

# Education Expenses and their Relationship with the Index of Development of Basic Education in Tocantins-Brazil between 2009 and 2017

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## Abstract

The aim of this study is to analyze if education expenses influenced the Index of Development of Basic Education (IDEB) in the municipalities of Tocantins-Brazil between 2009 and 2017. The sample was made up of 139 municipalities of Tocantins State and 695 notes, with data from the Education Balance Sheets and Gross Domestic Product municipalities. Software for Statistics 14.0 (Stata) was applied to identify the relationship of municipal public expenses with Ideb. Due to multicollinearity problems, regressions were carried out through an independent variable. Six equations were prepared; the bigger coefficient was obtained from equation (1), from 3.7% for each one million of pass-through increase. The coefficients from (4) and (6) obtained an impact of more than 3%, for each one million of pass-through increase. In (1), (2), (3), (4) and (6), investment increase had a positive impact on learning, flow and IDEB. Results from (5) were not relevant for showing percentage points over 1%. The results point out that investments in education have a positive impact on the students' performance. Therefore, the role of the population in the inspection and participation of government actions is essential, in order to provide society with better resources for education, enabling the effectiveness of public management.

**Keywords:** Education Expenses; Tocantins-Brazil; IDEB.

## 1. Introduction

One of the basic rights of the Constitution of the Federative Republic of Brazil (1988) is the guarantee of education, establishing percentages to cover public spending on education, thereby increasing its intellectual wealth through the preservation of teaching.

In order to ensure the fulfillment of the right to Education, the Constitution (1988) established percentages which should be applied annually, which cannot be lower than 18%, for the Union, the states and the Federal District; nevertheless, for the municipalities, the percentage will be 25% of its collection. In addition, Constitutional Amendment No. 14, of September 12, 1996, in its article 1, point “e”, emphasizes the compulsory nature of “application of the minimum required of the revenue resulting from state taxes, including that arising from transfer, in the maintenance and teaching development. In this context, the research was intended to answer the following problem: did spending on education influence the Index of Development of Basic Education (forward IDEB) of municipalities in the state of Tocantins-Brazil between 2009 and 2017? For this, we used the sample composed of 139 municipalities in Tocantins and 695 observations, with data from the Education Demonstration and Gross Domestic Product (GDP) reports of the municipalities. Software for Statistics 14.0 (Stata) was used to identify the relationship between municipal public spending and Ideb. Due to multicollinearity problems, regressions were performed with an independent variable.

There are no other studies on the expenditures applied to education in the municipalities of the state of Tocantins-Brazil, therefore, this study allows new perspectives on this reality, by demonstrating the impact that resources cause on the quality of education. In this way, it will be possible to awaken popular social responsibility to monitor the quality of public management with the resources earmarked for education.

The study is justified by the search to verify if the resources that are being applied in basic education, in Tocantins-Brazil, have helped to improve the quality of students' learning, based on the pass rate and the average performance in the exams applied by the Educational Studies and Research Anísio Teixeira (Inep), which adds values to three fundamental parts that cooperate for the development of society and analysis of information: the student who is graduating, society and the university.

This text discusses, in its first part, public spending on education, Ideb and the state of Tocantins. Following, the methodology and results are highlighted, ending with the Conclusions and References.

## **2. Literature Review**

### **2.1. Public Spending**

The public administration is part of the administration, responsible for representing the State. It works as a tool of the public power, with the objective of planning, organizing, directing and being able to control the segments and administrative actions, in order to meet the basic demands of the population. Magro and Silva (2016) affirm that the government spends its expenses aiming at the needs of the population, applying the collected resources efficiently, since the resources are limited, always taking into account the percentages described by the Fiscal Responsibility Act.

Thus, the responsibility of the public money management agents is observed, since it is their duty to provide the basic rights of society with a view of complying with the legislation, which refers to the limit of public spending. On May 4th, 2000, Complementary Law No. 101 or Fiscal Responsibility Act. The complementary law was instructed “as an instrument to contain public deficits and increasing indebtedness of the units of the federation” (Giuberti, 2005, p. 7).

For Nascimento and Debus (2002, p. 11), this Brazilian act “brings a new notion of balance to public accounts”. Silva Filho, Pereira, Dantas and Araújo (2016, p. 29) consider that the “enactment of the act was a milestone for the country's public finances, since it configured a system of planning, budget execution and fiscal discipline that did not exist until then”. Thus, it is noted that one of the impacts of this act was to limit public spending and produce a new perspective of stability in the result of the financial, budgetary and patrimonial management of the public entities of the federation, using budget planning and execution.

The Fiscal Responsibility Act establishes instructions regarding the expenses of the federation's powers, that is, executive, legislative and judicial. In its Art. 18, it addresses the understanding of what would be personnel expenses, understood by Berlt and Tristão (2017, p. 89), as “the active, inactive and pensioners, related to mandates, positions, functions or jobs, be they civilian, military or any other remuneration”. In Art. 19, it provides for limits on personnel expenses, using the current net revenue that cannot exceed 50% for Union, 60% for States, and 60% for Municipalities (Complementary Act No. 101, 2000). Thus, the legislation limits the use of public resources, taking into account its current net revenue, that is, the sum of all that was collected, through government taxes, referring to patrimonial, industrial, agricultural and / or social contributions, services, removing the values related to constitutional transfers (Câmara, 2011).

