Academic performance and investments in federal institutes of education in the Brazilian Northeast

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Abstract

The creation of the Federal Network of Professional and Technological Education, as a public policy of education, resulted in the expansion of technical-technological education in Brazil and led to an exponential increase of resources applied to them. In this context, the Federal Audit Court established academic indicators that express the expansion of supply and the improvement of the efficiency and effectiveness of the federal institutions of professional education. In order to monitor organizational performance and evaluate results regarding the allocation of material and human resource. The aim of this study was investigating the relationship between the Graduates Efficiency Rate and other established indicators, discussing whether the performance evaluation model reflects the complexity of these institutions and measures their performance as public policy. As for the methodology, the research was quanti-qualitative. After a bibliographical research, a documentary analysis of the data available in the Management Reports of the Federal Institutions of Education of the Northeast Region was performed, from the period between 2012 and 2016. The indicators available in these documents were compared in statistical treatment software, in evaluating the results, the various organizational issues involved in the process. The results show that there is no relation between the Academic Efficiency Rate of Graduates and the other management indicators established by the TCU. Therefore, it is necessary to adopt a performance evaluation model that advances the study of the elements that reflect the complexity of these institutions.

Keywords: Public Policies of Education. Federal Network of Technological Education Institutions in Brazil. Performance Measures. Graduates Efficiency Rate.

INTRODUCTION

The Brazilian Federal Constitution of 1988 (CF/88) establishes education as "a right of all and a duty of the State and of the family, fostered and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and its qualification for work "(Brazil, 1988). Thus, the State, although not alone in charge of the execution of education, is responsible for guaranteeing access to all citizens through conception through public educational policies, as well as for its monitoring and control.

The increasing demands for a training that included science, technology and work, as well as intellectual and instrumental activities, culminated in the creation, through Law 11.892/2008, of the Federal Network of Professional, Scientific and Technological Education, formed by Federal Institutes of Education, Science and Technology (Ifes), Federal Centers for Technological Education (Cefets), Technical Schools connected to Federal Universities, Federal Technological University of Paraná and Pedro II School. At the time, the expansion policy of the Federal Network was due to the perception that it, in universal terms, and in Brazil in particular, is increasingly important as a strategic element for the construction of citizenship and for a better insertion of young people and workers in contemporary society, full of great transformations and markedly technological (BRASIL, 2004). Since then, the number of existing units has quadrupled and the budget of these units, in order to pay the student spending amounts, the new investments and the hiring and qualification of technical-administrative staff and teaching staff, has increased exponentially.

In order to assess the level of management of the Ifes in the country, the Court of Accounts of the Union (TCU) established a series of indicators calculated using specific formulas whose values vary according to the institutional performance in each item observed. One of these indicators is the Academic Efficiency Rate of Graduates (EAC), which aims to measure the ability to achieve success among students who complete. This indicator lists all students who successfully completed their course in the period (completed or paid in), regardless of the time of their entry; and all those who, in some way, have finished their course, regardless of success or not; that is, it seeks to examine whether students have completed without evading, disconnecting, or transferring.

Thus, the question that is sought to answer with this article is: there is a relationship between the increase of government spending after the establishment of the public policy of expansion of federal public education in the Federal Institutes of the Northeast Region between 2012 and 2016, and academic efficiency as measured by

the indicators established by the TCU? The relevance of the work is mainly due to the possibility of discussing how the performance indicators proposed by TCU, based solely on quantitative criteria, reflect the performance of these institutions.

Therefore, the objective of the study is to analyze the correlation between the EAC and the management indicators established by the TCU. As specific objectives, the aim is to systematize the evolution of public policies aimed at professional and technological education over time and to highlight the importance of these policies for society, as well as to evaluate if the efficiency of the students, measured by EAC, are related to the level of financial management of the institution, through the analysis of the indicators expressed in the Management Reports of the institutions studied.

The present study brings, in addition to this introduction, a theoretical basis, in the subheadings: Public Policies in Federal Education - The expansion of the Federal Network of Professional, Scientific and Technological Education; Performance indicators; TCU indicators for evaluation of the Federal Institutes and Academic Efficiency Rate, followed by the Methodology item that records the procedures adopted in the accomplishment of the work. The Data Analysis section presents the result of the analysis of the data collected in comparison to the established parameters and to what was defined in the literature or the specific standard. Finally, the Conclusion will bring the final considerations.

