

## Implications in the Evaluation of Costs in Distance and Face-to-Face Education through the “Break-even-point” Technique, in Bachelor's Degree in Sociology

### Las Implicaciones en la Evaluación de Costos en Educación a Distancia y Presencial a través de la Técnica “Break-even-point”, en Licenciatura en Sociología

VÁSQUEZ-MARTÍNEZ, Claudio Rafael\*†, ALVAREZ-GÓMEZ, Miguel and MORFIN-OTERO, María

*Universidad de Guadalajara, Av. Juárez 976, 44100 Guadalajara, Jal., México*

ID 1<sup>st</sup> Author: *Claudio Rafael, Vásquez-Martínez*

ID 1<sup>st</sup> Coauthor: *Miguel, Alvarez-Gómez*

ID 2<sup>nd</sup> Coauthor: *María, Morfin-Otero*

DOI: 10.35429/JEH.2020.7.4.1.11

Received September 14, 2020; Accepted December 18, 2020

#### Abstract

Universities, both public and private, seek to implement a university policy that tries to address the academic, administrative, educational and economic problems would be faced with the concrete fact that ignore the behavior of those categories that explain such drawbacks. In the best case, too specific and traditional elements and equipment shortages are known problems, lack of training of certain administrative levels, inadequate buildings, the development of modules, presentation advice and obviously a relationship is established directly between the magnitude of these problems and inadequate financial resources. This project made the application of the technique "Break-even-point" (Breakeven) Costs of Distance Education and Higher Education Education Classroom. The project presents the ratio of fixed costs and variable costs and the influence of the number of students in the Semester Program Total Cost per case BA in Sociology.

#### Resumen

Las universidades, tanto públicas como privadas, intentarán implementar una política universitaria que trata de subsanar los problemas académicos, administrativos, docentes y económicos, se encontrarían ante el hecho concreto de que desconocen el comportamiento de aquellas categorías que explican tales inconvenientes. En el mejor de los casos, se conocen problemas demasiados específicos como la escasez tradicional de elementos y equipo, la falta de capacitación del personal de ciertos niveles administrativos, la inadecuación de locales, elaboración de módulos, presentación de asesorías y obviamente se establece una relación directa entre la magnitud de estos problemas y la insuficiencia de recursos financieros. Este proyecto realizó la aplicación de la técnica “Break-even-point” (Punto de Equilibrio) de los Costos en Educación a Distancia y Educación Presencial en Educación Universitaria. El proyecto presenta la relación de costos fijos y costos variables y la influencia que tiene el número de alumnos en el Costo Total Semestral por Programa, caso Licenciatura en Sociología.

**Management, Evaluation, Costs, Education**

**Gestión, Evaluación, Costos, Educación**

**Citation:** VÁSQUEZ-MARTÍNEZ, Claudio Rafael, ALVAREZ-GÓMEZ, Miguel and MORFIN-OTERO, María. Implications in the Evaluation of Costs in Distance and Face-to-Face Education through the “Break-even-point” Technique, in Bachelor's Degree in Sociology. Journal-Economic History. 2020. 4-7: 1-11

\* Correspondence to the Author (e-mail: crvasquezm@gmail.com)

† Researcher contributing first author.

## Introduction

ICFES (2012) developed a methodology for the determination of university costs given the need to have a functional tool that would allow cost studies to be carried out and become a mechanism capable of producing systematized information, useful for the development of theories and policies on Education Higher.

In the final report of the Deschooling University project (Arboleda, 2011), six cost models in Distance Education are presented, which are: capital recovery period according to books, internal rate of return, contribution to current net cost, equivalent annual cost, Schneider-Sigelen cost. All applied theoretically to Distance Education, without any adaptation to the cost system of the University of Antioch and without taking into account Face-to-Face Education.

The present study starts from the elaboration of a practical theoretical model, more dynamic, of greater flexibility, that allows feedback, both in Distance Education and in Face-to-face Education, adapting to the cost system of the University of Antioch in theory and in praxis.

## Object of Study

The purpose of this project is the application of the “Break-even-point” technique of costs in Distance Education and Face-to-Face Education in the Bachelor of Sociology. The project presents the relationship of fixed costs and variable costs and the influence that the number of students has on the Total Semester Cost in the Bachelor of Sociology, University of Antioch in periods A to I. \* \* 1999-2008.

