous job, α_1	0.0011
	(0.0028)
Unemployment at t0 of previous job, α_2	0.0009
	(0.0007)
Min unemployment during previous job, α_3	-0.0145
	(0.0054)**
Formal==1	0.1292
	(0.0140)***
Min unemployment during previous job * Formal==1	0.0126
	(0.0059)**
Constant	3.4910
	(0.0289)***
Observations	75,454
R-squared	0.5810
Controls	Yes
FE	Yes
Clustered	Yes

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

B.3 Minimum unemployment rate and small firm interaction

Since approximately two-thirds of informal workers in the sample indicate being employed in firms with no more than five workers, a pertinent inquiry arises: Does the observed amplification of bargaining power, as discussed in the main text, predominantly stem from the firm's size in this labour market segment? The firm's size could affect the information

Table 11: Equation 3 estimation: Minimum unemployment rate and formal interaction

	(1) Full Sample
Unemployment at T-4q, γ_1	0.0000
	(0.0010)
Unemployment at t0, γ_2	0.0007
	(0.0005)
Min unemployment between t0 and T-4q, γ_3	-0.0082
	(0.0019)***
Formal==1	-0.0275
	(0.0114)**
Min unemployment between t0 and T-4q * Formal==1	0.0048
	(0.0022)**
Constant	0.0033
	(0.0095)
Observations	144,779
R-squared	0.0250
Controls	Yes
FE	Yes
Clustered	Yes

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively.

Table 12: Equation 1 estimation: Maximum unemployment rate

	Full Sample			Formal	Informal
	(1)	(2)	(3)	(4)	(5)
Contemporaneous unemployment, β_1		-0.0077	-0.0010	0.0021	-0.0088
		(0.0033)**	(0.0036)	(0.0022)	(0.0082)
Unemployment at t0 of current job, β_2		-0.0048	0.0011	0.0012	-0.0043
		(0.0024)*	(0.0022)	(0.0022)	(0.0036)
Min unemployment during current job, β_3			-0.0237	-0.0162	-0.0354
			(0.0037)***	(0.0031)***	(0.0117)***
Max unemployment during current job, β_4	-0.0018	0.0027	0.0007	-0.0012	0.0111
	(0.0034)	(0.0052)	(0.0041)	(0.0044)	(0.0070)
Constant	3.6065	3.5842	3.5224	3.7441	3.2979
	(0.0245)***	(0.0259)***	(0.0326)***	(0.0399)***	(0.0605)***
Observations	75,454	75,454	75,454	58,271	17,177
R-squared	0.5800	0.5802	0.5808	0.5635	0.3689
Controls	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes
Clustered	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively. Colombian Households Survey (2017m7-2019m12).

channel between workers and employers, such as higher access to information about the firm's profits for small firm workers. In Table 13, I present the results of introducing an interaction term between the proxy for the best labour market conditions during a job spell and a dummy variable indicating whether a worker is in a small firm. The findings show a significant wage premium associated with not being in a small firm in both sectors. However, neither case does the interaction with the minimum unemployment rate provide evidence of heightened effects on workers' bargaining power.

Table 13: Equation 1 estimation: Minimum unemployment rate and small firm interaction

VARIABLES	(1) Full Sample	(2) Formal	(3) Informal
Contemporaneous unemployment, β_1	-0.0003	0.0027	-0.0068
	(0.0036)	(0.0021)	(0.0098)
Unemployment at t0 of current job, β_2	0.0016	0.0007	0.0022
	(0.0014)	(0.0009)	(0.0038)
Min unemployment during current job, β_3	-0.0227	-0.0183	-0.0333
	(0.0041)***	(0.0034)***	(0.0128)**
Number of workers $<= 5$	-0.1501	-0.0729	-0.1355
	(0.0282)***	(0.0329)**	(0.0319)***
Min unemployment during current job * Number of workers $<= 5$	-0.0093	0.0132	-0.0054
	(0.0079)	(0.0085)	(0.0074)
Constant	3.5194	3.7283	3.3884
	(0.0334)***	(0.0391)***	(0.0613)***
Observations	75,454	58,271	17,177
R-squared	0.5765	0.5583	0.3616

Note: Clustered standard errors at region level in parentheses. *, ** and *** represent statistical significance at 10%, 5% and 1% levels, respectively. Colombian Households Survey (2017m7-2019m12).

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