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**Returns to Education of Colombian Economists:
Analysis from the Theory of Human Capital (2009-
2013)**

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Abstract. This research work aims to identify the rate of return of graduates of economics in Colombia since the tenets of human capital theory and criticism of the theory of signaling. The methodology is quantitative court where income Mincerian equations were used as the method of Heckman (1979) to correct for selection bias using data from the GEIH in the period 2009-2013 for 11 professions. The main conclusion is that graduates of economics in the period studied show returns to education over the vast majority of professions.

Keywords. Economists, returns to education, human capital theory, signaling theory, labor market.

JEL. C01, J24, E24.

1. Introduction

Human capital theory is built upon the principles of Schultz (1960; 1961) Becker (1964; 1983; 1990) and Mincer (1958; 1970; 1974) in the 1960s under the guidelines of the neoclassical theory of economics. Its flagship contribution is that there is a direct relationship between a greater number of years of education and experience of an individual, with higher returns in the salary of the person concerned in the short term. Similarly, these economists emulated the parent of this school, Professor Marshall, in his book *Principles of Economics*, where states that "the most valuable asset of all is the one that has been invested in human beings" (Becker, 1983). Consequently, Becker plays investment in education, as the opportunity cost of sacrificing the individual in the present for a future in which you will get better returns. Hence it exposes this possibility is determined by the investment made by the organization and / or effort as the motivation of the individual (Becker, 1964). Roughly Becker, human capital is a variable that can improve the development and economic growth of a country.

With the same purpose Schultz, widely recognized as the precursor of the economics of education, he explains that education and health are imperative for society variables. Therefore Schultz (1961) stated that years of education, and quality of life of people are standards which set the types of life of individuals. On the other side, but on the same page Mincer (1974), was the first economist to develop the empirical analysis of the correlation between human capital income individuals. Thanks to him are born where the quantitative studies enriches the

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discourse of human capital through a Mincerian equation which is estimated by least squares (OLS) with cross-sectional data usually:

Mincerian equation:

$$\ln(y) = \beta_0 + \beta_1 S + \beta_2 Exp + \beta_3 Exp^2 + \varepsilon \quad (1)$$

Where Y: they are the income of the individual.

S: number of years of education.

Exp: years of work experience.

e: random term that can not explain the model.

Which it has been used as a reference in a lot of research (Freire & Terjeiro 2010; Barceinas et al, 2001; McConnell et al. 2003; Harmon et al, 2001 etc.)

Both international and national literature is very prolific in front of studies with these characteristics. These investigations Pabon (2004) point out, Salas-Velasco (2001), Isaza (2003; 2002; 2013), which have contributed to increasing the scientific expertise deal with the relationship between the returns to education with the economic policies of the countries. However, studies that emphasize a specific profession are rather scarce. These can indicate Gomez & Barbosa (2014), where an analysis of the rate of return of education for the union of teachers in Colombia between 2009 and 2012. Demonstrating held that on average, teachers have rates of return below the vast majority of occupations and economics graduates are above them. Those of Paschopoulos (1985) and (1993) who claim that the highest social returns are for graduates of Engineering, Law and Economics and the lowest in Physics and Agronomy. Concluding that the economy generates the highest social return, Medicine and Agronomy private both socially and private the lowest rate. At the same tune the conference in Mexicali, BC at the Faculty of Political Science, UABC by Roviroso (2008), who said that economists in the US received an average income of \$ 77,000 a year and is 10% decile less, they have a monthly average of \$ 42,000. Noting that no data are the same for Mexico in that period.

Moreover Stiglitz (1975), Arrow (1973) and Spence (1973) constructed the theory of signaling, as an alternative to the theory of human capital. Under that conceive of education as a tool, as a mechanism, which causes signals on productivity of graduates. From this perspective, education is understood as the vehicle that indicates the productivity of workers, noting that there may be differences between those who say such certificates issued by educational institutions with employee productivity Garrido (2010) and (2005). For thus the theory of signaling, indicating wage differences between individuals with identical teachings, which would be contrary to the tenets of human capital theory look. Consequently, employers may find differences in determining the salaries of its employees as they have information of some features of its employees, but not perfect information productivity. Which contributes according to theory, generating costs associated with hiring. Therefore, employers are based on indices, which give signals contributor to identify marginal productivity and hence assign a salary in correspondence with hiring expectations (Garrido, 2005, p.22).