## Objectives

Determine the fixed cost, the variable cost and the total semester cost of the Degree in Sociology. Through the “Break-even-point” technique, make the comparison of the costs, mentioned above, between Distance Education and Face-to-Face Education in the Bachelor of Sociology program.

## Hypothesis

The Costs in Distance Education are lower than in Face-to-Face Education.

## Research questions

What is the fixed cost in distance education and face-to-face education?

What is the variable cost in distance education and face-to-face education?

What is the “break-event-point” in distance education and face-to-face education?

## Justification

In the universities, public and private, many financial policies are unknown to correct academic, administrative, educational and economic problems. It is necessary to study university costs with their respective categories of fixed costs, variable costs, total costs, in order to differentiate what is being spent in each administrative process. In the best of cases, too specific problems are known, such as the traditional shortage of elements and equipment, the lack of training of the personnel of certain administrative levels, the inadequacy of premises, the preparation of modules, the presentation of advice, and obviously a relationship between the magnitude of these problems and the insufficiency of financial resources.

For this reason, this study emphasizes the search for the equilibrium point (“break-event-point”) in distance education and face-to-face education.

At the extra-institutional level, it is a cost study.

It facilitates the carrying out of comparative studies between different university institutions, since it allows to unify criteria in relation to the structure and magnitude of operating costs and basic activities (teaching, research, consulting, extension and elaboration of modules) developed by the institution.

## At the institutional level:

It allows institutional evaluation (research) and self-evaluation, since the cost methodology vertebrates the different systems through which the institution operates for the fulfillment of its objectives and goals, namely: General administrative systems, academic, financial, accounting and human resources.

In short, university cost studies respond to the needs of administrative adjustments. Costs are handled as first factors in academic policy. Among the different variables, those of a curricular nature can be pointed out: number of subjects in the program, number of theoretical and practical hours per course, number of students per course. Distribution of the programming between full-time professors and full professors and distribution of their time, in teaching, research and other activities. Financial variables such as salary level, general expenses and administrative expenses are also included. The phenomenon that is interesting to mention here is that one of the parts of the budget, expenses, tend to grow.

On the other hand, income does not grow at the same rate due to the demand for places to access university.

### **Theoretical Framework. (Theoretical foundation)**

The costs in Distance Education and Face-to-Face Education. Social Costs.

Cost studies observe that globally, the days have passed when the allocation of public funds for education had the highest priority (Snowden and Daniel, 2011). It is in the 90s when a greater concern to rationalize the allocation of resources in the field of education becomes evident and when economists begin to study educational costs more intensely. At the same time, a tendency to substitute capital goods for the labor force is hinted at. The labor force in traditional education represents the highest region in costs, reaching percentages of 80% and 90% for salaries. And not only that; increases in labor force costs affect other costs of production. In conventional education, teachers' salaries represent the largest component of total costs. On the contrary, it has been determined that in Distance Education the three most important factors in this regard are: The "Multimedia System", the "Curricular Organization" and the "Number of students". (Snowden and Daniel, 2011).

### **Curriculum Organization**

The broader and more varied the range of courses offered by a Distance Education model, the higher the costs that their production and maintenance will generate.

### **Number of students**

Unlike what happens in Conventional Education, in which a greater number of students necessarily implies the hiring of more teachers, in the case of Distance Education this variable is what allows that, once a critical point has been reached, the increase in the number of students makes the average cost per student lower and lower.

In short, Distance Education is economically viable on a small scale, as long as the means used are consistent with the size of the population they serve and are adequate from the point of view of costs. These, in turn, in Distance Education, are more subject to variations produced by changes in institutional policies. This implies that the economic success of small Distance Education models depends to a great extent on the intelligence that is used in the setting of policies and a skillful administration (Snowden and Daniel, 2011). (Azad, 2013), (Gill, 2012), (Shah, 2011), (Tilak, 2010), (Burker 2009), (Ghosh 2013).

Fixed Costs and Variable Costs in Distance Education and Face-to-Face Education.

Fixed costs in an educational system are those that occur regardless of the number of students enrolled. On the contrary, the variable costs are those that depend directly on the enrollment.

In Classroom Education, variable costs are normally higher than fixed costs, since, as mentioned, teachers' salaries represent the most important variable in terms of costs.

The most important fixed costs incurred by Distance Education are: production of materials, transmission of programs and administration.

