

## SCHOOLING EFFECTS ON YOUNG WORKERS' WAGES: THE ECUADORIAN CASE

EFFECTOS DE LA ESCOLARIZACIÓN SOBRE LOS SALARIOS DE LOS TRABAJADORES JÓVENES: EL CASO DE ECUADOR



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### Abstract

Mincer's schooling returns model is one of the econometric tools most used in the investigation of wages in an economy. In Ecuador, the labor market is characterized by high levels of informality and discrimination against certain groups, including young workers, which in some cases are vulnerable population with low education levels. In Ecuador, between 2010 and 2015 within the group of workers aged between 23 and 29 years, for each additional year of schooling that individual has her labor income increases by an average of 10%. In the case of skilled workers the additional year of schooling translates into an average increase of 20% while for unskilled workers there is no salary premium for education.

**Keywords:** Wages, labor market, youth, Ecuador.

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## Resumen

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El modelo de retornos educativos de Mincer es una de las herramientas econométricas más utilizadas en la investigación de salarios. En Ecuador, el mercado laboral está caracterizado por altos niveles de informalidad y discriminación, entre ellos los jóvenes los mismos que en ciertos casos son población en vulnerabilidad y baja escolaridad. En Ecuador entre los años 2010 y 2015, dentro del grupo de trabajadores de entre 23 y 29 años, por cada año adicional de escolaridad que tiene el individuo, su ingreso laboral crece en un promedio de 10%. En el caso de los trabajadores calificados, el año adicional de educación se traduce en un incremento salarial de 20%, mientras que para los trabajadores no calificados no existe ninguna prima salarial por escolaridad.

**Palabras clave:** Salarios, mercado laboral, jóvenes, Ecuador.

### 1.- Introduction

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Differences on individual's schooling levels determine asymmetries in earnings. Skilled workers are in a better position in the labor market with higher levels of employment. Young workers are no exception, since the beginning of participation in the labor market differences in the years of schooling of individuals cause substantial wage gaps.

The seminal work developed by Mincer (1958), demonstrates that wage gaps are caused by the differences in schooling levels and work experience, nonetheless

the simple estimations of schooling on wages do not present an accurate magnitude since schooling is not a random phenomenon for every worker.

Individual's schooling depends on multiple factors which determine how far a person can achieve on that matter. Therefore schooling is an endogenous variable that creates bias on Mincer's wages model which can be corrected using instrumental variables approach (Heckman, Lochner and Todd 2003).

Mincer's educational return model (1974) is one of the most used and studied in the literature of labor market. The ratio of high school and higher wages found by Mincer has accommodated a number of investigations related to the effects of schooling and earnings standing out the research conducted by Card (1995, 1999), Conneely and Uusitalo (1997) among others.

The performance of an individual in the early years of schooling is a determining factor in the completion of school life thereof having a direct relation to wages (Ashenfelter, Harmon and Oosterbeek 1999 Ashenfelter and Rouse 1998 Ashenfelter and Zimmerman 1997).

It has been found that marginal increases in education levels lead to increase in the salaries of those individuals who achieved this marginal increase (Oosterbeek and Webbink 2006). Population studies from peer groups observable characteristics but with different levels of schooling entrench Mincer hypothesis (Miller,

Mulvey and Martin 1995, Oreopoulos 2006). While differences in labor market performance lead to distortions in wages (Leuven, Oosterbeek and van Ophen 2004) schooling remains a determining factor in labor income.

In Ecuador, there is a marked difference in earnings in different segments of the labor market; there is also usually an important component of discrimination against women, indigenous, young workers and unskilled workers.

This work aims to determine which are the schooling effects on wages into the population between 23 and 29 years old, also to find out the differences between skilled and unskilled workers<sup>3</sup> on that group. Using the method of instrumental variables to correct the effects of endogeneity in the schooling of the individual and applying this methodology into a pooled data for 2010 – 2015 periods, we identified what are the differences and the impact of schooling in young worker's wages.

The paper is organized as follows; section two contains the description of Instrumental Variables methodology, section three details the Ecuadorian labor market for young workers, used data and the results of the instrumental variables estimations; finally section four contents the conclusions of this research.

