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An Evaluation of Overspending on Primary Education in Brazilian Municipalities

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Abstract:
The over-spending on public elementary education in Brazil, driven by the universalization of public education by the 1988 Federal Constitution, has been seen as a means to overcome the economic backwardness. The Common Pool Theory may be used to explain the failure of educational policy. This analysis is carried out using the Common Pool Model by Persson and Tabellini (2000), a branch of the Public Choice School. According to the logic of the model, the strengthening of a group in the dispute for resources intensifies the voracity effect and, therefore, the dispute between pressure groups, which results in excessive consumption of a public good by some agents to the detriment of others, causing a drop in consumption for all. In order to test the model's adherence to the trajectory of municipal finances, elementary education expenses and other expenses for the 2009/2019 period have been analyzed. Indeed, overspending on elementary education has been observed, reflected in the negative marginal utility of consumption, which was identified in the stagnation of educational and economic indicators. This expense has been partly financed by an increase in taxation and partly by indebtedness. This sub-optimal provision of public goods has increased outlays on debt service and reduced resources for non-financial expenditures demanded by groups. As a result, the expected beneficial effects of educational spending were neutralized and there was a collective loss of welfare, which is called the tragedy of the commons. Therefore, the results predicted by the theory are consistent with what has been observed in municipal public accounts. This impact of primary education spending on the municipal GDP growth and educational indicators was estimated using panel data regression. It is intended that this study can guide the formulation of public policies in federations.

Key Word*:*Common Pool Theory; Economic growth; Counties, Spending on education.

I. Introduction

The Federal Constitution required the universalization of elementary public education to improve education and, consequently, economic growth throughout the country.The theory of human capital, according to public policymakers, presented arguments in favor of this state action. This theoretical current established a link between higher population education and increased working-class productivity, and thus increased poor income and GDP. The guidelines put forth by UNESCO (1996) supported these claims. According to this theoretical framework, Spending on education would provide improved education, which in turn would generate increased productivity among workers and increased wages. This relationship between years of study and higher wages and higher workforce qualification as a factor of production and therefore a driver of economic growth has gained prominence in literature and in international bodies such as the IADB. (1996). As a result, the priority of primary education in Brazil was supported by the expectation that increased spending would lead to greater societal benefits. As an outcome, it was assumed that universal access to primary education with no budgetary constraints would raise per capita income and well-being.

However, the signalling theory refutes the results of the human capital theory. This criticism stems from the belief that increasing educational spending does not always lead to better teaching. This finding can be summarised in the following expression: "More money makes no difference", Monte and Leopoldino (2017, our translation). Newman et al. (2002), who explain that the composition of education expenditure can explain the outcome of learning indexes, corroborate this result. In line with these findings, the pedagogical part of education was seen as the most important way to improve teaching, as in Lamas e Seabra (2022). The theory of signalling, as explained by

Horner (2008), shows that the educational system doesn't make people more productive after a certain point. At that stage, improving education would not have any effect on the growth of the product.

Although education is not the only factor producing economic growth, public opinion has become convinced that education would provide a "miraculous cure". Politicians, academics, and the media all think that education expenses are enough to make the economy grow, but this is not a complete understanding of human capital theory. These players, known as median voters, have the ability to influence their groups' decisions on the allocation of public goods, ensuring that the decisions reflect their will. They form opinions based on a partial interpretation of the essential aspects of scientific studies. This is because many of these players have objectives unrelated to the well-being of the population. This is also Borcherding's (1977) and Olson's (1965) understanding of how to budget manipulation fulfils electoral purposes.

Based on this political judgment, there was no use of scientific evidence to subsidize the implementation of educational policy. Thus, the pedagogical part of education identified as the key element for improving teaching, as in Lamas and Seabra (2022), was discarded. Moreover, GDP spent on education in developing countries such as Brazil is higher than that of rich countries when they were still in development. In short, the conception of educational policy has adopted assumptions contrary to empirical evidence. In fact, these assumptions should show the causal relationship between increased spending on education and the success of state action.

It is noted that the importance of other theoretical assumptions for the successful implementation of educational policy lies in the foundations of economics. In this perspective, education is a piece, among other things, for the proper functioning of the system. This is because economic theory predicts that sustained economic growth necessarily requires an increase in productive investments in different sectors to overcome barriers in the economy, such as in the Jaguaribe diagnosis. (1958). In addition, it is essential to undertake a medium-term budgetary strategy to curb deficit growth with an adjustment of spending to revenue and to reduce the debt/GDP ratio, achieving self-sustainable growth. Measures will also be needed to strengthen the industry by increasing spending on research and development (R&D) and promoting progress in education.

