SCHOLARSHIPS, AN OPPORTUNITY FOR DEVELOPMENT IN ECUADOR

Luis Tobar-Pesántez, Universidad Politécnica Salesiana
Antonio Pérez-Torres, Universidad Politécnica Salesiana
Santiago Solano-Gallegos, Universidad Politécnica Salesiana

ABSTRACT

During the presidency of Rafael Correa in Ecuador, there was a qualitative change in the field of education, particularly in Higher Education. The aim of this analysis is not to assess whether it was positive or negative. However, we can point out that the aim of this government was to give research a leading role in all levels. One of the factors that contributed to the structural change in higher education was the granting of scholarships to students from different areas of knowledge, especially to pursue masters and doctoral degrees in several countries around the world. Upon their return, they would contribute to the country's development.

Therefore, the aim of this research is to analyse the scholarships that were granted and then take a representative sample in order to monitor the scholarship holders and learn about their employment status once they have completed their studies and returned to the country. Information for this research was collected from higher education bodies and was processed by using descriptive statistics

Keywords: Higher Education, Scholarships, Equal Opportunities.

INTRODUCTION

Article 356 of the Ecuadorian Constitution guarantees free public higher education up to tertiary education. Based on this constitutional principle, the Organic Law of Higher Education (LOES for its acronym in Spanish) was issued in 2010 and reformed in the year 2016; it states that the bodies which govern the Higher Education System are the Higher Education Council (CES, for its acronym in Spanish) and the Evaluation, Accreditation and Quality Assurance in Higher Education Council (CEAACES, for its acronym in Spanish).

During the last 15 years, Ecuadorian higher education has faced a series of impacts such as the closure of some universities for not passing the evaluation carried out by CEAACES, the admission of students according to their results on the National Exam for Higher Education (ENES, for its acronym in Spanish), which was then replaced by the "*Ser Bachiller*" exam; as well as massification, equal access and permanence, the intensive use of ICTs, the variety of entry profiles and the increasing demand for postgraduate studies (Ponce & Carrasco, 2016; Galárraga, 2009). Facing these challenges, the constitution establishes a close relationship between higher education and national development.

On the other hand, within the new model of university education carried out by the CES, the analysis of Ecuadorian higher education identifies some critical nodes related to academic organization and the curriculum, for example,

> *"The integrity of the system and the educational itineraries, related to the expansion of enrolment, the reduction of gaps in coverage and in the trajectories of the system, access and equal opportunities in conditions of equity and quality, the improvement of the profiles of educational subjects (academic staff and students) and the articulation of the system" (Larrea, 2014; Larrea & Granados, 2016).*

Postgraduate education in Ecuador lacks an adequate admission system, which makes it difficult to timely establish an appropriate profile of applicants to fourth-level education programs. There is also no formal definition of the postgraduate educational and curricular model and furthermore, the research component that characterizes it, is not evident.

These issues dramatically reduced the offer of graduate programs which before 2010 were very attractive in terms of costs, modality and fields of specialization. Just in 2012, the CES established the need of new Postgraduate Regulations to regulate current offers, basically limiting the opening of new programs and submitting new programs to an approval in accordance with the Constitution of the Republic. At the end of that year, 138 master's programs were regularized nationwide (The Council of Higher Education, 2012). One of the reasons for these restrictions was based on the fact that 84% of the postgraduate academic offer was not linked to the so-called strategic sectors established in the National Plan for Good Living (The Council of Higher Education, 2013).

Therefore, by March 2016, 174 postgraduate programs had been approved at 26 universities and polytechnic schools. 79% of these programs were offered through on campus mode, with rigorous control by the CES, which continued its work by assessing the relevance of postgraduate courses with the requirements of society and its development plans; as well as the identification of problems in the projection of academic and research development (The Council of Higher Education, 2015).

For 2018, the offer of postgraduate programs reached 277 programs. The National Secretariat of Higher Education, Science, Technology and Innovation (Senescyt, for its acronym in Spanish) registered 271,353 fourth-level degrees and 4,181 doctorate or PhD degrees (national and international), going from 10,003 in 2005 to 18,912 in 2015 (El-Universo, 2017).

According to former President Rafael Correa and his report "*La Nación*" 2007-2017 (Senplades, 2017), the 1998 Constitution promoted research, technology and innovation. However, it never happened due to the lack of a correct public policy for its implementation. As a result, investment in Research and Development in 2006 reached only 0.14% of the Gross Domestic Product (GDP), thus legal reforms and complementary actions were necessary in order to make changes in public policy in higher education and generate changes in the national productive matrix. Therefore, in 2016 investment in higher education increased to 0.46% of GDP. Due to this investment, between 2007 and 2016, 19,586 scholarships were awarded, which was significantly higher than the 237 awarded between 1997 and 2006, of which 4,818 scholarship holders have returned to the country (Senescyt, 2012).

The 2016 Higher Education Organic Law (LOES, for its acronym in Spanish), article 24, states that the Secretariat of Higher Education, Science, Technology and Innovation is in charge of the distribution of resources, thus the scholarship programs offered by the government are handled by this secretariat and are aimed at people with Ecuadorian nationality who are in national or international territory, who meet the requirements requested in each of the programs and who wish to continue their academic and professional education for subsequent transfer of knowledge (Senescyt, 2018) .

