

# Programa de Economía Documentos de Trabajo



**Evolution of returns to education in Colombia  
(1976-2014)**

Jaime Tenjo Galarza<sup>1</sup>  
Oriana Álvarez Vos  
Alejandro Gaviria  
María Camila Jiménez

N. 2015-9

## EVOLUTION OF RETURNS TO EDUCATION IN COLOMBIA (1976-2014)

Jaime Tenjo Galarza<sup>1</sup>  
Oriana Álvarez Vos  
Alejandro Gaviria  
María Camila Jiménez

### SUMMARY

This document presents estimates of returns to education in Colombia, based on household surveys. Several econometric models are estimated and efforts have been made to correct possible selectivity biases. Our results indicate that over the last 40 years returns to education have fluctuated within a fairly limited range (10.8% to 14.3%). This reveals a good deal of stability in these returns despite the significant changes that occurred during this period. We also found that there is a large difference between post-secondary and pre-university returns, not only in their levels but also in their tendencies: returns to pre-university education have been declining continuously, while post-secondary returns seem to have stabilized around 20% since 1995.

JEL Classification: I21, I26, O15, O54

Key words: Education, returns to education, gender, labor markets

Corresponding author:

Jaime Tenjo  
Chair Department of Economics  
Universidad Jorge Tadeo Lozano  
Carrera 4 # 22-61  
Bogotá, Colombia  
[Jaime.tenjog@utadeo.edu.co](mailto:Jaime.tenjog@utadeo.edu.co)

---

<sup>1</sup> The authors are: Chair of the Department, Associate Professors (Álvarez and Gaviria) and research assistant in the Department of Economics of Universidad Jorge Tadeo Lozano.

## **1. INTRODUCTION**

Colombia has undergone a very significant expansion of the educational system during the last 50 years, and the country has also experienced important changes in its institutions, its economic structure, and its development policy orientation. All these factors have very likely affected the functioning of the labor market and have in turn been affected by it. To a very large extent, the rates of return to education (an indicator of the market price of educational services) capture the relationship between the demand, generated by the economy, and the supply of those services, but, to our knowledge, no serious attempts have been made recently to evaluate the long term relationship between the evolution of the economy and the provision of educational services. This paper constitutes a contribution in that direction by providing series of returns to education on which such an analysis can be based.

This article has seven parts. Part one is the introduction. In the second part, a brief literature survey is presented. The third part reviews some basic information about Colombian labor markets considered relevant to understand the evolution of returns to education. In the fourth part, some technical and methodological aspects of the estimations are discussed. The data used in the study and their limitations are the subject of part five. In the sixth part, the results of the estimations are presented and discussed. Finally the paper concludes with a brief summary of the most important findings.

## 2. BRIEF LITERATURE REVIEW FOR COLOMBIA

Literature on returns to education in Colombia is fairly abundant. However, we restrict ourselves to the pieces that we consider the most representative of the type of work done in this area. One of the earlier attempt to estimate returns to education were made by Tenjo (1992) in which he estimates mincerian equations with and without selectivity correction. Later on Tenjo (1993) analyzes the evolution returns to education between 1976 and 1989 using the methodology of Mincer equations, combined with spline models to obtain different estimates for the returns to various levels of education. Returns are estimated both for men and women and also for salaried and independent workers. The author finds that average returns are higher for women than for men among wage workers, but it is not clear that there is a difference in the case of independent workers. In both cases, average returns decrease during the period under analysis. He does not find evidence of a statistically significant difference in returns between levels of education in the case of female wage workers, but the difference is significant for male wage workers. In the case of independent workers, the situation is the opposite: women's returns are different for different educational levels, but no significant difference is found for men. The author explains the behavior of returns in terms of the behavior of the labor force participation of women (which increased a great deal) and the increase in the amount of human capital (average number of years of education).

In a second article Tenjo (1993-2) studies the bias on returns to education generated by missing variables such as individual ability. He used a sample of 4000 workers in Bogotá<sup>2</sup> to which tests of individual ability (Progressive Raven Matrices) and knowledge were applied to measure their individual ability and educational quality, and those results used as explanatory variables in Mincerian earnings equations. The results indicate that the non-inclusion of these measures of ability and quality of education could overestimate the returns to education by around 1.5 percentage points.

Tenjo (1996) estimated a heterogeneity model to capture the effect of differences in individual ability on the decisions to study beyond secondary education and its impact on returns to education. The model includes a post-secondary selectivity process based on individual ability and other characteristics of the individual (including financial resources). The results indicate that in general individuals who *select* themselves to undertake post-secondary education have higher returns to their investment than those who do not. Tenjo concludes that this provides fairly strong evidence for the existence of meritocratic elements in the Colombian labor market.

---

<sup>2</sup> The sample was collected by the Instituto SER de Investigación and financed by the University of Toronto.

Arias and Chavés (2002) use a methodology similar to that of Tenjo (1993) to analyze returns to education from a competitive perspective. They use a spline model with selectivity correction. The information comes from the household surveys covering the periods 1990-1995 (when several important labor reforms took place) and 1999-2000 (years of very high unemployment). Their findings indicate that returns were higher for women than for men in both periods and that in 2000 returns fell, probably as a consequence of the economic recession.

Tenjo, Ribero and Bernat (2004) in a study comparing six Latin American countries (Argentina, Brazil, Colombia, Costa Rica, Honduras and Uruguay) estimated Mincerian earnings equations for men and women (salaried and independent) correcting for selectivity bias for the period 1980–1998. In the case of Colombia they found that selectivity correction increased the estimates of returns to education for women and in some cases for men too. They also found that during the period of analysis the returns to education for women increased, but those for men fell. In all cases the returns were higher for women.

Forero and Gamboa (2006), estimate selectivity corrected Mincerian equations for Bogotá, using DANE's Quality of Life surveys for 1997 and 2003.<sup>3</sup> As in the case before, they found that selectivity correction increased the returns to education. However, the returns drop between the two years covered by their study. They attribute this result to the increase in unemployment which limited the bargaining position of unions and to the expansion of higher education in Bogotá, which affected the relative position of more educated workers.

Hernandez (2010) used information from the Ministry of Education's Observatorio Laboral para la Educación (OLE). This study includes as explanatory variables the degrees obtained by the person and a number of characteristics of the university and the program attended by the worker. As expected, incomes increase with the level of the degree (technical, professional, postgraduate, etc.), but the area of study and school characteristics also affected the results.

Montenegro and Patrinos (2014) used household surveys for several countries to estimate comparable rates of return covering the period 1970 – 2013. They used a Mincerian model with dummy variables for different levels of education (primary, secondary and higher education). In their comparison they find that the African Sub-Sahara countries have the highest returns (12.4%). Latin America and East Asia have returns between 9.2% and 9.4%. the lowest returns are in East Europe

---

<sup>3</sup> DANE (National Administrative Department of Statistics) is Colombia's department of statistics.

and South Asia (7.7%). They also find that returns have fallen during the last 30 years by about 3.5 percentage points.

### **3. SOME ASPECTS OF THE COLOMBIAN LABOR MARKET DURING THE PERIOD 1976-2014**

The two most important labor market developments in Colombia during the period of study are the rapid growth of labor supply (especially of women) and the increase in the levels of education of the population.

#### **Labor Supply**

During the period 1976-2014, Colombia was progressing through the advanced stages of the demographic transition, with rapidly declining rates of population growth. At the beginning of the period (before 1985) the growth rates for the population over 15 years of age in urban areas was above 2.75% per year, which was a high rate; however, by the end of the period they had reached a 1.6% average (see Table 1). This means that although demography was important in the early years, towards the end of the period of analysis other factors were probably more significant to explain the behavior of labor supply.

At the same time, labor force participation rates were increasing more or less continuously over the period (see Table 2)

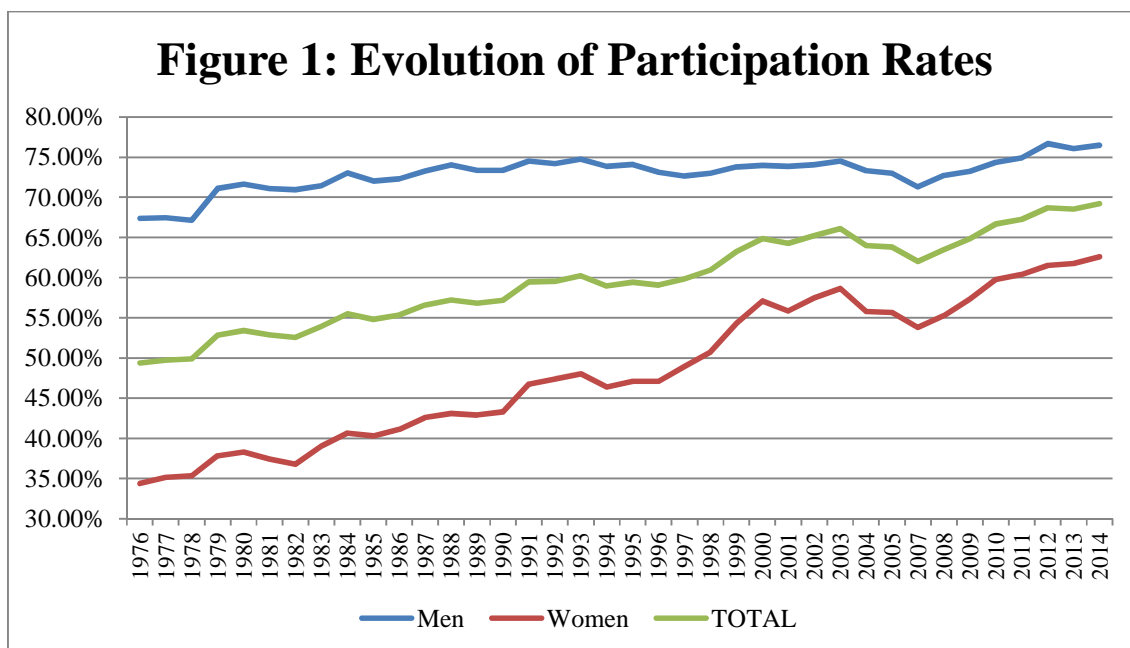


Figure No. 1 summarizes the evolution of participation rates between 1976 and 2014. On average these rates went up by about 20 percentage points between the beginning and the end of the period. Practically all increase was due to the growth in female participation, which went from 34.4% in 1976 to around 63% in 2014, a change of 30 percentage points.

This rise in participation rates was more or less continuous over the 38 year period, except for a significant drop between 2003 and 2007 (almost 5 percentage point in the case of women and more than 3 for men). Unfortunately no study that investigates this behavior has been located.

### Average Years of Education

As indicated above, since the early 1970s Colombia has been increasing the coverage of the educational system. One way of seeing the results of these efforts is to look at the average years of education of the population.

The information about average years of education corresponds to 7 cities covered by the sources we are working with.<sup>4</sup> and is presented in Tables 3A and 3B. What the tables show is that levels of education have been increasing continuously since 1976, but faster for women than for men. For the working age population (defined as 12 years and up), the annual growth rate of years of

<sup>4</sup> See section 5 on data sources, below

education was around 1.2%, which is an important rate, considering that throughout the period the rate of population growth, although declining, was positive and still high (above 2%). Thus, the educational system not only had to provide education for the new population, but also to increase the levels of the existing population.

Table 3A presents information about levels of education for the over-12 population, which clearly includes people who were out of the educational system from the beginning of the period. The fact that it shows increases in the average number of years of education of more than 1% per year indicates that the expansion of the system was important, but it underestimates the actual increase. A better estimate is presented in Table 3B, which shows the average years of education of the cohort between 30 and 35 years of age. The annual growth rates in this table are much higher than the ones estimated in Table 3A, especially in the case of women. For the cohort of women between 30 and 35 years of age, the average number of years of education increased at a rate of 1.87% per year. Although not so high, the rates for female labor force participants (both employed and unemployed) were also significant. The growth rates were much smaller (except in the case of unemployed workers).

The conclusion that one could derive from this information is that the supply of human capital in the market, particularly that of female workers, increased substantially between 1976 and 2014. At the beginning of the period women in the 30 to 35 years of age cohort had between one and two years of education less than men; ten years later labor force participants (men and women) had about the same amount of education; by the end of the period of study (2014) employed women had one year more education than men.

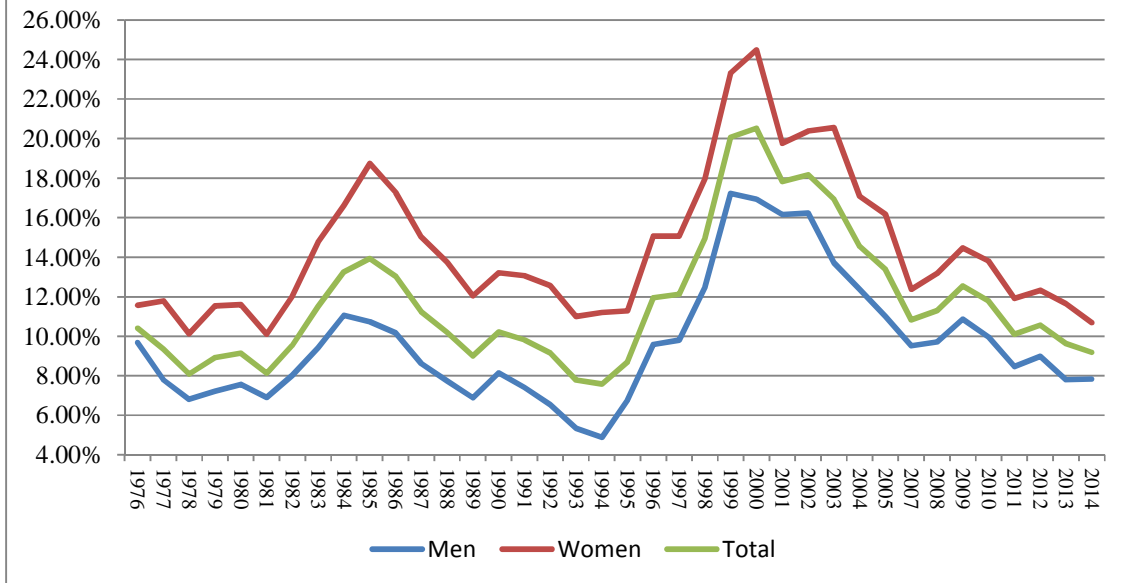
It is also interesting to point out that the group that experienced the fastest increase in years of education is that of unemployed workers of the same cohort, which raises some questions about the capacity of the economy to absorb the increased human capital.

### **Unemployment**

During the period studied, the economy has had rates of unemployment that are high by international standards. The average rate was 11.7%, and fluctuated between 7.6% and 20.5%. The information is presented in Table 2 (last three columns) and summarized in Figure 2.



