Is the wage curve formal or informal?
Evidence for Colombia[1]

Raul Ramos[a,*], Juan C. Duque[b], Jordi Surinach[a]

[a] Grup d'Anàlisi Quantitativa Regional (AQR-IREA), Department of Econometrics, Statistics and Spanish Economy, Universitat de Barcelona, Avda. Diagonal, 690, 08034 Barcelona, Spain.
[b] Research in Spatial Economics (RiSE-group), Department of Economics, EAFIT University. Carrera 49 N. 7 Sur – 50, Medellin, Colombia.

Abstract

Using microdata from the 2002-2006 Colombian Continuous Household Survey, we find an elasticity of individual wages to local unemployment rates of -0.07. However, the elasticity for informal workers is significantly higher, a result which is consistent with efficiency wage theoretical models and relevant for regional labour markets analysis in developing countries.

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*Corresponding author: Tel.: +34 934024310; fax: +34 934021821.
 E-mail addresses: rramos@ub.edu (R. Ramos), jduquec1@eafit.edu.co (J.C. Duque), jsurinach@ub.edu (J. Surinach).

1. Motivation and objectives

According to the OECD (2009), informal employment account for more than the 50% of total employment in Latin America. Informal employment can be the result of both, people being excluded from formal jobs, or people voluntary opting out of formal structures to avoid paying for taxes and social contributions. However, informal employment usually implies that people are trapped in unproductive, precarious and less protected jobs that are much more exposed to local labour market conditions than jobs in the formal sector.

Since the contribution by Blanchflower and Oswald (1994), the literature has found a negative and significant relationship between individual wages and local unemployment, with a value of the elasticity close to -0.1 for different countries and time periods.[2] Although the list of considered countries is huge, there are only some studies that have focused on Latin America, and only three of them have considered the labour market duality between formal and informal workers,[3] which is clearly relevant in this geographical area and has been totally ignored in the studies for developed economies.

Taking this into account, the main objective of this paper is to provide new evidence on the existence of a wage curve in Colombia, paying special attention to the differences between formal and informal workers (who represent a 40% of total workers), an issue that has not been analyzed yet.

2. The Colombian Continuous Household Survey (CHS)

The data used in this paper come from the Continuous Household Survey (CHS), carried out by the National Administrative Statistics Department (DANE). Our analysis focuses on the period 2002-2006,[4] a homogenous period which was characterized by a remarkable macroeconomic performance with very high GDP growth rates and controlled inflation.

This survey involves monthly household surveys with questions on labour force, unemployment, a special module on informality during the second quarter, and other

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[2] See Blanchflower and Oswald (2005).
[3] Berg and Contreras (2004) found no evidence of significant differences in the response of wages to local unemployment in the case of Chile while Castro (2006) for Mexico and Bucheli and González (2007) for Uruguay found higher values of the elasticity for informal workers.
[4] The CHS was created to replace the National Household Survey (NHS), conducted since 1970 by the same institution. Later, in June 2006, the CHS underwent a major methodological change that gave rise to the Integrated Household Survey (GEIH). These changes make it difficult to extend the analysis prior to 2002 and after 2006.

socioeconomic and sociodemographic characteristics of thirteen metropolitan areas in Colombia.[5,6] So, it is possible to analyse 13 territorial labour markets along the three months of the second quarter of the period 2002-2006. The panel dimension of the dataset also permits to control for unobservable regional characteristics, and, so, (at least, partially) avoid the omitted bias problem.

Regarding informality, although there is not a consensus about how to define and measure it, the available information from the CHS permits to apply the most usual definition of informality which is related to coverage by the social security system (formal) or not (informal) (Maloney, 2003). An additional advantage of the CHS is that it was the official source for the analysis of regional labour markets, so unemployment rates at the territorial level can be directly calculated from this source. Regarding labour income, we have combined information from monthly income and worked hours in order to obtain a measure of hourly wages that has been converted into real hourly wages using regional consumer price indices as deflators.[7]

Our final sample, after dropping individuals younger than 12 years old and older than 65, includes 174,908 worker and it is uniformly distributed along time. The share of informal workers in the sample is 41.0%, a figure that is quite close to the 38.4% estimated by OECD (2009). The 6.6% of workers are employed in the public sector, while the rest, 52.4% work in the formal private sector.

3. Econometric methodology and empirical evidence

Our starting point to estimate the wage curve in Colombia is a Mincerian equation where the logarithm of labour income is a function of a vector of individual and job characteristics and the local unemployment rate:

$$w_{ijt} = f(z_{ijt}, u_{jt}) + e_{ijt} \tag{1}$$

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[5] Barranquilla, Bogota, Bucaramanga, Cali, Cartagena, Cucuta, Ibague, Manizales, Medellín, Monteria, Pasto, Pereira and Villavicencio, representing more than the 45% of total population.
[6] There are two main reasons for reporting our result by using these metropolitan areas: 1) these areas are the best way for communicating research results to policy-makers in Colombia, and 2) metropolitan areas are much more related to the concept of local labour markets than the usual administrative areas, so they are a good option for overcoming the Modifiable Areal Unit Problem (Openshaw and Taylor, 1979).
[7] The regional consumer price indices were obtained from the DANE. Besides the national level, indices for the thirteen biggest cities in Colombia are also reported. Since each one of these cities is the core of a metropolitan area, we applied the consumer price index of the city to the whole metropolitan area.

where w_{ijt} is the natural logarithm of the real hourly wage[8] of the individual i who lives in the metropolitan area j at time t, z_{ijt} is a set of individual factors that can affect wages of the individual, such as the level of schooling, potential experience, gender, occupation, activity sector, among others, u_{jt} is the unemployment rate in the metropolitan area j at time t and, finally, e_{ijt} is a random error term which is assumed to follow a normal distribution with mean zero and constant variance.

