

Canelas, Carla

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Poverty and informality in Ecuador

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WIDER Working Paper 2015/112

Poverty and informality in Ecuador

Carla Canelas*

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Abstract: This paper uses national representative data from the Ecuadorian Family Expenditure survey to study the determinants of poverty and informality in the country, taking into account the simultaneous two-way relationship between these two phenomena. The results support the view of a heterogeneous informal market, where informal work is both a demand-led phenomenon as well as a voluntary and primarily supply-led form of employment. As such, informal salaried work and self-employment are both a last resort option for low-skilled workers and a voluntary choice for the more educated and entrepreneurial ones.

Keywords: informality, poverty, developing economy

JEL classification: I32, J46

*UNU-WIDER, Helsinki, Finland; carla@wider.unu.edu.

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1 Introduction

For the vast majority of households in the developing world, labour income accounts for the main if not the only source of income. In 2013, the estimates of the World Development Report revealed that self-employment and farming represent almost half the jobs in the developing world. They also revealed that the important decline in poverty rates between 1981 and 2008 was achieved, to a large extent, through jobs. If non-wage employment represents such a large share of total employment in these countries, understanding the links between informal jobs (whether defined on the basis of self-employment, social security coverage, or written employment contract) and poverty becomes critical from a policy perspective.

Indeed, labour informality is a common characteristic of developing countries which are also characterized by high levels of poverty. In this context, it is easy to think that a link between poverty and informal employment exists. In particular, one may think that being poor affects the probability of working informally, but also that having an informal employment is a determinant of poverty. The question then becomes whether informality is both a cause and a result of poverty. That is, are informal employment and poverty interrelated? While there is some agreement about this idea in the literature, there is still limited evidence about the interactions between the two phenomena. Actually, most articles on informality or poverty study only the one-way relationship and do not take into account the simultaneous causality that may exist between these two phenomena, thus the estimates may be biased. This article adds to the limited number of empirical studies that address this problem, by using a simultaneous equation model to assess the changes in the joint probabilities of having an informal employment and being poor.

The case of Ecuador is of particular interest since little evidence exists for this country even though its poverty and informality rates are among the highest ones in Latin America. In Ecuador, the share of employees who do not have social security coverage is the highest among the poorest. Also, households headed by informal workers have higher poverty rates than those headed by formal workers. There is thus a strong association between informality and poverty in the country.

This paper contributes to the literature in several ways. First, it controls for the simultaneity of poverty and informality by using a simultaneous equation model that allows for error correlation across equations. Second, it provides evidence for a country for which no other study linking poverty and informality exists. Third, it presents the results for both salaried and self-employed workers. These results, yet unavailable in the literature, contribute to a better understanding of the heterogeneity of the informal sector employment in a developing country.

The structure of the paper is as follows: Section 2 revises the literature and the main

theories of informality. Section 3 presents the empirical specification. Section 4 describes the data and gives some descriptive statistics. Section 5 discusses the results, Section 6 the robustness checks, and Section 7 concludes.

2 Conceptual framework and literature review

The relationship between informal employment and poverty is a very complex one that is not yet well understood. In the theoretical literature on the informal sector, three contrasting views prevail regarding the origins of informal employment, namely the dualistic labour market approach, the alternative or neo-liberal approach, and the structural articulation approach.

In the first approach, informal employment is seen as an involuntary solution to unemployment. Basically, it is the second best strategy that substitutes the lack of formal employment. As such, the informal sector absorbs the surplus labour existing in the economy. In this view, informal employment is involuntary, requires little capital investment, and only provides a subsistence wage. This approach originated with the works of [Lewis \(1954\)](#) and [Harris and Todaro \(1970\)](#), and was later extended by [Fields \(1975\)](#).

The alternative (or neo-liberal) approach sees informal employment as a voluntary choice. In this view, informal employment represents a cost minimizing strategy for entrepreneurs trying to avoid the costs of labour regulations. Basically, the informal sector is viewed as the optimal and coherent response of economic units to government-induced distortions like minimum wages and excessive taxes [Chaudhuri and Mukhopadhyay \(2010\)](#).

The third theory of informal employment sees the informal sector as heterogeneous and made up of at least two distinct sub-sectors: informal activities with direct subsistence goals and dynamic activities with decreasing labour costs and capital accumulation goals [Chaudhuri and Mukhopadhyay \(2010\)](#).

For empirical literature supporting the view that working in the informal sector is supply-led and a voluntary choice related with possible financial advantages, see [Heckman and Sedlacek \(1985\)](#), [Magnac \(1991\)](#), [Gindling \(1991\)](#), and [Pratap and Quintin \(2006\)](#). Under this hypothesis, the link between informality and poverty is not obvious.

For studies supporting the idea that the informal market is the only available option for people already excluded from the formal labour market; that is, informal employment is demand-led and involuntary, see [Fields \(1975\)](#) and [Kingdon and Knight \(2007\)](#). Poverty and informality here are clearly related. Finally, for more recent literature providing evidence of a heterogeneous segmented labour market, see [Cunningham and Maloney \(2001\)](#), [Paulson and Townsend \(2005\)](#), [Günther and Launov \(2012\)](#), and [Harati \(2013\)](#). Poverty and informality are also clearly related in this approach.