In short, the ineffectiveness of educational policy in promoting economic growth occurred due to the direction of resources for education at the expense of other sectors, such as health, infrastructure, transport, science and technology, sanitation, culture and others. The lack of resources in other segments hindered the growth of public revenue and the financing of public spending, with negative impacts on the quality of life of the population.

This replacement of spending – with an emphasis on elementary education – may be the explanation for the LOA of 2023 having the lowest public investment forecast since 2010. This phenomenon is described in literature as a "short cover." (Mendes, 2014). In other words, increased spending on elementary education has replaced investments in other sectors. The size of this commitment can be measured by spending on education, which represents on average 30% of the municipal budgets.

This allocation policy increases the disbursement of debt with interest and, therefore, the inefficiency of government spending. In the beginning, increasing debt allows for increased spending. The allocation of resources for education financing instead of debt repayment leads to debt growth. This growth in debt increases spending on debt service and consequently reduces budgetary resources. This proposition corresponds to the findings of Amaral and Menezes (2008), for whom frustration with educational returns causes the waste of limited budgetary resources.

One of the effects of this policy is that it wastes scarce public resources on a badly designed public intervention. This excess supply of public goods limits the provision of other municipal public property. In this way, the increase in public production aimed at satisfying the needs, especially of the poorest, is reduced.

Oblivious to the above, it is observed that social science researchers take sides in the political struggle over resource allocation. In this dispute, the authors follow their own paradigms, with different diagnoses and prognoses, as shown by Kuhn (2006). They vie for the primacy of their publications in search of recognition in the academic and governmental fields. Quite often, the academic analyst concerns himself with the sale of his ideas and operates in a way similar to the political advisors of the government, whom Meltsner (1976) calls bureaucrats in residence.

In view of the allocation problem, this article seeks to answer the following questions using the assumptions of consumer theory and common fund theory: Does the increase in educational expenses guarantee a higher-quality elementary education? Did these expenses contribute to the increase in municipal GDP, a proxy for the well-being of individuals?

It is understood that this study is part of the public policy debate since it contributes to supporting the formulation of public policies in Federative countries, reinforcing the role of academic production as a subsidy to the implementation of government policies to serve the taxpayer. Or as Wildavsky (1979, p. 19) states: *improving citizen preferences regarding policies that he – the people – may prefer*.

In sum, this research is important to assess current educational policy and identify needs for change. The pursuit of change is necessary to improve the educational performance of students and the use of public resources available.

II. The Common Pool Theory

II.I The Common Pool Theory

The "Tragedy of the Common" is a multidisciplinary approach to public finances as well as psychoanalysis, biology, philosophy, demography, law and economics. It was presented for the first time by Hardin (1968). Then the study on the subject gained prominence with the publication of Governing the Commons, by Ostrom (1990), and the subsequent Nobel Prize in economics, in 2009. This publication provided a new tool for the study of public finances (Ostrom, 1993), and for the analysis of contemporary coordination problems.

In Hardin's exposition, it stands out the understanding of the Tragedy of the Commons as arising from the dispute between individuals for a common resource, characterized as rival and limited, leading to overconsumption, for some, and underconsumption, for others. Ward, Lankov, and Kim (2022) clarify that the consumption of rival goods of limited supply by one person decreases the amount available to others, which tends to generate excessive spending (Buchs & Soguel, 2022; De Haan, Jong-a-Pin & Mierau, 2013), for exaggerated use, by some, and scarcity, for others, as found by Baden, Baden, and Noonan (1998).

This result stems from the fierce dispute between the groups, which are subject to the so-called "voracity effect"[1], by as described by Tornell and Lane (1999). This effect implies a reduction in the supply of certain goods (Kidwai & Oliveira, 2020).

This incessant struggle is possible because individuals make decisions considering immediate interests and ignore the consequences of their actions, motivated by bearing only a portion of the cost of the public good enjoyed (Malott & Glenn, 2019). In literature, this problem is known as *free rider* (Torgler, 2022). The observation of this senseless behavior led Ostron (1990, p. 5) to state: "the paradox that individual rational strategies lead to collectively irrational outcomes[2] […]".