Therefore, by having adequate undergraduate and postgraduate education and once they obtain their degree, they will be able to develop the skills needed to work in a more efficient and productive way in a changing, innovative, competitive and complex work environment (Ravina et al., 2018).

In a recent report, the World Bank indicates that higher education is a key element in the search for growth and equity that no country can afford to ignore, it is a key element for the country's growth, and an aspect on which the government of former President Rafael Correa focused on (Tobar & Solano, 2018).

Based on this background, the aim of this research is to make a thorough analysis of the Senescyt scholarship holders who have returned to Ecuador and consider different parameters such as: study areas, degree of studies, countries where they studied, but primarily their current employment situation and the areas they work in.

Preliminary Information

The database obtained from the Secretariat of Higher Education, Science, Technology and Innovation (Senescyt) demonstrates that up to June 2016, 5,715 people were granted a scholarship to study at a postgraduate level. Even though there was a significant number of scholarship holders after 2016, they have not been considered because they are not included in this database.

The information is detailed below, it is aligned and coincides in several parameters with what was stated by (Jiménez, 2016).

Table 1 shows the lack of parity in the distribution of scholarships per province; scholarships were mainly granted in the province of Pichincha, 47.9%, followed by the province of Guayas, 13%, and Azuay 7.1%; there is a marked gap in the awarding of scholarships in the capitals of these provinces. The category titled "*Others*" refers to all the remaining provinces of Ecuador, including people who lived abroad and represent values lower than 2.0% of the population.

Table 1
PROVINCE OF RESIDENCE

Province	Frequency	Percentage
Pichincha	2736	47.9
Guayas	742	13
Azuay	404	7.1
Manabí	296	5.2
Loja	291	5.1
Chimborazo	187	3.3
Tungurahua	142	2.5
Esmeraldas	137	2.4
Imbabura	130	2.3
El Oro	122	2.1
Others	528	9.2
Total	5715	100

Source: Senescyt

According to Table 2, the country of preference for scholarship holders was the United States, 23.1%. However, it is necessary to clarify that 14.5% of these students also decided to take English classes. The second country of preference was Spain with 17.6% and Cuba with 17.1%, mainly due to the language. The category titled "*Others*" includes the rest of the countries whose incidence is less than 2%.

Table 2
COUNTRY WHERE PEOPLE STUDIED

Country	Frequency	Percentage
USA	1321	23.1
Spain	1004	17.6
Cuba	976	17.1
Australia	526	9.2
U Kingdom	522	9.1
Chile	171	3
France	161	2.8
Argentina	153	2.7
Netherlands	124	2.2
Mexico	112	2
Others	645	11.3
Total	5715	100

Source: Senescyt

The scholarships granted by the Senescyt were mainly used for fourth level studies, 76.4%, followed by instruction in English, 14.5%, and third level studies, 9.1%, as shown in Table 3.

Table 3
AGGREGATED LEVEL OF EDUCATION

Level of Studies	Frequency	Percentage
Fourth level (postraduate)	4366	76.4
English instruction	828	14.5
Third level	521	9.1
Total	5715	100

Source: Senescyt

Regarding the level of education, Table 4 shows that 54.5% of scholarship holders opted for master's degree studies, followed by medical specialties, 11.9%, doctorate, 9.7%, and post-doctoral, 0.3%.

Table 4
LEVEL OF EDUCATION

Level	Frequency	Percentage
Master's degrees	3113	54.5
English instruction	828	14.5
Medical specialties	682	11.9
Doctorate	555	9.7
Graduate	521	9.1
Post-doctoral	16	0.3
Total	5715	100

Source: Senescyt

As presented in Table 5, the preferred field of study of scholarship holders is the Health sector, 21.9%, followed by engineering 17.8% and education 16.9%. In lower percentages, there is natural sciences and social sciences and at the end of the table there is administration and agriculture, with percentages lower than 5%. Here, it is worth making an observation due to the scarce support for Agriculture, considering that historically this area has represented one of the pillars of Ecuadorian exports, it is also difficult to appreciate the efforts indicated in the Plan of Good Living, particularly the fulfillment of goal 14 *"to double the participation of peasant family agriculture in agricultural exports by 2013"* (Senplades, 2009).

Table 5
FIELD OF STUDY

Area of Knowledge	Frequency	Percentage
Health and wellbeing	1250	21.9
Engineering, industry and construction	1020	17.8
Education	966	16.9
Natural science, mathematics and statistics	757	13.2
Social sciences, journalism and information	698	12.2
Information and communication technologies	428	7.5
Art and humanities	247	4.3
Business administration and law	228	4
Agriculture, forestry, fisheries and veterinary medicine	121	2.1
Total	5715	100

Source: Senescyt

Once the base information has been presented, this research seeks to deepen several issues related to the employment situation of people who obtained their degrees with the scholarships granted by the Ecuadorian government.

