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A COHORT-BASED ANALYSIS OF THE INFLUENCE OF MINIMUM WAGE LEVELS ON LABOUR FORCE PARTICIPATION IN THE INFORMAL SECTOR: QUANTITATIVE AND SUBSTITUTION EFFECTS

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Abstract

This paper discuses the effect of the minimum wage level on the decision to join the informal job sector. We estimate a pseudo panel of the engagement in the informal sector using an IV-probit. The findings show that an increase in the minimum wage level leads to a substitution effect between young and older workers. This results show that the standards effects over the labor market in the WGM segmented model are moderate because an increase of the minimum wage level does not imply total mobility between sectors.

Keywords: Informality, Minimum wages, Instrumental variable probit, Pseudo panel, Sample selection bias.
JEL classification: C35, J32

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1. Introduction

The minimum wage in Colombia is established through negotiations between representatives of the workers' union and an employers' association in December every year. If they fail to reach an agreement, the government establishes the minimum wage. Only in three out of the last eight years there has been an agreement between both parties.

The minimum wage is a key element of economic and social policy in developing countries. The minimum wage affects not only workers in the formal sector, but also many prices and taxes which are set based on it in Colombia. For this reason, the policy with respect to the minimum wage is significant in Colombia where approximately 56 percent of all workers earn the minimum wage (Hernandez and Pinzon 2006, 12) and 73 percent of all workers affiliated to the social security system earn two or less minimum salaries (Arango, Herrera and Posada 2007, 14).

Furthermore, the minimum wage is the base level for wages in the formal sector. Although there are different explanations as to what is considered informal and formal, there seems to be a consensus with regard to the ease of joining the informal sector because there are no entry barriers. In the formal sector, on the contrary, labor laws, company regulations, and fixed minimum wages, among others, have become entry barriers. In this context, government

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intervention in the economy via the determination of the minimum wage generates incentives to either join or leave the informal sector; for example, the minimum wage generates incentives to choose one sector. In this article we assume that those who work in the informal sector have actually chosen to do so.

Compared to other approaches to the problem, this paper differs in several aspects. Firstly, this review involves a follow-up of the informal sector from 2001 to 2005 based on the construction of a pseudo panel. Secondly, we assume the minimum wage to be an opportunity cost to join the informal sector. With the data available from 2001 to 2005 we built six cohorts based on information of 13 metropolitan areas, from the informal sector in the National Household Survey from last June. This selection provides a sample of 89,241 individuals for the period under review. Another contribution of this paper is the discussion of the higher minimum wages over labor force participation. In the standard WGM two-sector model, Welch (1976), Gramlich (1976), Mincer (1976), a higher minimum wage implies low wages in the uncovered or informal sector because of the movements from the formal to the informal sector, and the employment effects are negative in the informal sector and positive in the formal sector, Lemos (2009). Yet it is possible that the effects of the higher minimum wages on employment in the informal sector are moderate due to the substitution effects between young and older workers in the labor participation in the informal sector. This characteristic is particularly important in developing countries where the informality rate is high, and the total effect of the higher minimum wage over informality depends on the proportion of young/older workers over the total labor force participation in the informal sector

This paper is organized as follows: the second section discusses the literature about the effects of the minimum wage on employment and on both the formal and informal sectors. The third section presents a model and describes the methodology for modeling the engagement in the

informal sector based on pseudo panel data. The fourth section presents estimates of the model using an instrumental variable probit and presents the correction of the selection bias. We conclude in the last section.

2. Literature Review

The theory suggests that the impact of minimum wages on the labor market depends either on competitive or non-competitive assumptions. In a competitive labor market, minimum wages established above the market equilibrium wage result in unemployment. In a monopolistic labor market, if the minimum wage is above the monopsony wage level (but below the competitive level), employment will increase.