However, and before estimating equation (1), there is one potential problem that has to be taken into account: the possible omission of relevant variables at the territorial level. If relevant variables are not included, the coefficient associated with the unemployment rate (the only territorial variable in the regression) could pick up part of these effects when unemployment is correlated with these omitted variables. To consider this possibility, the usual approach is to include regional fixed effects, so equation (1) is augmented with regional dummy variables. Moreover, the panel dimension of our data allows us to include time fixed effects as additional control and additional time-varying regional variables. In particular, we have included regional productivity,[9] as there can be wage differences - not explained by previous control variables - related to the unequal efficiency levels among metropolitan areas or to the limited mobility of some factors. Moreover, this variable can capture the effects of different productive structures in each region, which probably are insufficiently controlled for by industry sector and occupational dummies. The relative advantages of panel data to cross-sectional analysis has been highlighted by Bratsberg and Turunen (1996) and, more recently, by Johnes (2007) in the context of the wage curve literature.

An additional difficulty arises when estimating this equation as it includes an explanatory variable of interest (the unemployment rate of the metropolitan area j) that is defined at a higher level of aggregation (territory) than the dependent variable (individual). As Moulton (1986) shows, the ordinary least squares estimation will bias upward the values of the test of individual significance for this variable, and thus the hypothesis of the presence of a wage curve may not be rejected due to the application of an inappropriate estimation procedure. To overcome this problem, it is necessary to group the data of the dependent and explanatory variables by calculating the average for the individuals in every territory j at time t (cell-means estimation). Therefore, our estimated equation is as follows:

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[8] This is the appropriate wage definition according to Card (1995).
[9] Data of Gross Domestic Product and employment were obtained from the National Administrative Statistics Department (DANE).

$$\overline{w}_{jt} = f(\overline{z}_{jt}, u_{jt}, y_{jt}) + \delta_j + \gamma_t + \overline{e}_{jt} \qquad (2)$$

where the notation of the variables is similar to that used in equation (1) and the subindex j and the subindex t are related to all the territories and time periods considered, respectively. Another difference to (1) is the inclusion of regional productivity (y_{jt}), regional fixed effects (δ_j) and time fixed effects (γ_t). It is also important to notice that when working with grouped data, the OLS estimator is inefficient and, for this reason, estimated standard errors have to be adjusted for the presence of heteroskedasticity.

The estimates for the wage curve coefficient, the elasticity of individual wages to local unemployment in (2), are shown in table 1.[10] The first column shows the results for wage curves without separating men from women. The results for all workers are shown in the first row, while the results for informal and formal workers are shown in the following rows. A significant and negative relationship between individual wages and the regional unemployment rate is observed. The elasticity of the curve is –0.07, a value close to the –0.10 found by Blanchflower and Oswald (1994) for several countries. However, when focusing on informal and formal workers, the results suggest that only wages of informal workers react to local labour market conditions. Their elasticity to regional unemployment is significantly higher than the usual -0.10: -0.18, while the elasticity for workers in the formal sector is not significantly different from zero for both public and private sector workers. The aggregate result seems to be related to the higher response of informal workers than to an average effect of the different groups.

TABLE 1

The results of estimating disaggregated wage curves by gender are shown in the second and third columns for men and women, respectively. A more robust wage curve is found for men with a significant elasticity of –0.07 as for women, no effect of unemployment on wages is found[11]. However, the results for informal workers are different as in both cases, a wage curve is found. One potential explanation of this result is that unemployment not only affects wages but also participation decisions: a high level of unemployment increases the number of discouraged workers, thereby reducing the labour supply and increasing wages. Where this effect is low –for example, among men- the initial negative effect on wages will

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[10] Full results are available from the authors on request.
[11] A result which is in line with the literature: see Janssens and Konings (1998).

clearly dominate, but if this effect is relevant –for example, for women- both effects will be opposite showing no evidence of a wage curve. The separate analysis of public sector workers is particularly interesting as their wages are fixed centrally and, typically, not through a bargaining process. Our results show that their wages are highly insensitive to local labour market conditions (Sanz-de-Galdeano and Turunen, 2006).

4. Final remarks

Our results have shown the existence of wage curve for workers in the informal sector (both men and women) and for men working in the private formal sector, although the value of the elasticity of wages to unemployment is significantly lower than for the rest of workers. This result is consistent with efficiency wage theoretical models and should be taken into account when analysing the functioning of regional labour markets in developing countries.

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Table 1. Cell means estimation of the wage curve for different groups of workers

		All workers	Male	Female
All workers		-0.0707**	-0.0761**	-0.0600
		[0.0276]	[0.0268]	[0.0369]
Informal workers		-0.1790**	-0.1810*	-0.2000*
		[0.0799]	[0.0839]	[0.109]
Formal workers	Private sector	-0.0598	-0.0941*	-0.0157
		[0.0343]	[0.0433]	[0.0555]
	Public sector	0.0145	0.1670	-0.0600
		[0.0658]	[0.104]	[0.109]

All models include controls for activity sector, occupation, regional productivity, regional and time fixed effects, and gender, informal sector and public sector, when possible.

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1