Because of these actions, there is the Tragedy of the Commons. This phenomenon is described as a continuous fall in assets *per capita*. "In this sense, without organizational rules that guarantee the provision and proper use of the common, despite the evident collective damage in its exhaustion, there is no surprise in the result of collapse" (Mattos, 2018, p.14).This concept was incorporated into the study of public finances by Ostrom (1990) because it was recognised as inherent in the actions of voters and politicians.

The Common Pool Theory (CPT) was incorporated into the framework of the School of Public Choices (SPC) in the study of public finances. CPT gained prominence with Persson and Tabellini (2000) for presenting as a solution to the Common Pool problem the creation of property rights (Rode, 2022). This theoretical framework continued to be disseminated by economic journals and various authors, such as Brueckner (2021), Krogstrup and Wyplosz (2010), Lago, Lago-Peñas and Martinez-Vazquez (2022).

The Common Pool works associated with the EEP make it possible to highlight the influence of taxpayers and users on the financing of government revenues and public spending. This is because both theories reinforce and complement each other. The EEP recognises that governments implement spending to meet the demands of voters and pressure groups, who act selfishly to stay in power, as exposed by Adekunle, Bekoe, Badmus, Anagun and Alimi (2021).

Thus, the problem of the common pool Theory begins with claims for public goods made to politicians by pressure groups. However, meeting this situation depends on the inclusion of the expenditure in the Budget Law by members of Congress and the existence of sources of revenue for financing spending. In the face of budgetary constraint, there is a dispute for public goods superior to the needs, in order to ensure the desired amounts. Thus, the problem is characterised by limited income and unlimited demands.

According to Rode (2022), the demand for public goods is explained by the absence of a counterpart between taxes paid by taxpayers and goods and services received. In other words, there is excessive consumption of

[1]The search by the groups to obtain most of the common resources is known as the "voracity effect."
[2] "The paradox that individual rational strategies lead to collectively irrational outcomes."

a public good due to the fact that agents pay a portion of the cost, with the rest of the burden being passed on to society.

II.II Common Pool Model

The application of the Persson and Tabellini (2000) Common Pool model to this study aims to allow the Common Pool Theory to be used to examine municipal public finances and find a link between the unlimited search of competing groups for consumption of public goods and the state of government finances.

This correlation is understood to be possible with a description of the role of the theoretical variables accompanied by their measurement. In this way, a practical question about how to deal with the Common Pool's problems would be answered, since theoretical suggestions would be useless without being backed up by real-world evidence.

It is worth mentioning that, in the transposition of the aforementioned model, the problems of the Common Pool concern the municipalities, as indicated by Wierts (2008). In this adaptation, The Common Pool corresponds to own revenues and municipal transfers. In the same way as in the Theory of The Common Pool, the model is divided into two formats, namely: simple form and with indebtedness.

In the simple form, you have the tragedy of the commons, because of the uncooperative behaviour of groups and members of the Congress. Because of selfish actions, groups compete for public goods, under the voracity effect, and end up pressing for increased public spending. Regarding this issue, Leite (2005, p. 33) clarifies that "the excess provision of public goods naturally leads to increased spending; members of Congress meet demands in exchange for votes, causing the concentration of the supply of a public good to the detriment of other goods." Therefore, there is a disregard for the fulfilment of national economic priorities by voters and members of Congress.

In the indebted model, due to the scarcity of some goods, governments resort to budget deficits to meet the demands of underserved groups. This growing public indebtedness stems from the popular pressure on members of Congress, who, in exchange for votes, make it possible to reduce less the supply of under-offered goods, which implies growing debt service[3] (Velasco, 2000). Leite (2005, p.33) argues that this is at the expense of a "continuous generation of public deficits".

Thus, the progressive disbursement with the payment of interest and amortisation continuously reduces current government revenues and, concomitantly, the capacity to provide public goods. Thus, the use of public debt to provide these resources to pression groups leads to a process that culminates in the reduction of public goods *per capita.*

Another incorporation of the Theory of The Common Pool to the present study is made explicit by the utilitarian theory of Jevons (1996). The identification of the budget allocation that maximizes the well-being of all groups is sought. In this model, the behavior of the welfare variable, a function of the marginal utility of consumption of public and private goods, follows utilitarianism.