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3. *Skilled workers are individuals with 11 or more years of schooling while unskilled workers are those with 10 or less years of schooling.*

## 2.- Instrumental variables method

OLS estimation has important assumptions that must be fulfilled, nevertheless the assumption of exogeneity it's the most difficult to comply. In social sciences many variables are not exogenous (random variables), there exist many observable and unobservable characteristics that influence and determine variables.

Instrumental variables method is wide used specially on impact evaluation, for example papers by Ravallion and Wodon (2000) using geographical variables as instrument for evaluating a program in Bangladesh, Glewwe and Jacoby (1995) who used IV approach for examining effects of child health on schooling in Ghana, among other works.

Schooling is determined by many factors that influence individual's schooling level, for example parents' schooling levels and access to educational system, household poverty status, and further more. Instrumental variables approach helps models to "break" the endogeneity of the independent variables (Wooldridge 2009).

The model is expressed as follows:

$$Y_i = \alpha X_i + \beta S_i + \varepsilon_i \quad (1)$$

Where:

$Y_i$  = is the logarithm of wages

$X_i$  = is the vector of control variables used in the model

$S_i$  = is the individuals' schooling years.

$\varepsilon_i$  = is the error term

The IV methodology aims to clean up the correlation between S and  $\varepsilon$ , which is the variation in S is uncorrelated with  $\varepsilon$  needs to be isolated. To do it, it is important to find an instrumental variable denoted by Z - mother's and father's schooling in our case- that satisfies these conditions:

- Correlated with S:  $cov(Z, S) \neq 0$
- Uncorrelated with  $\varepsilon$ :  $cov(Z, \varepsilon) = 0$

Therefore instrument Z affects the individual's schooling variables but is not correlated with factors affecting outcomes, known as the exclusion restriction. Finally the first stage regression can be expressed like:

$$S_i = \gamma Z_i + \phi X_i + \mu_i \quad (2)$$

The predicted impact of schooling on wages therefore reflects the part of the impact affected only by S and embodies only the exogenous variation on individuals' schooling. Equation (2) is substituted in (1) given the reduced-form outcome regression (Khandker et. al. 2010)<sup>4</sup>:

$$Y_i = \alpha X_i + \beta(\gamma Z_i + \phi X_i + \mu_i) + \varepsilon_i \quad (3)$$

### 3.- Data, Ecuadorian labor market and IV estimations results

The used data belongs to the national employment survey, which is quarterly and elaborated by the National Institute of Statistics and Censuses (INEC), it is composed by several chapters that explore

4. *Nonetheless Card (2001) determines that IV estimator is always greater than OLS estimator measuring returns of schooling.*

topics like employment status, earnings and transfers, educational status of the population, access to communication and information technologies, among other special issues requested to the Institute.

While gathering the information becomes a quarterly task, the survey on the months of June and December has national wide data which allows finding out the level of employment of the urban and rural areas of the country. Survey's chapter selected for this research belongs to the collection of data for the month of December 2010 to 2015. The whole sample consists of 80,000 observations (average for the period), the survey's strata belong to the urban and rural areas of each provinces on the Coast and Highland regions, for the Amazon region the strata are divided into rural and urban areas<sup>5</sup>. The average annual sample for the population between 23 and 29 years old 5,457; from this group the average annual percentage of people who lives with parents is 47.23%<sup>6</sup>.

Ecuador's labor market is characterized by high levels of informality and underemployment. In December 2015, the unemployment rate stood at 4.77% while the underemployment rate was 52.09% and full occupancy was 42.50%. However, during the period of analysis of this research full employment levels have increased by falling levels of underemployment and unemployment rate relatively constant.

