FINANCING OF HIGHER EDUCATION: AN ANALYSIS OF THE IMPACT OF INVESTMENTS IN UNDERGRADUATE EDUCATION FOCUSING ON CURRENT EXPENDITURES PER STUDENT

FINANCIAMENTO DA EDUCAÇÃO SUPERIOR: UMA ANÁLISE SOBRE A REPERCUSSÃO DOS INVESTIMENTOS NA GRADUAÇÃO COM ABORDAGEM NOS GASTOS CORRENTES POR ALUNO

FINANCIAMIENTO DE LA EDUCACIÓN SUPERIOR: UN ANÁLISIS SOBRE EL IMPACTO DE LAS INVERSIONES EN LA EDUCACIÓN UNIVERSITARIA CON ENFOQUE EN LOS GASTOS CORRIENTES POR ALUMNO

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ABSTRACT: This exploratory qualitative study employed a content analysis of documents using the data cross-referencing technique from the Nilo Peçanha Platform, Management Reports, and Self-assessment. The main objective was to analyze the impact of budgetary resources allocation on undergraduate education at IFPB from 2017 to 2019. This analysis aims to provide relevant information for managers, the academic community, and society, seeking to understand the representation and trends of institutional funding in education. The study focused on evaluating the effects of investments in higher education undergraduate programs, with a specific focus on IFPB. The results highlighted funding patterns by course types, technological axis, and shift, revealing a progressive reduction trend in undergraduate investments, except for Distance Learning courses, especially those in Literature.

KEYWORDS: Current expenditures per student. Federal institutes. Investments in higher education. IFPB budget.

***RESUMO**: Este estudo exploratório de abordagem qualitativa foi conduzido por uma análise de conteúdo de documentos, utilizando a técnica de cruzamento de dados da Plataforma Nilo Peçanha, dos Relatórios Gerenciais e de Autoavaliação. O objetivo principal foi analisar a repercussão da aplicação dos recursos orçamentários na graduação no IFPB no triênio de 2017 a 2019. Tal análise visa proporcionar informações pertinentes a gestores, comunidade acadêmica e sociedade, buscando compreender a representatividade e as tendências do financiamento institucional na educação. O estudo concentrou-se na avaliação dos efeitos dos investimentos no ensino superior de graduação, com foco específico no IFPB. Os resultados destacaram padrões de financiamento por tipos de curso, eixo tecnológico e turno, revelando uma tendência de redução progressiva nos investimentos na graduação, exceto para os cursos de Ensino a Distância, especialmente os de Letras.*

***PALAVRAS-CHAVE**: Gastos correntes por aluno. Institutos federais. Investimentos no ensino superior. Orçamento do IFPB.*

***RESUMEN**: Este estudio exploratorio de enfoque cualitativo se llevó a cabo mediante un análisis de contenido de documentos, utilizando la técnica de cruce de datos de la Plataforma Nilo Peçanha, de los Informes de Gestión y de Autoevaluación. El objetivo principal fue analizar la repercusión de la aplicación de los recursos presupuestarios en la educación de pregrado en el IFPB en el trienio de 2017 a 2019. Dicha análisis busca proporcionar información relevante para los gestores, la comunidad académica y la sociedad, buscando comprender la representatividad y las tendencias del financiamiento institucional en la educación. El estudio se centró en la evaluación de los efectos de las inversiones en la educación superior de pregrado, con un enfoque específico en el IFPB. Los resultados destacaron patrones de financiamiento por tipos de curso, eje tecnológico y turno, revelando una tendencia de reducción progresiva en las inversiones en la educación de pregrado, excepto para los cursos de Educación a Distancia, especialmente los de Letras.*

***PALABRAS CLAVE**: Gastos corrientes por alumno. Institutos federales. Inversiones en educación superior. Presupuesto del IFPB.*

Introduction

After the implementation, in 2008, of Law No. 11,892 by the Ministry of Education (MEC), which created and expanded the Federal Institutes (IFs, in Portuguese, or FIs, in English), managers had the challenge of managing the budget allocated to each level of education in these institutions. This scenario includes higher education at the Federal Institute of Education, Science and Technology of Paraíba (IFPB), the focus of this research. Item III of article 6 of the aforementioned Law recommends that the purpose of IFs is to promote, through verticalization, integration from basic education to higher education, using the physical infrastructure, personnel and budgetary resources made available by the Ministry of Education to management units. However, this vertical flow has a negative impact on the extraction of data regarding the resources invested in each level of education, since the institutional budget of the FIs' administrative units does not distinguish between basic and higher education.

