

**FUNDAÇÃO GETÚLIO VARGAS**  
**ESCOLA BRASILEIRA DE ADMINISTRAÇÃO PÚBLICA E DE EMPRESAS**

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**DIFFERENT TYPES OF TRANSPARENCY, DIFFERENT IMPACTS?**  
**THREE ANALYSES OF MUNICIPAL EDUCATION IN BRAZIL**

**RIO DE JANEIRO**

**2020**

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Thesis submitted to FGV-EBAPE,  
in partial fulfillment of the requirements  
for the degree of Master of Science in  
Administration.

**Academic Advisor:** Prof. Dr. Robert Gregory Michener

**Research track:** Institutions, Policy and Government

Rio de Janeiro, November/2020.

Barros, Jonas Coelho de

Different types of transparency, different impacts? : three analyses of  
municipal education in Brazil / Jonas Coelho de Barros – 2020.  
57 f.

Dissertação (mestrado) - Escola Brasileira de Administração Pública e  
de Empresas, Centro de Formação Acadêmica e Pesquisa.

Orientador: Robert Gregory Michener.

Inclui bibliografia.

1. Transparência na administração pública - Brasil. 2. Educação e Estado -  
Brasil. 3. Avaliação educacional - Brasil. I. Michener, Robert Gregory. II.  
Escola Brasileira de Administração Pública e de Empresas. Centro de  
Formação Acadêmica e Pesquisa. III. Título.

CDD – 352.53

Elaborada por Márcia Nunes Bacha – CRB-7/4403

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EDUCATION IN BRAZIL**

Dissertação apresentado(a) ao Curso de Mestrado em Administração do(a) Escola Brasileira de  
Administração Pública e de Empresas para obtenção do grau de Mestre(a) em Administração.

Data da defesa: 16/12/20

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**Presidente da Comissão Examinadora:** Prof<sup>º</sup> Robert Gregory Michener

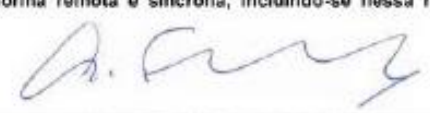
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## **Agradecimentos**

Esse trabalho é fruto do apoio que recebi de diversas pessoas ao longo desses dois anos. Dedico essa seção para retribuir em palavras o esforço coletivo que me possibilitou concluir essa etapa.

Em um ano de isolamento, poder contar com amizades que te deem suporte é fundamental para seguir em frente. Por isso agradeço aos meus colegas de turma, em especial a Joaquim, Leo, Lorena, Natália e Stela, por toda a ajuda acadêmica e emocional que permitiram desbravar as dificuldades do curso com mais tranquilidade.

Agradeço também à FGV e à CAPES pelas bolsas que possibilitaram tornar esta empreitada financeiramente viável. Ciente das dificuldades que permeiam a ciência brasileira, sinto-me honrado em ter minha educação prestigiada dessa forma.

Também não seria possível ter executado e planejado as análises aqui apresentadas sem o conhecimento intenso que adquiri em tão pouco tempo. Por esse motivo, agradeço aos professores do curso, que dominaram com maestria a difícil tarefa de transmitir o saber. Em especial, agradeço ao Greg, meu orientador, pelos seis anos de tutoria, ensinamentos e confiança que recebi.

Por fim, agradeço aos meus pais, que sempre se esforçaram ao máximo para que eu obtivesse a melhor educação possível dentro e fora de casa. Graças a esse esforço, pude ser agraciado com as oportunidades que me levaram a ser mestre.

## **Abstract**

This study aims to examine three different types of transparency, and relative levels of government compliance with those transparency policies at the municipal level. The goal is to quantitatively measure the impact of transparency on public administration outcomes. More specifically, I examine the impact of different types of transparency on public education outcomes at the municipal level in Brazil. First, I use a Data Envelopment Analysis (DEA) to quantify efficiency in education expenditures and identify if both internal and external types of transparency correlate with greater efficiency. Second, a Propensity Score Matching analysis is performed to measure the impact of transparency on education using the Brazilian National Index of Primary Education (IDEB). Results show that internal transparency is a significant but weak predictor of active and passive transparency. Moreover, active and passive transparency do not seem to be correlated among themselves. Third, the study provides tentative evidence that internal transparency might be correlated with greater educational efficiency, while active and passive transparency produced no such correlation. Importantly, the study finds a strong correlation between transparent municipal administration and better results on the IDEB (matched municipalities).

**Keywords:** Transparency, Education, Efficiency, DEA, Matching

## Resumo

Este estudo tem como objetivo contribuir com a literatura sobre transparência, medindo quantitativamente os impactos de três diferentes tipos de transparência nos resultados da administração pública no nível municipal. Para atingir esse objetivo, usará a educação como base para três análises diferentes, comparando os resultados nessa área com a transparência no nível municipal no Brasil. Será usada uma Análise Envoltória de Dados (DEA) para quantificar a eficiência nos gastos com educação e identificar se a transparência, tanto interna quanto externa, se correlaciona com maior eficiência. Além disso, um Propensity Score Matching será realizado para medir o impacto da transparência na educação usando o Índice de Desenvolvimento da Educação Básica (IDEB). Os resultados mostram que a transparência interna é um indicador significativo, mas fraco, de transparência ativa e passiva. Além disso, a transparência ativa e passiva não parecem estar correlacionadas entre si. O estudo também fornece evidências de que a transparência interna pode estar correlacionada com uma maior eficiência educacional, enquanto a transparência ativa e passiva não produziu tal correlação. Por fim, através da análise de pareamento, foi encontrada uma alta correlação entre administração municipal transparente e melhores resultados no IDEB.

**Palavras-chave:** Transparência, Educação, Eficiência, DEA

## Contents

<a href="#">1</a>	<a href="#">Introduction</a>	1
<a href="#">2</a>	<a href="#">Literature review and hypotheses</a>	5
<a href="#">2.1</a>	<a href="#">Education and efficiency</a>	6
<a href="#">2.2</a>	<a href="#">Transparency</a>	10
<a href="#">3</a>	<a href="#">Data collection and context</a>	14
<a href="#">3.1</a>	<a href="#">Education expenditure</a>	14
<a href="#">3.2</a>	<a href="#">Educational performance</a>	16
<a href="#">3.3</a>	<a href="#">Contextual variables</a>	17
<a href="#">3.4</a>	<a href="#">Transparency</a>	18
<a href="#">4</a>	<a href="#">Analysis I</a>	19
<a href="#">4.1</a>	<a href="#">Methodology</a>	19
<a href="#">4.2</a>	<a href="#">Description</a>	20
<a href="#">4.3</a>	<a href="#">Results</a>	23
<a href="#">4.4</a>	<a href="#">Discussion</a>	24
<a href="#">5</a>	<a href="#">Analysis II</a>	24
<a href="#">5.1</a>	<a href="#">Analysis II.a</a>	25
<a href="#">5.1.1</a>	<a href="#">Methodology</a>	25
<a href="#">5.1.2</a>	<a href="#">Results</a>	30
<a href="#">5.2</a>	<a href="#">Analysis II.b</a>	32
<a href="#">5.2.1</a>	<a href="#">Methodology</a>	32
<a href="#">5.2.2</a>	<a href="#">Results</a>	33
<a href="#">5.3</a>	<a href="#">Discussion</a>	34
<a href="#">6</a>	<a href="#">Analysis III</a>	35
<a href="#">6.1</a>	<a href="#">Methodology</a>	35
<a href="#">6.2</a>	<a href="#">Description</a>	37
<a href="#">6.3</a>	<a href="#">Results</a>	40
<a href="#">7</a>	<a href="#">Conclusion</a>	43
<a href="#">8</a>	<a href="#">References</a>	45



# 1 Introduction

Research on governmental transparency has gained increasing interest over the last years (Marino et al. 2017). Specifically, many works have analyzed its impacts and consequences. One of the puzzles surrounding transparency, however, is how different *types of transparency* elicit varying levels of compliance and exert different impacts. For example, compliance with one type of transparency may be a result of better governance within the public administration, while compliance with another type of transparency might be driven by a fear of legal penalties.

There are two types of “external transparency”. The first is active and open data transparency, which typically entails web-based and often obligatory publishing (disclosure) of information to the public. The second is passive transparency, defined as responses to requests for information, usually via email or an online form. Analyses often do not distinguish among different types of transparency and their corresponding impacts, treating them as monolithic. Yet different types of transparency ought to produce different incentives for public managers, citizens and other stakeholders.

Both active and passive transparency are considered external types of transparency because they are directed at the general population. Beyond external forms of transparency, there is internal transparency, inter-organizational ‘reporting’. Adopting, implementing, and complying with these different types of transparency occurs in variable ways and with variable impacts. The aim of this study is to understand how different types of transparency interact with each other and their effect on public management.

It is well established that transparency has different impacts on different objects. For example, Cucciniello and her coauthors (2017) report how the impact of transparency on citizens differs from how transparency impacts government. Impacts on citizens include trust in government, perceptions of greater legitimacy, greater satisfaction, and so on. Impacts on government include greater accountability, decreased corruption, increased efficiency, and so forth. However,

there is a gap in the literature with regards to the impact of different types of transparency.

This thesis aims to help fill this gap by quantitatively measuring the impact of three different types of transparency on municipal level performance in education. The types chosen are differentiated with respect to the incentives for adoption and the consequences of non-compliance. As such, valuable insights can be gained from how different types of transparency produce different levels of performance. To achieve the intended goal, this thesis deploys three different analyses, comparing outcomes in municipal education with levels of municipal transparency across Brazil.

The first analysis is meant to measure how internal transparency compares with external transparency. Internal transparency speaks to the sharing of information among governmental institutions themselves, while external transparency implies the sharing of information from government to citizens. The second analysis will use a Data Envelopment Analysis (DEA) to quantify efficiency in education expenditure and identify if both internal and external types of transparency correlate with greater efficiency. The third and last analysis will use propensity-score matching to identify how different levels of internal transparency impact education performance on a national index publicized by the federal government.<sup>1</sup>

As a public policy, education in Brazil is well suited to help us better understand the role of transparency on policy performance. This affirmation is supported by three rationales: first, education has repeatedly shown itself to be the best public sector return on investment (Psacharopoulos and Patrinos 2004). In other words, education has a greater impact on citizen's lives than any other comparable investment. The second rationale for studying the impact of transparency on education is that primary education in Brazil is a responsibility of all 5550+ municipalities. Potentially large numbers of observations permit researchers the statistical power and variation needed to make robust inferences.

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<sup>1</sup> All analysis on this work was done on R software, using the packages Benchmarking and Matchit. Code and data used can be found on <https://github.com/JnCoe/Dissertacao>.

Lastly, lower and middle-income nations such as Brazil are often ranked poorly in their performance and their investments in education, when compared to their higher-income peers (Azar Dufrechou 2016). Poorer performance and investment raise the question of whether transparency may have marginally greater impacts in a country such as Brazil as compared to a country such as Sweden.

Countries with lower Gross Domestic Product (GDP) per capita cannot afford to expand their expenditures indiscriminately, even in areas where the return is guaranteed, such as education. As such, they ought to extract the maximum return for each cent invested. This logic implies that the public administration should seek to maximize efficiency, especially in lower to middle-income countries.

Theoretically, transparency and greater efficiency should be correlated with each other. First, efficient public managers may seek to follow transparency norms to avoid penalties. Second, high compliance with public transparency might also be a proxy for conscientious administrations, which have a culture of keeping track of public management indicators. Such indicators could be used to allocate resources most efficiently or to “praise or shame”, as a means of motivating the performance of bureaucrats (Boer, Eshuis, and Klijn 2018).

Transparency can be the cause of greater efficiency in public administration for at least two primary reasons. First, transparency exhorts a level of bureaucratic organization, since data must be organized enough to be found, it must be screened for classified information, and it should be appropriately presented before being disclosed. Having data organized provides an advantage, as public managers can spot possible sources of inefficiency more easily. Second, providing external ‘transparency reports’, backed up by data, tends to increase the risk that irregularities will be detected, resulting in reduced maladministration.