Literature relating poverty and informal employment is more scarce, mostly based on studying a one-way relationship, being usually descriptive. For instance, [Gasparini and Tornarolli \(2009\)](#) study the trends of labour informality in the Latin American region during the period 1989-2005. The evidence in all countries suggests that labour informality remains high and the difference in the poverty head-count ratio¹ between informal and formal workers is four times on average. [Ghosh et al. \(2008\)](#) found that informal employment has raised faster than formal employment in an environment that has benefited from sustained growth as it is the case of India, where nearly 50 per cent of the urban workers have no formal contracts and often work under precarious conditions. [Harati \(2013\)](#) found that Egyptian labour market has two well-differentiated segments: one of choice and one of obligation. [Loayza et al. \(2009\)](#) show that informality has a significant negative impact on growth and an equally significant positive impact on the incidence of poverty across Latin American and Caribbean countries. [Maurizio \(2012\)](#) studies the links between informality, income segmentation, and poverty in Argentina, Brazil, Chile, and Peru. She finds a positive relationship between informality and poverty. However, she has also found that the elimination of informality does not eliminate poverty. [Amuedo-Dorantes \(2004\)](#) studies the determinants of poverty and its implications on the informal sector in Chile and [Devicienti et al. \(2009\)](#) study the same process using panel data for Argentina. Both found a strong correlation between poverty and informality in the countries.²

3 Empirical specification

The aim of the article is to analyse the relationship between poverty and informal employment in Ecuador. In particular, it aims to address the following questions: does being poor affect the probability of having an informal employment? Is being an informal worker a determinant of poverty? That is, are informality and poverty interrelated? In this framework, informality and poverty are assumed to affect each other in both directions. On the one hand, informal employment affects the poverty status of the household mainly through low earnings. On the other hand, household poverty may be the main reason for a household head to accept informal employment, since they cannot afford being unemployed.

Modeling this inverse relationship is usually challenging. First, the analysis needs to account for the potential endogeneity of household poverty and household head's informal employment status as well as for unobserved factors that may affect these two phenomena simultaneously. Second, focusing the analysis on working individuals raises the problem

¹According to the international standard of 2 USD (PPP) per day.

²To the best of my knowledge, these are the only two studies that have used a simultaneous equations framework to study the relationship between poverty and informality.

of sample selection. Third, poverty is measured at household level while informality, and other human capital variables, are based on individual status. While the later problem is handled by focusing the analysis on a sample of household heads (see Section 4), a simultaneous equations probit model with sample selection is well suited to tackle the first two issues. The model is specified as follows:

$$y_{1i}^* = \gamma_1 y_{2i} + \beta_i X_{1i} + \varepsilon_{1i}, \quad (1)$$

$$y_{2i}^* = \gamma_2 y_{1i} + \beta_i X_{2i} + \varepsilon_{2i}, \quad (2)$$

$$y_{ji} = \mathbb{1}(y_{ji}^* > 0), \quad (3)$$

where y_{1i} is a dummy variable indicating the i^{th} household head's employment status, y_{2i} is a dummy variable indicating the i^{th} household's poverty status, and X_{ji} is a vector of sociodemographic and work-related characteristics of the i^{th} household head, with $j = 1, 2$. This kind of mixed process model is thoroughly discussed in [Maddala \(1983\)](#). The model is estimated as a simultaneous equations probit model using ML methods and it is corrected for sample selection. Corrected standard errors are obtained by bootstrapping (1200 repetitions).

3.1 Explanatory variables

The variables used on the estimation are standard in the literature. In both equations, I control for economic sectors (10 classified according to the UN International Standard Industrial Classification), occupations (9 classified according to the ILO International Standard Classification of Occupations), tenure, tenure squared, gender of the household head, age of the household head, age squared, educational attainment (with primary education as the reference category), number of household members with an informal employment, whether the household is located in an urban area, and geographical region. Equation 1 is identified by the inclusion of dummy variables indicating the size of the firm (with small size as the reference category). Equation 2 is identified by the inclusion of the number of working individuals in the household and a dummy variable indicating the ethnic origin of the household head. Table A.1 in the Appendix, presents the definition for each variable used in the estimation.

The logic behind the use of these variables is as follows: individual characteristics such as the respondent's age and education are found to affect both informality and poverty. More experienced and educated workers are supposed to be more productive and have

access to better paid jobs. Firm and regional characteristics are also important. For instance, smaller firms with limited access to capital markets might be more inclined to hire workers on an informal basis in order to reduce labour-related costs. Industry of activity may also affect the duration of the services. Jobs in construction, tourism, and agricultural sectors are characterized for being of relatively short term. In addition, poverty is mostly concentrated in rural areas which are mainly characterized by agricultural employment.

Finally, household's characteristics such as household size and the number of household members working are also expected to affect the likelihood of poverty and informality. For instance, while poverty increases with household size, it decreases with more household members working. However, with an increasing number of household members working informally, the likelihood of poverty may increase if informal work is coupled with low earnings.

4 Data and descriptive analysis

The data used in this paper is drawn from the Ecuadorian National Living Standards Survey (ECV) 2006 conducted by the Ecuadorian National Institute of Statistics (INEC). The ECV is a cross-sectional survey representative of the Ecuadorian population. The survey collected detailed information on household demographics, health, education, occupations and labour force participation, housing and asset ownership, household food and non-food expenditures, and income.

