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### Constitutional Amendment 95/2016 and its impact on a federal university

### La Enmienda Constitucional n.º 95/2016 y su impacto en una universidad federal

### Emenda Constitucional n.º 95/2016 e seu impacto em uma universidade federal

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### Abstract

**Purpose:** To evaluate the effects of Constitutional Amendment 95/2016 on the budget of the University of Brasília in the period from 1995 to 2017, based on an econometric model for forecasting expenditure, using a hypothetical scenario and a retrospective approach.

**Methodology:** Based on bibliographic and documentary research, statistical multiple linear regression modeling by the ordinary least squares method was used as a tool to measure and identify the possible effects of the Amendment on the University of Brasília's budget.

**Results:** The constructed area, the length of stay of students, and the total number of employees were identified as the variables that have the greatest impact on the forecast of the University's expenditure. These variables are statistically significant and positively related to the dependent variable "expenses paid". When considering the historical scenario of UnB, especially with regard to the government policies adopted in the period analyzed, there were insufficient resources for maintaining the University's main activities, which are widely recognized as the teaching, research and extension course tripod. This lack of resources was not a situation specific to UnB; it affected all federal institutions of higher education (*IFES*), and was linked to the period analyzed, during the time Constitutional Amendment [CA] 95/2016 was hypothetically valid in relation to the budget of the University of Brasília, from 1995 to 2017.

**Contributions of the study:** This study seeks to help expand the literature dealing with the management of public entities, specifically universities. By putting forward the respective variables, we enable future managers to measure the impact of the Constitutional Amendment in its historical context. These scenarios will enable adequate planning and decision making for expanding or reducing the supply of public services depending on the resources available.

**Keywords:** Constitutional Amendment 95/2016; Budget; Federal Higher Education Institutions [*IFES*]; University of Brasília; UnB.

### Resumen

**Objetivo:** Evaluar, en un escenario hipotético y mediante un enfoque retrospectivo, en el período de 1995 a 2017, los efectos de la Enmienda Constitucional No. 95/2016 sobre el presupuesto de la Universidad de Brasília, con base en un modelo econométrico para previsión de gastos pagados.

**Metodología:** Se utilizó la modelación estadística de regresión lineal múltiple por el método de mínimos cuadrados ordinarios como herramienta para el abordaje cuantitativo de medición e identificación de los posibles efectos de la Enmienda sobre el presupuesto de la UnB, anclado en la investigación bibliográfica y documental.

**Resultados:** Se identificaron el área urbanizada, la estancia de los estudiantes y el número total de empleados como las variables con mayor impacto en la previsión del gasto pagado de la Universidad. Dichas variables son estadísticamente significativas y se relacionaron

positivamente con la variable dependiente gasto pagado. Al considerar el escenario histórico de la UnB, especialmente en lo que respecta a las políticas de gobierno adoptadas en el período analizado, se destacó la insuficiencia de recursos para el mantenimiento de sus principales actividades, ampliamente reconocida como el trípode de docencia, investigación y extensión. Esta falta de recursos no fue considerada como una situación específica de la UnB, ya que se relaciona con todas las instituciones federales de educación superior (IFES), y se vinculó al período bajo análisis, bajo la hipotética vigencia de la Enmienda Constitucional No. 95/2016. en el presupuesto de la Universidad de Brasilia, de 1995 a 2017.

**Contribuciones del estudio:** Este estudio busca contribuir a la expansión de la literatura que se ocupa de la gestión de las entidades públicas, específicamente las universidades. Al proponer las respectivas variables, permitimos a los futuros gerentes medir el impacto de la Enmienda Constitucional desde su contexto histórico. Estos escenarios producidos permitirán una adecuada planificación y toma de decisiones para ampliar o reducir la oferta de servicios públicos en función de los recursos disponibles.

**Palabras clave:** Enmienda Constitucional No. 95/2016; Presupuesto; Instituciones Federales de Educación Superior; Universidad de Brasilia; UnB.

### Resumo

**Objetivo:** Avaliar, em um cenário hipotético e por meio de abordagem retrospectiva, no período de 1995 a 2017, os efeitos da Emenda Constitucional n.º 95/2016 sobre o orçamento da Universidade de Brasília, a partir de um modelo econométrico de previsão de despesa paga.

**Metodologia:** Utilizou-se a modelagem estatística de regressão linear múltipla pelo método dos mínimos quadrados ordinários como ferramenta para a abordagem quantitativa de mensuração e identificação dos possíveis efeitos da Emenda sobre o orçamento da UnB, ancorada em pesquisa bibliográfica e documental.