### **Individual costs in Distance Education**

Being understood by this the total cost that a student pays during a semester for his support in the program or career that he is studying. Among such variables are: transport, food, accommodation, printed materials and modules, tools and stationery.

### Conceptual Categories

**Cost:** The maintenance expenses for the operation of a program, degree or organization, without taking into account the individual cost and also without taking into account the income that students deprive themselves when they are studying and not working.

**Total semester cost per program:** It is the total semester maintenance expense for the operation of the Bachelor's Degree in its respective modality, comprising its personal services expenses, general expenses, financial expenses, leases, depreciations, amortizations, in addition to the corresponding expenses of the central administrative units (proration), academic units (apportionment) and units other dependencies with their special programs (apportionment). (Note: Prorations were given based on the percentage of students). This is given according to the "criteria" of the Planning Office of the University of Antioch and they are agreed between it and the directors of the Faculty, in a governmental entity of the Republic of Colombia.

The total is multiplied by the semi-annual inflation and devaluation index, taking as a deflator with respect to period A.

Note: The biannual inflationary and devaluation index from A to H was taken as a deflator with respect to period A in each of the costs of this study, provided by DANE (National Administrative Department of Statistics). Bogota A, B, C, D, E, F, G, H, shown in the following table:

Inflation and Devaluative Index	Period - Semester
0.83420	A
0.76418	B
0.65270	C
0.59890	D
0.53140	E
0.50580	F
0.45590	G
0.43669	H

**Table 1** Semi-annual inflation and devaluation index from a to h with respect to period a (according to dane)

**Academic semester:** It is the number of academic weeks that lasts one of the periods in which an academic program is usually divided, generally separated from another by a vacation period; For purposes of measuring its duration in academic weeks, the first day of classes is taken into account until the day of the last exam. In the present study, the academic semester is considered 16 weeks.

**Number of students in the program:** It is the number of students enrolled in a given program, regardless of the number of subjects they take, but adhering to the specific regulations of the University of Antioch. The information is taken approximately three months after the day of initiation of classes, when the period of additions and cancellations of subjects and enrollments is supposed to end. **Face-to-face education:** System or modality of education that encourages the teaching-learning process, basically face-to-face.

**Distance education:** System or modality of education that relies on the use of multimedia that promote the teaching-learning process basically in a non-face-to-face way, in order to achieve educational objectives with a geographic and demographic coverage greater than that of a system of Conventional Face-to-Face Education.

**Fixed cost:** It is a concept taken from the industry and suitable for education. For the industry, fixed costs are all those costs that normally do not vary in direct relation to production, but are in direct function over time; notwithstanding this, one should not have the idea that they never vary, by virtue of the fact that they have more or less frequent changes; Its main characteristic is precisely its invariance, within certain limits of time and capacity.

They remain fixed, or almost constant, regardless of whether more or less is produced, or more or less is sold. In relation to the unit, that is, to the unit cost of production or distribution, they are inversely proportional to increases or reductions in production or sale; example: rent, depreciation (straight line), amortization, administrative staff salaries, sales manager salary, etc. Fixed costs are also named constant costs, scheduled indirect costs, period costs, capacity costs, committed costs, representative costs of production capacity, auxiliary costs, support costs, etc.

Fixed costs are also usually called time costs, due to their irrelevant quality, to their invariance within certain limits of time and capacity, that is, such expenditures will have to be made periodically, whether or not there is production.

Appropriate to the University of Antioch, the fixed cost is the cost independent of the number of students served in the period studied. Fixed costs are those cost items that do not vary with the volume of students served in a given period of time.



For the University of Antioch, according to the “criteria” of the Planning Office are fixed costs:

- Personal services, includes all payments to staff, whatever their connection modality and in the case of teachers, whether or not there are classes, teachers receive their salary, for the period of time studied from A to I.
- General expenses: other expenses other than personal services, required for the operation of the University of Antioch, are grouped together. And when it is consumed during the validity of the scheduled period.
- Financial operating expenses: These are the interests caused by overdrafts or loans intended to cover personal services or general expenses.
- Leasing: Includes all items spent on payments for the rental of premises and equipment for the operation of the respective unit.
- Depreciation and amortization: includes the values of the depreciation and amortization of fixed assets such as buildings, vehicles, machines, laboratory equipment, furniture and office supplies.