PUBLIC POLICIES IN FEDERAL EDUCATION - THE EXPANSION OF THE FEDERAL NETWORK OF PROFESSIONAL, SCIENTIFIC AND TECHNOLOGICAL EDUCATION

Brazilian society is characterized by its diversity as to gender, age, ethnicity, religion, values, ideals, incomes, professions, etc. The interests are as different as possible and, since resources are scarce to meet all citizens, it is up to the public managers to manage them to meet their expectations. These social demands, which have historically been institutionalized and recognized as rights, are the basis for the construction of public policies (MARTINS, 2010).

Public policy, as defined by Souza (2006, p. 20), is "a field of knowledge that seeks at the same time to" put the government into action "and / or to analyze this action (independent variable) and, when necessary , propose changes in the course or course of these actions (dependent variable), "however, as important as discussing a definition, is to examine the repercussion of these governmental actions on society.

The institution of educational public policies, as state action in social relations, is understood as a public social policy. These, according to Höfling (2001, p. 31), are

those "geared towards the redistribution of social benefits aimed at reducing the structural inequalities produced by socio-economic development." The public policy perspective in the creation of federal institutes in 2008 has significantly broadened this concept, that is, it is not enough to guarantee that it is public because it is linked to the budget and resources of public origin, it is essential, above all, (social, economic, geographical, cultural, etc.); and, on the other hand, it is necessary to make a commitment to the social whole as a basis for equality in diversity. and to be articulated with other policies (of work and income, of sectoral, environmental, social and even educational development) in order to provoke impacts in this universe (MEC, 2010). In this sense, it is worth analyzing the expansion of the Federal Network of Technical and Technological Education, which took place from the first decade of the 21st century, under the aegis of what was proposed at the time and its reach in a decade.

From 1909 to 2002, 140 technical schools were built in the country. Meanwhile, between 2003 and 2016, the Ministry of Education (MEC) completed the construction of more than 500 new units related to the professional education expansion plan, totaling 644 campuses in operation, from 119 to 568 municipalities served by the Federal Education Network Professional, Scientific and Technological (MEC, 2018). After the expansion, the North region, which has a percentage of 8.3% of the Brazilian population, now has 9.1% of campuses. The Northeast region, which has 27.8% of the Brazilian population, now has 33.6% of the campuses; the Central-West region, which has 7.4% of the population, reached 11.1% of campuses; the Southeast region, which has 42.1% of the population, reached 25.3% of the number of campuses; and the South region, which has 14.4% of the Brazilian population, reached 20.7% of the Federal Network campuses (SILVA & SILVA, 2016).

In fact, the expansion of professional and technological education has been integrated into the public agenda by providing for the presence of the State in the consolidation of educational policies in the field of schooling and professionalization, thus assuming the ideology of education as a right and the affirmation of a project which supported social emancipation and consequent local and regional development, with the improvement of the standard of living of the population (MEC, 2010).

As regards the public policy character, Souza et al (2016, p.19) explain that the Federal Institutes "assume the role of collaborating agents in the structuring of public policies for the region that polarize, establishing a more direct interaction with the public authorities and local communities". This statement corroborates the understanding provided by Brazilian law that states that the State has responsibility for guaranteeing access to education, placing it as a duty of the State and a right of all

aimed at the full development of the person, his preparation for the exercise of citizenship and its qualification for work (BRASIL, 1988).