**Resultados:** Área construída, permanência dos alunos e quantidade total de servidores foram identificadas como as variáveis de maior impacto na previsão de despesa paga da Universidade. Tais variáveis são estatisticamente significativas e se relacionaram positivamente com a variável dependente despesa paga. Ao se considerar o cenário histórico da UnB, especialmente quanto às políticas de governo adotadas no período analisado, destacou-se a insuficiência de recursos para a manutenção de suas atividades-fim, reconhecidas largamente como o tripé ensino, pesquisa e extensão. Essa insuficiência de recursos não foi considerada como uma situação específica da UnB, por estar relacionada a todas as instituições federais de ensino superior (IFES), e foi vinculada ao período analisado, sob a hipotética vigência da Emenda Constitucional n.º 95/2016 sobre o orçamento da Universidade de Brasília, no período de 1995 a 2017.

**Contribuições do Estudo:** Esse estudo procura contribuir para ampliação da literatura que versa sobre gestão de entidades públicas, especificamente as universidades. Ao propor as respectivas variáveis possibilitamos aos futuros gestores mensurar o impacto da Emenda Constitucional a partir do seu contexto histórico. Esses cenários produzidos possibilitarão o planejamento e a tomada de decisão adequados para ampliação ou redução na oferta de serviços públicos em função dos recursos disponíveis.

**Palavras-chave:** Emenda Constitucional n.º 95/2016; Orçamento; Instituições Federais de Ensino Superior; Universidade de Brasília; UnB.

## 1 Introduction

Brazilian fiscal policies have undergone a series of changes in recent years. Since 1997, Brazil had mainly had primary surpluses (Nascimento, 2018), which, when applied to consecutive years, helped control the evolution of the public debt, despite the increase in spending (Saraiva *et al.*, 2017).

From another perspective, the generation of these primary surpluses was an important element of macroeconomic policy, since they ensured that part of the economic surplus was earmarked for paying the interest on public debt (Pires, 2010).

Over time, however, Brazil's primary surpluses gradually reduced, and little by little the country lost the ability to offset the effect of nominal interest on the fiscal result (Saraiva *et al.*, 2017).

The primary surplus dropped to 2.2% of Gross Domestic Product (GDP) in 2012, and to 1.8% in 2013. In 2014 it inverted and became a primary deficit of 0.6 % of GDP, a situation that had not been seen in the country's public accounts since 1997 (Giambiagi & Além, 2016). Successive primary deficits between 2014 and 2016 characterize a lack of control in government accounts (Maciel, 2017).

According to Giambiagi & Além (2016), Brazil's nominal deficit rose from around 5% of GDP in 2003, to an average of 3% of GDP in 2007. In 2010 and 2011, there was a relative fiscal improvement, marked by an increase in the consolidated primary surplus of just under 0.5% of GDP, which was not significant given the fiscal crisis that already existed.

In 2016, the Proposal for Amending the Constitution (*PEC*) No. 241/55 was drafted, which resulted in Constitutional Amendment 95/2016 being passed, the objective being to control the expenses and deficit of the federal government. Its purpose was to contain the evolution of the debt/GDP ratio, reduce the instability generated in the Brazilian economy because of the deterioration in its public accounts, and institute the New Fiscal Regime (Saraiva *et al.*, 2017).

Constitutional Amendment 95/2016, known as the Spending Ceiling Amendment, established a maximum limit for the Federal Government's primary expenditures for a period of 20 financial years. This measure applied to the Executive, Legislative and Judiciary Branches and the functions that were essential to justice (Federal Prosecution Service, National Council of the Prosecution Service, and the Federal Public Defender's Office).

In this scenario, there are the federal institutions of higher education (*IFES*), among which is the object of this study, the University of Brasília (UnB), which is linked to the Ministry of Education and, therefore, part of the Executive Branch.

UnB was inaugurated in 1962, and following successive expansions, it now has three more campuses, in addition to the one it opened initially. It also has structures such as the Água Limpa Farm (*FAL*) and the University Hospital of Brasília (*HUB*), which are financed almost exclusively with federal funds.

According to Vilella (2017), in the context in which universities operate they seek to obtain resources that allow them to enjoy the autonomy necessary for carrying out their functions of generating and transmitting knowledge. For this author, the expenditure must be both effective (it performs a certain function) and, above all, efficient (it performs a certain function in the most rational way and at the lowest possible cost).

Considering the Brazilian fiscal scenario of successive deficits, the history of UnB and its form of funding, responses are sought to the following questions: **Over twenty-two years, between 1995 and 2017, which elements contributed to the evolution of the expenditure? Because of the budget ceiling, what is the expected budget scenario for future administrations?**

The objective of this study, therefore, is to analyze those elements that contributed to the evolution of the expenditure and the possible budget scenarios based on Constitutional Amendment 95/2017, which limited the spending ceiling in the budget of the University of Brasília. For this purpose, statistical modeling employing multiple linear regression was used to identify which expense elements are statistically significant in relation to expenditures in the interval between 1995 and 2017.