This dynamic, however, could be heavily influenced by the type of transparency. If a public manager only complies with transparency rules for fear of penalties, variable levels of enforcement and penalties will determine variable levels of compliance with transparency. For example, one might envisage a scenario in which not complying with internal transparency rules leads to budgetary restrictions for a municipality, while not complying with external active transparency only leads to a small fine. In this case, public managers driven by

penalties should be inclined to respect rules of internal rather than external transparency.

Public managers who comply with transparency rules for other reasons, such as personal motivations, should exhibit little difference in how they comply with internal versus external types of transparency regulation. To understand what could be leading to eventual discrepancies in levels of compliance, it is first essential to outline the relationships between types of transparency, that is, if active transparency can be a good predictor for passive transparency or internal transparency, for example. After addressing such relations, it is then possible to understand how each type of transparency impacts the performance of public administration. In other words, there is considerable value to be had in mapping the inter-relation among types of transparency and their impact on various aspects of public administration.

Three different metrics of transparency will be used in this thesis. For internal transparency, I will use municipalities' adherence to the deadlines of the System of Budgetary Information on Education (*Sistema de Informações sobre Orçamentos Públicos em Educação* - SIOPE). All municipalities in Brazil are legally obliged to send annual budgetary information to the federal government within a month after the end of each year. Although, in theory, there are many consequences for non-compliance, research shows that in practice, there are few (Tássia Cruz, Michener, and Andretti 2020). As such, municipalities have some level of freedom to comply with this transparency regulation according to their preferences and, consequently, there is great variation in compliance among municipalities. Fortunately, it is possible to obtain an internal transparency score for over 5,000 Brazilian municipalities according to their levels of compliance with the SIOPE deadline.

For municipal government compliance with external transparency, this thesis makes use of the Brazilian Transparency Index (*Escala Brasil de Transparência* - EBT) to assess passive transparency. The EBT is undertaken by the Brazilian Office of the Comptroller General (*Controladoria-Geral da União* or CGU), the federal agency responsible for overseeing transparency compliance. EBT consists of scoring municipalities according to their *de jure* and *de facto* compliance

with the requirements of the freedom of information law (*Lei de Acesso à Informação* or LAI), which includes responding to freedom of information requests and adopting transparency regulations.

For external active transparency, I will be using a transparency evaluation of the 260 most populous municipalities in Brazil executed by the *Fundação Getúlio Vargas' Public Transparency Program* (FGV-PTP). This double-coded evaluation provides a transparency score for each municipality according to their level of compliance with the Brazilian law on transparency (LAI).

Each of these assessments provides information on one different aspect of transparency, with compliance to SIOPE's deadline indicating the level of internal transparency, EBT indicating the level of external transparency for passive transparency (requesting transparency), and the FGV-PTP evaluation indicating the level of "active" transparency on disclosing administrative information online to the public.

This thesis is divided into six sections. First, I examine the literature on transparency and efficiency in education policies and present this study's hypotheses. Next, I present the context of Brazilian regulations that allowed data to be collected and explain how the collection process took place. In the third, fourth, and fifth sections, I lay out the methodology, results, and discussions for each of the three analyses in turn. Lastly, I conclude by discussing the results, examining the thesis' limitations, and pointing directions towards new research.

## **2 Literature review and hypotheses**

To empirically test the extent to which different types of transparency produce different results, I will be comparing the results of each type of transparency with public administration outcomes (e.g. performance). As such, the first question this thesis expects to answer is the following: are more efficient public managers more transparent? Specifically, are they able to obtain superior outcomes with the same level of resources? The measurement of efficiency in public administration has produced an extensive body of work (Buleca and Mura 2014;

Vitezić, Šegota, and Setnikar-Cankar 2016). However, most studies focus solely on ranking countries or public entities by their efficiency without examining the instrumental use of this knowledge. While this approach enriches debates by providing crucial information to the public administration, it does not offer public managers or citizens straightforward recommendations on how to improve efficiency or what to do with information on efficiency.

There is also a gap in empirical works linking transparency and efficiency in public administration. While Busse et al. (2013) do focus on this connection, these authors examine the management of hospitals rather than looking at the public administration as a whole. Hauner and Kyobe (2010) provide one of the most complete analyses of which variables are related to efficiency. These authors look at data for 114 countries from 1980 to 2004 to obtain an efficiency score for the health and education sector in each country. They then use this efficiency score to statistically explore its determinants, including per capita income, inflation, corruption control, and many others. The most critical finding is the positive correlation between accountability and efficiency. Greater accountability corresponds with greater efficiency in spending. While one might assume this result is related to reduced corruption, the study provides no evidence to this end.

In sum, the literature provides strong evidence to support the positive effect of transparency on public expenses. This relationship is the basis for this study's first hypothesis:

*H1: Higher levels of internal municipal transparency will be significantly and positively correlated to higher outcomes in municipal educational performance.*

The work of Haune and Kyobe is important because it shows how the disclosure of information (i.e., transparency) is useful for principals beyond controlling agents. Increasing transparency can produce a myriad of other consequences that improve public administration. Michener (2019) points out the difficulty in obtaining direct causal evidence for the effects of transparency. Transparency policy may lead to indirect effects, both on variables commonly examined among scholars, such as accountability and trust, but also on other lesser

analyzed variables, such as bureaucratic capacity, policy coordination, and the quality of communication.

While the work of Hauner and Kyobe (2010) presents a crucial contribution to the literature, it is worth noting that the authors compare nations at the federal level of government. The measurements we have on the quality of primary education in Brazil tend to vary in their accuracy, precisely because they originate in sub-national governments rather than in the more professional realm of the federal administration. To correctly answer the question of whether transparency is related to efficiency in education, it is necessary to analyze efficiency at the local level.

## 2.1 Education and efficiency

The differences between Latin America and OECD countries in their performance on the Programme for International Student Assessment (PISA) are notable, with Latin America scoring far below other regions (Villar and Zoido 2016). In the case of Brazil, education also shows a vast disparity between students from private and public schools, illustrating the inequalities present in the country (Gamboa and Waltenberg 2012).

These inequalities are present among regions and states and even among neighboring municipalities. Evidently, inequalities in education are also highly correlated to socioeconomic inequalities. Such a correlation could lead one to assume that inequalities in education are solely caused by different socioeconomic scenarios or investments in the sector. However, previous research has repeatedly shown that under very similar circumstances, municipalities could still have significant disparities in their educational outcomes.

Using descriptive statistics, Crozatti (2013) demonstrates how the performance of municipal education relies much more on particularities among municipalities than pure expenditure in this area. As synthesized by Hauner and Kyobe (2010): *“throwing money at problems, particularly in the education and health sectors that we studied here, often fails to yield the expected improvement in public services if not bolstered by efficiency-increasing policies.”*

To better understand what could affect outcomes in this area, many authors have adopted an efficiency analysis that uses public expenditure as an input and performance on standardized tests as the output. Wilbert and D'Abreu (2013) used non-parametric analyses to evaluate the efficiency of public expenditure on education in municipalities within Alagoas, while Souza et al. (2012) perform the same analysis for 22 other states. Both works only analyze benchmarks in municipalities or states, without taking a further step and testing what might account for varying levels of efficiency encountered. On the international level, Dutta (2012) employ a similar approach in India and finds that more expenditure does not automatically lead to better results in education. This conclusion is analogous to what Crozatti (2013), Sousa et al. (2017), and Sousa et al. (2017) have encountered. The consolidated literature suggests that it is more productive for public managers to first focus on eliminating inefficiencies before proceeding to increase expenditures in education.

The use of non-parametric analyses to calculate the efficiency of public expenditure has been widely explored in the academic literature. This approach allows researchers to analyze populations that do not meet assumptions (or parameters) germane to parametric analysis, such as normal distributions of observations. The most common models adopted for non-parametric analysis are Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH). Both methods share many similarities as they are used to calculate the capacity of decision-making units (DMUs) in converting inputs to outputs.

Afonso and Aubyn (2005) used both DEA and FDH to measure the efficiency of public expenditure on education and health, respectively, among OECD countries. Similarly, Clements (2002) performed a DEA for educational expenditure in Europe, while Gupta and Verhoeven (2001) adopted FDH to quantify the same efficiency in Africa. It seems clear that, for this thematic analysis, both measurements are equally fitted. From a broad perspective, literature has shown that both may converge consistently (T. D. Silva, Martins-filho, and Ribeiro 2016).

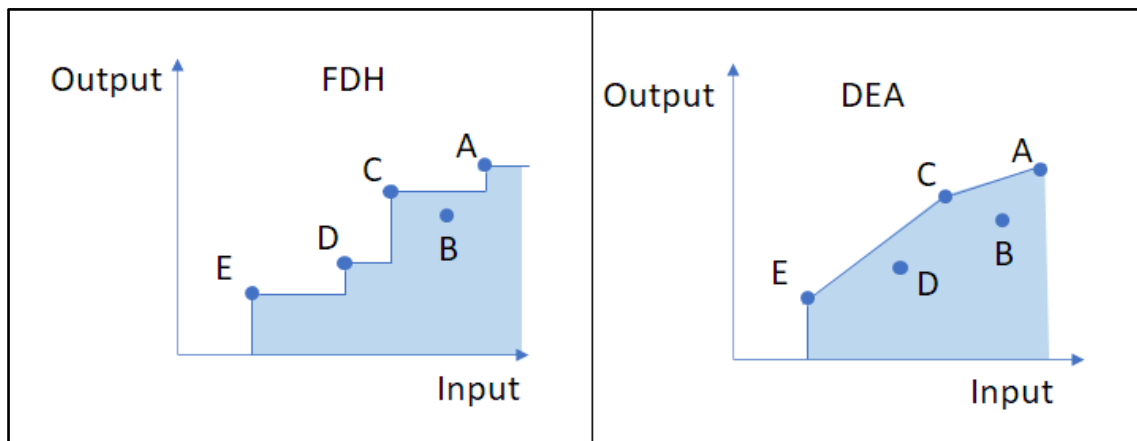
DEA and FDH both take inputs and outputs used by DMUs to create a frontier of efficiency. By measuring the distance of each DMU to the frontier, it is possible to estimate how much improvement can be made either by reducing inputs (while



keeping the same outputs) or increasing outputs (without any increase in inputs). A visual illustration of both methods can be seen in Figure i, where all units on the efficiency frontier (the dark blue line connecting each dot) are, as the name suggests, efficient. In the DEA scenario, DMU “D” could increase its efficiency either by increasing its outputs until reaching the line or achieving the same target by reducing its inputs.

The difference between both methods consists of how the frontier is drawn. In FDH, the frontier is constructed discarding unnecessary inputs and unwanted outputs (Bogetoft and Otto 2011). On the other hand, DEA is a more stringent evaluator, as it assumes a linear convex boundary, as shown in Figure i, below. Using FDH, the DMUs “A”, “C”, “D” and “E” are considered fully efficient. Using DEA, however, that is no longer true for the DMU “D”.

**Figure i: Illustrative Differences in FDH and DEA Frontiers**



Considering that DEA has a more rigid assumption regarding the performance of DMUs, there is an expectation that results obtained by DEA will be more distinct among units. Since I will be using the efficiency score to compare this score with transparency, DEA is superior to FDH in this case, especially considering that in FDH many DMUs would have the same efficiency score. By contrast, with DEA, any small variation will be captured. If transparency has marginal effects on efficiency, it is important to consider these small variations rather than disregard them, as would be the case with FDH.

Different models of DEA can be used, with the most traditional ones being named after its creators: CCR (Charnes, Cooper, and Rhodes 1978) and BCC (Banker, Charnes, and Cooper 1984). CCR operates under the assumption of a constant return to scale, which means that DMUs are expected to be operating with perfect competition. For CCR to be applicable, DMUs should have no different constraints in obtaining the same output with the same level of input. BCC brings a more realistic approach to this case by allowing variable returns to scale, which means that DMUs might incorporate suboptimal status on efficiency due to external constraints. Considering the complexity of education, this seems to be the most appropriate model for this analysis.