Affiliation to the national social security system is mandatory for all salaried workers. A registered worker has access to health-care services and retirement benefits. A salaried worker, has also the right to earn at least the minimum wage, be paid for extra hours of work, and to receive mandated benefits (teen salaries and a percentage of utilities at the end of the fiscal year). Since, the social security card constitutes a sufficient proof of labour dependence, it assures employers compliance with all these benefits. On the other hand, it also reduces the chances of employees under-declaration of revenue since the information is cross-validated between the National Revenue Tax Institute, employers, and employees. Hence, our definition of informality is based on the lack of social security coverage. Since this definition applies only to salaried workers, I run separate regressions using self-employment status as an alternative definition of informality. We interpret these results in Section 6.

Studying the relationship between informality and poverty is a difficult task since poverty is measured at household level while informality and other human capital variables, are based on individual status. In order to deal with this problem, I follow the standard practice on the literature, see [Amuedo-Dorantes \(2004\)](#) and [Devicienti et al. \(2009\)](#),

and I base the definition of informality on the formal/informal status of the household head. Thus, I work with a sample of working household heads.

The poverty status of the household is assessed using the index of unsatisfied basic needs or UBN (Necesidades Basicas Insatisfechas or NBI) proposed by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and used as an official measure of poverty in many countries in Latin America, including Ecuador.³ The idea behind this index, is that it can be seen as a proxy for income. Most UBN indices include indicators such as access to clean water, quality of housing, crowding, education level of household head, school attendance, nutrition, and others. All these variables are somehow related with family income, which in most developing countries mostly come from labour. In the case of Ecuador, a household is considered poor if one of the following holds:

- the house is made of irregular/inadequate materials (housing);
- it does not have adequate services such as flush toilet and pipe water (sanitation);
- there is a high dependency ratio with three or more persons per person working and a household head with two or less years of primary school (subsistence capacity);
- there is at least one child between 6 and 12 years who is not attending school (school attendance);
- there are more than three persons per room for sleeping (crowding).

The use of composite index to measure poverty is not free of criticisms. The most obvious problem with the UBN is that the greater the number of indicators used to create the index, the greater the level of poverty is likely to be. Basically, the probability of being poor will be higher if I use five indicators instead of three.

In order to measure the robustness of the estimates, I also present in Section 6 the results using the food share of household expenditure (Engel's coefficient) as a measure of poverty. Engel's law basically implies that poor households spend a greater proportion of their income on food than higher-income households. This negative correlation between expenditure (income) and the food budget share has been verified by cross-sectional data from many countries. The law has also been used by the United Nations (UN) as an indicator of living standards. In this article, I use 0.60 as the poverty threshold. Basically, a coefficient of food above or equal to 0.60 represents poverty. Note that, the mean and median budget share in our dataset are both around 0.52 with a standard deviation of 0.16;

³This indicator has already been calculated by the INEC and the variable is available in the dataset.

thus our measure of poverty is approximately the mean/median value of the population plus half standard deviation, which allows for measurement errors.

Table 1: Poverty measures

	All	Self-employed	Salaried	Salaried formal	Salaried informal
	(1)	(2)	(3)	(4)	(5)
Unsatisfied Basic Needs (%)	45.46	54.60	27.89	18.47	41.07
UBN (% sample)	45.46	35.90	9.55	3.68	5.86
Engel's coefficient (%)	34.18	40.89	21.27	9.67	37.49

Source: author's calculations based on ECV 2006

Table 1 presents the percentage of poor households for different sub-samples and two measures of poverty. As mentioned before, working individuals are divided in salaried and self-employed workers. Salaried workers represent in average 30 per cent of all working individuals, while the 70 per cent left corresponds to self-employed. The first row of the table gives the percentage of poor households with respect to each sub-sample, while the second row presents the same results with respect to the entire sample of workers. For instance, using the UBN indicator around 55 per cent of self-employed workers and 28 per cent of salaried workers are poor (first row, columns 2 and 3). With respect to the whole sample, poor self-employed workers represent 36 per cent of the sample and poor salaried workers represent almost 10 per cent (second row, columns 2 and 3). Together, poor self-employed and salaried workers correspond to 45.5 per cent of the sample. Columns 4 and 5 decompose the results of salaried workers in formal and informal workers. The interpretation of the results is similar as for columns 2 and 3.⁴ Finally, the interpretation for row 3, is similar to row 1.

While it is obvious from these results that poor workers are mostly self-employed, not all self-employed are poor. Indeed, Figure 1 illustrates kernel density estimates of monthly salaried and self-employed earnings (Table 2 reports the corresponding sample means along other descriptive statistics). From this figure, it is easy to see that while, in average, self-employed workers earn less than salaried workers (formal and informal), the two distribution overlap each other. Thus, there is a considerable number of self-employed workers that earn more than some salaried workers.

⁴Note that, in the second row, the proportions showed in columns 2 and 3 add to that of column 1, and those in columns 4 and 5, add to that in column 3.