This investigation is justified in view of the current political-economic situation that *IFES* find themselves in: budgetary strangulation caused by the constitutional ceiling and amplified by the accounting, economic, financial, social and cultural effects resulting from the emergence and exacerbation of the Covid-19 pandemic.

According to Villela (2017), higher education institutions (especially public ones) are particularly affected by the recession and systematic cuts coming from the federal government and various other federal bodies.

For Santos (2013), Brazilian federal public universities not only lack sustainable funding policies that fully meet the demands of society, they mainly lack resources for expanding their activities at the regional and national levels.

This research is important, therefore, because it shows the variables that affect the expenses associated with a public federal university, and also tries to contribute to public management by indicating the expenditure elements that lack specific public policies that enable them to be managed efficiently, which is the perspective under which the present work was developed.

This study is divided into five sections, in addition to this introduction. The second section gives the literature review, the third presents the methodology used to achieve the proposed objective, while the fourth and fifth sections address the model and provide the analysis of the results obtained. Finally, the concluding considerations of this study are presented.

## 2 Literature review

### 2.1 The economic and fiscal policies of the Federal Government – 1995 to 2002

During the administration from 1995 to 2002, a series of reforms of the State apparatus was undertaken, which aimed to continue the Real Plan that started in 1994, with the main aim of controlling inflation. The diagnosis at the time was that the origin of Brazilian inflation lay in the lack of control over public spending and, therefore, it was necessary to cut spending and reduce the size of the State (Pires, 2010).

Among the initial measures adopted, in addition to a budget cut of six billion dollars, were a bill that was submitted to the National Congress that limited expenditure on civil servants to 60% of the current revenue of the federal government, the states and the municipalities, and the drafting of a project of what would become known as the Fiscal Responsibility Law (*LRF*) (Pires, 2010).

The actions implemented in this period were not limited to economic policy aimed at controlling inflation, since market-oriented reforms and adherence to neoliberally-inspired policies were also implemented, especially changes in the role of the State in the economy and a greater opening up of the economy to foreign influence/involvement (Belieiro Junior, 2016). Santos (2013), likewise, emphasizes that during the eight years they lasted (1995 to 2002), economic measures were implemented that were aimed at internationalizing the economy, privatizing state-owned companies, deregulating markets and controlling expenditure.

According to Belieiro Junior (2016), the privatization of state companies in the production infrastructure sector, which made it easy for foreign capital to enter and exposed the Brazilian economy more to the outside world and the dynamics of global markets, constituted the central pillar of the reform project of that government. For Pires (2010), however, inflation was controlled and monetary stability achieved to the detriment of other important macroeconomic targets, such as the growth rate, the level of employment, and income distribution.

In the context of *IFES*, Santos (2013) also explains that the policy of that period resulted in a reduction in federal government funding and a loss of teachers and technical and administrative staff, combined with a levelling out of salaries and budget limits in *IFES*. There was also criticism of the inefficiency of public universities and their inadequacy in relation to the labor market (Santos, 2013).

## 2.2 The economic and fiscal policies of the Federal Government – 2003 to 2010

The characteristics of the 2003–2010 government were the continuity of the effort for economic stability, a recovery in economic growth and a reduction in social inequality and poverty. According to Pires (2010), the election of the president in 2002 was largely due to the population's disenchantment with the results of the neoliberal economic policy that had been implemented in the previous government, the most evident results of which were low growth rates and high unemployment. For the author, important measures were taken to strengthen the structure of the State during that government.

Gremaud *et al.* (2017) argue that the consolidation of stabilization with improvements in the fiscal situation and especially in the external situation, but still with relatively low growth rates, were the main characteristics of that government's first term in office. The second term (2007 to 2010) of the then president, on the other hand, was characterized by higher economic growth rates, except in 2009 because of the severe global economic crisis (Gremaud *et al.*, 2017).

Pires (2010) explains that the performance of the Brazilian economy in the period was more favorable than in the previous government, at least in its most relevant aspects. He stresses, however, that this improvement was largely due to a favorable international situation until mid-2008, since there were no significant changes in economic policy between this government and the previous government (Pires, 2010).

A great effort was also made in public policies to increase investment in infrastructure and the return of private investments, especially in industrial sectors (Gremaud *et al.*, 2017).

This was also the focus of the attempt to expand the higher education system and to universalize access to it by opening dozens of new federal universities and hiring thousands of university professors throughout Brazil (Pires, 2010). This expansion was generally due to the implementation of government programs, such as the Support Program for Plans to Restructure and Expand Federal Universities (*Reuni*), which was instituted by Decree 6,096/2007.

