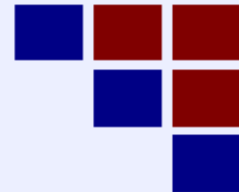




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Individual and structural characteristics of informality in North Lima

by

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First draft (not to quote)

Summary

Using ELHO (PROPOLI/OSEL) and ENAHO (MPTE) data for 2005 we describe the characteristics of informality at individual and family level in both North Lima and the Metropolitan area as a whole.

In order to measure the effects of informality on earnings we test both an OLS regression model and a treatment-effects model, to understand how the decision of being informal influences earnings. We find that there are two channels through which educational levels affect earning: the first augmenting the probability to be informal (or to find an informal job), the second directly influencing earnings once treated the effects of informality. As a consequence, the “mincerian” coefficient becomes significantly lower than in the great majority of studies in literature. We find that individual characteristics that conduct to informality are very important to define earnings.

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Introduction

This paper describes the characteristics of informality at individual and family level in both North Lima and the Metropolitan area as a whole, and it measures how much the decision of being informal influences earnings.

The remainder of the paper is structured as follows.

The first paragraph reviews the literature on informality, highlighting different interpretations and methods of measurement.

The second paragraph presents the database and the variables used.

In the third paragraph a descriptive analysis is conducted, mainly on the working situation and the characteristics of formal and informal workers.

In the fourth paragraph we test the influence of informality on earnings through a treatment-effects model. This model estimates the effects in an earning regression of the “choice” of being informal, where informality is modeled as the outcome of an unobserved latent variable which is a linear function of exogenous covariates (see Barnow et al. 1981; Maddala 1983).

The last paragraph provides a concluding discussion on the main results and policy implications.

1. What’s informality? A brief literature review

Informality started existing as an academic concept when someone noted that urban unemployment was not the right word to describe what was going on in some Third World countries.

In their researches, both the anthropologist Keith Hart in 1971 and the staff of the ILO mission in Kenya in 1972 revealed the presence of a number of small-scale, unregulated economic activities taking place without any governmental control or recognition. These activities involved a consistent part of the population in working age, often constituted of migrants from the rural areas, who did not find a job in the modern sector and at the same time could not afford a condition of permanent unemployment. Although facing a highly heterogenic reality, the final Report of the Kenya mission traced some common characteristics of these activities. It was called “informal” a “way of doing things” in which there are: low barriers of entry in terms of entrepreneurial skills and capital, local inputs, family ownership of the enterprise, small scale of operations, labor-intensive and adapted technology, skills acquired outside the formal school system and unregulated and competitive markets.¹

The very innovation brought up by the Report consisted in shedding a positive light on the Informal Sector (IS). While denouncing the fact that informal workers were largely ignored and sometimes openly opposed by the local Government, the authors stressed their dynamicity, resilience and economic efficiency. The conventional image of miserable, inactive masses at the margins of the society was leaving place to a more complex and constructive viewpoint.

The IS concept took quite a while to receive widespread scientific approval. The difficult task of finding a statistical definition risked many times to undermine its effectiveness. Moreover, since 1972 many disputes had been taking place in the academic arena between different interpretations of the phenomenon. Not only the

¹ Bangasser (2000).

experts were dealing with a vast and vague concept, whose boundaries were far from being defined, but also contrasting explanations were put forward in the attempt of giving the informal worker a precise profile.

In this paper, we will present three of the most influential schools of thought flourished on the topic.

The first, and more official, is headed by the ILO and, consequently, by its Latin America Regional Office, PREALC. Instead of keeping the track of the Kenya mission, the interpretation of the IS went through a complete revision. Taking inspiration from the strong dichotomy between the modern and the traditional sector theorized by Arthur Lewis in 1954, the ILO intends the IS as term of reference for all those activities excluded from the formal sector. Informal activities lose their positive connotations to become mere means for the survival of the poor. This interpretation is called *dualistic* because it sharply splits the economy in two sectors, formal and informal, the latter being anti-cyclical compared to the macroeconomic performance of the country. According to the ILO, the persistence of the IS is due both to a slow rate of economic growth and to a large demographic increase. These two combined factors make the number of jobs created by the formal sector greatly insufficient. ILO's political recommendations suggest a stronger public involvement both in investments and in technical assistance, training and credit openings to small businesses.

Opposite to this school of thought stands the interpretation of a famous Peruvian economist, Hernando De Soto. In his 1989 book, *The other path*, De Soto identifies the cause of the informal sector in the stifling presence of state regulations in the economy. Drawing a parallel to what he calls the "mercantilist phase" of Latin America, De Soto claims that the rich bourgeoisie protect their privileged position preventing anyone else, i.e. the migrants from the rural areas arriving in the cities, to participate legally in the economy. Through state intervention, a burdensome bureaucracy awaits those who intend to operate formally. Migrants, therefore, are forced to become informal. Yet, they put in that condition all their entrepreneurial ability, making informality the people's spontaneous and creative answer to the manipulation of the economic systems operated by powerful lobbies. De Soto's informal workers are depicted as popular heroes, who not only make profit out of their business, but also contribute in a relevant way to the national economy. The economist supports the simplification of administrative procedures and calls for deregulation, removal of state intervention in the economy and opening to foreign competition. Moreover, he believes informality could well represent the "engine of development" for the Latin Americans economies.

A quite similar view of the IS comes from a World Bank economist, William Maloney. As De Soto's, Maloney's attention is focused on the informal employers and their dynamicity. He claims that the IS in less developed contexts is the unregulated equivalent of a small firms sector in advanced countries. In particular, he puts the accent on the voluntary choice of many individuals to operate informally, as the result of a well pondered cost-benefit analysis of the two sectors. Maloney rejects the equation between informality and precariousness, as well as the conception of the IS as a "parking status" for those who are looking for better jobs.

To conclude our brief review of interpretations of the IS, it is worth mentioning the so called *structuralists*. This school of thought was born in the last '80 thanks to the contributions of academics such as Portes, Castells and Haller. It owns its name to the fact that the IS is not conceived as something separate from the modern half of the

society. Instead, it is viewed as an integral part (a structural part) of a country's economy, representing a physiological outcome of a capitalist system. Informality is defined in a neutral fashion, as a series of activities "unregulated by the institutions of society, in a legal and social environment in which similar activities are regulated".² Informal workers and poor do not necessarily coincide. Structuralists' positive contribution lays in their distinction between various components of the IS: poor people fighting for their survival, workers employed informally by large capitalistic firms decentralizing their production or micro-entrepreneurs with a profitable activity which often involves the whole family. Structuralists' policy recommendations suggest more flexibility in the state regulatory system and encourage the efforts of the authorities to transform informal enterprises in a new component of economic development.³

On a more technical ground, many years have passed and various adjustments have been made before reaching an internationally agreed statistical definition of informality. The last and more comprehensive result has been obtained in 2003, during the 17th International Conference of Labor Statisticians (ICLS). The previous definition, adopted by the 15th ICLS in 1993 and very much enterprise-based, has been completed with a new concept, able to capture the job-perspective, so far excluded from any statistics on the IS. Crossing the kind of job (professional status such as employer, independent or dependent worker, etc.) and the type of productive unit in which the job takes place (formal, informal or domestic), the Labor Statisticians have built a matrix that well represent all the possible declinations of informal employment. This recognition is particularly important because it allows an improved understanding and measuring of the phenomenon, bypassing a series of weaknesses emerged with the 1993 approach (i.e. the disregard of all cases in which an individual has more than one job).