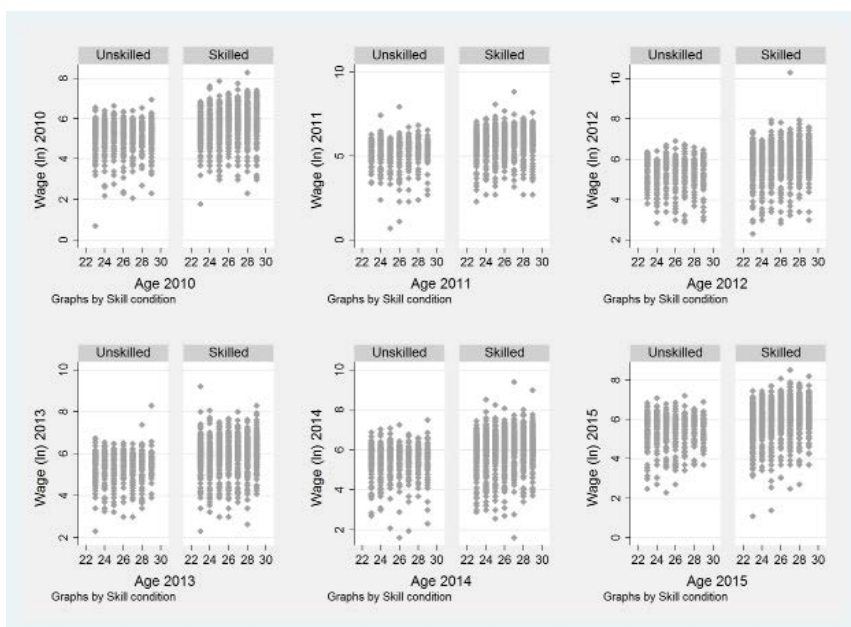
5. *Since the survey of 2014 amazon provinces also are survey's strata.*

6. *The reason why we used the part of the whole group of young workers is that they have the data for schooling of mother and father.*

Notably, the unemployment rate in Ecuador is one of the lowest in Latin America.

In the case of workers aged between 23 and 29 years old a negative bias shown towards this cohort. For example, the wage gap between the population's average regarding the analyzed group is at 9.30% for the years 2010 to 2015. Unemployment levels are higher for the analyzed cohort (6.87 % versus 4.77%), nonetheless full employment levels are located in better condition than the rest of the population (47.15% versus 42.50%). The wage gap between skilled and unskilled workers is notorious throughout the analyzed period. In the case of skilled ones the average income, between 2010 and 2015, stands at US\$431.31 per month while for unskilled workers the average wage is \$261.70; this implies an average pay gap of 64.81% (figure 1).

**Figure 1: Wage differences between skilled and unskilled workers – wage logarithm**



Source: INEC – ENEMDHUR December 2010 - 2015

Into analyzed period, the socio-demographic structure and participation in the labor market remains constant for both groups. Years of schooling of skilled workers averaging 14.21 years while in the case of unskilled workers the average is 6.60 years.

The percentage of women is higher in the group of qualified workers (41.60% versus 26.63%) and a higher percentage of population living in urban areas (84.80% versus 55.61 %). The percentage of workers who identify themselves as indigenous is greater

in the group of unskilled workers (6.49% vs 2.42% ), while the average age for both groups is almost identical with 25.72 years for individuals in the group of skilled workers and 25.64 average for the group of unskilled years.

In the case of participation in the labor market, for the group of skilled workers the percentage working in the sector of agriculture is three times lower compared to individuals of group of unskilled working in that sector (14.87% for the group of skilled workers and 42.45% in the group of unskilled).

Participation in the manufacturing sector is almost similar, 9.78 % of skilled workers and 10.21 % of unskilled ones labor in this sector. In the trade industry the percentage of individuals in the group of unskilled workers who work in the sector is higher than the percentage of the group of unskilled workers (descriptive statistics are detailed in Appendix 1).

The dynamics of the labor market among young people in Ecuador reflects important features that break generational demographic dynamics. For example, in the case of skilled workers women have greater labor participation in relation unskilled peers, fact given that attendance rates in higher education have been favorable for women in their peer group workers recent years<sup>7</sup>, however the average wage remain biased in favor of

men<sup>8</sup>.

Also evidenced greater participation of qualified workers in services sectors aimed at producing higher added value, such as technology or banking services. But the logic of the labor market for young people has links tied to the dynamics of poverty and evidence that higher levels of education are privileged socio-demographic sectors.