Figure 1. Spatialization of the Federal Network 2005 x 2015
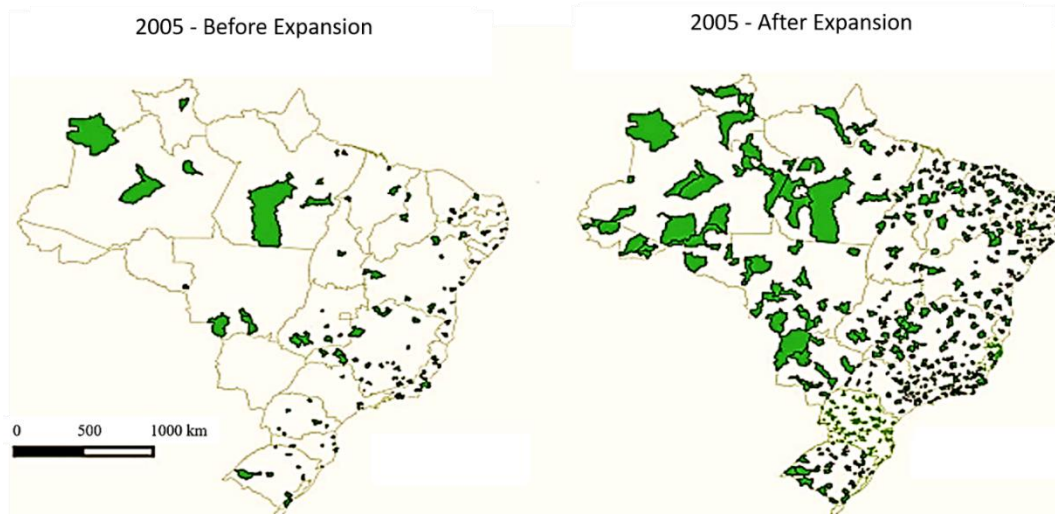
Source: Silva & Silva, 2016

It is important to note, however, that the strengthening of the Federal Network of Technical and Technological Education occurred at a time when the Brazilian economy was booming. It is also possible to relate the increase in the capacity of the Brazilian productive sector foreseen in the Pluriannual Plan 2000-2003 (PPA) with proposals that reflect a broader coverage of the Brazilian education as a whole, with emphasis on professional education and technological development (LIMA, 2013). Also, this advance in federal education occurred concurrently with the stabilization of the management model of Public Administration in the country and the performance of a State that, in search of better results, began to employ techniques of planning, monitoring and evaluation of actions.

All the efforts dedicated to promoting improvements in the quality of education offered by the Ifes could be observed through the gradual advances in their indicators that demonstrate greater investment in the permanence and student effectiveness in national and international examinations of knowledge, such as the results of the International Student Assessment Program (Pisa), conducted in 2015 in 70 countries, and coordinated by the Organization for Economic Cooperation and Development (OECD), according to Figure 2, which shows that the students of the Federal Network had a result higher than the Brazilian average, the state, municipal and private networks, and, except in Mathematics, the average of the OECD countries. The objective of this program is precisely to produce indicators that contribute to the discussion

of the quality of education in the participating countries. Using their results as a working tool in the definition and refining of educational policies, the governments of the countries involved can make more effective the training of young people for the future life and active participation in society (INEP, 2016).

Figure 2. Federal Network Performance in PISA

Science	Reading	Mathematics
•**Average of OECD countries:** 493 points •**Average of Brazil:** 401 points •**Brazil – Federal Network:** 517 points •**Brazil – Private System:** 487 points •**Brazil – State network:** 394 points •**Brasil – Municipal Network:** 329 points	•**Average of OECD countries:** 493 points •**Average of Brazil:** 407 points •**Brazil – Federal Network:** 528 points •**Brazil – Private System:** 493 points •**Brazil – State Network:** 402 points •**Brasil – Municipal Network:** 325 points	•**Average of OECD countries:** 490 points •**Average of Brazil:** 377 points •**Brazil – Federal Network:** 488 points •**Brazil – Private System:** 463 points •**Brazil – State Network:** 369 points •**Brasil – Municipal Network:** 311 points

Source: Pisa/Inep, 2016

In spite of the evolution, the rate of failure and abandonment of students in the Federal Network still remains significant, as can be seen in the data published annually by the National Institute of Educational Studies and Research Anísio Teixeira (Inep), according to Chart 1.

Chart 1. Disapproval and Abandonment in Schools of the Federal Network of the Northeast Region of Brazil between 2012 and 2016

State	Disapproval					Abandonment				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
MA	4,9	7,7	8,3	7,3	7,8	4,4	3,4	3,3	3,6	3
PI	11,1	13,75	8,3	10,2	11,3	4,95	1,6	2,45	5,65	3
CE	8,95	12	8,15	10,8	16	2,05	3	2,8	2	3,35
RN	1,05	9,8	12,7	10,95	10,55	1,5	1,3	1,2	1,25	1,65
PB	0,5	8,95	10,75	11,3	11,9	2,4	4,15	3,15	2,35	0,35
PE	23,2	16,45	16,25	15,7	15,75	1,6	2,65	1,9	1,75	3,4
AL	19,55	14,1	16,4	19,3	15,9	3,05	4,15	3,65	3,5	4,8
SE	35,3	7,3	10,4	5,05	2,25	5,9	2,95	1,3	6,25	13,2
BA	39,6	17,65	11,3	11,05	6,9	1,45	2,1	3,25	3,7	3,15

Source: Inep, 2017

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These vulnerabilities, however, do not reduce the merits of the expansion of federal education as a public policy. It is necessary to consider the social progress, provided by the implementation of professional training courses, which took place in all regions of Brazil.

