Education, labor market and life quality: A quantitative approach based on Mincer Equations

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Abstract

The discussion about factors that influence individual income has a long tradition. Most authors have concluded that education is a very important determinant of labor reward, based both on emprical and theorical studies. In the same way, most econometric studies on this topic have based on human theory, formalized by Becker, due to its advantages in explanation and empirical verifications. Because of these reasons, considering education as the main determinant of individual income has a wide theorical support. Besides, it is important to control for socio-economic and demographic characteristics, because life quality and habits affect labor income. In this work we explore the empirical relation between working income and education in Argentina and Paraguay in 2006. In order to do this we perform a quantitative approximation based on wage determination equation proposed by Mincer. This proposal is embedded in human capital theory. In empirical studies, it is widespread the use of this equation in order to explore effects of the education on individual income. We will also use two additional econometric refinements: Heckman selection bias correction to approach the problem of sample selectivity in terms of probability of labor market participation, and principal component analysis as a technique of data reduction in order to introduce a set of socio-economic and demographic variables mutually correlated in the model. Household surveys are the most proper available data sources to aboard this topic. We will employ Argentinian Permanet Household Survey (EPH) for the second semester of 2006, and the analogous Paraguayan survey collected in the same year.

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1 Introduction

There is a long tradition surrounding the debate on the determinants of income and the correct methods to study them. It is well known that wage determination is a complex process in which serveral factor intervene. Generally [1], the factors are grouped in two sources: job characteristics and worker characteristics. However, in the practices, it seems that wage detrmination relies more on worker attributes than on job characteristics. The latter are very subjective, while worker's knowledges and habilities are relatively more easy to define and to measure.

This argument is supported by Human Capital Theory, introduced by Becker in 1964 in his famous book *Human Capital* [2]. This theory has had a great acceptance in accademic research, and has been applied in most related econometric studies, because it has a strong theorical support and has been verified in numerous studies. In a few words, Becker defines human capital as the set of habilities, capabilities and knowledge inherent to worker. This characteristics are aquired by study, training and experience.

There are three main hypotesis about the effects of education on wage determination [3]. The fist hypotesis states that education rises marginal productivity of individual and, as under the assumption of benefit maximization of enterprises wages correspond to marginal productivity, the higher education level, the greater working rewards.

In second place, identification model proposes that education is a tool that allows enterprises to identify more productive workers. But under this hypotesis, productivity is only a function of individuals' innate capabilities. Education or, more specifically, title possesion, is a simple signal of marginal productivity. This statement has been also refered by Blaug in his study of imperfect work contract [4]. This is called "selection-signaling hypotesis", because it involves a jointly selection by enterprises and signaling by workers. Employers uses education as a filter to identify workers with desirable work habits. Workers, in turn, facing this behavior of enterprises, have incentive to generate signs such that they can maximize probability of being selected, that is, by means of a title consecution. Under this argumentation, education is economically valuable more because of behavior features it generates (punctuality, perseverance, attention, responsability, pursuit of success, cooperation, sumision, etc) and their signaling [8], than because of its effect on productivity and knowlege aquisition.

Finally, selection model states that education, when signaling worker productivity (in accordance to identification hypotesis), allows enterprises to make a more efficient allocation of work force, assigning tasks that require more qualification to more educated workers, and those with less requirement to workers with a lower level of instruction.

The latter two models have different implications in economic system: identification do not attach any outcome to education in terms of efficency, while the selection model augment global productivity by permitting a better allocation of work factor. Above all, none hypotesis can reject the fact that education does have a positive effect on workers salary, whichever it cause. This conclusion has been verificated in many empirical studies.

This work aims at exploring the empirical relationship between wage (taking into ac-

count that income has been considered the main determinant of living standards) and education in two Latin American countries: Argentina and Paraguay. In next section, we will make a breef revision of the conceptual framework of the discussion about the relationship between education and income. After that, we will present the results of the estimation of several versions of Mincer Equations, on the base of Argentina and Paraguay's household surveys. Taking into account data availability, benchmark year is 2006.

2 Conceptual Framework

The debate on the relationship between education and households' income generation has been located on an ideological space. Related to this, it has been a long time since efforts have been devoted in the core of economic theory in order to define capital. There are two main definitions: the restricted version, which states that capital can not apply to men, supported by John Stuart Mill and Alfred Marshall, among others, and the wide version, posed by Irving Fisher, who stated that capital is the stock of resources that enables people to generate future income flows. The latter was the one that permitted the application of the term capital to people. Is this second version the one that made possible the development of human capital theories, so setting the relationship between education and development.

In an early stage, education was considered simply a mechanism to get a more egalitarian and fair society, through human and social values incorporation. But later, more productivist visions of the relationship between economy and education were developed, starting to consider human capital as any voluntary movilization of scarce resources devoted to augment an individual's productive capacity. Economists enrolled in the Human Capital Theory, within the neoclassical framework, present this educative process as an investment election, that is, agents invest on education in order to raise their personal capacities and so their productivity. This necessarily translates in an increase of wages (in a neoclassical world, factors' retributions are determinated by their marginal return or productivity). This way, a causal correlation between education, productivity and wages emerges. So, education expenditure is investment, and not only consumption, and knowledge stock must be considered as a capital.

2.1 Becker's Human Capital Theory

Human Capital Theory was developed by Becker (1964) [2]. His study was motivated by the recongition of remaining substantian growth in income in the United States after growth in physical capital and labor have been accounted for. Becker's hypotesis, in line with some economists who had highlighted the importance of education in promoting economic development, was that this residual in American growth was mainly due to human capital not accounted for in traditional output measures. His original aim was to estimate rate of return to education, but he became aware of the lack of a theoric framework concerning the process of investing on people. Then, despite he was not the first author to refer to the impact of education on salary, he was the one who formalized

human capital theory, as an explanation of a wide range of empirical phenomena.

The stylized facts that Becker identified as the bases of his theory are:

1. Individuals' working income increases with age at a decreasing rate. Moreover, the rate of increase of earnings is positively related to the level of skill.
2. Unemployment rates and skill levels show a negative relation.
3. Enterprises located in developing countries have a more paternalistic behavior toward employees than those in industrialized countries[1].
4. Younger persons have greater job mobility than older ones, and they also receive more schooling and on-the-job training.
5. Earnings' distribution function is positively skewed, specially among highly qualified workers.
6. The quantity of education and other type of training received by abler people is bigger than the one received by others.
7. The extent of the market limits labor division.
8. Human capital investors tend to be more impulsive and to make more mistakes than people who typically invest on physical capital.

By the other hand, Becker [5] identified that the some activities can have an effect on future well-being, while others impact mainly in present. Education has both present and future effects, by means of human resources' acquisition. This feature both affects future income path, and impacts on the present because of the cost incurred in terms of resources devoted to education and incomes not received because of labor insertion postponement.

