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Resumen

En este documento se identifica al trabajador informal como aquel que no contribuye al sistema de seguridad social. Se analiza la probabilidad de ser informal y se estima el diferencial de remuneraciones entre sectores, utilizando tanto estimaciones MCO como un modelo de regresiones intercambiables (*switching regression*). Con ello se evalúa el diferencial por ser formal, recurriendo al cálculo de cinco *proxies* de la brecha promedio entre sectores. Se utiliza la información de la Encuesta Continua de Hogares relevada por el Instituto Nacional de Estadística en el año 2005. Se encuentra que la formalidad es más probable para los trabajadores con mayor nivel educativo, para las mujeres, los residentes en la capital, los jefes de hogar y los trabajadores tiempo completo. Además, de acuerdo a las cinco medidas de la brecha, se encuentra que las remuneraciones son mayores para los trabajadores formales que para los informales.

Palabras claves: sector informal, diferencial salarial.

Keywords: informal sector, wage differential.

JEL classification: J31

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Abstract

In this paper we define informal workers as those who are not contributing to the social security system. We analyse the likelihood of being informal and we estimate the differentials in earnings between sectors using both the OLS estimation and a switching regression model. We assess the premium for being formal by predicting five different proxies of the average gap. We use the cross-section data reported in a 2005 household survey. We find that formality is more likely among the better-educated, women, people residing in the capital city, heads of households and full-time workers. In addition, we find that according to the five measures of the gap, earnings are higher in the formal than in the informal sector.

Introduction

Although there is no universally accepted definition of informality, there is an understanding that the informal labour market has specific identifiable characteristics. In the first academic studies, informality was defined as small-scale and lack of organization in a business (Hart, 1971). Sethuraman (1976) added some other characteristics, such as lack of access to credit from financial institutions or the lack of a fixed labour schedule. On the other hand, in its well-known report about Kenya in 1972, the ILO defined informality as activities that did not comply with tax legislation.

Both of these traditional definitions appear in Latin American studies. According to Tokman (1978; 1987), the informal sector is made up of units that operate on a small scale and with low levels of organization, and with little division between labour and capital (Tokman, 1978; 1987). In line with this theoretical concept, several Latin American empirical studies on informality identified informal workers as those who are employed in small enterprises, self-employed, or unpaid family members. Among its more salient characteristics, informality has been linked to non-compliance with labour regulations.

Alternatively, following Portes, Castells & Benton (1989), other studies have defined informality as economic activities that do not comply with government regulations but are not illegal. From the labour perspective, this definition identifies informal workers as those for whom labour regulations are not applied or enforced in a context where workers in similar activities are subject to regulation. This definition raises some practical problems about identifying the relevant labour regulation to be taken into account. In any case, coverage by the social security system is one of the traditional empirical definitions. Once again, there is a link between the two concepts of informality: evidence has shown that lack of regulation enforcement is more likely to prevail in small units.

According to both these approaches, unit size and regulation evasion, informality is widespread in Latin America. Indeed, the annual ILO “Labour Overview” for Latin America and the Caribbean used the concept of firm size and estimated that in recent years around 45% of the labour force was informal. The regulation evasion approach showed that around 55% of the urban labour force in Latin America was not contributing to the social security system in recent years (ECLAC, 2006). Perry et al (2007) made estimations using different measures, and with all of them found a high degree of informality. However, these authors also analysed the correlation between GDP and informality for several countries and concluded that the level of informality in Latin America is not especially high for its development level.

A number of Latin American studies have focused on the debate about the nature of the informal sector. In the context of dualistic models, several authors have argued that informality stems from the restrictions faced by workers who are unable to find a job in the formal sector. This means they are in the informal sector with worse working conditions and receiving lower pay than formal workers who share the same characteristics. In addition, some authors have argued that at least part of the increase in informality in Latin America has stemmed from large modern enterprises that avoid labour regulation costs by subcontracting unprotected workers who work in little units. Once again, they see informality as the disadvantaged segment of a dual labour market.

An alternative approach is to see informality as a choice made by workers and firms for whom the cost of regulations in the formal sector is not attractive. People may choose informality because the benefits of regulation are not well targeted, or because of workers' myopia or as a transitory state, i.e. as an entry point in business activity. In any case, the informal sector is a result of an efficiency allocation of labour in a context of institutions' inability to enforce regulations.

Latin American empirical studies focusing on this debate have adopted different strategies, and the results as regards the relevance of each interpretation are not conclusive. One strategy was to analyse the likelihood of being informal in order to explore whether workers are negatively selected in the informal sector, given their skills. Pisani & Pagan (2004) defined informality on the basis of unit size and analysed the selection between sectors in Nicaragua in 1993 and 1998 using a switching regression model. They found that low education and being female were the main determinants of participation in the informal economy. A positive selectivity in both the formal and informal sectors –although non-significant for women- led the authors to conclude that each sector attracts the workers best suited to that sector.

Auerbach, Genoni & Pagés (2005) studied the characteristics of contributors and non-contributors to the social security system in several Latin American countries. They found that in all these countries the likelihood of not contributing to the social security system was higher for the unskilled, the young, married women, workers in households with many active members and many informal workers, people living in rural areas, and part-time and low paid workers. They concluded that the low rate of contribution was partly due to demand factors such as individual preferences. However, the results also suggested that informality was in some cases the result of rationing in the formal sector, as in the case of workers earning less than a minimum wage.

