

The university effect in Valle del Cauca 2009: a multilevel analysis

*Efecto universidad en el Valle del Cauca
2009: un análisis multinivel*

*Efeito universidade em 2009 o Valle del
Cauca: uma análise multinível*

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Resumen

Este artículo examina la existencia de un efecto universidad sobre los salarios de los egresados, es decir, si la universidad donde se gradúa el profesional determina el nivel de ingreso que recibirá en el mercado laboral. La investigación utiliza los datos de la *Encuesta del mercado laboral de profesionales en el área metropolitana de Cali* realizada en el año 2009, con una muestra de 606 estudiantes de cuatro universidades de la ciudad. Con base en la utilización de un modelo multinivel de tres niveles (estudiante, programa y universidad) para capturar los efectos de agrupaciones con factores comunes, el estudio sugiere que existe un efecto universidad significativo y alto de las instituciones de educación superior analizadas. Estos resultados son consecuentes con la teoría de la señalización, que sugiere la presencia de señales en los mercados de trabajo.

Palabras clave: efecto universidad, educación, mercado laboral, análisis multinivel.

Clasificación JEL: I21, I23, J24

Abstract

This article examines the existence of a “university effect” on the wages of college graduates, i.e., if the university from which the professional graduates determines the level of income that they will receive in the labor market. Data for this research comes from the *Encuesta del mercado laboral de profesionales en el área metropolitana de Cali* (Survey of the labor market of professionals in the metropolitan area of Cali), which was carried out in 2009, with a sample of 606 students from four universities of the city. Using a multilevel model with three levels (student, program, and university) in order to capture the effects of groups with common factors, this study suggests the existence of a significant and high university effect in the institutions of higher education analyzed. These results suggest the presence of signals in the labor markets, as proposed by the theory of signaling.

Keywords: university effect, education, labor market, multilevel analysis.

Resumo

Este artigo analisa o efeito da universidade sobre os ganhos, em outras palavras, se universidade determina o nível de renda que recebe profissional no mercado de trabalho. Os dados para esta pesquisa vem da “Encuesta del Mercado laboral de profesionales en el área metropolitana de Cali”, com uma amostra de 606 estudantes de quatro universidades da cidade. Usando um modelo multinível com três níveis (estudante, programa e universitários), a fim de capturar os efeitos de grupos de fatores comuns, o estudo sugere a existência de efeito universidade significativa e alta. Estes resultados são consistentes com a presença de sinais nos mercados de trabalho, tal como proposto pela teoria da sinalização.

Palavras-chave: efeito universidade, educação, mercado de trabalho, análise multinível.

INTRODUCTION

Education has always been considered one of the most important means a society has to give people recognition and for them to attain a higher degree of dignity and prestige. Already, in the times of the first western civilizations, those who dedicated themselves to cultivating their character through reading and writing achieved important positions in their societies and were listened to. With the passing of time, the relevance of education was shown not only to allow social advancement, but also as a tool which facilitated an increase in the income of the population and, for that reason, a better quality of life.

In the last fifty years, economic literature has directed an important

part of its cognitive body to analyzing the relationship between education and income. From early on, the discussion has taken place around the effect that education has on the well-being of individuals. From the statements of Schultz (1961) it has been considered that education has a positive effect on the salaries of workers, thanks to the productivity that it allows them to obtain. Becker (1964) would later reaffirm these concepts and from these ideas, along with those of other authors, the theory of human capital would arise. Later on, given the flaws that, according to some authors, the theory¹ had, new concepts would emerge.

However, the concept of the positive influence of education over income never lost face and, on the contrary, many

¹ Signaling theory (Arrow, Spence, and Stiglitz), labor market segmentation (Piore), among others.

researchers have tried to go deeper into the channels through which this influence took effect. For this reason, new studies arose that analyze primary and secondary education as sources of higher income (Card & Krueger, 1996; Hauser, 1973; Altonji & Dunn, 1995; Ashenfelter & Krueger, 2001). Nevertheless, the literature referring to higher levels of education and its influence over income is not as extensive (Solmon & Wachtel, 1975; & Zhang, 2005; Holmlund, 2009; Chevalier and Conlon, 2003; among many others).

Education has been analyzed homogeneously in a high percentage of the existing literature², but it is evident that the characteristics of the institutions have a big influence on the future income of the individuals. It is valid to pose the question here: does the institution of higher education that the student graduates from have an effect on his future salaries?

In Colombia, particularly, there is a substantial amount of literature that inquires about the relationship between education and income (Casas, Gamboa & Piñeros, 2002; Correa, 2004; Psacharopoulos & Vélez, 1992; Rodríguez & Murillo, 2011). Nonetheless, the research that focuses on the type of university and the salaries of the graduates is much less abundant, mainly due to the

lack of concrete information as regards the income of the professionals who have recently graduated (Farné, 2006). Some of these studies have explored the effect of the university on the results of State exams (Valens, 2007) and on the employment of the professionals (Castillo, 2004; Barón, 2012).