## 2.2 Transparency

Returning to the question, “*are more efficient public managers more transparent?*”, it is necessary to operationalize what is meant by ‘efficient’. An ‘efficiency index’ will aid in identifying “more efficient public managers”, however, an antecedent task is to define what being more ‘transparent’ means. Michener and Bersch (2013) warn how inaccurate and poorly conceptualized “transparency” can be, even in academia, leaving the term susceptible to conceptual stretching. The authors outline a definition of transparency that relies on information being visible and inferable. Being visible would consist of being complete and findable, while being inferable consists of being disaggregated, verified, and simplified.

Meijer (2013), on the other hand, defines government transparency from a relational perspective, as “*the availability of information about an actor that allows other actors to monitor the workings or performance of the first actor.*” Here, this concept is developed by detailing the institutional relations surrounding the information. With this assumption, a model is conceived to understand government transparency, assuming *strategic, cognitive, and institutional* complexities (Meijer 2013).

*Strategic* complexities are related to how actors expect other institutional players will react to an increase or decrease in transparency. Basically, it is the application of game theory to the institutional scenario, which will determine the

adoption of transparency based on costs and benefits. In this case, the construction of transparency will be dependent on the power of the institutional actor demanding transparency and the power of the institutional actor subject to it.

Another complexity in understanding government transparency has to do with *cognitive* considerations. Being transparent sometimes demands gathering documents and creating websites, which requires a level of expertise not always existent in public administration. Pasquier and Villeneuve (2016) demonstrate how this can be a constraint to transparency, even when public administration is motivated to be more transparent.

While the complexities articulated by Meijer help us understand the prevalence or weakness of transparency, Heald (2006) also contributes to conceptualizing transparency by theorizing transparency's directionality. These directions can be powerful tools to utilize the model conceived by Meijer. Of interest to this study are Heald's conceptualization of vertical and horizontal transparency.

Vertical transparency corresponds to upwards and downwards transparency, looking at transparency hierarchically through the lens of a principal-agent relationship. As described by the author: "*Transparency upwards means that the hierarchical superior/principal can observe the conduct, behaviour, and/or 'results' of the hierarchical subordinate/agent*" (Heald 2006). Transparency downwards is simply the reverse.

Horizontal transparency, on the other hand, is divided into transparency outwards and transparency inwards. As suggested by its nomenclature, transparency outwards, or external transparency, corresponds to the capacity of an organization to obtain information from outside of itself. By contrast, transparency inwards, or internal transparency (e.g., Cruz, Michener, and Andretti 2020), consists of information-sharing, obtaining information from within an organization or system of organizations (e.g., a government).

Lastly, another distinction that should be made is between *de jure* and *de facto* implementations of transparency. Michener and Nichter (2020) reveal that these different forms of implementation are associated with different variables, which reinforces the idea constructed so far of how transparency cannot be seen as a single characteristic. For example, municipalities that have a neighboring

municipality audited by the CGU are more likely to comply with transparency regulations (*de jure*), but not to comply in practice (*de facto*).

Combining the concepts previously presented, it is possible to conjecture theoretical models in which transparency would prosper or fail. For example, Organization A has a strategic incentive for adopting transparency upwards if their superior Organization B is able to use its advantageous hierarchical position to punish Organization A if it does not comply with transparency. Nevertheless, Organization A may not feel compelled to adopt transparency inward if doing so will reveal information that can be used against the institution.

This strategic reasoning can also be used to explain why some citizens elicit compliance while others do not. For example, Michener et al. (2020) explain how public servants are likely to search on the web for the name of a citizen that files a Freedom of Information request before answering it. When requesters could be identified as academics, there was an increase in response rates compared with unknown citizens. Considering that principles of impersonality exhort that all requesters receive equal treatment, it is likely that public servants feel more threatened by or sympathetic towards requesters with greater influence.

The difference in terms of incentives and penalties form the basis for this study's second hypothesis:

*Hypothesis 2: Internal municipal transparency will be positively and significantly correlated to active and passive transparency.*

Considering the different institutional roles these three types of transparency play, incentives for complying with different types of transparency are likely to converge on some level. Municipalities must observe transparency rules not only for legal reasons but also for instrumental purposes and institutional interactions, as will be described. Batista (2018) provides empirical evidence on how these institutional interactions occur. Using data collected by the Brazilian Institute of Geography and Statistics (IBGE) and the Brazilian Office of the Comptroller General (CGU) the author quantifies how factors such as being in the

same party as the president, electoral success, municipality size, and others factors impact the adoption of obligatory regulations for the Brazilian Transparency Law.

The results show how political variables can affect levels of adherence to transparency. Batista exposes that when a mayor belongs to the president's party, there is an increase in adherence, probably due to internal political pressures within the party. Similarly, when the governor of a state adopts transparency regulations, there is also a positive and significant effect on the adherence of municipalities within that state. Such results indicate that incentives to be transparent go beyond mere carrot-and-stick motivations, with factors such as reputation within a group playing a role as well.

Similarly, Michener (2015) demonstrates how support for transparency grows among leaders as the number of parties in their cabinets grows. The reasoning behind this effect is that transparency could also be used as a tool for leaders to monitor their allies, a need that increases with the number of parties on the cabinet. Michener and Nichter (2020) expand this finding by showing that municipalities with copartisan councils also tend to have greater transparency.

All of these findings show how adherence to transparency may converge with the interests of public managers; and the way transparency interacts with these interests will be fundamental to determine how likely managers are to adopt it. The ease of enforcing compliance differs notably among these three types of transparency. Active and internal transparency are both more easily enforced because they are public or inter-organizational and therefore more easily inferred. Meanwhile, passive transparency has weaker enforcement. Unlike the other two types of transparency, passive transparency requires the enforcement agent to make an information request, wait for the response and analyze it, which is a more time-consuming process than entering a website or checking whether or not a file was sent on an automated system. If the correlation between efficiency and transparency relies mostly on the fear of being punished by oversight agencies or institutional watchdogs, it seems clear that passive transparency can end up being overlooked by public managers.

In the case of Brazil, it is possible to trace the dynamics of each type of transparency. For external transparency, mayors should comply with the legal

regulation applied both to active and passive transparency (*Law 12.527/11*). Not following the rules established could imply legal action by the state prosecutor (*Ministério Público*). However, actions of this sort, although real, have been relatively rare and penalties for non-compliance are nearly symbolic in most cases.

It is also relevant to distinguish the difficulty of enforcing compliance with passive transparency. While active transparency has well-defined information that should be publicly available, passive transparency is entirely reliant on requests, and many legal loopholes allows public managers to deny freedom of information requests. As a consequence, mayors that fail to comply with active transparency assume a risk, even small, to be sanctioned in some way, while administrations that fail to comply with passive transparency are virtually immune to such risks.

Legal risk, however, is not the only risk involved. An incomplete website or even a legal action that results in no penalties could end up affecting the public image of the person responsible for the administration, in the case of municipalities, mayors. Similarly, while sanctions for non-compliance with internal transparency are also rare, there is a financial risk for the municipality and, consequently, for the administration. Table 1 provides a schematic review of each risk associated with not complying with each type of transparency.

**Table 1: Risk Associated With Non-Compliance With Transparency Regulation**

Risk type	External		Internal
	Active	Passive	
Legal risk	X	-	-
Financial risk	-	-	X
Image risk	X	-	-

As observed, not complying with passive transparency has virtually no risk associated with it. While it is true that legal action can still be taken against such municipalities, avoiding compliance by abusing legal loopholes can be easily accomplished, especially given lax enforcement. Therefore, compliance with active and internal transparency could be attached to anticipating and mitigating risks, while passive transparency would not fit into such dynamics.

If efficiency is linked to transparency, then understanding what would make one administration push for more transparency is fundamental in assessing the mechanisms of this interaction. Mayors who assume the risks intrinsic to non-compliance may pattern their behavior in this way, bringing down the efficiency of the whole administration. In this case, compliance with transparency rules would not be the cause of more efficiency, but by identifying noncompliance it would be possible to identify mayors who take legal or financial risks that may lead to greater inefficiency.

Following this logic, it seems plausible to estimate that passive transparency would not work in a similar way, considering that, for passive transparency, there are few risk associated with non-compliance. Therefore, even a risk-adverse mayor may feel comfortable in not complying with legislation. Hence the third hypothesis:

*Hypothesis 3: Efficiency of municipal public expenditures will be positively and significantly correlated to internal and active municipal transparency, but not with passive transparency.*

It should be observed that sociodemographic factors such as population size, wealth, and average schooling among citizens have also been consistently associated with greater transparency (W. A. de O. e Silva and Bruni 2019). As such, all observations in this study will be controlled by GDP per capita.

Lastly, it is important to consider that the characteristics of bureaucracy may also impact the level of compliance with transparency, especially passive transparency. The scope of this work, however, is limited to analyzing public administration as a whole. Future research distinguishing municipalities by their bureaucratic capacity could expand even further the findings presented in here.

### **3 Data collection and context**

To test the above hypotheses, I used data from 5,411 Brazilian municipalities. The country has over 5,000 autonomous municipalities, most of which are responsible for at least one public school. Although autonomous, the Brazilian

Constitution obligates that municipalities invest at least 25% of their annual income in education. The result is heterogeneous compliance among Brazilian municipalities, providing fruitful opportunities for inferential analysis.

Four different groups of variables are needed for this thesis: i) budgetary information on education; ii) data on educational performance; iii) data on transparency and; iv) contextual variables used for control of socioeconomic factors. Luckily, Brazilian municipalities are subject to many regulations that create the perfect scenario for obtaining all this information.

### 3.1 Education expenditure

While municipalities in Brazil have autonomy over their budget and administration, there are many obligations on accountability towards the federal government. Most notable, *Lei Complementar 101 / 2000* determines that the federal, state, and municipal executive leaders should publicize accounting reports electronically. Later in 2009, this legislation was altered to include the obligation of using a software with specifications drawn by the federal executive to control and manage the budget of public administration on all federative levels.

Based on this broad genre of responsibilities, entities of the federal government began to push to more centralized accountability. In 2008, the Brazilian Ministry of Education published Ordinance 844 / 2008, establishing the *Sistema de Informações sobre Orçamentos Públicos em Educação* (SIOPE), a system managed by the federal government. This system is basically a database with detailed information on income and expenses on education. As per the ordinance, all states and municipalities should use it to send data on their budgets.

While the federal government could not legally enforce this kind of obligation towards municipalities due to their legal autonomy, a workaround for this constraint was created. Most municipalities are heavily reliant on the federal budget. Even though part of federal transfers to municipalities are mandatory, the federal government exerts control over a considerable amount of discretionary funds highly prized by municipalities (see Cruz, Michener, Andretti 2020). As such,



the federal government only determines whether municipalities obtain discretionary transfers if they send their budgetary information on the SIOPE<sup>2</sup>.

The obligation was reinforced in 2009 by a legal device introduced on the annual budgetary law for that year. It stated that municipalities only would be able to receive discretionary transfers if they send their budgetary information on the SIOPE. Similarly, a new law was passed in 2016, obliging all states and municipalities to periodically send budgetary information to the federal government using a federal electronic system. Although this set of legislation could indicate a strong, enforceable policy, the reality is imperfect.

Cruz, Michener, and Andretti (2020) demonstrate that mayors (i.e., those who are legally responsible for sending data) who fail to send information on SIOPE face little or no punishment whatsoever. This team of researchers found that while the federal government can cut discretionary transfers for noncompliance, in practice, this measure is rarely taken. This omission can be explained by the lack of legal ground to execute any penalties since an ordinance (i.e., Ordinance 844 / 2008 cited before) could not create a burden for autonomous municipalities.