Despite this important achievement, measuring informality still raises some problems. In particular, the international comparability among IS surveys is compromised by different data sources, geographic coverage and interpretations of the very definition of informality. What normally occurs is that each study measures informality compatibly with the available data. Unfortunately this brings to disjointed definitions of the phenomenon, which in turn end up in different results.

In this paper, we have the opportunity of analyzing a unique data source referred to the population of three districts of North Lima and based on a LSMS-type household survey committed by the Peruvian Ministry of Labor (MTPE). Thanks to the extensiveness of the questionnaire, we are able to use three distinct definitions of informality based on:

- a **legal** perspective: existence of a signed contract in case of dependent labor, existence of firm registration (RUC) for an employer or and independent worker;
- a **social** perspective: existence of social insurance (i.e. health coverage);⁴
- a **retirement** perspective: existence of a retirement scheme for the worker.

² Portes, Castells, Benton (1989).

³ The following taxonomy is due to Chen (2004). Other scholars used the dichotomy structuralist/liberal in which the first two strands are melted.

⁴ Many studies on the informal sector adopt this criterion, for instance Henley, Arabsheibani, Carneiro (2006) and Merrick (1976) on Belo Horizonte labor market.

2. Data

In this analysis we use two surveys: ELHO 2005 (Encuesta Local de Hogares) and ENAHO 2005 (Encuesta Nacional de Hogares).

They are both household surveys of the LSMS type, they follow the same methodology and use a very similar questionnaire. Their samples are based on the 1999-2000 pre-censo of INEI - Instituto Nacional de Estadística e Informática -, updated with 2003 information on new settlements in some peripheral areas (research made by MTPE).

ELHO 2005 has been conducted by OSEL in the framework of the PROPOLI, a project on labor market in some districts of Lima. ELHO refers to Comas, Puente Piedra and Ventanilla, three districts situated in the *Cono Norte* of Lima. The sample of the survey has involved 1,500 *viviendas*. The total number of *viviendas* was stratified for each district in segments of 5 *viviendas* each and a sample of 300 segments was selected randomly.

In each chosen *vivienda*, all members of the household provided their basic information (mainly demographical), while only people aged more than 13 years were directly interviewed. The number of interviews to this latter group (population of working age) has resulted in 4,861.

ENAHO 2005 has been conducted by MTPE, according to the typical method of MTPE-ENAHO surveys, in the Province of Lima, the Constitutional Province of Callao and in 25 more Peruvian cities. For each town the sample is independent.

In this paper we only refer to Metropolitan Lima (Lima Province and Callao). In total were collected 8,249 individual interviews.

Adopting the usual methodology, from the original questionnaire-based data MTPE constructed some basic variables on income, educational level and working conditions. In annex A the questionnaire is reported. Annex B explains in detail the definition of these variables.⁵

Using MTPE basic variables, we added some new variables on educational aspects (years of study, level of study of the parents), working experience and condition of formality/informality (according to the three definitions reported in the introduction) for both private and public workers.

Table 1 contains the description of the variables retained in the analysis, divided into numerical, ordinal and dummy variables.

⁵ Annexes are available on request contacting the authors by mail. The questionnaire is only available in Spanish.

Table 1 – ELHO: Description of the main variables used

Variable	Label	n°(*)	Min	Max	Mean	S.D.
Numerical variables						
r11h	Working hours	4,847	0	120	31.04	32.18
r6	Total income (soles per month)	4,847	0	14973.1	403.45	685.57
IHT	Earnings per hour (soles)	2,691	0	199.6	14.60	16.11
AEOA	Duration of present job (years)	2,694	0.08	50	5.87	7.10
Exp	Working experience (years)	4,847	0	92	18.59	16.36
study_y	Schooling years	4,847	0	16	10.03	3.34
EDAD	Age (years)	4,847	14	98	34.58	15.39
Ordinal variables						
r2r	Aggregated educational level	4,847	1	5	3.12	0.83
r3	Condition of activities	4,847	1	3	1.83	0.95
r13r	Employment level	4,847	1	6	4.80	1.29
r13r1	Employment conditions	2,986	1	3	2.31	0.64
r5r2	Aggregated activities of main occupation	2,694	1	6	3.99	1.25
r8r1	Employment categories	2,694	1	7	3.82	1.52
CONACT	Attitude towards labor market	4,847	1	3	1.83	0.95
ED_classi	Age divided by classes	4,847	1	4	1.87	0.90
Tipo_occ	Kind of job	2,694	1	4	2.58	0.66
Newnivel	Educational level	4,847	1	5	2.70	0.91
Distrab	Working district	4,847	1	99	78.40	39.02
Dummy variables						
AP	Working in the public sector	4,847	0	1	0.03	0.18
EP	Working in the private sector	4,847	0	1	0.24	0.43
EINF	Informal entrepreneur (legal approach)	152	0	1	0.55	0.50
IINF	Informal independent worker (legal approach)	951	0	1	0.90	0.30
DEPINF	Informal dependent worker (legal approach)	1,478	0	1	0.55	0.50
TFNR	Unpaid domestic worker (legal approach)	113	1	1	1.00	0.00
EINF_S	Informal entrepreneur (social approach)	152	0	1	0.87	0.34
IINF_S	Informal independent worker (social approach)	951	0	1	0.92	0.27
DEPINF_S	Informal dependent worker (social approach)	1,478	0	1	0.65	0.48
TFNR_S	Unpaid domestic worker (social approach)	113	0	1	0.96	0.19
EINF_P	Informal entrepreneur (retirement approach)	152	0	1	0.93	0.25
IINF_P	Informal independent worker (retirement approach)	951	0	1	0.97	0.17
DEPINF_P	Informal dependent worker (retirement approach)	1,478	0	1	0.71	0.46
TFNR_P	Unpaid domestic worker (retirement approach)	113	0	1	0.99	0.09
INF	Informality (legal approach)	2,694	0	1	0.69	0.46
INF_S	Informality (social approach)	2,694	0	1	0.77	0.42
INF_P	Informality (retirement approach)	2,694	0	1	0.82	0.38
AFF	Other formal in the family (legal approach)	2,694	0	1	0.31	0.46
AFF_P	Other formal in the family (social approach)	2,694	0	1	0.22	0.42
AFF_S	Other formal in the family (retirement approach)	2,694	0	1	0.18	0.38
Father_h	Father's high educational level	4,575	0	1	0.08	0.27
Father_m	Father's medium educational level	4,575	0	1	0.63	0.48
Father_l	Father's low educational level	4,575	0	1	0.29	0.45
Mother_h	Mother's high educational level	4,608	0	1	0.04	0.21
Mother_m	Mother's medium educational level	4,608	0	1	0.55	0.50
Mother_l	Mother's low educational level	4,608	0	1	0.40	0.49
Sexo	Sex	4,847	1	2	1.52	0.50
sintit	Sin titulo	4,847	0	1	0.08	0.27
primaria	titulo de primaria	4,847	0	1	0.32	0.47
secundaria	titulo de secundaria	4,847	0	1	0.47	0.50
Sup_no_uni_compl	Superior no Universitaria completa	4,847	0	1	0.08	0.27
Sup_uni_compl	Superior Universitaria completa	4,847	0	1	0.05	0.22

(*) We have filtered out 14 cases from the total 4.861 because of statistical incoherencies.