Literature shows ambiguous effects of the minimum wage on the unemployment rate. Card and Krueger (1994) found that the restaurants in New Jersey, where the minimum wage was raised, expanded the workforce in comparison to restaurants in Pennsylvania. However, using different data, Newmark and Washer (1995) found an increase in unemployment in New Jersey. Castillo-Freeman and Freeman (1992) found that in Puerto Rico a 10% increase in the minimum wage caused an employment reduction of 5%. With respect to the results of Castillo-Freeman and Freman (1992), Krueger (1995) showed that the results are statistically fragile. Bell (1997) found that in Mexico the minimum wage has had no effects on wages in the formal employment sector, but found substantial unemployment effects associated with the minimum wage in Colombia. Suryahadi et al. (2003) discuss the substitution effects: minimum wage decreases employment of unskilled workers and increase employment of white-collar workers.

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In developing countries, Lemos (2007) showed that higher minimum wages in Brazil are associated with a reduction of inequality but not with lower employment. Lemos (2009) also showed that the employment effects are due to assumptions of the segmented or integrated labor market.

In Colombia, Magnac (1991) provides the first contrast of informality in Colombia. In Magnac's (1991) bivariate probit model, the informal sector is identified with self-employment (excluding employers). The obtained results reject a segmented labor market hypothesis. However, Magnac's model shows that when an individual chooses to work in the formal sector, the benefits associated with not working are indistinguishable from the benefits of working in the informal sector.

Núñez (2002) suggests that joining the informal sector in Colombia is a voluntary action of which individuals are aware. Why should one choose one sector or another? Núñez (2002) believes that there are several factors that encourage participation in the informal business sector since there is a lenient environment that facilitates evasion of labor-related taxes. This refers to evasion of taxes such as tax withholding at the source and other state-imposed taxes based on a formal employment agreement. However, Nuñez (2002) fails to discuss the effects of truncated sampling in his results when calculating the informal participation of individuals who earn more than $1,200,000 Colombian pesos. Ribero (2003) and Uribe et al. (2006) modeled informal employment as the result of socioeconomic characteristics of an individual, where education has a negative effect on the likelihood of participating in the informal sector. Depending on the purpose of the study, other variables have been included such as age, position in the household, non-labor income, gender, and fertility. Ribero (2003) did not make a selection bias adjustment, and Uribe et al. (2006) did not include the selection correction in his calculations.

Finally, Hernández and Pinzon (2006) discussed the effect of increase of minimum wage on labor participation using pooled data and found that there are substitution effects on workers with an increase in the minimum wage. However, Hernández and Pinzon (2006) did not consider the pseudo panel measurement error due to the nature of the Colombian data - the official information by the Colombian Department of Statistics does not include the possibility of panel data - and does not discuss the substitution effects through the cohorts[2].

3. Model Specification

The labor force participation shows individuals that maximize their utility over consumption and leisure, subject to budget constraints and dependent upon the time available for these activities, Gronau (1973), Deaton and Muellbauer (1980), Pencavel (1986), Killingsworth (1986) and Brue and Macpherson (2003).

In developing countries, the standard WGM two-sector model, Welch (1976), Gramlich (1976), Mincer (1976), shows that when a group of workers is outside the umbrella of minimum wage legislation, a minimum wage increases implies that wages in the uncovered sector fall as a result of displaced workers in the covered sector moving into uncovered sector employment. Then the wage effect is expected to be positive in the covered sector and negative in the uncovered sector, Lemos (2009).

It is evident that the prediction of the WGM model implies segmentation in the labor market. In Colombia, Arango and Posada (2001) suggest the possibility of segmentation based on a

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[2] There is no consensus about the effect of the minimum wages on employment in Colombia. While Maloney and Núñez (2003) found a negative relationship between the minimum wages and employment, Robbins (2003) determined that the minimum wages has not had such a negative effect.

discussion of the unemployment rate. García et al. (2007) discuss segmentation comparing Mincer regressions for the formal and informal sectors, and García et al. (2008) also use Mincer regressions which incorporate differences among cities and sectors. Using Markovian chains Mora (2010) discusses the possibility of segmented labor market and finds segmentation in professionals workers. Finally, Nupia (1997), Jaramillo et al. (2000) and Gálvis (2002) using time series find that there is no cointegration among wages, i.e. there is a segmented labor market.