In other words, the punishment is merely a symbolic suggestion. As such, in the few cases where it occurs, mayors go to court to undo the suspension and keep receiving federal discretionary funds. There are also some practical limitations that reduce compliance with such measures. For instance, mayors can send the information right before receiving any transfer, even if months after the official deadline. Also, the federal government will rarely suspend transfers after a project has already begun to be executed, as such a suspension could imply massive losses for the local population and seriously compromise the project's execution.

For these reasons, municipalities tend to flout the SIOPE's deadlines and sometimes fail to comply with the basic obligation of sending data. However, in order to send data for one year, it is mandatory to send the data for all previous years. So even if a municipality did not comply with the SIOPE's regulation, for example, for three years, they would eventually have to send data for all this missing period to obtain new federal funds.

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<sup>2</sup> A thorough explanation of the SIOPE can be found on Cruz, Michener, and Andretti (2020)

It should be noted that smaller and poorer municipalities might not have the resources necessary to request federal funding. These requests usually demand technical information to approve a project and also to execute it. Not all municipalities are capable of fulfilling these technical demands and, as a consequence, do not receive any discretionary funding from the federal government. However, these cases are extreme and should not influence results obtained.

As such, while some level of completeness is missing, the SIOPE is still a rich database of budgetary information, which is why it will be used for collecting data in the present work. Similarly, the SIOPE also registers the date when a new submission is received. Comparing this to the legal deadline allows us to stipulate how much a municipality is complying with internal transparency rules.

### 3.2 Educational performance

In Brazil, all students from public schools are enrolled in a national standardized exam (*Prova Brasil*) that has taken place every two years since 2005. The performance of students on this exam is combined with a complex aggregation of indicators such as the age of students in each class and approval ratings, which finally results in an index: the Primary Educative Development Index (*Índice de Desenvolvimento da Educação Básica* - IDEB).

The IDEB is a national index that aims to quantify the performance of public schools all over the country. The higher the IDEB score, the better, theoretically, the quality of education of the school. IDEB is also calculated by municipality, by averaging the score of public schools in each place. It is worth noting that IDEB scores undergo a specific process of normalization, which greatly concentrates scores between 2,5 and 6 (out of 10), with only exceptional outliers.

Also, it is essential to note that the IDEB is not immune to critique. Soares and Xavier (2013) point to several inconsistencies. First, the *Prova Brasil* allows up to 50% absence among students enrolled in each school. Below this threshold, the score for the school is zeroed. This rule should receive greater attention, considering that public administrators might game the index to increase their performance on it (Bevan and Hood 2006; Hood 2012; Mannion and Braithwaite 2012). Considering the relevance of the IDEB for mayors and school administrators, one might

hypothesize that teachers and school directors might be able to game the system in myriad ways, such as motivating under-achieving students to declare themselves ‘sick’ on the day of the test.

Similarly, it is important to stress the skewed preference for math on the score that composes *Prova Brasil*. The score is the result of grades obtained in math and Portuguese questions. However, the score for each student is based on their performance compared to the overall performance on the exam. This methodology results in a biased preference for math, which tends to be a subject with lower performances among students.

If a public agent is focused on gaming the results of the exam, that agent can prioritize teaching math to students in detriment to other subjects, such as Portuguese. The algorithm used by the INEP to grade students would overly compensate for the increased performance in math and minimize the loss of quality in Portuguese. Such tactics have been reported before (Vidal and Vieira 2011).

While these critiques are valid and should be kept in mind, they by no means invalidate the index, which is widely used by academic researchers as an accurate measure of education quality. Empirical evidence that nullifies the validity of the IDEB is still lacking. For this reason and for the lack of universal alternatives, the IDEB will be taken as the measure of school performance in each municipality.

### 3.3 Contextual variables

To properly incorporate other variables that could influence performance on the IDEB, additional information about students was collected. *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* (INEP) is a federal autarchy linked to the Federal Ministry of Education. Beyond the IDEB, the INEP is also responsible for executing the School Census (*Censo Escolar*). As the name suggests, it is a national census that gathers yearly information on all schools – public or private – regarding the number of students, number of professionals, their qualifications, primary living conditions (plumbing, electricity, number of computers, etc.), among other indicators.

By summing the number of enrolled students in each municipal school, it is possible to obtain the average expenditure by student in each municipality.

Similarly, it is possible to obtain the number of teachers per student and their qualifications. Furthermore, in 2015 the INEP also collected information on the socioeconomic level of all students in each school.

### 3.4 Transparency

Three different sources will be used to assess transparency: i) the compliance with the SIOPE's deadline (internal transparency), ii) the performance of municipalities on the *EBT* (passive transparency) and, iii) an analysis of the websites of 260 municipalities executed by academic researchers (active transparency). In this way, all dimensions of transparency will be covered.

The deadlines for the SIOPE have always been considerably relaxed, at least until 2017. Each municipality has until the end of April of the subsequent year to provide information on its annual budget. This deadline also coincides with other obligations, such as those imposed by the Audit Courts (*Tribunais de Contas*), the institutions responsible for approving budgetary information.

However, in 2018, the deadlines for sending information on the SIOPE were considerably reduced, with annual budgets' deadlines coming to an end by January 30<sup>th</sup>. These new deadlines drastically changed the demands placed upon municipalities and considerably increased non-compliance. As a result, it is possible to obtain two different degrees of internal transparency: an easier one, collecting compliance with SIOPE deadlines before 2018, and a more exigent one, using reports sent during or after 2018.

This thesis will use the first. The rationale is that the level of non-compliance for the 2018 reports is higher not only due to the stricter deadline but also due to chronological proximity. As previously explained, municipalities can “wait” to send their information until they need new federal funds and, as a consequence, data for recent years will always be more incomplete than data for previous ones. While such behavior would not change the transparency score (it would already be 0 since it is 30 days after the deadline), it limits data for education expenditure, making it less reliable to compare with financial data from previous years. Therefore 2018 is the oldest date (hence, the more complete dataset available on financial information) after the deadline change.

Moving on to the second transparency index, the Brazilian Transparency Index (*Escala Brasil Transparente* – EBT). The EBT was first executed by CGU (Office of the Comptroller General) in 2015, randomly assessing municipal compliance with de jure and de facto passive transparency obligations of the freedom of information law (LAI). The 2015 edition evaluated 492 municipalities. In 2016, the CGU emitted its third edition, assessing the transparency of 2328 municipalities and all 27 states. It provides a score from 0 to 10 according to legal compliance (i.e., if municipalities have regulated transparency within local public administration and respond to requests). Within this score, the EBT also provides a 0-2700 score for compliance with passive transparency as assessed by the CGU. This 0-2700 score is the one to be used in this study.

## 4 Analysis I

### 4.1 Methodology

This analysis aims to identify the correlation between internal transparency, active transparency, and passive transparency. Indexes for each of these types of transparency will be regressed on an Ordinary Least Square (OLS) regression. No control variables will be used because the goal is to understand how these variables relate to each other for the same municipalities. These are the variables to be used:

Variable	Description	Source
Score – Passive Transparency	0-100 score according to municipal compliance to passive transparency	EBT
Score – Active Transparency	0-100 score according to municipal compliance to active transparency	IGT-PTP
Score – Internal Transparency	0-100 score according to fulfilling SIOPE's deadline in 2017.	SIOPE

All EBT scores for passive transparency consist of a 0-2700 scale according to how well municipalities answered FOI requests sent by the CGU. Four questions

were sent between 2016 and 2017, and the response (or lack thereof), as well as the quality of the response, is incorporated into this score. In order to standardize the EBT with other variables in this study, all values on the EBT score were divided by 27 to obtain a 0-100 scale.

The IGT-PTP is already standardized from 0 to 100. It is worth noting that while many municipalities are present in both sample groups, not all of them are. IGT-PTP selected the 260 most populous municipalities, while the EBT randomly selects thousands of municipalities. Still, 130 municipalities are present in both datasets.

Lastly, the score for internal transparency consists of an index created for this thesis based on the SIOPE's deadline for sending budgetary information in 2017. The year 2017 was the last in which municipalities could send their budgetary information until April. Those that did so received a score of 100. Those that sent their information 30 days (a month) after the deadline receive a score of 0, with a proportionate penalty for each day delayed in this interim. As a result, municipalities that sent their information after the deadline received a penalty of approximately 3.3 points per day delayed.

While there is information on the SIOPE for all years before and after 2017, this year is the best reference for comparison with the other indexes. The year 2017 is when new mayors took office across all municipalities in Brazil. Thus, these same mayors and their administrations would be in place until 2020. Considering that the EBT was partially collected in 2017 and that the IGT-PTP was collected during 2018, the comparison of these two indexes makes sense in terms of timing.

## 4.2 Description

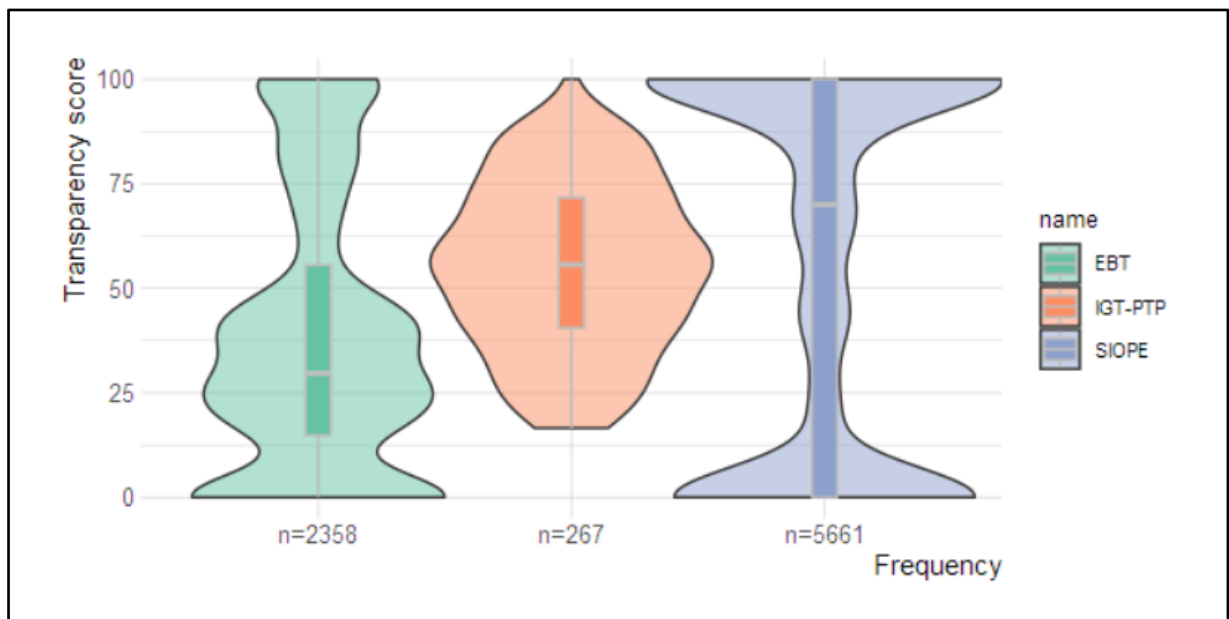
Table 2 provides descriptive statistics for the three variables.

**Table 2: Descriptive Statistics for Transparency Variables**

<b>Statistic</b>	<b>N</b>	<b>Mean</b>	<b>St. Dev.</b>	<b>Min</b>	<b>Pctl(25)</b>	<b>Pctl(75)</b>	<b>Max</b>
<b>EBT</b>	2,427	38.1	32.7	0	14.8	59.2	100
<b>IGT-PTP</b>	272	55.1	19.8	12.1	40.5	71.4	100
<b>SIOPE</b>	5,661	54.8	44.4	0	0	100	100

While the IGT-PT (active transparency) and the SIOPE (internal transparency) exhibit similar averages, it is worth noting that they have discrepant standard deviations. Most notably, the EBT seems to differ from both indexes, with a considerably smaller average than the other two indexes. Figure ii provides a visual representation of how this distribution occurs. The quartiles are represented by the boxplots on the center of each group, with the frequency of observations per strata being represented by the width of each group.