In order to curb the growth of public spending, the government of President Michel Temer drafts Constitutional Amendment 95/2016, using, together with the proposal, Interministerial Motifs No. 83/2016, prepared by the ministers Henrique de Campos Meirelles and Dyogo Henrique de Oliveira who quote: “Reversing, in the medium and long term horizon, the acute fiscal imbalance in which the Federal Government has been placed in recent years” (Interministerial Motifs Exposition No. 83/2016). For Souza (2017), the amendment provides a balance between the amount collected and the amounts spent by the government, creating a limit for the executive, legislative and judicial powers, which can adjust public accounts and move towards a surplus in the long run.

## 2.2. Public Spending on Education

Education has been considered one of the sectors with the highest degree of significance for the development of a nation to take place (Almeida & Gasparini, 2011). This reinforces the importance of public investments to foster the growth of quality in the most relevant sector to national progress. Zoghbi, Matos, Rocha and Arvate (2009) consider spending on education to be more relevant to a country's growth than other public spending. Thus, it is noted that education guides a country's progress, because the more it receives investments, the more positive results it obtains.

In order to ensure the fulfillment of the right to Education, the Constitution of the Federative Republic of Brazil (1988) established percentages that should be applied annually: for the Union, States and the Federal District, never lower than 18%; as for the Municipalities, the minimum amount to be applied will be 25% of its collection. Constitutional Amendment No. 14, of September 12th, 1996, emphasized the compulsory nature of “application of the minimum required revenue resulting from State taxes, including that arising from transfer, in the maintenance and development of education”. According to Amorim, Diniz and Lima (2017, p. 58), “the reflexes of these resource allocations are aimed at increasing productivity, economic growth and socioeconomic opportunities in the country”. Therefore, the legislation ensures public resources for education, both at federal, state and municipal levels, in view of the need to provide basic education to all citizens, guaranteeing minimum percentages, by force of law, to be transferred to the fulfillment of this objective and, consequently, providing financial and social growth. In order to ensure compliance with policies aimed at quality basic education, Act 11,494 / 2007 was created, which regulates the Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals (FUNDEB), and the Decree No. 6,253 / 2007, which provides for FUNDEB and provides other measures. The purpose of FUNDEB is to enable more effectiveness in providing the necessary resources and in the obligations attributed in relation to quality and quantitative assistance, with regard to basic education (Callegar, 2009). FUNDEB's financial resources come from the contribution percentage of 20%, from the States, Federal District and Municipalities, which cooperate to form the fund, using the following taxes and transfers:

State Participation Fund (SPF); Municipality Participation Fund (MPF); Tax on Circulation of Goods and Services (ICMS/ V.A.D.); Tax on Industrialized Products, proportional to exports (IPIexp); Transmission Tax Cause Mortgage donations of any

assets or rights (ITCMD); Motor Vehicle Property Tax (IPVA); Tax on Rural Territorial Property (share of municipalities) (ITRm); resources related to the exemption from exports referred to in LC No. 87/96; Rural Territorial Property (share of Municipalities) (ITRm); resources related to the exemption from exports referred to in LC No. 87/96; collection of tax that the Union may institute in the exercise of its competence (quotas of the States, Federal District and Municipalities); income from active tax debt, interest and fines related to the taxes listed above (Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals, 2009, p. 8).

The use and application of the funds collected through taxes or transfers must be in accordance with the provisions of articles 21 and 22 of Act 11,494 / 2007, in which at least 60% of the totality of the fund will be used to carry out the payment of the remuneration of the teaching staff, that are in effective exercise in basic education of the public school system, and the rest of the resources should be destined to other actions that result in the maintenance and development of education, with regard to basic education, with a maximum of 40% being used of the resources that make up FUNDEB.

Some studies have analyzed the performance of public spending on education, from different perspectives. The study by Macêdo, Filho and Júnior (2012) analyzed the efficiency of public resources directed to education, in 285 municipalities, in the state of Santa Catarina-Brazil, between 2005 and 2009. The results showed that larger cities have greater difficulty in achieving excellence in their performance, and the smaller the city, the greater its efficiency. Thus, smaller cities have better management of resources for education.

The study by Wilbert and D'Abreu (2013) evaluated the efficiency of public spending on education in the municipalities of the state of Alagoas-Brazil, using the Data Envelopment Analysis method, and surveyed 57 municipalities between 2007 and 2011. The results revealed that the efficient municipalities were those with less investments per student, and the municipalities, with high expenses per student, had the worst performances in IDEB, in 2011.

The study by Silva Filho et al. (2016) evaluated the efficiency in the allocation of public spending on education, in Army Military Schools, between 2009 and 2011, in 12 units, using the Data Envelopment Analysis methodology. The authors found that the best efficiency is related to the greatest amount of resources.