From the perspective of the public administration management model, as FIs expanded throughout Brazil, supervisory bodies adopted methodologies and procedures to measure the results achieved by these educational institutions. In this context, the Federal Audit Court (TCU) established, through Rulings No. 2,267/2005, that FIs include Performance Indicators (IDs), with critical assessments of their numbers and evolutions (Brasil, 2015), in management reports and annual financial statements.

In 2015, the Management Treasury (TG) emerged[3], a computerized program created with the purpose of preparing management reports registered and accounted for in the Federal Government's Financial Administration System (SIAFI). Its objective is to support managers in decision-making and support them in preparing annual financial statements and other institutional reports, enabling transparency in administrative acts and highlighting the results achieved and the quality of services made available to society.

However, even with the regulation undertaken by the TCU and the TG's potential in extracting budget information for the construction of reports, it is still not possible to separately quantify the resources allocated to the different levels of education at the IFPB, including higher education. Given this situation, this study sought to answer the following problem: How did the application of budgetary resources impact on graduation at IFPB in the three-year period from 2017 to 2019?

[3]This system is only available to employees of bodies linked to the federal public administration.

In order to address the question in question, the objective of this is: to analyze the repercussion of the application of budgetary resources on graduation at IFPB in the three-year period from 2017 to 2019.

This essay highlights the relevance of understanding how resources are distributed in higher education, with emphasis on the IFPB. By analyzing investment trends in university management, the research provides valuable reflections for managers, academics, and those responsible for formulating educational policies. In light of legislative and economic transformations, as well as the current demands of education, it is crucial to rethink resource allocation practices to promote quality education that is accessible to all. Thus, this study may contribute not only to understanding the challenges faced by IFPB, but also to improving the Brazilian educational system as a whole.

Given the previously exposed scenario, this research is based on the theories of Amaral (2003), Silva, Morgan and Costa (2004) and Magalhães, Silveira, Abrantes, Ferreira and Wakim (2010), which discuss topics related to education financing, using the Current Expenditure per Student (GCA) performance indicator, also recommended by the Judgment of the Court of Auditors no. 2,267/2005/Plenary.

FI performance indicators

In the search for administrative efficiency in government institutions, control bodies have developed, in recent years, evaluation criteria, with the aim of measuring the qualitative performance of each entity's management through institutional indicators. Studies by Bottani (1994) highlight that, in the educational structure, an indicator allows for the verification of both quantitative and qualitative information. Furthermore, it is capable of expressing a comprehensive vision of reality.

According to Amaral (2003), the parameters used to distribute the budget among Higher Education Institutions (HEIs) were established in Ministerial Ordinance No. 1,285/94. From that moment on, these parameters began to be based on mathematical criteria, using indicators with the purpose of determining performance and institutional needs based on the numbers found.

According to Amaral (2003), Reis, Oliveira, Silveira and Cunha (2017), in 1999, the aforementioned regulation underwent changes in the calculation methodology. With these changes, embodied in a format developed in England, teaching and research matrices began to

be applied. The first focuses on calculating the equivalent number of full-time studies linked to teaching. The second is based on the number of professors directly related to postgraduate studies and the performance of *stricto sensu programs* maintained by the Coordination for the Improvement of Higher Education Personnel (CAPES).

Within the scope of Brazilian infra-constitutional norms, the TCU, in its Decision No. 408/2002/Plenary, outlined two objectives regarding the direction for calculating management indicators: guiding universities in the standardized implementation of indicators; and define an action plan with the aim of improving them. However, it is worth highlighting that indicators, when isolated, do not allow definitive conclusions about the quality and performance of institutions. The purpose of these guidelines is to build a historical series to monitor the evolution of numbers, pointing out important issues in their performance.

Over time, the contact group responsible for this document, made up of technicians from the Audit Courts, the Federal Secretariat of Internal Control and Higher Education, has been updating these indicators, including the Current Cost per Student (CCA). Since the first version, it is clear that this group was already concerned with making the numbers of enrolled students equivalent, through mathematical calculations, at different teaching levels and modalities (Brazil, 2002).

Based on this decision applied to universities, the TCU made public Decision No. 2,267/2005/Plenary, with the aim of standardizing the extraction of data to be used by FIs, enabling the publication of numbers, supervision and the process of analysis of the federal education network (Brazil, 2015). In this sense, in search of improving educational services, expanding vacancies and improving the efficiency of Federal Higher Education Institutions, 12 (twelve) FIs were created based on the criteria of academic and administrative importance, with no degree of hierarchy between them, to carry out part of the accountability:

I – List of Candidates by Vacancies - RCV;

II – List of Tickets per Registration Serviced - RIM;

III – List of Graduates by Enrollment Completed – RCM;

IV - Academic Efficiency of Graduates – EAC;

V – School Flow Retention – RFE;

VI – Ratio of Students to Full-Time Teachers – RAD;

VII – Teaching Staff Title – TCD;

VIII – Current Expenditures per Student – GCA;

IX – Personnel Expenses – GCP;

X – Expenses with Other Costs – GOC;

XI – Investment Spending – GCI;

XII – Enrolled students classified according to per capita income – MRF.