With respect to the results of the WGM model, we suppose that if there are segmented labor markets in a developing country (such as, for example, Colombia), the results of increased minimum wage is moderate due to substitution effects between young and older workers. On other hand, the total effects on a particular labor market are due to the proportion of young/older workers in the economy. Thus, we suppose that the mobility within sectors with a minimum wage is not perfect because of the benefits of the minimum wage. Let us assume that the government imposes a minimum wage for the formal sector in the economy. Then, an individual's decision to join the informal sector results from comparing the benefits of working in the formal sector versus the benefits of working in the informal sector. Now, work in the formal sector consists of a standard fixed work time, and the guarantee of social security, pension, and health. The opportunity cost of leisure is different for young people and older people because the benefits of working in the formal or informal sector are different. It must be noted that the individual decision of participating in a specific sector implies considering the formal-informal sector wage ratio and produces substitution effects on the labor force.

Let us assume that individuals are able to choose whether they want to join the formal or informal sector based on a set of variables, Fields (1990), Maloney (2004)[3]. Therefore, the engagement in the informal sector can be estimated as follows:

$$I_{i(t),t}^* = \beta_0'S_{i(t),t} + \beta_1'NL_{i(t),t} + \beta_2' Hmale_{i(t),t} + \beta_3' OUH_{(t),t} + \beta_4' CMW_{i(t),t} + \eta_{i(t)} + \mu_{i(t),t} > 0 \qquad (1)$$

$$t = 1,....,T \; ; \; i=1,...,N \; ; \; P_{i(t),t} = 1 \text{ if } P_{i(t),t}^* > 0 \qquad (2)$$

Where $I_{i(t),t}^*$ is a latent variable that represents earnings from working in a given sector and $I_{i(t),t}$ equals one when an individual chooses to work in the informal sector or otherwise zero. The "i(t)" subscripts indicate that the observations are independent cross-sectional series where N individuals are only available in each period. Since there are different individuals in each period, i ranges from 1 to N for each t. Deaton (1985) suggests using cohorts to obtain consistent estimators of β when numeric variables are used and adjusting the estimator with the measurement errors. Moffitt (1993) proposed an IV-probit approach which, in the case of independent continuous variables subject to measurement errors, implies using a set of time-invariant variables and a set of time-variant variables,

$$S_{i(t),t} = \lambda 1' C_{i(t)} + Z_{i(t),t} + \omega_{i(t),t} \qquad (3)$$

$$NL_{i(t),t} = \lambda 1' C_{i(t)} + Z_{i(t),t} + \omega_{i(t),t} \qquad (4)$$

$$CMW_{i(t),t} = \lambda 1' C_{i(t)} + Z_{i(t),t} + \omega_{i(t),t} \qquad (5)$$

$S_{i(t),t}$ represents the number of years of education, which decrease the likelihood of joining the informal sector, Magnac (1991), Núñez (2002), Ribero (2003) and Uribe et al. (2006). $NL_{i(t),t}$

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3 This assumption is fundamental because of the characterization of "easy-entry" and "upper-tier" informal employment, Kucera and Roncolato (2008).

represents non-labor income, which decreases the likelihood of participating, Núñez (2002), Ribero (2003). $Hmale_{i(t),t}$ represents a male head of a household, which increases the likelihood of participation in the informal sector, Uribe et al. (2006).