The research by Magro e Silva (2016) sought to identify the efficiency in the performance of public spending on education and the Fiscal Responsibility Act of the capitals of Brazil. The results obtained demonstrate that the greatest effectiveness is found in small capitals. However, the investment of resources in education is still less than 25% of the collection of taxes and transfers that must be earmarked for public education spending. In addition, the capitals, with up to 500,000 inhabitants, obtain a better average in IDEB. The study identified that the more investment in education in the early years, the higher the IDEB score. The study by Ázara, Pessanha and Neto (2017) evaluated the level of technical efficiency of public spending in the municipalities of the Varginha-MG microregion, using the Stochastic Frontier Analysis methodology, between 2005 and 2014. The result shows that the higher the value of education and culture spending, the greater the increase in indicators.

### **2.3. Index of Development of Basic Education (IDEB)**

The Ministry of Education (MEC), a direct administration body, aims at the national education policy, from primary school to higher education, conducting assessment, training, through information and research related to education, developing the extension, in the university and teaching environment, and financial assistance to families in need of schooling for their children and / or dependents (Ministry of Education, 2018).

Thus, it is possible to see the importance and responsibility of the Ministry in collaborating for national development, in aspects related to education in all stages of the formation of the Brazilian citizen. MEC emerged in 1930, under the government of Getúlio Vargas, and it was integrated with Public Health and developed activities focused on health, sport and the environment (Ministry of Education, 2018). Thus, the priority, at the beginning of the Ministry, was not only educational progress, but the set of other programs. Currently, MEC seeks to carry out actions and programs aimed at the growth of national education, covering Higher Education, Professional and Technological Education, Basic Education and Continuing Education, Literacy, Diversity and Inclusion. The National Institute of Educational Studies and Research Anísio Teixeira (Inep) is responsible for collecting information related to basic education and higher education, referring to the annual education census, according to Decree No. 6,425, of April 4th, 2008. In its art. 2nd, the Decree clarifies that the collection will occur annually with the collaboration between the Union, the States, the Federal District and the municipalities, in a declaratory manner, and covering public and private establishments. On the MEC website (retrieved at <http://portal.mec.gov.br/component/tags/tag/32124?start=80>, 20 jan. 2020), the school census is defined as:

The main instrument for collecting information on basic education and the most important Brazilian educational statistical survey in the area, the School Census of Basic Education is coordinated by INEP and carried out in collaboration with the state and municipal education departments, and with the participation of all public and private schools in the country.

The FUNDEB Guidance Manual (2009) states that the data used to compute the number of students which will be considered in FUNDEB's resource allocation procedures will be based on the school census conducted by INEP. In this way, it is observed the importance of collecting information related to education, in order to make the number of students correctly available for carrying out the calculations that will promote the receipt of funds pertinent to the fund destined to education. As for FUNDEB, based on the legislation in force, it will be extinguished on December 31st, 2020, which has generated discussions focused on approving its continuity, through the Proposed Amendment to the Constitution (PEC) 15/2015, making the fund permanente (retrieved at <https://www12.senado.leg.br/noticias/materias/2020/07/01/aprovacao-do-fundeb-permanente-mobiliza-senadores-e-deputados>, July 1st, 2020).

The school census has become a tool of great importance to measure and understand the situation of education in the country, verifying each educational institution of the federal, municipal and Federal District Units (National Institute of Educational Studies and Research Anísio Teixeira, 2015). In this way, it is possible to carry out a detailed monitoring of the fulfillment of the country's public education goals and to verify whether there is efficiency in the quality of education made available to society, through public entities, because this way, it will be allowed to measure the aggregated return to education.

With the goal of improving the quality of national education, in favor of a quality educational policy, in 2007, a tool was created which statistically measures the performance of Brazilian basic education, using the Education Development Plan as a guide, which instituted as a target, for the year 2022, an index of 6.0, that is, an IDEB of a country of the first world (National Institute of Educational Studies and Research Anísio Teixeira, 2015). IDEB is an initiative coming from INEP with the objective of quantifying the performance of the educational system in Brazil, using the combination through the students' proficiency, achieved through the Basic Education Assessment System, and the pass rate indicator, which has performance in the efficiency of the school flow, which is acquired through the school census (National Institute of Educational Studies and Research Anísio Teixeira, 2015). Accordingly, Lourenço, Nascimento, Sauerbronn and Macedo (2017) consider an initiative that aims to accompany teaching and, as a result, encourage the quality of basic education throughout Brazil.

The technical note from the Ministry of Education, referring to IDEB, clarifies that this indicator is used through the combination of performance data, in standardized exams, such as *Prova Brasil* and the Basic Education Assessment System, which are always carried out at the end the stages of basic education in national education, that is, 5th and 9th years, of Basic School, and 3rd grade, of High School (Technical Note No. 1, 2007). Thus, it is perceived that each data collected will be a consequence of the quality of what has been taught, in the classroom, to each student, in the course of each stage of basic education, making it possible, thus, to evaluate and measure how students' performance has been.

#### **2.4. History of Education in the State of Tocantins-Brazil**

Tocantins is located in the Northern region of Brazil. It is the newest state in the country and constitutes the Brazilian Amazon, with predominantly bushy vegetation. It has a territorial extension of 277,466,763 km<sup>2</sup> and an estimated population for 2020 of 1,590,248 people (retrieved at <https://cidades.ibge.gov.br/brasil/to/panorama>, February 20th, 2020). Before its creation, it was part of the state of Goiás and its basic education was limited, due to the lack of opportunity and access, as there were few teaching units available at the time and were far from large centers (Vieira, 2011).