Income differences among people across countries and within the same country had been identified and studied prior to Becker's formulation. However, they were attributed to the amount of physical capital, based on the observation that this type of capital was more concentrated in richer population. However, studies of income growth came to confirm that factors other than physical ones have a greater importance in income growth's determination. Among this other factors, characterized by its intangibility (and, thus, they difficulty to be measured), the most important is human capital.

Becker defined human capital investment as the activity which affects monetary and psychical future rent by augmenting the amount of resources imbedded in individuals. The ways in which this investment can be acquired are: schooling, on-the-job training, medical care, migrations and acquiring information about the economic system. The characteristics acquired by these means improve physical and mental abilities of people. Moreover, this augment of capabilities translates into an individual productivity rase that

[1]This observation deserves a special comment: Becker wrote in 1964, and the production system is far different nowadays. The emergence of transnational firms may have distorted this behaviors, and is difficult to recognize currently different attitudes of firms toward workers, at least in tearms of their localization.

raises their income prospects.

This concept of human capital investment is rather wide. Investing on this capital can be considered a particular way of working and its singularity is that it is performed in order to obtain monetary benefits at present. This way, people can modify they future path of wages, after paying for their formation at present. The activity of getting education, formation and learning can be analyzed in terms of investment and is possible to obtain the return rates for this activities.

Human Capital Theory has its spectacular expansion during sixties, where education arises as one of the keys in economic development and reduction of social inequities. The aforementioned theory emphasizes that education is and must be one of the basis on which national policies must stand in order to increase efficiency and equality at the same time.

Along time, Becker development has been critizised and widened by many authos. But it is still of great relevance in education studies. Also, alternative approaches on education role in economic system arose, based on critics founded on relative failure of educative policies in line with Human Capital Theory. These critics came specially from Labour Economy and radical school.

2.1.1 Rate of return on education

Having reconized the positive relationship between education and wage determination, imbedded in human capital theory, it is also important to identify the determinants of amount invested in human capital. The most important factor in this decision is the rate of return of the aforementioned investment [5]. However, this indicator and its impact on the decision on how much to invest is difficult to identify. This is due to the extension and variability of the period along which the investment takes place. Thus, it is rather complicated to obtain a measure of the rate of return by means of traditional project investment evaluation tools. This difficulty derives in a greater one if the objective is to identify the effect on earnings of the change in the rate of return.

In the case of human capital investment through education, its rates of return constitutes then the link between labor market and educative sistem, for the aformentioned rates are the expression of the additional earning that an extra year of education provides. Rate of return of education then acts as a guide of education demand decisions. So, a high return of a level of education will make its demand to rise and, if supply responds to this signal, work force with the consequent qualification level will also rise, produce a fall in rate of return[2]. Under this approach, rates of return on different levels of education would tend to converge. However, the existence of many imbalances between demand and supply, mainly because of public subventions on certain educative levels (that result in a breaking-off of direct link between demand and supply in educative system and human capital requirements in the economy) makes this prediction not to hold. But the observed principle is that people demand education until net return of their private investment

[2]This reasoning is based on basic microeconomic principle that given a demand rise and a consequent rise in the price of a good, if supply also increases, the price will fall.

becomes zero.

There also are variations in rates of return on education worldwide. In developing countries, returns are generally higher than in developed nations due to limited access to education[3], and greater public subventions to education system. On the other hand, social rates of return on education tend to be lower than private ones, because they incorporates opportunity cost of public funds devoted to education system. Difference is particularly important in higher levels of education, and this feature derives in the recommendation to reallocate funds from these levels to basic education, which has greater positive externalities (crime reduction, improvement in social responsability, etc).

Concluding, the rate of return on education determines education market (constituited by demand for and supply of education) dynamics, making it to respond to changes in labor market. Even though, given that human capital formation requires time, the answer of education system is not immediate, it has an adjustment path which implies an imbalance period. But even considering this, labor market signs are determinants in education demand formation. Both demanded and supllied education vary with changes in labor market. But this process is not enough rapid such that public intervention on education supply can be avoided.

As regards estimation of the rate of return on education, there are two methods [6]. The most apropriate one is dynamic, employing time series. It consists of obtaining the income profile of a person (or cohort) on the basis of his observed incomes in different moments in time. This approach is methodological desirable given that it is analougous to an investment evaluation. However, longitudinal data is hardly available (morevover regarding income), and this makes it difficult to apply this technique.

Another possibility is to use an static method, based on cross-section data. The main idea is to infere income profile of a person along his life from incomes of others persons with the same characteristics. The most famous author enroled in this line of thought is Jacob Mincer, who estimated the returns on education by the static method.

2.2 Mincer's Approach: Wage Equation

In line with Human Capital Theory, Jacob Mincer, in its seminal work *Schooling, Experience, and Earnings* [7], published in 1974, presented a model of earnings' determination. The model focuses on life on life-cycle dynamics of earnings, exploring the relationship between observed earnings, potential earnings, and human capital investment, both in terms of formal schooling and on-the-job investment. No explicit assumptions are made about the background economic environmen [12].

Departing from the capital theory result that tere is a positive relationship between the number of years of schooling acquired by and individual and his subsequent earnings, his formulation of wage determination also accounts for the observed fact that the portion of wages variation explained by differences in years of schooling significantly in-

[3]Being more limited the access to education in developing countries, human capital is more scarce and, thus, its retribution is higher. This is in line with law of diminishing marginal returns.

creases if it is observed in group of individuals of similar ages. Nevertheless, Mincer found that neither the basic model (with years of formal education as the unique predictor) nor the shooling-plus-age model explain more than about 15% of earning variation. The author proposed then to supplement the basic model by introducing of variables such as postschool investment and weeks worked per year.

The underlying idea is that once individuals have finished school, they continue investing in themselves by working in occupations with a lower pay, but higher content of on-the-job training, in the earley years. The following years, they can acceede to better payed occupations because training starts to pay off. We can assume that individuals choice of occupation is such that they equalize the present value of lifetime earnings, with the effect that, inside a certain cohor, there is an initially high dispersion of earnings by education produced by postshool investment, but it start to decline later responding to the equalization of present value logic, and finally it increases again in last stages of working life. The time at wich dispersin is minimized is called point of "overtaking", observed by Mincer between 7 and 9 years after entry into labor force. At the overtaking point, effects of formal education are maximum because the returns on postshool training equal its cost. Then, controlling by experience allows to explain with education about one third of wage variations. If, in addition, we control by differences in postschool investment and the number of weeks worked a year, the explanatory power of the model rises to over 50%. Even more, this percentage can be risen to 60% or 70% by standardizing for differences in quality of schooling.