Variable cost: It is a concept taken from the industry and suitable for education.

For the industry, variable costs are considered to be all those that are a direct function of the volume of production and sales respectively, that is, those that vary directly and proportionally to the volume of production and sales..

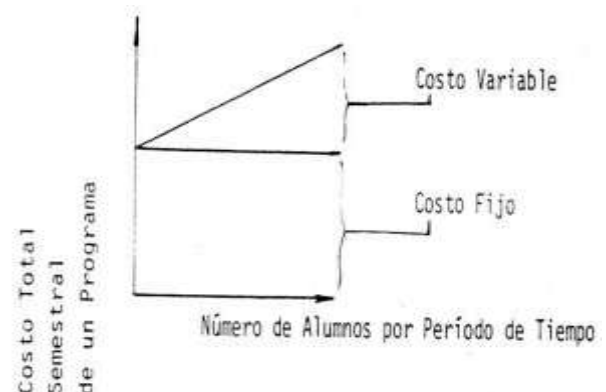
Regarding these, it can be stated with accuracy that the greater the volume of production and sales, the greater the number of variable costs.

Variable costs are also called volume costs, effective costs.

Appropriate to the University of Antioch, it is the cost that depends on the number of students served in the period studied.

Variable costs are those cost items that vary with the volume of students served in a given period of time.

Variable costs are activity costs because they accumulate as a result of the number of students served in the period studied. They would not exist if it were not for the performance of some activity. A variable cost is necessarily zero to zero activity. Variable costs increase or decrease directly with changes in the activity of the number of students attended in the period studied, which includes materials to support the learning process.



Total cost: It is the addition of the Fixed Cost and the Variable Cost in each program, Bachelor.

**Break-even-point:** For the present study, the equilibrium point is the intersection of the graphs of total cost in EDP and total cost in EDI corresponding to each program, Bachelor's degree, and this point indicates that in that space the total costs are equal in EDP (Face-to-face Education) and EDI (Distance Education).

**Limitations:** In the present study, it is limited by its confidentiality in the data and the academic abnormalities that the University of Antioch has had. Fixed costs and Variable Costs will be determined indirectly, so their value will be approximate. The cost is limited to maintenance expenses for the operation of a program or organization, without taking into account the individual cost and also without taking into account the income that students deprive themselves by studying and not working.

### Methodology

This study is based on university costs in the work "Distance Education in Antioquia from Theory to Reality", (Vásquez and Restrepo, 2012).

### Population

The population for the analysis of educational costs in Classroom Education (EDP) and Distance Education (EDI) at the University of Antioch, is as follows:

In Face-to-Face Education (EDP), Undergraduate, the following program will be taken into account:

- Bachelor's degrees in Sociology.

In distance education (EDI), Undergraduate, the following program will be taken into account:

- Bachelor's degrees in Sociology.

### Variables

Total semester cost per program

Where the Total Semester Cost per Program: is the total semester maintenance expense for the operation of the Bachelor's Degree in its respective modality, including personal service expenses, general expenses, financial expenses, leases, depreciations, amortizations, in addition to the corresponding expenses the central administrative units (apportionment), academic units (apportionment) and other units with their special programs (apportionment).

Bachelor's degrees in Sociology (EDP)  
7'925,725

For the other semesters, a similar procedure was applied, working beforehand with constant weights with respect to period A, thus making the following table:

PERIODO SEMESTRE	NUMERO DE ALUMNOS	COSTO TOTAL SEMESTRAL POR PROGRAMA, LICENCIATURAS EN SOCIOLOGÍA (EDP)
A	162	7'925,725
B	194	8'976,585
C	173	8'383,878
D	148	7'635,135
E	148	7'669,652
F	165	8'021,764
G	168	8'124,240
H	168	8'126,016
I	168	8'134,992

**Table 2** Period - number of students - total semester cost per undergraduate program - edp in constant pesos with respect to the period to

### Total semester cost per program

Bachelor of Sociology (EDI) 6'843458

For the other semesters, a similar procedure was applied, working beforehand with constant weights with respect to period A, thus making the following table:

Period Semester	Number of students	Cost Total semester by Program a, bachelor's degree In sociology (edi)
A	158	6'843458
B	181	7'169284
C	306	7'633859
D	275	7'315104
E	280	7'398760
F	407	7'914325
G	457	8'001716
H	404	7'714854
I	404	7'769428

**Table 3** Period - number of students - total semester cost per undergraduate program - average in constant pesos with respect to the period to.