$CMW_{i(t),t}$ represents the interaction between cohort variables and the minimum wage. In young individuals – cohorts 1 to 3 - the opportunity cost of working in the informal sector is low, and we expect the sign to be positive when there is an increase in the minimum wage. However, to older individuals – cohorts 4 to 6 - the opportunity cost of working in the informal sector is high, and a negative sign is expected. $OUH_{i(t),t}$ is a dummy variable that takes a value of either one if there is more than one individual unemployed in a household, or otherwise zero. We expected this variable to have a positive sign, Arango and Posada (2006). The $\eta_{i(t)}$ variable represents the deviation of the effect of the cohort after breaking down fixed individual effects. Therefore, if there are any fixed individual effects, these will be consistent with fixed effects in the cohort. Finally, $C_{i(t)}$ in (4) to (6) are time-invariant cohorts, whereas $Z_{i(t),t}$ represent time-variant variables. With regard to the latter there is no agreement as to which variables should be incorporated in $Z_{i(t),t}$. However, since economic growth is a determining factor when setting the minimum salary, the GDP lagged by a period is used as $Z_{i(t),t}$. It is also worth noting that binary variables will not be subject to correction, Deaton (1985).

3. Data

The labor market in Colombia showed an increasing rate of female labor force participation from 1981 to 2000. The female labor force participation rose from 36.46 percent in 1981 to 50.87 percent in 1998. Meanwhile, the male labor participation has remained stagnated for the last decades, i.e. 74.28 percent in 1981 and 73.98 percent in 1998 (Luisa Fernanda

Bernat, Rocio Ribero and Jaime Tenjo 2004:150). This means that the traditional gender gaps in labor force participation decreased in the last century. On the other hand, there has been an important decrease in the unemployment rate in the past few years. According to the Colombian Department of Statistics (DANE), the unemployment dropped from 16.6 percent in 2000 to 11.4 percent in 2006.

In Colombia, there are no panel survey statistics on household labor supply data. Our sample comes from the National Housing Survey (*NHS*) which consists of a time series of independent and representative cross-sections collected from 2001 to 2005 by the Colombian Department of Statistics (DANE). Since 2000, the DANE has collected information about the labor market through another mechanism called Continuous Housing Survey. The DANE measures engagement in the informal sector based on information about workers or employers who have less than 10 workers, independent non-professional, non-technical workers, housekeepers, and family assistants who do not earn monetary compensation. Ribero (2003) proposes four definitions and shows how the informal sector share changes substantially depending on each definition. His definitions take into account not only company size, but also membership to the social security system, an employment agreement, and medical insurance coverage.

Based on DANE's definition of informality, Castillo (2006) estimated informality to be 61 percent in 2002 and 58.8 percent in 2005. However, when the definition does not include the headcount size, but the kind of employment agreement or memberships, the informal sector share is approximately 30 percent, which was determined by Ribero (2003) and Hernández and Pinzon (2006) who found that the informal sector share is about 50 percent based on medical insurance coverage.

We define "informal" to refer to anyone who does not have social security coverage in health, a pension, and a formal employment contract. According to this definition and based on a sample of individuals who were engaged in the labor market, we defined six cohorts of individuals whose ages range from 18 to 56 years in the period from 2001 to 2005. Thus, 89,241 individuals were selected during the observed period. The means of the selected variables are listed in the table below:

[Insert Table 1]

As shown in Table 1 above, the average number of years of education is close to 10. This number seems to have been stable for the past 10 years. Mora and Muro (2008) showed a similar average for the period 1995-2000 also using pseudo panel data. Labor income and non-labor income were adjusted for inflation in each of the metropolitan areas, showing a slight improvement probably due to economic growth and the inflation drop. It must also be noted that the real minimum wage has been increasing in all metropolitan areas. Other unemployment in the households (OUH) has remained stable at nearly 30% throughout the entire period under review. The percentage of male heads of households who participate in the informal sector is close to 10%.[4] Finally, there are no substantial differences among the number of individuals each year.

With respect to the wages, we calculated by cohorts and cities the ratio between wages and minimum real wages by main cities and found an inverted U.

[Insert Figure 1]

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[4] As shown by Almanza (2006) the gap between men and women in the informal sector has been closing since last century.

In figure 2, the ratio is increasing in young cohorts and decreasing in old cohorts. Next, we explored participation in the informal labor market and found that the informal sector is not homogeneous by cohorts and regions. The results are depicted in Figure 2.