Having observed this empirical results, Mincer introduced a new concept in the classic relationship between wage and years of schooling: work experience. This is an innovation with respect to previous works because they treated age as a proxy of experience, even though indviduals of the same age with different years of schooling must differ in the number of years of experience. To overcome the lack of direct informatin on years of work experience, Mincer measured it by substracting the age of completion of schooling from age, stating that it is experience, rather than age, one of the determinants of wage. To capture the decreasing effect of experience on income, a quadratic term is added. In practice, with data currently available where usually there is no information about the age when individuals finished their schooling, the concept of potential experience in labor market arises, instead of traditional definition of experience. This new formulation of experience is generally defined as the age minus years of schooling minus years of initiation, usually taken as six.

In consequence, famous Mincer equation proposes to express income as a function of years of education and years of potential experience in labor market. Most widespread version of this equation states income (more precisely, natural logarithm of hourly income) as the addition of a lineal function of education years and a quadratic one of years of potential experience and its quadratic term. Thus, under this specification, natural logarithm of earnings is not a separable function of education and experience. The specification is as shown in Equation 1.

$$\ln\left[w\left(s,x\right)\right] = \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x^2 + \epsilon \tag{1}$$

being w working earnings, s years of schooling, x potential experience in labor market,

α_0, ρ_s, β_1 and β_0 regression parametres, and ϵ an error term, assumed to have a zero mean (white noise).

There is not a unique rate of return on education, but a set of different rates, one for each group with different experience. On the other hand, experience-earnings profiles are relativelly parallel for different education groups. In consequence, by introducing potential experience instead of age in wage determination equations is a way of capturing both the shape of the age-earning profile and the differential slope of the age-earning profile across education groups. That is, controlling by years of potential experience, there is a single rate of return to education in labor market. It is because of this result that Mincer equation is the most spread tool in empirical research to estimate the causal effect of education on earnings.

Mincer recognises that the argument underlying his wage determination equation is incomplete. The model of wage as determined by self-investment focus on supply of human capital, neglecting the effects of demand formed in labor market. Besides, while distribution of earnings is explained by distribution of accumulated human capital, the latter is in turn explained by the distribution of abilities and opportunities. Considering this argument, human capital theory has failed to incorporate in the analysis the effects of inhereted abilities, parental background and imperfections in capital market on the demand for education.

However, it is remarkable that more than thirty years after Mincer formulation, his earning function continues to be employed in almost every study on income determination, in its original specification or in modified versions. The fact that for most data sets Equation 1 is the most parsimonious model of income determination that would be obtained by econometric specification testing, could be suggesting that Mincer equation is some kind of law of earning determination. Moreover, the diffusion of this equation allows for comparison among countries and periods, wich is a very valuable characteristic of model specification. David Card [10] provides a thorough synthesis of the research papers adopting the Mincer equation as underlying framework. The reviewed works generally focus on the estimation of the average impact of schooling on earnings, by means of both ordinary least squares and instrumental-variable techniques. Attempts have been made toward a dynamic formulation of Mincer equations [11], on the argument that observed earnings do not instantaneously adjust to net potential earnings, thus introducing a term with lagged wage as predictor. However, this proposal needs longitudinal data sets, scarcely available.

To conclude with this breef revision of Mincer proposal, it is worth mentioning that his argument do not distinguish the cause of education effect on earning augmenting [9]. This can be due to a productivity rise effect of schooling, or to a signaling or identification effect. In this terms, Mincer equation is consistent with wichever hypotesis nested in human capital theory.

3 Results

In this section, we present the results of estimations or several versions of Mincer equations, aiming at analysing the effects of schooling on earnings. Given data availability, Argentinian and Paraguayan cases will be explored and compared. The most appropriate data sets employed in this kind of studies are household surveys. These are the source of exhaustive information related to demographic and socio-economic characteristics of population. Their main focus is on labor force. Household surveys in Argentina and Paraguay are similarly constituted. They are collected in urban agglomerations, leting rural areas without coverage, and provide information in two analysis levels: individual and household level. These surveys are the source of official figures of employment, unemployment, underemployment and poverty.

The results presented in this section correspond to the Argentinian Permanent Household Survey for 2006 second semester. It must be noted that the choice is justified because this was the last six-month period where information from this survey is reliable. By the other side, there were also employed the data from the Permanent Household Survey of Paraguay, in 2006 in order to get comparable outcomes. It was chosen as analysis unit the household, in order to remain in line with most life quality studies.

To adapt the variables collected individual level to a household level, there were two options taken: for some variables, the information was employed at household head level and, for some others, the average or the sum for the household was employed.

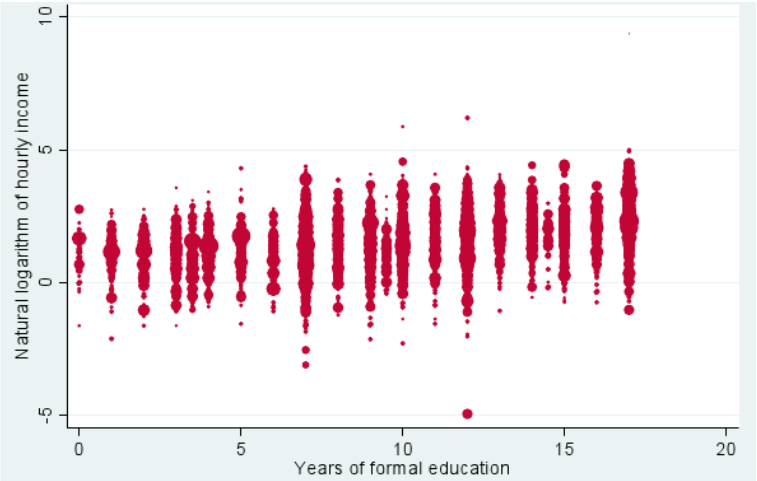
3.1 Argentinian Permanent Household Survey

Eliminating all the cases where there were no individual response, and consolidating all the information at a household level, the remaining number of observations is of 37.017, of which 22.144 are households with their head employed, with positive income in their main activity and declaring a positive number of working hours. From the total number of observations, 67% household heads are men and 12.299 33% are women. In turn, among employed people, there is a higher participation of men, with 76%, while the remaining 24% are women.

Previous to performing any estimation, we graphically present the relationship between the natural logarithm of hourly income and the number of years of formal education in Figure 1. As can be seen, these two variables do have a correlation. If we consider that wage is in logarithmic terms, the relationship between both variables is greater than at first sight. It is interesting that there is a change of slope at approximately seven years of schooling, the amount of years devoted to basic education. This suggests that the premium for additional years of schooling grows at a lower rate once finished primary school. Both secondary and superior education seem to have lower returns than primary education.

However, it is necessary to find the factors intervening in the relationship between education and income in order to control by them. Among these intervening factors, as

Figure 1: Argentina 2006: Natural logarithm of hourly income vs years of formal education



Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

proposed by Mincer, is work experience.