This research aims to show how the heterogeneity among the different institutions of higher education has an effect in the income of the graduates. That is to say, the existence of a “university effect” (Valens, 2007) that indicates the relationship between the salary and the institution the individual graduated from. The intention is to analyze whether, as is usually considered to be the case, studying in certain higher education institutions may be translated into a higher income in the future.

For this, multilevel analysis techniques or linear hierarchic models are used, because they allow us to capture the hierarchies or differences in groups (academic programs and universities)³. If this scheme is applied to a classical multiple regression model, it generates incorrect estimates of statistical error and autocorrelation problems. “This perspective of analysis is adequate in educational research because these models take the context into consideration, allow for its analysis along

² For example, the Mincerian equation allows for the analysis of the impact of additional years of education, but it neither takes the type nor the quality of the education into consideration.

³ Given that there are common characteristics of students in certain academic programs nested in certain universities, it will be necessary to consider that, in the context, variables exist which characterize the individuals and variables which characterize the group (university or program) (Hox, 2002).

with the heterogeneity of each student, and contribute to identifying patterns and specific groups that demand greater attention and intervention.” (Sammons, Thomas & Mortimore, quoted by Murillo & Carrasco, 2011, p. 3).

The development of the present study uses as its base the *Encuesta del mercado laboral de profesionales en el área metropolitana de Cali* (from now on, referred to as Survey of the labor market of professionals in the metropolitan area of Cali) carried out by the Pontificia Universidad Javeriana and the Universidad Autónoma de Occidente in 2009, taken by 606 people who had just graduated from administrative courses of studies (business administration, accounting, and economics) and engineering (electronic, industrial, and systems), from four well-known universities of the city (Universidad Libre, Universidad Autónoma de Occidente, Universidad del Valle, and Pontificia Universidad Javeriana). The results indicate the existence of a *university effect*. In other words, the outputs of the model reveal that the variance in the probability of obtaining a higher return on education depends 18% on the university where the graduate carried out his educational process, controlled by a group of variables related to the student and their current job.

These results are useful for recognizing the signs issued by graduates in the labor market through a characterization of desirable university students' profiles, which provides the education sector with

data that allows it to direct its efforts to the adjustment thereof. Likewise, research can be considered an asset that contributes to the revision of the policies of regulation and equity in the education sector as well as the labor market, for making adjustments as regards labor mobility and the subsequent effects on unemployment, and to closing the gaps caused by income distribution, are frequently questioned in Colombia.

This article is divided into four sections: in the first, there is a revision of the literature related to education and income. In the second section, the data used and the empirical strategy proposed in the study are described (the formulation of a multilevel model of three-levels). In the third section, the results of the study are presented and analyzed. Finally, in the fourth section, the conclusions and final comments of the research are outlined.

REVISION OF THE LITERATURE

Although studies as regards the influence of education on the well-being of the inhabitants of a country became profuse in the mid-20th century, Adam Smith already reflected upon it with respect to the importance of education on people's income, as a determining factor of the quality of life of the individuals:

“A man educated at the expense of much labor and time to any of those employments which require extraordinary dexterity and skill, may be compared to one of those

expensive machines. The work which he learns to perform, it must be expected, over and above the usual wages of common labor, will replace him the whole expense of his education, with at least the ordinary profits of an equally valuable capital” (Smith, 1997, p.99).

This statement reflected how Smith managed to identify a fundamental difference between the common and the qualified worker, as he put it. From there comes the idea that education is a means that allows for the differentiation of labor and, consequently, of income.

The systematic analysis of education and its influence on the income of human beings, and its impact on economic growth through productivity started to develop towards the beginning of the 60s with the appearance of a group of new constructs that would later be known as the “human capital theory” (HCT), in which authors like Schultz and Becker made their first contributions.

According to Schultz (1961), the differences between the incomes people receive⁴ depend on their education and health. He refers to the differences between younger workers, who have recently entered the labor market, and the oldest unemployed workers. The former have an advantage over the latter in obtaining the same job and this is not due to the inflexibility of the

welfare system, the retirement programs or the preference of the employers, but to the years of education the younger people have.

Likewise, Schultz (quoted by Selva, 2004) defines human capital as a determining factor in the differences in the productivity and the salaries of individuals. He states that education is not only a consumption expense, but an investment. However, this statement would not be new, given that since the eighteenth century Smith had mentioned said characteristic.

Later on, Becker’s studies (1964) focused on the importance of human capital over income, employment, and economic development in general. According to Pereyra et al., (2006), his greatest contribution, based on microfundamenting given by the human capital theory, is the analysis of the return on the investment in education that Schultz had already demonstrated. Becker explored the two types of educational returns: private and social.