However, from an empirical point of view both theories have their critics, because in general, they are equivalent observations, that is, an equation of income not "there is a possibility that the data show evidence for one "without forgetting" the variable "skill" is not directly "observable", there is no possibility to distinguish its direct contribution to the wages of the indirect, induced by the use of education as a sign of "skill" (Barceinas, et al., 2001, p.4) However the contributions from this theory help to better understand the dynamics of the labor market. A tacit

example was the study (Mora, 2000), which was entitled gains have a title: A job application Cali, Colombia, where the results indicate that the labor market of that city pays not only for education but have that workers should finish high school and college education. Delimiting the need to seek other different theories to human capital under according to the author the latter does little knowledge against the relationship between employers with employees in the labor market of the city. In the same sense the research of Bouillon & Rodes (2004) in Spain, used as a theoretical framework the theory of signaling, to verify the influence between employment experiences through (ETT¹) Temporary Employment with the careers of Workers. Precisely the results showed that prospective employers perceive the experience gained by these workers in such organizations or agencies, such as productivity indicator of future performance and position against studies of these potential partners.

Therefore, the objective of this research is to analyze the employment situation of graduates of economics Colombia, between the years 2009 -2013 with data GEIH from DANE, making estimates with Mincerian equations, correcting the proposed method by Heckman (1979) from the perspective of human capital. As well as looking at possible criticism from the theory of signaling To do this, you start with this short introduction, it goes on to describe the data as indicating the econometric micro, continuing with the results, discussion and conclusions finishing with small model.

2. Methodology

One of the great contributions that provided Mincer for the stock of economics are empirical analyzes through its Mincer equations. From which they corroborate the neoclassical theory of the economy, the linear relationship between returns to education with an individual's wages (Mincer, 1974). Mincer equation estimated reciprocity showing human capital variables on the logarithm of labor income (Pabón, 2004, cited in Gomez & Barbosa 2014, p.23).

The model in which the regression is presented below :

$$\ln Y_i = \beta_0 + \beta_1 \exp_1 + \beta_2 \exp_2 + \beta_3 Edu_1 + \beta_4 Edu_2 + \beta_5 carre + \beta_6 carre1_i + \beta_7 + p - 1 + \varepsilon \quad (2)$$

Where:

Ln yi = income of employees in logarithmic form.

Exp = Experience of the worker.

Exp2= employee experience squared

UNI1 = primary level.

Uni2 = secondary level.

Carre = representing the professions.

p = number of professions. See in (Gómez & Barbosa, 2014; Gómez, 2014)

The sense is expected coefficients (edu) positive, (exp) positive, (exp2) negative, differentiating effects on each of the professions which are false variables. (Quinones & Rodríguez, 2011). Similarly to the data they were made Heckman procedure (1979), which corrects the problem of selection bias from the inclusion of a term derived from the pseudo-residuos a probit model of labor participation. Such pseudo-residuos contain information about unobservable variables associated with wages. While you can not know exactly the effect of each

¹ acronym in Spanish

of the unobservable variables, yes Heckman procedure corrects the estimated betas of other variables included in the model. This method introduces the variable λ is the correction term (also known as the inverse of the Mills ratio hazard or non-selection) (see Isaza 2013). The equations to estimate are as follows:

$$\ln(Wf) = Xf * \beta f' + \sigma f \lambda f + Uf \tag{3}$$

$$\ln(Wm) = Xm * \beta m + \sigma m \lambda m + Um \tag{4}$$

Where

W_i = column vector of log hourly wage of individual i sex.

X_i = array that contains the observed characteristics of individuals.

β_i = vector of coefficients to estimate.

λ = correction term.

σ = covariance between the unobservable factors affecting labor participation and those that influence wages.

U_i = random error term, where $E(u) = 0$. (Barraza, 2010; Gómez & Barbosa, 2014; Gómez, 2014).

3. Results

From the point of view of innovation and knowledge intensive activity human capital benefits under that more educated people have more energy, time, experience, which greatly improves the organization in the innovation process (Brusoni et al., 2006). Hence, to summarize the results as do comparative dissimilar (vs. economists cabinetmaker) 12 of the 82 professions were chosen professions. Table 1a and 1b show the regression results by applying the average of the same antilogaritmo least 1 annual microdata from the Household Integrated Survey -GEIH corresponding to the period 2009-2013, and was based Variable seller Store assistant under its number of observations.