3. Descriptive analysis

3.1 General features

According to 2003 updated information on Comas, Puente Piedra and Ventanilla, their total population is of about 933 thousand inhabitants (table 1). 672 thousand (72%) is the Population in Working Age (in Spanish acronym PET). The participation rate is about 62% (see table 2 and figure 1) of the PET, the unemployment rate is about 10% of the PEA (Spanish acronym for Working Population).

The figures are similar for Metropolitan Lima, where the participation rate is of about 63% and the unemployment rate is 11% (see figure 2).

Between labor markets of North Lima and Metropolitan there is a major difference in the share of underemployed. In Metropolitan Lima the share of underemployment on employment is around 46%, while in the three districts of North Lima this figure grows to 53%. This is the first main sign of the weakness of labor market in North Lima vs. the whole Metropolitan area.

3.2 Informality

According to MTPE data for the period 1990-2004, informality is a growing phenomenon in Metropolitan Lima (see table 5). In fifteen years (1990-2004) the share of informal workers on the total employed population has grown of 5 percentage points, exceeding 60%. The figures reported in table 5 are estimated according to the definition of informality given by MTPE (see notes in table 5).

As already mentioned in the first paragraph, our way of defining informality is different. We adopt three approaches:

- a **legal** definition: the non existence of a signed contract in case of dependent labor, or the non existence of firm registration (RUC) for an employer or and independent worker;
- a **social** definition: the non existence of social insurance (i.e. health coverage);
- a **retirement** definition: the non existence of a retirement scheme for the worker.

In figure 3, we show the large overlapping occurred in Lima Norte between the three definitions. In general, we use the legal as our basic approach; the others are analyzed to show some possible discrepancies with the first one.

As regards Metropolitan Lima, from our analysis emerges that in 2005 informal workers -according to the legal approach- are slightly less than those registered by the MTPE in 2004 (59.2% vs. 62.3%, in table 6b and 5 respectively). The situation reverses if we compare the MTPE percentage with the numbers obtained from the social and the retirement approaches. In these cases, informality reaches an impressive size: 67.6% and 73.2% of the working population respectively.

Confronting Metropolitan Lima with North Lima, the share of informal workers is considerably higher in the latter: 67.1% for the legal definition; 75.8% and 81% for the other two definitions (table 6a).

There are gender differences, with some divergence from one definition to another. In Lima Norte, while for the legal definition women are less informal than

men, the result overturns adopting the social approach. This diversity, though quite relevant in Lima Norte, is less accentuated in the Metropolitan area (see table 6).

Informality is definitely common among independent workers and, by definition, among non remunerated family workers (in Spanish acronym TFNR). In Lima Norte about 90% of independent workers are informal. This quantity is only slightly lower in Metropolitan Lima. Gender differences in the level of informality for independent workers do not seem relevant.

Among the employers, women choose formality much more than men (in Lima Norte only 37.5% female employers are informal, against a share of 55.3% male employers: table 6a). This seems to be a peculiar characteristic of the districts of Lima Norte and it does not emerge in the results concerning the whole Metropolitan area.

3.3 Educational level and informality

Schooling represents a key element to understand the working situation of individuals (table 7), the kind of job they choose or are able to find (table 8) and their formal/informal situation (table 9).

The educational level is defined as an ordinal variable that classifies people as having no qualifications at all (*sin titulo*) or having completed either the primary school (*titulo de primaria*), or the secondary school (*titulo de secundaria*) or a post secondary degree, from technical/professional institutions (*superior no universitaria*) or universities (*superior universitaria*).

This variable is clearly related to the opportunity to find a proper job. Only the 32.5% of “sin titulo” individuals have an adequate job in Lima Norte. The share of people with adequate occupation more than doubles (72.9%) among those who have obtained a university degree. The same relation holds both for men and women.

The effects of the educational level on job quality are even clearer in Metropolitan Lima. In this case, the share of people with an adequate job is only 23.8% among those with no academic qualifications, while it rises to 79.4% for individuals with a university degree (see table 7 and figure 4). On the contrary, the percentage of underemployed workers is inversely proportional to the level of instruction received: in Lima Norte 58% are “sin titulo” and 21% attended post secondary courses; in Metropolitan Lima the numbers are 66% and 21% respectively.

In general, both in Lima Norte and Metropolitan Lima women are slightly more underemployed than men.

Different educational level also imply different choices in the kind of job. People with little schooling have a higher probability to become non remunerated family workers or to chose an independent occupation (table 8). Dependent workers are generally requested to have an instruction at least above the primary school. This holds both for Lima Norte and the Metropolitan area.

Lastly, the educational level definitely affects the choice (or the opportunity) of being formal. As illustrated in table 9b, the 87% of workers with no qualifications are informal. The percentage lowers to 19% for those with a university degree. These estimates are related to Lima Norte, but the same inverse relation between informality and schooling has proved to be strong also in Metropolitan Lima.

3.4 Informality, earnings and other characteristics

Informality negatively affects earnings. The total monthly income of informal workers is roughly half that of formal workers in Lima Norte and only 40% that of formal workers in Metropolitan Lima (see table 10). If we refer to earnings per worked hour, these differences are maintained. In Lima Norte informal workers gain per hour less than 50% of what formal workers earn; in Metropolitan Lima they are paid only 40% of the hourly wage of an individual formally employed.

In figure 5 we report the density distribution of both wage per hour (figure 5a) and total monthly earnings (figure 5b) of formal and informal workers in Lima Norte. The information provided by the two distributions is similar.

Table 10 shows some other characteristics of informal workers versus formal ones. What follows is a synthetic recapitulation:

- the opportunity to find a formal job is higher if other members of the family have a formal job (bandwagon effect) or if both parents have a high educational level (a third cycle degree);
- formal workers are more educated (an average difference of two schooling years between formal and informal workers)
- differences in average age and working experience are scarcely relevant;
- job stability (measured in years of duration of present occupation) seems higher for formal workers;
- concerning the above characteristics, there are minor differences between Lima Norte and Metropolitan Lima.

4. A treatment-effects regression model of informality on earnings

In order to measure the influence of informality on earnings we tested two models.

The first is an OLS earnings regression on the population of private workers, where the effects of informality are measured controlling for a dummy that classifies workers as formal or informal. Informal private workers (variable INF_PRI) are defined selecting out the non remunerated family workers (with zero earnings by definition) and public workers (who are almost totally formal). We operated this selection because we believe that private and public workers have different characteristics.

The second model is a treatment-effects model estimating the effects of choosing informality in an earning regression, where the decision of being informal is modeled as the outcome of an unobserved latent variable, which is a linear function of exogenous covariates (Barnow et al. 1981; Maddala 1983).

The regression function is then:

$$y_i = x_i \beta + \delta z_i + \varepsilon_i$$

where z_i is an endogenous variable indicating whether the treatment is assigned. The decision to obtain the treatment z_i (in our case the character of “informality”) is modeled

as the outcome of the unobserved variable z_i^* measured by the following probit model on exogenous covariates w_i :

$$z_i = x_i \gamma + u_i$$

with observed decision:

$$z_i = \begin{cases} 1 & \text{if } z_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

We used this second model because most of the characteristics that influence earnings have a prior influence on the probability to choose or obtain an informal job. So the second model will help us to understand:

- how these variables affect earnings both indirectly (through the choice to be informal) and directly;
- how coefficients (and in particular the mincerian coefficient connected to the schooling years) change if we control for the probability to be informal.