It is essential that management, when creating accounts, carries out a critical analysis of each performance indicator, demonstrating the institutional, academic or technical reasons that justify the results that are out of line with the expected standard. Without this detailed verification, the indicators become ineffective and in disagreement with the guidelines established by the TCU Ruling, in addition to resulting in possible sanctions from this control body (Brasil, 2015).

Current Expenditure per Student (GCA) and Student Cost Indicators

Faced with the challenge faced by Brazilian educational management, researchers dedicated to the study of financing in education have been widely using Student Cost Indicators (CA) and Current Expenditures per Student (GCA). Its objective is to evaluate and improve school management in the face of administrative difficulties in certain territories, universities and education levels during specific periods.

Amaral (2002) highlights the importance of caution when using terminologies in research on educational financing and makes a distinction between “student cost” and “cost per student”. He clarifies that the latter refers to the financial effort applied to the student's training, while the first concerns the division of investments applied to the institution by the number of students.

Silva, Morgan and Costa (2004) state that information related to “student costs” can present important data about the resources used in specific bodies within universities, helping to make decisions for a more efficient allocation of available resources. Following this line of thought, Magalhães *et al*. (2010) show that, as it is a key factor for academic administration, it is essential that managers are aware of the "cost per student" in a higher education institution. This information makes it possible to demonstrate the budgetary expenditure of each department, avoiding waste and identifying both the academic potential and opportunities for expansion of each course offered.

Different terminologies, such as “student cost”, “current expenses per student”, “current cost per student” and “cost per student”, are used in studies published by authors such as

Oliveira, Silva and Barbosa Neto (2021), Amaral (2002; 2003), Silva, Morgan and Costa (2004) and Magalhães *et al.* (2010). Despite the existence of various terminologies, the central idea remains the same: measuring the capacity to invest or apply resources in an institution, with the aim of offering excellent teaching and supporting managers in decision-making.

The dialogue between the literature that deals with the "Current Expenditure per Student" indicator and the financial management of the IFPB meets a legal requirement imposed by the TCU and highlights the importance of fiscal responsibility and transparency in the allocation of public resources. This combination can be methodologically replicated in any higher education institution, standing out as an exemplary model of good practice. In this sense, it is notable that the concept of current expenditure per student underwent evolution until reaching its current configuration, as well as the associated methodology. In more recent investigations, this topic has been guided by the guidelines of control bodies using mathematical formulas. For this reason, the results tend to be directed towards interpretations of numbers and graphs, through qualitative critical analyses.

Notes on the Current Expenditures per Student Indicator Formula

Crepaldi and Diehl (2014) point out that performance indicators present data that generate crucial information about the organizational direction. For them to be truly useful, they need to help managers make decisions, so that they can be corrected or maintained within an institutional process.

In the educational assessment scenario, the Current Expenditure Per Student Indicator demonstrates the relationship between financial and academic data, which allows measuring the average cost of each student enrolled in the institution. In accordance with Ruling No. 2,267/2005-TCU, the mathematical demonstration of this indicator is established as follows: Current Expenditure per Student (GCA) = $\frac{\boldsymbol{GASTO\ TOTAL}}{\boldsymbol{MATRÍCULA\ EQUIVALENTE}}$. The numerator corresponds to the sum of the institution's total expenses, subtracting expenses with inactive staff and pensioners, investments, court orders, support for professional training and distance learning. The denominator, Equivalent Enrollment (ME), refers to all Enrolled Students (AM) who attended a given course for at least one day during the period covered, multiplied by the Course Effort Factor (FEC) and the Load Equalization Factor Hourly (FECH) (Brazil, 2018a; 2018b) Thus, the equation "A" is obtained*: ME = AM x FEC x FECH* .

To determine the Equivalent Registration (ME) number, it is essential to know the calculation method of the elements that compose it, that is, the FEC and the FECH. The FEC equalizes the workload of each course based on the number of practical classes that require a smaller relationship between student and teacher. The FECH, in turn, refers to the division of the course's annual workload by 800 (eight hundred) hours, as regulated by the pedagogical project and annual cycle of the course (Brasil, 2016a). In this way, $\boldsymbol{Matrícula\ Equivalente\ (ME) = \frac{AM\ x\ FEC\ X\ Carga\ Horária\ Anual\ do\ Curso}{800}}$.