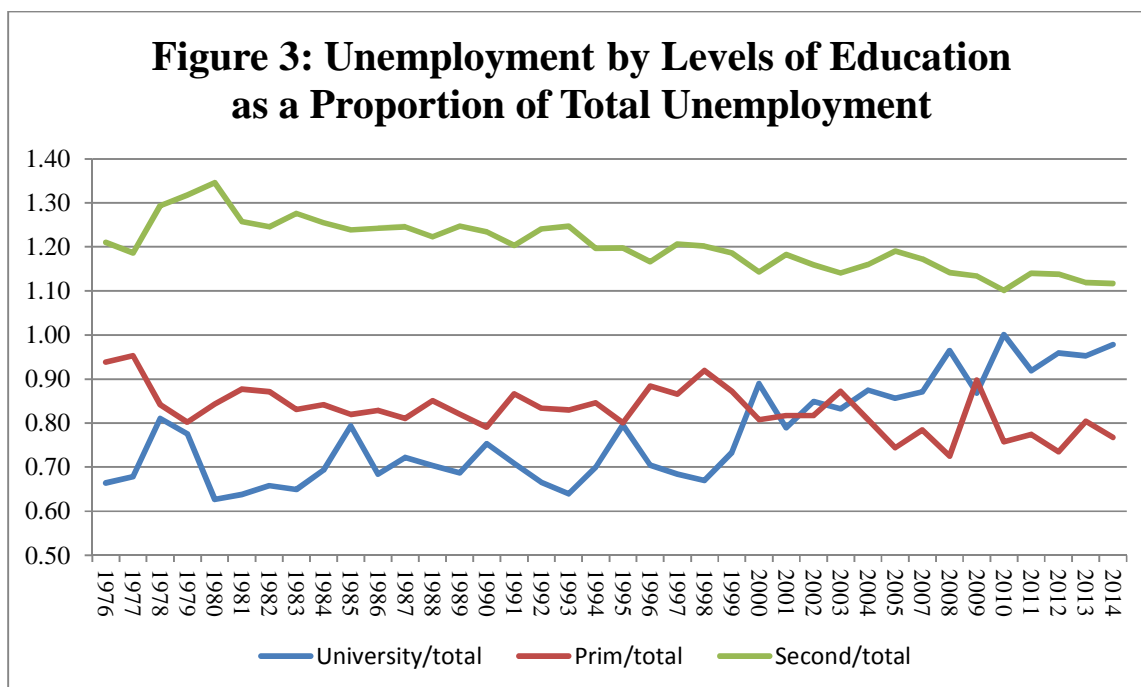
**Figure 2: Evolution of Unemployment Rates**



Loosely speaking, the period covers two economic cycles. The last one at the end of the 20<sup>th</sup> century is the most serious recession of Colombia's recent history. If one ignores the little spurt of unemployment in 2007-09, the recovery since 2000 has been the longest in the recent history.

Regardless of the phase of the economy, the unemployment rates for women have always been higher than those for men, and the gaps tend to be higher at the beginning of the recovery periods.

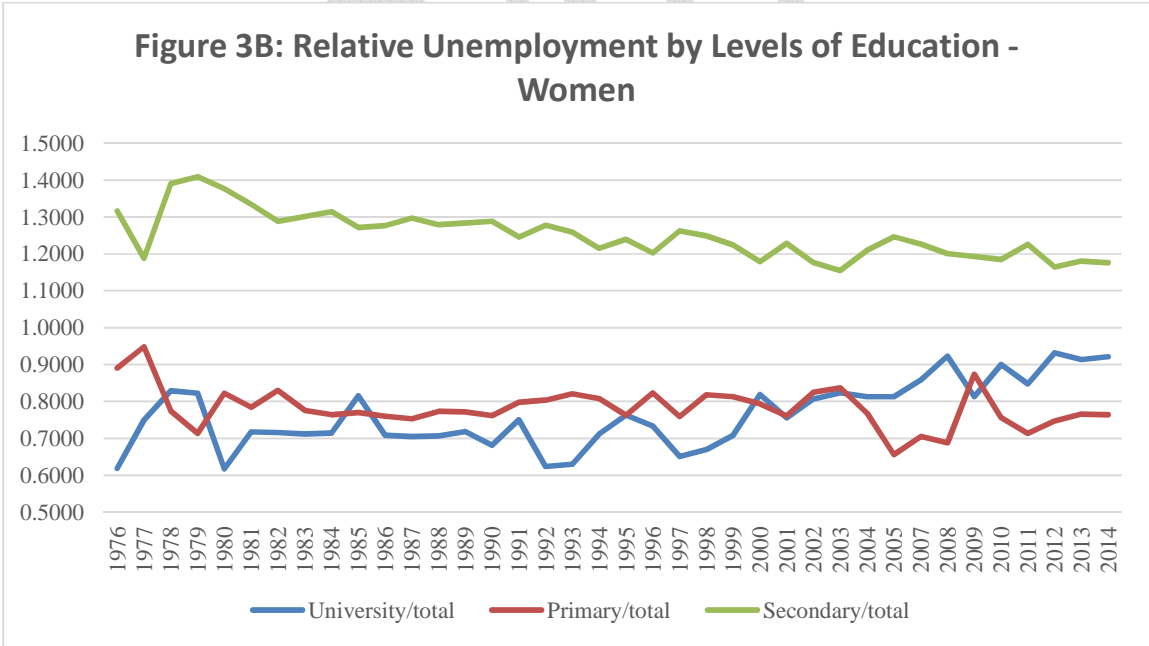
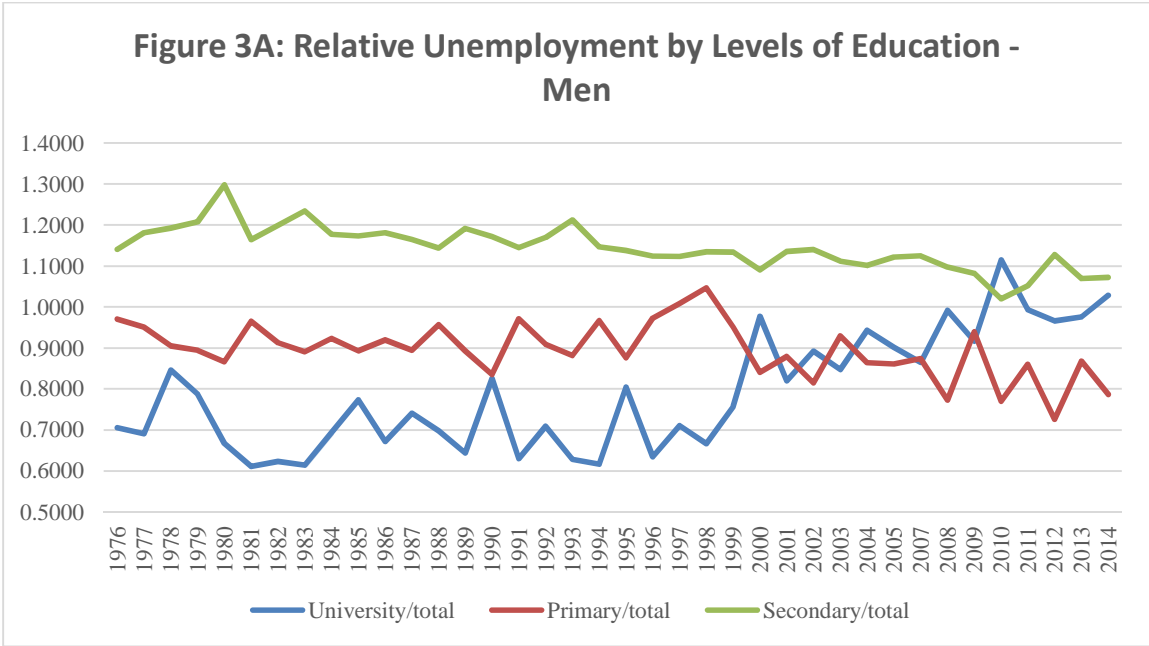
It is also important to know what happened with the rates of unemployment by levels of education. The information is presented in Table 4 and a summary of it can be seen in Figure 3 below.



This figure presents the evolution of relative unemployment by levels of education, defined as the unemployment rates of each level divided by the total unemployment rate. This is a way of seeing the changes in the ability of different groups to insert themselves in the labor market without the interference of the business cycle.

As is well known, the highest levels of unemployment are found among those with secondary education, while those with low levels of education and university educated people have lower unemployment rates (the inverted-U relationship between education and unemployment). However, Figure 3 shows two important things: one is the rapid decline of the relative unemployment rate of secondary education, and the second is the increase in the unemployment rates of people with university education, starting around 2000. During the last 15 years, the two rates have converged rapidly and in 2014 the difference were very small.

It is interesting to see how these relative unemployment measures when disaggregated by gender. The information is presented in Tables 4A and 4B, and summarized in Figures 3A and 3B below.



In the case of men there is considerable volatility but the tendencies are fairly clear: the relative unemployment of males with secondary education declined during the period studied, while the relative rates of men with university education have increased rather rapidly since the beginning of the century. This seems to imply that educated males have been having increasing difficulties in

finding jobs, but there are many factors, both on the supply and the demand sides, that could explain this phenomenon.

In the case of women we observe roughly the same tendencies, but it is much less pronounced.

BERNARD

#### 4. SOME THEORETICAL CONSIDERATIONS FOR THE ESTIMATION OF RETURNS TO EDUCATION

The most common form of estimating returns to education is using the well-known equation of Mincer, which associates the labor earnings of a person with his/her amount of human capital, measured by the years of schooling and the experience accumulated. This relationship can be summarized in the following equation:

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 Sex_i + \varepsilon_i \quad (1A)$$

where  $y_i$  is a measure of individual  $i$ 's income,  $X$  is a vector of measures of human capital (such as years of schooling,  $S$ , and experience,  $X$ ) and  $\varepsilon$  is an error term, assumed to have the usual characteristics (normally distributed with zero mean and constant variance).

The returns to education are given by

$$\text{Returns to education} = \frac{\delta y}{\delta S} \frac{1}{y} = \beta_1 \quad (1B)$$

This model has been criticized on several grounds: one is the implicit assumption that the only private cost of education is the opportunity cost, an assumption that could be inappropriate in some contexts. Another second area is possible selectivity bias caused by the lack of randomness of the samples used to estimate returns. A third line of criticism has to do with the measurement of schooling, which implies the accumulation of different types of education (adding apples and oranges), and the fact the some important explanatory variables are not usually included because they are difficult to observe and measure (these might include individual ability and quality of education for example). To the extent that schooling captures the effect of these unobserved variables, the returns to education measured by the Mincerian equation are positively biased (that is, the equation overestimates the real returns).

There are solutions to many of these problems. For example there are many techniques to correct for selectivity problems, but they all depend on how well we are able simulate the selectivity processes, about which we do not know very much.

Given the purpose of this study, which is to understand the general tendencies in returns to education in Colombia, we could start with the assumption that the correction of these biases is not a priority, either because the size of the bias remains more or less constant through time, or because it does not change enough to affect the general direction of the returns estimated using Mincer's model.

This assumption, however, will be reexamined later on to investigate the possibility that unemployment affects the size of the selection bias.

There is little that can be done about the lack of some relevant variables in the equation, such as ability and educational quality. Although there are econometric techniques to deal with this problem (instrumental variables, for example), the lack of adequate information is a serious limitation.<sup>5</sup>

More specifically, we estimated returns to education for the period 1976 – 2014, using the following models:

- a. The **Mincerian** model presented in equation (1)
- b. A **selectivity corrected Mincerian** equation.

In general Mincerian equations are estimated with samples of employed workers. Non participants and unemployed workers are excluded, regardless of their educational levels. Given that the period of analysis is a long one and includes at least two unemployment peaks (in 1985 and 2000), the assumption that the size of the bias generated by not correcting for sample selectivity remains constant does not hold.

The problem is that the presence of a person in the sample of employed workers involves a double selectivity process -- one is that associated with the decision to participate in the labor market and the other associated with the outcome of being employed (given that he/she decided to participate).

The way we handled this double selectivity process was the following:

- i. Employment equations corrected for participation selectivity were estimated. From these equations we estimated the probability that a person is employed, given that the person participates in the labor market.  $P(\text{Employed} \mid \text{participates})$ .
- ii. With these conditional predicted probabilities we estimated the inverse of the Mills' ratio and used it in the earnings equation.

More specifically, we estimated the following model

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \gamma D_i(S_i - 11) + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 Sex_i + \alpha_i \lambda_i + \varepsilon_i \quad (2)$$

---

<sup>5</sup> In the case of instrumental variables it would be necessary to find consistent instruments for the whole period of analysis, which is not easy to do.

where  $\lambda_i = \frac{\phi(Z_i)}{1-\Phi(Z_i)}$  is the inverse of the Mills' ratio;  $\Phi(Z)$  is the predicted probability of being employed given that the person participates in the labor market  $P(E|part=1)$  and  $\phi$  is the corresponding density function. The prediction of  $P(E|part=1)$  was made correcting the selectivity bias generated by the decision to participate.  $Z$  is a transformation of the variables that explain the probability of being employed.

- c. Another model used in the estimation was a **spline model**, which allows us to estimate different returns to different levels of education. More specifically, with this model it is possible to capture differences in the returns between primary and secondary education on the one hand and post-secondary education on the other.

The spline model used in the estimation has the following structure:

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \gamma D_i(S_i - 11) + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 Sex_i + \varepsilon_i \quad (3A)$$

Where  $D_i$  is a dummy variable equal to 1 if  $S_i > 11$ , and zero otherwise, and  $\gamma$  can be interpreted as a market premium associated with the possession of post-secondary education. The returns to pre-university education and post-secondary education are respectively given by:

$$\frac{\delta y}{\delta S} = \beta_1 \quad \text{and} \quad \frac{\delta y}{\delta S} = \beta_1 + \gamma \quad (3B)$$

As indicated above, the information available after 2006 makes it possible to include the effect of degrees (technical and professional). This allows us divide the premium to post-secondary education  $\gamma$  in two: one to just having post-secondary education without a degree ( $\gamma_1$ ) and another one ( $\gamma_2$ ) which will be a premium for a professional degree. The structure of the regression model for this estimation is the following:

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \gamma_1 D_i(S_i - 11) + \gamma_2 D_i K_i(S_i - 11) + \beta_2 X_i + \beta_3 X_i^2 + \beta_4 Sex_i + \varepsilon_i$$

(4A)

where  $K_i$  is a dummy variable equal to 1 if the person observed has a professional degree and zero otherwise.