D = Number of students (Tables 4 and 5)

**Procedure**

To establish the costs of each program, undergraduate, the work "Distance Education in Antioquia From Theory to Reality" (Vásquez and Restrepo, 2005) was consulted, in which the total costs per semester for each program are mentioned. as well as the number of students in each program, this for each semester period from A to I.

These costs were corrected with the inflationary and devaluation indices mentioned above. In each semester the number of students for each program is known, so that there are points of the function.

$$CT = CF + vD;$$

**WHERE**

CT = Total semester cost per Program.

CF = Fixed Cost.

v = Marginal Cost (pending)

D = Number of Students

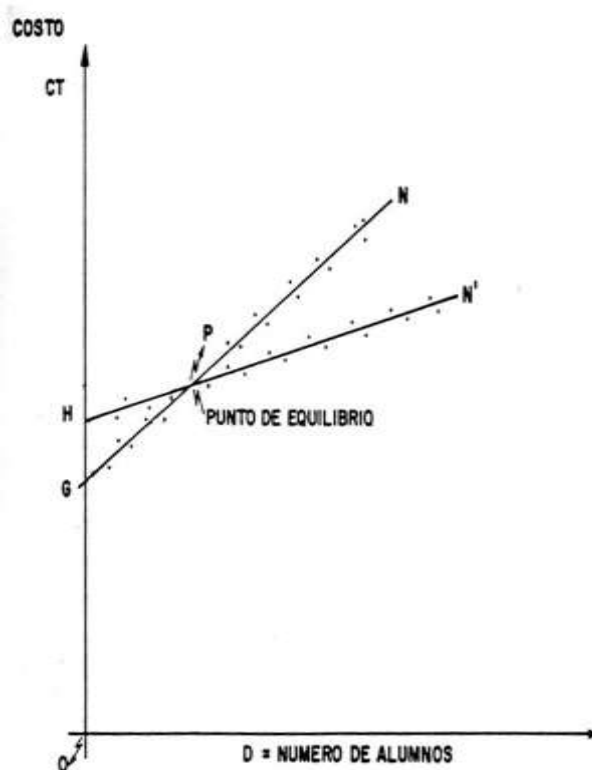
Semester Period	A	B	C	D	E	F	G	H	I
Program Bachelor of Sociology	162	194	173	148	148	166	168	168	168

**Table 4** Historical evolution of the number of students in edp-university of antioch programs period-semester a to i

Periodo Semestre	A	B	C	D	E	F	G	H	I
Programa Licenciatura en Sociología	158	181	306	275	280	407	457	404	404

**Table 5** Historical evolution of the number of students in edi- university of antioch programs period-semester a to i

GRAFICA I  
EL PUNTO DE EQUILIBRIO (P.E.)



Where:

GO: fixed cost of the line N: C.F. HO: fixed cost of line N': (C.F.)'

In order to know the fit is correct, the correlation coefficient was determined for each equation obtained, verifying the significance of the correlation through the critical values shown in the tables of "critical values of the correlation coefficient." (Glass, 2010 )

Linear regression is the straight line that passes equidistant through "its" cloud of corresponding points.



Line N of the EDP Mode Line N' of the EDI Mode The Lines have the equation  $CT = CF + vD$ :

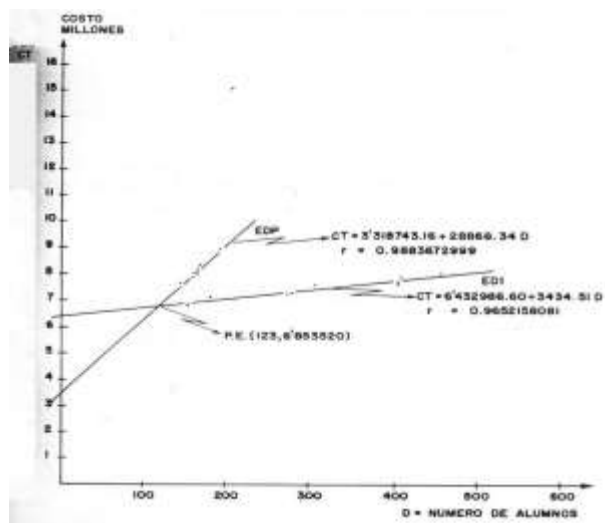
$$\therefore CF = \frac{\left(\sum_{i=1}^n D_i \sum_{i=1}^n CT_i\right) - \left(\sum_{i=1}^n D_i\right) \left(\sum_{i=1}^n CT_i\right)}{\left(n \sum_{i=1}^n D_i^2\right) - \left(\sum_{i=1}^n D_i\right)^2}$$