The presentation of these formulas is intended to clarify to the reader the scientific origin of the academic data that underlies the numbers corresponding to the GCA, especially with regard to the ME calculations. Both the GCA and the ME are available on the Nilo Peçanha Platform and are of fundamental importance for understanding the methodology for calculating investment in graduation, which will be presented in the following subsection.

Method for calculating resources applied to graduation at IFPB

The vertical organizational and administrative structure of the Federal Institutes (IFs), established by Law No. 11,892/2008, allows the coexistence of students from different educational levels - from high school to postgraduate studies -, all using the same physical, personal and budgetary structure. This scenario presented managers with the challenge of understanding individually the values applied/invested at each level of education, especially at the IFPB graduation level.

Starting from this problem, through the mathematical principle of ratio and proportion applied to the Current Expenditures per Student (GCA) indicator, the Current Expenditures per Student are multiplied by the amount of the Equivalent Undergraduate Enrollment. This allows us to specifically reach the values applied/invested in graduation from the researched institution, as shown below:

$$Gastos\ Correntes\ por\ Aluno\ (GCA) = \frac{Gastos\ Totais}{Matrículas\ Equivalentes}$$

Detailing the elements that make up the formula above, we obtain the following equation:

$$Gastos\ Corrente\ por\ Aluno\ (GCA) = \frac{\begin{array}{c} Gastos\ no\ ensino\ médio \\ + \\ Gastos\ na\ Graduação \\ + \\ Gastos\ nas\ Pós{-}Graduações \end{array}}{\begin{array}{c} ME\ do\ Ensino\ Médio \\ + \\ ME\ da\ Graduação \\ + \\ ME\ das\ Pós{-}Graduações \end{array}}\text{; or}$$

$$GCA = \frac{Gastos\ no\ Ensino\ Médio}{ME\ do\ Ensino\ Médio} = \frac{Gastos\ na\ Graduação}{ME\ da\ Graduação} = \frac{Gastos\ nas\ PÓS}{ME\ das\ Pós}$$

From the exposition of the formula above and based on the mathematical principle of ratio and proportion of terms, it can be stated that: $GCA = \frac{Gastos\ na\ Graduação}{ME\ na\ Graduação}$ or $Gastos\ na\ Graduação = GCA\ x\ ME\ na\ Graduação$.

It is important to highlight that academic literature does not use the terminology "spending" when referring to education, preferring the term "**investments**". To be aligned with the authors mentioned above and improve understanding of the topic, this research will adopt the term "Investments" instead of "Expenses".

Therefore, for this study, the formula will henceforth have the following terms: "**Undergraduate Investments (IG)** = Current Expenditures per Student (GCA) x Equivalent Undergraduate Enrollment (MEG)". From this equation, it is possible to calculate the resources invested in graduation at IFPB and their repercussions on academic management during the three-year period from 2017 to 2019.

Methodological approach

The present study [4]employed an exploratory and descriptive research approach. This choice is justified by the fact that the relevant information on the topic was dispersed in institutional documents, and the desired result is the exposure of a social phenomenon (Gil, 2012). The methodology is qualitative, as it involves social events and does not use statistical instruments (Richardson, 2017).

To collect the information, the researchers used documentary content analysis, through the classification of categories related to IFPB's financial and academic information. Then, they applied the data crossing technique from primary and secondary sources extracted from Self-Assessment and Management reports and, mainly, from the Nilo Peçanha Platform (PNP). In

[4]This research is an excerpt from the dissertation defended in 2021 by author 1 and supervised by author 2.

this sense, the study was conducted based on two approaches. The first aimed to directly verify the availability of budget data. The second, in a complementary way to the previous one, had the purpose of prospecting academic information, both quantitative and qualitative, with the aim of identifying methodological arguments that could support the research.

Analysis of results

The results presented were based on academic and financial elements from official institutional systems and reports, accessible to the general public. As the data was refined, it became evident that the main academic and financial information for this study was available on the Nilo Peçanha Platform (PNP). The IFPB Management Reports and Self-Assessment contributed in a complementary way, mainly by providing qualitative information. The period shown in the tables of this study covers the three-year period from 2017 to 2019.

In order to exhaust the inflationary effect and bring past monetary values to a single point in time - the date of the research -, the Consumer Price Index (IPCA) was used, expressed in Brazil's currency, the Real (R$).

To begin this study, as shown in Table 1, the number of Equivalent Undergraduate Enrollments at IFPB in the period from 2017 to 2019 was determined.