But, what is the channel that allows for the increase in the income of a worker, when he has more education? The answer given by the pioneers of the human capital theory is productivity. What makes workers more productive has to do with a number of skills and expertise that we know today as human capital, which is rewarded by employers

⁴ When comparing the workers who come from the countryside to those who live in the cities, and among the inhabitants of the cities, Schultz sees that there are differences in the income that can only be explained by the academic formation of these subjects.

with a higher salary because of the increase in productivity of the individual (Paz, 2007).

Studies on this subject were gradually led towards a more refined answer to the question: how much does the income of an individual increase per additional year of education? Mincer's (1958) seminal work deals with this issue. In fact, it puts forward an equation which, in the following decades, would be an obligatory reference for those who study the subject and it would be known as Mincer's equation (1958). The algebraic expression for this equation is the following:

$$\ln w_i = \beta_0 + \beta_1 s_i + \beta_2 x_i + \beta_3 x_i^2 + u_i$$

Where w_i is the salary rate of the i -th individual, s_i is the number of years of education, and x_i corresponds to the years of work experience. The coefficient β_1 expresses in what percentage, an increase in a year of education, will an increase in a year of education be represented in an increase of the salary rate of the individual.

Despite the great contributions made by the theory of human capital to the understanding of how important the role of education is in the development of individuals, economists have afterwards found weak points in the theory and, because of that, it has not been exempt from criticism.

One of the first comments made about the validity of the HCT has to do with the relationship between education and income. Even if they can be closely correlated, the relation can be spurious (Paz, 2007). The basis lies in the appearance of a new aspect that had not been taken into consideration by the pioneers of the HCT: innate ability (Schultz, 1961; Becker, 1964; Altonji & Dunn, 1994; among others).

Afterwards, new concepts came up which, even when they did not completely reject the basis of the human capital theory, did present new views about how the relationship between education and the labor market works.

The signaling or filter theory was one of the first alternative views to the human capital theory. Authors like Arrow (1987) and Spence (1973) were their advocates. The assumption that is central to the theory is that of markets with asymmetric information. Its basis lies in the relevance that credentials have in the labor market or, as some people call it, the "Sheepskin effect".⁵ It is not easy for employers to differentiate between more productive and less productive workers, so they have to resort to a form of selection through a signal. The professional certificate acts as a signaling instrument, given that the individual has studied and obtained a professional diploma, this shows skill, discipline, and

⁵ This term was first coined by Layard and Psacharopoulos (1974), alluding to the skin of the sheep that was generally used to make the graduate diplomas of the professionals.

that the person is achievement-oriented; that is to say, that productivity is innate and that the workers with greater skill to perform in a work environment, which is analogous to school, should be productive. Thus, education is presented as a sign for the employers, where individuals with more education will be better workers, so they will receive higher salaries (Spence, 1973).

Another alternative view (or a complementary one) is that of Piore (1973), whose work presents what he himself would call “segmented labor markets.” Piore proposes the existence of two groups or segments in the labor market: the primary sector and the secondary sector. The primary sector includes the jobs with a high remuneration, good work conditions, opportunities for promotion, and, in general, work stability. The secondary sector groups together jobs with low remuneration, poor work conditions, discipline affected by the close relations between workers and supervisors, and a considerable degree of instability. From this statement, Piore considers that education has its part to play. In a market with such characteristics, formal education will be a key requisite for people to obtain a job in the primary sector. Otherwise, if the person has less education, he will be part of the secondary sector. Note that productivity is pushed into the background, as what is relevant

here is education, which appears as a real entry barrier (Paz, 2005).

A type of extension of the signaling theory is the job competition theory, or the theory of labor queue. According to Thurow (quoted by Selva, 2004), employers, in light of the necessity of filling their vacancies, should classify potential workers according to the costs of their training. This includes personal aspects, such as discipline, punctuality, learning, technical skills, etc. In this way, the employer can obtain the highest productivity at the lowest cost, given that he will try to put them in a queue, from the best worker who fulfills the cost condition to the worst one according to said costs.

MOST IMPORTANT EMPIRICAL APPLICATIONS

The line of thought in the mid-sixties was mainly oriented towards studying the effect that education can have on the performance of the students. The starting point of these studies was the famous Coleman⁶ report, a study carried out among 600 thousand individuals, both students and teachers⁷, and which, first looked to determine if there were differences in the education of the students depending on their sex, age, and, above all, race. The main finding of this study was that the school has little effect on the academic results of the students. Coleman’s analysis concludes that the socioeconomic context of

⁶ The full name of the study was: “Equality of educational opportunity (Coleman) study (EEOS)”, developed in 1966.

⁷ Around 550 thousand students and approximately 60 thousand teachers.

the individual has a greater impact on said results: “the schools exert little influence on the students, so it is not possible to say that their performance is independent of their status and social context” (Coleman et al., 1966). According to Gamoran and Long (2006), Coleman used a function of production of education, or an input and output model, which economists in general consider to be a good tool for analyzing educational institutions as if they were firms in a market.