[Insert Figure 2]

Figure 2 shows that the youngest cohort has the highest participation in the informal sector. Medellín is the city with the lowest participation in the informal sector rates in each cohort, while Cartagena, on the other hand, has the lowest participation in the informal sector in the fourth cohort throughout the entire period under review.

4. Results

The estimates by Núñez (2002), Ribero (2003) and Uribe et al. (2006) of participation in the informal employment sector were determined only for working individuals. Ribero (2003) justifies this selection because there are other models, such as those by Ribero and Meza (1997), which specifically represent labor participation in Colombia. Uribe et al. (2006) did not raise any special considerations with regard to this. The results of the model of engagement in the informal sector are discussed below.

[Insert Table 2]

The first column in Table 2 shows a pooled probit, which is determined based on model (3) for the entire sample without considering the existence of a measurement error because of the nature of

the pseudo panel. The sign of the years of education is negative and statistically significant. The effect of the minimum wage on each cohort is positive and statistically significant on the probability of joining the informal sector. Only the last cohort shows negative effects on the decision to join the informal sector. The signs of non-labor income are not as expected and Hmale was found to be not significant.

The last column in Table 2, instrumental variable probit, shows the estimated probability of joining the informal sector using the pseudo panel technique[5]. Table 2 also discusses the existence of selection biases. As indicated by Ribero (2003) and Uribe et al. (2006), estimates of a model of engagement in the informal sector for the entire sample of workers led to the occurrence of selection biases because the unemployment choice was not considered[6].

The existence of such selection biases was corrected by estimating and incorporating Mills inverse ratio in model (3). We estimated the likelihood of participating based on the number of working individuals in the cohort following the work of Gronau (1974) and Lewis (1974) and Mora and Muro (2007). Mora and Muro (2007) showed that it was possible to correct the existence of selection biases based on a semi-parametric contrast, which involves incorporating Mills inverse ratio. This Mills inverse ratio is calculated from the proportion of the labor participating individuals in each cohort with respect to the total number of individuals in the cohorts[7].

The results show that all coefficients are statistically significant, and the percentage of success of the model is above 66 percent. The years of education and non-labor income have negative

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[5] The variance-covariance matrix of the IV-probit estimator was corrected using the method proposed by Amemiya (1978).

[6] Although Ribero (2003) and Uribe, Ortiz and Castro (2006) are aware of the problem, Ribero (2003) does not consider it. Uribe et al. (2003), on the other hand, try to avoid it by proposing a multinomial model which not only fails to correct the selection bias, but also raises a discussion about the independence of irrelevant alternatives.

[7] We used 274,162 individuals in all cohorts to estimate the equation of selection (see the appendix for a formal derivation of the selection bias).

effects on the probability of joining the informal sector. Hmale and OUN variables have a positive sign. In order to consider the relationship between minimum wage and informality, dummy interactions between the cohorts and the minimum wage were incorporated. We assumed two different types of interaction: The first one considers the minimum level, and the second one considers the ratio of the wages over minimum wages. Both interactions show that an increase in the minimum wage produces an increase of the probability to join the informal sector in young cohorts and decreases the probability to join the informal sector in older cohorts. These results show an interesting issue: an increase in the minimum wage produces substitution effects among young and older individuals in the informal labor market. [8]

Finally, the Mills inverse ratio was negative and statistically significant, thus corroborating selection bias in the sample.

5. Conclusions

The engagement of informal workers in the labor market is a topic that has been recently discussed in Colombia. Concerning the determining factors of engagement in the informal sector, there is only consensus around the assumption that the higher the educational level, the higher the incentives to engage in the informal sector, and non-labor income has negative effects.

On the other hand, the standard results of the WGM model in a developing country could be moderate if there are substitution effects between young and older workers. The estimates discussed in this paper corroborate this negative effect of both education and non-labor income on the decision to join the informal sector.

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[8] Boeri and Garibaldi (2009) show that the regulations in the labor market produce wage differences between sectors.