Another strategy has been to estimate the earnings gap between sectors. According to the dualistic view, we should expect lower earnings in the informal sector. A positive informal premium may be interpreted as a differential that compensates for the lack of regulation benefits. Marcouiller, Ruiz de Castilla & Woodruff (1997) did not evaluate the presence of segmentation, but they estimated

the formal-informal wage gap for El Salvador, Peru and Mexico using cross-section data. They found there was a positive formal sector wage premium for the first two countries but not for Mexico. Saavedra & Chong (1999) found that in Peru, earnings differentials were negligible in the case of self-employed workers, but formal wage earners were better off than informal ones. Pratap & Quintin (2003) estimated the earnings gap for Argentina and did not find evidence of a formal sector premium.

Maloney (1999) pursued another strategy that took advantage of longitudinal data, and this enabled him to analyse mobility patterns in Mexico. He concluded that these patterns were consistent with informality being a desirable option rather than a disadvantaged segment of a dualistic market.

In this paper we use cross-section data to study the probability of being informal and the informal earnings gap in Uruguay. We choose the regulation approach and, as a practical matter, we define informal workers as those who do not contribute to the social security system. The rest of the paper is organized as follows. In the first section we give a brief description of the social security system and the results of previous studies of informality in Uruguay. In the second section we present the characteristics of the data and the methodology. In the third section we present the results, and this includes a description of the main data, an estimation of the likelihood of being informal, and the earnings gap between sectors. Finally, we present our conclusions.

1. A review of informality in Uruguay

1.1. Institutional background

In Uruguay, the social security system was set up at the end of the 19th century on the basis of specific occupations' contributory programs that offered retirement pensions in a pay-as-you-go financial regime. Since then, the social security system has incorporated new programmes covering other risks. The coverage provided by contributory programmes was gradually extended to other occupations until it covered the whole of the workforce. This development meant a big increase in the number of programmes, and these were finally unified in a single system. Indeed, today there are only a very few occupations that still have their own programmes - police and armed forces personnel, bank employees and university graduates - and most of the system is administered by a public institution (the *Banco de Prevision Social-BPS*).

The *BPS* administers two funds. One of them (the *IVS* fund) covers the risk of retirement, death, unemployment and disability, and the other (the *DISSE* fund) covers maternity, sickness and medical benefits. In any case, these funds are not separately administered. In addition, the *BPS* has had a global budget deficit, and in recent years half of its expenditure has been supported from general taxes.

The main expenditure of the *IVS* fund is the Old Age, Disability and Survivors Programme. This covers all employed and self-employed persons, including rural and domestic workers. Since 1996, when the social security system was reformed, it has been a mixed social insurance and individual account system. There are two possible situations. First, workers below a certain threshold contribute to the pay-as-you-go regime unless they explicitly choose to deposit half their contributions in an individual account. Second, workers with higher income must contribute to the social insurance pillar up to the threshold and save in an individual account for the amount above that threshold, up to a ceiling. Above this ceiling, contributions to the individual account pillar are voluntary.

A worker's contribution is 15% of his monthly earnings. In the case of the self-employed, there is a minimum declared monthly income for contribution purposes, that is, a minimum contribution. Employers have to contribute 12.5% of their total payroll to the social insurance pillar, but there are several exemptions and rate reductions and these make for a complex rate structure. The rates are somewhat higher for public servants.

This contribution to the *IVS* fund also entitles contributors to the benefits from the unemployment insurance and family allowance programmes. However, access to these benefits is restricted by the eligibility requirements. The unemployment insurance scheme targets loss of work by privately-employed persons, but the self-employed are explicitly excluded. The benefit consists of a payment for six months of 50% of the average earnings received in the six months before unemployment. The family allowances programme involves a means test, and it also covers private employees but not the self-employed (except for some specific occupations, namely domestic service, newspaper vendors and small rural product vendors).

As regards the *DISSE* fund, the employee contribution is 3% of monthly earnings and the employer contribution is 5% of the payroll. The rate of contribution for self-employed workers is 8%. Contribution entitles workers to sickness benefits that amount to 70% of earnings and this is paid for up to one year, and to maternity benefits amounting to 100% of earnings for twelve weeks (six weeks before and six weeks after the expected date of childbirth). In addition, contributors may qualify for some in-kind benefits such as pre-natal care. The main medical benefit consists in the financing of health care in the private sector. The private health system is made up of different medical schemes among which the most important is the mutual insurance system that offers health services through a number of institutions. Membership of this system requires a monthly fee. Contributors to *DISSE* choose a mutual insurance institution and the *DISSE* fund pays the monthly fee.

When non-contribution takes place, we may infer that other labour costs are also avoided. Besides contributions, labour costs include compulsory insurance to cover work injury risk, and two taxes. One tax amounts to 0.25% of monthly earnings, the burden is shared equally by employers and

employees, and the funds are used to finance active labour programmes. The other is a progressive tax on earnings: 2% from 2 to 6 minimum wages and 6% for higher earnings; and employees have to pay an additional 1%. In the case of some occupations, contributions, taxes and work injury taxes are paid all together when contributing to the social security system.

Informality means that some people do not enjoy the benefits of the contributory systems. However, there are assistance programmes that provide benefits for non-contributors. A review of these benefits may suggest that contributory programmes might not be attractive enough, at least for some workers.

Public institutions provide free health care for the poor - i.e. medical services, medicines, hospitalisation, etc. Note that although the monthly fee for the mutual insurance scheme is paid by the contributory programme, each time the person makes use of the service he still has to make a payment. Thus, the contributory program is more onerous than public services. In any case, two features limit the use of public services: the fact that they involve a means test, and the widespread perception that they are of poorer quality than services in the private sector.

In addition, there is a family allowances programme whereby informal workers with children receive a payment when the household's income is below a threshold. This programme was created in 2004, and in 2005 its impact on poverty and income distribution was very limited because the transfer and the threshold were both low (Vigorito, 2005). There is also an assistance programme for poor, non-active elderly persons who are not receiving a pension from the contributory programme. This assistance programme has always provided lower benefits than the contributory programme; indeed, in 2005, the average assistance pension was 42% of the average contributory pension.