The returns to post-secondary education without and with a professional degree are given respectively by:

$$\frac{\delta y}{\delta S} = \beta_1 + \gamma_1 \quad \text{and} \quad \frac{\delta y}{\delta S} = \beta_1 + \gamma_1 + \gamma_2 \quad (4B)$$

The same selectivity correction used for Mincerian estimates were applied to spline regressions to produce corrected and uncorrected returns to pre-university and post-secondary education.

- d. Finally, quintile regressions models were used to differentiate segments of the distribution of labor income and evaluate whether the evolution of the returns was similar for all of them. One criticism of the estimation of Mincerian returns (whether corrected for selection bias or not) is that they represent average returns for the population as a whole. The spline model estimates returns for different levels of education (which are correlated with labor income), but do not answer the question of whether the average returns are a good estimate for all the segments of the distribution of income.

Quintile regression methods allow us to answer this type of question. This technique permits an estimation of returns to education for different percentiles of the distribution of labor income. Since the maximization techniques are different (quintile regression minimizes the sum of absolute differences, while regular regression minimizes squared differences), the results are not exactly comparable with the Mincerian ones, but the point here is not to make that type of comparison but to observe the dispersion of returns for different segments of the distribution.



## 5. STATISTICAL INFORMATION USED IN THE EMPIRICAL ANALYSIS

The information used in this exercise comes from the Colombian household surveys collected by the Colombian Department of Statistics (National Administrative Department of Statistics or DANE).<sup>6</sup> The surveys provide abundant information about individual characteristics (sex, age, amount of education, marital status, family position, labor market participation, employment situation, labor and other type of earnings, etc.). Many methodological changes have been introduced through the years, but the most important ones, which could affect seriously the comparability of our estimates, happened in 2000 and 2006. These changes divide the period on analysis in three sub-periods:

1976-2000: During this period the surveys were collected quarterly and covered only the 7 most important cities in the country, namely Bogotá, Medellín, Cali, Barranquilla, Manizales, Pereira, and Bucaramanga. We used the information for the third quarter of every year (months of July, August and September).

2001-2005: In the year 2000, DANE made important improvements in the surveys. One of them is to make the survey continuous (information would be collected every day, not every three months), which allow it to produce monthly results for the largest cities in the country. It also increased the size of the samples and the area covered by the surveys. New questions were included and others were changed and refined. On this occasion, DANE made parallel surveys with the new and old methodologies to compare results and found that the difference in terms of unemployment rates was about one percentage point lower with the new methodology. No other variables were compared.

These changes probably improved the quality of information a great deal; however, they do affect comparisons with previous estimates. We maintain the same 7 cities in our estimates and continue working with the information for the third quarter of each year, but there is little else one can do.

2006-2014: In 2006, DANE introduced a new methodology in household surveys and created the Integrated Household Surveys. Again the area covered was increased, some questions were reformulated, new questions were introduced and sample sizes were augmented. Unfortunately, in this case there were no parallel surveys collected using both old and

---

<sup>6</sup> The Household Survey project started in 1970, but surveys are available only from 1976.

new methodologies. Aggregate results between the pre-2006 and the post-2006 estimates of various variables were compared and some adjustments were made, but inconsistencies in the 2006 surveys were too big to be used in this document. For that reason this year was excluded from our estimates.

For the rest of the period 2002-2014, we estimated returns for the same 7 cities, using the third quarter for each year.

The definitions of the variables used in the regressions are as follows:

- a. Hourly labor income. It includes income both for wage workers and independent workers. It includes domestic servants, but excludes other workers such as employers, day laborers (*peones*), and unpaid family workers. It was estimated adding all the sources of labor income (converted to monthly income) and dividing by the number of hours worked in the month. In turn, this number of monthly hours was estimated assuming that the hours worked in the week previous to the interview -- the information collected by the surveys -- applied to the whole month.
- b. Schooling (years of) was estimated by adding the number of complete years of primary, secondary and university declared by the worker. It was assumed that complete pre-university education was 11 years, so the workers for whom the sum of primary plus secondary was higher than eleven, were adjusted to that number.<sup>7</sup>
- c. Since the household surveys do not have a consistent measure of experience that covers all the period of analysis we use *potential experience*, defined as age minus education minus 5, assuming that children enter primary education at the age of five.

---

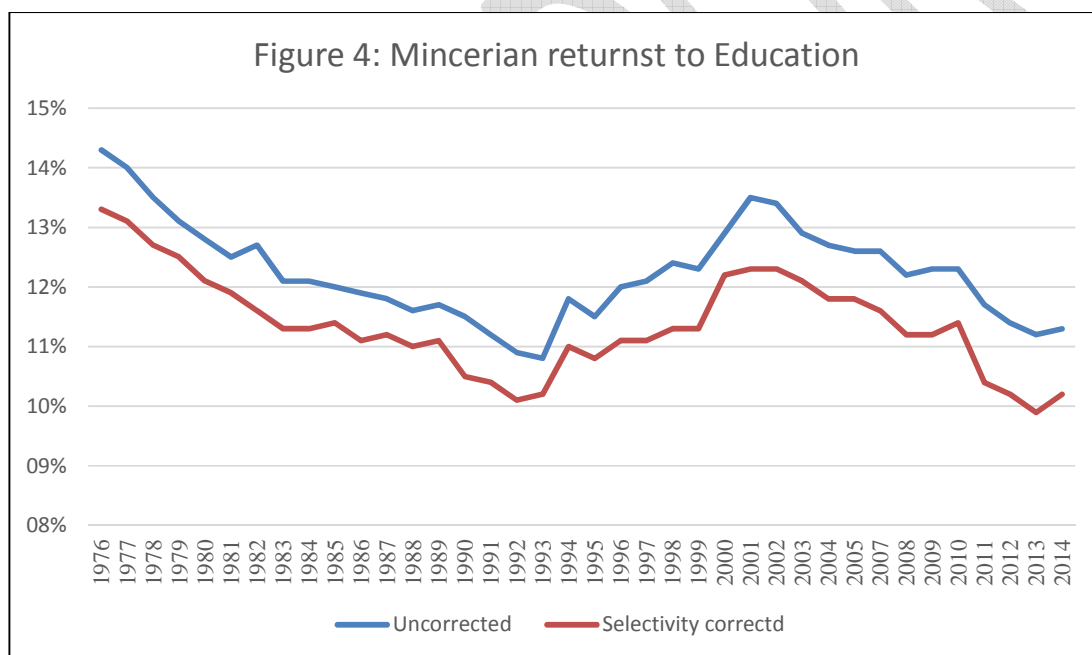
<sup>7</sup> For a very small number of workers that studied the so-called *technical secondary* program, or some students of international schools the sum of primary and secondary years could be 12 or 13 years. If these students have some years of university education, their total years of schooling was estimated assuming that their pre-university education was only 11 years.

## 6. SOME IMPORTANT FINDINGS FROM THE EMPIRICAL ANALYSIS

As indicated above, a great number of models were run and the most important results are included in the appendix. Here we concentrate on the analysis of the returns to education. It is important to mention, however, that all the estimates on which our analysis is based were very significant and robust. Specifically, the different estimates of returns to education had statistically significant levels of 1% or more.

### 6.1 Mincer Equations

A summary of the returns to education estimated using Mincer's model (denominated here *Mincerian returns*) is presented in Table 5. A summary is presented in Figure 4 below. Some of the most important results are the following:



- a. In spite of the long period covered by the study (almost 40 years), the range of variation of the estimated returns is small with returns varying between 10.8% in 1993 and 14.3% in 1976. This shows a high level of stability during the period of study despite the increase in human capital and the important change in institutions and educational policy that took place.
- b. It is possible to identify three periods in the evolution of returns to education: During the first one, between 1976 and 1992, returns were decreasing. The second period (1992-2001) witnessed a recovery in returns, but they never reached the level they had in 1976 (14.3%).

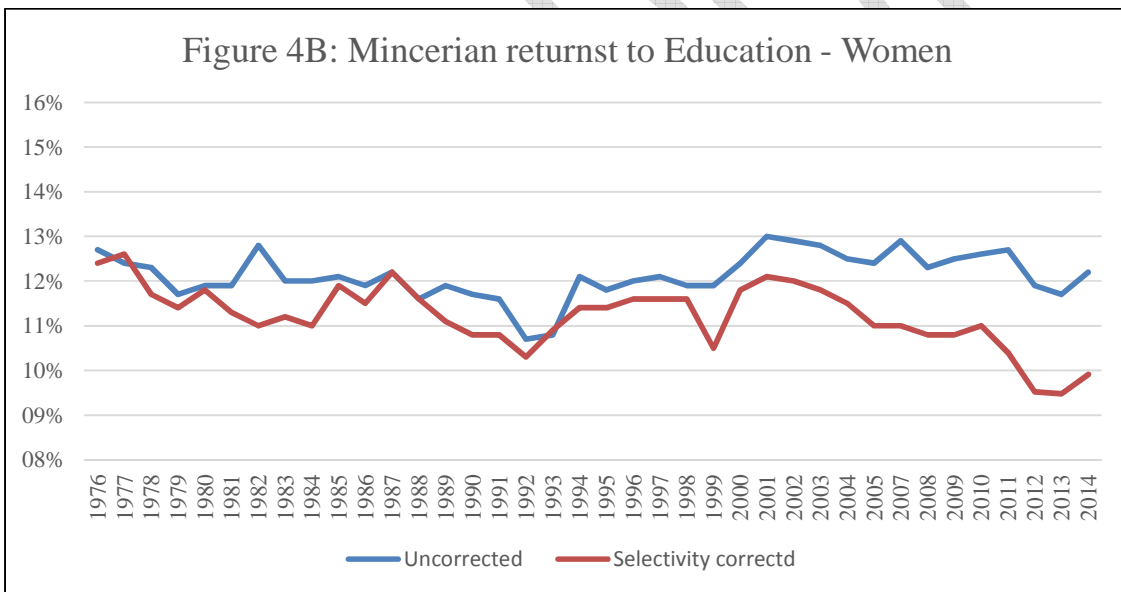
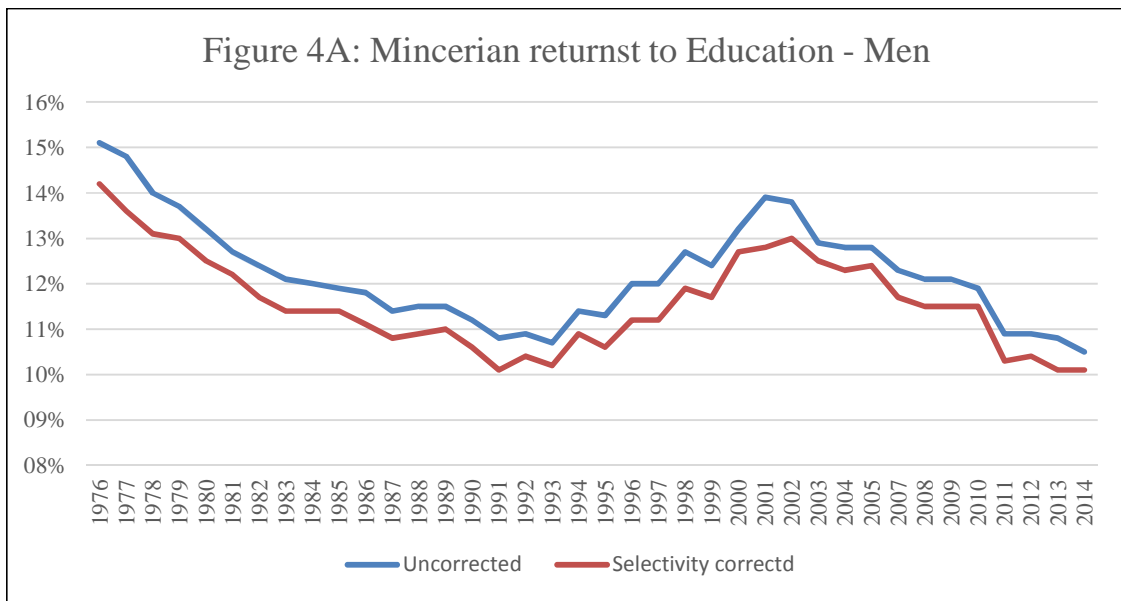
Since then returns have begun to fall again. By 2014 their level is around 11%. The behavior of returns by gender is very similar, but the returns for women seem to have smoother fluctuations.

- c. By gender (see Figures 4A and 4B), the behavior is similar to the one described. In the case of men the three sub-periods identified are very clearly observed. In the case of women there is more variance and the tendencies are not as clear, but in general they are similar to those noted.
- d. It is not clear whether men's returns are larger or smaller than women's. The period of analysis starts with a large difference (over two percentage point) in favor of men, but by 1981 that difference had disappeared. After that, the evolution is very similar. Since 2005 the returns have been in favor of women, and the gap seems to be increasing. In 2014 the difference is 1.5 percentage points, the largest favoring women in the entire period of analysis.

#### **Selectivity Correction:**

The fact that the returns to education are estimated with samples of employed workers could create some selectivity biases in the estimates. We started with the hypothesis that these biases were constant through time and therefore would not affect the tendencies in returns, which is our main interest. However, the fact that the probability that a worker is employed could be affected by the evolution of unemployment could imply that this hypothesis is wrong. Periods of high or low unemployment could affect people with different levels of education differently and therefore affect the probability that a person is observed in the sample used to estimate returns. This would imply that the bias is variable (and depends on unemployment). To correct for this possibility, we applied a selectivity correction approach based on the estimation of probability of employment equations corrected by labor market participation, which was explained above. The results of that correction are presented in Table 5 and included in the figures already mentioned.

As expected, the selectivity-corrected returns estimates are smaller, although in general the same behavior as the uncorrected returns is observed. The differences (uncorrected versus corrected) fluctuate between 0.6 and 1.8 percentage points. The gaps between corrected and uncorrected returns seem to be wider (and increasing) in the case of women, especially during the last 20 years of the period analyzed.



We also found that there is a small positive correlation between unemployment levels and the size of the bias in the returns to education, measured as the difference between uncorrected and corrected Mincerian returns. The simple correlation coefficient was 0.04. This constitutes some evidence that unemployment affects the returns to education, but certainly more research is necessary on this point.