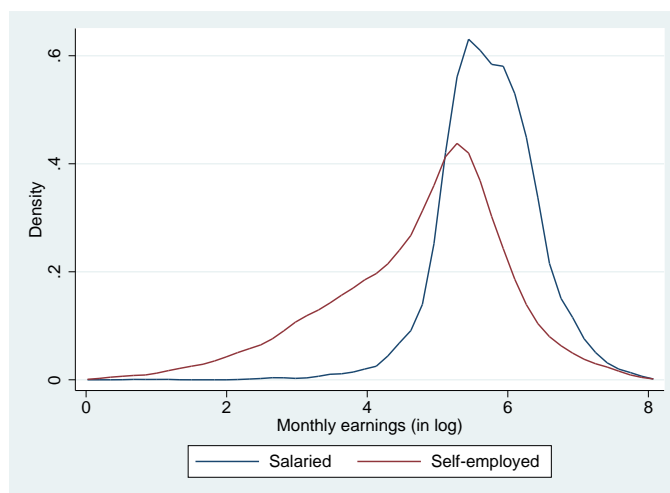
Table 2: Descriptive statistics

Variable	Whole sample		Salaried workers		Salaried formal		Salaried informal		Self-employed	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Monthly earnings	271.35	288.41	384.52	295.20	473.00	319.51	260.85	200.12	212.41	266.43
Remittances (yes=1)	0.08	0.27	0.06	0.23	0.05	0.21	0.07	0.26	0.09	0.28
Hh size	4.14	2.09	3.93	1.82	3.91	1.71	3.96	1.97	4.25	2.21
No. hh members working	1.65	0.80	1.66	0.73	1.67	0.71	1.65	0.76	1.64	0.83
No. hh members working informally	1.49	0.73	1.46	0.66	1.37	0.59	1.58	0.73	1.51	0.76
Living in couple (yes=1)	0.76	0.43	0.79	0.40	0.82	0.39	0.76	0.43	0.75	0.44
Children in hh (yes=1)	0.72	0.45	0.75	0.43	0.75	0.44	0.76	0.43	0.71	0.45
Gender (male=1)	0.83	0.38	0.87	0.34	0.87	0.34	0.86	0.35	0.81	0.39
Age (years)	44.86	14.41	39.82	12.03	41.84	11.95	37.00	11.58	47.48	14.84
<i>Education</i>										
Primary	0.57	0.50	0.33	0.47	0.22	0.42	0.47	0.50	0.70	0.46
Secondary	0.27	0.45	0.37	0.48	0.36	0.48	0.40	0.49	0.22	0.41
Tertiary	0.16	0.36	0.30	0.46	0.42	0.49	0.13	0.34	0.08	0.28
<i>Ethnic origin</i>										
Indigenous	0.10	0.31	0.05	0.23	0.04	0.20	0.07	0.25	0.13	0.34
Mestizo	0.77	0.42	0.81	0.39	0.84	0.36	0.76	0.43	0.75	0.43
White	0.07	0.25	0.07	0.26	0.06	0.24	0.09	0.29	0.07	0.25
Afro-american	0.06	0.24	0.06	0.25	0.05	0.23	0.08	0.27	0.06	0.23
<i>Area of residence (area=1)</i>										
Urban	0.58	0.49	0.77	0.42	0.81	0.39	0.72	0.45	0.47	0.50
North region	0.28	0.45	0.33	0.47	0.35	0.48	0.30	0.46	0.25	0.44
Coast region	0.34	0.47	0.35	0.48	0.31	0.46	0.40	0.49	0.33	0.47
Central region	0.20	0.40	0.17	0.38	0.18	0.38	0.17	0.38	0.22	0.41
South region	0.18	0.38	0.15	0.36	0.17	0.37	0.13	0.34	0.19	0.39
<i>Labour market (selected variables)</i>										
Tenure (years)	17.34	16.25	10.21	9.94	11.87	10.26	7.89	8.99	21.05	17.60
Small firm	0.72	0.45	0.30	0.46	0.08	0.28	0.60	0.49	0.93	0.25
Medium firm	0.09	0.29	0.18	0.38	0.14	0.35	0.22	0.42	0.05	0.21
Large firm	0.19	0.39	0.53	0.50	0.77	0.42	0.18	0.38	0.02	0.14
Agriculture	0.35	0.48	0.11	0.31	0.08	0.27	0.15	0.36	0.47	0.50
Manufacturing	0.10	0.30	0.15	0.36	0.13	0.34	0.19	0.39	0.07	0.26
Construction	0.08	0.28	0.05	0.21	0.02	0.14	0.08	0.28	0.10	0.30
Commerce and trade	0.16	0.37	0.13	0.34	0.10	0.30	0.17	0.38	0.18	0.38
Observations	11,337		3,882		2,263		1,619		7,455	

Notes: Values are proportions between 0-1, unless otherwise specified; income data in USD

Source: author's calculations based on ECV 2006

Figure 1: Monthly earnings



Source: Authors's calculation from ECV 2006

5 Results

Table 3 presents the results from the joint estimation of Equations 1 and 2. Several findings are worth discussing. First of all, the likelihood of having an informal employment is positively linked to household poverty. The results for the correlation coefficient of the error terms are positive and statistically significant showing that the error terms of the equations jointly estimated vary together (see the likelihood ratio test in the Appendix, Table A.2). Second, both the poverty status and the informal employment condition of the household head have a positive and significant effect on the informality and poverty equations, respectively. That is, poor household heads are more likely to work informally and household heads having an informal employment, as wage or salaried employees, are more likely to be poor.

After controlling for unobserved heterogeneity one can see that informal salaried work is less likely among older and tenured household heads. Indeed, experience is of high value in a market where 50 per cent of workers have attained at most primary school. The role of age, education, and residence area are of particularly importance. Younger household heads with tertiary education living in urban areas seem to be more likely to have an informal employment. This result may reflect the difficulties of younger cohorts to find a job in the formal sector, but also the fact that younger and more educated cohorts are more willing to participate in entrepreneurial activities.