Finally, the most widely-quoted disincentive to contribution is the weakness of eligibility requirement controls when people pay into the contributory pension scheme. Until 1996, there was no registration of individual contributions. The lack of administrative records meant that witness testimony about contribution history had to be allowed. There is a general perception that this procedure resulted in retirements that did not comply with the minimum of required years of contribution (Camacho, 1997; Rius, 2003). We may speculate that this situation undermined incentives to formality.

In 1996, when the individual account pillar was introduced, a labour history register was created. At that time, there was a belief that the introduction of an individual account pillar and the stringency of the enforcement system –based on the labour history register- would both work to reduce informality. However, non-contribution increased, particularly in 1999-2002 when the labour market was affected by a severe downturn in economic activity. In 2005, two years after economic recovery began, informal workers accounted for around 38% of employment.

1.2. Previous studies

In Uruguay, economics studies on informality appeared later than in the other Latin American countries. The first studies relied on the unit size definition and focused on the duality hypothesis. Indeed, Diez de Medina & Gerstenfeld (1986) concluded that informality should be viewed as the disadvantaged segment of a dual labour market. Also Grosskoff & Melgar (1990) found some evidence consistent with the dual hypothesis.

Although these studies suggested that the concept of informality would be relevant in a context of dual labour markets, the subject did not attract many other studies. As Grzetich & Mezzera (1994) pointed out, this definition of informality in Uruguay may be revised because the average size of firms is small and many self-employed people have high education levels. Probably these features, and the fact that so-called informal workers tend to be rather heterogeneous, discouraged empirical work on the subject. Recently, Amarante & Espino (2007) classified workers according to unit size and contribution to the social security system, and studied several dimensions of labour quality and the density functions of earnings. They concluded that social security coverage allows a classification with more in-group homogeneity than does the unit size criterion.

On the other hand, social security coverage has been studied more frequently, mainly because it is linked to the question of the financial sustainability of the pension programme. In addition, the change of rules that came with the setting up of the labour history system, and the fact that the number of workers with coverage was declining, have both acted as a spur to some recent studies.

The fact that labour history records are available has made it possible to study entry into and exit from the social security system. Lagomarsino & Lanzilotta (2004) analysed the frequency of individual contributions over ten years, and its determinants. They found that attachment to the social security system was higher for men than for women and for public servants than for private workers. In addition, membership increased with income and with age. Bucheli, Forteza & Rossi (2005) used social security records to estimate the predicted number of contributions accumulated at advanced ages (over 60 years old), and they also found differences between the public and private sectors and among workers with different earning levels.

Bucheli (2004) used a series of cross-section data (household surveys) to analyse the evolution of the contributor rate between 1991 and 2002 and contributor profile. This study concluded that at the beginning of the period, the likelihood of contributing was higher for prime ages, for the lowest education levels and for men. During the period, the educational gap increased and the gender gap narrowed until the rate was similar for both sexes in 2002.

Some studies focused on the causes of non-compliance. ICD/PIT-CNT (2000) compared the actual earnings of self-employed workers to the minimum fixed contribution, and analysed the net benefits those workers would accede to by contributing. This study concluded that the rules of the system did not suit most workers in this category. From a political economy perspective, Forteza (2003) emphasised the fact that different governments allowed contributory pensions to be paid to people who did not meet the requirements. He claimed that the political system tolerated these deviations because they attracted political support. Insofar as the willingness to exchange votes for pensions was greater among the poor, non-enforcement worked as an informal redistribution policy and, hence, was quite popular, although the rules for compliance were unclear.

Finally, Amarante (2002) estimated the wage differential between public servants, formal private workers and informal workers over the period 1991–2000 using yearly cross-section data. She disaggregated the average gap, in line with Oaxaca's proposal, and found that informal workers had the lowest earnings, given the characteristics. She also fitted a quantile regression model of earnings, including dummy variables –among others covariates- that captured the three labour categories (public sector, and formal and informal private sector). She found that informal workers received the lowest earnings in all the quantiles, but the disadvantage decreased with the quantile.

2. Data and method of estimation

Let w_j be the earnings of a worker j , x_j his observable characteristics, f and i two sub-indexes that denote formality and informality. We specify the following relationship:

$$(1) \quad \ln w_{i,j} = \alpha_i x_{i,j} + v_{i,j}$$

$$(2) \quad \ln w_{f,j} = \alpha_f x_{f,j} + v_{f,j}$$

If we assume that the disturbances v (which summarize the effects of non-observable variables) have a zero mean and are not correlated with observable variables, the coefficients can be estimated by OLS. Denoting the mean of the variables with a bar and making some calculations, we can disaggregate the raw earnings gap between sectors as the sum of two components, as proposed by Oaxaca (1973):

$$(3) \quad \left(\ln \bar{w}_f - \ln \bar{w}_i \right) = \left(\bar{x}_f - \bar{x}_i \right)' \hat{\alpha}_f + \bar{x}_i' \left(\hat{\alpha}_f - \hat{\alpha}_i \right)$$

The first term on the right is the difference among independent variables, and the second is the difference in the coefficients of the earnings equations. This last component –the difference not explained by independent variables- may be interpreted as the earnings gap computed in the mean of the characteristics.