Table 1 – Equivalent Undergraduate Enrollment at IFPB

Category	Period		
	Year 2017	**Year 2018**	**Year 2019**
Equivalent Undergraduate Enrollment (MEG)	14,540	16,114	17,078

Source: Prepared by the authors based on the Nilo Peçanha Platform

The numbers in Table 1 indicate a growth of 10.83% in 2018 compared to 2017. In 2019, this growth was 5.98% compared to the previous year. From an academic perspective, without taking into account the effort that the institution made with the available resources, the result was positive, as the numbers suggest that this growth may be related both to the increase in the number of students enrolled and, possibly, to the choice of courses more expensive or with a longer workload, since these variables directly interfere with the Equivalent Undergraduate Enrollment (MEG), as explained in the methodology.

Table 2 represents the financial effort that IFPB made to keep a student at the institution in the three-year period from 2017 to 2019, according to Current Expenditures per Student.

These data are essential to account for the amount invested in graduation and its repercussion within the context of academic management at IFPB.

Table 2 – Current Expenses per Student at IFPB

Categories	Period		
	Year 2017	**Year 2018**	**Year 2019**
Total Spend* (in R$)	574,544,857	596,747,177	611.856.221
Equivalent Registration (ME)	25,195	30,910	33,952
Current Expenses per Student*=> $\boldsymbol{GCA = \frac{GT}{ME}}$	**22,804**	**19,306**	**18,022**

*Values with two decimal places equal to or greater than 0.5 have been rounded to 1 (one) unit
Source: Prepared by the authors based on the Nilo Peçanha Platform

The financial effort that IFPB made to keep a student at the institution (Current Expenditures per Student – GCA) showed a reduction of R$3,498.00 in 2018 compared to 2017, and R$1,284.00 in 2019 compared to 2018, representing percentage decreases of -15.34% and -6.65%, respectively.

Analyzing the numbers mentioned, it is noted that the IFPB demonstrated efficiency in managing budgetary resources during this period, considering that GCA decreased while the number of Equivalent Enrollments increased. In other words, the institution managed to retain more students with fewer resources in 2019, proportionally to the ME numbers, compared to the previous two years. This suggests a possible budgetary bottleneck in other areas, which could negatively impact the quality of education.

To pursue the purpose of this research, it is necessary to know the amount invested in graduation at IFPB during the period in question, as evidenced in Table 3, constructed from data in Tables 1 and 2, using the formula: Investment in Graduation (IG) = Current Expenditure per Student (GCA) x Equivalent Undergraduate Enrollment (MEG).

Table 3 – Investment in graduation (IG) at IFPB

Category	Period		
	Year 2017	**Year 2018**	**Year 2019**
GCA*	22,804	19,306	18,022
MEG*	14,580	16,113	17,078
IG = GCA x MEG	**332,482,320**	**311,077,578**	**307,779,716**

* Values with two decimal places equal to or greater than 0.5 have been rounded to 1 (one) unit
Source: Prepared by the authors based on the Nilo Peçanha Platform

Analysis of Table 3 reveals that Investments in Undergraduate Studies (IG) suffered drops of 6.87% in 2018, and 8.03% in 2019 compared to 2017, due to decreases in Current Expenditures per Student (GCA) during the three-year period from 2017 to 2019.

Based on this logic, it is possible to analyze the repercussion of investments in IFPB graduation by multiplying the GCA by the Equivalent Enrollment in Graduation (MEG)[5], taking into account the course, type of course, technological axis and shift. This analysis can be seen in Tables 4 to 9.

Table 4 highlights the amounts invested in each type of course in proportion to the Equivalent Enrollment (ME) of each of them in the period from 2017 to 2019.

Table 4 – IG by type of course at IFPB

Types	Period					
	Year 2017	**%**	**Year 2018**	**%**	**Year 2019**	**%**
Technologist	199,968,276	60	182,866,432	59	168,956,250	55
Degree	78,901,840	24	79,096,682	25	83,658,124	27
Bachelor's degree	53,612,204	16	49,114,646	16	55,165,342	18
Total	**332,482,320**	**100**	**311,077,578**	**100**	**307,779,716**	**100**

Source: Prepared by the authors based on the Nilo Peçanha Platform

The first analysis that can be inferred from the numbers presented in Table 4 is that technology courses received the largest investments in the period, reflecting society's demand for shorter degrees to meet the needs of the job market. However, the representation of this type of course in relation to others decreased by one percentage point in 2018 and four points in 2019 compared to 2017, which had a negative impact on the total evolution of investment throughout this period.

[5] Available on the Nilo Peçanha Platform.