As a first approximation to the relationship between wage and education, we estimate a Mincer equation as originally formulated[4]. The variables involved in the simple Mincer Equation estimation are:

- Natural logarithm of hourly income from main activity (obtained by dividing the monthly income from main activity by the number of hours worked per month in it); as the working hours are declared for the week when survey is collected, they were divided into five (the number of days usually worked a week), and multiplied by twenty-one (the quantity of working days a month).
- Years of schooling, derived from the collapse of the variables of educative level and last year approved.
- Years of potential experience in labor market, calculated as the age minus the years of formal education minus the years of initialization in educative system (being 6 by convention); the same applies to the quadratic term of experience.

The results of the estimation of the simplest Mincer equation as stated in Equation 1 are shown in Table 1. Two estimations are presented: one model including constant and another without constant. All variables in both models are statistically significants, but in the first estimation (with constant), the model explains a lower proportion of the variation of the dependent variable (25,5%), while in the second estimation (without constant) the variability explained by the model accounts for 85,8%. This finding is coherent with the observation of Figure 1, where the intercept is near zero. In consequence, employing the results of the model without constant, it is possible to conclude that the education in Argentina in 2006 had a rate of return of approximately 11%. Moreover, in both models,

[4]The only difference with Mincer original formulation is that experience is defined as its potential version, that is, age minus years of schooling minus six.

the experience positively affects the wage (the effect is higher in the model without constant), and its quadratic term has a negative but small coefficient. These two coefficients together show that, as expected, the experience has a positive decreasing effect on the wage.

Table 1: Argentina: Simple Mincer equation estimation

Variables	With constant	No constant
Years of formal education	0,1028* (49,51)	0,1113* (83,84)
Experience	0,0188* (9,81)	0,0275* (19,62)
Quadratic experience	-0,0002* (-6,4)	-0,0003* (-11,13)
Constant	0,2363* (6,19)	
N	22144	22144
R^2	0,2545	0,8577
F	906,91*	17627,91*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics are in brackets.
Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

It is worth mentioning that the population included in the previous estimation includes only household heads actively taking part in labor market. However, household heads that are not employed (both because they are unemployed or economically inactive) may have a reserve wage above that of employed population. That is, there may exist a selection bias. Hence, it is necessary to correct the sample from this bias.

Following a paper by Herrero, De Santis and Gertel [13], we estimate a Mincer equation including the correction of sample selection bias proposed by Heckman [14], as shows Equation 2.

$$W = X\beta + \lambda\alpha + u \tag{2}$$

where W is the vector with hourly earnings, X is the matrix of observed human capital variables (schooling, work experience, etc) and personal characteristics that identify individuals, β is the vector with returns on such variables, λ is the factor for sample selection correction (inverse Mills ratio), α is the vector with coefficients associated to the inverse Mills ratio and u is the error term.

Inverse Mills ratio[5] is employed to correct for sample selection bias. The latter is due to availability of earnings data only for employed individuals in the moment of data col-

[5]Inverse Mills ratio (λ) is an inverse monothonic function of probability to participate in labor market and is calculated as the ratio between density function of the aforementioned probability and its accumulated function.

lection. In the uncorrected Mincer equation, outcomes can be biased because employed individuals can constitute a non random sample.

Traditionally, correction for sample selection bias has been used as a means to incorporate in Mincer equation additional information about the probability that each individual has to have an occupation, using variables that determines his reserve wage.

Heckman proposes a methodology to perform the explained correction using a model of two simultaneous equations, whose vector of dependent variables is formed by observed income and reserve salary (not observed income). Employed individuals are those whose reserve salary is lower than market wage. Reserve salary can not be directly observed, but it can be estimated on the base of variables representing individuals' characteristics. In order to do so, a participation equation is estimated whose dependent variable is of binary type, as shows Equation 3.

$$P = P\left(W, W*\right) \tag{3}$$

P assumes the value 1 if the person is employed and zero otherwise. W is income that individual can obtain in labor market and W* is his reserve salary. The higher is market wage and the lower is reserve salary, the higher is the probability to participate. Reserve wage is a function of productivity in activities outside labor market (such as children care, houswork, etc), of returns on human capital investment (access to information, for instance) and of preferences for leisure. Market wage, in turn, is determined by the amount of human capital (schooling, on-the-job training, etc).

Using as starting point the dependent variable defined in Equation 3, a Probit model is performed including the whole population. The determinant variables of participation included in the Probit model are:

- Wage, approximated by the variables of the original Mincer equation: years of formal education and of potential experience in labor market (and its quadratic term).
- House property, that takes on the value 1 if the household owns the land and the house where it lives, or only the house, and 0 otherwise.
- Bad housing conditions, that is 1 if it is not a household does not inhabit a house or apartment, or there is not water provision by a pipe inside the house, or the house is constructed with inappropriate materials.
- Children of 5 years old or less in the household.
- Children of between 6 and 12 years old in the household.
- Income earners, which is the number of people in the household that earn any income.

The coefficients of the participation equation are shown in Table 2.

The existence of selectivity is confirmed by the significance level of the χ^2 used in the Wald Test. This coefficient, commonly known as rho, tests for the independence between

Table 2: Argentina: Participation equation estimation

Variable	Coefficient	Standard Error	Marginal Effect
Years of formal education	-0,0172	0,0037	-0,0063
Experience	0,0631	0,0033	0,0230
Quadratic experience	-0,0015	0,0001	-0,0005
House property	-0,0964	0,0296	-0,0349
Bad housing conditions	-0,1852	0,0493	-0,0695
Children (5 or younger)	0,0057	0,0243	0,0021
Children (between 6 and 12)	-0,0470	0,0180	-0,0171
Income earners	0,2639	0,0153	0,0963
Constant	0,3507	0,0750	
Log pseudolikelihood	-8326804		
Wald test (chi2)	17,51*		
N	35017		
Censored	12873		
Unsensored	22144		
Dep. Var. Mean	0,6631		

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

the two equations involved in Heckman specification. If they are independent, i.e., if null hypotesis is not rejected, then it is possible to correct for selection bias. The results of the estimation of participation equation suggests the following coclusions:

- One year of additional education negatively affects the probability to participate in labor market, probably because for an educated individual, it is important to continue with education. This is in line with human capital theory and its vision of education as an investment. Formal education rises reserve wage and discourages individuals from working.

- Experience fosters individuals to enter labor market, what is an intuitive outcome. Moreover, the experience has a positive but decreasing effect on the probability to participate in labor market, which means that it has a maximum.

- The fact that the household owns the house where they live negatively affects the probability to work, may be because the house propiety its an indicator of household's wealth, and the wealthier is a household, the less urgent is for them to obtain additional income.

- The existence of children in the household reduce the probability to enter labor market, probably because adults have to take care of children and have less time remaining to work. However, children of between 6 and 12 years are the ones that have this effect. Children under 5 years old slightly augment the probability that household head participates in labor market.

- The probability of participating in labor market rises with the number of income earners in the household. These can be attributed to a higher work appraisal or to a greater amount of information and networks related to the labor market.