4.1 OLS earnings regressions

The results for the first model, the OLS earnings regression, are reported in table 11, both for Lima Norte and Metropolitan Lima.

The results are as expected:

- schooling years have a positive effect on earnings (earnings are measured as log of wage per hour) – the mincerian coefficient is 5.4% in Lima Norte and a higher 8.3% in Lima Metropolitana;
- the variable “years of experience” and its quadratic form, EXPQUAD, have the expected signs;
- the educational levels of the father and the mother (that we use as a proxy of other non-educational skills linked to family context) both matter; the coefficient is particularly high for the variable “mother high level of education”. Unfortunately we don’t have the same information for Metropolitan Lima;
- men have higher earnings than women, once controlled for other characteristics (the coefficient associated to the variable SEXO: =1(male), =2 (female), is negative);
- informality lowers earnings; the effect appears to be greater in Metropolitan Lima than in Lima Norte;
- there are other interesting differences between Lima Norte and Lima Metropolitana: first, as noted, the mincerian coefficient is higher in the Metropolitan labor market than in the Cono Norte; secondly, gender differences in earnings seem smaller in Metropolitan labor market than in Lima Norte.

4.2 Treatment-effects model of earnings

The results for the treatment-effects model on earnings are reported in table 12.

The first interesting result is that educational level strongly affects the probability to be informal. Low qualifications (*sin titulo, titulo de primaria, titulo de secundaria*) have a positive coefficient in the probit model on informality.

As a consequence, we have two channels through which educational levels influence earnings. The first, indirect, acts through the much higher probability to be informal; the second, direct, through a positive effect of schooling years on earnings, once controlled for informality. The mincerian coefficient in the earning regression of the treatment-effects model is much lower than that of the OLS model, because part of the effect is captured by the condition of informality (0.035 against 0.054). On the contrary, the coefficient associated to informality more than doubles compared to the OLS model (-.91 against -.39).

Age is negatively correlated with the probability to be informal (the coefficient is negative but low, as expected).

Similar results hold also for Metropolitan Lima.

Women seem to be less oriented to informality once controlled for educational and age variables. Probably this is due to a participation effect. Many women who do not take part in the labor market would have chosen (or would have been obliged to choose) an informal job in case of participation. How to manage this selection bias is an open problem at this stage of the analysis. In the equation for Lima Metropolitana (table 12b) the variable sex in the probit equation does not emerge as significant, stressing an interesting difference between labor market condition in Metropolitan and Cono Norte areas.

The Wald test rejects the null hypothesis of independence between the probit and the earnings regression in the treatment-effects model. The value of ρ (coefficient of correlation between ε and u) is .46 and .66 for Lima Norte and Metropolitan Lima respectively.

5. Conclusions

The main results of our exercise are:

- educational level affects earning through two different channels: augmenting the probability to be informal (or to find an informal job) and directly influencing earnings once treated the effects of informality;
- as a consequence of this two-channels effect, the “mincerian” coefficient in the Treatment-effects model becomes significantly lower than in the great majority of studies in literature;
- informality affects earnings very strongly, confirming what emerged in the descriptive analysis.

Yet, it is possible to continue with further analysis. First of all, it would be interesting to take in consideration within a similar model the participation effect for women in labor market. The rate of participation could reasonably hide a selection bias about the choice of informality.

Secondly, the analysis could be expanded running the same model for two different populations of workers: independent workers (mostly informal) and

employers/dependent workers. In fact, these two sub-populations show different characteristics in the dimension of informality and in educational levels.

A third possible way to widen the analysis is to run two different regressions for formal workers and informal ones. After using an Heckman model to control for the bias in the selection, we would obtain different coefficients of the regression for the two populations. In the model presented in this paper, the whole information on the effects of informality is summarized in the coefficient associated with the variable generated by the model itself. Yet, some results of the descriptive analysis suggest that other variables (family context, working experience and schooling years) could influence the two populations in different ways.

Table 2 – Total population by sex and age (in classes), Lima Norte, 2005

		Sex		Total
		Male	Female	
Age divided by classes	from 1 to 13 years	132,110	126,685	258,795
	from 14 to 29 years	139,393	144,153	283,546
	from 30 to 44 years	107,179	109,572	216,751
	from 45 to 64 years	66,223	67,757	133,980
	65 years or more	20,162	19,917	40,079
Total		465,067	468,084	933,151

Figure 1 – Disaggregated population in working age (PET), Lima Norte, 2005

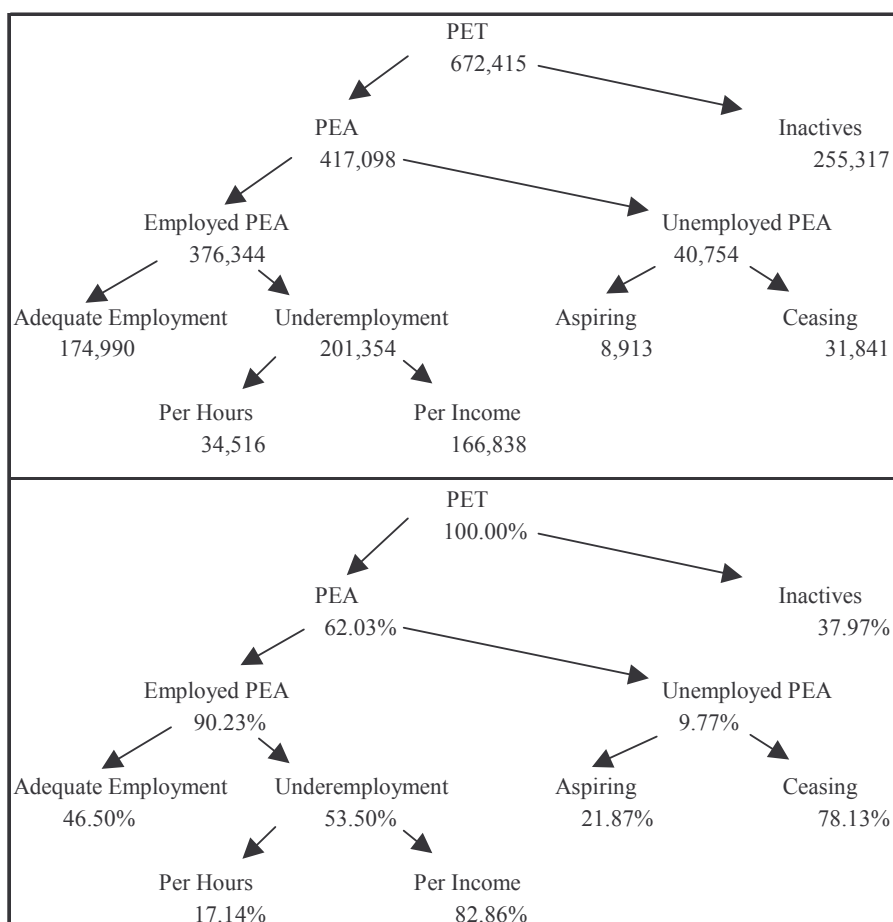


Table 3 – Population in working age (PET) by age (in classes), Lima Norte, 2005

		Employed PEA	Unemployed PEA	Out of PEA	Total
from 14 to 29 years	n°	127,755	22,502	130,305	280,562
	%	45.54%	8.02%	46.44%	100.00%
from 30 to 44 years	n°	158,002	13,061	46,731	217,793
	%	72.55%	6.00%	21.46%	100.00%
from 45 to 64 years	n°	82,619	4,533	47,638	134,789
	%	61.29%	3.36%	35.34%	100.00%
65 years or more	n°	7,968	659	30,643	39,270
	%	20.29%	1.68%	78.03%	100.00%
Total	n°	376,344	40,754	255,317	672,415
	%	55.97%	6.06%	37.97%	100.00%