Parents' education is an important determinant of individuals' schooling. Mincer model of educational returns must have given the bias corrections schooling gives to earning's estimations. As mentioned in the previous section, it was taken as an instrument to mother's and father's schooling levels for each individual. Behrman and Rosenzweig (2002) argue that parents' education is crucial at different times of the individual's education; in the case of primary education and high school, mother's schooling is the primary determinant of a child's schooling, while the father's schooling is a strong determinant for enrollment in higher education levels.

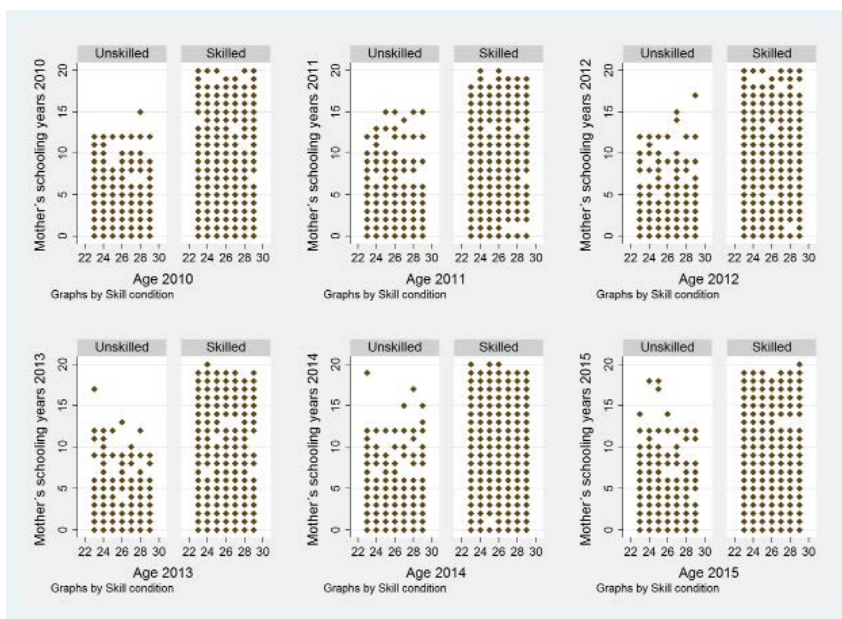
For the analyzed groups an important difference can be seen in levels of parental education. On average schooling of the mother it is of 9.04 years for the group of skilled ones while for the group of unskilled workers is 4.32. In the case of the father's schooling the average difference between the two groups is similar 9.38 years for the

7. According to the employment survey of December 2015, the attendance rate to higher education for women was 23.85%, in the case of men was 21.58%.

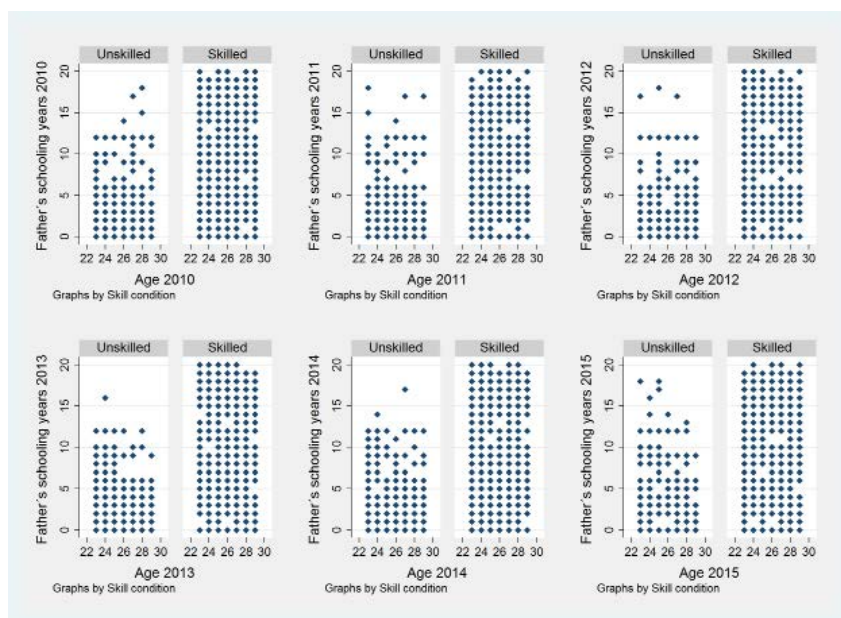
8. In December 2015, the average salary of a young man was US \$ 465.35 per month while for women the salary was US\$378.40 per month.