Table 1a. *Subsample summary of male and female graduates of economy*

Professional	2009	2010	2011	2012	2013	Average	Antilogarithm	-1
Women economists	0,8127	0,7756	0,6927	0,6701	0,6851	0,7272	5,336297087	4,336297087
Male economists	0,6978	0,7894	0,794	0,9016	0,9166	0,81988	6,605109169	5,605109169

Source: Author's calculations from data from DANE. The base category is Vendor, Shop Assistant. See Gomez and Barbosa (2014).

Indeed the results indicate that for the year women economists was greater rate of return was 2009 with 5.4 log points and the lowest was in 2012 with 3.6. For economists men in 2013 was the highest return with 7.2 and the lowest was in 2009 with 3.9. Showing that there are gaps between men and women graduating in economics in both years and the results, because on average the results of economists men was 5.6 and women 4.4, ie 1.2 log points above for first. These differences between men and women is in line with studies of job discrimination in the Colombian market, as demonstrated by research (Gómez, 2014) Isaza & Reilly (2011), Pabon (2004), Tenjo & Herrera (2009) and Barón (2010) who together conceived and shows that the Colombian labor market there gender wage segregation.

From the point of view of professions, economists on average women have a rate of return to education over administrative sciences at the counters .Since women set their results indicate 2.7, 2.8 managers statistics 3.3. Hence, economists on average are above this group to rock the difference between 2.0 to 1.1 log points. To natural sciences and related are above that obtained physical 3.3 as the engineers and architects respectively 4.2 and below 4.7 biologists. From the social

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sciences, they are below 4.7 Above lawyers journalists 1.1 and 2.7 teachers. Faced with health professionals the economist women are above that obtained medical 2.9 and 2.2 nurses. Roughly the results indicate that a woman graduate of economy compared with other professions, the rates of returns are on average above the vast majority of them.

For males compared to management science results show that is above where statistical coefficients were 2.5, 2.6 meters and 3.5 administrators. Since men economists coefficient was 5.6 log points. Compared with the natural and related sciences, the results are above 4.2 architects and engineers, physicists and biologists 3.8 5.4. From the social sciences lawyers coefficients are below economists, since they obtained 3.7, 1.3 journalists, teachers with 3.3. From these health professionals they are over, as were 2.9 doctors and nurses was 2.1. Indeed professionals economics graduates male on average, they are above the vast majority of professions, in their returns to education, without ignoring the effects of the economic situation of the country in labor income Colombian professionals as explained by the ANDI (2012), when they state that the characteristics of the Colombian productive apparatus honors disciplines that strengthen its competitiveness and professions that generate differentiators that can be identified, ie having linear relationships between the real economy and offers academic institutions such as economics graduates who have a greater influence line of CPC (2011; 2012) and (2012; 2013) .In the same way, the Davivienda Bank Report (2012) show in its sector, the vast majority of its senior managers have training in economics and is a trigger to empower your brand, under the social constructions that must deal with this profession compared to others such as being a teacher (Calvo ,2007). To conclude this section, we should not forget that these returns well be related to the dynamics of the Colombian economy also have to do with the external relations and Foreign Direct Investment, as this is in tune with changing production processes (DANE, 2011) in which, economists are more visible, given its interdisciplinary approaches such as social returns, as the imaginary in the country from the point to be a graduate of economy is good seen.

Likewise, the results show hierarchies in the returns to education, which can be divided disciplines with high average and low. Among the high returns to education are the professions of lawyers economists, biologists, architects and engineers ranging between 4.8 and 4.1 log points. For returns media education, statistics, physical, and medical are waving between 3.2 to 2.8 log points. In the case of low returns to education accountants, nurses and teachers, journalists where the results range from 2.7 to 2.2 log points for women are. From the perspective of men, disciplines with high returns to education are like women, biologist and economist, ranging from 5.6 to 5.4 log points. For media returns to education which are larger than females, are physicists, administrators, lawyers (which is a difference with women, under which the lawyers were in high yields) as architects and engineers teachers, the results fluctuating between 4.2 to 3.5 log points. The return to low education, doctors are unlike women who are in the media, nurses and statisticians with the same distinctive features as compared to the returns to women.