Figure 2 – Disaggregated population in working age (PET), Lima Metropolitana, 2005

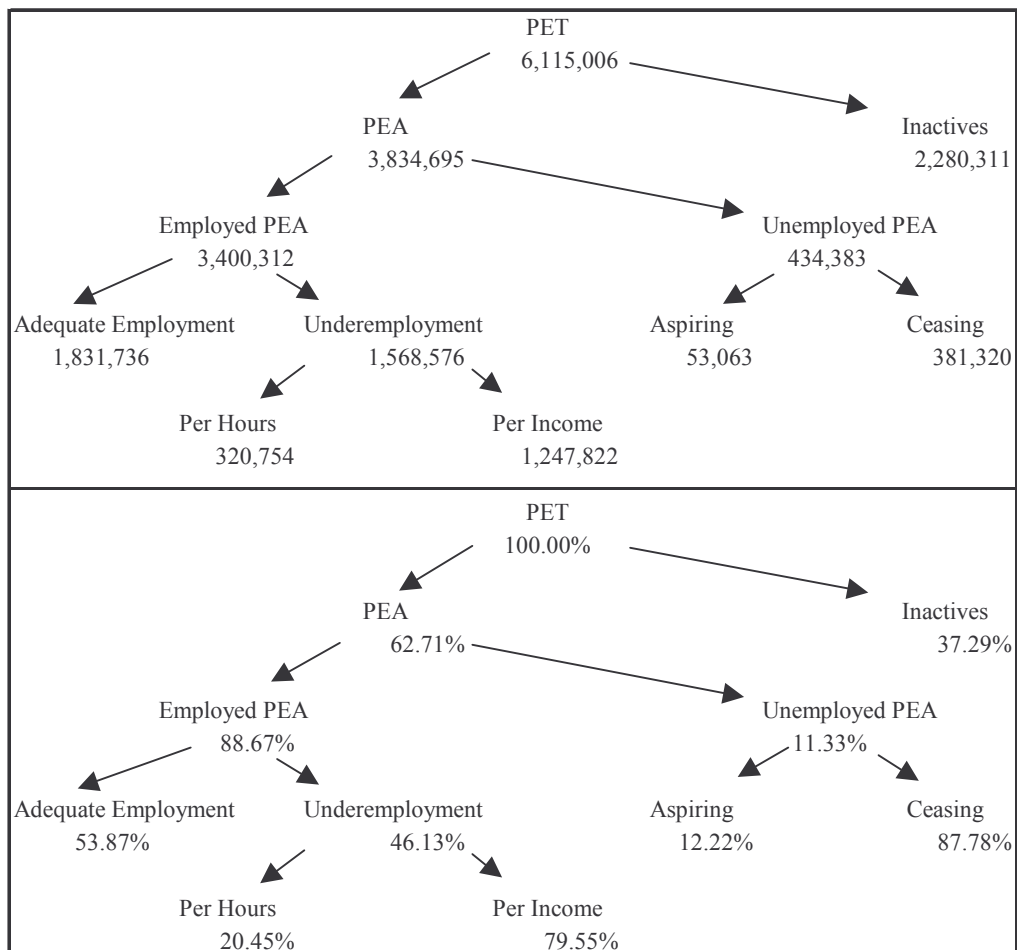


Table 4 – Population in working age (PET) by age (in classes), Lima Metropolitana, 2005

		Employed PEA	Unemployed PEA	Inactive Population	Total
from 14 to 29 years	n°	1,169,123	249,764	1,174,456	2,593,343
	%	45.08%	9.63%	45.29%	100.00%
from 30 to 44 years	n°	1,424,176	127,481	314,517	1,866,174
	%	76.32%	6.83%	16.85%	100.00%
from 45 to 64 years	n°	715,559	48,843	388,946	1,153,348
	%	62.04%	4.23%	33.72%	100.00%
65 years or more	n°	91,454	8,295	402,392	502,141
	%	18.21%	1.65%	80.14%	100.00%
Total	n°	3,400,312	434,383	2,280,311	6,115,006
	%	55.61%	7.10%	37.29%	100.00%

Table 5 – Share of informal workers in PEA, Lima Metropolitana, 1990 - 2004 (% values)

	1990	1995	2000	2004
SECTOR FORMAL (1)	42.9	38.6	37.4	37.7
SECTOR INFORMAL (2)	57.1	61.4	62.6	62.3

Sources: MTPE, Encuesta de Niveles de Empleo 1990 - 1996; Convenio MTPE-INEI, Encuesta Nacional de Hogares III Trimestre 1997-2001; MTPE, Encuesta de Hogares Especializada de Niveles de Empleo 2002 y 2004.

Elaborated by MTPE - Programa de Estadísticas y Estudios Laborales.

Technical notes:

- (1) It includes the public sector, small firms from 10 to 49 employees, medium and large firms of the private sector with 50 employees or more and the independent professionals
- (2) It includes micro firms (from 2 to 9 employees), the independent workers (not professionals), the unpaid family workers and all the rest (traineeship contracts, apprenticeship, etc).

Figure 3 – Pie chart for the three definitions of informality, Lima Norte, 2005

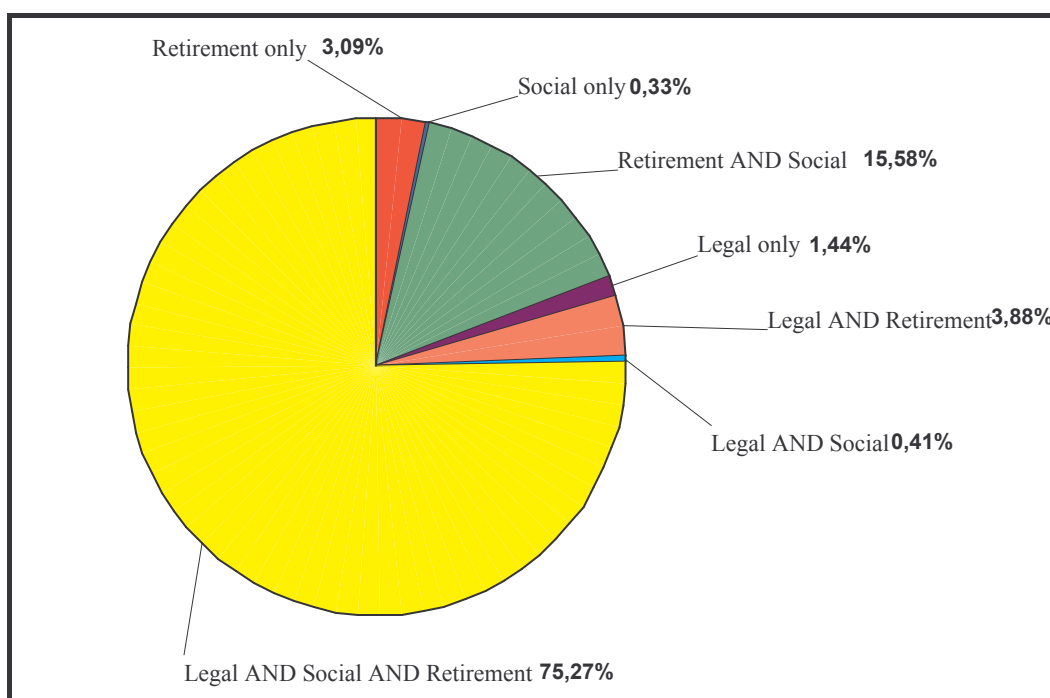


Table 6 – Level of informality (for the three definitions) by kind of job, Lima Norte and Lima Metropolitana, 2005