group of skilled workers and 4.80 years for unskilled (Appendix 1). Within six years in analysis, mother's and father's schooling reaches record observations with up to 20 years for individuals in the group of skilled workers, on the other hand parents' schooling of individuals in the group of unskilled arrives, mostly up to 10 years of schooling (figures 2 and 3).

**Figure 2: Mother's schooling differences between skilled and unskilled workers**



Source: INEC – ENEMDHUR December 2010 - 2015

**Figure 3: Father's schooling differences between skilled and unskilled workers**

Source: INEC – ENEMDHUR December 2010 - 2015

Table 1 contains the results of the OLS and IV estimates models of educational returns for each of the years comprising the period from 2010 to 2015 and for each of the groups of skilled and unskilled workers. The selected control variables for all estimations are: age, squared age, and dummy variables for women, indigenous, urban residence, single as marital status and if individual works in the agricultural sector.

The OLS estimators are significant at 1% for all years for the entire sample and for the group of skilled workers. In the case of the group of unskilled workers, the estimators are only significant for the years 2010 (the whole estimations) and 2012 (OLS estimation). Estimates IV have the same behavior, which is significant for the whole sample and for the group of skilled workers<sup>9</sup>.

For the whole sample a positive effect of schooling is shown. In the six-years analyzed period relatively constant coefficients educational returns magnitude are seen, implying a similar logic for educational returns to the analyzed cohort during the period in question. The coefficients corrected with instrumental variables are twice larger than those obtained with the OLS regressions, which means once made the correction, that for workers between 23 and 29 years each additional year of schooling increased by 10% average the salary.

9. Robustness of the instrument used is detailed in Appendix 2a and 2b.



In the case of group of skilled workers, educational magnitudes report higher returns compared to the estimated coefficients for the full sample. While OLS estimates of this group represent a slightly greater than the magnitude of the total sample, estimates corrected with instrumental variables are twice than the observed for the sample of young people. In this case, taking into account the corrections instrumental variables, it is observed that for each additional year of schooling that the individual has, the salary grows by an average of 20%.

For the group of unskilled workers, no coefficients with the exception of three are statistically significant. This result implies that for unskilled workers schooling has no effect on earnings (except for estimates of 2010). That is, whether the individual has 1 or 9 years of schooling, wages for people in this group are determined by factors outside formal education.

**Table 1: OLS and IV Estimations**

	All			Skilled (>10 years of schooling)			Unskilled (<=10 years of schooling)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	IV Mother's schooling	IV Father's schooling	OLS	IV Mother's schooling	IV Father's schooling	OLS	IV Mother's schooling	IV Father's schooling
Schooling	0.058***	0.104***	0.110***	0.089***	0.234***	0.244***	0.034***	0.093**	0.111**
2010	[0.004]	[0.009]	[0.010]	[0.010]	[0.032]	[0.032]	[0.012]	[0.040]	[0.045]
Schooling	0.058***	0.097***	0.105***	0.096***	0.162***	0.187***	0.006	0.043	0.036
2011	[0.005]	[0.011]	[0.011]	[0.010]	[0.022]	[0.024]	[0.017]	[0.080]	[0.072]
Schooling	0.065***	0.108***	0.118***	0.086***	0.208***	0.221***	0.044***	0.027	0.005
2012	[0.006]	[0.012]	[0.013]	[0.011]	[0.034]	[0.032]	[0.014]	[0.058]	[0.061]
Schooling	0.056***	0.109***	0.107***	0.105***	0.221***	0.216***	0.006	0.088	-0.009
2013	[0.005]	[0.013]	[0.013]	[0.011]	[0.035]	[0.033]	[0.015]	[0.080]	[0.088]
Schooling	0.067***	0.121***	0.119***	0.106***	0.237***	0.220***	0.019	0.079	0.148
2014	[0.004]	[0.011]	[0.011]	[0.009]	[0.030]	[0.028]	[0.016]	[0.073]	[0.091]
Schooling	0.072***	0.122***	0.131***	0.122***	0.208***	0.215***	-0.012	0.108	0.367
2015	[0.005]	[0.014]	[0.014]	[0.009]	[0.029]	[0.030]	[0.019]	[0.153]	[0.291]