Contrary to the general reduction in investments in undergraduate courses at IFPB, undergraduate courses, despite representing less than a third of all resources applied, showed growth over the period, driven, in large part, by distance learning courses.

Investments in bachelor's degrees were the smallest among the three types in the three-year period. As for representation, they maintained stability in the first two years, with a small increase of two percentage points in 2019. However, in absolute values, there was a fluctuation during the period analyzed.

Table 5, in a more analytical way, highlights the repercussion of investments applied to bachelor's degrees between 2017 and 2019.

Table 5 – IG in bachelor's degrees at IFPB

Bachelor's Degree Courses	Period					
	Year 2017	%	Year 2018	%	Year 2019	%
Administration	23,442,512	44	20,850,480	42	21,374,092	39
Electrical Engineering	13,773,616	26	11,120,256	23	10,344,628	19
Civil Engineering	7,684,948	14	7,432,810	15	10,795,178	20
Veterinary Medicine	5,336,136	10	5,077,478	10	4,487,478	8
Computer Engineering	3,374,992	6	4,633,440	9	5,821,106	11
Control and Automation Engineering	-	-	-	-	1,567,914	3
Mechanical Engineering	-	-	-	-	774,946	1
Total	**53,612,204**	**100**	**49,114,464**	**100**	**55,165,342**	**100**

Source: Prepared by the authors based on the Nilo Peçanha Platform

According to the numbers in Table 5, the courses that received the largest investments were Administration and Electrical Engineering. However, its representation in relation to other courses has been decreasing, although the Administration course registered a small increase in absolute values in 2019, compared to the previous year. On the other hand, Civil Engineering and Computer Engineering courses, despite low investment, were the ones that grew the most. The Civil Engineering course, specifically, saw an increase of 45% in 2019 compared to 2018.

The Control and Automation Engineering and Mechanical Engineering courses, as they were implemented in 2019, the researchers did not make inferences about them.

Regarding investments applied to technology courses, Table 6 presents the resources contributed in the years 2017 to 2019.

Table 6 – IG in technology courses at IFPB

Technologist Courses	Period					
	Year 2017	%	Year 2018	%	Year 2019	%
Building Construction	41,754,124	21	39,268,404	21	29,556,080	17
Design Analysis of System	20,523,600	10	15,657,166	9	14,327,490	8
Industrial Automation	20,318,364	10	17,838,744	10	15,030,348	9
Telematics	12,747,436	6	12,857,796	7	10,344,628	6
Work Safety	12,565,004	6	10,541,076	6	9,173,198	5
Internet Systems	11,926,492	6	11,544,988	6	11,966,608	7
Computer Networks	11,721,256	6	10,946,502	6	10,957,376	6
Telecom System	10,809,096	5	10,830,666	6	11,588,146	7
Environmental Management	9,988,152	5	9,189,656	5	10,146,386	6
Graphic Design	9,965,348	5	9,575,776	5	9,840,012	6
Geoprocessing	7,730,556	4	7,065,996	4	6,505,942	4
Agroecology	7,525,320	4	7,123,914	4	7,839,570	5
Interior Design	7,411,300	4	6,621,958	4	6,866,382	4
Commercial Management	6,043,060	3	5,405,680	3	6,127,480	4
Real Estate Business	5,381,744	3	5,135,396	3	5,370,556	3
Food	3,534,620	2	3,262,714	2	3,316,048	2
Total	**199,945,472**	**100**	**182,866,432**	**100**	**168,956,250**	**100**

Source: Prepared by the authors based on the Nilo Peçanha Platform

When analyzing the performance of the resources applied to technological courses in the period researched, it can be seen, according to Table 6, that the Building Construction, Systems Development Analysis and Industrial Automation courses received more financial contributions in the three consecutive years. However, in absolute terms, All of these courses experienced resource losses in the order of 41.24%, 43.24 and 35.20%, respectively, in 2019 compared to 2017. These losses represent a setback in their maintenance, due to their high operating costs, according to the budget matrix validated by the MEC, harming the proper functioning of each of them in the context of academic administration.

Following the same approach as the previous tables, Table 7 expresses the amounts invested in undergraduate courses in the years 2017 to 2019.