These results, which were later identified as the “school effect”, were backed up by researchers like Jencks *et al.* (1972) and, in another study, Hanushek (1997), who found that although the school effect was greater, it was still not very significant. Especially Hanushek, who argued, after a revision of 400 prior studies, that “there is no strong or consistent relationship between the students’ performance and the resources invested in the schools, at least after family inputs are taken into consideration” (Hanushek, 1997, p. 1).

From these studies and their findings, an endless number of researchers tried to controvert what had been stated by Coleman and his colleagues. It is a fact that his statements were arguable enough for continued research. It was not very convincing, at that time, that the school had little relevance in the academic performance of the students: where did this leave the role of public policies?

For this reason, Bowles and Levin (quoted by Correa, 2004), for example,

criticize the study for the excessive simplicity of the input-output model, in such a complex context; the existence of a “black box” which refers to the absence of an analysis related to the process inherent to education, and the calculation errors of the variant due to the collinearity between the school and family variables.

Other studies have focused on analyzing the importance of the institutions in the quality of the education and the future income of the individuals, which controvert Coleman’s work. Among these articles, we can find that of Card and Krueger (1996) who argue that: “the students that were educated in the schools or areas with more resources tend to earn more once they enter the labor market, keeping other factors constant” (Card & Krueger, 1996, p. 1). Bourdieu and Passeron (1964) revise the influence of the educational institutions on the individuals, given that the prestige and the social component inherent to them is translated into sociocultural advantages of well being, power and, a better quality of life in general. They also recognize the importance of the educational institutions through the concept of cultural capital, showing in their studies how the social differences are framed in the institutional context and their performance.

On the other hand, later studies delved into the effect of the socioeconomic context of the individual and tried to analyze what had previously been stated by Coleman and his colleagues from different perspectives. Works such as those of

Hauser (1973), Altonji and Dunn (1995), Ashenfelter and Krueger (1994) found mixed effects in the relation between education and income, which ranged from significant impacts on the context to effects of little relevance in the socio-economic environment of the individual.

Nevertheless, most of the studies have focused on the effect that the school has on the students' performance and relatively little has been written about the effect that another level of education has on the individuals: the university; more specifically, the effect that the university has on the income of the graduates, a topic that has been little explored in the literature.

One of the studies that deal specifically with the topic of higher education and its effect on the individual's income is that of Solmon and Wachtel (1975), which looks at the theme from the perspective of the type of university and its effect on income. These authors find that the effect is "highly significant" after taking into account a wide range of factors, among others, the skill of the students. The authors used a model based on Mincer's equation (1958) to which they add a series of dummy variables that represent the type of institution.

A large number of these studies focus on the relationship between education quality and income. The work of Zhang

(2005) finds that, independently of the way in which the quality of the higher education institution is measured, the effect on the income will always be relevant and significant (Zhang, 2005). On the other hand, Holmlund (2009), in his empirical analysis of the relation between the quality of higher education and income in Sweden, finds that the relation is weak⁸. As in Holmlund's study, many other researchers have analyzed the subject in different parts of the world and have mostly found positive and significant effects of the quality of higher education on income (Hussain, MacNally & Telhaj, 2009; Black, Smith & Daniel, 2005; Chevalier & Conlon, 2003, among others).

In Colombia, the studies on the relation of education and income have mainly focused on the "school effect", and its impact on the academic performance of the students. Some of them have used more modern techniques in the study of the economy of education such as the multilevel models (Correa, 2004; Casas et al., 2002; Rodríguez & Murillo, 2011). However, the studies that aim at delving into the "university effect" on variables such as performance have been less addressed (Valens, 2007); as have the studies that relate the effect of the university to income in Colombia.

⁸ He argues that his results are different from the ones found in regions of the United States and explains that this may be due to the fact that the structure of the Swedish educational system is mainly public. This means that there are no considerable differences in the quality of the education in higher education institutions. He states that this causes the employers to have fewer incentives to differentiate salaries based on the quality of higher education institutions, given that they believe that the quality of the universities does not differ much (Holmlund, 2009).

DESCRIPTIVE ANALYSIS OF THE VARIABLES

This study uses data collected from the Survey of professionals in the labor market in the metropolitan area of Cali, in four well-known universities of the city (Universidad Libre, Universidad Autónoma de Occidente, Universidad del Valle, and Pontificia Universidad Javeriana) carried out in 2009 by the Pontificia Universidad Javeriana and the Universidad Autónoma de Occidente on 606 graduates of administrative courses of studies (business administration, accounting, and economics) and engineering (electronic, industrial, and systems).

The results of the variables of the survey used in this study, related to the university of the graduate, are presented below.