Considering the importance of these governmental actions in the quest to improve the quality of Brazilian education and social development, and the high values invested, it was necessary to establish performance indicators that express the degree of achievement of the established goals and objectives (MEC, 2015).

PERFORMANCE INDICATORS

According to Cunha & Corrêa (2013), the conception of evaluating performance and productivity in organizations arose from positivist ideals, in a scientific revolution in which mathematics had served as a support for experimentation and validations of operational processes.

The identification of the results of actions through performance measures constitutes the axis of communication with society, which makes the key elements for the entire cycle of public policy management (MPOG, 2010). The measurement of performance through indicators constitutes a fundamental action to understand how the activities are being carried out, the results obtained, as well as to propose an analysis regarding the changes necessary to achieve better results. (SILVA, CURI FILHO, BRAGA, 2016). In this perspective, public institutions need to develop managerial processes that aid in the evaluation of their performance, counting on the performance indicators that are instruments capable of providing important information for the decision-making process.

The PPA is a document composed of programs, which bring together actions aimed at achieving a politically stated objective based on a problem, society's demand or taking advantage of an opportunity. Thus, the identification of the results of actions through performance measures constitutes the axis of communication with society and evidence of the evolution of the plan, which makes the indicators fundamental elements for the entire cycle of public policy management (MPOG, 2010).

As in the PPA, the National Education Plan (PNE) and the Term of Agreement of Targets and Commitments (TAM) in the MEC are fundamental elements of the definition of government commitments with the evolution and increase of the quality of Brazilian education. The monitoring of education actions in these programs, using in-

dicators, is fundamental to ensure that the actions and activities that are being developed towards fulfilling these commitments are really having the desired effect (MEC, 2016).

Performance indicators are management tools that provide information essential to the decision-making process and should be easily measurable, presented in accessible language and serve different decision-making hierarchies. For Petri (2005, p.39), managers should "look for ways to measure and evaluate efficiency, effectiveness, effectiveness, quality, productivity, innovation, profitability and other characteristics." Therefore, the indicators are used as qualified and/or quantified parameters that serve to detail the extent to which the objectives of a project have been achieved.

In public institutions, managers' actions must prioritize the public interest, since the use of public resources must be carried out transparently for society. Thus, the State must provide society with information on the financial results and the quality of the services provided.

Thus, the TCU indicators raised in this article aim to establish academic indicators that express the improvement of efficiency and effectiveness of federal institutions of professional education, specifically, an analysis of the relationship between student performance and investments in Ifes of the Region Northeast of Brazil.

TCU INDICATORS FOR EVALUATION OF FEDERAL INSTITUTES

As established in CF/88, the TCU is an external control body of the federal government that assists the National Congress to monitor the budgetary and financial execution of the country, contributing to the improvement of Public Administration for the benefit of society. This monitoring is usually performed through audits that result in judgments with information, evaluations and determinations.

Judgment No. 2.267/2005 - TCU/Plenary, resulting from the audit carried out in the Professional Education Program, by the Secretariat of Professional and Technological Education and the Federal Institutions of Technological Education, as a determinant the need to integrate indicators into the accounts of educational institutions, through the Annual Management Reports. The Judgment emphasized the need to collect data for the production of the indicators, electronically, for all the institutions of the network and to stimulate the collection of socioeconomic data of all students for the calculation of the indicator of income per capita of the students enrolled.

Subsequently, Judgment nº 2.508/2011 - TCU - 1ª Chamber, draws attention to the need to seek the evaluation of the institution as a whole, no longer through case studies, since federal institutes had already been created and Setec/MEC would need

to monitor the efficiency and effectiveness of program actions. These are those listed in Table 2.