Carried out between 2008 and 2012, *Reuni* resulted in a significant increase in the number of places available at federal universities, from 33,941 in 2007 to 212,387 in 2010

(Santos, 2013). According to the decree, the objective of this program was to create the conditions necessary for expanding access to higher education and remaining in it at the undergraduate level, by making better use of the physical structure and human resources that existed in federal universities (Decree 6,096, 2007).

### 2.3 The economic and fiscal policies of the Federal Government – 2011 to 2018

According to Gremaud *et al.* (2017), the main challenge at the beginning of the government from 2011 to 2014 was to build the basis for sustainable growth: maintaining economic growth rates, increasing social gains by reducing poverty, and continuing to improve income distribution. The government's focus on growth, however, contributed to the increase in average inflation rates, because fiscal, monetary and exchange rate policies focused on stimulating demand (Gremaud *et al.*, 2017).

According to Dweck and Teixeira (2017), the behavior of the Brazilian economy went from deceleration in the 2011 - 2014 period, to recession in 2015, which intensified the debate about the role of fiscal policy on the pace of activity.

There was a relative drop in real growth in education. When we look at current spending on funding, the true, very high growth remained practically the same, even though the base had expanded a lot after years of rapid growth. In the case of investment, the same nominal value of R\$ 5 billion was maintained throughout the period, leading to a real drop to close to the average of the *IPCA* (Broad Consumer Price Index) (Dweck & Teixeira, 2017). Since 2013, especially after the demonstrations in June of that year, strong opposition to the government's economic policy at the time and, to some extent to the previous one, also began (Dweck & Teixeira, 2017).

According to Matias-Pereira (2016) there were numerous mistakes that led Brazil to an unprecedented economic crisis, which resulted in an economic depression in the 2015-2016 biennium, a sharp drop in tax revenue, a rapid increase in unemployment, a reduction in workers' incomes, rising inflation, rising interest rates, growth in the gross public debt, and other maladjustments. The intensity of the political, economic and ethical crisis provoked a crisis of governability, which paralyzed public administration and resulted in the impeachment of the then president (Matias-Pereira, 2016).

In the period from 2016 to 2018, with a severe crisis that peaked in mid-2014 having already erupted producing an imbalance in economic indicators, the vice president in the previous administration took over as president of the republic (Nascimento, 2018). According to Matias-Pereira (2016), the disorganization in the economy, especially in public finances, required that the new government implement austerity measures to put the country back on the path to economic growth.

At the time, there were intense debates about the solution to this crisis, and the government's economic team proposed *PEC 241/55*, which aimed to implement a new fiscal regime in Brazil. This was approved as Constitutional Amendment 95/2016 and went into force in 2017 (Nascimento, 2018). This regulation was designed to resolve imbalances in the public accounts, and limited public spending to the variation in inflation measured as by the Broad Consumer Price Index (*IPCA*) (Matias-Pereira, 2016; Nascimento, 2018).

### 2.4 Constitutional Amendment 95/2016

*PEC 241/55*, which was called Constitutional Amendment [CA] 95/2016, was approved in 2016. It amended the Transitory Constitutional Provisions Act (*ADCT*) and introduced a

fiscal adjustment that fixed primary expenses for a period of twenty years, according to its Article 106:

Art. 106. The New Fiscal Regime is hereby instituted in relation to the country's fiscal and social security budgets, which will come into force for twenty financial periods within the terms of Articles 107 to 114 of this Transitory Constitutional Provisions Act (CF, 1988, p. 96).

As previously mentioned, the context in which this constitutional amendment was proposed was one of economic crisis, because there were deficits in primary expenditure in the years 2014 to 2016. Brazil had nominal deficits in every year between 1997 and 2016, that is, the primary result was less than the interest account because of high interest rates that are linked to the gross debt, leading to high interest payments (Birth, 2018). These expenses are related to public spending on social assistance, education, health, culture, basic sanitation, national defense, and others.

According to Nascimento (2018), the primary result indicates the government's effectiveness in creating revenue to pay off its usual expenses, without affecting its competence to manage existing debt. In this regard, Matias-Pereira (2016) reports that the federal government's primary spending had been growing well above the GDP in the previous two decades in real terms. Primary expenditure had increased by 5.6% per year in the 1997 – 2015 period; in other words, it tripled in real terms. The primary expenditure of the central government in this period (excluding transfers to states and municipalities) grew by 178% in real terms (after discounting inflation), which represented real growth of 5.85% per year. The GDP in this same period (1997-2015) increased by only 58% (Matias-Pereira, 2016). With this bias, Ramos (2018) emphasizes the fact that, despite the recessionary picture of the years prior to the constitutional amendment, the government continued with its very restrictive set of economic measures and gambling that the confidence of economic agents would return.