METHODOLOGY

The population of interest for this research are the people who obtained a scholarship granted by the Ecuadorian state through SENESCYT to study undergraduate and postgraduate levels both in and out of the country. According to the database, up to June 2016 there were 5715 beneficiaries, those who had English instruction have been excluded. In other words, 4489 scholarship holders are considered for this research.

The sample was obtained by means of stratified random sampling, considering the parameter to be the level of study, that is, undergraduate, master's, medical specialty, doctorate and postdoctoral students. The data was collected through telephone interviews and the information was processed in the IBM® SPSS Statistic 24 software.

Sample Size

The sample size formula for finite population was used to calculate the sample size, with a confidence level of 97% and a 3% margin of error

$$\frac{N * z^2 * p * (1-p)}{e^2 * (\mathrm{N}-1) + \mathrm{z}^2 * p * (1-p)}$$

Where:N = Population size (4889);

Z = Value of the statistician according to the confidence level of 97% (2.17);

e = margin of error (0.03);

p = Expected proportion (0.5) to maximize sample size;

n= 1033 interviews.

The sample size is 1033, but 1055 interviews were conducted. The most relevant data is presented below in result.

RESULTS

Once the survey was conducted and the information was processed, the results of the interviews are detailed below, considering intervals over the population value with a confidence level of 97%.

The information in Table 6 shows that 58.4% of the scholarship holders are men and 41.6% are women; the population percentage of men is between 55.1% and 61.7%. The beneficiaries of these scholarships were mostly men.

Table 6
GENDER OF THE SCHOLARSHIP HOLDER

	Frequency	Percentage
Men	616	58.4
Women	439	41.6
Total	1055	100

Source: Senescyt

According to Table 7, 90.4% of scholarship holders are working, while 9.6% are unemployed. This being a very considerable and worrying percentage due to the education level; the population confidence interval for this indicator regarding those who do not work is between 7.6% and 11.6%. To have a baseline with the national unemployment rate in Ecuador, in December 2019 it reached 3.8% (Independent National Electoral Commission, 2020).

Table 7
ARE YOU WORKING?

	Frequency	Percentage
Yes	954	90.4
No	101	9.6
Total	1055	100

Source: Senescyt

The data in Table 8 indicates that from the total number of scholarship holders who work, 63.8% work in the public sector and 36.2% in the private sector, the missing data of the system, 9.6%, represents scholarship holders who are currently not working. The percentage of the population that works in the public sector is between 60.6% and 67.01%. This behavior is different from the historical data of total number of full employment, which was that from every 100 jobs, 92 were created by the private sector, and 8 by the public sector (Independent National Electoral Commission, 2020).

Table 8
EMPLOYMENT SITUATION ACCORDING TO THE PUBLIC AND PRIVATE SECTOR

Sector	Frequency	Valid Percentage
Public sector	609	63.8
Private sector	345	36.8
Total	954	100
System's missing data	101	
Total	1055	

Source: Senescyt

Table 9 shows that 45.30% of people who were granted scholarships are working in the academic or research field, mainly in Ecuador's higher education system. 54.7% of the scholarship holders work in a different field; the demographic percentage of this indicator is between 51.37% and 58.02%.

Table 9
WORKS IN THE ACADEMIC OR RESEARCH FIELD

	Frequency	Valid Percentage
Yes	432	45.3
No	522	54.7
Total	954	100
System's missing data	101	
Total	1055	

Source: Senescyt

Table 10 shows that 92% of the people who were granted scholarships, work in their field of specialization, while 8% works in a different field; the demographic percentage of people who work in their field of study is between 90.18% and 93.81%.

Table 10
WORKS IN THEIR FIELD OF SPECIALIZATION

	Frequency	Percentage	Valid Percentage
Yes	878	83.2	92
No	76	7.2	8
Total	954	90.4	100
System's missing data	101	9.6	
Total	1055	100	

Source: Senescyt

Independence between Variables

Pearson's chi squared test was used to analyze the independence between variables. The following hypotheses were analyzed:

H_0 *The analyzed variables are independent.*

H_1 *The analyzed variables are no independent (they are correlated).*

To calculate the correlation between variables, both Cramer's V and the Contingency Coefficient were analyzed because to the number of options the different variables have.

Comparison (Cross) variables

Are you currently working with:

1. Province of residence;
2. Education level;
3. Broad field of study.

One of the goals of this research is to verify whether there is independence or some degree of correlation between the employment situation (employment or unemployment) variable with the variables: province, level of education and broad field. When analyzing Table 11, the value of $p>0.05$ admits the null hypothesis H_0. Therefore, the employment situation is independent of the province, the level of education and the broad field of study. After analyzing the information from the research, the unemployment rates are similar for each category of the second analyzed variable.

Table 11
CHI-SQUARED TEST
IS CURRENTLY WORKING → PROVINCE, LEVEL AND BROAD FIELD

	Value	Gl	Asymptotic Significance(2 sided)
Pearson's chi squared test	13.504	23	0.94
Likelihood ratio	16.639	23	0.827
Linear by linear association	0.684	1	0.408
N of valid cases	1055		

Source: Senescyt

Comparison variables

Employment sector with:

1. Level of education;
2. Broad field of study;
3. Works in area of specialization.

Another aim of the research is to verify if there is any relationship between the *employment sector* variable (public or private) with the variables: level of education, broad field and the works in his/her area of specialization variable. According to the contingency table shown in Table 12, the public sector employs mostly scholarship holders, regardless of their level of education, field of study or whether or not they work in their area of specialization.