Table 3: Simultaneous equation probit coefficients
salaried workers

	Informal employment			Household poverty		
	Coef.	Std. Dev.	Z	Coef.	Std. Dev.	Z
Hh poverty	0.67	0.10	6.60	-	-	-
Informal employment	-	-	-	0.18	0.06	3.18
Medium firm	-0.61	0.10	-6.07	-	-	-
Large firm	-1.27	0.18	-6.90	-	-	-
No. hh members working	-	-	-	-0.38	0.07	-5.42
Ethnic origin (minority=1)	-	-	-	0.36	0.10	3.65
Urban	0.89	0.25	3.52	-1.29	0.24	-5.49
Secondary education	0.29	0.21	1.39	-0.44	0.21	-2.09
Tertiary education	0.70	0.39	1.79	-1.22	0.39	-3.10
Living in couple (yes=1)	-1.12	0.18	-6.25	1.41	0.16	8.62
Age	-0.04	0.02	-2.44	0.07	0.02	4.00
Age ²	0.00	0.00	1.98	0.00	0.00	-4.24
Gender (male=1)	0.24	0.14	1.75	-0.37	0.15	-2.50
Tenure	-0.03	0.01	-2.57	-0.01	0.01	-1.69
Tenure ²	0.00	0.00	1.67	0.00	0.00	0.95
No. hh members working informally	0.18	0.05	3.58	0.31	0.08	3.93
Agriculture	-0.01	0.14	-0.06	0.18	0.13	1.36
Manufacturing	-0.13	0.10	-1.34	0.14	0.10	1.43
Construction	0.29	0.18	1.62	0.27	0.15	1.78
Commerce	-0.11	0.10	-1.11	-0.04	0.10	-0.42
Transportation	0.21	0.12	1.76	-0.04	0.13	-0.28
Public sector	-0.50	0.14	-3.66	0.00	0.12	0.02
Education	-0.43	0.14	-3.06	0.50	0.15	3.43
Professionals	0.12	0.18	0.66	-0.20	0.21	-0.99
Service workers	-0.12	0.10	-1.17	0.10	0.10	0.93
Skilled agricultural workers	-0.18	0.16	-1.09	0.20	0.17	1.15
Craft and related trades workers	0.26	0.11	2.39	-0.06	0.12	-0.46
Plant and machine operators	0.08	0.11	0.72	-0.08	0.11	-0.70
Elementary occupations workers	-0.22	0.11	-1.98	0.25	0.11	2.26
North region	0.01	0.13	0.07	-0.51	0.11	-4.58
Central region	0.13	0.13	1.04	-0.52	0.11	-4.90
South region	0.30	0.15	2.02	-0.82	0.11	-7.61
Rho	-0.69	0.10				

Source: author's calculations

Note: Bootstrapped standard errors. 1,200 repetitions

Similarly, informal salary employment is more frequent in low productivity and income sectors where low-skill workers are in higher demand. This is, for instance, the case of the transportation sector and small firms that may need to reduce labour costs. Indeed, medium and large size firms, compared to small firms, are subject to more institutional control and face the prospect of disciplinary action by the Government. Thus, informal salaried work is less likely to occur there. This fact is also confirmed from the descriptive statistics, 60 per cent of informal salaried work is concentrated in small size firms.

Finally, the regional dummies capture geographical differences and region specific shocks that influence the informality and poverty status of the household. For instance, household poverty is more frequent in the Coast region than in the rest of the country. The coastal region employs low-skilled hand labour for agriculture and fishing, particularly on cacao and banana plantations, rice fields, tuna industries, and shrimp farms. The high dependence on agriculture and fishing and its geographical location makes the region more vulnerable to natural phenomena such as ‘El Niño’, which in turn, increases the incidence of poverty. In addition to this, the economy highly relies on tourism making the labour market more inclined for short-term/seasonal occupations than the rest of the country.

The results from the poverty equation are as expected. Poverty is concentrated in rural areas and among older cohorts and less educated household heads. The feminization of poverty is also evident. Households headed by women are more likely to be in poverty than those headed by males.

Finally, It is also interesting to see how minorities (afro-american and indigenous people) are more likely to be in poverty than mestizos or white people. Ethnic segregation is a common feature of the Ecuadorian labour market. It is stronger when one takes into account that ethnic minorities face pre-market discrimination. They have, in general, limited access to education and health services and are concentrated mainly in rural areas.

In general, informal salaried work seems to be a last resort option for poor (usually less educated) low-skilled workers and a voluntary choice for the more educated and entrepreneurial ones.

6 Robustness checks

6.1 *Self-employed*

The previous analysis focused only on salaried employees, with the definition of informality relaying on whether the firms where these employees work comply with the legislation. However, as mentioned above, salaried workers represent only 30 percent of the working population. The 70 percent left corresponds to self-employed workers.

Since this group of workers is more heterogeneous than the group of salaried workers, as shown in the descriptive statistics, estimating the determinants of self-employment will provide us with a clearer picture of the informal sector in the country.