	Employer	Independent worker	Dependent worker	Non remunerated family workers (TFNR)	Total
a) Area OSEL – Lima Norte					
% informal workers (legal)	51.9	89.5	52.3	100.0	67.1
% informal workers (social)	87.3	92.0	62.7	97.4	75.8
% informal workers (retirement)	92.7	96.7	68.5	98.8	81.0
Men					
% informal workers (legal)	55.3	89.5	58.3	100.0	69.2
% informal workers (social)	85.3	92.8	61.6	98.2	74.5
% informal workers (retirement)	92.8	96.3	66.8	96.9	79.2
Women					
% informal workers (legal)	37.5	89.4	41.4	100.0	63.6
% informal workers (social)	95.4	91.0	64.9	96.8	78.0
% informal workers (retirement)	92.2	97.2	71.5	100.0	83.9
b) Lima Metropolitana					
% informal workers (legal)	39.2	85.9	43.4	100.0	59.2
% informal workers (social)	71.3	86.9	55.2	88.8	67.6
% informal workers (retirement)	84.1	95.6	58.2	98.7	73.2
Men					
% informal workers (legal)	38.8	83.9	47.8	100.0	59.5
% informal workers (social)	71.7	91.3	53.1	92.4	67.2
% informal workers (retirement)	83.0	94.9	55.1	98.7	70.5
Women					
% informal workers (legal)	40.5	88.8	37.3	100.0	58.1
% informal workers (social)	69.9	80.9	58.1	87.7	67.7
% informal workers (retirement)	87.8	96.6	62.5	98.7	76.5

Table 7 -Working situation by educational level and sex, Lima Norte and Lima Metropolitana, 2005

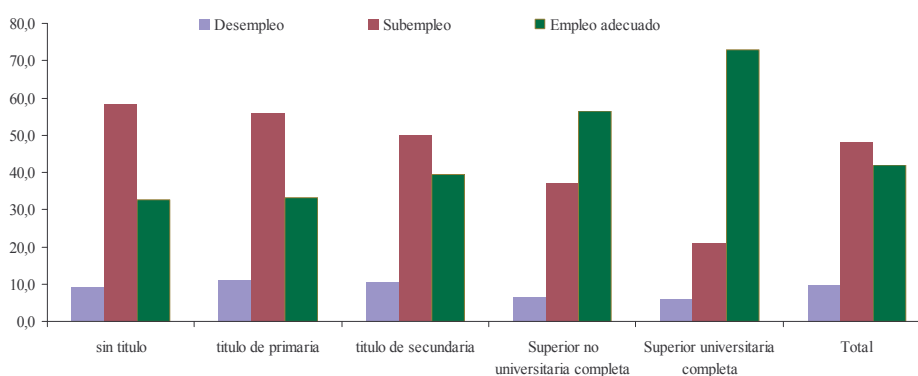
(% values)	Unemployed	Underemployed	Adequately Employed	Total
a) area OSEL- Lima Norte				
Sin título	9.1	58.4	32.5	100.0
Título de primaria	11.0	55.9	33.1	100.0
Título de secundaria	10.5	50.0	39.5	100.0
Superior no universitaria completa	6.6	37.1	56.4	100.0
Superior universitaria completa	5.9	21.1	72.9	100.0
Total	9.8	48.3	42.0	100.0
Men				
Sin título	7.8	54.7	37.5	100.0
Título de primaria	9.5	50.9	39.6	100.0
Título de secundaria	9.1	44.5	46.4	100.0
Superior no universitaria completa	3.4	29.7	66.9	100.0
Superior universitaria completa	3.7	15.9	80.4	100.0
Total	8.2	43.2	48.6	100.0
Women				
Sin título	10.5	62.0	27.5	100.0
Título de primaria	13.3	63.7	23.0	100.0
Título de secundaria	13.3	60.1	26.6	100.0
Superior no universitaria completa	10.1	45.4	44.5	100.0
Superior universitaria completa	8.3	26.8	64.9	100.0
Total	12.2	56.1	31.7	100.0
b) Lima Metropolitana				
Sin título	10.2	66.1	23.8	100.0
Título de primaria	11.7	53.2	35.0	100.0
Título de secundaria	12.9	44.1	43.0	100.0
Superior no universitaria completa	11.2	28.1	60.7	100.0
Superior universitaria completa	5.2	15.4	79.4	100.0
Total	11.3	40.9	47.8	100.0
Men				
Sin título	13.6	58.6	27.8	100.0
Título de primaria	10.6	50.1	39.2	100.0
Título de secundaria	10.9	40.2	49.0	100.0
Superior no universitaria completa	8.8	21.6	69.6	100.0
Superior universitaria completa	2.9	14.0	83.1	100.0
Total	9.6	36.8	53.6	100.0
Women				
Sin título	8.2	70.4	21.4	100.0
Título de primaria	13.1	57.2	29.6	100.0
Título de secundaria	16.0	49.7	34.4	100.0
Superior no universitaria completa	14.1	36.1	49.8	100.0
Superior universitaria completa	8.1	17.3	74.6	100.0
Total	13.6	46.3	40.1	100.0

Table 8 - Educational level by kind of job, Lima Norte and Lima Metropolitana, 2005 (% values)

Kind of job Educational level	Entrepreneur	Independent worker	Dependent worker	Non remunerated family worker	Total
	a) Area OSEL – Lima Norte				
Sin titulo	2.8	10.5	3.3	8.6	6.0
Titulo de primaria	25.2	26.2	18.9	33.4	22.4
Titulo de secundaria	53.0	51.1	52.8	50.2	52.1
Superior no universitaria completa	13.9	8.6	14.5	5.8	12.1
Superior universitaria completa	5.0	3.5	10.5	1.9	7.4
Total	100.0	100.0	100.0	100.0	100.0
b) Lima Metropolitana					
Sin titulo	2.7	8.2	3.1	9.3	4.9
Titulo de primaria	12.7	24.3	13.3	30.2	17.4
Titulo de secundaria	53.4	52.1	50.0	53.1	51.0
Superior no universitaria completa	11.2	8.3	15.0	4.3	12.3
Superior universitaria completa	20.0	7.1	18.7	3.1	14.5
Total	100.0	100.0	100.0	100.0	100.0