## 6.2 Spline Model

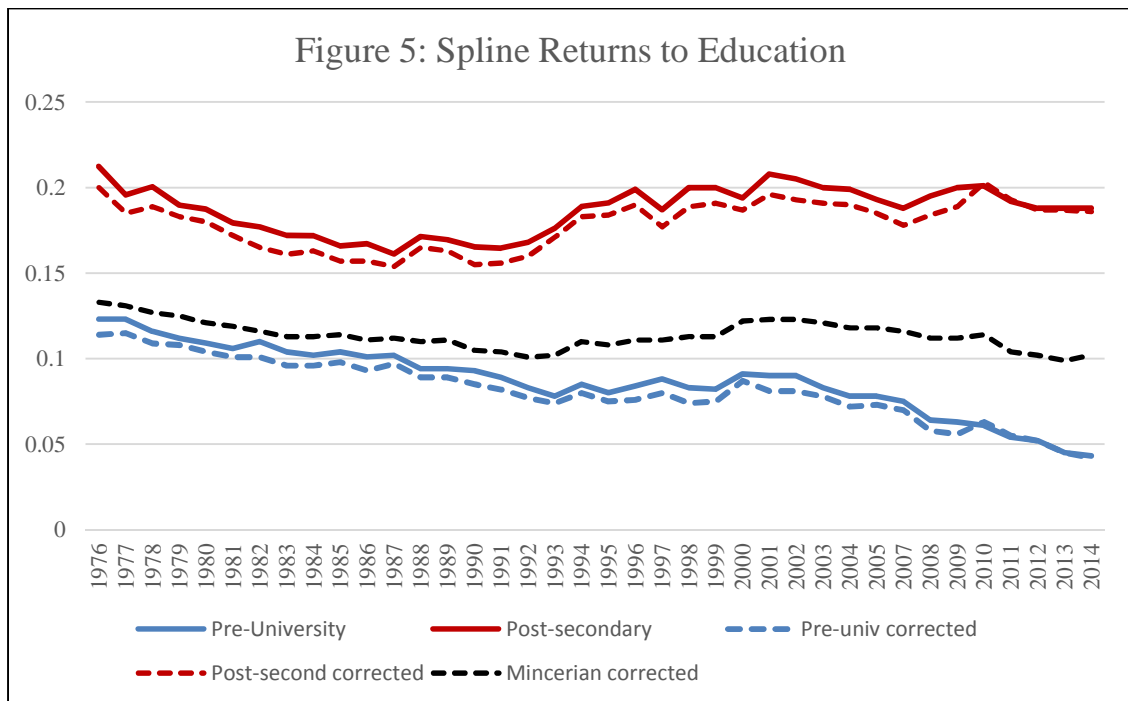
One way of checking whether the *average* returns to education generated by the Mincer equations are a good approximation for all levels of education is to use *spline* models. Here we use the *piecewise-linear-regression* model<sup>8</sup> with one knot<sup>9</sup> in the education variable. The obvious point to set the knot is at 11 years of education (complete pre-university education) because it allows us to obtain separate estimates of returns for pre-university and post-secondary education.<sup>10</sup> The returns obtained are presented in Tables 6A and 6B, and summaries can be seen in Figures 5, 5A and 5B. The selectivity corrected Mincerian returns are included both in the tables and in the figures below as a reference point for the analysis. As in the case of the Mincerian model, all the returns and the post-secondary premiums estimated with the spline model had high levels of statistical significance (above 1%).

---

<sup>8</sup> See Pindyck and Rubinfeld,(1991), or Poirer (1978), or, more recently, Marsh and Cormier (2002)

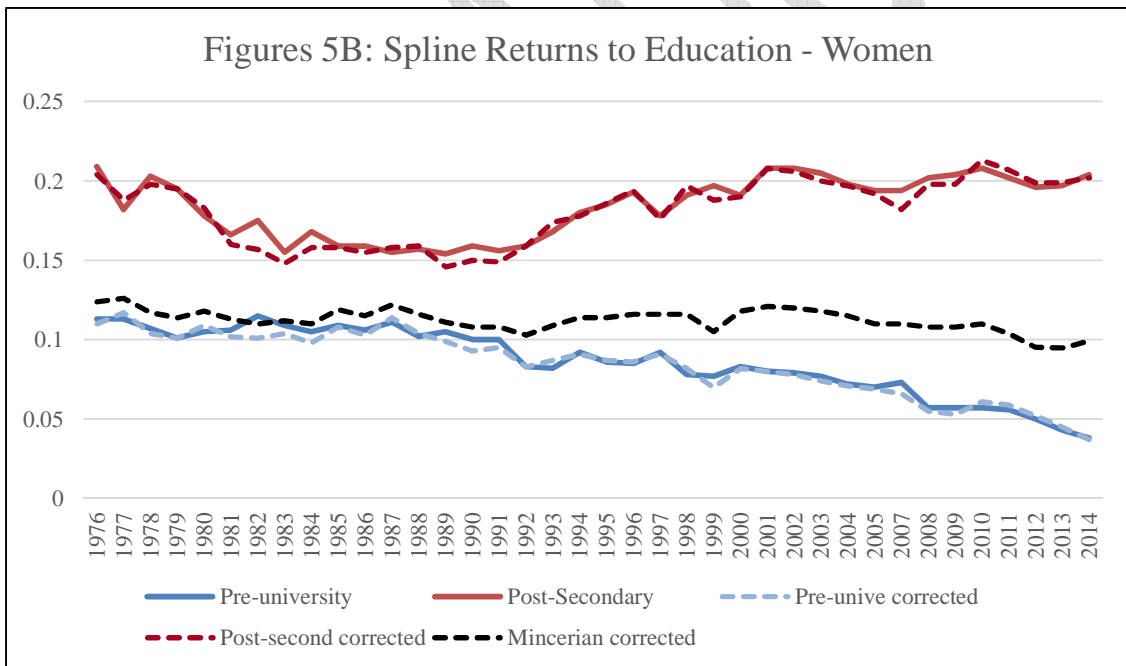
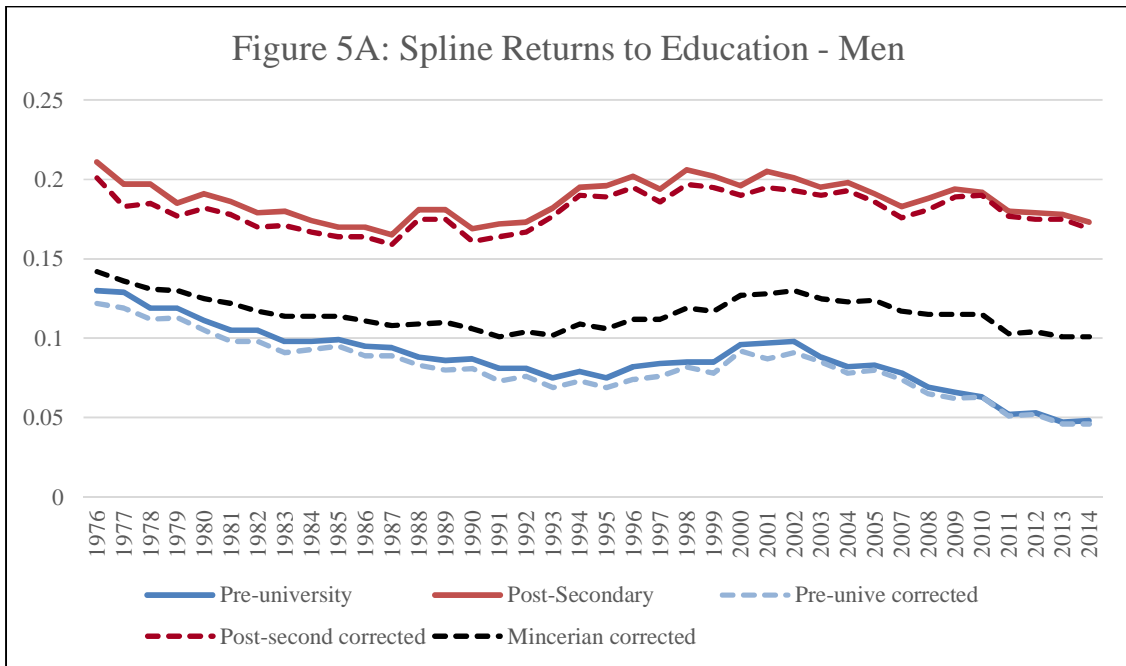
<sup>9</sup> In this case knots are the points in the regression line where slope changes.

<sup>10</sup> Technical education is included in post-secondary education, but only in the last few years is it possible to identify it as a separate option from professional education.



Some of the most important conclusions are the following:

- a. The first and most striking conclusion is that there is a very clear difference in the rates and the behavior of the returns to education by educational types.
- b. The returns to pre-university education show approximately the same patterns as the average (Mincerian) returns, but the recovery after 1992 was much weaker and ended two years earlier than that of the average returns. After that moment, these returns dropped rapidly (almost 5 percentage points between 2000 and 2014).
- c. On the other hand, the returns to post-secondary education dropped between 1976 and 1986, increased rapidly between that year and 1996, and stabilized around 20% since then.
- d. The explanation as to why the average returns (Mincerian) have decreased since 2002 is the fast decline in the returns to pre-university levels of education. The gap between pre-university and post-secondary education has been widening since approximately 1986, but particularly in the 21<sup>st</sup> century.



- e. The behavior for men and women is similar to the one described above, except that in the case of women the returns to pre-university education have been declining during the whole period of analysis and the gap between returns to pre-university and post-secondary is much wider than in the case of men and has been growing much faster.

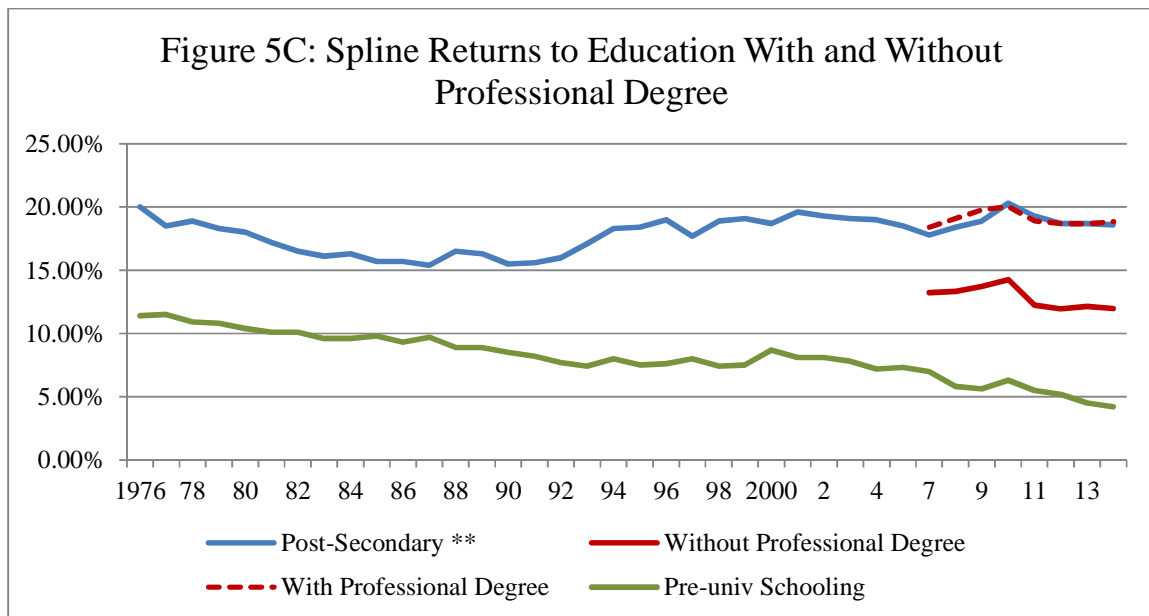


With the information available after 2007, it is possible to distinguish between persons who took post-secondary education and obtained a professional degree and those who did not. So, for these years, we estimated a version of the spline model that allows us to estimate the difference in returns between having and not having a degree such as the one in equation (4A). The results are presented in Table 6C and summarized in Figure 5C.

Our results indicate that there is a large difference in educational returns between having and not having a degree and that the difference appears to be growing fast; in 2007 there was a 5 percentage-point difference and by 2014 it had grown to almost 7 points. This indicated that formal credentialism is an important element of Colombian labor markets in the sense that academic degrees are a criterion to set wages.<sup>11</sup>

---

<sup>11</sup> This is consistent with the findings of Tenjo, Alvarez and Jimenez (2015) indicating that professional or technical degrees are important to explain unemployment: people with degrees have a lower probability of being unemployed, and if they are unemployed, have shorter search periods.



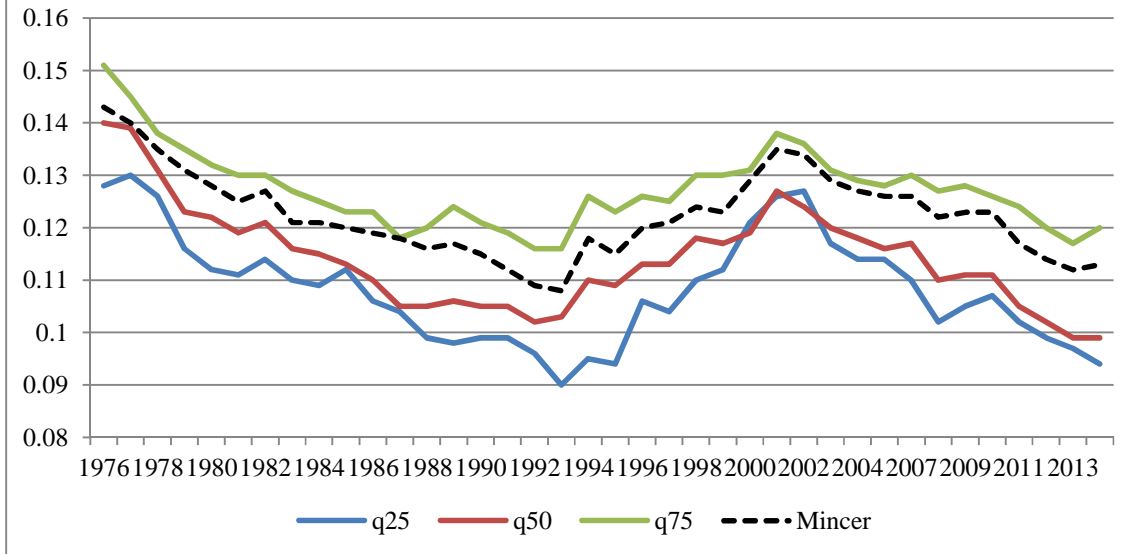
### 6.3 Quantile Regression Model

As indicated above, the use of Quintile Regression models allows us to estimate returns to education for different segments of the distribution of labor hourly income (our dependent variable). In the exercise we used several percentiles, but we present only the results quartiles (q25, q50, and q75) in Table 7. Figure 6 summarizes such results.