The decomposition specified in (3) is based on returns in the informal sector and the difference between coefficients is weighted by the average characteristics of informal workers. However, structure rewards may be weighted by another stock of endowments, such as, for example, those of formal workers, as specified in equation (4)

$$(4) \quad \left(\ln \bar{w}_f - \ln \bar{w}_i \right) = \left(\bar{x}_f - \bar{x}_i \right)' \hat{\alpha}_i + \bar{x}_f' \left(\hat{\alpha}_f - \hat{\alpha}_i \right)$$

Thus, we decide to estimate two proxies of the gap $G1$ and $G2$ as:

$$(5) \quad G1 = \bar{x}_i' \left(\hat{\alpha}_f - \hat{\alpha}_i \right)$$

$$(6) \quad G2 = \bar{x}_f' \left(\hat{\alpha}_f - \hat{\alpha}_i \right)$$

These estimations have the same spirit as those estimated by Amarante (2002). They have the disadvantage of ignoring the endogeneity of the selection decision to be formal or informal. Suppose that an individual chooses to be formal or informal in accordance with his expected earnings in the two sectors. And suppose also that unobserved individual characteristics increase both earnings and the likelihood of choosing informality. For example, people with easy access to informal networks could enjoy greater potential gains by being informal. Then, observed income in the informal sector will be higher than expected income for the whole population, and the formal-informal gap estimated by OLS will be biased.

There are different strategies to deal with this problem. We choose to estimate a switching regression model (Maddala, 1986) which means jointly estimating the selection rule that sorts workers between sectors and the earnings equation of each sector.

A latent variable I^* defines a variable I that takes the value 1 when the worker is informal and 0 when he is formal. The variable I^* depends on two different types of characteristics: those that affect the level of earnings and hence the choice of being formal or informal, and those that have a direct effect on this choice. By Z we denote the vector of both types of characteristics (which contains vector x), and the earnings-generating model may be described by:

$$(7) \quad I_j^* = \gamma z_j + u_j$$

$$(8) \quad I_j = 1 \quad \text{if} \quad I_j^* > 0; I_j = 0 \quad \text{otherwise}$$

$$(9) \quad \ln w_{f,j} = \beta_f x_{f,j} + \varepsilon_{f,j} \quad \text{if} \quad I = 0$$

$$(10) \quad \ln w_{i,j} = \beta_i x_{i,j} + \varepsilon_{i,j} \quad \text{if} \quad I = 1$$

The disturbances u are potentially correlated with ε_i and ε_f . We assume that these residuals have a trivariate normal distribution and we perform a joint estimation using the full-information maximum likelihood method:

$$(\varepsilon_f, \varepsilon_i, u) \approx N(0, \Sigma) \quad ; \quad \Sigma = \begin{bmatrix} \sigma_f^2 & \sigma_{f,i} & \sigma_{f,u} \\ & \sigma_i^2 & \sigma_{i,u} \\ & & \sigma_u^2 \end{bmatrix}$$

Hence we obtain estimations of the coefficients, the standard deviation of the disturbances of the selection equation (σ_u) and of the wage equations (σ_i and σ_f), the correlation coefficient between u and ε_i ($\rho_i = \sigma_{iu} / \sigma_i \sigma_u$), and finally, the correlation coefficient between u and ε_f ($\rho_f = \sigma_{fu} / \sigma_f \sigma_u$).

A positive value of ρ_i may be interpreted as if unobserved attributes that lead workers to informality push the earnings in this sector up. For example, a high u_j of an informal self-employed person may be based on social networks that insure him against risks. At the same time, social networks may increase the informal self-employed person's number of clients, thus pushing up his earnings. Pisani & Pagan (2004) use this estimation in order to test whether the informal sector attracts the least able workers. A positive value would indicate that this hypothesis may be rejected. Notice that ρ_f is an indicator of positive or negative selection in the formal sector.

We denote the density and accumulated density of a normal distribution by ϕ and Φ . These estimations allow us to predict the expected earnings in informality conditional upon observing the worker in the informal sector:

$$(11) \quad E\left(\ln w_{i,j} / I_j^* > 0; x_{i,j}\right) = E\left(\ln w_{i,j} / u_j > -\gamma z_j; x_{i,j}\right) = \beta_i x_{i,j} + \sigma_i \rho_i \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)}$$

Notice that a positive ρ_i adds a plus to unconditional expected earnings in informality ($\beta_i x_i$), as would be expected if this sector attracts the most able workers (given observed skills).

We can also estimate the expected earnings that a worker observed in informality would receive in a formal job (equation 12). A positive ρ_f indicates that the expected earnings, given the selection rule, are higher than unconditional expected earnings.

$$(12) \quad E\left(\ln w_{f,j} / I_j^* > 0; x_{i,j}\right) = E\left(\ln w_{f,j} / u_j > -\gamma z_j; x_{i,j}\right) = \beta_f x_{i,j} + \sigma_f \rho_f \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)}$$

Therefore we can estimate another proxy of the formal-informal gap as the average difference between equations 12 and 11 among informal workers. We denote the number of informal workers as n_i , and we calculate the gap $G3$ as:

$$(13) \quad G3 = \frac{1}{n_i} \sum_j \left[(\beta_f - \beta_i) x_{i,j} + (\sigma_f \rho_f - \sigma_i \rho_i) \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)} \right]$$

The gap $G3$ is the difference between the earnings that an “average” informal worker would have received in the formal sector and his expected earnings in informality. It will be higher or lower than the non-conditional expected wage in accordance with the absolute values of the selections terms in (11) and (12).