This theory advocates that the marginal utility of the consumption of a good varies according to consumption and can be measured by indicators. Based on this proposition, utility is conceived as a numerical measure of a consumer's satisfaction. That defined, it can be said that the greater the consumption, the greater the total utility. However, this growth is progressively lower, given that the increase in marginal utility is less and less, often assuming negative values. These values would correspond to the oversupply of public goods. In this case, the additional consumption of public goods would lead to a reduction in total utility.

However, consumers make choices in order to maximise their utility, confronting benefits and costs (Varian, 2010). Thus, the demand for public goods by groups is inversely related to the marginal cost for the group to obtain the good. This means that the higher the marginal cost for the group to enjoy the good, the lower the demand, with the cost being measured by the group's expenditure in taxes for the production of the public good. Therefore, each group demands public goods to the point where the benefit of consumption does not become inferior to the cost.

[3]In the 2019–2019 period, the increase in debt service was significant. See data available on the website of the Secretaria do Tesouro Nacional (National Treasury of Brazil) and the Ministry of Economy (STN/ME, 2022). In 2009, the Federal Government of Brazil carried out a redemption exceeding the public debt issuance by R$ 13,235 million, while in 2019, the redemption was lower than the issuance by R$ 42,270 million. Therefore, between 2009 and 2019, the federal government stopped amortising the debt to increase it.

It is noteworthy that, in this study, for the analysis of educational spending, the suggestion of Hood (1976) was followed, contemplating a "perfect budget allocation" to evaluate the impact of educational spending. This procedure is comparable to the way economists employ the perfect competition model. Thus, the ideal budget allocation that optimises well-being is one in which the marginal utility of the groups' consumption of public goods is equal and positive, not negative or identical (Periola, 2019). In an ideal model, each level of public good provision is Pareto efficient, that is, the marginal utility of each public good offered is equal.

After the descriptions of the theoretical issues, it is sought to demonstrate the applicability of the common pool model in both the simple and indebtedness models. Recommendations to avoid oversupply of municipal public goods without being able to identify this situation through the use of indicators would be of little use.

III. The Basic Model of the Common Pool of Persson And Tabellini

The Common Pool model used in this study seeks to highlight observable aspects-overexpenditure and overtaxation-that stand out in the trajectory of the Brazilian economy, especially in the allocation of budgetary resources among federal entities, as studied by Giubert (2005). According to the model, these expansionary measures of public spending serve the interests of groups and, for this reason, contribute to the re-election of politicians, as well explained by Aidt, Veiga, and Veiga (2011) and Klomp and De Haan (2013). For no other reason than that, Théret (1991, p. 128) States: "in the liberal regime, there is an uninterrupted growth of public debt [...]".

III.I The Basic Model of the Common Pool With a Balanced Budget Assumption

In the application of the Theory of the Common Pool to municipalities, the primary issue facing groups – rich and poor – concerns the choice between public and private goods. In the first, it is considered a grouping formed predominantly by taxpayers with a higher purchasing power; in the second, by taxpayers with a lower purchasing power. This is because the prevailing form of taxation is based on the ability to pay. In this modality, individuals with a greater ability to pay pay more taxes, and those with the same ability to pay should collect the same amount in taxes (Murphy & Nagel, 2002). In the predominantly wealthy group, the preference is for private products. This choice is justified by the simplifying hypothesis that this group does not consume public goods[4]; therefore, the payment of tribute is a loss. It follows that the amount that is not paid gives them the possibility to buy private goods with a view to their well-being.

On the other hand, when the group consists predominantly of low-income individuals, the preference is for public items. These individuals have a reduced income. Thus, they pass on small amounts of taxes individually, this transfer being less than the value of the public goods demanded by them. In other words, the choice of the poor for the public good occurs because the costs are less than the benefits.

Once the choice between public and private goods is made, the next step is the choice between the public goods elected by the population. Given the diversity of the demand for public goods and the budgetary constraints, it is up to the leaders of each pressure group to reduce the demand for a certain public good. In this way, it is determined that the goods will be demanded by the group by majority election.Therefore, the chosen good is the preferred one in the group, so that this choice does not express the individual will but that of a community.