**Figure ii: Distribution of Municipalities on Different Transparency Indexes**

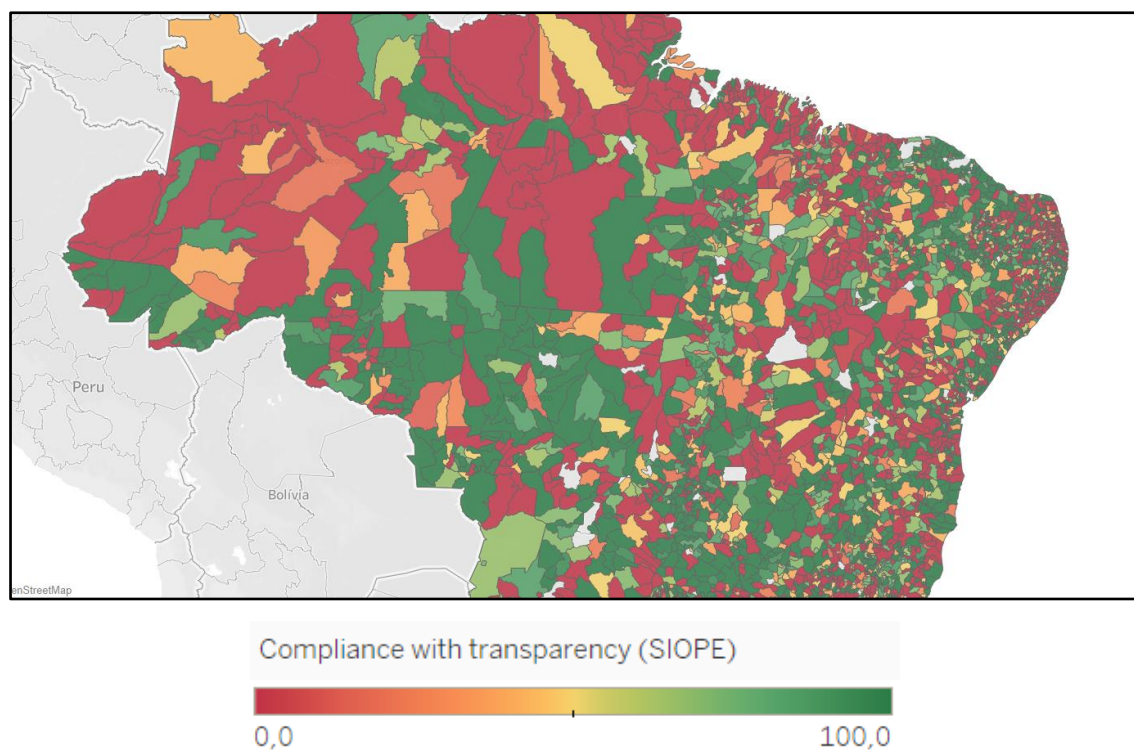


The score presented by the IGT-PT index (active transparency) seems to be the most homogeneous, with an apparent normal distribution along its axis. If municipalities have a multitude of different degrees of compliance with transparency, this index seems to be the one that best captures this phenomenon. The SIOPE index, however, is highly concentrated on the top and the bottom of the ranking. This distribution suggests that instead of creating an index for delayed deliveries, it could be more useful just to check whether or not the deadline was met.

Lastly, as an exploratory analysis, it is possible to observe a geographical effect on the SIOPE index. Instead of appearing randomly distributed, municipalities seem to cluster according to their compliance with SIOPE's deadline. We observe geographic clusters of compliance, whereby a group of municipalities appears to all

comply, or none comply. When a municipality scores 0, it appears to correlate with other municipalities around it, creating “islands” of non-compliance. Figure iii shows a close-up of Brazil, illustrating the phenomenon.

**Figure iii: Map of Municipalities According to Their Compliance With SIOPE’s Deadline**



This is known as the neighborhood effect and has been widely documented in public administration (Sampson, Morenoff, and Gannon-Rowley 2002), including for education attendance (Garner and Raudenbush 1991). In this case, the effect can be explained by a variety of different hypotheses. A first possibility could be the “peer effects” described by (ben-Aaron et al. 2017). The authors explain that when jurisdictions find out that neighboring jurisdictions are complying with transparency regulations, they become more likely to comply as well. Another possibility consists of the presence of local institutions capable of exerting some political pressure on municipalities. Piña and Avellaneda (2019) illustrate the effect of administrative guidance and enforcement in upping municipal compliance.

It is worth noting that the effect shown on the map before can even be seen across state borders. It is also important to point out that unlike active transparency,



where citizens can compare their municipalities to others, fulfilling SIOPE's deadline is relatively hidden from the general population. While compliance to the deadline is publicly displayed for each municipality on the federal government website, it is not meant to be accessed by the general population and requires some level of prior knowledge about education and transparency regulation. As such, it is curious to see such a geographical phenomenon. Future research could expand this finding.

#### 4.3 Results

Table 3 provides results for linear models among the three transparency variables. Each observation is a municipality, and the variables being regressed are their performance in either the SIOPE, EBT, or IGT-PTP index. Only municipalities present in both samples being regressed could be included in each case, hence the different number of observations in each model. All values were standardized and therefore each coefficient is reflecting the standard deviation.

**Table 3: Results Linear Model for Transparency Variables**

	<i>Dependent variable:</i>		
	<b>SIOPE</b>	<b>IGT-PTP</b>	
	(1)	(2)	(3)
<b>IGT-PTP</b>	0.160** (0.064)		
<b>EBT</b>		0.094*** (0.021)	-0.035 (0.083)
<b>Constant</b>	0.033 (0.064)	-0.012 (0.021)	-0.071 (0.096)
<b>Observations</b>	260	2,327	129
<b>R<sup>2</sup></b>	0.024	0.009	0.001
<b>Adjusted R<sup>2</sup></b>	0.020	0.008	-0.007
<b>Residual Std. Error</b>	1.029 (df = 258)	1.002 (df = 2325)	1.017 (df = 127)
<b>F Statistic</b>	6.253** (df = 1; 258)	20.383*** (df = 1; 2325)	0.173 (df = 1; 127)

*Note:*

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

Internal transparency seems to be significantly correlated both with active transparency and passive transparency. Active and passive transparency, however,

do not correlate among themselves. Although there is a correlation, it should be mentioned that the coefficients are not considered high. The best correlation is between internal and active transparency. For each increase of 1 standard deviation in active transparency, there is a 0.1 average increase on the standard deviation of internal transparency.

Considering that both variables are for identical units of analysis (municipalities) and, theoretically, measure the same attribute (transparency), this coefficient of 0.1 is not a striking correlation. The EBT passive transparency index also does not seem to be a good proxy to all types of transparency due to its even smaller coefficient.

#### 4.4 Discussion

The results obtained provide strong evidence to support H2: “Internal transparency will have a positive and significant correlation to active and passive transparency.” This result suggests that complying with transparency regulations could be the consequence of an institutional culture either motivated by political leaders or public servants themselves. In this case, different incentives or penalties for being compliant would not affect the level of transparency on different types.

Considering the small coefficients obtained, however, transparency adherence seems to be justified by other factors. Institutions seem to be complying with different types of transparency to different degrees. This could be related to the strategic complexity described by Meijer (2013), previously discussed. The consequences of not complying with active transparency legislation are considerably less severe than the consequences of not sending budgetary reports on SIOPE. As a result, some municipalities comply with the SIOPE’s internal transparency rules, but this is not a guarantee that the same municipality will comply with active or passive transparency rules, considering the observed small correlation between the three groups.

## 5 Analysis II

In the second analysis, I aim to quantify the impact of transparency on the efficiency of municipal administrations. The second analysis is subdivided into two parts. In the first part, a measure of efficiency will be created for each municipality using DEA with variable returns to scale. This measure will be correlated with the three types of transparency being analyzed (internal, active, and passive). In the second part, the same methodology will be used for the IGT-PTP, EBT, and SIOPE transparency indexes. However, since the IGT-PTP and EBT indexes are only available for 2017-2018, it is not possible to identify any effects that might be correlated to transparency in the previous years. As such, the second part will solely use SIOPE's transparency index, comparing the long-term effect of municipalities to a potential evolution of efficiency.

### 5.1 Analysis II.a

#### 5.1.1 Methodology

The goal of this analysis is to quantify the correlation between active, passive, and internal transparency with efficiency in public education. As demonstrated in section 2.1., non-parametric analyses are growing in popularity to measure the efficiency of public administration. Following the consolidated literature on this methodology applied to education, DEA seems to be the best methodological fit. As a benchmarking method, it will take inputs and outputs to calculate the most efficient combination of the two when looking at the values obtained by Decision Making Units (DMUs). Each municipality will be a different DMU.

Outputs in education would be associated with measures or indicators of how well schools are able to execute their tasks, such as making sure teachers are showing up and adequately preparing their lessons, among others. Inputs would be any resources applied to improve students' outcomes. Financial resources will inevitably be of great importance, considering their importance to investments, salaries, and obtaining assets that aid in improving education. Similarly, teachers will have a major influence, considering that they are the ones who most actively

play a role in educating children in school. Lastly, students themselves can be considered an input.

Summing up this perception, we come up with three inputs: a) financial, b) faculty-related, and c) student-related. As an output, I will be using the score of each municipality in the 2019 edition of the IDEB. Among all mayors who assumed office in 2017, 2019 is the third year of their administration (January 2017 to January 2020). While this edition of IDEB and the beginning of the new administrations are still relatively proximate in temporal terms, it is possible to identify variations among the IDEBs only four years apart, which suggests that public managers can, to some extent, influence education outcomes in only one term of office. For example, the municipality of Jequiá da Praia, in Alagoas, went from an IDEB score of only 4.0 in 2015 to 7.2 in 2019, the fourth best score for that year. On the other hand, Senador José Bento, in Minas Gerais, fell from an IDEB score of 6.3 in 2015 to 4.3 in 2019. If an efficient administration entered in 2017, it is reasonable to expect that by 2019 any effect would be felt.

The first input, financial, can be obtained by using expenditure per student, and it is the most important input considering the goal of this analysis. Unsurprisingly, expenditure per student has been correlated with an increase in the IDEB score, even though it is clear that mere expansion of expenditure does not necessarily lead to such an increase (Diaz 2012). For this reason, and considering that this is the most quantifiable metric of resource allocation by the DMU, the “cost” of each student is a universally used input measure on studies that assess the efficiency of public expenditure in school (Clements 2002; Savian and Bezerra 2013; Zoghbi et al. 2011).

This data can be obtained using budgetary information reported on the SIOPE system. Considering this data’s high level of detail, it is possible to obtain the expenditures of each municipality in each year for primary education. Brazilian budgeting is extremely complex at the municipal level, especially when it comes to education and health. Most municipalities cannot afford to finance their own

expenses on education, which is why a fund (FUNDEB<sup>3</sup>) exists whereby contributions from municipalities, states, and the federal government are redistributed among municipalities. The point is to reduce regional inequalities.

This money cannot be held by the federal government and must obligatorily be distributed to municipalities. In turn, municipalities also have full autonomy to allocate this resource if they observe specific criteria demanded by the FUNDEB. One of the key conditionalities is that municipalities employ at least 60% of these funds to remunerate teachers. The FUNDEB represents an important income stream for most municipalities. For this reason, two types of expenses were employed in analyses herein: those originating from municipal taxes and those from the FUNDEB.

In addition to these two sources of education funding, there are “discretionary funds” from state-level or federal programs. States or the national government have considerable control over how these discretionary funds are invested and can even hold them back conditional on other stipulations, making them a less reliable source of income for municipalities.

These resources are usually restricted to investments (building new schools, buying new computers, etc.) rather than operational or maintenance costs. While investments do increase the expected performance of students in a specific school, investments cannot be considered an input for DEA as it is not meant to express the number of resources a Decision Making Unit, DMU, (in this case, the municipality) is taking.