Table 4 shows the results of the joint estimation of Equations 1 and 2 using the whole sample of workers. The first thing to notice is that similar to the results of the estimations using only salaried workers (specification 1), the correlation coefficient between poverty and informality, defined here as self-employment, is positive and statistically significant, though smaller than the one from the first specification. However, while the coefficient of informal employment is positive and statistically significant in the poverty equation (as in the first specification), the coefficient of the household poverty status in the informal employment equation is not.

Table 6 shows the same results using the food budget share as a second measure of poverty. In general, most estimates are similar to those using the UBN indicator, but in this specification, both poverty status and informal employment condition of the household head have a positive and significant effect on the informality and poverty equations, respectively. This difference in results may simply indicate that the self-employment group is actually constituted by different segments of workers. As noted by Harati (2013), the huge heterogeneity of the informal sector makes both the direction of the relationship between informality and poverty and the effect of each of them on the other ambiguous.

Regarding the rest of controls, similarly to informal salaried work, self-employment seems to be more likely among household heads with tertiary education. This fact, in addition to the positive significant coefficient of tenure, may suggest that more skilled and experienced workers may be more willing to participate in entrepreneurial activities.

As for the sectors of activity, one sees that working in low-income sectors such as agriculture, construction, and transportation increases the probability of self-employment. In fact, this result could have been anticipated from the raw data since 46 per cent of all workers are concentrated in these three industries that, as explained above, are characterized for low productivity and low-income jobs.

It is worth noting that working in the agriculture and fishing sector seems to affect only self-employment and not informal salaried work, contrary to the transportation sector which increases the likelihood of both informal salaried work and self-employment. This may be explained by the seasonal nature of the agricultural sector compared to a more stable demand in the transportation sector.

All in all, these results seem to suggest that informal employment, as salaried work or self-employment, is both a last resource option for low-skilled workers and a voluntary choice for the more educated and entrepreneurial ones. From a policy perspective, this result shows the heterogeneity of the Ecuadorian labour market and the need of public policies targeted to specific groups of workers.

Table 4: Robustness checks: simultaneous equation probit coefficients
all workers

	Self-employment			Household poverty		
	Coef.	Std. Dev.	Z	Coef.	Std. Dev.	Z
Hh poverty	0.10	0.09	1.11	-	-	-
Informal employment	-	-	-	0.08	0.02	4.25
Medium firm	-1.52	0.06	-24.44	-	-	-
Large firm	-2.47	0.08	-29.92	-	-	-
No. hh members working	-	-	-	-0.22	0.04	-5.71
Ethnic origin (minority=1)	-	-	-	0.55	0.05	12.00
Urban	-0.01	0.15	-0.05	-1.47	0.06	-24.34
Secondary education	0.08	0.08	1.00	-0.70	0.04	-17.74
Tertiary education	0.57	0.18	3.21	-1.82	0.09	-20.19
Living in couple (yes=1)	0.18	0.09	2.03	0.67	0.07	9.32
Age	0.04	0.01	3.61	0.00	0.01	-0.07
Age ²	0.00	0.00	-1.77	0.00	0.00	-1.56
Gender (male=1)	-0.42	0.06	-6.69	-0.06	0.06	-1.06
Tenure	0.03	0.00	7.79	-0.01	0.00	-4.33
Tenure ²	0.00	0.00	-3.04	0.00	0.00	5.60
No. hh members working informally	-0.14	0.03	-4.85	0.33	0.04	8.06
Agriculture	0.91	0.10	9.51	0.39	0.07	5.19
Manufacturing	0.10	0.07	1.34	0.06	0.07	0.92
Construction	0.99	0.10	10.39	0.19	0.08	2.42
Commerce	0.29	0.06	5.21	-0.16	0.06	-2.73
Transportation	0.39	0.09	4.41	-0.09	0.08	-1.06
Education	-1.13	0.16	-7.01	0.54	0.13	4.11
Professionals	0.23	0.11	2.13	-0.15	0.17	-0.91
Service workers	0.59	0.08	7.36	0.02	0.09	0.25
Skilled agricultural worker	0.55	0.11	4.84	0.03	0.10	0.32
Craft and related trades workers	0.47	0.09	5.38	-0.01	0.09	-0.06
Plant and machine operators	0.04	0.10	0.43	-0.10	0.09	-1.04
Elementary occupations workers	1.20	0.09	12.96	0.25	0.09	2.87
North region	-0.12	0.07	-1.71	-0.63	0.04	-14.56
Central region	-0.01	0.07	-0.16	-0.65	0.05	-12.89
South region	0.10	0.10	1.00	-0.89	0.05	-17.32
Rho	-0.20	0.09				

Source: author's calculations

Note: Bootstrapped standard errors. 1,200 repetitions

Table 5: Robustness checks: simultaneous equation probit coefficients
salaried workers