Table 12
EMPLOYMENT SECTOR→SECTOR*LEVEL OF EDUCATION

	Level of Studies					
Sector	**Doctorate**	**Medical Specialty**	**Undergraduate**	**Master's**	**Post-Doctoral**	**Total**
Public	56.3%	66.9%	57.3%	65.2%	50.0%	63.8%
Private	43.7%	33.1%	42.7%	34.8%	50.0%	36.2%
Total	100%	100%	100%	100%	100%	100%

Source: Senescyt

When analyzing Table 13, the value of $p>0.05$ admits the null hypothesis H_0. Therefore, the employement sector variable is independent of the variables: educational level, broad field and works in their area of specialization.

Table 13
CHI-SQUARED EMPLOYMENT SECTOR → SECTOR*LEVEL OF EDUCATION

	Value	GL	Asymptotic Significance(2 Sided)
Pearson's chi squared test	5.184	4	0.269
Likelihood ratio	5.095	4	0.278
N of valid cases	954		

Source: Senescyt

Comparison variables:

Province of residence with:

1. Level of education.

By means of Pearson's Chi-square test, Table 14 shows that there is a significant correlation between the province of residence variable and level of education variable considering the value of $p<0.05$. Therefore, the null hypothesis H0 is rejected and the alternative hypothesis H1 is accepted, which indicates the concentration of scholarship holders with education levels in certain provinces.

Table 14
CHI-SQUARED PROVINCE OF RESIDENCE*LEVEL OF EDUCATION

	Value	GL	Asymptotic Significance (2 Sided)
Pearson's chi squared test	390.616	92	0
Likelihood ratio	340.508	92	0
N of valid cases	1055		

Source: Senescyt

For example, in the Table 15, the Doctorate level is mainly concentrated in the provinces of Pichincha, Guayas, Azuay and Loja; the degree of correlation is moderate, as detailed in Table 15 using Cramer's V. It should be noted that the first two are the largest provinces in Ecuador, both in size and number of inhabitants, they also have the largest number of higher education centers (Table 16 & 17).

Table 15
SYMMETRIC MEASURES PROVINCE OF RESIDENCE*LEVEL OF EDUCATION

		Value	Aprox. Sig.
Nominal by Nominal	Phi	0.608	0
	Cramer's V	0.304	0
	Contingency coefficient	0.52	0
No of valid cases		1055	

Source: Senescyt

Table 16
PROVINCE OF RESIDENCE*LEVEL OF EDUCATION

	Level of Education					Total
Province	**Doctorate**	**Medical Specialty**	**Undergraduate**	**Master's**	**Post-doctoral**	
Azuay	8.8%	4.3%	0.9%	5.5%		5.1%
Bolívar		2.5%	1.8%			0.6%
Cañar	1.1%			0.6%		0.5%
Carchi	1.1%	1.2%	2.7%	0.4%		0.9%
Chimborazo	6.6%	10.6%	7.3%	1.6%		4.0%
Cotopaxi		3.7%	3.6%	0.7%		1.4%
El Oro		1.9%	0.9%	0.9%		0.9%
Esmeraldas		5.0%	6.4%	0.7%		1.9%
Galápagos				0.4%		0.3%
Guayas	14.3%	5.6%	8.2%	12.2%		10.9%
Imbabura	3.3%	2.5%	4.5%	0.9%		1.7%
Loja	19.8%	6.2%	3.6%	4.3%		5.9%
Los Ríos	1.1%	5.0%	2.7%	0.6%		1.5%
Manabí	3.3%	12.4%	15.5%	1.0%		4.5%
Morona S.				0.1%		0.1
Napo		0.6%	0.9%			0.20%
Orellana		1.9%	0.9%	0.1%		0.5%
Pastaza	1.1%	1.9%	2.7%	0.1%		0.8%
Pichincha	37.4%	28.0%	29.1%	66.7%	100.0%	54.4%
Santa Elena		0.6%	1.8%	0.6%		0.7
S. Tsáchilas		1.2%	0.9%	0.3%		0.50%
Sucumbíos			4.5%			0.5%
Tungurahua	2.2%	4.3%	0.9%	1.7%		2.1%
Zamora Ch.		0.6%		0.4%		0.40%
Total	100%	100%	100%	100%	100%	100%

Source: Senescyt

Comparison variables

Province of residence with:

1. Broad field of study.

Table 17
PROVINCE OF RESIDENCE*BROAD FIELD OF STUDY CROSS TABULATION

	Broad Field of Study									Total
Province	**AED**	**ASPV**	**AH**	**CNME**	**CSPI**	**E**	**IIC**	**SB**	**TIC**	
Azuay	3.6%	6.3%		3.3%	1.4%	18.2%	7.5%	3.6	12.2%	5.1%
Bolívar								2.20%		0.6%
Cañar					0.7%		2.0%			0.5%
Carchi		6.3%		0.6%			1.0%	1.8		0.9%
Chimborazo				3.9%	0.7%		3.5%	8.20%	4.1%	4.0%
Cotopaxi		6.3%		0.6%	0.7%	3.0%	0.5%	3.2%	1.0%	1.4%
El Oro		6.3%			0.7%	3.0%	0.5%	1.40%	2.0%	0.9%
Esmeraldas				1.1%	2.1%		0.5%	5.0%		1.9%
Galápagos				1.1%			0.5%			0.3%
Guayas	16.1%	12.5%	8.3%	9.9%	13.3	9.1%	11.9%	6.8%	17.3%	10.9%
Imbabura		12.5%		2.8%	0.70%	6.1%	0.5%	2.5%		1.7%
Loja		6.3%		14.4%	2.1%		4.5%	5.7%	7.1%	5.9%
Los Ríos		6.3%		1.1%			0.5%	3.9%	1.0%	1.5%
Manabí	3.6%			0.6%	4.2%	3.0%	0.5%	12.9%		4.5%
Morona S.							0.5%			0.1%
Napo								0.7%		0.2%
Orellana							0.5%	1.4%		0.5%
Pastaza		6.3%					1.0%	1.8%		0.8%
Pichincha	76.8%	25.0%	91.7%	57.5%	69.2%	54.5%	61.2%	31.5%	52.0%	54.4%
Santa Elena				1.1%	1.4%			1.1%		0.7%
S. Tsáchilas		6.3%					0.5	1.1%		0.5%
Sucumbíos								1,8%		0,5%
Tungurahua				2,2%	2,8%		1,50%	2,9%	3,1%	2,1%
Zamora Ch.						3,0%	1,0%	0,4%		0,4%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

AED Business administration and law;
ASPV Agriculture, forestry, fisheries and veterinary medicine;
CNME Natural sciences, mathematics and statistics;
CSPI Social sciences, journalism and information;
E Education;
IIC Engineering, industry and construction;
SB Health and wellbeing;
TIC Information and communication technologies.

Source: Senescyt

This analysis rejects the null hypothesis and accepts the existence of a significant and moderate correlation between the Province of residence variable and the Broad field of study variable according to Pearson's Chi-square test Table 18 and Cramer´s V Table 19. In fact, there are broad fields of studies which focus on certain provinces, for example: engineering, industry and construction and information and communication technologies are mostly concentrated in the provinces of Pichincha, Guayas and Azuay, which are the most industrialized provinces in

Ecuador. To a certain extent, it is related to the number of companies, both public and private, which are located in these provinces.

Table 18
CHI-SQUARED
PROVINCE OF RESIDENCE*BROAD FIEL OF STUDY

	Value	**gl**	**Asymptotic Significance (2 sided)**
Pearson's chi squared test	441.207[a]	184	0.000
Likelihood ratio	437.854	184	0.000
N of valid cases	1055		

Source: Senescyt

Table 19
SYMMETRIC MEASURES
PROVINCE OF RESIDENCE*BROAD FIEL OF STUDY

		Value	Aprox. Sig.
Nominal by Nominal	Phi	0.647	0.000
	Cramer's V	0.229	0.000
	Contingency coefficient	0.543	0.000
N of valid cases		1055	

Source: Senescyt

Comparison variables

Country where people studied with:

1. Level of education.

Table 20
CHI-SQUARED
COUNTRY WHERE PEOPLE STUDIED*LEVEL OF EDUCACTION

	Value	**gl**	**Asymptotic Significance (2 Sided)**
Pearson's chi squared test	981.450	124	0.000
Likelihood ratio	1016.387	124	0.000
N of valid cases	1055		

Source: Senescyt

Table 21
SYMMETRIC MEASURES
COUNTRY WHERE PEOPLE STUDIED*LEVEL OF EDUCATION

		Value	Aprox. Sig.
Nominal by Nominal	Phi	0.965	0.000
	Cramer's V	0.482	0.000
	Contingency coefficient	0.694	0.000
N of valid cases		1055	

Source: Senescyt

Table 22
COUNTRY WHERE PEOPLE STUDIED*LEVEL OF EDUCATION

Country	Level of Education					Total
	Doctorate	Medical specialty	Undergraduate	Master's	Post-doctoral	
Germany	3.3%	0.6%		1.9%		1.6%
Argentina	3.3%	2.5%		4.3%		3.5%
Australia	2.2%		1.80%	15.8%		10.7%
Austria				0.1%		0.1%
Belgium	1.1%			1.0%		0.8%
Bolivia				0.1%		0.1%
Brazil	1.1%	0.6%	3.60%	1.3%		1.4%
Canada			0.90%	0.4%		0.4%
Chile	5.5%	3.1%		3.0%		2.9%
China				0.6%		0.4%
Colombia		0.6%		0.3%		0.3%
South Korea				0.1%		0.1%
Costa Rica				1.0%		0.7%
Cuba	15.4%	87.0%	72.70%	0.9%		22.7%
Ecuador				0.1%		0.1%
El Salvador				0.1%		0.1%
Spain	29.7%	0.6%		31.5%		23.3%
USA	7.7%		5.50%	11.1%	50.0%	8.6%
Finland	1.1%					0.1%
France	8.8%			2.7%	50.0%	2.7%
Italy	5.5%			1.0%		1.1%
Mexico	5.5%	1.2%		2.3%		2.2%
Netherlands	3.3%			2.7%		2.1%
Peru				0.3%		0.2%
Poland				0.1%		0.1%
UK	1.1%		0.90%	15.5%		10.3%
Russia	3.3%	1.2%	6.40%	0.6%		1.5%
Singapore				0.1%		0.1%
Sweden	1.1%					0.1%
Switzerland				0.4%		0.3%
Ukraine	1.1%					0.1%
Venezuela		2.5%	8.2%	0.1%		1.3%
Total	100%	100%	100%	100%	100%	100%