Taking this case as an example, schools from a municipality will not need to constantly purchase new computers to properly work. As such, considering investments as an input, would lead to wrongfully assuming that a DMU is more inefficient than it actually is, since the value invested is not being constantly and intrinsically used by the DMU to obtain the output. Providing new computers for a school will directly impact how, with the same level of resources, students can produce better outputs (i.e., the DMU’s efficiency). It does not, however, consist of

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<sup>3</sup> Fund for Maintenance and Development of Primary Education and Teacher’s Remuneration (*Fundo de Manutenção e Desenvolvimento do Ensino Fundamental e de Valorização do Magistério*)

an increase of resources being used by the school. The cost per student does not increase due to some new investment and hence does not fit into the categorization of an input for DEA.

It should be noted that external funding to education (such as FUNDEB) is associated with greater spending within the sector, while discretionary fund transfers do not show the same effect (Cruz and Silva 2020). That is, while the FUNDEB seems have an effect on financial inputs, other external funding does not. This observation reinforces the adequacy of including one but not the other in the DEA.

Summing up, only two kinds of values will be considered for financial inputs: expenditures on the maintenance of public primary education financed by the municipality's budget and expenditures on the maintenance of public primary education financed by the FUNDEB. By dividing the sum of these two items by the number of students enrolled in primary municipal public schools, we obtain the annual cost per student in public municipal primary schools.

The second input is related to teachers and should capture both ratios of teacher per student and the quality of teacher qualifications. Similar to financial inputs, the number of teachers should be compared to the number of students. This teacher-student ratio is a widely used metric for benchmarking performance (Afonso and Aubyn 2005; Azar Dufrechou 2016), as fewer students per teacher typically results in stronger learning performance and educational outcomes.

While many factors render the evaluation of teachers a challenge, the INEP provides a rich and detailed categorization of its yearly census. The Teacher's Qualifications Adequacy Index (*Adequação da Formação Docente* - AFD) is a 5-level stratification of teachers in schools according to their qualifications. These five groups are the following:

Group	Description
1	Teachers who possess at least undergraduate degrees on the subject they are teaching and also completed a special course during college, focused on teaching methods, i.e., Bachelor's Degree ( <i>Licenciatura</i> ).

2	Teachers who possess at least an undergraduate degree on the subject they are teaching, but who lack extra qualification Bachelor's Degree (Licenciatura) for teaching methods.
3	Teachers who possess at least an undergraduate degree, but are not teaching on the subject of their degree.
4	Teachers that do not fit into the previous categories.
5	Teachers without an undergraduate degree.

On the INEP Census, each teacher in each school is qualified as described above. Then, the proportion of each group is calculated for each school. This calculation provides descriptive information on faculty members. Combining this descriptive data with numbers on the proportion of teachers per student, it is possible to conceive of a single index that can adequately capture teacher-related input for the DEA.

By assigning weights to each group according to their quality and then multiplying these weights by the proportion of each group, it is possible to obtain a coefficient that synthesizes information on the quality of faculty members. Taking a hypothetical school with 100% of its teachers in group 1, its coefficient would be  $5 * 100 = 500$ . On the other hand, a school with 100% of its teachers in group 5 would have a coefficient of  $1 * 100 = 100$ . By multiplying this coefficient to the ratio of teachers per student in each school, the result is a 'teacher index' reflecting both quantitative and qualitative information on teachers. It is important to note that there is some limitation to this approach, as these categories do not have ordinal differences assumed between them. However, there is a gap in the literature on the best way to quantify teacher quality, and the method employed here seems an adequate metric for the aims of the study.

As a final input, this study employs data on student-related inputs. In 2015, the INEP collected information on the socioeconomic level of all students in public schools. The INEP data includes the purchasing power of families and other information, such as educational attainment. The INEP aggregates this data into a single index, assigned to each school, which reflects the average socioeconomic level of students in that school.

While data on the socioeconomic origins of students provide the necessary information for the DEA, it should be noted that data is limited only to 2015. Unlike all other variables, the socioeconomic index is not collected in the INEP annual census. Although not ideal, the lack of current data should not affect the robustness of this analysis, as socioeconomic variables change little in the short term, even with an increase in educational performance.

In conclusion, for the DEA analysis, the inputs that will be used are: a) cost on public municipal primary education per student, b) teacher index (qualitative and quantitative), and, c) the socioeconomic background index. As an outcome variable, the performance of each municipality on IDEB 2019 will be used. Since DEA requires some level of homogeneity among DMUs, the analysis will be grouped by state. That is, DMUs (municipalities) will be grouped according to their states before running the DEA for each group.

As a result, a value from 0 to 1 will be obtained for each municipality according to their efficiency level on education. The distribution of the efficiency score by state can be found on the appendix. This will later be regressed with transparency indexes to measure the correlation between the two components, efficiency and transparency. Ribeiro (2008) and Soares and Xavier (2013) proposed a similar approach, including socioeconomic variables in their regression.

Considering the collinearity between socioeconomic factors and efficiency, as well as the collinearity between socioeconomic factors and transparency (C. F. Cruz et al. 2012; W. A. de O. e Silva and Bruni 2019), isolating variables such as GDP per capita will produce more robust results (W. A. de O. e Silva and Bruni 2019).

GDP per capita is a better-suited control variable for socioeconomic factors than the Human Development Index (HDI), since the latter already accounts for educational performance, creating problems of endogeneity. As such, it will be highly correlated to the output used (the IDEB score). GDP per capita, on the other hand, is a variable that reflects socioeconomic dimensions without endogenously incorporating data for education. It also correctly reflects municipalities' capacity to invest, which is a reliable way of identifying the cognitive complexity of municipalities, as described by (Meijer 2013).



Lastly, it is important to outline that, although the analysis being made is chronologically limited to just one term of office, institutional characteristics of the municipalities are also related to efficiency. Batista (2015) shows how the quality of local bureaucracy (i.e., the number of public servants and their qualifications) could impact the efficiency on public administration. This is observed in the analyses of this thesis as both variables used on the regression (efficiency and transparency) end up reflecting political and institutional designs of public administration. Additionally, analysis II.b. was conceived to incorporate even more the institutional aspect of administrations.

#### 5.1.2 Results

Table 4 reports the results of ordinary least squares models. Six models are presented, two for each type of transparency (active, passive, and internal). I present regressions both with and without GDP per capita as the control variable, for a better examination of each variable's effect. All models use municipal efficiency scores as the dependent variable. The transparency indexes are normalized to a 0-1 scale to match the efficiency scale.

**Table 4: Results for OLS Between Transparency Indexes and Efficiency**

	<i>Dependent variable:</i>					
	<b>Efficiency</b>					
	<b>Model 1.1</b>	<b>Model 1.2</b>	<b>Model 2.1</b>	<b>Model 2.2</b>	<b>Model 3.1</b>	<b>Model 3.2</b>
<b>SIOPE</b>	0.019*** (0.006)	0.018*** (0.006)				
<b>GDP per capita</b>		0.00000*** (0.00000)		0.00000*** (0.00000)		0.00000** (0.00000)
<b>EBT</b>			0.030*** (0.011)	0.019* (0.011)		
<b>IGT-PTP</b>					-0.001 (0.0004)	-0.0005 (0.0004)
<b>Constant</b>	0.777*** (0.003)	0.762*** (0.004)	0.773*** (0.006)	0.759*** (0.006)	0.828*** (0.023)	0.793*** (0.028)
<b>Observations</b>	2,621	2,621	1,215	1,215	192	192
<b>R<sup>2</sup></b>	0.004	0.024	0.006	0.024	0.012	0.034
<b>Adjusted R<sup>2</sup></b>	0.004	0.023	0.005	0.022	0.007	0.024
<b>Residual Std. Error</b>	0.124 (df = 2619)	0.123 (df = 2618)	0.129 (df = 1213)	0.128 (df = 1212)	0.104 (df = 190)	0.104 (df = 189)
<b>F Statistic</b>	10.642*** (df = 1; 2619)	31.908*** (df = 2; 2618)	6.960*** (df = 1; 1213)	14.896*** (df = 2; 1212)	2.266 (df = 1; 190)	3.337** (df = 2; 189)

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Of all three indexes, only internal transparency seems to be initially correlated to an increase in efficiency in the public administration. The EBT obtained a significant correlation with an even greater coefficient, but this is no longer significant ( $p < 0.05$ ) when controlling for GDP per capita. Municipalities that fulfilled the SIOPE's deadline in 2017 demonstrate an increase in efficiency of 0.019 on the efficiency score provided by the DEA that goes from 0 to 1. These results seem to hold even when controlling by GDP per capita. Although small, it is still a noteworthy result considering the environmental complexities in this field.

As previously discussed, a correlation between the EBT and IGT-PTP indexes on the one hand and, on the other, efficiency, resulted in no significant effects. As such, the conclusion for analysis II.a is that internal transparency is correlated to increased efficiency, while passive and active transparency are not. As a logical consequence, although all three indexes reflect transparency, it seems safe to

assume that the three indexes reflect different dynamics of the public administration. Internal transparency reflects deference towards the federal government, while active transparency reflects a worry about how the general population might see the institution. Meanwhile, passive transparency deals with the capacity and the willingness of an administration to provide information to individual citizens.

## 5.2 Analysis II.b

### 5.2.1 Methodology

Although previous examples of dramatic changes in IDEB scores are available, they are rare. Four years simply does not allow enough time to produce a noticeable effect in the IDEB scores of most municipalities. To overcome this limitation, this analysis will use ‘variation in efficiency’ as the dependent variable to test whether transparency increases or decreases efficiency. By comparing efficiency in 2019 to the efficiency obtained four years earlier, variations might be more convincingly attributed to changes undertaken by mayoral administrations.

Although measurement of each external transparency index is available only for one year, this is not so for internal transparency. Data for the SIOPE is available from 2012 onwards, and it is possible to measure its variation by comparing the transparency in 2013 and 2017. However, only accounting for the difference in transparency might be misleading, as municipalities that did not fulfill the SIOPE’s deadlines in both years would have the same score as those who complied. Evidently, for the purposes of this analysis, they are largely opposites, as a municipality that obtained a 10 score on both years should not be equalized to a municipality that obtained a 0 score on both years.

As such, grouping each case into different categories is more suitable for this analysis. Considering the previously demonstrated concentration of scores on the top and bottom of the index, municipalities will be categorized only considering whether they sent budgetary reports on time or not for the two years in question (Y, for “yes” or N, for “no”). As a result, four groups will be created (each letter

representing one year's result): YY, YN, NN, and NY. If transparency is correlated to increased efficiency, groups NY and YY are expected to have positive coefficients, while groups NN and NY are expected to be negative.

Summing up, two types of linear regression will be executed in this analysis: the first one is similar to analysis ii.a, but taking the variation of efficiency (i.e., the difference between one year and another) as the dependent variable. The second one is a regression taking the delta efficiency as the dependent variable and the presence in each group as the independent variable.

### 5.2.2 Results

Results for the linear models using transparency indexes as independent variables are shown in Table 5. Results for the linear model grouping compliance with the SIOPE's deadlines are shown in

Table 6. The intercept used for comparison in table 6 is the average of the NN group.