In view of this recessive scenario and fiscal deterioration, the government prepared and approved a new fiscal regime, which was defined in Constitutional Amendment 95/2006. In the previous budget system, no rule prohibited the programming of expenditures and including them in budgets pending execution. There were payment ceilings, but they were calibrated up or down over the year, with the aim of achieving certain fiscal results (Silva & Bittencourt, 2017). As control was based on financial aspects, there were no obstacles to budget programming and reprogramming with a positive variation in its volume (Silva & Bittencourt, 2017). Once the constitutional amendment had been enacted, therefore, the new fiscal regime for Brazil was established.

Freitas (2017) adds that the limitation for any year will be given, therefore, by the primary expenditure incurred in the previous year, corrected by the variation of the Broad Consumer Price Index (*IPCA*), as published by the Brazilian Institute of Geography and Statistics (*IBGE*), and so on in subsequent years.

In accordance with CA 95/2016, obtaining additional or special credit that expands the total amount of primary expenditure is prohibited, unless there are cuts in other areas to compensate for the changes. The only change that can be made between one year and the next is a correction for inflation. Any change in content can only be made within ten years, and is limited to changing the annual correction index, according to Article 108 of CA 95/2006:

Article 108. From the tenth financial year after the start of the New Fiscal Regime, the President of the Republic can propose a complementary bill to alter the method for correcting the limits referred to in Item II of §1 of Article 107 of this Constitutional Transitory Provisions Act (Brazil, 1988, p. 97).



Matias-Pereira (2016) emphasizes that Brazil's new fiscal regime is a model that has already been adopted in several countries. The Innocenzo Gasparini Institute for Economic Research (IGIER, 2019) presented a detailed file of countries that have used fiscal adjustment plans that are similar to the Brazilian plan. In 2006, after incurring the largest deficit to GDP ratio among developed countries and a very high public debt, Japan raised taxes and cut spending, which further reduced the total amount of public investment. In 2010, the United States of America had a public debt of almost 70% of GDP, with a deficit of more than 10% of GDP. To reduce these figures, automatic spending cuts of at least US\$ 1.2 trillion over a 10-year period were provided for, according to data presented by IGIER (2019). In 2010, Canada also implemented economic recovery action plans aimed at controlling the deficit, reducing the rate of growth in spending over the medium term, reducing costs and improving efficiency (IGIER, 2019).

This brief historical outline indicates that the idea of fiscal adjustments worldwide did not start with Constitutional Amendment 95/2006 in Brazil. Other countries had already had similar experiences with equivalent measures that were either satisfactory or not.

In their wake, fiscal adjustment measures lead to divided opinions about their efficiency and effectiveness for achieving the desired results. Matias-Pereira (2016) believes that the experiences of other countries that imposed limits on public spending produced good results.

For Ramos (2018), the measure adopted in Brazil may have had an impact on economic and social development over the coming years, since Constitutional Amendment 95/2006 was to become a new project for Brazil, with a reduction in the size of the State and its actions, which may have negatively affected the financing capacity of public investments and basic services for the population, especially the neediest, and further increase income concentration.

According to Roznai and Kreuz (2018), the new rules disregarded economic growth rates and population growth for the next twenty years, which may have led to a scarcity of social policies, especially in health and education.

## 2.5 Higher education

The history of Brazilian universities is recent, especially when compared to European universities, for example. During Brazil's colonial period, the metropolis prohibited the creation of universities in the country, the aim being to prevent the teaching and learning of sciences, literature and the arts, in order to maintain the existing order and avoid revolutionary movements (Flowers, 2017).

The first Brazilian university institutions emerged as from 1808, when the royal family arrived in Brazil (Bottoni, Sardano, & Costa Filho, 2013). The education they provided was aimed at a select group of people, which resulted in an intellectual elite formed by graduates, bureaucrats and the self-employed (Flores, 2017).

Bottoni *et al.* (2013) add that after 1889, the year of the proclamation of the Republic, education fluctuated because it was administratively linked to the State. According to them, the Organic Law of Rivadavia Correia of 1911 established elementary, higher and normal education, and removed the State's power to interfere in the education sector. But in 1915, the law of Minister Carlos Maximiliano revised this policy and re-officialized education in Brazil, following which several universities were created in the country. The early decades of the Republic were marked by the expansion of higher education, brought about by the multiplication of the number of faculties (Flores, 2017).

Later, with pressure from the market for qualified labor and the increase in the demand for higher education courses, private universities also emerged. According to Bottoni *et al.*

(2013), from 1996 onwards there was a significant increase in the number of enrolments in higher education as a result of the notable expansion of the private sector.