When analyzing the variables: Country where people studied and Level of education, Pearson´s chi squared test, Table 20, and Cramer's V, Table 21, indicate there is a significant and moderate correlation between them. Therefore, as shown in Table 22, there are countries that concentrate scholarship holders according to the level of education, for example Cuba with 87% of medical specialties or Spain, Cuba, France and the USA for doctoral studies.

Comparison Variables

Country where people studied with:

1. Broad field of study.

There is a significant and moderate correlation between the Country where people studied variable and the Broad field of study variable according to Pearson´s Chi squared test, Table 23, and Cramer's V, Table 24. Therefore, there are countries where fields of study have focused on the most, such as Cuba with Health and Wellbeing, and Spain, Australia, UK and the USA with studies in the field of engineering, industry and construction (Table 25).

Table 23
COUNTRY WHERE PEOPLE STUDIED*BROAD FIELD OF STUDY

	Broad Field of Study									
Country	**AED**	**ASPV**	**AH**	**CNME**	**CSPI**	**E**	**IIC**	**SB**	**TIC**	**Total**
Germany				3.3%	2.1%		2.5%	0.7%	1.0%	1.6%
Argentina		18.8%	2.1%	5.0%	4.2%		4.5%	1.8%	4.1%	3.5%
Australia	30.4%		8.3%	15.5%	10.5%	3.0%	14.4%	0.7%	17.3%	10.7%
Austria					0.7%					0.1%
Belgium	1.8%			2.8%	1.4%					0.8%
Bolivia				0.6%						0.1%
Brazil			8.3%	1.7%	0.7%		1.0%	1.1%	2.0%	1.4%
Canada	1.8%		2.1%	0.6%	0.7%					0.4%
Chile	1.8%	18.8%		1.7%	3.5%		5.0%	2.5%	2.0%	2.9%
China					2.1%		0.5%			0.4%
Colombia				1.1%				0.4%		0.3%
S. Korea	1.8%									0.1%
Costa Rica		6.3%		2.2%	1.4%					0.7%
Cuba		12.5%	2.1%	5.0%	0.7%	21.2%	1.0%	77.8%	1.0%	22.7%
Ecuador							0.5%			0.1%
El Salvador				0.6%						0.1%
Spain	21.4%	31.3%	29.2%	26.5%	19.6%	12.1%	38.8%	5.0%	43.9%	23.3%
USA	17.9%	6.3%	14.6%	8.3%	7.7%	57.6%	10.9%	0.7%	4.1%	8.6%
Finland			2.1%							0.1%
France			4.2%	6.1%	7.7%		1.5%		1.0%	2.7%
Italy			2.1%	1.7%			2.0%		4.1%	1.1%
Mexico				4.4%	3.5%	3.0%	3.0%	1.1%		2.2%
Netherlands	3.6%			2.8%	6.3%		1.5%	1.1%		2.1%
Peru				1.1%						0.2%
Poland				0.6%						0.1%

Table 23
COUNTRY WHERE PEOPLE STUDIED*BROAD FIELD OF STUDY

UK	16.1%		25.0%	5.5%	21.7%	3.0%	11.9%	2.5%	15.3%	10.3%
Russia	1.8%			1.7%	4.9%		1.0%	0.7%	1.0%	1.5%
Singapur				0.6%						0.1%
Sweden				0.6%						0.1%
Switzerland					0.7%				2.0%	0.3%
Ukraine								0.4%		0.1%
Venezuela	1.8%	6.3%		0.6%				3.6%	1.0%	1.3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

AED Business administration and law
ASPV Agriculture, forestry, fisheries and veterinary medicine
CNME Natural sciences, mathematics and statistics
CSPI Social sciences, journalism and information
E Education
IIC Engineering, industry and construction
SB Health and wellbeing
TIC Information and communication technologies

Source: Senescyt

Table 24
CHI-SQUARED
COUNTRY WHERE PEOPLE STUDIED*BRIAD FIELD OF STUDY

	Value	**gl**	**Asymptotic Significance (2 sided)**
Pearson's chi squared test	1182.261	248	0.000
Likelihood ratio	1078.838	248	0.000
N of valid cases	1055		

Source: Senescyt

Table 25
SYMMETRIC MEASURES
COUNTRY WHERE PEOPLE STUDIED*BROAD FIELD OF STUDY

		Value	**Aprox. Sig.**
Nominal by Nominal	Phi	1.059	0.000
	Cramer's V	0.374	0.000
	Contingency coefficient	0.727	0.000
No of valid cases		1055	

Source: Senescyt

Comparison variables

Broad field of study with:

1. Level of education.

There are levels of education such as doctorate and master's that concentrate on natural sciences, mathematics and statistics, engineering, industry and construction. The undergraduate level of education basically focuses on Health, Table 26.