Figure 4 - Working situation by educational level, Lima Norte and Lima Metropolitana (% values)

a) Area OSEL – Lima Norte



b) Lima metropolitana

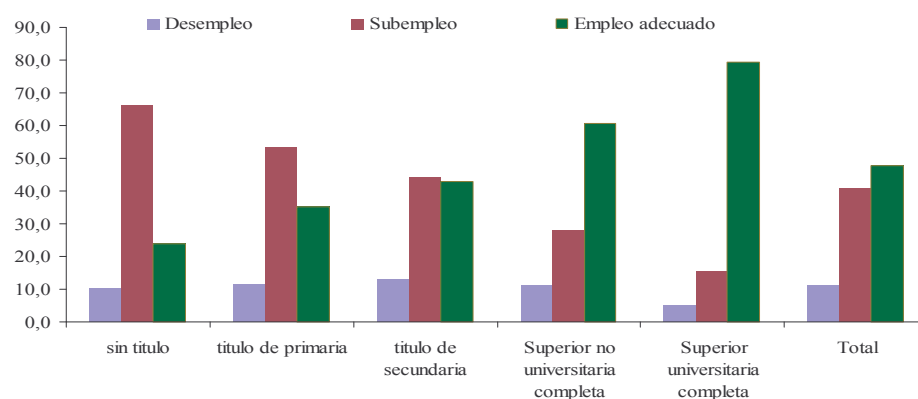


Table 9 - Educational level of formal and informal workers (legal approach), Lima Norte and Lima Metropolitana, 2005

9.1- Column percentage values

	Formal Workers	Informal Workers	Totale
a) Area OSEL – Lima Norte			
Sin título	2.4	7.8	6.0
Título de primaria	13.4	26.8	22.4
Título de secundaria	44.9	55.6	52.1
Superior no universitaria completa	21.2	7.7	12.1
Superior universitaria completa	18.1	2.1	7.3
Total	100.0	100.0	100.0
b) Lima Metropolitana			
Sin título	2.8	6.3	4.9
Título de primaria	9.9	22.6	17.4
Título de secundaria	39.3	59.1	51.0
Superior no universitaria completa	17.9	8.3	12.3
Superior universitaria completa	30.1	3.6	14.5
Total	100.0	100.0	100.0

9.2 - Row percentage values

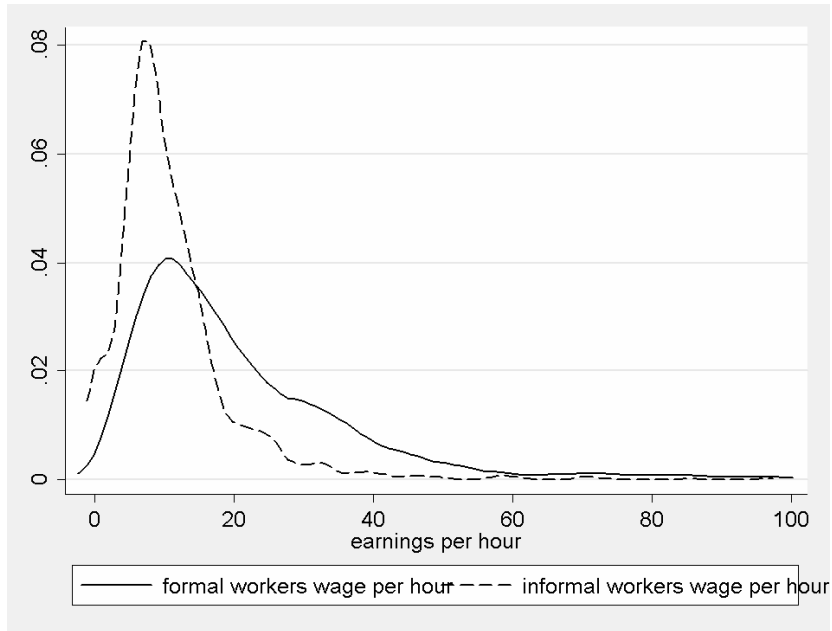
	Formal Workers	Informal Workers	Total
a) Area OSEL – Lima Norte			
Sin título	13.1	86.9	100.0
Título de primaria	19.7	80.3	100.0
Título de secundaria	28.4	71.6	100.0
Superior no universitaria completa	57.5	42.5	100.0
Superior universitaria completa	81.3	18.7	100.0
Total	32.9	67.1	100.0
b) Lima metropolitana			
Sin título	23.7	76.3	100.0
Título de primaria	23.4	76.6	100.0
Título de secundaria	31.7	68.3	100.0
Superior no universitaria completa	60.0	40.0	100.0
Superior universitaria completa	85.3	14.7	100.0
Total	41.1	58.9	100.0

Table 10 – Individual and family characteristics of informal workers (legal definition), Lima Norte and Lima Metropolitana, 2005

	Formal Workers	Informal Workers	Total
a) Area OSEL – Lima Norte			
N° of cases	123,995	252,349	376,344
Presence of another “formal” worker in the family (legal approach, %)	45.0	26.3	32.5
Presence of another “formal” worker in the family (social approach, %)	50.0	15.4	23.7
Age (years)	36.7	35.7	36.0
Working experience (years)	18.5	19.7	19.3
Schooling years	12.1	10.0	10.7
Monthly earnings (soles)	1185	558	765
Earnings per hour (soles)	23.5	11.4	15.4
Father’s high educational level (%)	10.9	4.1	6.4
Mother’s high educational level (%)	5.9	2.4	3.5
Duration of present job (years)	6.8	5.5	5.9
b) Lima Metropolitana			
N° of cases	1,396,732	2,003,580	3,400,312
Presence of another “formal” worker in the family (legal approach, %)	51.3	34.2	39.7
Presence of another “formal” worker in the family (social approach, %)	52.4	20.9	31.1
Age (years)	37.9	35.1	36.2
Working experience (years)	19.2	18.7	18.9
Schooling years	12.8	10.4	11.4
Monthly earnings (soles)	1477	536	922
Earnings per hour (soles)	30.0	12.3	19.6
Father’s high educational level (%)	--	--	--
Mother’s high educational level (%)	--	--	--
Duration of present job (years)	7.5	5.4	6.2

Figure 5 – Wage per Hour and Total monthly Income, formal versus informal workers, Lima Norte, 2005

a) wage



b) income

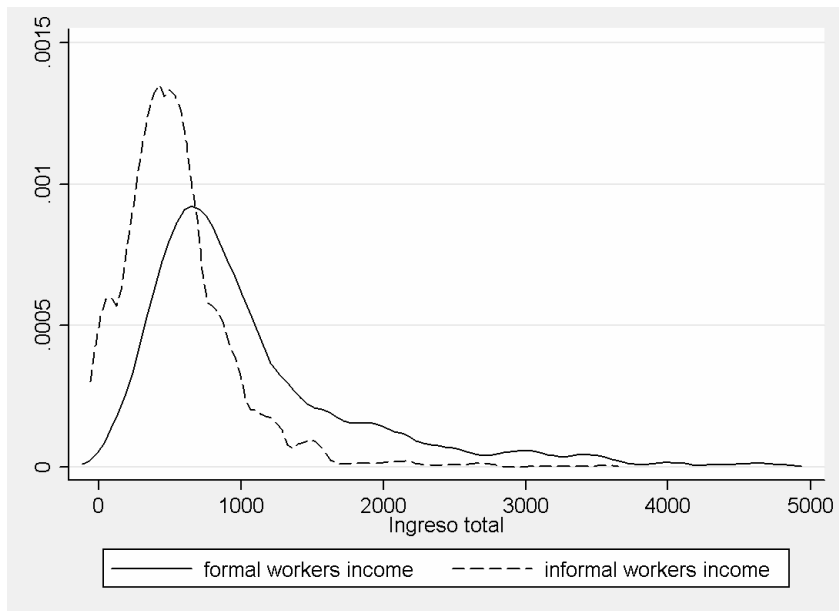


Table 11 – OLS earning regression

a) Area OSEL Lima Norte

```
. regress LN_EPH INF2 SEXO STUDY_Y EXP EXPQUAD MOTHER_H FATHER_H
```