In terms of economic growth, offering a higher quality education generates more qualified employees and provides greater productivity and, consequently, greater growth. In this sense, the universalization of education generates greater income distribution (Pinfeld, 2006).

Nevertheless, the State has a duty to offer other public policies to the population, in addition to those aimed at education. The State's provision of higher education to the population has to do with the analysis of the allocation of scarce resources. From this point of view, for Santos (2013) the recent increase in demand for free higher education and the growing number of registrations by those interested are well-known, but the public resources earmarked for this purpose are scarce and insufficient to meet all of the demands of society.

The Federal Constitution of 1988 ensures free education in public higher education institutions (HEIs). The federal government, therefore, is the main funder for maintaining these institutions, although a small number of HEI'S are self-funded and rely on their own efforts to raise funds (Santos, 2013).

The cost of education, in general, includes direct costs (tuition fees, school materials), indirect costs (transportation, food), and the opportunity cost of the time the individual, who could help supplement their family's income rather than going to school (Villela, 2017).

In the specific case of *IFES*, public spending is financed by way of taxes, arising from the efforts of the whole of society. The *IFES*' budget is discussed and approved by the National Congress and is part of the government's general budget, in the chapter dedicated to the Ministry of Education (Santos, 2013). According to the author, the fund sources are divided into resources from the National Treasury, own resources or those that are collected directly, and resources from contracts and agreements with public and private bodies and entities.

In the context of the management of public universities, one of the difficult tasks is allocating the resources made available by way of budgetary laws to the various aspects of education, such as teaching, research and extension courses (Santos, 2013). The aim, therefore, is to establish whether the difficulties mentioned by the author, and described in a period prior to Constitutional Amendment 95/2016, will become more serious now that the CA is in force. What is the impact of applying CA 95/2016 to the budget of *IFES*, when considering its main objective, which is to establish a spending ceiling? Will this impact, if there is any, be positive or negative? To evaluate it, and if it is confirmed, will it be necessary to look to the past, but on what temporal bases?

### 3 Methodology

This research adopted a bibliographic, documentary and quantitative approach, using multiple linear regression mathematical modeling, which allows a greater number of variables to be measured, in an attempt to verify and explain their influence on other variables (Appolinário, 20016).

The proposal, therefore, was to carry out a regression analysis of independent variables on the dependent variable: the expenditure of the University of Brasília. Annual periods were employed in order to identify the relationship between the variables studied by way of multiple linear regression.

The variables we used tried to include elements that justify current and capital expenditure on personnel and social charges. Variables that might identify the values of the products the university delivers to society were also explored. We used data that are available

in public documents and in the Federal Government's Integrated Financial Administration System (*SIAFI*).

All data were collected in September and October 2019, and comprised the period from 1995 to 2017 for analysis purposes. The decision to choose this period is due to two facts: (1) the initial year, 1995, was the one in which the current Brazilian currency, the Real, was adopted, which facilitates comparison between the budget data used and; (2) the final year, 2017, was used because of the data that were made available by the University of Brasília in its Statistical Yearbooks.

To calculate the dropout and retention rates of students at UnB, the model created by Instituto Lobo (Lobo, 2012) was adopted, in which, to calculate and estimate the annual dropout rate from the system, first of all the permanence rate was calculated using the following formula:

$$P = [M(n) - Lg(n)] / [M(n-1) - Eg(n-1)] \quad (\text{Eq. 1}), \text{ in which:}$$

$P$  = permanence;  $M(n)$  = enrolments in a particular year;  $M(n-1)$  = enrolments in the year prior to  $n$ ;  $Eg(n-1)$  = those concluding in the previous year;  $Lg(n)$  = new students in year  $n$ .

To calculate the dropout rate the formula is:

$$\text{Dropout} = 1 - P \quad (\text{Eq. 2}).$$

The result is multiplied by 100 to obtain the percentage ratio.

The above calculation is relevant in this study, since both the dropout and the permanence of students in the university involve greater expenditure and even a loss of resources and social losses, as seen above.

The relationship between this measure and its effect on the budget being analyzed also needs to be identified, according to Vieira (2013).

The general multiple linear regression equation can be written using the following formula:

$$DP = -\beta_0 + \beta_1 QT\_ST + \beta_2 ML + D1REUNI - D2FHC + \beta_3 AC + u_i \quad (\text{Eq. 3}),$$

in which:

- $DP$  is the natural log of UnB's expenditure, a dependent variable explained by the model;
- $\beta_0$  is the intercept.