When correlating the Broad field of study variable with the Level of education variable, according to the results of the Pearson´s chi squared test, Table 27, and Cramer's V, Table 28, these two variables have a significant and moderate correlation.

Table 26
BROAD FIELD OF STUDY*LEVEL OF EDUCATION

	Level of Education					Total
Broad field of study	**Doctorate**	**Medical specialty**	**Undergraduate**	**Master's**	**Post-doctoral**	
Business administration and law			2.7%	7.7%		5.3%
Agriculture, forestry, fisheries and veterinary medicine	4.4%		0.9%	1.6%		1.5%
Arts and humanities	3.3%		6.4%	5.5%		4.5%
Natural science, mathematics and statistics	45.1%		3.6%	19.5%	50.0%	17.2%
Social science, journalism and information	9.9%		6.4%	18.4		13.0%
Education	1.1%		5.5%	3.80%		3.1%
Engineering, industry and construction	14.3%		2.7%	26.6%	50.0%	19.1%
Health and wellbeing	11.0%	100%	70.0%	4.5		26.4%
Information and communication technologies	11.0%		1.8%	12.40%		9.3%
Total	100%	100%	100%	100%	100%	100%

Source: Senescyt

Table 27
CHI-SQUARED
BROAD FIELD OF STUDY*LEVEL OF EDUCATION

	Value	**gl**	**Asymptotic Significance (2 sided)**
Pearson's chi squared test	813.516	32	0.000
Likelihood ratio	843.773	32	0.000
N of valid cases	1055		

Source: Senescyt

Table 28
SYMMETRIC MEASURES
BROAD FIELD OF STUDY*LEVEL OF EDUCATION

		Value	Aprox. Sig.
Nominal by Nominal	Phi	0.878	0.000
	Cramer's V	0.439	0.000
	Contingency coefficient	0.660	0.000
No of valid cases		1055	1055

Source: Senescyt

Comparison variables

Broad field of study with:

1. Gender of the scholarship holder.

According to Table 29 and Table 30, there is a low significant correlation between the Broad field of study variable and the Gender of the scholarship holder variable. Table 31 shows that the field of study in engineering, industry and construction is mainly taken by men, while health and wellbeing is taken by women.

Table 29
BROAD FIELD OF STUDY*GENDER OF THE SCHOLARSHIP HOLDER

	Gender		Total
Broad field of study	**Male**	**Female**	
Business administration and law	5.4%	5.2%	5.3%
Agriculture, forestry, fishery and veterinary medicine	1.6%	1.4%	1.5%
Arts and humanities	3.9%	5.5%	4.5%
Natural sciences, mathematics and statistics	17.2%	17.1%	17.2%
Social sciences, journalism and information	12.3%	15.3%	13.6%
Education	3.1%	3.2%	3.1%
Engineering, industry and construction	23.5%	12.8%	19.1%
Health and wellbeing	21.9%	32.8%	26.4%
Information and communication technologies	11.0%	6.8%	9.3%
Total	100%	100%	100%

Source: Senescyt

Table 30
CHI-SQUARED
BROAD FIELD OF STUDY*GENDER OF THE SCHOLARSHIP HOLDER

	Value	gl	Asymptotic Significance (2 sided)
Pearson's chi squared test	35.146	8	0.000
Likelihood ratio	35.860	8	0.000
N of valid cases	1055		

Source: Senescyt

Table 31
SYMMETRIC MEASURES
BROAD FIELD OF STUDY*GENDER OF THE SCHOLARSHIP HOLDER

		Value	Aprox. Sig.
Nominal by Nominal	Phi	0.183	0.000
	Cramer's V	0.183	0.000
	Contingency coefficient	0.180	0.000
N of valid cases		1055	

Source: Senescyt

Logistic Regression

Part of this research is to predict different work parameters that a person who is granted a scholarship would have once they finish their studies. It was not possible to determine a significant model that allowed to predict whether or not a scholarship holder would get a job; neither was it possible to determine a significant model regarding the public or private work sector or if the person would work in the academic or research field.

The significant logistic regression model, where a f (x) function can be obtained, is presented for the area of specialization variable, that is, the prediction model has been determined in order to analyze if a scholarship holder in a work setting, would or would not work in his/her area of specialization or degree; the logistic regression function f (x) and its analysis are shown below:

$$f(x) = \frac{e^{\Sigma_{i=0}^{n} \beta_i x_i}}{1 + e^{\Sigma_{i=0}^{n} \beta_i x_i}}$$

Where β_i and x_i represent the values that will be introduced to the logistic regression model as a coefficient and as a change in the variables of study, respectively.