Source	SS	df	MS	Number of obs =	2316
Model	238.315854	7	34.045122	F(7, 2308) =	78.82
Residual	996.944207	2308	.431951563	Prob > F =	0.0000
				R-squared =	0.1929
				Adj R-squared =	0.1905
Total	1235.26006	2315	.533589659	Root MSE =	.65723

LN_EPH	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
INF2	-.3897208	.0314245	-12.40	0.000	-.4513441 -.3280975
SEXO	-.2833469	.0284472	-9.96	0.000	-.3391316 -.2275622
STUDY_Y	.0540734	.0050067	10.80	0.000	.0442552 .0638916
EXP	.0167562	.0032691	5.13	0.000	.0103455 .0231669
EXPQUAD	-.0002107	.0000668	-3.16	0.002	-.0003416 -.0000797
MOTHER_H	.2759395	.0851047	3.24	0.001	.1090499 .4428292
FATHER_H	.1367591	.066807	2.05	0.041	.0057511 .2677672
_cons	2.268984	.0876549	25.89	0.000	2.097093 2.440874

b) Lima Metropolitana

```
. regress LN_EPH INF2 SEXO STUDY_Y EXP EXPQUAD
```

Source	SS	df	MS	Number of obs =	4300
Model	799.232519	5	159.846504	F(5, 4294) =	377.48
Residual	1818.32622	4294	.423457433	Prob > F =	0.0000
				R-squared =	0.3053
				Adj R-squared =	0.3045
Total	2617.55873	4299	.608876189	Root MSE =	.65074

LN_EPH	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
INF2	-.493451	.0217042	-22.74	0.000	-.5360025 -.4508995
SEXO	-.1245023	.0203082	-6.13	0.000	-.1643169 -.0846878
STUDY_Y	.0827417	.0035762	23.14	0.000	.0757304 .0897529
EXP	.0157447	.0022332	7.05	0.000	.0113665 .0201228
EXPQUAD	-.0001797	.0000429	-4.19	0.000	-.0002638 -.0000957
_cons	1.961338	.0639025	30.69	0.000	1.836056 2.08662

Table 12 - Earning regression with treatment effect on informality condition

a) Area OSEL Lima Norte

```
. treatreg LN_EPH SEXO STUDY_Y EXP EXPQUAD MOTHER_H FATHER_H, treat(INF_PRI=
SEXO EDAD SINTIT PRIMARIA SECUNDARIA SUP_UNI ) robust
```

```
Iteration 0: log pseudolikelihood = -3641.973
Iteration 1: log pseudolikelihood = -3577.6566
Iteration 2: log pseudolikelihood = -3574.4607
Iteration 3: log pseudolikelihood = -3574.4193
Iteration 4: log pseudolikelihood = -3574.4191
```

```
Treatment-effects model -- MLE                               Number of obs   =       2304
                                                            Wald chi2(7)    =       434.65
Log pseudolikelihood = -3574.4191                          Prob > chi2     =       0.0000
```

	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	

LN_EPH						
SEXO	-.3365257	.032512	-10.35	0.000	-.400248	-.2728034
STUDY_Y	.0352438	.005898	5.98	0.000	.023684	.0468037
EXP	.016188	.0036887	4.39	0.000	.0089583	.0234176
EXPQUAD	-.0002308	.0000792	-2.91	0.004	-.0003861	-.0000755
MOTHER_H	.2538647	.0938297	2.71	0.007	.0699619	.4377674
FATHER_H	.1088103	.0677492	1.61	0.108	-.0239757	.2415963
INF_PRI	-.9193788	.0783829	-11.73	0.000	-1.073007	-.7657511
_cons	2.938179	.1263544	23.25	0.000	2.690529	3.185829

INF_PRI						
SEXO	-.2318714	.0605565	-3.83	0.000	-.35056	-.1131827
EDAD	-.0051654	.0024285	-2.13	0.033	-.0099253	-.0004056
SINTIT	1.367535	.1455726	9.39	0.000	1.082218	1.652852
PRIMARIA	1.058596	.0866306	12.22	0.000	.8888034	1.228389
SECUNDARIA	.884512	.0746812	11.84	0.000	.7381396	1.030884
SUP_UNI	-.5417959	.1492699	-3.63	0.000	-.8343595	-.2492323
_cons	.2892729	.1456812	1.99	0.047	.003743	.5748029

/athrho	.5012527	.0791985	6.33	0.000	.3460266	.6564789
/lnsigma	-.3628614	.0245396	-14.79	0.000	-.4109581	-.3147648

rho	.4631018	.0622133			.332847	.5760153
sigma	.6956828	.0170717			.6630147	.7299606
lambda	.322172	.0485992			.2269193	.4174246

Wald test of indep. eqns. (rho = 0):				chi2(1) =	40.06	Prob > chi2 = 0.0000

b) Lima Metropolitana

```
. treatreg LN_EPH SEXO STUDY_Y EXP EXPQUAD , treat(INF_PRI= SEXO EDAD SINTIT
PRIMARIA SECUNDARIA SUP_UNI ) robust
```

```
Iteration 0: log pseudolikelihood = -6290.0409
Iteration 1: log pseudolikelihood = -6252.3964
Iteration 2: log pseudolikelihood = -6251.6768
Iteration 3: log pseudolikelihood = -6251.6744
Iteration 4: log pseudolikelihood = -6251.6744
```

```
Treatment-effects model -- MLE                               Number of obs   =       3952
                                                            Wald chi2(5)    =       995.83
Log pseudolikelihood = -6251.6744                          Prob > chi2     =       0.0000
```

	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	

LN_EPH						
SEXO	-.1801265	.0249894	-7.21	0.000	-.2291048	-.1311482
STUDY_Y	.0395557	.0049286	8.03	0.000	.0298959	.0492156
EXP	.0155824	.0024277	6.42	0.000	.0108242	.0203407
EXPQUAD	-.0002434	.0000462	-5.27	0.000	-.0003339	-.0001529
INF_PRI	-1.277983	.0675824	-18.91	0.000	-1.410442	-1.145524
_cons	3.042882	.1034431	29.42	0.000	2.840137	3.245626

INF_PRI						
SEXO	-.0190726	.0435496	-0.44	0.661	-.1044284	.0662831
EDAD	-.0032069	.0017233	-1.86	0.063	-.0065846	.0001707
SINTIT	.761983	.1079613	7.06	0.000	.5503826	.9735834
PRIMARIA	.6873447	.0681838	10.08	0.000	.5537068	.8209825
SECUNDARIA	.4008957	.0560452	7.15	0.000	.2910492	.5107422
SUP_UNI	-.9837238	.0821349	-11.98	0.000	-1.144705	-.8227424
_cons	.2076864	.1022463	2.03	0.042	.0072874	.4080853

/athrho	.8054786	.0763875	10.54	0.000	.6557619	.9551953
/lnsigma	-.2821319	.0313221	-9.01	0.000	-.3435221	-.2207416

rho	.6670885	.0423945			.5755361	.7421261
sigma	.7541742	.0236224			.7092678	.8019239
lambda	.503101	.0458632			.4132108	.5929911

Wald test of indep. eqns. (rho = 0): chi2(1) = 111.19 Prob > chi2 = 0.0000						

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