In view of the need for the development of northern Goiás (whose region was later called Tocantins), the state was created, with the promulgation of the Federal Constitution of Brazil, through article 13, of the Transitional Constitutional Provisions Act of 1988: "The State of Tocantins is created, by dismembering the area described in this article" (Constitution of the Federative Republic of Brazil, 1988). Thus, the 27th unit of the Brazilian Federation emerged, separated from the state of Goiás, full of challenges and opportunities.

After the creation of Tocantins, in 1989, the acting governor, Raimundo Nonato Pires dos Santos, adopted Provisional Measure No. 01, which the State Constituent Assembly approved. Among the various acts described in the measure, executive power was structured and, consequently, the State Secretariat for Education and Culture was created. Thus, work began to promote access to education and reduce educational deficiency, making more opportunities available to residents of the state.

Vieira (2011) states that, in the past, Tocantins had one of the highest illiteracy rates, as in the *Bico do Papagaio* region, which exceeded 50%, causing people to search either Maranhão or Goiás to study. This highlights the challenges and needs of this region, in addition to demonstrating the absence of a basic structure to assist in professional and social developments. The panorama of education in Tocantins has changed significantly. According to the Brazilian Institute of Geography and Statistics, in 2017, there are more than 1,500 schools, approximately 300,000 enrollments, and more than 15,000 teachers collaborating to increase the quality and quantity of the education offered and, thus, providing social and professional training to citizens of the state.

### **3. Methodology**

The research population was formed by the cities of the state of Tocantins and the sample consisted of 139 municipalities and 695 observations. The analyzed period involved the information available between 2009 and 2017. The collection was first carried out using the Tocantins State Court of Auditors website (retrieved at <https://www.tce.to.gov.br/sitetce/>, January 20th, 2020), through the Citizen Portal, in which the Education Statement Reports for the exercise of each studied municipality are stored. In the second moment, data from the IDEB result of the researched period were collected on the QEDU website (retrieved at <https://www.qedu.org.br/brasil/ideb>, January 20th, 2020). Finally, information on the Brazilian Domestic Product of each municipality was collected through the website of the Brazilian Institute of Geography and Statistics (retrieved at <https://www.ibge.gov.br/explica/pib.php>, February 10th, 2020), for the elaboration and treatment of data for statistical research, using the software for Statistics 14.0 (Stata).

The research data were run on Stata, in order to identify the relationship between public spending in all municipalities in Tocantins and IDEB. Due to the multicollinearity problems presented in the data, it was decided to perform only regressions with an independent variable. The choice of models was made through the lowest value of the Akaike test. Thus, six equations were elaborated, in which all data were weighted by the GDP of each year of the analyzed municipalities:

$$Apren\_AI_{it} = \beta_0 + \beta_1 Fundeb_{it} + \epsilon_{it} \quad (1)$$

“Apren\_AI”: Learning from the early years.

“FUNDEB”: Basic Education Expenses – FUNDEB.

$$Fluxo\_AI_{it} = \beta_0 + \beta_1 Outros Rec_{it} + \epsilon_{it} \quad (2)$$

“Fluxo\_AI”: Flow of the early years.

“Outros Rec”: Other Tax Resources.

$$Ideb\_AI_{it} = \beta_0 + \beta_1 Magist_{it} + \epsilon_{it} \quad (3)$$

“IDEB\_AI”: Ideb Initial Years.

“Magist”: Payment of Teaching Professionals.

$$Aprend\_AF_{it} = \beta_0 + \beta_1 Fundeb_{it} + \epsilon_{it} \quad (4)$$

“Aprend\_AF”: Learning Final Years.

“FUNDEB”: Basic Education Expenses – FUNDEB.

$$Fluxo\_FF_{it} = \beta_0 + \beta_1 Fundeb_{it} + \epsilon_{it} \quad (5)$$

“Fluxo\_FF”: Final Years Flow.

“FUNDEB”: Basic Education Expenses – FUNDEB.

$$Ideb\_IF_{it} = \beta_0 + \beta_1 Fundeb_{it} + \epsilon_{it} \quad (6)$$

“IDEB\_IF”: IDEB Final Years.

“FUNDEB”: Basic Education Expenses – FUNDEB.

Wilbert and D’Abreu (2013) found that efficient municipalities are those that had the least investment per student. However, most studies, as well as this article, have already shown that the greater the amount of public resources allocated to education, the greater the efficiency (Silva Filho et al., 2016; Magro & Silva, 2016; Ázara et. al, 2017). Macêdo *et. al.* (2012) add that larger cities have greater difficulty in achieving excellence in their performance.

## 4. Empirical Results

Based on the development of six equations, the model was chosen using the lowest Akaike value. The results of the Akaike tests are presented, referring to each analyzed equation, through tables that show the results of the equations, with data weighted by the GDP of each year of the analyzed municipalities.

The results were organized in Initial Years, considering equations 1 to 3, and in Final Years, with equations 4 to 6.

### 4.1. Initial Years

As for equation 1, tables 1 to 4 stand out. In them, Akaike tests were verified for the variables: Teaching; FUNDEB and Other Resources.