A fourth proxy of the earnings gap is a calculation of the difference between the earnings of an “average” formal worker and those he would have received in the informal sector, both conditional on being formal. The expected earnings in each situation are:

$$(14) \quad E\left(\ln w_{f,j} / I_j^* < 0; x_{f,j}\right) = E\left(\ln w_{f,j} / u_j < -\gamma z_j; x_{f,j}\right) = \beta_f x_{f,j} - \sigma_f \rho_f \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)}$$

$$(15) \quad E\left(\ln w_{i,j} / I_j^* < 0; x_{f,j}\right) = E\left(\ln w_{i,j} / u_j < -\gamma z_j; x_{f,j}\right) = \beta_i x_{f,j} + \sigma_i \rho_i \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)}$$

Thus, denoting the number of formal workers as n_f , we calculate $G4$ as:

$$(16) \quad G4 = \frac{1}{n_f} \sum_j \left[(\beta_f - \beta_i) x_{f,j} + (-\sigma_f \rho_f - \sigma_i \rho_i) \frac{\phi(-\gamma z_j)}{1 - \Phi(-\gamma z_j)} \right]$$

Finally, the gap may be estimated as the difference between expected earnings in formality conditional on being selected as formal, and expected earnings in informality conditional on being selected as informal. Both terms are valued on the average characteristics of all workers. The gap thus defined ($G5$) is calculated for the whole sample ($n = n_i + n_f$) as:

$$(17) \quad G5 = \frac{1}{n} \sum_j \left[(\beta_f - \beta_i) x_j + \left(-\sigma_f \rho_f \frac{\phi(-\gamma z_j)}{1 - \Phi(-\gamma z_j)} - \sigma_i \rho_i \frac{\phi(-\gamma z_j)}{\Phi(-\gamma z_j)} \right) \right]$$

In order to fit the earnings-generating models described above, we use the Continuous Household Survey (*ECH - Encuesta Continua de Hogares*) conducted by the National Statistics Institute (*INE - Instituto Nacional de Estadística*) in 2005. The *ECH* is a survey carried out in urban areas. As more than 90% of the Uruguayan population is urban, the survey gives a good representation of the country.

We restrict the sample to 18-to-59-years-old workers who declared they were paid or self-employed at the time of the interview. We exclude unpaid family members, domestic workers living at the house where they work and enterprise owners, except when the production unit was operated by a single individual (self-employment).

The survey inquires into individual endowments (age, sex, marital status, schooling), labour characteristics (hours of work, industry) and income received in the preceding month, classified by source. Besides this, the survey reports whether or not the individual contributes to the social security system and/or is a *DISSE* beneficiary. When an individual has more than one job, we consider the characteristics of the main one –that is, the job that accounts for the highest earnings.

Earnings are calculated as the sum of in-cash and in-kind labour income, including the in-cash regular wage, tips and bonuses. In addition, we estimate the amount of three labour benefits.

First, when the worker is a *DISSE* beneficiary we add the regular cost of the monthly fee required to get assistance in the mutual insurance system.

Second, we take into account that private and public paid employees have the right to receive a thirteenth monthly salary or wage. The *ECH* shows whether the worker receives this benefit. So in this case we add an amount equivalent to 1/12 of the monthly in-cash regular salary or wage.

Third, by law, private wage earners are entitled to a payment of 2/3 of regular monthly remuneration to be paid when they have their annual holiday. The *ECH* does not capture whether the worker receives this benefit. However, when the worker is a private earner and states that he receives a thirteenth wage or salary, we assume he also receives “vacation pay”.

3. Results

3.1. Data description

As can be seen in Table 1, in 2005 around of 36% of workers aged 18-to-59 were informal. Comparisons between sectors suggest that informal workers tend to be young and lower-educated. Indeed, informality accounts for 48.2% of youth employment (18 to 24 years old) and between 33 and 35% of prime age employment. Many young people study and do part-time work at the same time, so informality at this life-cycle stage has been seen as a desirable personal situation.

Some 65% of workers with incomplete primary education are informal but 92% of those who completed the tertiary level are formal. Notice that informality is quite widespread among workers with incomplete tertiary studies (21%), but this figure is affected by the heavy weight of young students in the group.

As mentioned above, at the beginning of the 1990s informality was higher among women than men and that the gender gap steadily narrowed during that decade (Bucheli, 2004). The figures in Table 1 show that in 2005 the rate of informality was higher among men than women, but the difference was quite small.

Firm size appears to be closely correlated with formality. The group of self-employed workers who do not use physical capital (94%) have the highest percentage of informality. In contrast, employees in private firms with more than 10 employees (90%) and public servants (99%) have the highest rates of formality.

As regards industrial classification, workers are more likely to be informal when employed in the building industry (62%) and commerce, restaurants and hotels (46%). At the other end of the scale, there are high rates of formality in finance (96%) and electricity, gas and water (98%), which are activities with a low weight in employment (1%). Notice that public enterprises are the main suppliers of these services.

Table 1. Percentage of informal workers and average distributions by formality. 2005.

	Percentage of informal workers	Average distribution		
		Formal	Informal	All
All	35.8	100.0	100.0	100.0
Age				
18 – 24	48.2	11.4	19.0	14.1
25 – 49	33.4	67.8	60.9	65.3
50 – 59	34.9	20.9	20.1	20.6
Gender				
Male	36.2	54.6	55.6	55.0
Female	35.3	45.4	44.4	45.0
Level of education				
Less than 6 years	65.6	2.7	9.1	4.9
6 to 8 years	50.6	22.9	42.1	29.8
9 to 11 years	37.7	27.8	30.2	28.6
12 years	26.0	15.9	10.0	13.8
Tertiary incomplete	21.0	11.7	5.6	9.5
Tertiary complete	8.2	19.0	3.0	13.3
Employment type and firm size				
Public servants	1.3	27.9	0.7	18.2
Wage earners in private firms	30.7	63.8	50.8	59.1
Less than 5 employees	62.4	17.9	66.9	32.9
From 5 to 9 employees	33.3	14.3	16.1	14.9
10 or more employees	10.0	67.8	17.0	52.2
Self-employed	76.6	8.3	48.6	22.7
with capital	67.0	7.6	27.5	14.7
without capital	94.2	0.7	21.0	8.0
Industry				
Agriculture and mining	40.6	3.8	4.7	4.1
Manufacturing	38.3	14.7	16.3	15.3
Electricity, gas, water	1.4	1.5	0.0	1.0
Building	61.9	4.4	12.7	7.4
Commerce, restaurants, hotels	45.8	20.0	30.1	23.6
Transport and communications	22.1	7.5	3.8	6.1
Finance	3.5	3.1	0.2	2.1
Personal and Community Services	28.7	45.0	32.2	40.4