Given the above, the question to be answered is this: how is the provision of public goods processed by the government? To answer this question, one can resort to an example: let's assume that J = 1 and 2, with J = 1 being the group that demands education services and J = 2 being the group that demands other goods. Thus, the population size is the sum of all groups, being N:

$$N = \sum_{J=1}^{J} N^{J}. \qquad (1)$$

It is evident that the measurement of the well-being of individuals in Group J of the population that demands private and public goods is represented by the utility function described below: (2) and (3). This utility

[4] The public goods referred to here are those called merit goods. The consumption of these goods is subject to rivalry and excludability. These are goods provided by the government so that the low-income population can enjoy them. Examples include public education and public health.

function portrays the decrease in the income of the richest individuals as a result of the payment of taxes that finance public spending. It also shows the increase in income of individuals with lower purchasing power due to the acquisition of public goods. These functions represent a set of individuals, namely:

$W^i = c^i + H(g)$ (2)

be $H(g) = \ln g$, one has:

$W^i = c^i + ln(g^J)$ (3)

In the equation (3), the well-being provided by c^i and $H(g)$ causes decreasing rates to grow, in accordance with the law of decreasing marginal utility. In mathematical terms, the first derivatives of these variables are positive, and the second, negative.

In this simple version, it is assumed the premise of financing public spending only for taxes τ. The tax burden can be raised to the amount sufficient to finance the demand for public goods, limited to their value. The increase in rates could generate greater tax revenue and thus allow the government to act more intensively in the economy. It is important to make it clear that the government can only use tax revenue to increase public spending.

As in the model of Persson and Tabellini (2000), there is the financing of public spending by the tax rate τ, which can assume a value between 0 and 1, incident on the income of each individual y^i, with budget constraint:

$\tau xy = 1$ (4)

Thus, more public spending corresponds to less private spending. It is thus understood that the State spends what it collects, and taxpayers recover what they pay in taxes in aggregate terms. However, the return of resources to taxpayers is uneven, with some groups receiving greater value from public goods than they paid in taxes. Thus, public consumption is carried out at the expense of private consumption and unevenly. Each group consumes:

$C^J = y - g^J = y - \tau$ (5)

Aggregate demand for public goods (G) is the result of the sum of the tribute paid by individual:

$N = N^J + g^J = G$ (6)

Once the demand for public goods is understood, it is possible to know the tax rate necessary for public production:

$\tau = \frac{\sum_J N^J g^J}{N}$ (7)

The result g^{JFS} of the common Pool distant of the social optimum can be evidenced through some algebraic operations. By inserting (9) and (11) in expression (7) and maximizing the well-being function, one has:

$W^J = \left(y - \frac{\sum_J N^J}{N} g^J\right) + \ln g^J$ (8)

Max W^J in relation to g^J: $W^J = \frac{dW^J}{dg^J} = -\frac{N^J}{N} + \frac{1}{g^J} = 0$

$g^{JFS} = \frac{N}{N^J} > 1$, $N > N^J$ (9)

The level of public production does not correspond to the Pareto-optimal, since the situation of some is improved at the expense of others. This is because, some benefited groups acquire public goods by paying in taxes a fraction of the cost (NJ/N). This demand tends to grow with the inequality of the level of median and average income. The lower the median income in relation to the average income, the higher the demand for public goods –

median voter theorem (Meltzer & Richard, 1981). Consequently, there is an oversupply of the public good to serve those with lower purchasing power, and an increase in the tax burden to finance public spending. Thus, the public goods supply of the Common Pool solution is greater than the g* of the social optimum ($g^{J*}=1$), as shown in (9). This means that the more decentralized the spending decision (i.e., N^J the smaller it is relatively to N), the farther one is from the social optimum.

III.II The Dynamic Model of the Common Pool with Hypothesis of Indebtedness

Once these considerations are made to compute the equilibrium expense, the solution method is used *backward*, starting with the last period. Initially, the equilibrium expenses of groups I and J in the second period are calculated, and then those of the first period are obtained.

The government seeks to reconcile the interests of the groups, which are often divergent, without exercising its spending-limit authority. Each group sets its own spending according to its interests, without a national guideline or perspective. The philosophy of adapting the budget to the needs of pressure groups predominates, not the opposite conception that the demands for expenses must conform to the limits imposed by budget constraints. On this issue, Van der Ploeg (1984, p. 217) states that "the fiscal deficit arises as the outcome of a political process of harmonising interest in the economy."