Pendiente de las Rectas  $y = \frac{n \sum_{i=1}^n D_i CT_i - \sum_{i=1}^n D_i \sum_{i=1}^n CT_i}{n \sum_{i=1}^n D_i^2 - \left(\sum_{i=1}^n D_i\right)^2}$

Coefficiente de Correlación  $r = \frac{\sum_{i=1}^n D_i CT_i - \frac{\left(\sum_{i=1}^n D_i\right) \left(\sum_{i=1}^n CT_i\right)}{n}}{\sqrt{\left[\sum_{i=1}^n D_i^2 - \frac{\left(\sum_{i=1}^n D_i\right)^2}{n}\right] \left[\sum_{i=1}^n CT_i^2 - \frac{\left(\sum_{i=1}^n CT_i\right)^2}{n}\right]}}$

n = Observed periods.  
CT = Cost corresponding to each period  
D = # of students corresponding to each period

The equations thus obtained allowed drawing a graph for each program, where when graphing the EDP modality and the EDI modality as a function of the number of students (abscissa) and the Total Semester Cost per Program (ordinate), it showed the equilibrium point as well as the cost ratio. The equilibrium point was obtained by simultaneously solving the equations in EDP and EDI modes..



Graphic 2 Total semester cost per undergraduate program in sociology

This made it possible to carry out an analysis of each program, specifying the equation of the Total Cost and the breakeven point. The information found was condensed in the following tables:

Modality	Equation	Coefficient Correlation	Point Of Balance
EDP	$CT=3'318743.16+28868.34D$	0.988367299	D=123 Alumnos
EDI	$CT=6'432986.60+3434.51D$	0.9652158081	CT=6'853520 pesos

Table 6 Modality-equation-correlation coefficient-equilibrium point in the degree program in sociology in constant pesos with respect to the period-semester

Programa	Costo Fijo	Costo Variable
Licenciatura en Sociología	3'318743	3'534784

Table 7 Fixed cost and variable cost with respect to the breakeven point in constant pesos for the period-semester a in edp programs - university of antioch

Programa	Costo Fijo	Costo Variable
Licenciatura en Sociología	6'432987	420539

Table 8 Fixed cost and variable cost with respect to the equilibrium point in constant pesos of the period-semester a in edi programs - university of antioch

Discussion of results and analysis

In the period of time Period-Semester A to I at the University of Antioch, in the EDP and EDI modalities, regarding costs, the following analysis is presented.

In graph 1 the linear regression equations of EDI and EDP of the Bachelor of Sociology with their P.E. (Breakeven).

In EDP the linear regression is  $CT = 3'318743.16 + 28868.34 D$  (Table 6) with a correlation coefficient  $r_1 = 0.988367299$  significant with  $\alpha = 0.05$ , n-2 g. L., since the theoretical value in Statistical Table Glass (2006) of  $r = 0.666$ , g. L. n-2 al  $\gamma = 95\%$  bilateral, is less than the value found  $r_1 = 0.988367299$ . ( $p < 0.01$ ).

A Fixed Cost (C. F.) 3'318743,16 (Table 7)



A Marginal Cost  $v1 = 28868.34$ , which is the slope of the linear regression.

Where  $v1$  represents the cost necessary for one more student on the D axis.

By equivalence in Bivariate Regression, the slope and correlation tests are equivalent.

The correlation coefficient  $r1 = 0.9883672999$ , indicates a good positive direct linear relationship between Y (CT = Total Semester Cost per Program) and X (D = Number of students, (Table 4). With a coefficient of determination

$= 97.69\%$ , expresses the proportion of total variation in the values of the variable Y

(CT = Total Semester Cost per Program) that can be considered or explained by a linear relationship with the values of the variable X (D = Number of Students).