In Table 1, the results related to the age of the graduate and the university he graduated from, are shown. In general terms, most of the professionals (32.6%) surveyed are in the range of 20 to 39 years old. These ages are consistent with the average age at which students of a professional degree finish their studies and start their working life (between 20 and 30 years old).

Table 1. Age-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
20 to 29 years old	Frequency	126	63	14	58	261
	% per University	45.7 %	56.3 %	13.7 %	50.0 %	43.1 %
30 to 39 years old	Frequency	126	47	70	57	300
	% per University	45.7 %	42.0 %	68.6 %	49.1 %	49.5 %
40 to 49 years old	Frequency	21	2	17	0	40
	% per University	7.6 %	1.8 %	16.7 %	0.0 %	6.6 %
50 or more	Frequency	2	0	1	0	3
	% per University	0.7 %	0.0 %	1.0 %	0.0 %	0.5 %
No information given	Frequency	1	0	0	1	2
	% per University	0.4 %	0.0 %	0.0 %	0.9 %	0.3 %
Total	Frequency	276	112	102	116	606
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

Table 2. Sex-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
Male	Frequency	136	58	33	69	296
	% per University	49.3 %	51.8 %	32.4 %	59.5 %	48.8 %
Female	Frequency	140	54	69	47	310
	% per University	50.7 %	48.2 %	67.6 %	40.5 %	51.2 %
Total	Frequency	276	112	102	116	606
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from Survey of professionals in the labor market in the metropolitan area of Cali

As regards the sex of the graduates (Table 2), the increase of the female population in the universities is evident. In this sample, 51% are women, whereas 48.8% are men, which reflects a greater concern on the part of women about receiving an education, and reveals the importance of the participation of women in the labor market. Particularly in the

Universidad Libre, female participation is higher, whereas in the Universidad del Valle most of the graduates are men. However, if income is compared by sex, it is evident that women receive a lower income than men. This reveals an imbalance in opportunities in the labor market regarding the relative equity that exists in education at a university level.

Table 3. Month looking for work-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
From 0 to 10 months	Frequency	179	91	86	91	447
	% per University	90.9 %	93.8 %	93.5 %	90.1 %	91.8 %
From 11 to 20 months	Frequency	14	4	5	5	28
	% per University	7.1 %	4.1 %	5.4 %	5.0 %	5.7 %
From 21 to 30 months	Frequency	4	1	1	4	10
	% per University	2.0 %	1.0 %	1.1 %	4.0 %	2.1 %
More than 30 months	Frequency	0	1	0	1	2
	% per University	0.0 %	1.0 %	0.0 %	1.0 %	0.4 %
Total	Frequency	197	97	92	101	487
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

It is noticeable how relatively quickly the professionals who graduate from the higher education institutions studied find a place in the labor market. Table 3 shows that 91.8% found a job within a year of their graduation and only 9.2% took longer. Specifically, the graduates who found a work position faster were the ones from Universidad Javeriana with

only 6.2% of professionals who took more than ten months to find a job. On the other hand, graduates from Universidad del Valle took a bit longer with 9.9% of graduates in said situation. In general, the channels of placement for newly graduated professionals seem to work, in the specific case of the universities studied.

Table 4. Training-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
Seminar	Frequency	162	62	96	63	383
	% per University	58.7 %	55.4 %	94.1 %	54.3 %	63.2 %
Diploma	Frequency	86	36	4	46	172
	% per University	31.2 %	32.1 %	3.9 %	39.7 %	28.4 %
Postgraduate	Frequency	12	9	0	6	27
	% per University	4.3 %	8.0 %	.0 %	5.2 %	4.5 %
Undergraduate	Frequency	15	4	1	1	21
	% per University	5.4 %	3.6 %	1.0 %	0.9 %	3.5 %
Does not know / No answer	Frequency	1	1	1	0	3
	% per University	0.4 %	0.9 %	1.0 %	0.0 %	0.5 %
Total	Frequency	276	112	102	116	606
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

The investment that employers make in the training of their professionals is focused mainly on seminars and diplomas (92.6%), as is shown in Table 4. This can be explained by the fact that the investment is less onerous and the worker has to stay less time out of the workplace. Nevertheless, it cannot be ignored that there is a clear interest on the side of the employer to improve the qualifications

of his employees. If differentiated by university, it can be noted that graduates from the Universidad Autónoma have received training other than seminars and diplomas. Their employers, although in a small proportion, have allotted resources for training in postgraduate courses. The graduates of the Universidad Libre do not receive postgraduate training.