Some of the most important conclusions are the following:

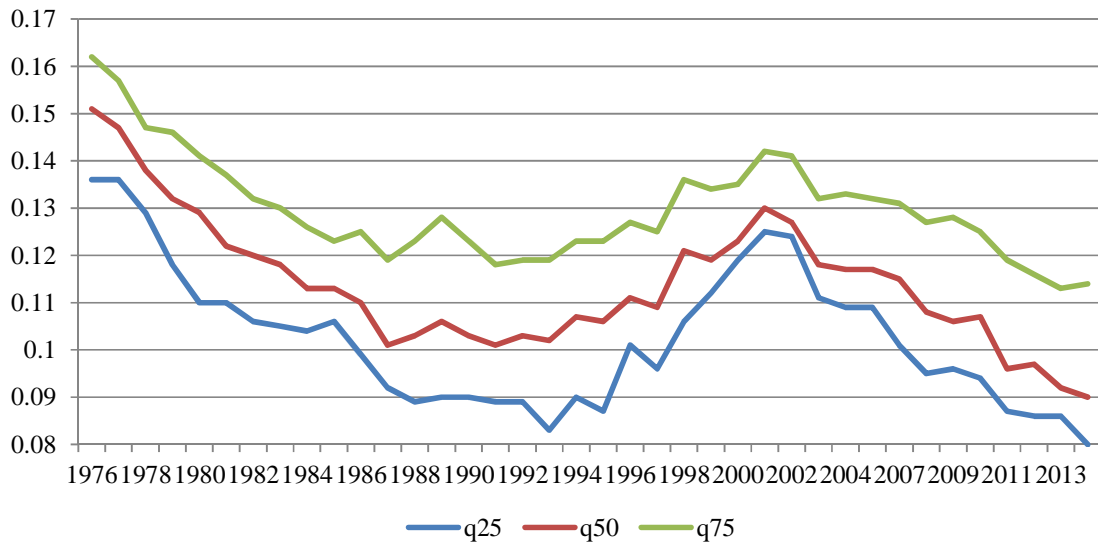
- a. In general the quintile returns are higher for the upper part of the distribution of labor hourly income than for the bottom part. Since 2001 the gap between the top quartile (q75) and the lowest one (q25) has widened a great deal (from 1.2 percentage points to 2.5). The largest gap was in 1994 (3 percentage points). The gaps in returns between the first and the second quartile (q25 and q50) are small and some time the returns are higher for q25.

**Figure 6: Quantilic Returns to Education**

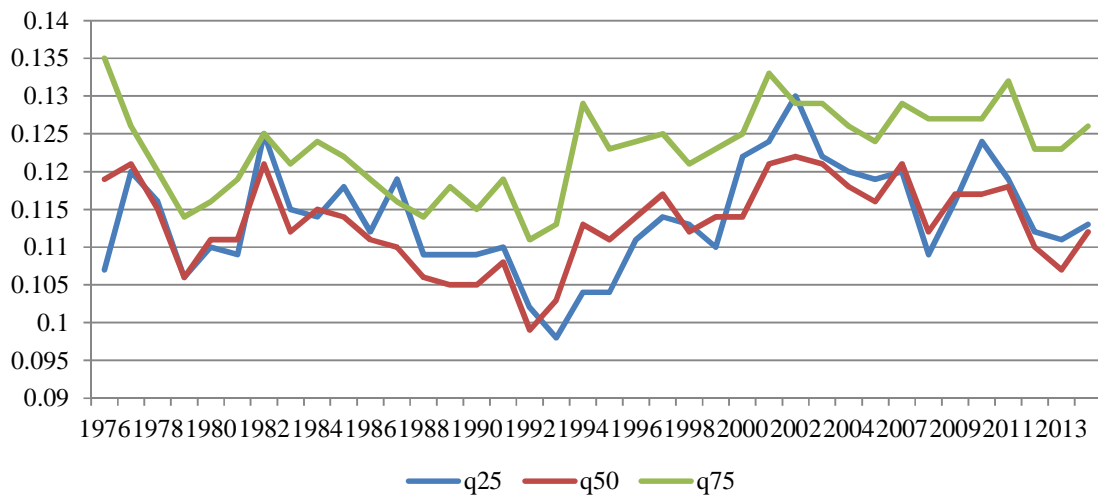


- b. The evolution of quintile returns to education for men is similar to the total, but women's returns behave very differently. For one thing, the volatility of the returns for women is much higher than that of men, which makes it difficult to identify a clear path of behavior. Also, the difference between the upper and lower quintiles is much narrower in the case of women. It seems like the gap between the third and the first quartile has been widening since 2001, both for men and for women.
- c. In general the returns for women are higher than those for men in the lower percentiles of the distribution of labor hourly earnings, but as one moves to higher percentiles the situation changes. In the third quartile the returns are higher for men in almost all the years of the period studied.

**Figure 6A: Quantilic Returns to Education - Men**



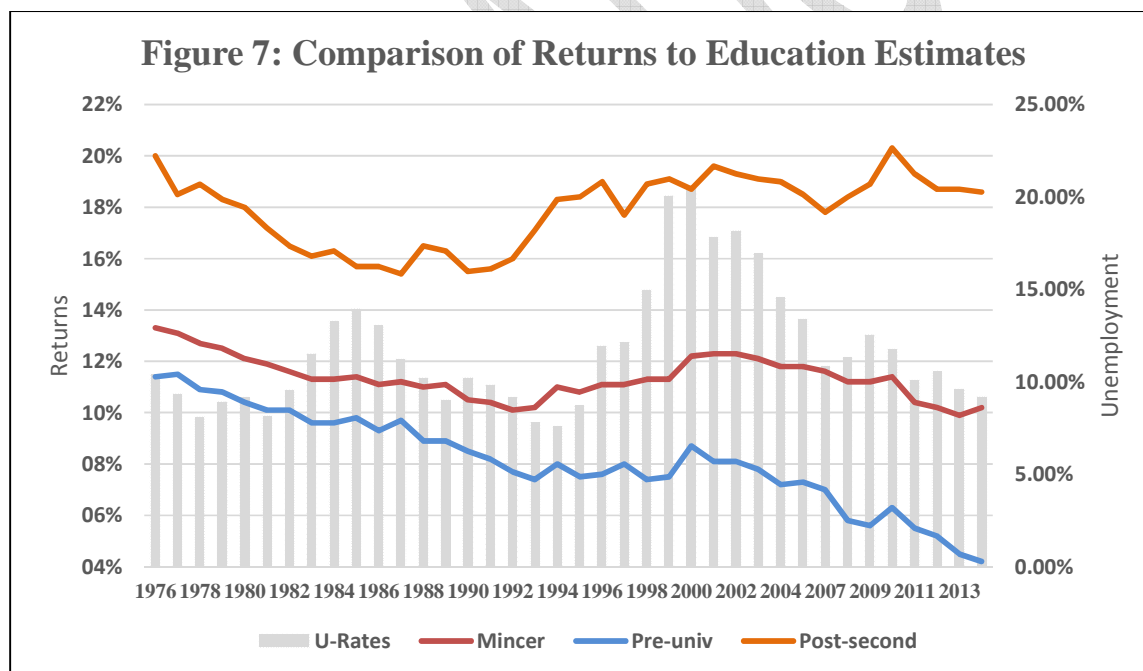
**Figures 6B: Quantilic Returns to Education - Women**



## 7. SUMMARY AND CONCLUSIONS

The exercise we just presented is an attempt to understand the evolutions of returns to education in the last 40 years. It is based in estimates made using the most similar data possible, but the various changes and improvements in methodologies that have occurred impose limitations on the analysis. In spite of that, it was possible to construct consistent series of returns to education based on different techniques of estimation, that present a fairly coherent picture of what has happened in recent years.

The best summary of our estimates is presented in Figure 7, below. In this figure we have the selectivity corrected returns of the Mincerian and spline models, as well as the rates of unemployment for the whole period.



The general conclusion is that the Mincerian returns to education have been declining since the beginning of the century, but this decline seems to be caused by the drop in the returns to pre-university education, that is, 11 years of education or less. The returns to post-secondary education have been increasing (with ups and downs) since the early 1990s, in spite of the fact that the

unemployment rates for this sector of the population seem to have increased relative to the rates of other groups.

In our estimates we also found evidence indicating that an important part of the returns to post-secondary education is associated with some credentialism in the sense that university degrees have a premium relative to the same levels of education without a degree.

Although the purpose of this paper is to describe the evolution of educational returns rather than to explain it, it is tempting to present some hypotheses that could help to understand our findings. The drop in returns between 1976 and 1992 was probably the result of the increase in the supply of human capital produced by the expansion of educational services by the government in previous years. By the late 1980s the country started a revision of its growth strategy, switching from an import substitution strategy to an approach favoring a more open economy. This generated a change in the composition of the demand for labor in favor of skilled workers, which resulted in an increase in their relative earnings (vis-à-vis unskilled ones) and in their returns to education. The recession at the close of the last century, the worst in the recent history of the country, brought the labor market back to the path of decreasing returns to education for workers with pre-university education, probably as a result of the increase in the relative supply of this group of persons vis-à-vis the demand.

## TABLES

<b>TABLE 1: ANNUAL RATES OF POPULATION GROWTH IN URBAN AREAS - POPULATION 15 AND UP</b>			
<b>Period</b>	<b>Total</b>	<b>Men</b>	<b>Women</b>
1985-90	2.75%	2.32%	3.15%
1990-95	2.85%	2.63%	3.05%
1995-2000	2.60%	2.55%	2.64%
2000-05	2.39%	2.47%	2.32%
2005-10	1.89%	1.96%	1.83%
2010-15	1.60%	1.64%	1.56%
<b>1985-2015</b>	<b>2.44%</b>	<b>2.36%</b>	<b>2.51%</b>

<b>TABLE 2: PARTICIPATION AND UNEMPLOYMENT RATES - 7 CITIES</b>						
<b>Years</b>	<b>PARTICIPATION RATES</b>			<b>UNEMPLOYMENT RATES</b>		
	<b>Men</b>	<b>Women</b>	<b>Total</b>	<b>Men</b>	<b>Women</b>	<b>Total</b>
1976	67.38%	34.37%	49.38%	9.68%	11.56%	10.40%
1977	67.46%	35.17%	49.74%	7.79%	11.78%	9.34%
1978	67.14%	35.34%	49.88%	6.81%	10.13%	8.09%
1979	71.11%	37.82%	52.85%	7.22%	11.53%	8.91%
1980	71.64%	38.30%	53.42%	7.56%	11.61%	9.15%
1981	71.11%	37.46%	52.88%	6.90%	10.11%	8.13%
1982	70.95%	36.79%	52.56%	8.03%	12.03%	9.53%
1983	71.44%	39.05%	53.94%	9.41%	14.76%	11.51%
1984	73.03%	40.66%	55.53%	11.06%	16.61%	13.26%
1985	72.02%	40.31%	54.81%	10.73%	18.74%	13.93%
1986	72.30%	41.12%	55.37%	10.17%	17.27%	13.03%
1987	73.29%	42.60%	56.60%	8.63%	15.02%	11.25%
1988	74.05%	43.11%	57.23%	7.74%	13.74%	10.20%
1989	73.34%	42.90%	56.84%	6.89%	12.04%	8.99%
1990	73.34%	43.28%	57.19%	8.14%	13.21%	10.21%
1991	74.53%	46.75%	59.46%	7.41%	13.07%	9.82%
1992	74.20%	47.36%	59.54%	6.54%	12.56%	9.15%
1993	74.75%	48.03%	60.25%	5.34%	11.00%	7.79%
1994	73.86%	46.40%	58.98%	4.89%	11.21%	7.58%
1995	74.07%	47.11%	59.43%	6.75%	11.29%	8.71%
1996	73.12%	47.09%	59.07%	9.58%	15.06%	11.94%
1997	72.65%	48.96%	59.87%	9.80%	15.06%	12.12%
1998	73.01%	50.75%	60.95%	12.49%	17.99%	14.97%
1999	73.79%	54.35%	63.26%	17.23%	23.31%	20.06%
2000	73.97%	57.11%	64.86%	16.94%	24.47%	20.52%
2001	73.84%	55.87%	64.27%	16.16%	19.76%	17.83%
2002	74.04%	57.48%	65.23%	16.23%	20.37%	18.17%
2003	74.51%	58.65%	66.09%	13.71%	20.55%	16.93%
2004	73.32%	55.77%	64.01%	12.37%	17.09%	14.55%
2005	72.99%	55.67%	63.81%	11.00%	16.17%	13.39%
2007	71.30%	53.80%	62.05%	9.52%	12.38%	10.83%
2008	72.74%	55.29%	63.52%	9.70%	13.17%	11.30%
2009	73.25%	57.34%	64.85%	10.85%	14.47%	12.54%
2010	74.37%	59.77%	66.67%	9.97%	13.81%	11.78%
2011	74.91%	60.41%	67.26%	8.47%	11.91%	10.10%
2012	76.68%	61.53%	68.70%	8.99%	12.32%	10.56%
2013	76.08%	61.77%	68.54%	7.80%	11.65%	9.62%
2014	76.50%	62.61%	69.19%	7.84%	10.68%	9.19%