Source: *Encuesta Continua de Hogares* (2005), INE

3.2. Determinants of participation in informality

The estimated coefficients of the switching regression model selection equation are given in Table 2. The set of explanatory variables contains variables also included in the earnings function: years of schooling; potential experience (age - years of schooling - 6) and squared potential experience; a gender dummy that takes the value 1 when the worker is a woman; a dummy showing that weekly

hours worked are less than 30 (part-time work); a regional dummy that takes the value 1 for the capital city and 21 dummies that distinguish different industries.

In addition, we include the characteristics that have a direct effect on selection and do not have an indirect effect through the level of earnings: a set of dummies that capture position in the household (head, spouse, son/daughter, other relationship with the head -omitted-); a dummy variable that indicates cohabitation (legally married or not); a dummy variable that takes the value 1 when the worker is receiving a pension; an index of household overcrowding (household size / number of dorms) as a *proxy* of wealth; household formality defined as the ratio of formal workers to workers in the (rest of the) household.

In previous Uruguayan and Latin American studies it was found that the likelihood of being informal decreases with education, is lower for women than for men, and is lower for people who do not live in the capital city. Experience is non-significant at the standard statistical levels.

Other determinants of informality are job and sector characteristics. Not surprisingly, part-time work has a positive effect on the likelihood of being informal. We report the estimated coefficients of sectors in Annex 1. The sectors where informality is most likely are printing and furniture, building, wood and paper, the retail trade and textiles. On the other hand, workers in electricity, gas and water, education, the financial system and health are the most likely to be in a formal situation.

Formality is more common for married workers, and it also depends on position in the household. Heads of households are the most likely to be formal and spouses are the most likely to be informal.

The likelihood of being informal is greater for workers receiving a pension. Notice that, with only a few exceptions, people receiving a pension are forbidden to work, and it is possible to avoid this rule by having an informal job.

Table 2. Switching regression model: selection equation estimates (probability of informality)

Variable	Coefficient
Household head	-0.156 (-4.63)**
Spouse	0.161 (3.60)**
Son/Daughter	0.070 (1.95)
Married	-0.328 (-10.96)**
Pension	0.336 (7.00)**
Household overcrowding	-0.234 (-12.10)**
Household formality	-0.349 (-15.62)**
Years of schooling	-0.093 (-24.40)**
Experience	-0.004 (-1.18)
Experience (squared)	0.004 (0.50)
Female	-0.066 (-2.34)*
Part-time	1.155 (40.40)**
Capital city	-0.180 (-8.14)**
Constant	1.013 (14.11)**

Notes: Absolute value of t statistics in parentheses: * significant at 5%; ** significant at 1%.

The estimation also includes a regional dummy and 21 industry dummies; the omitted category is agriculture

The negative estimated coefficient of “household formality” indicates that the likelihood of being informal decreases with the share of formal workers in the household. That is, informality is more likely for workers living with other informal workers. One way of explaining this is the hypothesis that there are barriers that impede entry into informality, such as the requirements of social networks. If this is so, the presence of informal workers in a household make it easier for other household members to accede to informal work. This would indicate that if family background is informal the benefits of being informal increase.

Notice that we do not find evidence that if one household member is entitled to formal benefits, this acts as a disincentive to other members contributing to the social security system. This result is similar in other Latin American countries and, as was pointed by Auerbach, Genoni & Pages (2005), it could be due to unobserved household characteristics that are correlated with both household formality and the probability of contributing.

We find a negative sign for the effect of household overcrowding. As this variable is negatively correlated with wealth, we may infer that the poor obtain less benefit through being informal. In particular, overcrowding is positively correlated with the number of children. So it is possible that the contributory family allowances program plays some role as an incentive to contribute to the social security system.

3.3. Earnings differential

We estimate three wage equations by OLS: one for formal workers, one for informal workers and another for the whole sample. In addition, we estimate wage equations for formal and for informal workers in line with the switching regression model. As mentioned above, the explanatory variables are years of schooling, potential experience and its square, and the above-mentioned set of dummies that capture gender, part-time work, region and industry. The OLS estimation for the whole sample of workers also includes a dummy that indicates informality.

We report the results of all these estimations in Table 3. For all the estimations, we obtain the expected coefficient signs of the human capital variables. Earnings increase with experience at a decreasing rate, and rise with schooling. Both the OLS estimations and the switching regression model indicate that the returns to schooling and experience are greater in the formal sector than in the informal sector.

In addition, as expected, earnings are higher for men, part-time workers and people residing in the capital city. The gaps due to gender, part-time work and region are greater in the informal sector.

Although the coefficient signs are stable, the coefficient magnitudes differ depending on whether or not we use the selection procedure. The returns to schooling and the gender gap are lower in the switching regression model, and the part-time differential is higher.

Table 3. Wage equation estimates.