Thus, in the second period, the model brings as hypotheses for Group J the assumption of public debt, b, and public spending of Group I, g_2^I, as data. That is, during this period, Group J does not consider that its spending increases the public debt, and makes its decision without taking into account the resource demand of Group I, g_2^I, maximizing its wellness function:

$W\left(b + g_2^J + g_2^I + H\left(g_2^J\right)\right)$ (10), which results in the first-order condition:

$W\left(b + g_2^J + g_2^I + H\left(g_2^J\right)\right)=0$

The assumptions of the model, of J spending and the debt of the second period, reach Group I. In this way, this group behaves like Group J. Consequently, it maximizes the wellness function.

The spending maximizations of groups I and J allow to determine the equilibrium spending. By obtaining the condition of the first period of both groups and applying the implicit function theorem, the equilibrium expenditure of the two groups is determined. For Group J, in period 2, the equilibrium expenditure consists of a decreasing function of the debt:

$G_2^J = G(b) = \sum_J G^J(b)$, with $G_b^J < 0$

The equations presented show the growth of debt to finance public spending based on increasing costs. The rise in debt increases the marginal cost of public spending due to higher expenditures with amortisation and interest payments.

In accordance with the assumptions of the model, the agents seek to raise public spending, at first, with debt financing because they can have more resources to re-elect. This perception causes everyone to seek to spend more, which tends to increase public debt service in subsequent periods, reducing the budget for non-financial spending. Because of this, the well-being of the users of the educational good is a function of private consumption and education:

$W^I = C^I + Ge^I$ (11)

where,

W^I, is the well-being of the users of the educational good of the municipality i measured by the average salary of the Municipality i. It is the dependent variable.

C^I, private consumption of the users of the educational good in the municipality;

Ge^I, private consumption of the users of the educational goods in the municipality;

Similarly, the well-being of the users of other public goods is a function of private consumption and public good, as expressed in the equation (12):

$W^J = C^J + Gd^J$ (12)

Where,

W^J ,is the well-being of the users of other public assets of the municipality I measured by the average salary of the Municipality i. It is the dependent variable.

C^J, private use of other public goods in the municipality I;

Gd^J, expenses with other public goods of the municipality I.

This logic is present in the excess spending on education and, in particular, on elementary education. However, as higher spending is accompanied by decreasing improvement in education, expansion may imply negative or inexpressive marginal utility. With this, the pursuit of greater well-being of the pressure groups may not be achieved with over-spending in elementary education.

In accordance with the assumptions of the model, agents seek to raise public spending, at first, with debt financing, because they can have more resources to re-elect themselves, without revealing the costs. This perception causes everyone to seek to spend more, which tends to increase the service of public debt in subsequent periods, reducing the budget for non-financial spending.

This dispute that causes rival groups to demand property under the effect of "voracity" occurs with budgetary resources, and, in particular, with the Fundamental Education. These groups are pressured to obtain most of the common resources. Also, like in the CPR, the outcome of the dispute is over-spending on education. This excessive provision of educational goods is accompanied by less and less improvement of education increasingly. In other words, the expansion of spending and provision of educational goods may imply negative marginal utility for the users of the educational property.

In addition, given the scarcity of resources, the greater expenditure on a public good implies the reduction of the supply of other public goods and thus the total utility of its users. Therefore, the inefficient expansion of the supply of a public good at the expense of the provision of other public services reduces the overall benefits of all users of public goods. Thus, we have that the well-being of all pressure groups of public goods results from the sum of the educational goods and the other public property.

$W^T = W^J + W^I$ (13)

Where,

W^T = well-being ofall groups;

W^J = well-being of group J;

W^I = well-being of group I.

We have that the increase in the well-being of all groups of users of goods is elevated with the increase of the total utility of the consumption of the public good for education and other goods. The increase in the supply of the educational good and the decrease of the other goods raises the marginal utility of the former and decreases the rest. In this way, the increase in the supply of the educational good reduces its marginal utility, and can lead to the

decline of the total utility. In this situation, the reduction of the supply of other public goods raises their marginal utility, but reduces their total utility.

Thus, it is intended to infer what has happened with the utility of the public educational good. If the increase in wages has not been achieved, the total utility of the spending on education ceases to reach its purpose, ceasing to raise the total usefulness of the users of education. In this situation, we have a decline in the total utility of consumption of all users because the total usefulness of the educational good has not grown and that of the other goods has decreased. It is known that the supply of public education goods has grown at the expense of others.