Thus, the indicators indicated in Judgments No. 2.267/2005 - TCU/Plenary and No. 2.508/2011 - TCU - 1st Chamber, seek to allow the monitoring of the efficiency and effectiveness of the actions of the programs destined to Ifes. Therefore, the method of extraction and calculation of the indicators must be standardized in order to guarantee consistency and homogeneity among all Federal Network institutions.

To standardize the generation of indicators, since 2012 MEC has centralized the extraction of data and the construction of tables with the indicators, which are sent to the Federal Network Institutions. In this way, the indicator reports are generated in a standardized and automated way, by the centralized extraction of the MEC - from the raw data of the official registration systems, people management and financial movement - and later validated with the institutions themselves.

Table 2. Performance Indicators of the Ifes proposed by the TCU

Indicator	Description
Ratio of Vacant Candidate (RCV)	This indicator measures the consonance between the supply of vacancies in relation to the demand of the public.
List of Matched Ticket Entries (RIM)	This indicator measures the renewal capacity of the student body.
List of Students by Registration Attended (RCM)	This indicator measures the ability to achieve school success.
Graduates Efficiency of Students (EAC)	This indicator measures the ability to achieve success among students who complete.
School Flow Retention (RFE)	This indicator measures the ratio of students who do not complete their courses in the expected period.
List of Students by Full Time Teachers (RAD)	This indicator measures the capacity of attendance by the teaching workforce.
Teacher's Qualifications (TCD)	This indicator measures the refresh rate of teachers.
Current Expense per Student (GCA)	This indicator measures the average cost of each student of the Institution.
Workers Expenses (GCP)	This indicator measures the expenses with workers in relation to the total expenses of the Institution.
Expenses with Other Costs (GOC)	Este indicador mede os gastos com outros custeios em relação aos gastos totais da Instituição.
Investment Expenses (GCI)	This indicator measures investment spending in relation to the institution's total expenditures.

Source: TCU, 2005

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GRADUATES EFFICIENCY RATE

In addressing academic efficiency measures, Cavalcante (2011, 24) defines efficiency as "the ability of institutional management to turn available resources into results, optimizing cost-effectiveness." The author still delimits two attributes to qualify education: value and merit. Being valuable the use of resources to meet the stakeholders and merit the good fulfillment of what they propose to do (CAVALCANTE, 2011).

The Indicator Graduates Efficiency Rate (EAC), established in Judgment No. 2.267/2005-TCU/Plenary, measures the ability to achieve success among students who complete. The proposed calculation was to calculate this indicator by relating all the students who completed their course in the period, regardless of the time of their entry; and all those who "should have concluded" in this period.

Subsequently, to adapt to the methodology adopted by the National Information System of Professional and Technological Education (SISTEC), based on the concept of enrollment cycle, this indicator became the relationship between all the students who successfully completed their course in the period, independently of the time of your entry; and all those who, somehow, have finished their course, regardless of success or not.

As for the calculation methodology, all the registrations that had a change of status to Completed in the reference months of the analysis interval were considered for the records of the final students. Regarding the records of the completed, all the registrations that had a status change were considered for Completed, Dismissed or Transferred External in the reference months of the analysis interval.

This indicator is of great relevance since it expresses the result of all the investment in the federal network of education. It expresses the culmination of the work accomplished. If the student successfully completes, all the resources spent on him will return to society in the form of a fully formed citizen.

METHODOLOGY

In order to reach the objective of this work, that is, to analyze the relationship between the EAC and the management indicators established by the TCU, the methodology adopted in this article was developed in two parts.

First, an exploratory bibliographical research was developed in order to understand the reason for the existence of the Ifes, as a product of a public education policy, as well as the reasons that led the TCU to establish certain indicators for the

evaluation of these institutions. Subsequent documentary research was then carried out in the Management Reports of the institutions evaluated in this study. In this stage, the data referring to the management indicators recommended by the TCU were collected.

In this second stage of the research, of a quantitative nature, an analysis of data obtained directly from the published annual management reports was performed. These data were inserted in statistical treatment software to analyze the relationship between the EAC rate and the other indicators, in order to find some influence of the increase of the expenditures on the efficiency of the students.

The choice to analyze institutes in the same Brazilian region was intended to minimize the social and cultural impacts that could interfere with the indicators. In a universe of 39 institutions distributed across all regions of the country, most of them - a total of 11 schools - are in the Northeast region, and this was the first reason for the non-probabilistic choice of the sample. The second reason is because the region where the work was developed.