Besides having an impact on the distribution of wages among formal and informal workers, Arango and Pachón (2004), Maloney and Núñez (2003), Lemos (2007, 2009) [9], the minimum wage also generates incentives to join one sector or another. Therefore, the estimates provided in this paper show that there are substitution effects on the labor market.

Therefore, we recommend that the political discussion about the elimination of the minimum wage in Colombia should incorporate an analysis of the current encouraging factors that have had an impact on the Colombian labor market. It is also necessary to conduct a more in-depth discussion of advisable policies with respect to the reduction or elimination of the minimum wage in Colombia.

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[9] Arango and Pachón (2004), and Maloney and Núñez (2003) did not estimate the effect of minimum wages on the informal employment share directly.

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Appendix 1. Selection bias in Pseudo Panel Data.

In the pseudo panel case with selectivity bias, the cohort expression will be as follows:

$E(I_{i(t),t} | X_{i(t),t}, S_{i(t),t}=1, g_{i(t)} \in I_c)=$

$E(X'_{i(t),t} \beta + \tau_{i(t)} + \mu_{i(t),t} | X_{i(t),t}, S_{i(t),t}=1, g_{i(t)} \in I_c)=$

$E(X'_{i(t),t} \beta | X_{i(t),t}, S_{i(t),t}=1, g_{i(t)} \in I_c) + E(\tau_{i(t)} | X_{i(t),t}, S_{i(t),t}=1, g_{i(t)} \in I_c) + E(\mu_{i(t),t} | X_{i(t),tx}, S_{i(t),t}=1, g_{i(t)} \in I_c)$ (1A)

Where $I_{i(t),t}$ is an interest variable in a repeated cross-sectional model with measurement error.[10] And $I_{i(t),t}$ is only observed when $S_{i(t),t}=1$. $X_{i(t),t}$ are covariates; $\tau_{i(t)}$ are individual effects in t; $\mu_{i(t),t}$ are idiosyncratic errors; i run for individuals. In the above equation, $g_{i(t)} \in I_c$ implies that the observation i(t), in the appropriate cross section, belongs to a specific cohort, that is, taking expectations conditional to $i \in c$ (in random terms $g_i \in I_c$). The data consist of a time series of independent cross-sections so we can only observe the same individual in one given period of time. The solutions for pseudo panel data show that the direct procedure for the first term in equation (1A) implies the use of the sample mean of the variables in the respective cohorts. Mora and Muro (2006, 2007) shows that the second term becomes zero while the deviation of the cohort is independent from the selection process. There is, however, no guarantee that the last term equals zero, which shows that the estimator is inconsistent when there is a potential selection bias. Because the selection process does not affect the presence or absence of a cohort in a specific cross section, cohorts will comprise a set of different individuals in each repeated cross section, and the presence of different individuals in each cross-section is independent from the incidental truncation process. Therefore, a random selection of representative samples of each sub-population of cohorts will contain different individuals in each cross section. This makes it necessary to find an expression that allows inferring the behavior of a cohort based on the behavior of different individuals in the cohort. Thus, the last expression in equation (1A) is,

$E(\mu_{i(t),t} | X_{i(t),t}, S_{i(t),t}=1, g_{i(t),t} \in I_c) = E(R_{i(t),t} | g_{i(t),t} \in I_c)$ (2A)

In equation (2A) above, $R_{i(t),t}$ is Mills inverse ratio, which shows the transformation of individual results into cohort results. It is worth noting that if the nature of the selection process is known, then it is possible to use individual parameters (estimated for the selection process) and apply them to the means of the cohort to obtain a selection indicator for each cohort. To evaluate the expression in (2A) Mora and Muro (2007) proposed calculating Mills inverse ratio for the normit of a consistent estimation of the observed proportion of individuals in each cohort, instead of integrating out the individual Mills inverse ratio for all the observed individuals in each cohort,. In particular in the following cases:

$E(R_{i(t),t} | g_{i(t),t} \in I_c) \propto \phi(P_{c,t}) / \Phi(P_{c,t})$ (3A)

In (3A) equation $P_{c,t}$ is the proportion of individuals selected from cohort c in t time. Finally this expansion of the original specification with a selectivity bias correction term for equation 3 implies,

$I_{i(t),t} = X'_{i(t),t} \beta + \tau_{i(t)} + R'_{i(t),t} \rho + \psi_{i(t),t} ; E(\psi_{i(t),t} | \tau_{i(t)}, X_{i(t),t} + S_{i(t),t}) = 0$ (4A)

[10] That is, over all individuals in a specific cohort.