IV. Methodology

In this section, the results of the CPR model will be presented. A regression was carried out as a variable dependent on the variation of the average wage in the municipalities between 2009 and 2019 and as explanatory variables the spending on elementary education per student, the average salary of 2004, the percentage of industrial workers over the total of workers, the population per municipality, the rate of growth of municipal GDP and the Municipal GDP of 2004. It also included the qualitative variable factor to capture state particularities. Thus, the hypothesis to be tested is $\beta 2 = 0$, that is, that spending on primary education, by not improving education, did not provide an increase in the productivity of work and therefore did not increase the wages of workers in general.

• Hypothesis : $\beta 2 = 0$, Indicating that spending on education did not contribute to the improvement of education, and therefore did not leverage productivity and wages.

The equation to test the hypothesis was as follows:

$$varsal^i = desensfund^i + salainic^i + ind^i + pop^i + txpib^i + pib04^i + factor(estado) \quad (15)$$

Where,

$varsal^i$ =is the measure of the total utility of voters in municipality i, using the variation in average wages between 2009 and 2019 as a proxy;

$salainic^i$ =average salary of workers in municipality i;

ind^i =percentage of the number of industry workers in the total number of workers;

pop^i =population of municipality i;

$txpib^i$ =per capita GDP growth rate of municipality i;

$pib04^i$ = PGDP of municipality i in 2004.

The equation (15) is tested in cross section model. This equation seeks to answer whether the spending on education of municipalities contributed to the rise of average wages in municipalities. It would be expected that improved education would contribute to increased productivity and consequently wages.

4.1 The data

The accounting data were taken from the FINBRA/STN website and from the MEC's educational performance websites; the data relating to population, per capita income and the rate of growth of per-capita income were extracted from the IBGE website. He was employed as a proxy, for the marginal utility of municipal education, the average salary per municipality. These data are annual and refer to the period from 2009 to 2019. These values are available in the RAIZ system by the Ministry of Labour. In this system, the salaries of all employees are informed by the companies.

It should be noted that the literature of public finances and the theories of economic development provided support for the selection of the proxies of the variables used in the model. The most used proxies in the national literature were selected which suited the models best, based on statistical criteria.

IV. The results

The following table reports the results of education spending for the period 2005/2015 on salaries from 2009 to 2019 in the cross-section model. The main factor that explained wage growth was the rate of GDP growth. This is because the increase in GDP increases the demand for labor, and therefore wages. The reduction in the percentage of industrial workers over the total number of workers explains its negative sign. It is precisely in the industry where improved education can impact productivity and thus wages. In this sector, productivity gains due to a higher skilled workforce would be more noticeable. Population variation had little influence on wage growth due to migration to large centers that already had abundant labour. The negative dummy was due to the fact that it is in large cities and small cities where the highest payment with education without expressive wage increases.

Regression Framework of Return of Education Expenditures on Average Wages by Municipalities

Parameter

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	1.647e+02	3.569e+01	4.613	4.06e-06	***
desensfund	-1.600e-04	1.279e-04	-1.250	0.211269	
salinic	2.916e-03	1.386e-03	2.104	0.035465	*
ind	-7.570e+01	2.175e+01	-3.481	0.000504	***
pop	-2.946e-05	1.714e-05	-1.719	0.085632	.
txpib	8.438e+00	3.764e+00	2.242	0.025028	*
pib04	-1.967e+00	2.305e-01	-8.534	< 2e-16	***
dummy	-2.933e+01	8.171e+00	-3.589	0.000334	***
factor(estado)12	2.660e+01	6.337e+01	0.420	0.674709	
factor(estado)13	-5.655e+01	4.718e+01	-1.199	0.230703	
factor(estado)14	-7.476e+01	7.292e+01	-1.025	0.305326	
factor(estado)15	6.618e+01	4.096e+01	1.616	0.106225	
factor(estado)16	-1.217e+02	7.287e+01	-1.670	0.095038	.
factor(estado)17	1.184e+01	4.071e+01	0.291	0.771152	
factor(estado)21	-2.056e+01	3.903e+01	-0.527	0.598404	
factor(estado)22	-1.510e+01	3.894e+01	-0.388	0.698168	
factor(estado)23	4.189e+01	3.944e+01	1.062	0.288228	