	Informal employment			Household poverty		
	Coef.	Std. Dev.	Z	Coef.	Std. Dev.	Z
Hh poverty	0.91	0.08	11.53	-	-	-
Informal employment	-	-	-	0.47	0.13	3.76
Medium firm	-0.33	0.14	-2.37	-	-	-
Large firm	-0.68	0.28	-2.40	-	-	-
No. hh members working	-	-	-	-0.19	0.09	-2.20
Ethnic origin (minority=1)	-	-	-	0.07	0.04	1.69
Urban	0.54	0.19	2.87	-0.58	0.17	-3.44
Secondary education	0.45	0.17	2.71	-0.50	0.15	-3.42
Tertiary education	0.88	0.31	2.85	-1.03	0.27	-3.86
Living in couple (yes=1)	-0.05	0.14	-0.37	-0.04	0.12	-0.34
Age	0.01	0.02	0.79	-0.01	0.01	-0.76
Age ²	0.00	0.00	-1.62	0.00	0.00	1.37
Gender (male=1)	0.23	0.12	1.89	-0.26	0.11	-2.31
Tenure	-0.01	0.01	-0.73	-0.01	0.01	-1.45
Tenure ²	0.00	0.00	-0.02	0.00	0.00	1.61
No. hh members working informally	0.06	0.06	0.95	0.20	0.09	2.23
Agriculture	0.14	0.14	1.07	-0.09	0.12	-0.74
Manufacturing	0.05	0.10	0.52	-0.08	0.10	-0.77
Construction	0.50	0.17	2.92	-0.27	0.14	-1.92
Commerce	0.09	0.11	0.85	-0.18	0.09	-1.98
Transportation	0.07	0.13	0.57	0.03	0.11	0.26
Public sector	-0.05	0.18	-0.27	-0.24	0.14	-1.70
Education	-0.12	0.14	-0.82	0.08	0.14	0.56
Professionals	0.45	0.22	2.06	-0.51	0.22	-2.31
Service workers	-0.47	0.11	-4.18	0.49	0.11	4.66
Skilled agricultural worker	-0.54	0.17	-3.12	0.57	0.16	3.58
Craft and related trades workers	0.07	0.13	0.53	0.05	0.12	0.45
Plant and machine operators	-0.32	0.12	-2.68	0.36	0.11	3.16
Elementary occupations workers	-0.36	0.12	-3.12	0.37	0.11	3.30
North region	0.19	0.13	1.46	-0.39	0.09	-4.48
Central region	0.37	0.14	2.70	-0.53	0.10	-5.28
South region	0.04	0.12	0.30	-0.18	0.09	-1.92
Rho	-0.92	0.07				

Source: author's calculations

Note: Bootstrapped standard errors. 1,200 repetitions

Table 6: Robustness checks: simultaneous equation probit coefficients
all workers

	Informal employment			Household poverty		
	Coef.	Std. Dev.	Z	Coef.	Std. Dev.	Z
Hh poverty	0.21	0.11	1.96	-	-	-
Informal employment	-	-	-	0.19	0.02	10.92
Medium firm	-1.40	0.09	-15.69	-	-	-
Large firm	-2.33	0.14	-16.69	-	-	-
No. hh members working	-	-	-	-0.31	0.04	-8.93
Ethnic origin (minority=1)	-	-	-	0.18	0.03	5.19
Urban	-0.11	0.06	-1.75	-0.17	0.05	-3.86
Secondary education	0.08	0.06	1.40	-0.34	0.04	-9.20
Tertiary education	0.57	0.11	5.19	-0.93	0.07	-13.97
Living in couple (yes=1)	0.31	0.07	4.43	-0.35	0.05	-6.71
Age	0.05	0.01	4.12	-0.04	0.01	-4.99
Age ²	0.00	0.00	-2.50	0.00	0.00	4.11
Gender (male=1)	-0.44	0.06	-7.29	0.16	0.05	3.22
Tenure	0.03	0.00	7.92	-0.01	0.00	-5.06
Tenure ²	0.00	0.00	-3.19	0.00	0.00	5.09
No. hh members working informally	-0.13	0.03	-5.05	0.36	0.04	9.66
Agriculture	0.86	0.10	8.86	0.11	0.06	1.82
Manufacturing	0.11	0.07	1.58	-0.08	0.06	-1.31
Construction	0.97	0.09	10.45	-0.13	0.07	-1.94
Commerce	0.31	0.06	5.36	-0.23	0.05	-4.33
Transportation	0.37	0.09	4.05	-0.03	0.08	-0.41
Education	-1.10	0.15	-7.14	0.42	0.12	3.44
Professionals	0.28	0.11	2.57	-0.40	0.16	-2.56
Service workers	0.50	0.10	4.92	0.30	0.08	3.86
Skilled agricultural worker	0.51	0.12	4.40	0.04	0.09	0.45
Craft and related trades workers	0.41	0.09	4.34	0.14	0.09	1.64
Plant and machine operators	-0.01	0.10	-0.14	0.22	0.09	2.41
Elementary occupations workers	1.10	0.12	9.03	0.26	0.08	3.28
North region	-0.12	0.05	-2.28	-0.22	0.04	-6.00
Central region	0.02	0.07	0.26	-0.41	0.04	-9.76
South region	0.08	0.07	1.20	-0.34	0.04	-7.84
Rho	-0.44	0.10				

Source: author's calculations

Note: Bootstrapped standard errors. 1,200 repetitions

6.2 *Single equation probit*

In the specification used in Section 5, I have controlled for unobserved heterogeneity between Equations 1 and 2 using a simultaneous probit model that allows for error correlation across equations.

In order to verify the validity of the results I also estimate Equations 1 and 2 separately, for both informal salaried workers and self-employed. While these estimates⁵ have different coefficients, their sign and significance level remain similar to the previous estimates, and thus the main conclusion of the paper remains unchanged.

6.3 *Engel's coefficient*

As discussed in Section 4, the use of the UBN indicator to define poverty is not free of criticism. Mainly because the level of poverty measured by the UBN highly depends on the number of variables used to construct the index.