Then a contrast about the existence of selection biases involves contrasting the hypothesis of a lack of significance of ρ in (4A), that is, a contrast implies the use of a Wald test of H_0: $\rho=0$ as a test of the null hypothesis of absence of sample selection bias.

Table 1. Descriptive statistics (means)**.**

Variable/Year	2001	2002	2003	2004	2005	2001-2005
Years of education	9.85	9.99	10.17	10.32	10.43	10.15
Non-labor income	60.3	78.05	88.66	98.1	112.65	87.76
Inflation (13 metropolitan areas)	8.35%	6.32%	7.78%	5.99%	5.03%	6.44%
Minimum wage (thousand Col$)	286	309	332	358	381.5	333.75
Real minimum wage (thousand Col$)	262.11	289.46	306.16	336.52	362.3	311.79
Other individuals unemployed at home	36.07%	34.67%	31.61%	29.41%	27. 63%	31.84%
Male head of a household	9.84%	9.73%	10.90%	11.13%	11.93%	10.72%
Informality	44.51%	44.60%	44.74%	43.65%	43.71%	44.26%
Number of individuals	18,136	17,348	17,415	17,444	18,898	89,241

Source: Authors' calculations from The National Housing Survey (DANE-ECH).

Figure 1. Wages by Cohorts.

Evolution of Wages in Colombia: 2001-2005
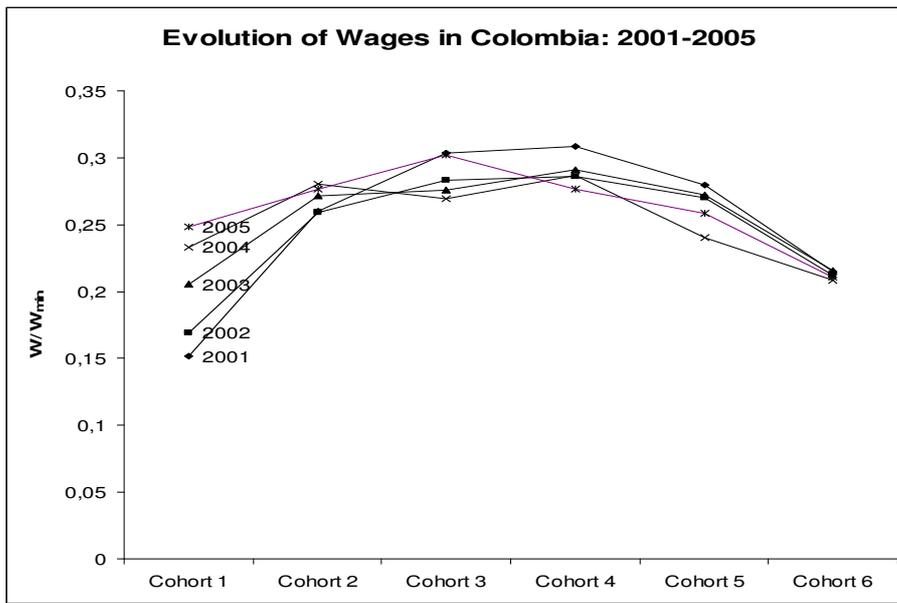
Source: Authors' calculations from The National Housing Survey (DANE-ECH).