The indicators of the following institutions were analyzed: Federal Institute of Alagoas (Ifal), Federal Institute of Bahia (IFBA), Baiano Federal Institute (IFBaiano), Federal Institute of Ceará (IFCE), Federal Institute Federal of Maranhão (IFMA), Federal Institute of Paraíba (IFPB), Federal Institute of Pernambuco (IFPE), Federal Institute of Pernambucano Backwoods (IFSertão-PE), Federal Institute of Piauí (IFPI), Federal Institute of Rio Grande do Norte (IFRN) and Federal Institute of Sergipe (IFS).

Regarding the period, it was decided to analyze the years comprised from 2012 to 2016, since the expansion, object of this study, was already in the process of being implemented, as well as, the indicators had already been adopted by all institutions in their management reports in accordance with Judgment No. 2.508/2011 - TCU - 1ª Chamber.

ANALYSIS AND RESULTS

Taking into account the data provided by the management reports of the selected institutions as a sample, in the analyzed period from 2012 to 2016, it was possible to compare the current expenditure per student (GCA) in historical series.

Graph 1. Current expenditure per student (GCA) of the institutions analyzed in the period from 2012 to 2016
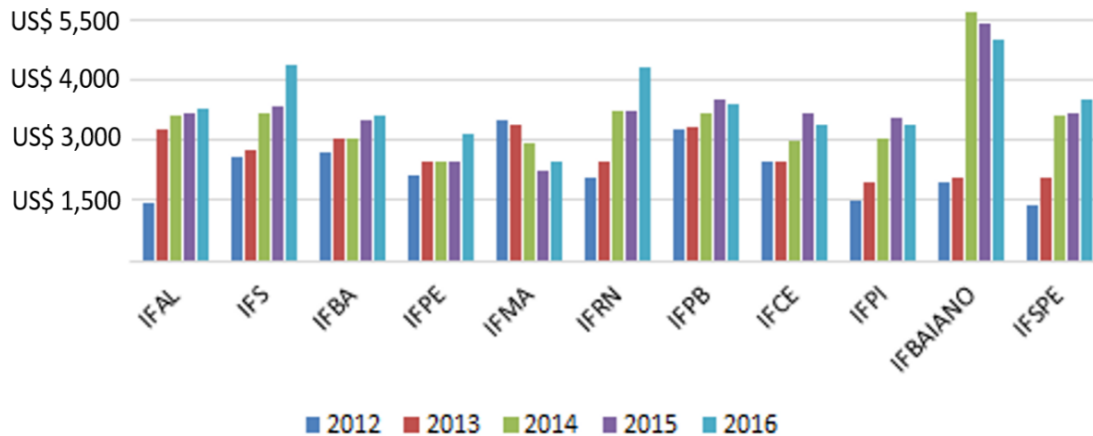
Thus, observing Graph 1, it is possible to understand that, besides having undergone several augmentative or diminutive variations, it is clear that there is no standardization of the values spent per student in the institutions. While IFPE spent an average of US$ 2,200 per student on average during the period, the IFBaiano spent an average of US$ 4,000 per student. This discrepancy, however, is not reflected in the EAC rate.