TABLE 3A: AVERAGE YEARS OF SCHOOLING												
Years	Working Age			LABOR FORCE			EMPLOYED			UNEMPLOYED		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
1976	6.6	5.8	6.2	6.7	6.0	6.5	6.8	5.9	6.5	6.5	6.3	6.4
1977	6.8	6.0	6.3	6.9	6.3	6.7	6.9	6.2	6.7	6.8	6.6	6.7
1978	6.9	6.1	6.4	7.0	6.5	6.8	7.0	6.4	6.8	7.1	7.1	7.1
1979	6.9	6.1	6.5	7.1	6.7	6.9	7.1	6.6	6.9	7.1	7.2	7.1
1980	6.9	6.2	6.5	7.0	6.7	6.9	7.0	6.7	6.9	7.1	7.2	7.1
1981	7.2	6.5	6.9	7.4	7.2	7.3	7.4	7.1	7.3	7.1	7.7	7.4
1982	7.1	6.5	6.7	7.2	7.2	7.2	7.3	7.1	7.2	7.0	7.4	7.2
1983	7.1	6.6	6.8	7.3	7.3	7.3	7.4	7.3	7.3	7.2	7.6	7.4
1984	7.2	6.7	6.9	7.4	7.4	7.4	7.4	7.3	7.4	7.3	7.8	7.6
1985	7.2	6.7	7.0	7.4	7.6	7.5	7.4	7.6	7.5	7.3	7.9	7.6
1986	7.5	7.0	7.2	7.7	7.9	7.8	7.8	7.8	7.8	7.5	8.2	7.9
1987	7.5	7.0	7.3	7.7	7.9	7.8	7.7	7.9	7.8	7.8	8.3	8.1
1988	7.6	7.1	7.4	7.9	8.1	8.0	7.9	8.1	8.0	7.6	8.3	8.0
1989	7.8	7.3	7.6	8.1	8.3	8.2	8.1	8.3	8.2	7.9	8.6	8.3
1990	7.9	7.4	7.6	8.1	8.4	8.2	8.1	8.3	8.2	8.1	8.4	8.3
1991	7.9	7.5	7.7	8.2	8.5	8.3	8.2	8.5	8.3	7.8	8.6	8.2
1992	7.9	7.5	7.7	8.2	8.5	8.4	8.2	8.6	8.3	8.2	8.5	8.4
1993	8.0	7.6	7.8	8.2	8.6	8.4	8.3	8.6	8.4	8.0	8.5	8.3
1994	8.0	7.7	7.9	8.3	8.9	8.6	8.3	8.9	8.5	8.2	8.8	8.6
1995	8.1	7.8	8.0	8.5	8.9	8.6	8.5	8.9	8.6	8.4	9.1	8.8
1996	8.1	7.8	7.9	8.4	8.9	8.6	8.5	8.9	8.6	8.1	8.8	8.5
1997	8.3	8.0	8.1	8.6	9.1	8.8	8.6	9.1	8.8	8.4	9.1	8.8
1998	8.4	8.1	8.2	8.7	9.1	8.9	8.8	9.1	8.9	8.4	9.1	8.8
1999	8.4	8.1	8.3	8.8	9.1	8.9	8.8	9.1	8.9	8.5	9.1	8.8
2000	8.5	8.3	8.4	8.9	9.2	9.1	8.9	9.2	9.0	9.0	9.3	9.2
2001	8.7	8.4	8.5	9.1	9.4	9.2	9.1	9.4	9.2	8.8	9.6	9.2
2002	8.8	8.5	8.6	9.2	9.5	9.3	9.2	9.5	9.3	9.1	9.6	9.4
2003	8.8	8.6	8.7	9.3	9.5	9.4	9.2	9.5	9.4	9.5	9.7	9.6
2004	9.0	8.8	8.9	9.5	9.8	9.6	9.5	9.8	9.6	9.5	9.9	9.7
2005	9.1	8.9	9.0	9.6	10.0	9.8	9.6	10.0	9.8	9.8	10.2	10.0
2007	9.2	9.0	9.1	9.8	10.2	10.0	9.8	10.2	10.0	9.8	10.5	10.2
2008	9.3	9.1	9.2	9.9	10.4	10.1	9.9	10.4	10.1	10.0	10.6	10.3
2009	9.2	9.1	9.1	9.8	10.2	10.0	9.8	10.3	10.0	9.7	10.2	10.0
2010	9.3	9.2	9.3	9.9	10.3	10.1	9.8	10.2	10.0	10.1	10.5	10.3
2011	9.4	9.3	9.4	10.0	10.4	10.2	10.0	10.5	10.2	10.2	10.4	10.3
2012	9.5	9.4	9.4	10.1	10.5	10.3	10.0	10.5	10.2	10.3	10.6	10.5
2013	9.7	9.5	9.6	10.3	10.7	10.5	10.3	10.7	10.5	10.2	10.8	10.6
2014	9.7	9.6	9.6	10.3	10.8	10.5	10.2	10.8	10.5	10.5	10.9	10.7
Annual growth	1.00%	1.36%	1.19%	1.11%	1.57%	1.29%	1.10%	1.58%	1.29%	1.27%	1.46%	1.36%

TABLE 3B: AVERAGE YEARS OF SCHOOLING OF POPULATION BETWEEN 30 AND 35 YEARS OF AGE												
Years	TOTAL			LABOR FORCE			EMPLOYED			UNEMPLOYED		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
1976	7.6	5.8	6.6	7.6	6.4	7.1	7.6	6.4	7.2	6.8	5.4	6.1
1977	7.4	6.2	6.8	7.5	6.8	7.2	7.5	6.8	7.3	5.7	5.7	5.7
1978	7.7	6.2	6.8	7.7	6.8	7.4	7.7	6.9	7.4	6.8	5.6	6.1
1979	8.0	6.4	7.1	8.0	6.9	7.6	8.0	7.0	7.6	7.6	6.4	6.9
1980	7.9	6.5	7.2	7.9	7.1	7.6	7.9	7.2	7.6	7.6	6.0	6.8
1981	8.0	7.0	7.5	8.1	7.7	7.9	8.1	7.8	8.0	7.3	7.5	7.4
1982	7.9	7.0	7.4	7.9	7.8	7.9	8.0	7.9	8.0	6.6	6.6	6.6
1983	8.1	7.1	7.6	8.1	7.8	8.0	8.1	7.9	8.0	7.8	6.8	7.3
1984	8.1	7.3	7.7	8.1	8.1	8.1	8.2	8.2	8.2	7.2	7.5	7.3
1985	8.4	7.6	7.9	8.4	8.4	8.4	8.5	8.6	8.5	7.3	7.4	7.4
1986	8.5	7.8	8.1	8.6	8.5	8.6	8.6	8.6	8.6	8.0	8.0	8.0
1987	8.4	8.0	8.2	8.5	8.8	8.6	8.5	8.8	8.6	8.5	8.4	8.5
1988	8.7	8.1	8.4	8.8	8.9	8.8	8.8	8.9	8.9	7.9	8.4	8.2
1989	8.8	8.4	8.6	8.8	9.2	9.0	8.9	9.3	9.0	8.0	8.6	8.3
1990	9.0	8.4	8.6	9.0	9.1	9.0	9.0	9.2	9.1	8.5	8.1	8.3
1991	9.1	8.7	8.8	9.1	9.2	9.2	9.1	9.3	9.2	8.5	8.4	8.4
1992	8.9	8.8	8.8	8.9	9.5	9.2	9.0	9.5	9.2	8.6	9.0	8.9
1993	9.0	8.7	8.9	9.1	9.2	9.1	9.1	9.4	9.2	8.5	7.9	8.1
1994	9.1	8.8	9.0	9.1	9.5	9.3	9.2	9.6	9.4	8.4	8.6	8.5
1995	9.0	9.0	9.0	9.1	9.5	9.3	9.1	9.6	9.3	8.9	9.0	9.0
1996	9.2	9.0	9.1	9.3	9.7	9.4	9.3	9.8	9.5	8.7	8.7	8.7
1997	9.3	9.3	9.3	9.4	9.9	9.7	9.4	10.0	9.7	9.4	9.1	9.2
1998	9.3	9.2	9.2	9.3	9.7	9.5	9.3	9.8	9.5	8.8	9.2	9.1
1999	9.3	9.2	9.3	9.4	9.7	9.5	9.5	9.8	9.6	8.8	9.2	9.0
2000	9.5	9.6	9.5	9.5	10.0	9.7	9.5	10.1	9.8	9.4	9.4	9.4
2001	9.6	9.5	9.5	9.7	9.9	9.8	9.7	10.0	9.9	8.9	9.5	9.3
2002	9.9	9.9	9.9	10.0	10.3	10.2	10.1	10.3	10.2	9.8	10.1	10.0
2003	10.0	9.8	9.9	10.0	10.2	10.1	10.1	10.3	10.2	9.9	9.7	9.8
2004	10.0	10.0	10.0	10.0	10.4	10.2	10.0	10.5	10.3	10.1	9.8	9.9
2005	10.2	10.2	10.2	10.2	10.7	10.4	10.2	10.7	10.5	10.1	10.2	10.2
2007	10.3	10.5	10.4	10.5	10.9	10.7	10.5	11.0	10.7	10.6	10.8	10.7
2008	10.6	10.8	10.7	10.8	11.3	11.0	10.8	11.3	11.1	10.3	11.1	10.8
2009	10.5	10.8	10.6	10.5	11.2	10.8	10.6	11.3	10.9	10.2	10.4	10.3
2010	10.8	11.0	10.9	10.9	11.3	11.1	10.9	11.4	11.1	10.8	10.8	10.8
2011	10.9	11.2	11.1	11.0	11.6	11.3	11.0	11.7	11.3	10.9	10.8	10.8
2012	11.1	11.3	11.2	11.2	11.6	11.4	11.2	11.7	11.4	11.0	11.2	11.1
2013	11.2	11.6	11.4	11.3	11.9	11.6	11.3	12.0	11.6	11.1	11.2	11.2
2014	11.3	11.8	11.6	11.4	12.1	11.7	11.4	12.1	11.7	11.4	11.5	11.4
Annual growth	1.05%	1.87%	1.48%	1.07%	1.70%	1.31%	1.06%	1.69%	1.29%	1.39%	2.00%	1.67%

TABLE 4: UNEMPLOYMENT BY LEVELS OF EDUCATION									
Years	Unemployment Rates					Rates as a Proportion of Total Unemployment			
	None	Primary	Secondary	University	Total	None	Primary	Secondary	University
1976	7.29%	9.76%	12.58%	6.91%	10.40%	0.7470	0.7756	1.8215	0.6644
1977	5.63%	8.90%	11.08%	6.33%	9.34%	0.6326	0.8033	1.7494	0.6781
1978	3.51%	6.81%	10.47%	6.55%	8.09%	0.5149	0.6507	1.5969	0.8102
1979	5.40%	7.15%	11.75%	6.91%	8.91%	0.7551	0.6086	1.6989	0.7757
1980	4.48%	7.71%	12.31%	5.73%	9.15%	0.5804	0.6262	2.1486	0.6266
1981	5.20%	7.13%	10.22%	5.19%	8.13%	0.7288	0.6975	1.9711	0.6380
1982	6.97%	8.31%	11.87%	6.27%	9.53%	0.8392	0.6996	1.8928	0.6581
1983	8.32%	9.56%	14.68%	7.47%	11.51%	0.8702	0.6511	1.9663	0.6489
1984	7.99%	11.16%	16.63%	9.19%	13.26%	0.7156	0.6711	1.8091	0.6934
1985	9.26%	11.42%	17.25%	11.05%	13.93%	0.8107	0.6622	1.5610	0.7934
1986	9.03%	10.81%	16.19%	8.91%	13.03%	0.8355	0.6675	1.8167	0.6839
1987	6.42%	9.13%	14.04%	8.14%	11.27%	0.7030	0.6504	1.7254	0.7221
1988	6.06%	8.68%	12.48%	7.18%	10.20%	0.6978	0.6959	1.7383	0.7035
1989	6.11%	7.39%	11.23%	6.18%	9.00%	0.8270	0.6580	1.8164	0.6865
1990	8.05%	8.10%	12.64%	7.72%	10.24%	0.9941	0.6409	1.6377	0.7536
1991	7.51%	8.54%	11.85%	6.98%	9.85%	0.8802	0.7202	1.6981	0.7084
1992	6.82%	7.70%	11.45%	6.14%	9.23%	0.8855	0.6725	1.8646	0.6653
1993	4.09%	6.47%	9.73%	4.99%	7.80%	0.6322	0.6654	1.9496	0.6395
1994	8.03%	6.43%	9.09%	5.32%	7.60%	1.2501	0.7069	1.7094	0.7001
1995	4.55%	6.99%	10.45%	6.94%	8.73%	0.6515	0.6687	1.5058	0.7954
1996	12.06%	10.58%	13.96%	8.43%	11.97%	1.1404	0.7580	1.6560	0.7044
1997	9.89%	10.49%	14.62%	8.28%	12.11%	0.9424	0.7175	1.7655	0.6837
1998	11.81%	13.78%	18.01%	10.04%	14.99%	0.8565	0.7654	1.7931	0.6701
1999	16.62%	17.54%	23.86%	14.75%	20.11%	0.9473	0.7351	1.6179	0.7333
2000	17.19%	16.63%	23.52%	18.31%	20.58%	1.0342	0.7069	1.2847	0.8897
2001	13.85%	14.60%	21.13%	14.10%	17.86%	0.9489	0.6908	1.4994	0.7890
2002	12.57%	14.92%	21.18%	15.51%	18.27%	0.8426	0.7045	1.3656	0.8489
2003	16.22%	14.82%	19.39%	14.15%	17.00%	1.0943	0.7643	1.3706	0.8323
2004	11.15%	11.85%	17.01%	12.83%	14.66%	0.9411	0.6963	1.3258	0.8751
2005	9.27%	10.00%	16.00%	11.51%	13.44%	0.9272	0.6251	1.3901	0.8566
2007	8.68%	8.50%	12.70%	9.43%	10.83%	1.0214	0.6690	1.3472	0.8704
2008	7.83%	8.19%	12.90%	10.91%	11.30%	0.9564	0.6348	1.1830	0.9650
2009	8.74%	11.26%	14.23%	10.89%	12.54%	0.7765	0.7913	1.3066	0.8681
2010	9.89%	8.93%	12.98%	11.80%	11.79%	1.1086	0.6876	1.1004	1.0008
2011	10.91%	7.82%	11.51%	9.28%	10.10%	1.3952	0.6792	1.2410	0.9185
2012	9.52%	7.76%	12.02%	10.13%	10.56%	1.2268	0.6457	1.1865	0.9590
2013	7.40%	7.74%	10.77%	9.17%	9.63%	0.9566	0.7187	1.1740	0.9530
2014	7.40%	7.06%	10.27%	8.99%	9.19%	1.0480	0.6874	1.1420	0.9779