- On the contrary, if the household inhabits an house in bad conditions, the individuals have a lower incentive to participate in labor market. It is interesting to notice that

if the lack of a proper house was indicating the existence of more urgent needs, the household's members would have a greater probability to be employed. But in this case, this fact acts discouraging from work participation, may be because people who live in poorer houses have a lower appraisal for work.

The people not participating in labor market, as stated by the EPH, are unemployed, retired, student, housewives, children younger than 6 years old, disabled or others. The composition of population not employed is shown in the Table 3.

Table 3: Argentina: Description of not employed population

Category	Male	Female
Unemployed	32,5%	14,4%
Retired	30,0%	23,5%
Student	2,1%	1,8%
Housewife	16,4%	17,3%
Younger than 6 years old	9,3%	40,6%
Disabled	2,9%	0,3%
Other category	6,8%	2,0%

Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

It can be seen that the proportion of men unemployed (32,5%) doubles the one of women (14,4%), while that of retired is more similar for both sexes (30% and 23,5% for men and women respectively). Moreover, the proportion of men studying is greater than the one of women, and the same holds for disabled, but the amount of these two categories is far lower than the others. It is surprising that the weight of housework is similar for both sexes (16,4% for males and 17,3% for women). It also highlights that the percentage of children under 6 years old is higher between women (40,6%) than in men (9,3%).

Once having done the correction for selection bias, it is possible to re-construct the Mincer equation taking into account this bias. The results, together of those of the Mincer equation estimation without constant, are shown in Table 4.

All variables in both models are statistically significant (at the 99% confidence level), the same as the model as a whole (Wald statistic in the case of the corrected one). The rate of return of education slightly falls for the model with the correction, from 11,13% to 10,86%. The effect of experience on wage is marginally greater (going from 0,0275 to 0,0293), and its curvature is a little greater also (-0,0004 instead -0,0003).

One of the purposes of this paper is to explore the effect of socio-economic and demographic characteristics on wage determination. Because of that, the proposal here is to incorporate some variables regarding socio-economic level and demographic features of households. As this type of variables are usually inter-correlated, a principal components analysis is being performed to avoid multicollinearity.

Table 4: Argentina: Mincer Equation estimation corrected by selection bias

Variables	Without Correction	Corrected
Years of formal education	0,1113* (83,84)	0,1086* (71,87)
Experience	0,0275* (19,62)	0,0293* (20,10)
Quadratic experience	-0,0003* (-11,13)	-0,0004* (-12,13)
N	22144	22144
R^2	0,8577	
F	17627,91*	
Wald Statistic		27175,54*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics for the uncorrected model and of z statistics for the corrected one are in brackets.
Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

Principal component analysis [15] is a technique of dimensionality reduction which constructs new variables as linear combinations of original ones. By this means, it allows to collapse and, consequently introduce in a regression analysis, a set of correlated variables avoiding multicollinearity. The new variables, named principal components, are uncorrelated among each other, because they are projections of original variables over a new set of orthogonal axes. Given a set of p variables, the first new axis, X_1^* constitutes a new variable, x_1^*, such that it collects the maximum variance as possible. The second axis, orthogonal to the first one, is constructed such that the new variable attached to it, x_2^*, reflects the maximum variance not involved in the first new variable, x_1^*, and x_1^* and x_2^* are incorrelated to each other. This procedure continues until all new p axes are identified, such that new variables, x_1^*, x_2^*,..., x_p^* collect in turn the maximum variance and are mutually uncorrelated. The maximum number of new variables or principal components is equal to that of original ones.

This analysis is particularly useful because it allows to represent p variables in an m-dimensional space, being m minor than p. The addition of variance of new variables which are not kept in the analysis represents a measure of information loss resulting from data reduction. Whether or not this loss is significant depends on the study main purpose. The model can be represented as in Equation 5.

$$\zeta_1 = w_{11}x_1 + w_{12}x_2 + w_{1p}x_p \tag{4}$$

$$\zeta_2 = w_{21}x_1 + w_{22}x_2 + w_{2p}x_p \tag{5}$$

$$\vdots \tag{6}$$

$$\zeta_p = w_{p1}x_1 + w_{p2}x_2 + w_{pp}x_p \tag{7}$$

being ζ_1, ζ_2, ..., ζ_p the p principal components and the weight or loading of j-th variable in the i-th principal component. The greater the loading, the greater the influence

of the respective variable on the component. Then, loadings are very relevant in order to give a proper interpretation to the components.

The variance retained by i-th component, denoted λ_i, is the eigenvalue of the variable. The decision on how many components to retain depends on the how much variance the researcher is prepared to loose. However, one of the most spread criterium is to retain only factors with eigenvalues greater than one. This rule balances the trade-off between the need to retain as much variance as possible, and the wish to minimize the number of variables to be introduced in the model. A final comment about this technique is that it only permits to collapse numeric variables, not nominal ones.

The variables assumed to intervene in the relationship between wage and education, and so involved in the principal component analysis are:

- Demographics:
  - Number of persons per room of exclusive use by the household.
  - Number of children under 10 years old in the household.
  - Number of people with 10 years old or older.
  - Mean age of household members.
- Laboral:
  - Number of occupations of household head.
  - Quantity of hours devoted to work (both in main activity and in secondary ones) by household head in benchmark week.
  - Dependency rate of the household, which is the ratio between the economically inactive individuals and the economically active ones, and means the number of inactive supported by each active.
  - Activity rate in the household, defined as the ratio between active household members and total number of members, it indicates the proportion of people working or searching for a job in the household.
- Economics:
  - Participation of working income in total income in the household.
  - Participation of non working income in total income in the household.

Three components are kept, following the criterium of $\lambda \geq 1$, and these components absorb 72% of total variation of the set of original variables. To obtain a better interpretation of the components, it is applied an orthogonal rotation by means of the Varimax method. This method acts by rotating new axis such that each variable maximizes its loading on a certain axis. Total variance retained is the same as in the unrotated case.

The loadings for the construction of the rotated principal components are shown in Table 5.

Table 5: Argentina: Rotated component loadings

Variables	Comp. 1	Comp. 2	Comp. 3
Persons per room	-0,0186	0,1329	0,6164
Children younger than 10	-0,0237	-0,0959	0,7381
People of 10 or older	0,0800	0,5666	0,0260
Average age	-0,3254	-0,2335	-0,2300
Number of occupations of household head	0,1452	-0,2439	0,0883
Total hours worked by household head	0,3226	-0,2932	0,0358
Dependency rate	0,0092	0,5903	-0,0534
Activity rate	0,4808	-0,2666	-0,0046
Participation of working income	0,4882	0,1217	-0,0460
Participation of non working income	-0,5405	-0,1336	0,0873
Rho	0,6383		

Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

The interpretation of the principal components arises from the loadings of the variables on each component. The first component has the greatest loadings on participation of working income over total family income, activity rate and total hours worked by household head and, with a negative sign, participation of non-working income over total family income. Hence, it is reflecting the impact of the insertion in labor market. With a similar reasoning, the second component, having the greatest loadings on dependency rate and people of ten years old or older, stands for household aging structure. Finally, the last component is mainly determined by family composition and its arrangement according to housing conditions, being the most important variables number of persons per room and the presence of children under ten years old.