Figure 2. Informal sector rate by cohorts.
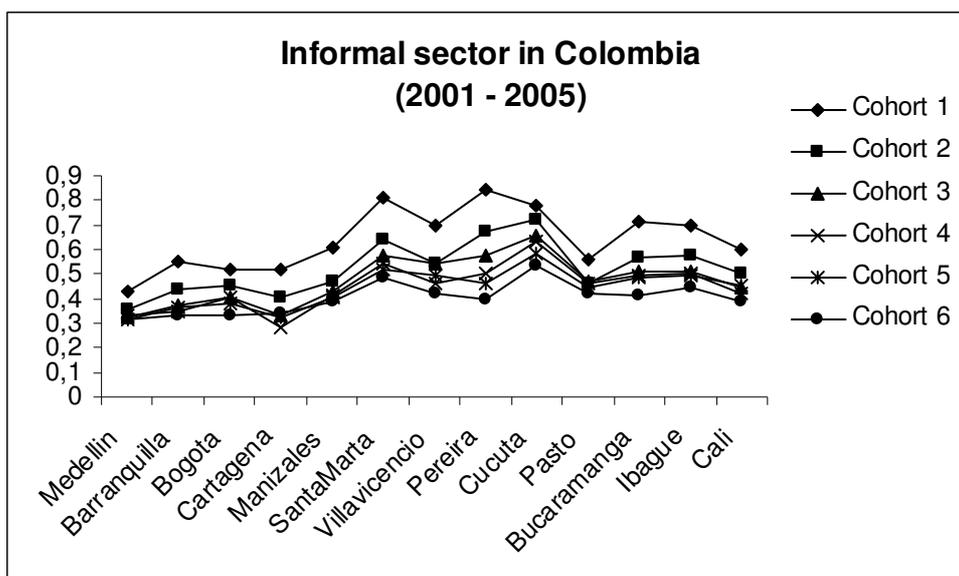
Source: Authors' calculations from The National Housing Survey (DANE-ECH).

Table 2. Marginal effects for informal workers.

Variable / Model	Pool-Probit	IV-Probit	IV-Probit	IV-Probit
Education	-0.0641845	-0.0322842	-0.0679544	-0.0838423
	(0.00049) **	(-0.0002752)**	(0.004143) **	(0. 0048275) **
Non-labor income	0.0000162	-0.0002752	-0.0004799	-0.0004305
	(0.000003)**	(-14.99)**	(0.000062)**	(0.0000727)**
Hmale	0.0025179	0.0650612	0.1824889	0. 1568135
	(0.00621)**	(0.0225352) **	(0.0220179) **	(0.0265475) **
OUN	0.0534534	0.0812005	0.0369982	0.0458268
	(0.00399) **	(0.0045363)**	(0.0047308)**	(0.005519)**
C1*MWR	0.0008334		0.0011671	0.3771594
	(0.00003)**		(0.0000304)**	(0.0108374)**
C2*MWR	0.0005139		0.0004916	0.1079831
	(0.00003)**		(0.0000327)**	(0.0084813)**
C3*MWR	0.0002682		0.0000816	0.0146035
	(0.00003)**		(0.0000319)**	(0.0069588)*
C4*MWR	0.0001266		-0.0001284	-0.0356545
	(0.00003)**		(0.0000318)**	(0.0062999)**
C5*MWR	0.0000634		-0.0002017	-0.0465519
	(0.00003)**		(0.0000324)**	(0.0058238)**
C6*MWR	-0.0001509		-0.0002936	-0.057555
	(0.00003)**		(0.0000334)**	(0.005562)**
Mills		-1.443092	-4.800297	-5.564868
		(0.09062)**	(0.1145766)**	(0.1296018)**
χ^2	(10) =22643.98	(5) =1042.01	(11) =5130.71	(11) =5175.88
% Success	70.78%	58.86%	68.47%	66.31%
N	89,241	89,241	89,241	89,241

Source. Authors' calculations from The National Housing Survey (DANE-ECH).
Note: Dummy variables for cities are included in all regressions. Standard errors in parenthesis. *: p< .05; **: p< .01.

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