In applying the procedure of Heckman (1979) for male subsample, as a female, the results indicate no selection bias under lambda coefficients, there is also a statistically significant negative correlation to 1 percent in the selected variables. Which can be explained that variables such as motivation and skill not necessarily skew the results (Isaza, 2013) and (Gómez & Barbosa, 2014) .From the point of view of the results of the variables that are aligned to the theory of human capital, the results show that the potential returns to work experience are significant at 1% in most cases (see Isaza, 2013). Regarding the results of the variables listed

education, follow the path that the greater number of years of education, the better the results. Just as men as observed and identified in the professions, have higher rates of return. That is, there is evidence of gender wage discrimination, as equal in the labor market, this favors the earnings of men compared to women as literature specializing has prolifically reflected (Gómez, 2014; Isaza, 2013; 2003; Farné & Vergara, 2008; Galvis, 2010).

4. Discussion and Conclusions

From the perspective of Becker (1964), individuals with more years of education and experience sighted a greater wealth of opportunities that those without these collections. Therefore, creativity and innovative processes are variable to solve the everyday problems of the Paez organizations, (2012). In this sense, being a graduate of economics in Colombia will in relation to the aforesaid, by virtue of its powers and returns to education. Hence, this research agrees with the results of the study by the Universidad del Rosario in Colombia by Forero & Ramírez (2008), when they tested in one of its conclusions, that professional graduates of economics are more likely to accrue higher, income under that are more likely to have higher incomes if they work in the public sector, where you can find a lot of labor supply looking for a requirement to be graduates of economics, not to mention another crucial it is for parents of these graduates have higher education, which impacts positively on wages as well as being a graduate of this profession in the capital (Bogotá) expands the possibilities of higher returns to education OLE (2011).

With the same purpose the research results are in line with the thesis (Gomez & Barbosa, 2014; Gómez, 2014) when they explain that the coefficients of the returns to education by teachers are below Economists results for both men and women. Likewise with the data of the Labour Observatory of Education in the newsletter 20 MEN² (2012) when exposed to a greater number of years of schooling are better returns to education, which was evident with the results of the variables associated with human capital. However I would not be in tune when the MEN says that among the ten programs with higher incomes are graduates of medicine, since the research data indicated that graduates of health were below the results of graduates economy. Which is influenced by the repeated loss tended salaries Colombian physicians, given the very unfortunate processes in working conditions from the Law 100 of 1993, Escobar (2013) Robledo (2014) López (2011). In the same way this investigation is consistent with the analysis (Santamaría, 2009) when it states that in terms of income, women have lower returns than men and that the greater the number of years is also higher than the difference. Finally, research arranges with declaring Medina (2012), stating that there is a great variance in the returns to education in the professions, which is related both social constructs face graduate in a particular discipline be like labor demand against a group of graduates; delimiting the economic growth that occurred in the decade of 2000 to 2012 period was contravía with the decreases in returns to higher education in Colombia. Consequently economic growth catapulted by GDP and rising international direct investment, was not aligned with the staking of employment, which could lead to an excess of labor supply, which is consistent with decreases in salaries. Hence, this might be leveled with the growth in the years of study Farné & Vergara (2008).

Furthermore this research dialogue with (Castellar & Uribe, 2004) when they conclude in their article that it is imperative to prioritize public education and

² Acronym in Spanish Ministry of Education in Colombia .

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improving the quality of education, which the authors can generate signals in the market which may generate negative imaginary employers. Without forgetting that match the returns of education identified as the human capital theory, which holds that more years of schooling to the market rewards them in detriment of individuals who only finished primary or secondary school. In the same way you tune with the findings of Riomaña (2008), when it states that the impact of public spending relate both to the theory of human capital and signaling theory. Without ignoring the differences in each one, in that the first effect is small accumulated over the years and second, encourages operators to provide their educational level signal under greater reporting capabilities within the labor market for prospective employers.

The results indicate that graduates of economics both men and women on average coefficients are above the vast majority of professions except biologists, lawyers Similarly. In the results show that there are wage differences between men and women graduates this profession which confirms what has been widely reported by the specialty literature regarding the topic.

Furthermore, the results show that there is hierarchy against the returns to education. Which can be seen in that being a graduate of economics, they have higher returns than being a teacher or administrative sciences given the very significant differences. Which could open another investigation, in which it can be demonstrated empirically that affect such variables as well as social returns. For example, the particular university leaving. However these proposals would be above the present investigation and as mentioned above would be another process. From the point of view of the theory of signaling, the data show little information about the relationship between empelados and collaborators under the dynamic that was exposed. However, if the assumptions of the theory of signaling on preferences for education to generate signals for employers is confirmed, then clearly these would not be looking for productivity since the effort of society would not be compensated and thus generate losses stock capital. Therefore the principles of human capital would force under conceiving education as profitable for both individuals and society as a whole. Consequently, both theories can help to explain "the process of wage formation, agreeing that individuals choose to study for higher incomes, whether they obtain increases in productivity or only achieve output signals in the market" (Angulo, Quejada & Contreras, 2012, p.63).