Graph 2. Relationship between the mean values of GCA and the CAE of the institutions analyzed in the period from 2012 to 2016
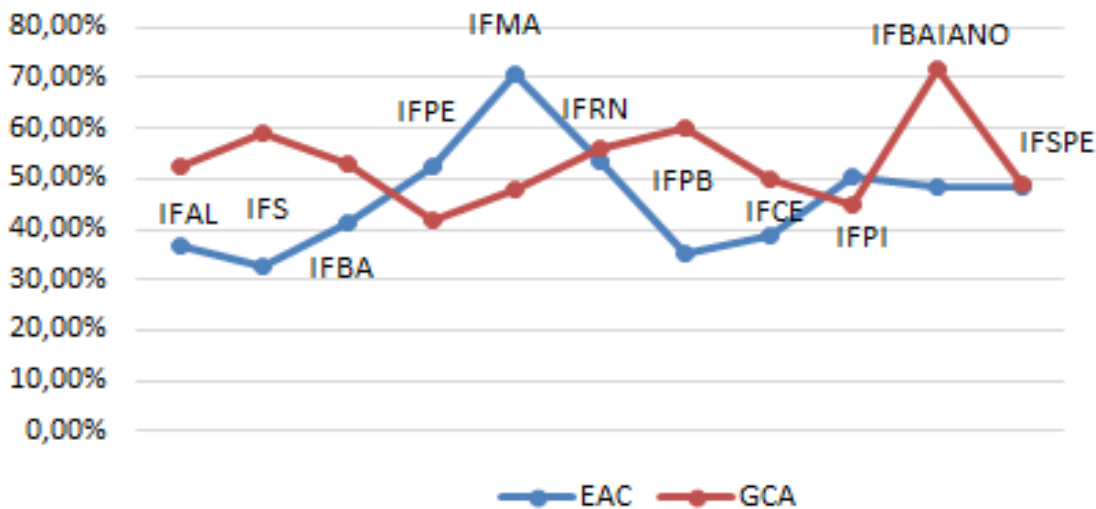
According to Chart 2, the mean of the highest EAC in the period - IFMA - does not correspond to the highest GCA average, which is the IFBaiano. The average EAC of the IFBaiano, inclusive, does not reach even 50%.

Establishing relationships among all indicators, it was possible to notice that even the average school flow retention index does not interfere with the EAC.

Graph 3. Relationship between the average retention, EAC and RCM of the institutions in the period from 2012 to 2016
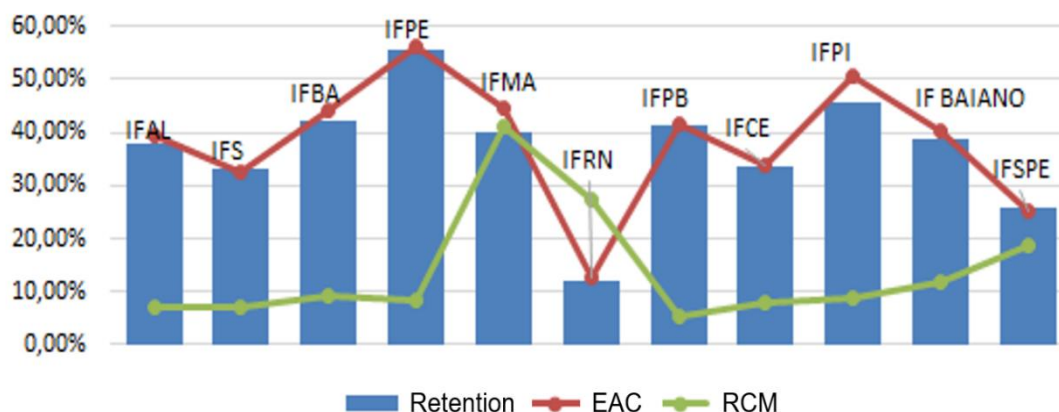
As the EAC measures the ability to achieve success among students who complete, a possible relationship would be that the greater the retention of school flow - which refers to the students who locked the course or were disapproved - the lower should be the EAC. However, by analyzing the data available in the management reports, this does not happen and the indexes behave independently.

In general, in the analyzed period, despite the investments and dedication to the expansion, there is maintenance of the EAC of the researched institutions. According to the data presented in Graph 4, in 2014 there was a better performance of the EAC, however, in 2015, there was an involution, being the worst mean EAC of the period analyzed.