In EDI the linear regression is  $CT = 6'432986.60 + 3434.51 D$  (table 6) with a correlation coefficient  $r2 = 0.9652158081$  significant with  $\alpha = 0.05$ , n-2 g. L. because the theoretical value in Statistical Table Glass (2006) of  $r = 0.666$ , g. L. N-2 to  $\gamma = 95\%$  bilateral, is less than the found value  $r2 = 0.9652158081$ . ( $p < 0.01$ ).

A Fixed Cost (C.F.) =  $6'432986.60$  (Table 8)

A Marginal Cost  $v2 = 3434.51$ , which is the linear regression slope.

Where  $v2$  represents the cost needed for one more student on the D axis.

By equivalence in Bivariate Regression, the slope and correlation tests are equivalent.

The correlation coefficient  $r2 = 0.9652158081$ , indicates a good linear, direct positive relationship between Y (CT = Total Semester Cost per Program) and X (D = Number of students (table 5)).

With a coefficient of determination  $r_2^2 = 93.16\%$ , expresses the proportion of total variation in the values of the variable Y (CT = Total Semester Cost per Program) that can be considered or explained by a linear relationship with the values of the variable X (D = Number of students).

When the linear regression of EDP intersects with the linear regression of EDI, it forms the Equilibrium Point (PE) (Break-Even-Point), where at this point CT and the number of students are equal (D Table 4 and 5) in EDP and EDI. Linear Regression in EDP:  $CT = 3'318743.16 + 28868.34 D$  Eq. (1) Linear Regression in EDI:  $CT = 6'432986.60 + 3434.51 D$  Eq. (2)

Equating CT in equations (1) and (2)  $3'318743,16 + 28868,34 D = 6'432986,60 + 3434,51 D$

$$D = \frac{3'114243.44}{25433.83} = 122.445 \approx 123$$

$$D = 123 \text{ Alumnos.}$$

$$CT = 6'853520$$

At the Equilibrium Point (PE) (Break-Even-Point), it corresponds to a CT =  $6'853520$  constant pesos with respect to period A, a D = 123 Students (Table 6), a Variable cost (CV) (table 7) in EDP of  $3'534784$  constant pesos with respect to period A, a Variable Cost (CV) (Table 8) in EDI of  $420539$  constant pesos with respect to period A. In conclusion, if the number of students is greater than 123, EDI's Bachelor's Degree in Sociology is less expensive than EDP's.

### Conclusions

The equilibrium point (Break-Even-Point) is valid for the series of conditions that existed during the period from A to I in which the data provided by the Planning Office of the University of Antioch were used. The equilibrium point takes into account past experience and determines probable effects that the projection of the past may produce in the operations of the immediate future for the University of Antioch, such as, for example, increase or decrease in physical staff, teachers, teaching materials, equipment, replacement of physical plant and obsolete equipment.

In the EDP programs, the linear regressions were of the form  $CT = (CF) 1 + v1D$ , where CT is the Total Cost per semester per program, D is the number of students, (CF) 1 is the independent term and indicated a fixed cost, v1 is the marginal (slope) cost.

Regarding the correlation coefficients (greater than 0.9), they were found significant with  $\alpha = 0.05$ , n-2 g.L., since the theoretical value in Glass (2006) statistical tables of  $r = 0.666$ , g.L. n-2  $\alpha = 95\%$  bilateral, is less than those found ( $p < 0.01$ ),

By equivalence in bivariate regression, the tests for slopes and correlations are equivalent. The correlation coefficients found in the different EDP programs are good (greater than 0.9), indicating a good positive direct linear relationship between CT and D, so that the values of (C.F.)

(Fixed Costs in EDP) and (C.V.) (Variable Costs in EDP) must be significant. And there are also good coefficients of determination (greater than 0.8), where it is probable that with these coefficients of determination they express the proportion of the total variation in the values of the variable CT that can be considered or explained by a linear relationship with the values of the variable D.

In the EDI programs, the linear regressions were of the form  $CT = (CF) 2 + v2D$ , where CT is the total semester cost per program, D is the number of students, (CF) 2 is the independent term and indicating a fixed cost, v2 is the marginal (slope) cost.

Regarding the correlation coefficients (greater than 0.9), they were found to be significant with  $\alpha = 0.05$ , n-2 g.L., since the theoretical value in Glass (2006) statistical tables of  $r = 0.666$ , g.L. n-2  $\alpha = 95\%$  bilateral, is less than those found. ( $p < 0.01$ ).