	OLS estimates wage equation without selection correction			Switching regression wage equations	
	All	Formal	Informal	Formal	Informal
Informal	-0.601 (54.81)**				
Schooling	0.096 (63.51)**	0.097 (58.03)**	0.095 (29.82)**	0.079 (41.26)**	0.064 (16.50)**
Experience	0.034 (23.91)**	0.034 (20.57)**	0.032 (12.26)**	0.032 (18.17)**	0.028 (10.04)**
Experience (squared)	-0.041 (13.46)**	-0.038 (10.58)**	-0.042 (7.70)**	-0.035 (-9.25)**	-0.038 (-6.68)**
Female	-0.218 (21.55)**	-0.196 (17.55)**	-0.246 (11.10)**	-0.181 (-15.38)**	-0.228 (10.02)**
Part-time	0.394 (32.10)**	0.384 (22.36)**	0.397 (21.24)**	0.610 (30.23)**	0.677 (24.97)**
Region	0.19 (19.99)**	0.151 (13.68)**	0.256 (14.39)**	0.117 (10.97)**	0.202 (10.70)**
Constant	-0.601 (54.81)**			0.079 (41.26)**	0.064 (16.50)**
Observations	18688	12263	6425		
R-squared	0.49	0.41	0.28		
σ_i					0.756
σ_f				0.610	
ρ_i					0.571
ρ_f				0.652	

Notes: Absolute value of t statistics in parentheses: * significant at 5%; ** significant at 1%. The estimation also includes a regional dummy and 21 industry dummies; the omitted category is agriculture

In Table 4 we present the results of the different estimates of the formal-informal gap. As Amarante (2002) found, the estimated gaps based on the OLS procedure indicate that earnings are lower in the informal sector. The raw gap is 0.86 and the proxies resulting from the Oaxaca decomposition are 0.61 ($G1$) and 0.58 ($G2$). Remember that the former figure is obtained by weighting

the difference of parameters by the average characteristics of informal workers, and the latter is calculated with the average characteristics of formal workers. Thus, in both cases, working in the informal sector is less rewarded and the non-explained difference is 71% or 67% of the raw average gap, depending whether it is calculated as $G1$ or $G2$.

Table 4. Gap in wage earnings between formal and informal workers: different measures of the mean gap and its components

	Average predicted earnings		Average selection term		Mean Gap (E)
	Formal (A)	Informal (B)	Formal (C)	Informal (D)	
Raw gap					0.860
G1	3.632 ^{1/}	3.024 ^{1/}			0.608
G2	3.853 ^{2/}	3.276 ^{2/}			0.577
G3	4.268 ^{1/}	3.027 ^{1/}	0.312 ^{1/}	0.339 ^{1/}	1.241
G4	3.852 ^{2/}	2.879 ^{2/}	-0.166 ^{2/}	0.180 ^{2/}	0.973
G5	3.759 ^{3/}	3.244 ^{3/}	-0.237 ^{3/}	0.529 ^{3/}	0.535

1/ Weighted by the average characteristics of the informal workers.

2/ Weighted by the average characteristics of the formal workers.

3/ Weighted by the average characteristics of the whole sample.

However, $G1$ and $G2$ may be biased if the peculiarities that determine wages are those that drive workers to each sector. The selection bias may be due to individual preferences or to the rationing in the formal sector. There is no consensus about how workers sort themselves or are sorted between sectors. As explained in section 2, we choose to introduce a selection rule through modelling a switching regression specification and we calculate three additional proxies of the gap. Estimated gaps and their components are also given in Table 4.

Let us first analyse the correlation coefficient between the error terms in the selection equation and the disturbances in each wage equation (ρ_i and ρ_j). Both correlation coefficients are positive and significant. A positive ρ_i means a positive selection term in informality (equation 11). That is, observed informal workers derive a comparative advantage from working in informality and so they are more successful than informal workers in a random sample. The prediction of informal earnings that stems from a non-selection procedure estimation, overestimates the expected informal earnings of a random

worker. Analogous reasoning applies to a positive ρ_f .¹ Thus, the predicted earnings of formal workers obtained with a non-selection procedure underestimate the expected formal earnings of a random worker.

These results suggest that unobservable characteristics do not contribute to explaining the positive values of $G1$ and $G2$. Indeed, the positive ρ_i indicates that informal workers are not drawn from the lowest part of the informal earnings disturbance distribution. Besides, as ρ_f is positive, we may infer that formal workers are not drawn from the highest part of the formal distribution.

In columns C and D of the $G3$ row in Table 4, we report the average selection terms involved in the estimation of $G3$, that is, the difference between the predicted earnings in formality and in informality, conditional on informality. The selection terms' signs are driven by the correlation coefficient signs, as stated in equations 11 and 12. The selection term is lower when calculating conditional average predicted earnings in the formal sector (column C) than when doing so for the informal sector (column D). Thus, the difference between the selection terms is negative. However, the gap $G3$ is positive (1.241).

The proxy $G4$ is the gap conditional on being formal. As formal workers also do better in informality, the selection term of conditional average predicted earnings in the formal sector is negative (column C). Analytically, it is the result of a positive ρ_f in equation 14. On the other hand, formal workers do better in informality, which means a positive selection term when calculating conditional average predicted earnings in the informal sector (column D). Once again, the difference between the selection terms is negative but the mean gap $G4$ is positive (0.97).

Finally, $G5$, the difference between earnings in formality and in informality, conditioned on being selected on the sector where the worker is observed- is 0.53.

4. Conclusions

In 2005, around 36% of employed workers between 18 and 59 years old were not covered by the social security system. This level of informality has been quite stable in the country in recent decades. This phenomenon is widespread in Latin America and there have been many studies that examine whether it is the result of the presence of segmentation through evaluating the earnings gap

¹ This result may be surprising because one would expect that highly rewarded workers in the formal sector select themselves as formal. A similar result was found by Marcouiller, Ruiz de Castilla & Woodruff (1997) for Mexican men, but they did not find it for Mexican women or for workers in the other Latin American countries studied (El Salvador and Peru).

among sectors. In this paper we explore the patterns of the personal characteristics of informal workers and their jobs, and the extent to which their earnings differ from those of formal workers.