**Table 5: Results for Linear Models Using Efficiency Variation and Transparency Indexes**

	<i>Dependent variable:</i>					
	Difference in efficiency 2015-2019					
	<b>Model 1.1</b>	<b>Model 1.2</b>	<b>Model 2.1</b>	<b>Model 2.2</b>	<b>Model 3.1</b>	<b>Model 3.2</b>
<b>SIOPE 2017</b>	0.001 (0.006)	-0.0002 (0.006)				
<b>GDP per capita (log)</b>		0.019*** (0.003)		0.014*** (0.005)		0.004 (0.013)
<b>EBT</b>			0.010 (0.011)	0.002 (0.011)		
<b>IGT-PTP</b>					-0.001* (0.0003)	-0.001 (0.0003)
<b>Constant</b>	0.005 (0.003)	-0.173*** (0.031)	-0.006 (0.005)	-0.139*** (0.049)	0.047** (0.019)	0.005 (0.135)
<b>Observations</b>	2,621	2,621	1,215	1,215	192	192
<b>R<sup>2</sup></b>	0.00003	0.013	0.001	0.007	0.015	0.015
<i>Note:</i>				*p<0.1; **p<0.05; ***p<0.01		

**Table 6: Results with Linear Models Using Delta Efficiency and Compliance to SIOPE**

	<i>Dependent variable:</i>	
	Difference in efficiency 2015-2019	
	<b>Model 4.1</b>	<b>Model 4.2</b>
<b>NY</b>	0.002 (0.008)	-0.0005 (0.008)
<b>YN</b>	-0.0004 (0.006)	-0.006 (0.006)
<b>YY</b>	-0.004 (0.011)	-0.016 (0.011)
<b>GDP per capita (log)</b>		0.020*** (0.003)
<b>Constant</b>	0.006* (0.003)	-0.183*** (0.031)
<b>Observations</b>	2,621	2,621
<b>R<sup>2</sup></b>	0.0001	0.014
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01		

In both cases, no transparency index shows any significant correlation with gains in efficiency. While the IGT-PTP demonstrated a surprisingly negative coefficient in Model 3.1 ( $p<0.1$ ), this effect disappears once controlled by GDP per capita. Similarly, municipalities that complied with SIOPE's deadline both in 2013 and 2017 or solely in 2017 had a surprisingly negative coefficient when compared to municipalities that did not comply with either of the deadlines. These results, however, show no significance.

### 5.3 Discussion

Results for both analyses reveal mixed results. Hypothesis 2 states: “Efficiency in public expenditure will have a positive and significant correlation to internal and active transparency, but not with passive transparency.” Analysis ii.a provides some evidence to support the idea of a correlation between internal and passive transparency and efficiency. Active transparency, on the other hand, does not seem to have any correlation with efficiency whatsoever. Meanwhile, results

from analysis ii.b demonstrate no gains in efficiency in those municipalities with more transparency.

It is possible to theorize what could explain this apparent contradiction. The impact of transparency on efficiency might occur only in specific situations. For example, a new public manager who decides to increase transparency would likely see no results if public servants do not adhere to institutional changes, i.e., if the institutional culture does not change. If that is the case, changes that took place between 2015 and 2017 would not be able to change the institutional culture fast enough to generate any perceivable effect in 2019. Only further research will provide answers to these questions.

It is worth noting that GDP per capita seems to be a good predictor for efficiency, both in terms of absolute values as well as in its variation over the years. That is, municipalities with higher GDP per capita not only are more efficient but also become more efficient over time when compared to other municipalities.

## **6 Analysis III**

### **6.1 Methodology**

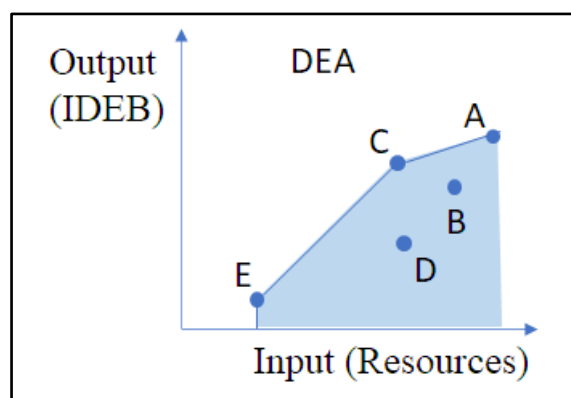
In the third analysis, I aim to quantify the impact of transparency on the performance of each municipality on the IDEB. While the previous analyses used the IDEB as an output of efficiency, they had a small quantifiable result since efficiency variations are scaled from 0 to 1. Additionally, the analyses also do not provide an intuitive interpretation since efficiency scores are a result of complex calculations that are not naturally understood by most people. The third analysis of this thesis aims to furnish intuitive results on the effect of transparency on education.

DEA is powerful for comparing expected results from units with equivalent levels of inputs. However, it is limited as it does not consider qualitative variation in the output variable. In this case, for example, the municipality of Fonte Boa, in Amazonas, has an IDEB of 2.4, but an efficiency score of 1 (on a 0-1 scale). This is the same efficiency score of Boca do Acre, in the same state, that has an IDEB of 5.3. Evidently, 2.4 is not a good score, being one of the lowest in the country. However,

since Fonte Boa has a considerably small expenditure per student and teachers with low qualifications, it is still considered relatively efficient by the prevailing logic.

Taking Figure iv as an example: the DMU "E" has a very low IDEB score, just as Fonte Boa. Similarly, it also uses very few resources (fewer teachers, students in worse socioeconomic levels, and fewer expenditures). As such, the combination of both a low IDEB score and the use of few resources still gives DMU "E" greater efficiency than, for example, unit B, which has a much higher IDEB although using more resources.

**Figure iv: DEA Example**



Another limitation of DEA consists of the need to run analyses using homogeneous units. Unit homogeneity is necessary since the efficiency frontier is drawn based on output values that all units should, in theory, reflect. However, even when metrics such as levels of socioeconomic development are incorporated, there are still limitations on how much a municipality can better its educational performance. For this reason, the DEA was run among municipalities in the same state. Grouping by state provides samples large enough for the analysis while keeping some homogeneity, as many similarities are shared by municipalities within the same state.

While grouping increases the precision of the DEA, it reduces our ability to compare results with other metrics that might not follow the same grouping, as was the case in the previous analysis, which used national transparency indexes. To overcome these limitations, I will also use a nearest neighbor propensity score, matching to estimate the impact of more transparency in the public administration. By employing this methodology, I will be able to compare pairs of different



municipalities with very similar characteristics. Any difference between the two observations can be attributed to the treatment, in this case, being transparent.

Incorporating previous findings from analyses 1 and 2, a comparison will be made between municipalities that did not comply with one SIOPE deadline, either in 2013 or 2017, and municipalities that complied with both. If transparency only impacts results in the long term, this analysis makes more sense as it isolates municipalities that harbor more stable levels of compliance with transparency. Variables used to perform the matching will be GDP per capita, the teacher index used previously, the average cost per student, population, and the socioeconomic index.

## 6.2 Description

Table 7 provides descriptive information for each group that will be used in the matching. The treatment group (T) is the one with full compliance on transparency. The control group (C) includes municipalities that did not send at least one budgetary report to the SIOPE by the deadline.

**Table 7: Descriptive Results for Analysis III**

<b>Statistic</b>	<b>N</b>	<b>Mean</b>	<b>St. Dev.</b>	<b>Min</b>	<b>Pctl(25)</b>	<b>Pctl(75)</b>	<b>Max</b>
<b>IDEB 2019 (C)</b>	1693	4.402	0.8	2.1	3.8	5	7.8
<b>IDEB 2019 (T)</b>	124	4.955	0.836	2.9	4.4	5.525	7.7
<b>SLI (C)</b>	1693	45.966	4.645	36.724	42.381	49.92	60.75
<b>SLI (T)</b>	124	49.463	5.114	36.359	44.833	53.568	58.153
<b>Average yearly cost per student (C)</b>	1693	5,053.248	1,502.214	1,364.994	4,100.777	5,755.312	13,714.98
<b>Average yearly cost per student (T)</b>	124	5,777.40	1,706.37	3,073.52	4,473.17	6,655.34	10,351.43
<b>Teacher index (C)</b>	1693	0.043	0.015	0.015	0.032	0.051	0.134
<b>Teacher index (T)</b>	124	0.05	0.019	0.02	0.036	0.057	0.116
<b>GDP per capita (C)</b>	1693	17,996.66	22,033.94	3,285.028	7,770.021	20,567.24	34,4847.2
<b>GDP per capita (T)</b>	124	30,627.80	25,864.53	6,655.16	13,846.39	39,530.49	209,320.90
<b>Population 2017 (C)</b>	1693	56,284.32	36,1178.7	1,228	8,904	33,935	12,106,920
<b>Population 2017 (T)</b>	124	55,968.27	108,842.40	2,691	9,440.50	43,624.50	695,956

One important difference between the two groups consists of population. No municipality with more than 700,000 inhabitants missed the SIOPE's deadline. This fact will reduce the number of observations used for the matching, as larger municipalities are effectively excluded from the analysis. Similarly, there is a striking difference in both groups on GDP per capita. This difference makes it clear that larger and richer municipalities are more compliant with internal transparency rules, confirming the findings reported in Cruz, Michener, and Andretti (2020).

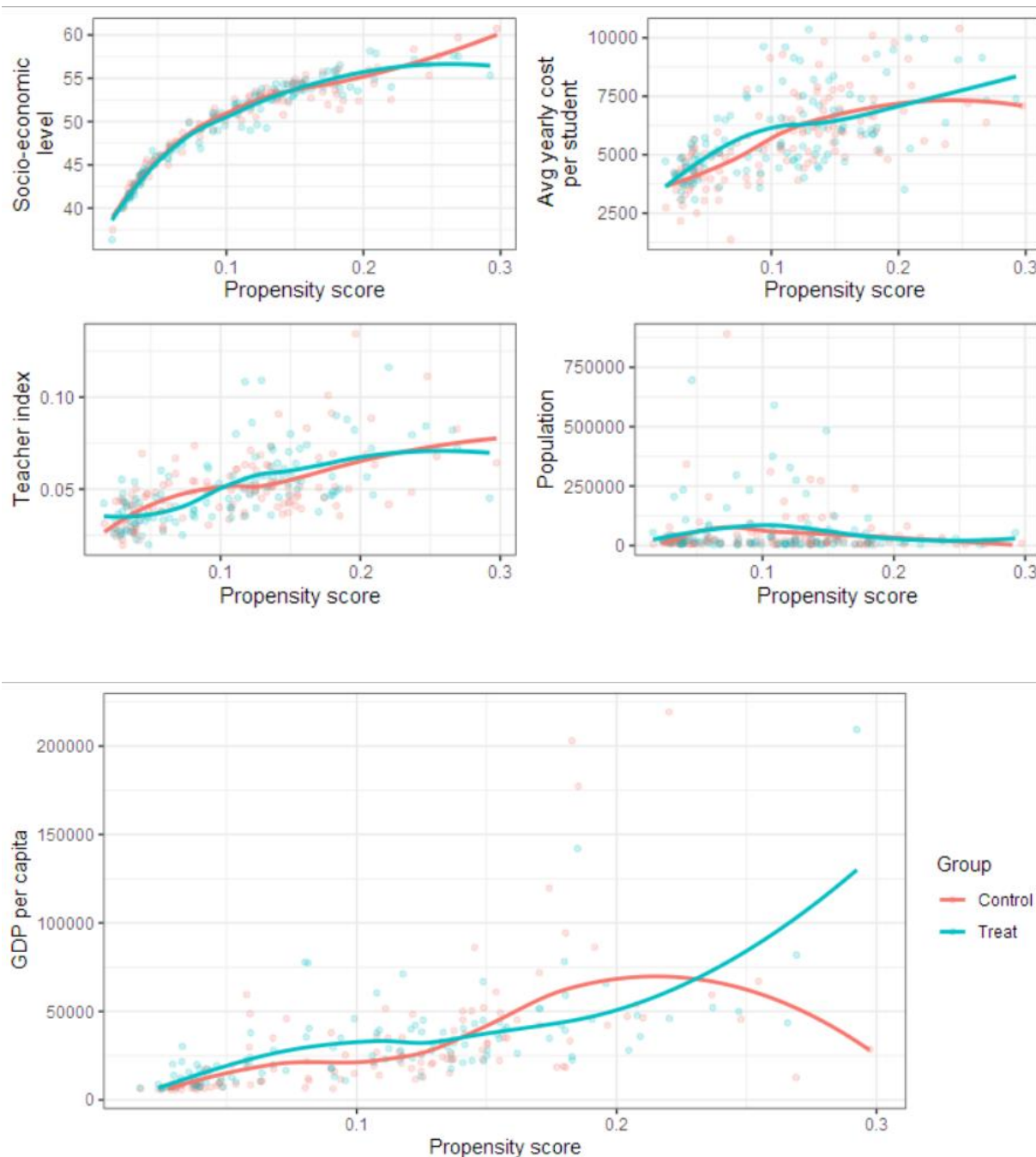
Moving to the next task, a propensity score (PS) will be calculated for each unit. That is, based on the variables previously described, an estimate will be

provided regarding the probability of a certain unit being treated or not. Then, units with similar PS will be paired to compare their performance IDEB. An OLS can be executed using the dummy for treatment against all other variables to check if there is any imbalance in the matching.