Appendix

Table 1. Results of OLS and IV Estimations

Variable	OLS Estimates		2SLS- Model 1 Instrument = Domestic Violence		2SLS-Model 2	
Mother's Power	0.148**	[0.076]	2.528***	[1.231]	3.080*	[1.177]
Mother's BMI	0.037***	[0.008]	0.046***	[0.011]	0.051***	[0.014]
Mother's Education	0.185***	[0.073]	0.143	[0.095]	0.134	[0.116]
Mother's Age	-0.004	[0.005]	-0.022**	[0.012]	-0.036**	[0.016]
Mother Working	-0.068	[0.115]	-0.643**	[0.331]	-0.778*	[0.448]
Child Age	0.094***	[0.025]	0.091**	[0.032]	0.098***	[0.037]
Household Wealth (if Poor)	-0.060	[0.074]	0.127	[0.397]	0.036	[0.154]
Non-Educated Father					-0.098	[0.122]
Father's Age					0.009	[0.007]
Residence (if Rural)					0.170	[0.139]
Observations	1563		1563		1471	
R-Squared	0.04		
F-Stat /Wald Chi ²	9.29***		42.13***		39.63***	
*** Significant at 1% ** Significant at 5% * Significant at 10%						

Table 2. Results of First Stage Logistic IV Regression

Variable/Predictor of Woman's Power	Co-efficient	P-Value	Std. Error
Domestic Violence (No Controls)	0.085***	0.000	0.019
Domestic Violence (With Controls)	0.085**	0.002	0.027
Woman's Years of Education	0.032	0.147	0.022
Woman Working	0.235***	0.000	0.038
Woman's Age	0.007***	0.000	0.001
Child Gender (if Female)	-0.05**	0.025	0.021
Child BMI	0.84**	0.087	0.008

Table 3. Hausman Test for Endogeneity

Reduced Form Model (Dependent =Mother's Power)		Structural Equation (Dependent= Child Health)	
Variables	Co-Efficient [P-Value]	Variables	Co-Efficient [P-Value]
Domestic Violence ¹	.361 [0.004]**	Mother's Power	1.553[0.009]**
Woman's Years of Education	0.543[0.642]	Woman's Years of Education	0.171[0.019]**
Woman's BMI	-0.013[258]	Woman's BMI	0.039[0.000]***
Child Age	0.021[0.147]	Child Age	0.086[0.001]***
Woman Working	1.241[0.000]***	Woman Working	-0.438[0.023]**
Woman's Age	0.037[0.000]***	Woman's Age	-0.012[0.046]**
Household Wealth	-3.09[0.009]**	Household Wealth	0.027[0.740]
***Significant at 1%, **Significant at 5% and * at 10%		Reduced Form Residuals ²	-0.584[0.017]**
¹ Domestic Violence is statistically significant		² Residuals are statistically significant	
H ₀ = Residual= 0, i.e. Mother Power is exogenous		Since The Residuals in the Structural Equation is statistically significant at 5% we	
H ₁ = Residual ≠ 0, i.e. Mother Power is endogenous			

Table 4. Summary Statistics

Variable	Sample Size	Mean	Std. Dev.	Min	Max
Child BMI Z-score	1759	-0.54	1.27	-3.94	5.89
Child Gender Dummy (2 if female, 1 if male)	3299	1.48	0.50	1	2
Child Age in Years	3128	4.39	5.08	0	5
Woman's Age	4916	28.99	9.70	15	49
Mother Power Dummy	2948	0.78	0.41	0	1
Woman's BMI	4814	23.42	4.69	12.18	57.61
Woman's Educated Dummy (1 if Yes, 0 if No)	4916	0.75	0.44	0	1
Woman Working Dummy (=1 if yes, 0 if No)	4916	0.78	0.42	0	1
Domestic Violence (Dummy)	4916	0.83	0.38	0	1
Father's Education Dummy (1 if not educated, 0 if yes)	4916	0.83	0.38	0	1
Father's Age in Years	2902	40.23	11.12	18	85
Household Wealth Status (1 if poor, 0 if not-)	4916	0.409	0.49	0	1
Residence Dummy (1 if Rural, 0 if Urban)	4916	1.56	0.50	0	1

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