The empirical results of the sectoral selection indicate that formality is more likely for people who are better-educated, women, residents in the capital city, heads of households and full-time workers. In addition, the likelihood of being formal increases with the share of formal workers in the household and household overcrowding. Job and sector characteristics also impact on the likelihood of being informal. Not surprisingly, informality is less widespread in activities in which the public sector is important in terms of production volume.

In order to evaluate the earnings gap between sectors, we estimate five proxies that involve different procedures. First, we estimate a wage equation for formal workers and another for informal workers, and we use these to disaggregate the gap in line with the traditional Oaxaca decomposition. We find that after controlling by skills and other characteristics, the average earnings of formal workers are higher than those of informal workers. Then we look for a way to introduce the selection procedure underlying the sectoral status of workers. Secondly, we estimate a switching regression model and three proxies of the formal-informal gap.

The results obtained through the joint estimation of sectoral selection and earnings indicate that the gap estimation needs to take into account a selection rule. The signs of the selection terms indicate that formal and informal workers are both more successful in informality than a randomly chosen worker. Thus, estimations without a selectivity correction overestimate informal earnings and underestimate formal earnings with respect to the expected values for a randomly chosen worker. We find that the three estimations of the gap that involve a selection rule indicate that earnings are lower in the informal sector than in the formal sector.

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Table 5: Oaxaca-Blinder parameters and estimation

	Parameters		Characteristics		Beta f- Beta i	Beta f- Beta i
	Formal	Informal	Formal	Informal	pond XF	Pond XI
Informal			0.0	1.0		
Years of education	0.097	0.095	11.376	8.679	0.031	0.024
Experience	0.034	0.032	21.652	22.717	0.048	0.051
Experience (squared)	-0.038	-0.042	6.087	6.825	0.021	0.023
Female	-0.196	-0.246	0.461	0.445	0.023	0.022
Partial	0.384	0.397	0.117	0.371	-0.001	-0.005
Resident of Montevideo	0.151	0.256	0.616	0.457	-0.064	-0.048
Mining	0.167	-1.269	0.001	0.001	0.001	0.001
Food products and beverages	0.083	0.110	0.051	0.032	-0.001	-0.001
Textiles	-0.090	-0.262	0.022	0.043	0.004	0.007
Wood/Paper	-0.061	0.042	0.006	0.012	-0.001	-0.001
Printing/Furniture	0.106	0.038	0.014	0.032	0.001	0.002
Chemicals and petroleum	0.253	0.003	0.022	0.013	0.005	0.003
Machinery and equipment	0.063	0.115	0.017	0.018	-0.001	-0.001
Electricity, gas and water	0.418	1.106	0.014	0.000	-0.010	0.000
Building	0.137	0.076	0.039	0.117	0.002	0.007
Retail trade	-0.137	-0.067	0.116	0.205	-0.008	-0.014
Wholesale trade	0.105	-0.090	0.040	0.039	0.008	0.008
Hotels and restaurants	-0.026	0.132	0.025	0.031	-0.004	-0.005
Transport	0.055	0.127	0.052	0.028	-0.004	-0.002
Post and telecommunications	0.235	0.027	0.017	0.006	0.004	0.001
Financial services	0.739	0.513	0.032	0.002	0.007	0.000
Services	0.033	0.180	0.083	0.078	-0.012	-0.012
Education	0.072	0.330	0.096	0.017	-0.025	-0.004
Health	0.091	0.097	0.108	0.028	-0.001	0.000
Other services	0.186	0.210	0.212	0.254	-0.005	-0.006
Others	-0.515	-0.243	0.000	0.001	0.000	0.000
Constant	2.085	1.528	1.000	1.000	0.558	0.558

Table 6: Switching regression model: selection equation estimates (probability of informality) and Switching regression wage equations

	Selection	Formal	Informal
Mining	-0.455 (-1.08)	0.060 (0.28)	-1.331 (-3.28)**
Food products and beverages	-0.225 (-3.14)**	0.022 (0.59)	0.046 (0.71)
Textiles	0.447 (5.67)**	-0.008 (-0.17)	-0.162 (-2.49)*
Wood/paper	0.567 (4.78)**	0.034 (0.47)	0.182 (1.91)
Printing/Furniture	0.739 (8.5)**	0.232 (4.33)**	0.216 (3.15)**
Chemicals and petroleum	-0.124 (-1.29)	0.215 (4.56)**	-0.038 (-0.43)
Machinery and equipment	0.272 (2.94)**	0.095 (1.86)	0.172 (2.15)*
Electricity, gas and water	-1.330 (-4.60)**	0.288 (5.18)**	0.667 (1.42)
Building	0.621 (9.66)**	0.280 (7.07)**	0.236 (4.50)**
Retail trade	0.439 (7.50)**	-0.066 (-1.95)	0.037 (0.76)
Wholesale trade	0.190 (2.61)*	0.117 (2.94)**	-0.043 (-0.69)
Hotels and restaurants	0.191 (2.41)*	-0.005 (-0.12)	0.168 (2.48)*
Transport	-0.226 (-3.06)**	0.011 (0.28)	0.047 (0.70)
Post and telecommunications	-0.151 (-1.29)	0.188 (3.62)**	-0.077 (-0.62)
Financial services	-0.704 (-5.21)**	0.651 (14.88)**	0.200 (1.08)
Services	0.1230 (1.88)*	0.045 (1.27)	0.195 (3.53)**
Education	-0.821 (-10.39)**	-0.072 (-1.93)	0.057 (0.68)
Health	-0.492 (6-.89)**	0.018 (0.50)	-0.067 (-0.94)
Other services	0.038 (0.65)	0.177 (5.53)**	0.213 (4.23)**
Others	0.554 (1.03)	-0.461 (-1.39)	-0.116 (-0.38)

Absolute value of t statistics in parentheses: * significant at 5%; ** significant at 1%