Robust standard errors in brackets

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: INEC - ENEMDHU December 2010 – 2015

The Ecuadorian labor market in the segment of young workers offered a wage premium for each additional year of schooling that the individual possesses. This additional payment for schooling that skilled workers are beneficiaries has important implications for variables such as poverty and inequality in society. While only talking about a concept of flow (earnings), income surpluses are aimed at such an accumulation process that deepens inequality levels especially during the early years of participation in the labor market.

Another important point of analysis that determines the differential payments for schooling are industries where young people work. Unskilled workers labor in low added-value industries in which are not needed skills that are linked with schooling. This category of workers engaged in activities related to physical effort more intellectual or creative production so that schooling is not a determining factor in labor income activities.

Given that the population analysis corresponds to young workers, variable work experience is not a factor in determining labor income, so the salary is clearly determined by the years of schooling especially for workers with more than ten years of formal education.

Differences in unskilled young workers' schooling respond to intergenerational poverty logic, because as we observed the parents of those individuals also have low levels of education which leads to low wage income that force children and

adolescents in those homes to participate in the labor market early and drop out from educational system.

An important cause of the low level of education in a given group of young workers is the failure of quality that suffered in the past the Ecuadorian educational system in relation to the transition from basic education level to high school level. In 2006 only four out of ten teenagers in the educational system continued to move toward the high school level, now seven out of ten teenagers who successfully pass the transition.

#### 4.- Concluding remarks

In Ecuador, the labor market is characterized by significant levels of informality and asymmetries against certain groups including young workers. This age group has a higher incidence of unemployment compared to the national incidence also with the level of full employment reports higher percentages within this cohort.

The educational model returns of Mincer is a fundamental tool for analyzing the impact of schooling on wages provided they take into account the econometric corrections that allow the elimination of schooling endogeneity caused by the individual. In this respect the corrections to the model were made through robust instruments that ensure the correct estimation of the coefficients, these results that allow verifying that schooling among unskilled workers has no causal effect on labor income of the conglomerate. While the analysis was done on a truncated

sample, based on information in the used source, it can be established that the population of young people which still live with their parents, schooling is an important determinant in wages as long as the individual has more than ten years of formal education.

This condition leads to a series of analyzes to be performed in the future, highlighting the incidence of poverty in households whose members have low levels of schooling, the contribution is the entry of unskilled workers in total household income and the distribution and fate of such income within households.

As seen, employees who have no schooling wage premiums are linked in the labor market in industries that do not generate much added value, generally agriculture; so, given the low wages that these industries gives, maintained in the medium term logic low wages for people in vulnerable situations.

It is important to strengthen public policies that allow the increase of schooling among unskilled workers, taking into account with a greater emphasis on technical careers that allow boost the labor market and increase the salaries of this group. Additionally, it is necessary to promote a short-term policy of employment and production allowing better compensation to unskilled workers to diminish asymmetries in income distribution existing in the Ecuadorian economy. Additionally greater mechanization of production, transfer of technology and improvements in productivity levels of unskilled workers

is necessary.

Schooling relations with wage and salary with poverty are very marked in Ecuador, in this investigation we found a strong determination that has schooling in wages in Ecuador, with what was established logic of increased revenue and its impact on poverty have intergenerational behavior that can determine to live in conditions of vulnerability to particular population group that did not have a guaranteed access to formal education.

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