**Table 1:** Akaike Test – Teaching Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-869.5049	-861.3314	2	1726.663	1735.751

**Table 2:** Akaike Test – FUNDEB Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-869.5049	-860.8943	2	1725.789	1734.876

**Table 3:** Akaike Test – Other Resources Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-869.5049	-863.2873	2	1730.575	1739.662

**Table 4:** Equation 1 – Learning in the Initial years and FUNDEB

Source	SS	df	MS	Number of obs	=	695
Model	12.1590087	1	12.1590087	F(1, 693)	=	17.39
Residual	484.650686	693	.699351639	Prob > F	=	0.0000
Total	496.809694	694	.715864113	R-squared	=	0.0245
				Adj R-squared	=	0.0231
				Root MSE	=	.83627

  

a_ai	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
fundeb_pib	3.704008	.8883224	4.17	0.000	1.959882 5.448134
_cons	4.788174	.0379012	126.33	0.000	4.713759 4.862589

Given the above, in the data in Tables 1 to 4, it appears that the adjustment of the model was low, representing only 0.0231, equivalent to 2.31% of the variations in learning in the initial years. The “FUNDEB” variable was relevant at 1%, as evidenced by the p-value of 0.00, for each 1 million increase in the value of onlending from FUNDEB. The learning index tends to grow by 3,704 percentage points.

In relation to equation 2, tables 5 to 8 are presented, with the Akaike tests for the variables: Teaching; FUNDEB and other resources.

**Table 5:** Akaike Test – Teaching Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	893.2042	896.325	2	-1788.65	-1779.562



**Table 6:** Akaike Test –FUNDEB Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	893.2042	895.9158	2	-1787.832	-1778.744

**Table 7:** Akaike – Other Resources Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	893.2042	896.7693	2	-1789.539	-1780.451

**Table 8:** Equation 2 - Early Years Flow and Other Resources

Source	SS	df	MS	Number of obs	=	695
Model	.031775824	1	.031775824	F(1, 693)	=	7.15
Residual	3.08146078	693	.004446552	Prob > F	=	0.0077
Total	3.11323661	694	.004485932	R-squared	=	0.0102
				Adj R-squared	=	0.0088
				Root MSE	=	.06668

  

f_ai	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
outros_pib	.0642195	.0240232	2.67	0.008	.0170526 .1113864
_cons	.9083597	.0026317	345.16	0.000	.9031926 .9135268

In Equation 2, the data reveal the model adjustment, at 0.0088, equivalent to 0.88% of the variations. The “Other Resources” variable was relevant at 1%, as evidenced by the p-value of 0.00, for each 1 million increase in the transfer value of “Other Resources”, and the learning index tends to grow 0.0064 percentage points.

In equation 3, Tables 9 to 12 are presented, with the Akaike tests for the variables: Teaching; FUNDEB; Other Resources and Ideb Early Years and Teaching.

**Table 9:** Akaike – Teaching Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-872.6083	-861.2443	2	1726.489	1735.576

**Table 10:** Akaike – FUNDEB Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-872.6083	-861.7801	2	1727.56	1736.648

**Table 11:** Akaike – Other Resources Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-872.6083	-863.0441	2	1730.088	1739.176

**Table 12:** Equation 3 - IDEB Initial Years and Teaching

Source	SS	df	MS	Number of obs	=	695
Model	16.127279	1	16.127279	F(1, 693)	=	23.04
Residual	485.139107	693	.700056431	Prob > F	=	0.0000
				R-squared	=	0.0322
				Adj R-squared	=	0.0308
Total	501.266386	694	.722285859	Root MSE	=	.83669

  

i_ai	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
mag_pib	1.119642	.2332733	4.80	0.000	.6616345 1.577649
_cons	4.402178	.0337086	130.60	0.000	4.335994 4.468361

In view of the results evidenced in equation 3, it is observed that the adjustment of the model was low, totaling only 0.00308, which explains only 3.08% of the variations.

The variable “Teaching” was relevant at 1%, as evidenced by the p-value of 0.00, for each 1 million increase in the value of the transfer of payment from teaching staff, and the learning index tends to grow by 1,119,642 percentage points.

In the next section, the data analyzed for the final years, for equations 4 to 6, with their respective variables are discussed.

#### 4.2. Final Years

As for equation 4, tables 13 to 16 stand out, presenting the Akaike tests for the variables: Teaching; FUNDEB; Other Resources and Learning Final Years and FUNDEB.

**Table 13:** Akaike – Teaching Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-794.6731	-788.8242	2	1581.648	1590.736

**Table 14:** Akaike – FUNDEB Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-794.6731	-785.8424	2	1575.685	1584.773

**Table 15:** Akaike – Other Resources Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	-794.6731	-790.2481	2	1584.496	1593.584

**Table 16:** Equation 4 – Learning from Final Years and FUNDEB

Source	SS	df	MS	Number of obs	=	695
Model	10.050801	1	10.050801	F(1, 693)	=	17.84
Residual	390.509252	693	.563505414	Prob > F	=	0.0000
				R-squared	=	0.0251
				Adj R-squared	=	0.0237
Total	400.560053	694	.577175869	Root MSE	=	.75067

  

a_f	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
fundeb_pib	3.36762	.7973919	4.22	0.000	1.802027 4.933214
_cons	4.344316	.0340215	127.69	0.000	4.277519 4.411114

In Equation 4, the model fit was low, representing only 0.0237, which explains only 2.37% of the variations. “FUNDEB” was relevant at 1%, as evidenced by the p-value of 0.00, for each 1 million increase in the value of onlendings from FUNDEB, and the learning rate tends to grow by 3.36762 percentage points.