factor(estado)24	9.118e+00	3.990e+01	0.229	0.819245
factor(estado)25	7.074e+01	3.867e+01	1.829	0.067420 .
factor(estado)26	1.383e+00	3.938e+01	0.035	0.971986
factor(estado)27	1.289e+01	4.291e+01	0.301	0.763794
factor(estado)28	5.586e+01	4.516e+01	1.237	0.216182
factor(estado)29	-6.355e+01	3.694e+01	-1.720	0.085437 .
factor(estado)31	-8.556e-01	3.578e+01	-0.024	0.980925
factor(estado)32	-1.295e+01	4.480e+01	-0.289	0.772560
factor(estado)33	5.539e+00	4.356e+01	0.127	0.898826
factor(estado)35	-2.580e+01	3.628e+01	-0.711	0.476936
factor(estado)41	1.147e+02	3.702e+01	3.097	0.001962 **
factor(estado)42	1.462e+02	3.797e+01	3.850	0.000119 ***
factor(estado)43	7.236e+01	3.682e+01	1.965	0.049420 *
factor(estado)50	1.529e+01	4.478e+01	0.341	0.732764
factor(estado)51	4.634e+01	4.082e+01	1.135	0.256363

The statistical significance levels at 1%, 5%, and 10% are indicated as ***, **, and * respectively.

The result of the regression, in the table above, indicates that the variation in the average salary in municipalities was not explained by education spending. As a result, the amount paid by the municipalities in basic education (proxy of human capital) did not generate growth in the municipality's average salary. The economic growth ratio of these variables, expressed in economic return to society, was the economic argument for the increase in privileged spending. However, such an association has not been identified. Therefore, spending on education did not create value for society.

One possible explanation for this finding is that it is not useful to spend increasingly on education, although it may be a factor of production, because, from a given limit, marginal gains are zero, as predicted by the theory of signalling, as in Hörner (2008). This phenomenon has been observed in the fact that the Dominican Republic, the Philippines, Paraguay, and Sri Lanka have human capital stocks like South Korea and Taiwan, but showed lower economic growth.

The CPR points to the exacerbated supply of the educational good as a result of the dispute between the groups, accompanied even by the marginal negative utility of the good chosen by the majority. This result of allocating scarce resources for a given good is known in the literature as the "tragedy of the common," a link recognized by Zhu and Kirley (2019).

II. Conclusion

After 30 years of the implementation of the universalization of public elementary education, no significant improvement in education has been observed in qualitative terms, nor have the expected effects on the growth of municipal GDP been verified. Although this expenditure has been seen as a means to resolve some social ills, the idea has remained misguided.

In this sense, in Brazil, it cannot be said that there is a relationship between educational spending, school performance, and the growth of municipal GDP. The results of the regressions with the cross-section model did allow for the rejection of the hypotheses that spending on education contributes to the improvement of education. Thus, this spending did not increase productivity and wages. The findings can be explained by the Common Pool Theory.

Fundamental education spending, which in 2009 represented 25% of the budget of the Brazilian municipalities, increased to 33% in 2019, according to FINBRA/STN. There has been an increase in public debt and current spending. The result was increased public spending in addition to the Optimo de Pareto.

It is found that some agents have excessively consumed a public good at the expense of others, financed by the increased tax and debt burden. Brazil's public income of 31.2% of GDP is one of the largest in Latin America.Therefore, spending on education did not generate wealth for society. There was no impact of the spending on primary education on average wages in municipalities. Thus, the expansion of education spending did not raise the total utility of the users of public goods. Because the expenditure on primary education increased and the other expenses decreased. As a result of this policy, the total utility of goods consumed by the entire educational group and society decreased.

There is an apparent paradox in which the government's privileged spending on primary education has not reached the promised goals, yet governments insist on increasing it. The Common Fund theory explains this contradiction by highlighting that while increasing public spending on elementary education does not improve the quality of education and does not increase GDP growth, fiscal policy will continue to be used because it is not related to technical goals; it only fulfils the goal of making the government perpetuate in power. Furthermore, the absence of rejection by the electorate in relation to excessive spending on education is due to the voter not realising the reverse relationship between education spending and lower GDP growth.

The public policy implemented has focused on expanding public spending on education. However, the costs outweighed the economic benefits. Society ceased to enjoy various public goods, so there was an increase in the supply of public educational goods. Moreover, spending on education did not boost economic growth.

Future research should extend the duration of this study. A study with more than 30 years of coverage could corroborate the findings or point out new measures.

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