The logistic regression model was determined by introducing the independent variables or predictors (x) using stepwise regression; Table 32 shows the results obtained in step 3, in which a greater number of independent and significant variables intervene, both for coefficients β_i and for the variables x_i considered in the mathematical model. It is validated due to the p values <0, 05, which rejects hypothesis H_0; values $\beta_i = 0$. The variables that intervene as predictors are: Province of residence the change in values in this variable affects the odds ratio in the mathematical model an Exp (B) 0.96, aggregated level of education which affects the prediction model by modifying the value of this variable in its odds ratio with an Exp (B) 0.51; and Works in the academic or research field which has the highest incidence and the change in value in this variable acts on the odds ratio with Exp (B) 1.994.

Table 32
VARIABLES IN THE LOGISTICS REGRESSION MODEL

Step 3	B	Standard Error	Wald	gl	Sig.	Exp(B)
Province of residence	-0.041	0.019	4.615	1	0.032	0.96
Aggregate level of education	-0.674	0.33	4.181	1	0.041	0.51
Works in the academic or research field	0.69	0.26	7.019	1	0.008	1.994
Constant	-1.722	0.781	4.865	1	0.027	0.179

Source: Senescyt

Table 33 allows a comparison between the observed values available in the database and the values expected according to the logistic regression model. Table 34 shows that there is no significant difference between the observed and expected values. Therefore, it is possible to accept hypothesis H_0; observed values=expected values because the value p>0.05 in the Hosmer and Lemeshow test.

Table 33
RESULTS OF THE HOSMER LEMESHOW TEST

Step 3	Works in his/her Area of Specialization = Yes		Works in his/her Area of Specialization = No		Total
	Observed	Expected	Observed	Expected	
1	16	16.389	1	0.611	17
2	209	211.018	11	8.982	220
3	97	93.622	2	5.378	99
4	60	60.413	5	4.587	65
5	243	245.192	23	20.808	266
6	85	84.174	8	8.826	93
7	76	76.195	10	9.805	86
8	92	90.996	16	17.004	108

Source: Senescyt

Table 34
HOSMER AND LEMESHOW TEST

Step	Chi-squared	gl	Sig.
3	3.424	6	0.754

Source: Senescyt

The mathematical model, obtained through logistic regression, that predicts whether or not a scholarship holder will work in their area of specialization is:

$$f(x) = \frac{e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3}}{1 + e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3}}$$

Where the values for β_0, β_1, β_2, β_2 are presented in Table 32 for the independent variables $x_1 =$ *Province of residence,* $x_2 =$ *Aggregated level of education and* $x_3 =$ *Works in the academic or research field.*

CONCLUSIONS

1. Ecuador has made a significant investment in third and fourth level education mostly since 2010. It has created public policies and laws to strengthen the development of people's skills in different areas.
2. Scholarships have not been distributed equally, neither considering the geographic situation, nor the gender of scholarship holders. Most scholarships were awarded in the province of Pichincha, the capital of Ecuador, and most scholarship holders are men.
3. Spain and Cuba are the preferred countries among scholarship holders, indifferently from the field of study. Cuba mostly in the field of health.
4. The reason of Ecuador's investment in higher education has been to change the country's production model. According to this research, the main employer of scholarship holders who return to Ecuador is the State, where there is a considerable number of scholarship holders that are working in the academic and research field and are supporting the development of higher education institutions. However, it is important to point out that there is a considerable percentage of highly prepared people who are unemployed.
5. The level of education is determined by the scholarship holders' province of residence. The doctoral studies are concentrated in the provinces of Pichincha, Loja and Guayas; master's degree in Pichincha, Guayas and Azuay.
6. There is also a relation between the province and the broad field of study. Engineering, industry and construction and information and communication technologies are concentrated in the provinces of Pichincha, Guayas and Azuay. On the other hand, agriculture, forestry, fishery and veterinary medicine are concentrated in Pichincha, Guayas and Imbabura.
7. The level of education is related to the country that was chosen. Cuba took up medical specialties and Spain took up doctoral studies and master's, mainly because of the language advantage.
8. There is also a relation between the broad field of study and the country chosen to study in. Australia was preferred to study business administration and law. Spain, to study agriculture, forestry, fishery, veterinary medicine, arts and humanities, natural sciences, mathematics and statistics, engineering, industry and construction and information and communication technologies. The United States was preferred for studies in education and health and wellbeing; and the UK for social sciences, journalism and information.
9. Regarding the level of education and the broad field of study, these two variables were dependent. Doctoral studies were mostly done in Natural Sciences, mathematics and statistics, and master's degrees in engineering, industry and construction.
10. There is a relation between the broad field of study variable and the gender variable. Engineering, industry and construction was taken up by men, while health and wellbeing by women.
11. Finally, by means of logistic regression, it was possible to determine a mathematical model of prediction in order to determine if a scholarship holder would work in his/her area of specialization or not. Here, the province of residence, the broad field of study and if the work would be done in the academic or research field, would significantly intervene.

This research can contribute to future longitudinal studies in this field to determine if the government policy continues, is strengthened or eliminated by considering the social, political and economic situation of the country.

A limitation of this research is the lack of available and updated information that can be found in several government agencies regarding the processes of granting scholarships for third and fourth level studies.

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