Chart 4. Evolution of the EAC by institution in the period between 2012 and 2016
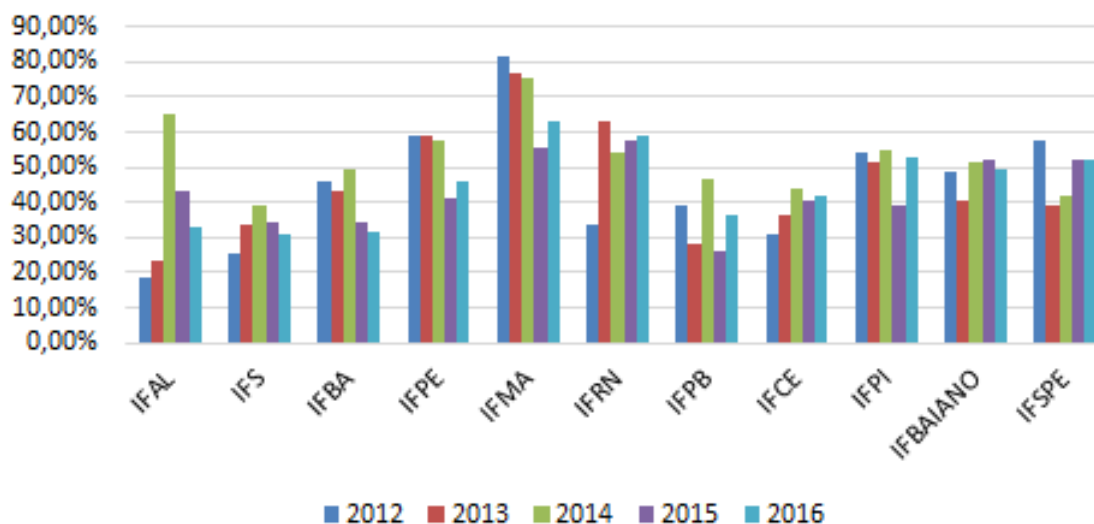
Although it is not initially possible to establish a direct relationship between management indicators, such as those related to student spending, investments, personnel and other expenses and the EAC, it is necessary to analyze the evolution of these indicators together with other information and data that do not were established by judgment and are not the subject of this study.

In order to analyze the correlation between the EAC and the management indicators established by the TCU, we conclude that there is no relationship between the efficiency of the students of the analyzed institutions and the management indicators proposed by the TCU. One possibility for this result is that the Court of Auditors was concerned with developing formulas to measure institutional performance, however, it overlooked socioeconomic and cultural aspects of the students.

The public policy of expansion of the Federal Network found in the first decade several historical challenges to establish itself in certain regions.

The culture of tolerance to out-of-school youth to occupy informal and seasonal work stations, as indicated in a survey by the Brazilian Institute of Geography and Statistics (IBGE), has the power to interfere in the results of the indicators proposed by the TCU. The Northeast region, analyzed in this article, is the one with the highest poverty index in the country, where 43.5% of the population fall into this situation (IBGE, 2017). According to the document Synthesis of Social Indicators 2017 (IBGE, 2017), all the great regions of the country experienced "an increase in the percentage of young people who did not study and were not employed between 2014 and 2016, but only in the Northeast the increase was greater than observed nationally".

The Ifes, with the possibility of bringing excellence in teaching, research and extension impacting this region, fulfills the role of structured intersectoral public policy to reduce social inequalities through a developmental education. However, for this to happen, the results need to be analyzed more realistically, considering the various aspects that influence indicators.

CONCLUSION

This research proposed to analyze if there is a relationship between the increase of government spending, after the establishment of the public policy of expansion of federal public education in the Ifes of the Northeast Region, between the years of 2012 and 2016, which has its execution measured by management indicators established in Judgment No. 2.508/2011 - TCU - 1st Chamber and the academic efficiency measured by indicator indicated in the same document.

After this analysis, from the information provided in the management reports of the institutions, the results show that the indicators are not related to each other, either presenting as directly or sometimes inversely proportional. One of the possible causes for this phenomenon is due to the sociocultural aspects neglected in the establishment of the indicators by the TCU that did not even consider the regional particularities where each institution is located and the public that attends.

To consider the Federal Network as a successful public policy in reaching regions of Brazil, which were not previously on the map of education, goes beyond analyzing relations between the students' conclusion and the amounts spent for it. Without daring to minimize the importance of monitoring the results of public institutions in order to assess their efficiency and effectiveness and to exercise the monitoring and control that are vital in the public policy cycle, it should be pointed out that EAC cannot be the only direct measure of student performance.

Especially after the expansion, the Ifes have achieved outstanding results in several national and international examinations, being always among the institutions best placed in the Enem ranking, and, surpassing, in PISA, the state and private teaching networks in Mathematics, Reading and Sciences, in addition to the excellent performance in olympiads of knowledge and in scientific research and initiation.

Thus, it should be emphasized that this article concentrated the analysis of the academic efficiency of the institutions established as a sample, only in relation to a limited group of indicators. This choice of scope was due to the scarcity of scientific production that deals with this theme. In time, it is suggested as a topic of future research a new research whose focus is the approach of socioeconomic and cultural aspects that impact on the result of the EAC.

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