The results of including these three components in the regression analysis of Mincer equations, both in its corrected and its not corrected-with constant versions[6], are shown in Table 6 and Table 7.

The main effect of including this specific set of social variables consists of diminishing education rate of return: in the model that incorporates selection bias, the rate of return without these new variables was 10,86%, while when adding them, such rate becomes 9,76%. Experience has the expected positive effect and its quadratic term is not significantly different from zero, but the components are statistically significant. The impact of insertion in labor market, has a positive effect on wage. This is an intiuitive result, given that the more dependent is the household on labor income, the more effort is devoted by household head to earn a better wage. As regards household etarian structure, the presence of more adult people and a greater dependence rate, may force household head to obtain a greater salary. The impact of this variable is also positive, but of a smaller magnitud than previous one. Finally, the last component is negativly related to wage, meaning that people who live in overcrowding or have more children (tipically, the poor) tend to earn a smaller wage.

As regards the selection equation, opposite to simpler estimation of wage equation, indicates that the number of years of study rises the probability to enter labor market,

[6]In order to obtain a rho (correlation of the residuals in the equation of participation and in the one of wage) significantly different from cero, besides reasonable results, it is necessary to include the constant in the model.

Table 6: Argentina: Selection equation including principal components

Variable	Coefficient	Standard Error	Marginal Effect
Years of formal education	0,0051	0,0046	0,0018
Experience	0,0440	0,0038	0,0158
Quadratic experience	-0,0008	0,0001	-0,0003
Component 1	0,8460	0,0159	0,3036
Component 2	-0,1023	0,0124	-0,0367
Component 3	-0,0419	0,0234	-0,0151
House property	0,0641	0,0363	0,0231
Bad housing conditions	-0,2110	0,0561	-0,0783
Children (5 or younger)	0,0647	0,0370	0,0232
Children (between 6 and 12)	0,1448	0,0260	0,0520
Income earners	0,0735	0,0172	0,0264
Constant	-0,2715	0,0943	
Log pseudolikelihood	-7.203.100		
Wald test (chi2)	25,37*		
N	35017		
Censored	12873		
Unsensored	22144		
Dep. Var. Mean	0,6773		

Source: Own elaboration on the base of Argentinian EPH (Second Semester 2006)

Table 7: Argentina: Mincer Equation estimation including principal components

Variables	Without Correction (WC)	Without Correction (NC)	Corrected
Years of formal education	0,0985* (42,16)	0,1104* (67,32)	0,0976* (41,33)
Experience	0,0142* (6,78)	0,0243* (13,78)	0,0070* (2,59)
Quadratic experience	-0,0001* (-4,68)	-0,0003* (-7,42)	-0,0000 (-0,76)
Component 1	0,0231 (1,17)	0,0575* (3,37)	0,0793* (-2,51)
Component 2	0,0416* (6,21)	0,0441* (6,56)	0,0390* (5,69)
Component 3	-0,0619* (-7,96)	-0,0416* (-6,12)	-0,0631* (-8,07)
Constant	0,3542* (6,25)		0,6264* (7,27)
N	22.144	22.144	22.144
R^2	0,2628	0,8589	
F	469,73*	9107,65*	
Wald Statistic			2702,25*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics for the uncorrected model and of z statistics for the corrected one are in brackets.
Source: Own elaboration on the base of the EPH (Second Semester 2006)

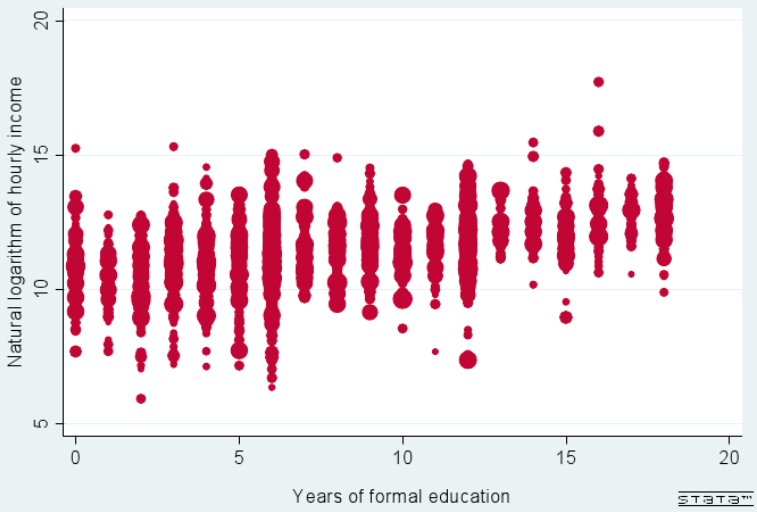
but the marginal effect is considerably small. The same holds in the case of experience, with a positive but decreasing effect. As in the model without social control variables, if the family inhabits an inadequate house, it has less incentives to work and if the number of members who perceive an income is greater, the probabilty to take part in labor market rises. Contrary to the results obtained in the previous selection equation, the fact of owning the house constitutes an incentive to work, maybe because of opportunities that this enables to take, and the fact of having children under 12 years old creates a necessity to work, specially for those between older than 6. Finally, variables related to labor market insertion foster individual to work, and the contrary happens with etarian structure and inhabiting conditions.

3.2 Paraguayan Permanent Household Survey

The number of observations kept in order to perform the analysis with wage equations in the Paraguayan Permanent Household Survey, that is, after eliminating the individual observation without response, and consolidating at a household level, is 5.292. Among them, 4.003 belong to household heads with an employment. There are 3.878 households leaded by men (73%) and 1.414 (27%) whith a female head. The same as in Argentina, among the employed household heads, the weight of men is even greater (82% are men while only 18% are women). Because of the presence of household heads that are not actively participating in labor market, it will be necessary to correct for selection bias.

As a previous step, it is possible to identify an a priory possitive relationship between wage and years of formal education, as Figure 2 shows. In the case of Paraguay, it seems that slope decreases after 7 years of schooling, growing again once the individuals have reached 12 years of formal education. This could be suggesting that rate of return on incomplete secondary education is lower than when this level is finished. This is interesting because this phenomenon was not observed in Argentina.

Figure 2: Paraguay: Natural logarithm of hourly income vs years of formal education



Source: Own elaboration on the base of Paraguayan EPH (2006)

To obtain a first approach to the Mincer equation, a preliminary simple equation estimated, regressing the natural logarithm of wage against years of formal education and controlling by the experience and its quadratic term. Two variants are presented here: a first one including a constant term and a second one without it. The estimation results are shown in Table 8.