By equivalence in bivariate regression, the tests for slopes and correlations are equivalent.

The correlation coefficients found in the different EDI programs are good (greater than 0.9), indicating a good positive direct linear relationship between CT and D, so that the values of (CF) (fixed costs in EDI) and (CV) (Variable costs in EDI) must be significant. And there are also good coefficients of determination (greater than 0.8), where it is probable that with these coefficients of determination they express the proportion of the total variation in the values of the variable CT that can be considered or explained by a linear relationship with the values of the variable D.

When the linear regression of the respective EDP program intersects with the linear regression of the respective EDI program, it forms the "Break-even-point", where at this point it equals CT (Semiannual Total Cost per Program).

Concluding, the hypothesis is approved. Hence, if the number of students is greater than the abscissa assigned at the equilibrium point in the EDI programs analyzed, then they are less expensive than those of EDP in the period from A to I.

### Recommendations

It is suggested that for future studies of university costs, the equilibrium points of each of the careers in each educational institution be carefully analyzed to observe the variable costs and fixed costs of university administration.

In the educational complex in which we live, it is increasingly necessary for techniques that help the University of Antioch and other universities in achieving their objectives. This is why the break-even-point can play an essential role in the life of the institution by informing and specifying data capable of making decisions and rationalizing its resources in the institution.

The result of the analysis is valid only for that period from A to I in which the "costs" and the "equilibrium point" were found where the factors to be studied were subjected to that point, but the technique (Break-even-point), the procedure, and the methodology can be applied to other educational institutions.

The breakeven point can be used for the administration of the University of Antioch, other institutions and the correct interpretation of the various changes that are presented leads to decisions made by the management of the University of Antioch and other universities. In addition, the equilibrium point (Break-Even-Point), can be used as a tool for planning and programming a budget more appropriate to the needs of the University of Antioch and other universities, planning activities according to past experience, its economic situation, its resources and future trends; organizing its physical and human elements, directing and coordinating them; monitoring activities as they are carried out; and to carry out the corrective operation of EDI and EDP according to the pertinent government policies. In the case of the University of Antioch, the face-to-face education modality tends towards a greater participation in costs with respect to the Distance learning modality (EDI).

This contrast of resources and results suggests the reformulation of policies in EDI and EDP, the rationalization of their physical and human resources, the planning of minimum conditions for the gradual strengthening of the programs.

The break even point can also be used to project costs, depending on the situations and temporal, economic and political circumstances of the University of Antioch and other institutions. The breakeven point can also help change financing policies for the rationalization of resources in both the EDI programs and the EDPs of the University of Antioch and other universities.

## References

- Arboleda T., J. (2011). Informe final del Proyecto de Universidad Desescolarizada. Volúmen IV. Medellín. Edición Corporación Educativa San Pablo.
- Azad, J. L. (2013). Criteria based funding of higher education. *Journal of Educational Planning and Administration* 12 (4), 25-31.
- Burker, J. C. (2009). Performance funding for public higher education: fad or trends? San Francisco: Jossey-Boss.
- Ghosh, D. K. (2013). Financing education; vol. 1-Finance management and planning in education: lessons from the UK system. New Delhi: Cosmo.
- Gill, T. K. (2012). Financial management of universities in developing countries. *Higher Education Policy*. 16 (2), 35-36.
- Glass, G. V. (2010). *Métodos Estadísticos Aplicados a las Ciencias Sociales*. New York. Ed. Prentice Hall.
- ICFES. (2012). Indices para el análisis de los costos universitarios en la Universidad Externado de Colombia. Seminario Nacional sobre Costos Universitarios. Bogotá. ICFES.
- Shah, K. R. (2011). University-industry relations in Financing higher education: some issues. *Journal of Educational Planning and Administration* 16 (2), 24-26
- Snowden, B. L., Daniel, J. S. (2011). The economics of small open universities. Open University Conference on the Education of Adults at a Distance. 15(3), 18-23.
- Tilak, J. B. G. (2010). Student loans as the answer to lack of resources in higher education. "Economic and Political Weekly". 34 (2): 2-15.
- Vasquez M., C. R., Restrepo, B. (2012). La educación a Distancia en Antioquia. De la Teoría a la realidad. Bogotá. Ed. Guadalupe.