Table 7 - IG in undergraduate courses at IFPB

Degree Courses	Period					
	Year 2017	(%)	Year 2018	(%)	Year 2019	(%)
Letters – Portuguese Language	38,401,936	49	39,886,196	50	43,090,602	52
Mathematics	13,363,144	17	12,587,512	16	13,912,984	17
Chemical	9,509,268	12	7,915,460	10	8,127,922	10
Computing	5,746,608	7	4,729,970	6	1,784,178	2
Physical	5,244,920	7	5,984,860	8	6,019,348	7
Biological Sciences	3,648,640	5	4,672,052	6	7,641,328	9
Physical education	3,010,128	4	3,320,632	4	3,081,762	4
Total	**78,924,644**	**100**	**79,096,682**	**100**	**83,658,124**	**100**

Source: Prepared by the authors based on the Nilo Peçanha Platform

The data from Table 7 reveals that the Literature – Portuguese language and Mathematics courses received the largest investments, with more than 60% of resources applied for three consecutive years. The continuous growth in investment for the Literature course stands out, while Mathematics fluctuated between losses and gains in resources applied throughout the period.

The numbers presented in Table 8 demonstrate the behavior and representativeness of the amount of resources applied to the different technological axes at IFPB in the years 2017 to 2019. This approach allows us to visualize the distribution of financial resources according to the organizational structure in the undergraduate courses at the unit.

Table 8 – IG by technological axis at IFPB

Technological Axis	Period					
	Year 2017	%	Year 2018	%	Year 2019	%
Educational and Social Development	78,901,840	24	79,115,988	25	83,658,124	27
Information and Communication	71,125,676	21	66,470,558	21	65,005,354	21
Infrastructure	57,146,824	17	53,747,904	17	46,839,178	15
Business Management	34,867,316	10	31,391,556	10	32,872,128	11
Control and Process. Industrial	34,114,784	10	28,978,306	9	27,717,836	9
Cult and Design Production	17,376,648	5	16,178,428	5	16,706,394	5
Natural Resources	12,861,456	4	12,201,392	4	12,345,070	4
Security	12,565,004	4	10,541,076	3	9,173,198	3
Environment and Health	9,988,152	3	9,189,656	3	10,146,386	3
Food Production	3,534,620	1	3,262,714	1	3,316,048	1
Total	**332,482,320**	100	**311,077,578**	100	**307,779,716**	100

Source: Prepared by the authors based on the Nilo Peçanha Platform

Taking the year 2017 as a reference, it is clear that the majority of Technological Axis recorded reductions in 2019, with the exception of the Educational Development Axis, which had an increase of 5.69%, and the Environment and Health Axis, with a small increase of 1.56% in 2019 compared to 2017. In a more comprehensive perspective, there was a general decrease in investments by Technological Axis of 8.03% in 2019 compared to 2017.

This analysis aims to determine the amount invested in undergraduate courses per shift at IFPB in the period from 2017 to 2019, in order to evaluate the financial effort made by the institution to maintain the operation of the courses in the different shifts, as shown in Table 9.

Table 9 – IG per shift at IFPB

Shift	Period					
	Year 2017	%	Year 2018	%	Year 2019	%
Nocturnal	109,071,532	33	103.229.182	33	91,750,002	30
Full Time	98,399,260	30	102,263,882	33	98,021,658	32
Does not apply	49,347,856	15	48,786,262	16	48,677,422	16
Morning	46,064,080	14	41,411,370	13	40,964,006	13
Evening	29,599,592	9	15,386,882	5	28,366,628	9
Total	**332,482,320**	100	**311,077,578**	100	**307,779,716**	100

Source: Prepared by the authors based on the Nilo Peçanha Platform

When examining Table 9, it is evident that the resources allocated to graduation per shift at IFPB are mostly directed to night and full-time shifts. During the period from 2017 to 2019, the night shift represented 33% in the first two years of the research and 30% in 2019, while the full shift had a participation of 30% in 2017, 33% in 2018 and 32% in 2019. Despite Furthermore, there is a tendency to reduce investments in evening courses in 2019 compared to 2017. On the other hand, full-time courses showed small fluctuations throughout the period, with a slight decrease in 2019, remaining slightly below the level of investment in 2017. As for morning courses, successive drops can be seen during the period, although this reduction was less pronounced in 2019 compared to 2018, indicating a certain stability in the application of resources in the last two years.

Final remarks

The changes introduced by item III of article 6 of the legislation that regulates Federal Institutes, especially with regard to integration between education levels, had a direct impact on the collection of institutional data. This generated significant challenges for managers in the individual calculation of invested resources, both in high school and in undergraduate studies at the Federal Institute of Paraíba (IFPB). The complexity arises from the sharing of infrastructure, such as classrooms, laboratories and administration, between high school and higher education students, from enrollment to the completion of their courses.

In this context, the importance of the variable "Equivalent Enrollments" stands out as a mechanism to equalize the different types of students, guaranteeing equitable treatment in the calculation of the "Current Expenditures per Student" indicator. Without this equalization, it would be impossible to make comparisons between students from different courses.