TABLE 4A: MALE UNEMPLOYMENT BY EDUCATIONAL GROUPS									
Years	Unemployment Rates					Relative Rates*			
	None	Primary	Secondary	University	TOTAL	None	Primary	Secondary	University
1976	9.08%	9.40%	11.04%	6.83%	9.68%	0.9376	0.9702	1.1405	0.7050
1977	5.60%	7.41%	9.20%	5.38%	7.79%	0.7191	0.9510	1.1810	0.6908
1978	4.13%	6.17%	8.13%	5.76%	6.82%	0.6064	0.9049	1.1925	0.8456
1979	5.37%	6.46%	8.72%	5.69%	7.22%	0.7430	0.8944	1.2073	0.7870
1980	5.39%	6.55%	9.82%	5.05%	7.56%	0.7125	0.8664	1.2981	0.6677
1981	6.87%	6.66%	8.03%	4.21%	6.90%	0.9957	0.9652	1.1645	0.6110
1982	8.31%	7.32%	9.62%	5.00%	8.03%	1.0352	0.9125	1.1993	0.6234
1983	8.17%	8.39%	11.61%	5.78%	9.41%	0.8685	0.8911	1.2339	0.6141
1984	9.26%	10.21%	13.02%	7.67%	11.06%	0.8376	0.9235	1.1775	0.6937
1985	10.23%	9.58%	12.59%	8.30%	10.73%	0.9536	0.8929	1.1733	0.7734
1986	8.34%	9.35%	12.01%	6.83%	10.17%	0.8203	0.9194	1.1810	0.6718
1987	8.15%	7.74%	10.08%	6.41%	8.65%	0.9428	0.8944	1.1653	0.7407
1988	5.83%	7.41%	8.87%	5.41%	7.75%	0.7523	0.9569	1.1441	0.6980
1989	9.39%	6.16%	8.22%	4.44%	6.90%	1.3610	0.8934	1.1916	0.6438
1990	8.02%	6.83%	9.58%	6.74%	8.17%	0.9809	0.8356	1.1721	0.8250
1991	9.04%	7.21%	8.50%	4.68%	7.42%	1.2178	0.9710	1.1444	0.6304
1992	6.35%	5.98%	7.70%	4.67%	6.58%	0.9644	0.9088	1.1697	0.7093
1993	3.77%	4.71%	6.48%	3.36%	5.34%	0.7062	0.8818	1.2122	0.6282
1994	6.14%	4.73%	5.61%	3.02%	4.89%	1.2556	0.9665	1.1469	0.6162
1995	6.66%	5.94%	7.71%	5.45%	6.78%	0.9833	0.8763	1.1376	0.8045
1996	13.92%	9.31%	10.76%	6.07%	9.57%	1.4545	0.9729	1.1244	0.6347
1997	7.94%	9.88%	11.01%	6.96%	9.80%	0.8105	1.0085	1.1235	0.7106
1998	11.77%	13.08%	14.18%	8.33%	12.50%	0.9420	1.0469	1.1349	0.6664
1999	16.51%	16.42%	19.57%	13.06%	17.26%	0.9562	0.9509	1.1336	0.7567
2000	15.01%	14.28%	18.52%	16.60%	16.99%	0.8839	0.8406	1.0903	0.9772
2001	15.91%	14.25%	18.41%	13.29%	16.21%	0.9812	0.8791	1.1354	0.8198
2002	11.14%	13.32%	18.63%	14.58%	16.34%	0.6814	0.8150	1.1400	0.8924
2003	13.09%	12.77%	15.29%	11.65%	13.74%	0.9524	0.9292	1.1121	0.8473
2004	8.48%	10.78%	13.74%	11.77%	12.48%	0.6801	0.8642	1.1015	0.9430
2005	6.82%	9.51%	12.38%	9.95%	11.04%	0.6179	0.8612	1.1217	0.9013
2007	10.79%	8.32%	10.71%	8.23%	9.52%	1.1335	0.8742	1.1248	0.8648
2008	8.75%	7.50%	10.65%	9.63%	9.71%	0.9016	0.7730	1.0972	0.9919
2009	6.95%	10.19%	11.75%	9.95%	10.86%	0.6405	0.9390	1.0821	0.9167
2010	10.51%	7.68%	10.17%	11.11%	9.97%	1.0543	0.7702	1.0201	1.1148
2011	10.16%	7.28%	8.91%	8.41%	8.47%	1.2002	0.8603	1.0517	0.9930
2012	8.79%	6.53%	10.14%	8.69%	8.99%	0.9776	0.7260	1.1277	0.9661
2013	7.02%	6.77%	8.34%	7.61%	7.80%	0.8996	0.8683	1.0694	0.9758
2014	5.65%	6.17%	8.41%	8.06%	7.84%	0.7202	0.7864	1.0721	1.0281

\* Relative rate<sub>i</sub> = rate group<sub>i</sub>/total

**TABLE 4B: FEMALE UNEMPLOYMENT BY EDUCATIONAL GROUPS**

Years	Unemployment Rates					Relative Rates*			
	None	Primary	Secondary	University	TOTAL	None	Primary	Secondary	University
1976	5.62%	10.30%	15.22%	7.16%	11.56%	0.4861	0.8905	1.3159	0.6191
1977	5.65%	11.17%	14.00%	8.84%	11.78%	0.4796	0.9478	1.1878	0.7498
1978	2.98%	7.84%	14.08%	8.39%	10.13%	0.2946	0.7742	1.3905	0.8289
1979	5.42%	8.23%	16.25%	9.48%	11.53%	0.4704	0.7133	1.4087	0.8222
1980	3.58%	9.54%	15.97%	7.16%	11.61%	0.3082	0.8221	1.3760	0.6167
1981	3.54%	7.92%	13.48%	7.25%	10.11%	0.3505	0.7841	1.3342	0.7172
1982	5.41%	9.98%	15.49%	8.61%	12.03%	0.4500	0.8300	1.2882	0.7160
1983	8.48%	11.45%	19.21%	10.51%	14.76%	0.5743	0.7758	1.3010	0.7117
1984	6.66%	12.69%	21.84%	11.87%	16.61%	0.4012	0.7637	1.3145	0.7142
1985	8.00%	14.44%	23.82%	15.29%	18.74%	0.4270	0.7702	1.2711	0.8159
1986	9.77%	13.12%	22.05%	12.24%	17.27%	0.5654	0.7596	1.2764	0.7085
1987	4.60%	11.34%	19.54%	10.62%	15.06%	0.3058	0.7533	1.2972	0.7052
1988	6.28%	10.63%	17.58%	9.71%	13.74%	0.4570	0.7735	1.2793	0.7067
1989	2.73%	9.29%	15.45%	8.65%	12.04%	0.2267	0.7717	1.2832	0.7186
1990	8.09%	10.10%	17.08%	9.03%	13.25%	0.6102	0.7618	1.2884	0.6812
1991	6.00%	10.47%	16.35%	9.84%	13.12%	0.4573	0.7977	1.2457	0.7502
1992	7.39%	10.19%	16.21%	7.92%	12.69%	0.5826	0.8035	1.2776	0.6239
1993	4.45%	9.05%	13.88%	6.94%	11.03%	0.4038	0.8206	1.2586	0.6298
1994	10.57%	9.07%	13.65%	7.99%	11.23%	0.9411	0.8076	1.2153	0.7115
1995	2.41%	8.62%	14.01%	8.63%	11.30%	0.2134	0.7622	1.2395	0.7630
1996	9.92%	12.46%	18.20%	11.10%	15.14%	0.6556	0.8234	1.2021	0.7333
1997	12.24%	11.42%	18.99%	9.80%	15.04%	0.8133	0.7591	1.2622	0.6512
1998	11.84%	14.73%	22.49%	12.06%	18.02%	0.6574	0.8178	1.2486	0.6692
1999	16.73%	19.01%	28.63%	16.57%	23.38%	0.7156	0.8130	1.2245	0.7086
2000	19.79%	19.47%	28.92%	20.08%	24.53%	0.8067	0.7936	1.1789	0.8187
2001	12.00%	15.04%	24.30%	14.95%	19.78%	0.6065	0.7604	1.2287	0.7560
2002	14.18%	16.87%	24.05%	16.51%	20.45%	0.6932	0.8247	1.1758	0.8071
2003	19.60%	17.28%	23.84%	16.99%	20.65%	0.9492	0.8368	1.1545	0.8229
2004	14.20%	13.21%	20.82%	13.99%	17.21%	0.8253	0.7680	1.2098	0.8129
2005	11.79%	10.64%	20.22%	13.19%	16.22%	0.7266	0.6562	1.2463	0.8133
2007	5.35%	8.73%	15.19%	10.62%	12.38%	0.4322	0.7051	1.2268	0.8581
2008	6.88%	9.06%	15.82%	12.15%	13.18%	0.5225	0.6878	1.2009	0.9224
2009	10.91%	12.64%	17.26%	11.77%	14.47%	0.7542	0.8737	1.1931	0.8134
2010	8.98%	10.45%	16.36%	12.43%	13.81%	0.6501	0.7568	1.1845	0.9004
2011	11.76%	8.50%	14.61%	10.11%	11.92%	0.9865	0.7132	1.2257	0.8480
2012	10.49%	9.21%	14.34%	11.49%	12.32%	0.8514	0.7475	1.1639	0.9324
2013	7.90%	8.92%	13.75%	10.64%	11.65%	0.6784	0.7657	1.1801	0.9130
2014	10.11%	8.16%	12.56%	9.84%	10.68%	0.9461	0.7641	1.1760	0.9208

\* Relative rate<sub>i</sub> = rate group<sub>i</sub>/total

TABLE 5: MINCERIAN RETURNS TO EDUCATION							
Source	Year	Without Selectivity Correction			With Selectivity Correction		
		Total	Men	Women	Total	Men	Women
Households Surveyed	1976	14.3%	15.1%	12.7%	13.3%	14.2%	12.4%
	1977	14.0%	14.8%	12.4%	13.1%	13.6%	12.6%
	1978	13.5%	14.0%	12.3%	12.7%	13.1%	11.7%
	1979	13.1%	13.7%	11.7%	12.5%	13.0%	11.4%
	1980	12.8%	13.2%	11.9%	12.1%	12.5%	11.8%
	1981	12.5%	12.7%	11.9%	11.9%	12.2%	11.3%
	1982	12.7%	12.4%	12.8%	11.6%	11.7%	11.0%
	1983	12.1%	12.1%	12.0%	11.3%	11.4%	11.2%
	1984	12.1%	12.0%	12.0%	11.3%	11.4%	11.0%
	1985	12.0%	11.9%	12.1%	11.4%	11.4%	11.9%
	1986	11.9%	11.8%	11.9%	11.1%	11.1%	11.5%
	1987	11.8%	11.4%	12.2%	11.2%	10.8%	12.2%
	1988	11.6%	11.5%	11.6%	11.0%	10.9%	11.6%
	1989	11.7%	11.5%	11.9%	11.1%	11.0%	11.1%
	1990	11.5%	11.2%	11.7%	10.5%	10.6%	10.8%
	1991	11.2%	10.8%	11.6%	10.4%	10.1%	10.8%
	1992	10.9%	10.9%	10.7%	10.1%	10.4%	10.3%
	1993	10.8%	10.7%	10.8%	10.2%	10.2%	10.9%
	1994	11.8%	11.4%	12.1%	11.0%	10.9%	11.4%
	1995	11.5%	11.3%	11.8%	10.8%	10.6%	11.4%
1996	12.0%	12.0%	12.0%	11.1%	11.2%	11.6%	
1997	12.1%	12.0%	12.1%	11.1%	11.2%	11.6%	
1998	12.4%	12.7%	11.9%	11.3%	11.9%	11.6%	
1999	12.3%	12.4%	11.9%	11.3%	11.7%	10.5%	
2000	12.9%	13.2%	12.4%	12.2%	12.7%	11.8%	
Continuous Household Surveys	2001	13.5%	13.9%	13.0%	12.3%	12.8%	12.1%
	2002	13.4%	13.8%	12.9%	12.3%	13.0%	12.0%
	2003	12.9%	12.9%	12.8%	12.1%	12.5%	11.8%
	2004	12.7%	12.8%	12.5%	11.8%	12.3%	11.5%
	2005	12.6%	12.8%	12.4%	11.8%	12.4%	11.0%
Integrated Household Survey	2007	12.6%	12.3%	12.9%	11.6%	11.7%	11.0%
	2008	12.2%	12.1%	12.3%	11.2%	11.5%	10.8%
	2009	12.3%	12.1%	12.5%	11.2%	11.5%	10.8%
	2010	12.3%	11.9%	12.6%	11.4%	11.5%	11.0%
	2011	11.7%	10.9%	12.7%	10.4%	10.3%	10.4%
	2012	11.4%	10.9%	11.9%	10.2%	10.4%	9.5%
	2013	11.2%	10.8%	11.7%	9.9%	10.1%	9.5%
	2014	11.3%	10.5%	12.2%	10.2%	10.1%	9.9%



TABLE 6: SPLINE RETURNS TO EDUCATION						
Source	Year	Uncorrected		Selectivity Corrected		Mincerian Selectivity Corrected
		Pre-University	Post-Secondary	Pre-University	Post-Secondary	
Households	1976	0.123	0.212	0.114	0.200	13.3%
	1977	0.123	0.196	0.115	0.185	13.1%
	1978	0.116	0.200	0.109	0.189	12.7%
	1979	0.112	0.190	0.108	0.183	12.5%
	1980	0.109	0.187	0.104	0.180	12.1%
	1981	0.106	0.179	0.101	0.172	11.9%
	1982	0.11	0.177	0.101	0.165	11.6%
	1983	0.104	0.172	0.096	0.161	11.3%
	1984	0.102	0.172	0.096	0.163	11.3%
	1985	0.104	0.166	0.098	0.157	11.4%
	1986	0.101	0.167	0.093	0.157	11.1%
	1987	0.102	0.161	0.097	0.154	11.2%
	1988	0.094	0.171	0.089	0.165	11.0%
	1989	0.094	0.170	0.089	0.163	11.1%
	1990	0.093	0.165	0.085	0.155	10.5%
	1991	0.089	0.165	0.082	0.156	10.4%
	1992	0.083	0.168	0.077	0.160	10.1%
	1993	0.078	0.176	0.074	0.171	10.2%
	1994	0.085	0.189	0.08	0.183	11.0%
	1995	0.08	0.191	0.075	0.184	10.8%
1996	0.084	0.199	0.076	0.190	11.1%	
1997	0.088	0.187	0.08	0.177	11.1%	
1998	0.083	0.200	0.074	0.189	11.3%	
1999	0.082	0.200	0.075	0.191	11.3%	
2000	0.091	0.194	0.087	0.187	12.2%	
Continuous Household Surveys	2001	0.09	0.208	0.081	0.196	12.3%
	2002	0.09	0.205	0.081	0.193	12.3%
	2003	0.083	0.200	0.078	0.191	12.1%
	2004	0.078	0.199	0.072	0.190	11.8%
	2005	0.078	0.193	0.073	0.185	11.8%
Integrated Household Survey	2007	0.075	0.188	0.07	0.178	11.6%
	2008	0.064	0.195	0.058	0.184	11.2%
	2009	0.063	0.200	0.056	0.189	11.2%
	2010	0.061	0.201	0.063	0.203	11.4%
	2011	0.054	0.192	0.055	0.193	10.4%
	2012	0.052	0.188	0.052	0.187	10.2%
	2013	0.045	0.188	0.045	0.187	9.9%
	2014	0.043	0.188	0.042	0.186	10.2%