This task presents new challenges as few works have previously used PS Matching on Brazilian municipalities. Usually, this is done by matching students, rather than municipalities (Fahel et al. 2012; Rocha, Menezes-Filho, and Komatsu 2018), which uses individual variables (such as student individual performance) rather than aggregated ones (such as IDEB score). Following the same logic used for the efficiency analysis, the variables used for the PS Matching will be those municipal variables that are associated with better results on the IDEB. All variables used are highly correlated with the IDEB, with statistical significance on a linear model taking the IDEB as the dependent variable, with the exception of population size.

To check if the matching was executed correctly, a Student's t-test was performed, with no significant difference between the treatment and control groups on the matched pairs. To visually confirm this balance, a visual analysis was executed by comparing the mean of each group (treatment x control) on each covariate according to their respective propensity score. The result can be seen in Figure v.

**Figure v: Mean of Each Group on Matched Pairs by Each Covariate**



While results for the socioeconomic level of students and numbers on population seem to be perfectly balanced, the average yearly cost of each student and the teacher index has slight variations among the treatment and control groups. Most important, however, are differences in GDP per capita. As demonstrated by the units that obtained a propensity score of nearly 0.25 or more, the trends between both groups diverge in opposite directions. That is, municipalities with propensity

scores greater than 0.23 were paired with municipalities that had very distinct levels of GDP per capita. While these differences might be considered a limitation, in no way do they invalidate the results. First, the differences account for only a small number of observations. Second, the t-test shows no significant differences in means between the two groups.

### 6.3 Results

Table 8 provides the result for an OLS between the dummy variable, indicating the treated group (transparent), whose coefficient reflects the average increase of a municipality complying with the SIOPE's deadline. No control variables were added, given that PS matching was already executed.

**Table 8: Results For Propensity Score Matching Measuring The Effect Of Transparency on IDEB 2019**

	<i>Dependent variable:</i>
	<b>IDEB 2019</b>
<b>Treatment</b>	0.304*** (0.106)
<b>Constant</b>	4.651*** (0.075)
<b>Observations</b>	248
<b>R<sup>2</sup></b>	0.032
<b>Adjusted R<sup>2</sup></b>	0.028
<b>Residual Std. Error</b>	0.837 (df = 246)
<b>F Statistic</b>	8.174*** (df = 1; 246)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Municipalities that complied with the SIOPE's deadline scored, on average, 0.3 points higher on the IDEB than municipalities with the same characteristics but that did not comply with the SIOPE's deadline. This result is highly significant ( $p<0.01$ ) and notable, considering that the score on the IDEB has a standard deviation of around 0.8, as shown in Table 7.

Analysis 3 thus provides strong evidence for how internal transparency is associated with better public administration outcomes, supporting H1. While

propensity score matching is often used as a causal identification method, it is important to outline that results presented here do not indicate that transparency is the cause of better results since covariates between both variables (such as institutional cultures oriented towards greater productivity) could not be included.

However, it seems safe to affirm that administrations with better results on the IDEB possess a great level of compliance with internal transparency. The reasons for this result could vary greatly. Transparency might be causing an improvement in the operation of public administration or, alternatively, more efficient managers simply tend to be more transparent. Although results for larger and richer municipalities are less reliable given differences between treatment and control groups, the result for medium and small municipalities is robust.

Although it was not possible to perform the same analysis for other transparency variables, it is intriguing to consider what results might be obtained through a similar analysis. Considering that active and passive transparency are not correlated (refer to the analysis I), it is possible to hypothesize that only one would be correlated to greater outcomes. That is, while internal transparency is associated with higher scores on the IDEB, the same may not happen to active or passive transparency, or even both.

While lying outside of the scope of this study, I performed a small exploratory analysis to observe the performance of matched units on other transparency indexes. Table 9 provides the results for this exploratory analysis.

**Table 9: Descriptive Analysis of Matched Units for Other Transparency Variables**

<b>Statistic</b>	<b>N</b>	<b>Mean</b>	<b>St. Dev.</b>	<b>Min</b>	<b>Pctl(25)</b>	<b>Pctl(75)</b>	<b>Max</b>
<b>IGT-PTP (C)</b>	12	46.2	22.0	16.6	22.4	62.4	77.4
<b>IGT-PTP (T)</b>	13	55.5	19.5	21.7	47.2	68	88
<b>EBT (C)</b>	53	40.2	33.6	3	10	62	100
<b>EBT (T)</b>	52	38.6	32.1	3	17.5	61	100

It is possible to see that the matching process seems to have resulted in a considerable balance, since both groups have nearly the same number of municipalities evaluated by the EBT and the IGT-PTP. While the treatment (transparent) municipalities have higher average scores on the IGT-PTP, the

opposite occurs for the EBT. However, it should be pointed out that this difference was not statistically significant ( $p > 0.1$ ).

This exploratory analysis reinforces what has been previously established: different types of transparency evince different levels of compliance within the same administration. It is worth remembering that the matching entails grouping units that complied with the SIOPE deadline and those that did not. As a consequence, the complete lack of difference between the two groups on the other transparency variables shows how little similarity can be found among types of transparency, especially when comparing municipalities with very similar characteristics.

As a final note, it should be emphasized that this exploratory analysis is limited to a small sample, which naturally weakens the robustness of these findings. Nevertheless, it provides grounds for future research.

## **7 Conclusion**

This work aimed to answer two questions: first, how do different types of transparency interact with each other, and second, are better public managers more transparent? Analysis 1 showed that internal transparency seems to be a significant but weak predictor of active and passive transparency. Additionally, compliance with active and passive transparency does not seem to be correlated.

Analysis 2 provides tentative evidence that internal transparency is correlated with greater efficiency, while active and passive transparency produced no such correlation. Analysis III later reinforces this finding, illustrating a strong correlation between transparent administrations and better results on the IDEB. Combining both results, it seems safe to assume that while transparency increases performance on the IDEB, it does not seem to do so by improving efficiency. One possible explanation for this apparent contradiction might be found in the dynamics of more populous municipalities, including higher costs of living, which might bring down the compared efficiency of public administration, as teacher's salaries, for example, will be expectedly higher.

These findings are important both empirically and theoretically. Empirically, the study provides evidence that might be used by public managers to heighten their

performance in education rankings, by adopting more transparency within their administration. Although this study sought to illuminate correlations and not delve into the question of causation, it is possible to hypothesize many paths through which transparency can lead to both greater efficiency and performance in education, such as more organized administrations being more capable of spotting inefficiencies.

As a contribution to the literature, this work emphasizes how transparency cannot be seen monolithically. It is imperative that scholars distinguish among different types of transparency when analyzing effects and causes. The fact that no correlation could be found between active and passive transparency reinforces how different incentives for compliance with each type of transparency exist. Each type of transparency implies different incentives for compliance and different impacts on public administration, and much can be gained by examining them distinctly. This thesis also provides additional support for works that seek to assess the neighborhood effect on compliance with internal transparency.

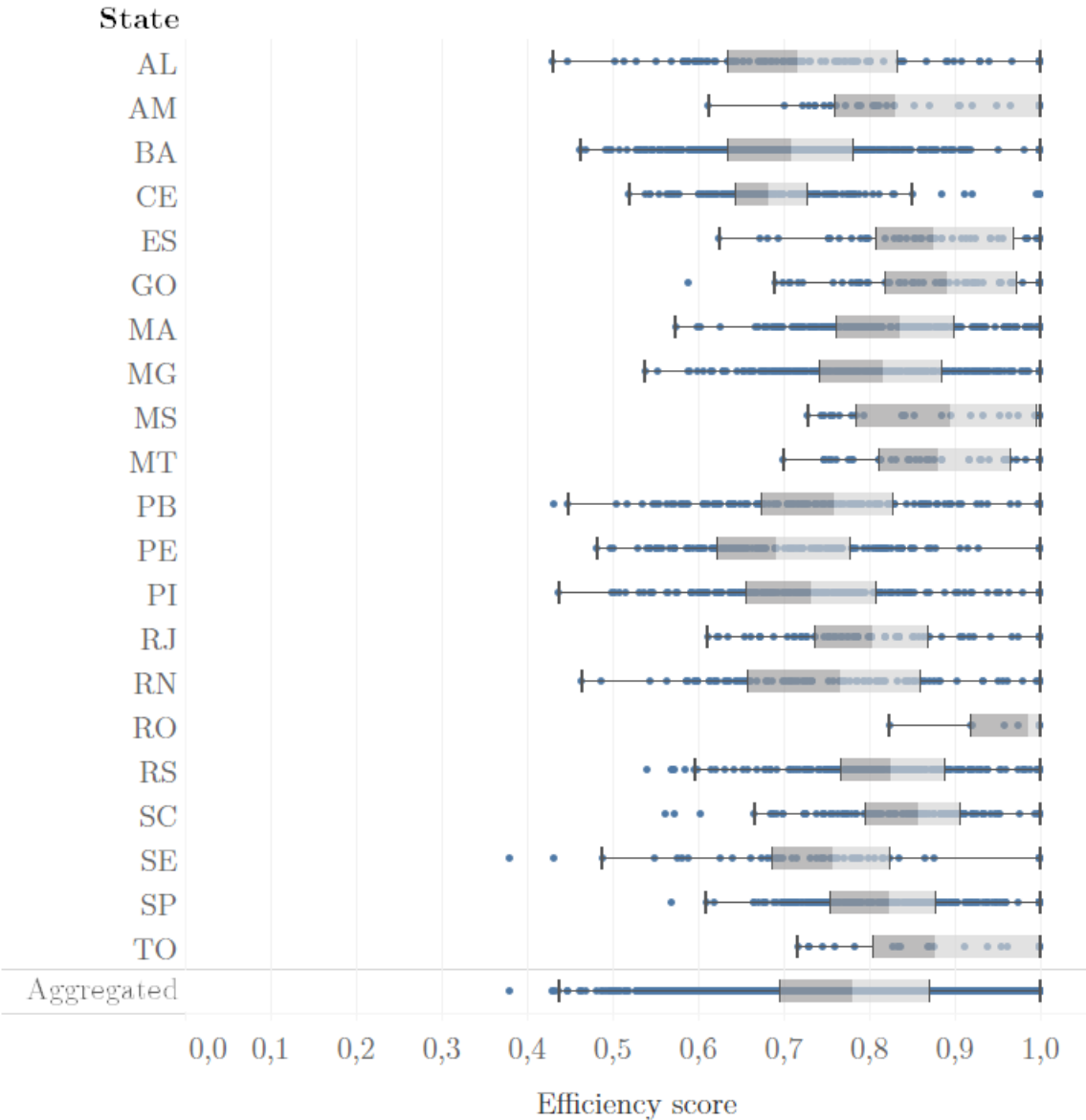
Results, however, should also be noted for their limitations. First, as already mentioned, no causal relationship was determined, which limits the conclusions on how transparency affects public administration. Secondly, Analyses I, II.a, and II.b all were limited to one term of office in each municipality. Results could be limited not only due to the small-time period analyzed but also because these time periods do not account for electoral changes that might affect public administrations and the institutional aspects of these administrations. As more data is generated over time, it will be interesting to reproduce these analyses in the future, providing results with a greater level of complexity.

The hope is that these findings advance research on transparency and education. A causal relationship between transparency and education outcomes represents an important step toward defending the need for greater disclosure and openness in the public administration.



# 8 Appendix

Figure i – Distribution of Efficiency Score on Each State



## 9 References

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