Based on this principle of equity, data analysis revealed a decrease in IFPB's Undergraduate Investments. This reduction occurred due to the drop in Student Cost Expenditure (GCA) (Table 3), influenced by the low growth in total investments in relation to the number of Equivalent Enrollments in the period studied (Table 2). According to the method used to calculate the Undergraduate Investment (IG) at IFPB, two directly proportional data are necessary, that is, for this indicator to grow, there must be an increase in both Current Expenditure per Student (GCA) and Enrollment Undergraduate equivalents (MEG) or at least one of them.

With regard to Investment in Undergraduate Studies (IG) by type of course at IFPB, technology courses were the recipients of the largest amount during the three-year period from 2017 to 2019, with emphasis on the Building Construction course. However, there was a decrease in allocations throughout the analyzed period, possibly due to the economic crisis and Constitutional Amendment 95/2016, which limited public spending, affecting civil construction in the state (Brasil, 2016b).

In the case of undergraduate courses, they received the second largest investment in the period, with constant growth, especially evidenced by the Literature - Portuguese Language course in 2019. This increase is directly related to the expansion of courses in the Distance Education modality (EaD), the permissibility of creation, the low maintenance cost and the legal requirements, which establish a minimum percentage of 20% of vacancies for undergraduate courses at IFPB.

Bachelor's degrees registered the lowest investment among the three types, with fluctuations throughout the period. The Administration course stood out in this category, due to the federal government's expansionist policy towards Federal Institutes in the interior of Brazil, including Paraíba. Furthermore, its implementation presents a favorable cost-benefit ratio, as it does not require substantial investments in laboratories.

With regard to financing by technological axis, the Educational and Social Development Axis stands out, consisting exclusively of undergraduate courses, with constant growth over the period studied. This increase is related to society's demand for Distance Learning courses and educational policies that aim to increase the supply of undergraduate courses, with the aim of reducing the gap in the Brazilian educational system.

In relation to Investment in Undergraduate Studies (IG) per shift, it is observed that evening and full-time courses absorbed more than 60% of the resources in the three-year period. These numbers indicate that evening courses are most sought after by students who work or intend to work during morning and afternoon shifts.

A qualitative analysis of institutional documents, especially the Management Report (RG), showed that the decrease in investments was aggravated by Constitutional Amendment No. 95, known as the Constitutional Amendment of the Public Spending Ceiling.

Therefore, it appears that the analysis of the results of this study sought to contribute to education financing policies in Federal Institutes, presenting possible guidelines for educational managers. From the data collected, several conclusions emerged, such as the differentiation between investments by type of course, technological axis, modality and shift, revealing the complexity of resource allocation and the strategic decisions that must be taken in relation to their distribution, the which must be aligned with the needs of the academic community and the job market. This scenario emphasizes the importance of governance mechanisms to ensure adequate resource distribution.

With regard to the creation of courses, these decisions directly interfere with institutional financial management, since each undergraduate course has, according to the current expenditure per student, a weight in the distribution of the budget slice retained by the ministerial bodies linked to the Ministry of Education. Regarding society's demand, the market is a determining factor that can influence the decision-making of an educational institution. It is he who defines the lack of labor in a given region, causing society to seek, together with these institutions, the necessary qualifications to meet these demands at specific times. Therefore, the manager must be attentive to technological and social changes, anticipating the market and

making decisions that enable the creation of courses that meet both the needs of society and the market, supplying it with qualified labor in a timely and efficient.

Regarding the reflections provided by the analysis of investments in graduation, these are fundamental to guide educational managers in their strategic decisions. With a deeper understanding of the impact of investments in academic-financial management, managers can improve budget planning, optimize resource allocation and respond more quickly to changes in educational demands and the socioeconomic context. Therefore, this essay offers an empirical basis for the debate on higher education financing policies, with the potential to serve as a reference for other federal institutions. IFPB's findings can significantly contribute to the development of more efficient and equitable education financing strategies.

In short, the study conducted at IFPB expands the understanding of financing dynamics in Federal Institutes, providing substantial evidence for the review and formulation of more solid public policies in higher education. This critical and thorough analysis enriches the literature on educational management, offering valuable guidance to educational managers in the search for excellent, accessible and sustainable higher education.

Finally, it is important to highlight that this research does not intend to exhaust all possible analyzes on investment in graduation at IFPB. It represents only an embryonic study that can stimulate future academic studies and in-depth studies on the topic, especially with regard to the parameters "Current Expenditure per Student" and "Equivalent Enrollment", used to determine these values. Ultimately, it is believed that the results obtained here were satisfactory and achieved the proposed objectives.

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