In order to verify the validity of the results I re-estimate Equations 1 and 2 using the Engel's coefficient as a measure of poverty. The estimates, presented in Tables 5 and 6, reinforce again the main conclusion of the paper.

7 Conclusion

This study uses microeconomic data from the Ecuadorian Family Expenditure survey (ECV 2006), to study the determinants of poverty and informality in the country, taking into account the possible simultaneity that exists between these two phenomena. The estimations confirm previous results in the literature that despite of controlling for many relevant variables, informality and poverty are correlated and so this simultaneity should be taken into account when studying them.

Informality is widespread in Ecuador with more than 70 per cent of the labour force lacking social security coverage. In absence of unemployment benefits, workers do not have other choice that to work even if they have to do it informally; in particular when the fraction of non-labour income is small as it is in the country.

In Ecuador, as in many Latin American countries, a high proportion of informal employment is of poor quality. In general, informal workers are found to have a relatively low education and low-pay wages, which supports the idea that these workers have no choice but to work informally. However, the complexity of the informal sector supports the view

⁵Complete estimates available from the author upon request.

of a heterogeneous informal market, where work in the informal sector is both a demanded phenomenon and a voluntary and primarily supply-led form of employment. Basically, informal salaried work and self-employment are both a last resort option for low-skilled workers and a voluntary choice for the more educated and entrepreneurial ones.

From a policy perspective, this result shows the heterogeneity of the Ecuadorian labour market and the need of public policies targeting specific groups of workers, i.e. individuals who would like to have a formal job and those who, for the moment, have no incentive to have one.

The concentration of working poor among those with informal employment requires a wide range of policy interventions. Providing social protection to informal workers is definitely among the first priorities. Informal work in the region is not a new phenomenon. Informality rates in Ecuador have been as high as they are today for decades, despite significant labour reforms, and the reality is that the informal sector is the primary source of employment in the country.

The role of education in reducing the likelihood of poverty is also of great importance, in particular considering the low level of human capital in the country.

Finally, policies aiming to increase fiscal revenues from the higher-paid segment of the informal sector (salary job or self-employment) should be designed in such a way that they also provide incentives for these workers to become formal. Measures to increase the attractiveness of formalization of small enterprises should also be part of these reforms. More than 50 per cent of informal workers are concentrated in small size firms.

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Appendix A

Table A.1: Variables definition

Variable	Definition
Hh poverty	Dummy variable for poverty status of the hh (poor=1)
Informal employment	Dummy variable for informal employment of the hh head (informal=1)
Monthly earnings	Household head's monthly earnings
Remittances	Dummy variable for receiving remittances (yes=1)
No. hh members working	No. of household members working
No. hh members working informally	No. of household members with an informal employment
Living in couple	Dummy variable for married or couples living together
Gender	Dummy variable for gender of the hh head (male=1)
Ethnic origin	Dummy variable for ethnic origin of the hh head (minority =1)
Age	Household head's age in years
<i>Education</i>	
Primary	Dummy variable for completed primary education or less
Secondary	Dummy variable for completed secondary education
Tertiary	Dummy variable for more than completed secondary education
<i>Area of residence</i>	
Urban	Dummy variable for urban residence
North region	Dummy variable for North region residence
Coast region	Dummy variable for Coast region residence
Central region	Dummy variable for Central region residence
South region	Dummy variable for South region residence
<i>Labour market</i>	
Tenure	Years of tenure
Small firm	Dummy variable if the firm has fewer than 10 workers
Medium firm	Dummy variable if the firm has 10-49 workers
Large firm	Dummy variable if the firm has more than 50 workers
Agriculture	Dummy variable for the agriculture and fishing industry
Mining	Dummy variable for the mining industry
Manufacturing	Dummy variable for the manufacturing industry
Construction	Dummy variable for the construction industry
Commerce and trade	Dummy variable for the commerce and trade related services industry
Transportation	Dummy variable for the transportation industry
Public sector	Dummy variable for the public sector
Education	Dummy variable for the education services industry
Professionals	Dummy variable for professionals and technicians
Service workers	Dummy variable for service workers
Skilled agricultural worker	Dummy variable for skilled agricultural workers
Craft and related trades workers	Dummy variable for craft and related trades workers
Plant and machine operators	Dummy variable for plant and machine operators
Elementary occupations workers	Dummy variable for elementary occupations workers

Source: author's definitions

Table A.2: Likelihood-ratio test

Model: Informal salaried workers-NBI	
Likelihood-ratio test	LR $\chi^2(1) = 32.3700$
(Assumption: b nested in a)	$Prob > \chi^2 = 0.0000$
Model: Self-employed-NBI	
Likelihood-ratio test	LR $\chi^2(1) = 4.9300$
(Assumption: b nested in a)	$Prob > \chi^2 = 0.0264$
Model: Informal salaried workers-food budget share	
Likelihood-ratio test	LR $\chi^2(1) = 44.5000$
(Assumption: b nested in a)	$Prob > \chi^2 = 0.0000$
Model: Self-employed-food budget share	
Likelihood-ratio test	LR $\chi^2(1) = 13.6600$
(Assumption: b nested in a)	$Prob > \chi^2 = 0.0002$

Source: author's calculations

Note: b constrained model ($\rho = 0$)