The independent variables referred to above are the following:

- $QT\_ST$  – the total number of civil servants (natural log of the result of the sum, Teachers + Technicians) employed at UnB. It is expected that the greater the number of employees, the greater will be the expected expenditure. A positive result is, therefore, expected for this variable.
- $ML$  – the natural log of the Dropout and Permanence rate of students at UnB, considering the formula of the model of Lobo (2012). As students drop out, or the time necessary for concluding the course increases, in other words, the student stays at UnB longer than the time previously defined, the expenditure also increases. A positive sign for this variable is, therefore, expected.
- $AC$  – the natural log of the constructed area. Likewise, expenditure increases with the increase in constructed area. A positive sign is, therefore, expected for this variable.
- $D1 Reuni$  – the “Reuni program” dummy variable, in line with

Decree 6,096/2017, which instituted the “Support for the restructuring and expansion plans of federal universities” (Reuni). A positive sign is expected with this expenditure.

- D2 FHC – “FHC government” dummy variable, in which a negative correlation is expected with expenditure. This can be explained by the expense containment policy adopted by this government.

## 4 Results and Analyses

Analysis of the study data is shown in Tables 1 and 2 below.

**Table 1**  
*Variables*

Variable	Mean	Std. Dev.	Min	Max
Expenditure	8,854,788	0.3363337	8,301,545	9,290,784
Reuni Program dummy	0.4782609	0.5107539	0	1
FHC government dummy	0.3478261	0.4869848	0	1
Total number of civil servants	3,611,831	0.0823685	3,521,661	3,760,045
Lobo model - Permanence	-0.0525813	0.0530002	-.151014	0.0486998
Constructed area	5,719,069	0.0808899	5,560,258	5,811,249

**Table 2**

*Result of the linear regression – Expenditure – Least minimum squares*

Total number of civil servants	0.7371914*** (0.000)
Lobo model - Permanence	0.2156566 (0.221)
FHC government dummy	-0.1318926* (0.008)
Reuni Program dummy	0.220041*** (0.000)
Constructed area	1.666724*** (0.000)
Constant	-3.387953** (0.002)
Number of observations	23
R2	0.9841
F Test	0.0000

Note: Based on data taken from Stata®.

Robust standard deviation between parentheses; \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1.

Source: *Research data.*

Although the “Lobo Model - Permanence” variable is not statistically significant, the other variables analyzed were significant at 1%, 5% and 10%. There was multicollinearity between the independent variables in this study, but we found no evidence of multicollinearity between the adopted variables. The regression residuals had normal distribution values. We tested the heteroscedasticity of the model’s residuals using the White test, whose hypotheses to consider were H0: homoscedasticity and H1: heteroscedasticity. The null hypothesis was rejected.

To verify whether the model was correctly specified, we used the Reset test, in which the null hypothesis ( $H_0$ ) was rejected, that is, the original regression was correctly specified. The “hatsq test” was not significant, which reveals that the link test failed to reject the assumption that the model was correctly specified. The conclusion, therefore, is that there is no specification error.

In order to verify whether there was first-order autocorrelation, a “Lagrange multiplier” type test was performed, which proved that the residuals do not correlate, since the regression was robust.

The analyzed variables that were seen to be positively related to the increase in expenditure were: “Total number of civil servants”, “Lobo Model - Permanence” and “Constructed area”. Likewise, the “Reuni Program” dummy was positively related to the increase in expenses, unlike the “FHC Government” dummy, which was negatively related to the variable we analyzed.

For Santos (2013), the public policy for higher education, which was adopted particularly in FHC’s second term, had a neoliberal bias, leading to a drastic reduction in federal government funding and a loss of teachers and technical and administrative staff, combined with the levelling off of salaries and the budget limits that were earmarked for *IFES*.

We measured the relationships between the studied variables in the model based on the coefficients. As expected, hiring professors and administrative and technical staff increases expenditure. In this regard, Santos (2013) states that the funds required for paying staff and for social charges are constantly increasing, which is a reflection of the hiring of new teaching and administrative staff and technicians. The amounts spent on students who stay at the institution beyond the time initially foreseen also lead to an increase in expenditure. In this sense, institutions that have a more efficient policy for managing student permanence and retention will tend to have budgetary gains (Vieira, 2013).

We also observed that each square meter of UnB’s constructed area results in a considerable increase in expenditure, which corroborates Santos’s (2013) statement that the expansion of new university campuses automatically increases the funds needed for effectively maintaining *IFES*.

Gonçalves (2013) likewise emphasizes that constructed buildings need maintenance and people to occupy and use them in order to improve public services, thus requiring available resources for such purposes. The expansion of *IFES* in Brazil, therefore, over a short period of time, led to an increase in public spending on higher education and, more specifically, on public federal universities.

Considering the analyzed variables, it is correct to state that during the period of government from 1995 to 2001 the expenditure of UnB decreased. This is justified by the neoliberal policy adopted by that government, which reduced public service with the argument that managerialism had been instituted in it.