Table 5. Business size

		University				Total
		Autónoma	Javeriana	Libre	Valle	
Micro- enterprise	Frequency	51	15	22	11	99
	% per University	20.3 %	14.7 %	23.2 %	10.2 %	17.8 %
Small enterprise	Frequency	52	19	21	10	102
	% per University	20.7 %	18.6 %	22.1 %	9.3 %	18.3 %
Medium-sized enterprise	Frequency	29	17	20	10	76
	% per University	11.6 %	16.7 %	21.1 %	9.3 %	13.7 %
Large enterprise	Frequency	119	51	32	77	279
	% per University	47.4 %	50.0 %	33.7 %	71.3 %	50.2 %
Total	Frequency	251	102	95	108	556
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

In Table 5 the relation between the size of the business where the graduate works at present and the university he/she comes from is presented. In general, graduates from the higher education institutions analyzed have found work in big companies⁹. Graduates from

Universidad del Valle are the ones who, in a larger proportion, work in big companies, while of the professionals from Universidad Libre only 33.7% are working in companies with these characteristics.

⁹ According to the existing classification in the Law 905 from 2004 or Law MIPYME (micro, small, medium-sized enterprise).

Table 6. Time working-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
0 to 12 months	Frequency	41	18	21	43	123
	% per University	14.9 %	16.1 %	20.6 %	37.1 %	20.3 %
13 to 24 months	Frequency	23	14	10	22	69
	% per University	8.3 %	12.5 %	9.8 %	19.0 %	11.4 %
25 to 36 months	Frequency	10	12	2	13	37
	% per University	3.6 %	10.7 %	2.0 %	11.2 %	6.1 %
More than 36 months	Frequency	6	15	4	7	32
	% per University	2.2 %	13.4 %	3.9 %	6.0 %	5.3 %
No answer / Does not work	Frequency	196	53	65	31	345
	% per University	71.0 %	47.3 %	63.7 %	26.7 %	56.9 %
Total	Frequency	276	112	102	116	606
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

Table 6 shows the results with respect to the time that the professional has been working for their current company and the university they attended. In this case, 20.3% were working in the same company for a short time. The students who have greater

seniority –over 36 months– are the students from Universidad Javeriana with 13.4%. It is important to highlight the lack of information in the case of this question (56.9%), given that the people surveyed either were not working or did not want to answer the question.

Table 7. Current salary-university

		University				Total
		Autónoma	Javeriana	Libre	Valle	
0 to 500 thousand pesos	Frequency	3	3	2	4	12
	% per University	3.8 %	5.2 %	5.3 %	4.7 %	4.6 %
501 thousand to 1 million pesos	Frequency	22	3	7	13	45
	% per University	27.5 %	5.2 %	18.4 %	15.3 %	17.2 %
1 million and one to 1.5 million	Frequency	25	18	26	23	92
	% per University	31.3 %	31.0 %	68.4 %	27.1 %	35.2 %
1.5 million and one to 2 million	Frequency	25	12	3	14	54
	% per University	31.3 %	20.7 %	7.9 %	16.5 %	20.7 %
2 million and one to 2.5 million	Frequency	5	19	0	15	39
	% per University	6.3 %	32.8 %	0.0 %	17.6 %	14.9 %
More than 2.5 million	Frequency	0	3	0	16	19
	% per University	0.0 %	5.2 %	0.0 %	18.8 %	7.3 %
Total	Frequency	80	58	38	85	261
	% per University	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Source: the authors, from the Survey of professionals in the labor market in the metropolitan area of Cali.

Finally, as regards the salary received by the graduates (Table 7), it is possible to see that most of the income of the professionals (35.2%) is in the range of 1 million to 1.5 million, numbers that show a relatively low remuneration. However, if the incomes higher than 1.5 million pesos were considered in total, we would have most of the sampling located in this range (42.9%). In this sense, graduates from Universidad del Valle and Universidad Javeriana receive better remuneration while graduates from Universidad Libre take in the lowest income.

The model

Multilevel model

The multilevel models used in the development of educational research present specific structural characteristics which allow them to distinguish categories within the same variable and recognize grouping patterns in their data, for this reason. They are regularly known as hierarchical models.

In the classic multiple regression model, the determination of the variables does not capture the relations by effect of groups of common factors in its interior. For example, if the academic results of a fourth grade student are being evaluated, they are calculated according to the number of individuals, but not to the differences that exist among students in a same classroom such as socioeconomic

level, sex, or race:

The data was analyzed using the traditional multiple regression techniques which only recognized individual children as the units of analysis and did not take into consideration their grouping as regards teachers or classes. The results were statistically significant. Later, Aitkin et al. (1981) showed that when the analysis correctly considered grouping the children into classes, the significant differences disappeared and the children who received formal education did not show differences from the others. (Bennet, 1976, quoted by De la Cruz, 2005, p, 1).

In other words, the use of multiple regressions in these types of effects leads to inconsistencies in the estimation of the standard error and gives characteristics that do not correspond to the individuals in one sole variable, which affects the correlation of the variables.

In this context, therefore, it is necessary to apply multilevel models that allow for the evaluation of the intraclass correlation and the capture of the effects that facilitate a correct estimation of embedded data, recognizing the influence of the environment in which the individual develops (in this case, the graduate). An example is given in Figure 1, where it is possible to observe a level within another to explain the behavior of a variable.