Table 8: Paraguay: Simple Mincer Equation estimation

Variables	With constant	No constant
Years of formal education	0,1256*	0,4813*
	(25,36)	(44,04)
Experience	0,0202*	0,4159*
	(4,49)	(61,79)
Quadratic experience	-0,0002*	-0,0045*
	(-3,70)	(-34,65)
Constant	10,1060*	
	(107,76)	
R^2	0,2360	0,9650
F	308,84*	32.072,22*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics are in brackets.
Source: Own elaboration on the base of Paraguayan EPH (2006)

In both models, all variables are of statistical significance. Even though the latter (without constant) has a greater part of the dependent variable explained (the R^2 is 96,5%, while in the first variant this coefficient is 23,6%), the education rate of return implied by it is rather extraordinary: 48%. Because of this, the model with constant will be taken as benchmark. The rate of return of an additional year of education as derived by this specification is 12,5%. The effect of experience in wage determination has the expected form (positive but decreasing).

As in the case of Argentinian household survey, it is possible to hold the hypotesis that there is an underlying selection bias produced by the divergence between the reserve wage of some individuals and the one observed in labor market. To correct this bias, Heckman specification is employed, with the same assumptions as in the Argentinian case. The details of participation equation are shown in Table 9.

The variables involved in wage determination, that is, years of formal education and experience, have effects in the same direction as in Argentina. However, their marginal effect on the probability to enter labor market are lower.

Opposite to the case analyzed before are the signs of the effects of house property and inadequate house. Both factors raise the probability to envolve in labor market. About the first one, the explanation can be that, as an indicator of wealth, it also implies a determined social status, and the consequent interest in its maintenance in the case of

Table 9: Paraguay: Participation equation estimation

Variable	Coefficient	Standard Error	Marginal Effect
Years of formal education	-0,0152	0,0084	-0,0047
Experience	0,0261	0,0064	0,0080
Quadratic experience	-0,0007	0,0001	-0,0002
House property	0,0380	0,0685	0,0117
Bad housing conditions	0,2805	0,0729	0,0851
Children (5 or younger)	-0,0824	0,0349	-0,0253
Children (between 6 and 12)	-0,0318	0,0271	-0,0098
Income earners	0,1046	0,0263	0,0321
Constant	0,7268	0,1833	
Log pseudolikelihood	-2.075.664		
Wald test (chi2)	14,12*		
N	5.292		
Censored	1.289		
Unsensored	4.003		
Dep. Var. Mean	0,7655		

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Source: Own elaboration on the base of Paraguayan EPH (2006)

wealthier households (incentives to work). As regards the latter, an inadequate environment can foster individuals to take part in labor market because of they probably have more urgent needs.

Household heads where there are children tend also to have a greater participation in labor market but, different from what happens in Argentina, children under five years old discourage parents from working presumably because of time involved in their care.

Finally, the greater is the number of people earning an income in the household, the greater is the probability that the head works, also due to labor cultural. But its marginal effect in Paraguay is greater than in Argentina.

Considering the presence of the selection bias, the coefficient of wage equation slightly vary, as exposed in Table 10.

The arguments of the equation continue to be statiscally significant, and the hypotesis of a null rho is rejected (the Wald statistic is also significant). There is a slight decrease in the rate of return of an additional year of schooling, from 12,56% to 12,28%, and a marginal rise in the effect of experience on wage, from 0,0202 to 0,0249 and its curvature. In Argentina, this changes mean a 2,4% decline in rate of return and 6,5% rise of experience effect, and in Paraguay, 2,2% and 23,3% respectively.

To incorporate the impact of social determinants on wage determination, as in the previously analyzed case, a principal component analysis is performed using analogous variables to Argentinian case. Here four components are kept as well, retaining 72% of total variability. The loadings of the components, which are rotated by the Varimax method in order to allow a better comprehension, are shown in Table 11.

Considering variable loadings, the first principal component represents family composi-

Table 10: Paraguay: Mincer Equation estimation corrected by selection bias

Variables	Without Correction	Corrected
Years of formal education	0,1256* (25,36)	0,1228* (24,25)
Experience	0,0202* (4,49)	0,0249* (5,16)
Quadratic experience	-0,0002 (-3,70)	-0,0004* (-4,77)
Constant	10,1060* (107,76)	10,0070* (100,16)
N	4.003	4.003
R^2	0,2360	
F	308,84*	
Wald Statistic		897,71*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics for the uncorrected model and of z statistics for the corrected one are in brackets.
Source: Own elaboration on the base of Paraguayan EPH (2006)

Table 11: Paraguay: Rotated component loadings

Variables	Comp. 1	Comp. 2	Comp. 3
Persons per room	0,4837	0,0166	0,0202
Children younger than 10	0,6315	-0,0649	-0,1082
People of 10 years or older	-0,0406	0,1354	0,5573
Average age	-0,4830	-0,1389	-0,0115
Number of occupations of household head	-0,2332	-0,0891	-0,4236
Total hours worked by household head	0,0626	0,0392	-0,1814
Dependency rate	-0,1291	-0,0852	0,6193
Activity rate	-0,2352	0,4318	-0,2773
Participation of working income	0,0318	0,6162	0,0488
Participation of non working income	-0,0311	-0,6124	-0,0447
Rho	0,6747		

Source: Own elaboration on the base of Paraguayan EPH (2006)

tion and its arrangement according to housing conditions, being the number of persons per room and the presence of children under ten years old the determinant variables. Activity rate and participation of working income on total family income are the most weighted variables in the second component. Hence, it stands for labor market attributes in terms of dependence of household on labor market insertion of its members. In the case of the last component, the underlying variables with the greatest loadings are dependency rate and number of persons of ten year or older. It represents then household age composition.

The next step is to introduce the variables in the regression model. We will use two versions: a first one estimated by Ordinary Least Squares, both including and excluding constant, and a second one with selection bias correction (Heckman specification). The results are shown in Table 12.