Regarding equation 5, tables 17 to 20 are shown, which address the Akaike tests for the variables: Teaching; FUNDEB; Other Resources and Final Years and FUNDEB.

**Table 17:** Akaike – Teaching Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	685.6115	685.7112	2	-1367.422	-1358.335

**Table 18:** Akaike – FUNDEB Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	685.6115	686.0521	2	-1368.104	-1359.016

**Table 19:** Akaike – Other Resources Variable

Model	Obs	ll (null)	ll (model)	df	AIC	BIC
.	695	685.6115	685.7947	2	-1367.589	-1358.502

**Table 20:** Equation 5 - Final Years Flow and FUNDEB

Source	SS	df	MS	Number of obs	=	695
Model	.007169026	1	.007169026	F(1, 693)	=	0.88
Residual	5.65072655	693	.008154007	Prob > F	=	0.3487
				R-squared	=	0.0013
				Adj R-squared	=	-0.0002
Total	5.65789557	694	.008152587	Root MSE	=	.0903

  

f_f	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
fundeb_pib	.08994	.0959198	0.94	0.349	-.0983883 .2782683
_cons	.8425618	.0040925	205.88	0.000	.8345266 .850597

As explained, the multicollinearity problems were solved within the models with the option to choose through the lowest value of the Akaike test. Despite the choice for the Akaike test, the results of the variable for Equation 5 are not relevant.

With regard to Equation 6, Tables 21 to 24 are highlighted, which deal with the Akaike tests for the variables: Teaching; FUNDEB; Other Resources and IDEB Final years and FUNDEB.

**Table 21:** Akaike – Teaching Variable

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	695	-764.1564	-759.1036	2	1522.207	1531.295

**Table 22:** Akaike – FUNDEB Variable

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	695	-764.1564	-755.9538	2	1515.908	1524.995

**Table 23:** Akaike – Other Resources Variable

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	695	-764.1564	-759.9861	2	1523.972	1533.06

**Table 24:** Equation 6 - IDEB Final Years and FUNDEB

Source	SS	df	MS	Number of obs	=	695
Model	8.55880087	1	8.55880087	F(1, 693)	=	16.55
Residual	358.325309	693	.517063939	Prob > F	=	0.0001
				R-squared	=	0.0233
				Adj R-squared	=	0.0219
Total	366.88411	694	.528651456	Root MSE	=	.71907

  

i_f	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
fundeb_pib	3.10763	.7638269	4.07	0.000	1.607937 4.607322
_cons	3.681826	.0325894	112.98	0.000	3.61784 3.745812

In Equation 6, the model fit was low, referring only to 0.0219, which explains 2.19% of the variations. “FUNDEB” was relevant at 1%, as evidenced by the p-value of 0.00, for each 1 million increase in the value of onlending from FUNDEB, and the learning rate tends to grow by 3,10763 percentage points.

The results of this study reveal the dialogue with the research presented by Silva Filho et. al. (2016), Magro e Silva (2016) and Ázara et. al. (2017), (2017), given that, like these scholars, it was found that investments in education have a positive impact on the result of student’s performance. This reveals the importance of the social responsibility of the population of the state of Tocantins, in the sense of inspecting and participating in governmental actions, in order to provide society with better resources for education and, consequently, provide opportunities for the effectiveness of public management.

## 5. Conclusion

Public education resources are a priority established by the Constitution of the Federative Republic of Brazil, as it requires the allocation of minimum percentages of money to municipalities and states, in order to provide quality learning to the population. To verify that education expectations are met, MEC applies the IDEB to monitor students’ performance. Thus, this study sought to answer the question: did spending on education influence the IDEB of municipalities in the state of Tocantins between 2009 and 2017?

The results indicate that the greater the public investment, the greater the influence on IDEB. Six equations were elaborated, in (1) a higher coefficient was obtained, of 3.7%, for each one million increase in transfer, when analyzing the data of the final years, the dependent variables were learning, flow and IDEB, and there was only one independent variable, resulting from the lowest value of the Akaike test, which was “FUNDEB”. The coefficients of (4) and (6) had an impact of more than 3%, for each one million increase in transfers. Thus, “FUNDEB” was the independent variable that most impacted the learning of the initial and final years of the surveyed municipalities, showing the importance of this resource in fostering quality education in the state. In (1), (2), (3), (4) and (6), the increase in investments had a positive impact on learning, flow and IDEB. The result of (5) was not relevant, as it presented a percentage above 1%.

Therefore, when considering only the public investments applied in the education of the municipalities of Tocantins, one can perceive the efficiency of the indicator in the proportion of resources to education. To deepen future work on the growth of education indicators in the municipalities, it is suggested to include other factors, such as quality of life, food, regularity in the teaching staff, etc.