TABLE 6A: SPLINE RETURNS FOR MEN						
Source	Year	Uncorrected		Selectivity Corrected		Mincerian Selectivity Corrected
		Pre-University	Post-Secondary	Pre-University	Post-Secondary	
Households	1976	0.13	0.211	0.122	0.201	14.2%
	1977	0.129	0.197	0.119	0.183	13.6%
	1978	0.119	0.197	0.112	0.185	13.1%
	1979	0.119	0.185	0.113	0.177	13.0%
	1980	0.111	0.191	0.105	0.182	12.5%
	1981	0.105	0.186	0.098	0.178	12.2%
	1982	0.105	0.179	0.098	0.17	11.7%
	1983	0.098	0.180	0.091	0.171	11.4%
	1984	0.098	0.174	0.093	0.167	11.4%
	1985	0.099	0.170	0.095	0.164	11.4%
	1986	0.095	0.170	0.089	0.164	11.1%
	1987	0.094	0.165	0.089	0.159	10.8%
	1988	0.088	0.181	0.083	0.175	10.9%
	1989	0.086	0.181	0.08	0.175	11.0%
	1990	0.087	0.169	0.081	0.161	10.6%
	1991	0.081	0.172	0.073	0.164	10.1%
	1992	0.081	0.173	0.076	0.167	10.4%
	1993	0.075	0.182	0.069	0.177	10.2%
	1994	0.079	0.195	0.073	0.19	10.9%
	1995	0.075	0.196	0.069	0.189	10.6%
1996	0.082	0.202	0.074	0.195	11.2%	
1997	0.084	0.194	0.076	0.186	11.2%	
1998	0.085	0.206	0.082	0.197	11.9%	
1999	0.085	0.202	0.078	0.195	11.7%	
2000	0.096	0.196	0.092	0.19	12.7%	
Continuous Household Surveys	2001	0.097	0.205	0.087	0.195	12.8%
	2002	0.098	0.201	0.091	0.193	13.0%
	2003	0.088	0.195	0.085	0.19	12.5%
	2004	0.082	0.198	0.078	0.193	12.3%
	2005	0.083	0.191	0.08	0.186	12.4%
Integrated Household Survey	2007	0.078	0.183	0.074	0.176	11.7%
	2008	0.069	0.188	0.065	0.181	11.5%
	2009	0.066	0.194	0.062	0.189	11.5%
	2010	0.063	0.192	0.063	0.19	11.5%
	2011	0.052	0.180	0.051	0.177	10.3%
	2012	0.053	0.179	0.052	0.175	10.4%
	2013	0.047	0.178	0.046	0.175	10.1%
	2014	0.048	0.173	0.046	0.169	10.1%



TABLE 6B: SPLINE RETURNS FOR WOMEN						
Source	Year	Uncorrected		Selectivity Corrected		Mincerian Selectivity Corrected
		Pre-University	Post-Secondary	Pre-University	Post-Secondary	
Household Surveys	1976	0.113	0.209	0.11	0.204	12.4%
	1977	0.113	0.182	0.117	0.188	12.6%
	1978	0.107	0.203	0.104	0.198	11.7%
	1979	0.101	0.195	0.101	0.195	11.4%
	1980	0.105	0.178	0.109	0.183	11.8%
	1981	0.106	0.166	0.102	0.16	11.3%
	1982	0.115	0.175	0.101	0.157	11.0%
	1983	0.109	0.155	0.104	0.148	11.2%
	1984	0.105	0.168	0.098	0.158	11.0%
	1985	0.109	0.159	0.108	0.158	11.9%
	1986	0.106	0.159	0.103	0.155	11.5%
	1987	0.111	0.155	0.114	0.158	12.2%
	1988	0.102	0.157	0.104	0.159	11.6%
	1989	0.105	0.154	0.099	0.146	11.1%
	1990	0.1	0.159	0.093	0.15	10.8%
	1991	0.1	0.156	0.095	0.149	10.8%
	1992	0.083	0.159	0.083	0.159	10.3%
	1993	0.082	0.168	0.087	0.174	10.9%
	1994	0.092	0.180	0.091	0.178	11.4%
	1995	0.086	0.185	0.087	0.186	11.4%
1996	0.085	0.193	0.086	0.194	11.6%	
1997	0.092	0.178	0.091	0.176	11.6%	
1998	0.078	0.191	0.082	0.197	11.6%	
1999	0.077	0.197	0.07	0.188	10.5%	
2000	0.083	0.191	0.082	0.19	11.8%	
Continuous Household Surveys	2001	0.08	0.208	0.08	0.208	12.1%
	2002	0.079	0.208	0.078	0.206	12.0%
	2003	0.077	0.205	0.074	0.2	11.8%
	2004	0.072	0.198	0.071	0.197	11.5%
	2005	0.07	0.194	0.069	0.192	11.0%
Integrated Household Survey	2007	0.073	0.194	0.066	0.182	11.0%
	2008	0.057	0.202	0.055	0.198	10.8%
	2009	0.057	0.204	0.053	0.198	10.8%
	2010	0.057	0.208	0.061	0.213	11.0%
	2011	0.056	0.202	0.059	0.207	10.4%
	2012	0.05	0.196	0.052	0.199	9.5%
	2013	0.043	0.197	0.045	0.199	9.5%
2014	0.038	0.204	0.037	0.202	9.9%	

TABLE 6C: SPLINE RETURNS WITH AND WITHOUT PROFESSIONAL DEGREE*					
Source	Years	Pre-univ Schooling	Post-Secondary		
			Post- Secondary **	Without Professional Degree	With Professional Degree
H o u s e h o l d  S u r v e y s	1976	11.40%	20.00%		
	77	11.50%	18.50%		
	78	10.90%	18.90%		
	79	10.80%	18.30%		
	80	10.40%	18.00%		
	81	10.10%	17.20%		
	82	10.10%	16.50%		
	83	9.60%	16.10%		
	84	9.60%	16.30%		
	85	9.80%	15.70%		
	86	9.30%	15.70%		
	87	9.70%	15.40%		
	88	8.90%	16.50%		
	89	8.90%	16.30%		
	90	8.50%	15.50%		
	91	8.20%	15.60%		
	92	7.70%	16.00%		
	93	7.40%	17.10%		
	94	8.00%	18.30%		
	95	7.50%	18.40%		
96	7.60%	19.00%			
97	8.00%	17.70%			
98	7.40%	18.90%			
99	7.50%	19.10%			
2000	8.70%	18.70%			
Continuos Hosehold Surveys	1	8.10%	19.60%		
	2	8.10%	19.30%		
	3	7.80%	19.10%		
	4	7.20%	19.00%		
	5	7.30%	18.50%		
Integrated Household Survey	7	7.00%	17.80%	13.23%	18.41%
	8	5.80%	18.40%	13.33%	19.10%
	9	5.60%	18.90%	13.71%	19.80%
	10	6.30%	20.30%	14.26%	20.05%
	11	5.50%	19.30%	12.24%	18.91%
	12	5.20%	18.70%	11.95%	18.72%
	13	4.50%	18.70%	12.14%	18.69%
	14	4.20%	18.60%	11.96%	18.87%

\* Corrected for selectivity bias

\*\* Corresponds to the returns of the spline regression in table 6A.

TABLE 7: QUANTILIC RETURNS TO EDUCATION										
Source	Years	MEN			WOMEN			TOTAL		
		q25	q50	q75	q25	q50	q75	q25	q50	q75
H o u s e h o l d  S u r v e y s	1976	0.136	0.151	0.162	0.107	0.119	0.135	0.128	0.14	0.151
	1977	0.136	0.147	0.157	0.12	0.121	0.126	0.13	0.139	0.145
	1978	0.129	0.138	0.147	0.116	0.115	0.12	0.126	0.131	0.138
	1979	0.118	0.132	0.146	0.106	0.106	0.114	0.116	0.123	0.135
	1980	0.11	0.129	0.141	0.11	0.111	0.116	0.112	0.122	0.132
	1981	0.11	0.122	0.137	0.109	0.111	0.119	0.111	0.119	0.13
	1982	0.106	0.12	0.132	0.125	0.121	0.125	0.114	0.121	0.13
	1983	0.105	0.118	0.13	0.115	0.112	0.121	0.11	0.116	0.127
	1984	0.104	0.113	0.126	0.114	0.115	0.124	0.109	0.115	0.125
	1985	0.106	0.113	0.123	0.118	0.114	0.122	0.112	0.113	0.123
	1986	0.099	0.11	0.125	0.112	0.111	0.119	0.106	0.11	0.123
	1987	0.092	0.101	0.119	0.119	0.11	0.116	0.104	0.105	0.118
	1988	0.089	0.103	0.123	0.109	0.106	0.114	0.099	0.105	0.12
	1989	0.09	0.106	0.128	0.109	0.105	0.118	0.098	0.106	0.124
	1990	0.09	0.103	0.123	0.109	0.105	0.115	0.099	0.105	0.121
	1991	0.089	0.101	0.118	0.11	0.108	0.119	0.099	0.105	0.119
	1992	0.089	0.103	0.119	0.102	0.099	0.111	0.096	0.102	0.116
	1993	0.083	0.102	0.119	0.098	0.103	0.113	0.09	0.103	0.116
	1994	0.09	0.107	0.123	0.104	0.113	0.129	0.095	0.11	0.126
	1995	0.087	0.106	0.123	0.104	0.111	0.123	0.094	0.109	0.123
1996	0.101	0.111	0.127	0.111	0.114	0.124	0.106	0.113	0.126	
1997	0.096	0.109	0.125	0.114	0.117	0.125	0.104	0.113	0.125	
1998	0.106	0.121	0.136	0.113	0.112	0.121	0.11	0.118	0.13	
1999	0.112	0.119	0.134	0.11	0.114	0.123	0.112	0.117	0.13	
2000	0.119	0.123	0.135	0.122	0.114	0.125	0.121	0.119	0.131	
Continuos Hosehold Surveys	2001	0.125	0.13	0.142	0.124	0.121	0.133	0.126	0.127	0.138
	2002	0.124	0.127	0.141	0.13	0.122	0.129	0.127	0.124	0.136
	2003	0.111	0.118	0.132	0.122	0.121	0.129	0.117	0.12	0.131
	2004	0.109	0.117	0.133	0.12	0.118	0.126	0.114	0.118	0.129
	2005	0.109	0.117	0.132	0.119	0.116	0.124	0.114	0.116	0.128
Integrated Household Survey	2007	0.101	0.115	0.131	0.12	0.121	0.129	0.11	0.117	0.13
	2008	0.095	0.108	0.127	0.109	0.112	0.127	0.102	0.11	0.127
	2009	0.096	0.106	0.128	0.116	0.117	0.127	0.105	0.111	0.128
	2010	0.094	0.107	0.125	0.124	0.117	0.127	0.107	0.111	0.126
	2011	0.087	0.096	0.119	0.119	0.118	0.132	0.102	0.105	0.124
	2012	0.086	0.097	0.116	0.112	0.11	0.123	0.099	0.102	0.12
	2013	0.086	0.092	0.113	0.111	0.107	0.123	0.097	0.099	0.117
	2014	0.08	0.09	0.114	0.113	0.112	0.126	0.094	0.099	0.12

## BIBLIOGRAFIA

- Amador, Diego, Raquel Bernal, y Ximena Peña. «El aumento de la participación laboral femenina en Colombia: ¿ fecundidad, estado civil o educación?» *Documento CEDE*, 2013: 1-26.
- Arias Helmuth, Chaves Álvaro. «Cálculo de la tasa interna de retorno de la educación en Colombia.» 2002.
- Becker, Gary. En *Human capital: a theoretical and empirical analysis, with special reference to education*, 22-0. NBER, 1975.
- Bohorquez, Camilo, Rodriguez Sergio, y Rocha Romero. «Trends in Education Quality and Labor Market Returns in Latin America: Evidence from Household Surveys.» *Report to the World Bank for Background Paper FY10*, 2011.
- Cardona Marleny, Montes Isabel, Vásquez Juan, Villegas María, Brito Tatiana. *Capital humano: una mirada desde la educación y la experiencia laboral*. Medellín: Dirección de Investigación y Docencia Universidad EAFIT, 2007.
- Casas Andrés, Gallego Juan, Sepúlveda Carlos. *Retornos a la educación y sesgo de habiliad. Teoría y aplicaciones en Colombia*. Bogotá: Borradores de investigación, 2002.
- Castellar Carlos E., Uribe José. «Una aproximación econométrica a la tasa de retorno social de la educación.» *Revista Sociedad y Economía*, Septiembre de 2001: 77-102.
- Dougherty, Christopher. «¿ Why are the Returns to Schooling Higher for Women than for Men?» *The Journal of Human Resources*, Vol 40, N°4, 2005: 969-988.
- Duarte, Jorge Leonardo. *Estimación de los retornos a la educación a partir de encuestas de hogares y algunos resultados para Colombia*. Santiago de Cali: Universidad ICESI, 2012.
- Fairlie, Robert. «An Extension of the Blinder-Oaxaca decomposition Technique to Logit and Probit Models.» *Institute for Study of Labor IZA, paper N°1917*, 2006: 1-16.
- Felipe, Prada Carlos. «¿Is the decision of study in Colombia profitable?» *ESPE*, 2006.
- Forero Nohora, Gamboa Luis. «Cambios en los retornos de la educación en Bogotá entre 1997 y 2003.» *Documentos de trabajo universidad del Rosario*, 2006.

- Gamboa Luis, Rodríguez Paul. «Do colombian students underestimate higher education returns?» *Serie documentos de trabajo*, 2014.
- Hernández, Gustavo. «¿Cuán rentable es la educación superior en Colombia?» *Lecturas de Economía*, 2010: 181-214.
- Marsh, L. C. & D.R. Cormier (202). *Spline Regression Models Series: Quantitative Applications in Social Sciences* (137). SAGE Publications. London U.K.
- Mincer, Jacob. «Schooling, Experience, and Earnings.» 41-63. Columbia University Press, 1974.
- Montenegro C. & H.A. Patrinos. (2014). "Comparable Estimates of Returns to Schooling Around the World." Policy Research Working Paper 7020. World Bank Group. World Bank. Washington D.C.
- Pindyck R. & D. Rubinfeld (1991). *Econometric Models & Economic Forecasts* (third edition). McGraw-Hill, INC. New York USA
- Tenjo, J. 1992. "Labor Markets, the Wage Gap, and Gender Discrimination: The Case of Colombia." In G. Psacharopoulos and Z. Tzannatos, eds. *Case Studies on Women Employment and Pay in Latin America*. The World Bank. Washington, D.C.
- Tenjo, J. 1993. "Evolución de los Retornos a la Inversión en Educación 1976-1989". Revista *Planeación y Desarrollo*, Vol XXIV Edición Especial (Diciembre). Departamento Nacional de Planeación. Bogotá, Colombia, pp 85-102.
- Tenjo, J. 1993-2. "Educación, Habilidad, Conocimientos e Ingresos". Revista *Planeación Nacional y Desarrollo*, Vol XXIV. Departamento Nacional de Planeación. Bogotá, Colombia, pp. 103-116
- Tenjo, J. 1996. "Heterogeneidad, Autoselección y Retornos a la Educación". *Revista Ensayos sobre Política Económica*, Banco de La República. Bogotá, pp 35-37.
- Tenjo J., R. Ribero M.& L.F. Bernat D. 2004. "Evolution of Salary Differences between Men and Women un six Latin American Countries. in Claudia Piras (editor) *Women at Work*, Inter-American Developmnet Bank, Washington. Chapter 5, pp 139-185.
- Tenjo J., O. Álvarez & M.C. Jiménezn. 2015. "Diferencias en Tasas de Desempleo por Género" (forthcoming)

**APPENDIX: ECONOMETRIC RESULTS**

BARHAR