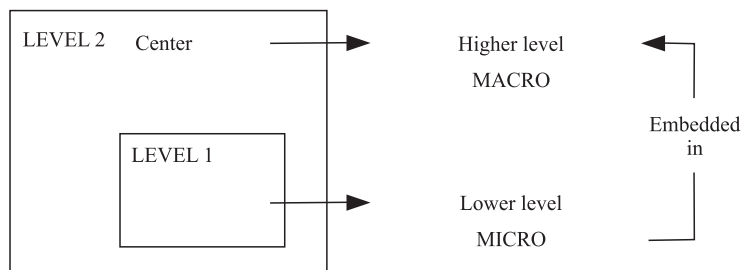


Figure 1: Structure of the data
Source: Amador & López (2007)

From the use of a survey carried out by the GIDR Research Group of the Universidad Javeriana from Cali of graduate students in 2009, the aim was to find factors which are associated with the fact that a graduate

receives a better return from their education, taking into consideration an analysis in three levels (individual, program, university). This is the estimation of the following Logit Model for three levels:

$$\text{logit } y_{ijk} = \beta_{0ijk} + \beta_{1ijk} \text{EDAD} + \beta_{2ijk} \text{SEXO} + \beta_{3ijk} 29_MES\sim T + \beta_{4ijk} 22_CAP\sim 0 + \beta_{5ijk} 34B_TA\sim 1 + \beta_{6ijk} 43_PER\sim 1 + E_{1ijk}$$

Where:

$$[\epsilon_{ijk}] \sim N(0, \sigma_{\mu s0}^2)$$

$$[\mu_{ijk}] \sim N(0, \sigma_{\sigma s0}^2)$$

A peculiarity of the multilevel models is that they minimize the ijk forecast error; that being the variance error divided into several components (Bryk & Raudenbush, 1992; Searle, Casella & Mc-Culloch, 1992; quoted by Castillo, Escandón & González, 2012).

The variables are interpreted as:

Dependent variable

Current salary

y_{ijk} = probability of receiving a salary of above 1.5 million pesos for graduates i of program j from university k .

Independent variables

AGE: age of the graduates. This variable has four ranges: 20 to 29 years old, 30 to 39 years old, 40 to 49 years old, and over 50 years old; represented as **EDAD** in the equation.

SEX: 1 male 0 female; represented as **SEXO** in the equation.

29_Month~T: number of months that the graduate was looking for their current job. It is a variable that allows the determination of any relation between the time of the search and the university the individual graduated from; represented as **MES** in the equation.

22_Training~O: receiving training at work. It is considered if the graduate received financing for his studies on the part of the employer (undergraduate, postgraduate, diploma or seminar); represented as **CAP** in the equation.

34B_Size~I: business size. There are types of enterprises according to the Law 905 of 2004 (Mipyme Law): micro, small, medium-sized, and large. The size of the company where the graduate works is related to the possibility of receiving a higher income; represented as **TA** in the equation.

43_PER~I: remains in the same job. The number of months that the graduate has worked in his present job is a variable that shows the stability of the employee and is associated with better work conditions; represented as **PER** in the equation.

RESULTS

In the model presented in Table 8, the odds ratios are identified (defined as the quotient between the probability that the event occurs and the probability that it does not), which allows for the determination of how much return associated to higher education the

people surveyed have according to the explanatory variables.

As regards age, an older graduate has a greater probability of having a higher salary; if the value of the odds ratio is above one. If it is lower than one, it is understood that a greater age lowers the probability of having a higher income. To put it in other words, the older the graduate is, their current salary will be higher than 1.51. As regards the sex of the graduate, being male increases the probability of receiving a higher salary, if it is higher than one. For that matter, being male increases the probability of receiving a better salary in 2.1.

Furthermore, not receiving training at work increases the probability of having a higher salary if the odds are higher than one. If they are lower than one, it is interpreted as a decrease in the probability of receiving a higher income. In this case, a 0.697 odds ratio indicates that not receiving training at work reduces the probability of receiving a higher income.

With regards to business size, having access to a larger enterprise (more than 200 employees) increases the graduates' probability of receiving a higher income. In this study that increase in the probability is 1.45%.

And finally, remaining in the same job, that is to say, having more time working for the same company, increases the probability of receiving a higher salary by 1.02%.