## References

- [1] Almeida, A. T. C., & Gasparini, C. E. (2011). Gastos Públicos Municipais e Educação Fundamental na Paraíba: Uma Avaliação usando DEA. *Documentos Técnicos Científicos*, 42(3), 621-640.
- [2] Amorim, K. A. F., Diniz, J. A., & Lima, S. C. (2017). A visão do controle externo na eficiência dos gastos públicos com educação fundamental. *Revista de Contabilidade e Organizações*, 11(29), 56-67. <https://doi.org/10.11606/rco.v11i29.126312>
- [3] Ázara, L. N., Pessanha, G. R. G., & Neto, J. E. B. (2017). Eficiência dos Municípios com Relação aos Gastos Públicos em Educação e Cultura na Microrregião de Varginha/MG. *Revista Capital Científico*, 15(4), 1-20. <http://dx.doi.org/10.5935/2177-4153.20170031>
- [4] *Ato das Disposições Constitucionais Transitórias* (1988). Retrieved on July 10th,2020, at <http://www2.camara.leg.br/legin/fed/conadc/1988/constituicao.adct-1988-5-outubro-1988-322234-publicacaooriginal-1-pl.html>

- [5] Berlt, C., Filho, R. B., & Tristão, P. A. (2017). Gastos Públicos: Análise da Aplicação da Lei de Responsabilidade Fiscal e da Constituição Federal no Corede Alto Jacuí. *Rev. Adm. UFSM*, 10(1), 85-100. <https://doi.org/10.5902/1983465910409>
- [6] *Constituição da República Federativa do Brasil de 1988*. (2016). [Coleção Saraiva de Legislação](21a ed.). São Paulo: Saraiva.
- [7] *Decreto n. 6.425, de 4 de abril de 2008*. Provides for the annual education census. Retrieved on June 5th, 2020, at [http://download.inep.gov.br/download/censo/2008/Decreto\\_n\\_6425.pdf](http://download.inep.gov.br/download/censo/2008/Decreto_n_6425.pdf)
- [8] *Decreto n.º 6.253/2007, de 13 de novembro de 2007*. Provides for the Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals - FUNDEB, regulates Law 11.494, of June 20, 2007, and makes other provisions. Retrieved on June 5th, 2020, at [http://www.planalto.gov.br/ccivil\\_03/ Ato2007-2010/2007/Decreto/D6253.htm](http://www.planalto.gov.br/ccivil_03/ Ato2007-2010/2007/Decreto/D6253.htm)
- [9] *Emenda Constitucional, n.º 14, de 12 de setembro de 1996*. Modifies arts. 34, 208, 211 and 212 of the Federal Constitution and gives new wording to art. 60 of the Transitional Constitutional Provisions Act. Retrieved on June 5th, 2020, at [http://www.planalto.gov.br/ccivil\\_03/constituicao/emendas/emc/emc14.htm](http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc14.htm)
- [10] *Emenda Constitucional, n.º 95, de 15 de dezembro de 2016*. Amends the Transitional Constitutional Provisions Act, to institute the New Tax Regime, and takes other measures. Retrieved on June 15th, 2020, at [http://www.planalto.gov.br/ccivil\\_03/constituicao/emendas/emc/emc95.htm](http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc95.htm)
- [11] Callegar, C. (2010). *O Fundeb e o financiamento da educação pública no estado de São Paulo*. (5.ed.). São Paulo: Aquariana: Ibsa: Apeoesp.
- [12] Câmara. (2011). *Entenda o que é receita corrente líquida*. Retrieved on June 15th, 2020, at <http://www2.camara.leg.br/camaranoticias/noticias/53635.html>
- [13] *Exposição de Motivos Interministerial n.º 00083/2016 MF MPDG*. Retrieved on June 22nd, 2020, at [http://www.planalto.gov.br/ccivil\\_03/Projetos/ExpMotiv/EMI/2016/83.htm](http://www.planalto.gov.br/ccivil_03/Projetos/ExpMotiv/EMI/2016/83.htm)
- [14] Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação (Fundeb). (2009). *Manual de orientação*. Retrieved on June 22nd, 2020, at [http://ftp.fnde.gov.br/web/fundeb/manual\\_orientacao\\_fundeb.pdf](http://ftp.fnde.gov.br/web/fundeb/manual_orientacao_fundeb.pdf)
- [15] Giuberti, A. C. (2005, dezembro). Lei de Responsabilidade Fiscal: efeitos Sobre o Gasto com Pessoal dos Municípios Brasileiros. *Anais do Encontro Nacional de Economia*, Natal, RN, Brasil, 33. Retrieved on June 22nd, 2020, at <http://www.anpec.org.br/encontro2005/artigos/A05A048.pdf>
- [16] Instituto Brasileiro de Geografia e Estatística. (2017). *Panorama do Estado do Tocantins*. Retrieved on June 22nd, 2020, at <http://cidades.ibge.gov.br/brasil/to/panorama>
- [17] Instituto Nacional de Estudos e Pesquisas Educacionais. (2015). *Censo Escolar*. Retrieved on June 27th, 2020, at <http://inep.gov.br/censo-escolar>.
- [18] *Lei n.º 11.494, de 20 de junho de 2007*. Regulates the Fund for Maintenance and Development of Basic Education and Valorization of Education Professionals - FUNDEB, referred to in art. 60 of the Transitional Constitutional Provisions Act. Retrieved on June 27, 2020, at [http://www.planalto.gov.br/ccivil\\_03/ ato2007-2010/2007/lei/11494.htm](http://www.planalto.gov.br/ccivil_03/ ato2007-2010/2007/lei/11494.htm)
- [19] *Lei Complementar n.º 101, de 4 de maio de 2000*. It establishes public finance rules aimed at responsibility in fiscal management and takes other measures. Retrieved on June 27, 2020, at [http://www.planalto.gov.br/ccivil\\_03/leis/LCP/Lcp101.htm](http://www.planalto.gov.br/ccivil_03/leis/LCP/Lcp101.htm)
- [20] *Lei n.º 001, de 23 de janeiro de 1989*. Provides for the basic organization of the Executive Branch in the Public Administration System of the State of Tocantins. Retrieved on June 27, 2020, at <https://www.tce.to.gov.br/museu/lei01.html>.
- [21] Lourenço, R. L., Nascimento, J. C. H. B., Sauerbronn, F. F., & Macedo, M. A. S. (2017). Determinantes Sociais e Pedagógicos das Notas do Ideb. *Revista Pensamento Contemporâneo em Administração*, 11(4), 27-43. <http://dx.doi.org/10.12712/rpca.v11i4.931>