Table 12: Paraguay: Mincer Equation estimation including principal components

Variables	Without Correction (WC)	Without Correction (NC)	Corrected
Years of formal education	0,1182* (23,35)	0,4844* (48,14)	0,1194* (23,56)
Experience	0,0091** (1,83)	0,3858* (55,16)	0,0077 (1,54)
Quadratic experience	-0,0001** (-1,73)	-0,0039* (-28,85)	-0,0001 (-1,18)
Component 1	-0,0676* (-4,15)	0,5222* (16,28)	0,0649* (-3,99)
Component 2	0,1716* (6,51)	0,3111* (6,14)	0,1409* (4,86)
Component 3	0,0989* (6,07)	-0,4350* (-12,33)	0,102* (6,27)
Constant	10,2833* (102,63)		10,3310* (100,71)
N	4.003	4.003	4.003
R^2	0,2624	0,9695	
F	184,03*	16931,97*	
Wald Statistic			1045,38*

*Statistically significant at the 99% confidence level. **Statistically significant at the 95% confidence level.
Note: The value of t statistics for the uncorrected model and of z statistics for the corrected one are in brackets.
Source: Own elaboration on the base of Paraguayan EPH (2006)

First of all, the ordinary estimation without constant will be discarded because, despite its greater R^2, it provides estimators with anomal values (specially, the rate of return of 48,44%). The model that includes the constant, with more reasonable results, proposes an education rate of return of 11,82%. Besides, all variables are significative, and both experience and its quadratic term have the expected signs (positive and negative respectively, as discussed above). The first factor from the principal component analysis has a negative coefficient, thus implying that, under the assumptions of the model[7], if the household head without overcrowding in his house or numerous children would earn a better salary. The positive sign of second component's coefficient indicates that if the houshold is more dependent on working insertion of its members and the latter is of good quality

[7]The most relevant assumption here is that there is not selection bias

(high activity rate), household head would earn more. It highlights that this component has a considerable effect on wage determination. Finally, as regards age composition, the number of adults composing the household affects positively household wage. This can be attributed to two effects: in the one hand, the number of adults augment possibilities of labor insertion of household members and, in the other hand, if the number of economically inactive people in the household is big, its head could find himself forced to gain a better wage.

The other version, with selection bias corrected, have similar results to the basic version described above. Main diferences are that the rate of return of education is slightly bigger (11,94% instead of 11,82%), experience and its quadratic term are not statistically significant, the first component's coefficient is positive, presumably reflecting the effect of needs on poorer households, the second component has a lower effect on wage determination and the third one, a greater impact. However, main conclusions hold.

As regards the selection equation, its results are exhibited in Table 13.

Table 13: Paraguay: Selection equation including principal components

Variable	Coefficient	Standard Error	Marginal Effect
Years of formal education	-0,0206	0,0083	-0,0060
Experience	0,0122	0,0072	0,0035
Quadratic experience	-0,0005	0,0001	-0,0001
Component 1	-0,1965	0,0403	-0,0569
Component 2	0,4978	0,0191	0,1441
Component 3	-0,0710	0,0292	-0,0205
House property	0,0901	0,0762	0,0267
Children (5 or younger)	0,1423	0,0612	0,0412
Children (between 6 and 12)	0,2079	0,0405	0,0602
Income earners	-0,1056	0,0299	-0,0306
Constant	1,1453	0,1709	
Log pseudolikelihood	-1.916.231		
Wald test (chi2)	7,52*		
N	5.292		
Censored	1.289		
Unsensored	4.003		
Dep. Var. Mean	0,7883		

Source: Own elaboration on the base of Paraguayan EPH (2006)

Opposite to Argentinian case, greater education level discourages from work participation, in line with the results in Paraguay in the case without socio-economic variables. Experience acts decreasingly augmenting the probability to take part in labor market, as was the case in previous selection equations. In line with Argentinian outcomes, house property and children presence in household fosters its head to participate in labor market. The children effect is contrary to the outcome found in Paraguay when socio-economic variables were not taken into account. It is surprising the effect concerning to the number of income earners, which contradicts the ones previously found. This could be related to reduction in urgent needs, due to a greater cost diffusion involved in a greater rate of participation in labor market within the household.

4 Final Remarks

The analysis performed in this work, beyond its limitations, provide interesting empirical notes on the relationship between education and earnings determination. Besides, the fact that Argentina and Paraguay are analyzed allows to compare the outcomes in two countries with different level of development.

Taking 2006 as a benchmark year[8], we can compare and contrast the influence of wage determinants in both Argentina and Paraguay. Table 14 exhibits the compared results. For each case, we consider the most complete specification previously explored, that is, including principal components about socio-economic and demographic characteristics and corrected for selection bias.

Table 14: Final Mincer Equation estimation. Argentina and Paraguay comparison

Variables	Argentina	Paraguay
Years of formal education	0,0976*	0,1194*
	(41,33)	(23,56)
Experience	0,0070*	0,0077
	(2,59)	(1,54)
Quadratic experience	-0,0000	-0,0001
	(-0,76)	(-1,18)
Component 1	0,0793*	0,0649*
	(-2,51)	(-3,99)
Component 2	0,0390*	0,1409*
	(5,69)	(4,86)
Component 3	-0,0631*	0,102*
	(-8,07)	(6,27)
Constant	0,6264*	10,3310*
	(7,27)	(100,71)
N	22.144	4.003
Wald Statistic	2702,25*	1045,38*

*Significant with 1% of significance level. **Significant with 5% of significance level.
Note: The value of t statistics for the uncorrected model and of z statistics for the corrected one are in brackets.
Source: Own elaboration on the base of Argentinian and Paraguayan Househol Surveys (2006).

The most significant result is that education rate of return estimated by this static method in Argentina is considerably lower (9,76%) than the one estimated in Paraguay (11,94%). This indicates that additional education is better economically rewarded in Paraguay that in Argentina. This is line with theories that indicates that in countries where education is scarce, its return is greater[9].

It is remarkable that the magnitud and form of the effect of experience on wage determination are very similar in both countries. However, the quadratic term is not significant in Argentina and neither this one nor the linear term are significant in Paraguay.

[8]This was the last period in which reliable data were published in Argentina.
[9]The microeconomic theory proposes that, given a good supply, if it is scarce, its price is higher.

Recalling that the first principal component in Argentina is equivalent to the second in Paraguay, labor market incidence within the household has a bigger impact in Paraguay, suggesting that in this country the fact of economic dependency on labor income and accomplishing an adequate labor market insertion makes the household head to earn a higher income.

The second component in Argentina is analogous to the third in Paraguay, representing household aging structure. The same as in the previous case, in both households with more adults and economically inactive people tend to have a head with a better salary. The effect is greater in Paraguayan case.

As regards the third component in Argentina and its equivalent, the first one in Paraguay, the effect, despite of similar magnitude, is of different sign. In Argentina, household head income is lower if there is more children and overcrowding, indicators of poor living conditions. On the contrary, in Paraguay these conditions imply a higher salary. This outcome could have great implications, because it suggests that in Argetina poor household tend to perpetuate as a consequence of worse labor reward, while in Paraguay, they have possibilities to ameliorate their conditions becase of better salaries. However, to conclude this, further research is needed.

Finally, it is interesting that the constant in Argentina the constant is smaller than the one in Paraguay. This fact is consistent with the graphic analysis. Paying attention to the scatter plots above, we can see that the relationship between income natural logarithm and education departs from zero approximately in Argentina and 10 in Paraguay[10]. This matter is due to different measure units (each country's currency), and can be solved by standardizing the observations. However, such operation is beyond the scope of this work and would not change main conclusions.

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