Table 8. Multilevel model in three levels

Mixed-effects logistic regression						Number off obs = 260
Group Variable	No. of Groups	Observations per Group			Integration Points	
		Minimum	Average	Maximum		
CodU_versi~d	4	36	65	85	7	
CodPrograma	16	1	16,3	30	7	
Log likelihood = -146.45421				Wald chi2(6)= 25.49 Prob> chi2 = 0.0003		
salarioact~1	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
Edad	1,511989	0,4236192	1,48	0,14	0,8731011 2,61838	
1.sexo	2,099394	0,6695573	2,33	0,02	1,123625 3,922534	
29_mes~t	0,973603	0,0343973	-2,56	0,01	0,8423866 0,9773455	
22_cap~o	0,6972724	0,1691387	-1,49	0,137	0,4334359 1,121709	
34b_Ta~1	1,44992	0,2013708	2,67	0,007	1,104398 1,903541	
43_per~1	1,01976	0,0097878	2,04	0,041	1,000755 1,039125	
Random-effects Parameters		Estimate	Std. Err.		[95% Conf. Interval]	
CodU_versi~d: Identify						
	var (_cons)	0,505565	0,4199578		4,3E-09 594920,7	
CodPrograma: Identify						
	var (_cons)	0,7564	0,5287154		0,1922078 2,97668	
LR test vs. logistic regression: chi2(2) = 16.97 Prob> chi2 = 0.0002						
Note: LR test is conservative and provided only for reference.						

Source: the authors

Intragroup correlation coefficient

The intragroup correlation ρ is an estimator of the proportion of explained variance in the population. The following equation establishes that the intragroup correlation equals the estimated proportion of the variance of the group level compared to the total estimated variance.

$$\rho = \frac{\sigma_{\mu 0}^2}{\sigma_{\mu 0}^2 + \sigma_{f 0}^2 + \sigma_{\xi 0}^2}$$

The intragroup correlation coefficient measures the proportion of the total variance that is explained by the difference between groups. According to Rabash *et al.*, (2005), in a logistic distribution the residue of level 1 has a $\pi^2/3$ distribution. According to the estimations presented in the table of the model, the Program effect would be:

$$\rho = \frac{0.0505565}{0.0505565+0.7564+3.29} = 0.0123 = 1.23 \%$$

This means that 1.23% of the variance in the probability of obtaining a better return from higher education depends on the program that the person graduated from.

And the university effect will be:

$$\rho = \frac{0.7564}{0.0505565+0.7564+3.29} = 0.1846 = 18.46\%$$

18.46% of the variance in the probability of obtaining a better return from higher education depends on the university the person graduated from.

DISCUSSION AND CONCLUSIONS

The results presented in this study suggest that there is evidence that the university the person graduates from does matter. And, particularly, in the group of universities used in this article, the institution in which the graduate studied shapes, to some degree, the level of income that the individual will reach. This conclusion indicates that higher education institutions should take into consideration the perception of employers as regards prestige and the quality of the education imparted by the universities. This demands greater concern on the part of the universities as regards their image in the labor market which, evidently, should be associated with improving the quality of the education, looking to train more competitive professionals. These results are useful for the agents involved, as they allow the state, from the evaluation of higher education institutions, to

strengthen the parameters of measurement in the hope that universities adjust their training programs to the needs of the labor market, and give the universities the possibility, through instruments like high quality accreditation, to send a message to the labor market about the attributes of their graduates.

Evidence suggests the existence of signs in the labor market of Cali, associated not only with a university degree, but also with the university where the degree was obtained. That is to say that, from the statements made in the signaling theory (Spence, 1973; Arrow, 1973), there is another signal that can be taken into consideration apart from the academic credentials: the higher education institution which issues the diploma. This indicates that, through this signal, the employer will understand that he can put individuals who graduated from certain universities in the best positions, or in those with higher remuneration. This result is consequent with the findings of Forero and Ramírez (2007) in the Colombian labor market, who using information from the *Observatorio Laboral de Educación* (Labor Observatory of Education), and making estimations of OLS, ordered probit model, and interval regression, affirm that having obtained the professional diploma from a private or accredited university, increases the probability of receiving a higher income. To summarize, these results show that individuals with the same level of credentials –a university degree– can obtain different salaries (Forero &

Ramírez, 2007). This can be explained in two ways: the higher education institutions that have more rigorous selection systems guarantee that they choose the individuals that show they have greater innate skill¹⁰, which can lead them to be more competent professionals in their working life. Conversely, employers may consider that there are institutions of higher quality, so they generate better work conditions in order to attract the graduates from those institutions.

Finally, future research could be directed along different lines: i) obviously, the expansion of this study to include national data which would allow for the validation of the existence of a university effect in Colombia, through the use of multilevel

models, which facilitate the capture of the influence of the context over the results; ii) it can go into detail regarding aspects related to the quality of the university, determining which factors within the institutions can generate higher incomes for the graduates; iii) the use of multilevel models in research related to education is scarce. This allows for the supposition that there is still a lot to do, considering that the suitability of this methodology for the development of studies on education has been empirically demonstrated. Thus, new research projects can focus on the application of the method to analyze the determining factors of incomes in different levels of higher education, and a very important aspect: the social returns on the investment in higher education.

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¹⁰ As a result of better preparation in high-school, the studies of their families, their network, and, in general, their context.

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