- [22] Macêdo, F. F. R. R., Filho, L. S., & Júnior, M. M. R. (2012). Análise da Eficiência dos Recursos Públicos Direcionados à educação: estudo nos Municípios do Estado de Santa Catarina. *Anais do Encontro da Anpad*, Natal, RJ, Brasil, 36. Retrieved on June 27th, 2020, de [http://www.anpad.org.br/admin/pdf/2012\\_APB41.pdf](http://www.anpad.org.br/admin/pdf/2012_APB41.pdf)
- [23] Magro, C. B. D., & Silva, T. P. (2016). Desempenho dos gastos públicos em educação e a Lei de Responsabilidade Fiscal das capitais brasileiras. *Contabilidade, Gestão e Governança*, 19(3), 504-528. [http://dx.doi.org/10.21714/1984-3925\\_2016v19n3a9](http://dx.doi.org/10.21714/1984-3925_2016v19n3a9)
- [24] *Ministério da Educação*. (2018). Retrieved on June 27th, 2020, at <http://portal.mec.gov.br/institucional>
- [25] Nascimento, E. R., & Debus, I. (2002). *Lei complementar n° 101/2000: entendendo a Lei de Responsabilidade Fiscal*. Brasília: Secretaria do Tesouro Nacional.
- [26] *Nota Técnica n° 1: Índice de Desenvolvimento da Educação Básica – Ideb*. (2007). Retrieved on July 10th, 2020, at [http://download.inep.gov.br/educacao\\_basica/portal\\_ideb/o\\_que\\_e\\_o\\_ideb/Nota\\_Tecnica\\_n1\\_concepcaoIDEB.pdf](http://download.inep.gov.br/educacao_basica/portal_ideb/o_que_e_o_ideb/Nota_Tecnica_n1_concepcaoIDEB.pdf)
- [27] Silva Filho, G. M. da, Pereira, T. R. L., Dantas, M. G. da S., & Araújo, A. O. (2016). Análise da Eficiência nos Gastos Públicos com Educação Fundamental nos Colégios Militares do Exército em 2014. *Revista Evidenciação Contábil & Finanças*, 4(1), 50-64. Retrieved on June 27th, 2020, at <https://periodicos.ufpb.br/ojs/index.php/recfin/article/view/27425>.
- [28] Souza, F. O. (2017). *Emenda Constitucional 95/2016: Percepção dos Estudantes de Ciências Contábeis do Município de Campina Grande – PB sobre o novo Ajuste Fiscal (Trabalho de Conclusão de Curso)*. Universidade Estadual da Paraíba, Paraíba, PB, Brasil. Retrieved on June 27th, 2020, at <http://dspace.bc.uepb.edu.br/jspui/handle/123456789/15497>
- [29] Vieira, E. (2011, setembro). Educação no Tocantins: uma história de desafios em intensa transformação. *Secretaria da Comunicação*. Retrieved on June 27th, 2020, at <https://secom.to.gov.br/noticias/educacao-no-tocantins-uma-historia-de-desafios-em-intensa-transformacao-57179/>
- [30] Wilbert, M. D., & D’Abreu, E. C. C. F. (2013). Eficiência dos Gastos Públicos na Educação: Análise dos Municípios do Estado de Alagoas. *Advances in Scientific and Applied Accounting*, 6(3), 348-372. [10.14392/ASAA.2013060304](https://doi.org/10.14392/ASAA.2013060304)
- [31] Zoghbi, A. C. P., Matos, E. H. C., Rocha, F. F., & Arvate, P. R. (2009). Mensurando o Desempenho e a Eficiência dos Gastos Estaduais em Educação Fundamental e Média. *Estudos Econômicos*, 39(4), 785-809. <http://doi.org/10.1590/S0101-41612009000400004>