This policy also led to a drastic reduction in funding from the federal government, which resulted in a loss of teaching and administrative staff and technicians, combined with the levelling off of salaries and budget limitations for *IFES* (Santos, 2013).

On the other hand, each year of the Reuni Program increased the amount allocated to expenditure, according to Santos (2013), when he stated that public spending on education grew after 2007, with the introduction of Reuni, and when the government started paying more attention to that area. From 2007 to 2013, therefore, investment increased considerably, which can be explained by the introduction of the Reuni Program (Santos, 2013).

It was possible, therefore, to measure the effect of the variables we analyzed on UnB’s budget, and considering the econometric model we used in this work, which evaluated the

impact of UnB's budget freeze resulting from the limits proposed in CA 95/2016, because expenditure increased considerably, mainly because of the measures adopted during Reuni.

## 5 Final considerations

We analyzed the impact of Constitutional Amendment 95/2016 on UnB's budget retrospectively (1995-2017) and experimentally, by building an econometric forecast model.

As for the impacts that were visualized using statistical modeling, we found that in that particular period there was an increase in the expenditure of the *IFES* (UnB), caused mainly by the introduction of the incentive program for expanding higher education, which was known as the Reuni Program. During the time Reuni was in force, from 2007 to 2013, measures were adopted, such as the construction of three new campuses and the hiring of teachers and technical and administrative staff.

Our study indicated that the investments of the Reuni Program were made in a way that did not consider the future of the *IFES*, and this growth also resulted in an increase in maintenance and funding expenses, for example. The variables with the greatest influence that we identified in the final model were "Constructed area" and "Total number of public employees", and these justify the considerable increase in expenses.

Identifying the variables that affect the expenses associated with a federal institution of higher education, such as UnB, which we obtained using this methodology, can help redefine the *IFES* budget, because with the limitations imposed by CA 95/2016, that is, the freezing of resources for maintaining their teaching, research and extension activities, *IFES* need additional resources to those that are transferred to them by the federal government.

In looking for an econometric model for forecasting the impacts on the budget of a federal university, the University of Brasília, due to the application of CA 95/2016, we made no value judgment in this study on the different governments in power during the period we analyzed. Rather than discussing just statistical models that seek to measure the impacts of CA 95/2016, the historical context and the scenario that the governments faced had to be analyzed, since each, in their time, had their merits and demerits when it came to managing the public resources entrusted to them.

By identifying the variables that most affected UnB's budget and considering the budgetary impact caused by the increase in personnel expenses and maintenance expenses of the constructed area, this study shows that UnB is facing a great challenge for maintaining the activity levels of its teaching, research and extension courses.

Despite the funds it receives being frozen, from our analysis we can infer that after twenty years of resource containment, as imposed by CA 95/2016, the operating and maintenance conditions of a large part of the physical structure that was achieved following the introduction of the Reuni Program will be negatively affected, and this reality is the same for other *IFES* throughout Brazil. There is evidence that the remuneration of the employees of these *IFES* will suffer, due also to the current inflationary process, which may affect their purchasing power.

Using a theoretical model applied to UnB's budget, this study showed that multiple linear regression statistical modeling can be used as a tool for identifying and analyzing those items that contribute to an increase in expenditure. It also endorsed the practical application of an econometric model that is capable of analyzing the possible effects of CA 95/2016 both retrospectively and longitudinally, based on available accounting data.

Identifying these effects and recognizing that UnB — and by inference, all *IFES* — will be unable to sustain itself with government funding alone will allow for the construction of instruments that favor the search for new sources of funding for higher education.

With the emergence and exacerbation of the effects of the Covid 19 pandemic, this whole discussion took on a new guise, and became much more urgent and necessary. In view of this new pandemic scenario, we suggest that the model here proposed be tested in future studies with data from other *IFES*, that an indicator of student retention be developed, and that investment be made in the use of control variables for use in the model.

The results of this study also seek to contribute to expanding the literature dealing with the management of public entities, specifically universities. In proposing the respective variables, we enable future managers from other *IFES* to measure the impact of CA 95/2016 based on their own historical context. These scenarios will enable managers to plan and take appropriate decisions for expanding or reducing their supply of public services based on the funds available to them.

Despite successfully identifying the impact of CA 95/2016 on UnB's budget, this study has its limitations, mainly because it is a case study. The absence of a more significant sample, especially considering that Reuni was implemented in very different ways in the *IFES*, undoubtedly results in sampling bias. In future studies, with a more varied sample, the feasibility of using the prospective application of multiple linear regression statistical modeling may be confirmed. The way in which this research will continue will undoubtedly be by way of a sampling framework that involves all Brazilian *IFES*.

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