Access to loans and local development: evidence from Brazilian municipalities*

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Abstract

Limited access to credit has been identified as a major constraint to sustainable municipal development, but empirical evidence on the effectiveness of credit operations remains inconclusive. This paper evaluates the impact of federal government guaranteed loans on public expenditures. Using data from Brazilian municipalities and a regression discontinuity design — that leverages a discontinuity in the eligibility criteria for federal government guarantees —, I show that the loans have a positive impact on the quality of local expenditure and on social outcome indicators. This impact is characterized by a significant increase in investment while keeping personnel expenditures stable.

Key words: State Capacity; Access to Credit; Public Expenditure; Municipal Development.
JEL: H71; H75; R51.

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1 Introduction

Access to credit is a major obstacle to municipal development, particularly in developing countries. Local governments often face challenges resulting from limited fiscal capacity, stiff regulation for federal transfers, and legal restrictions on issuing bonds and accessing international credit markets. Even if these legal restrictions were removed, many municipalities in impoverished and developing countries would still struggle to find lenders willing to finance them directly, at least at the favorable interest rates available to the federal government. To make matters worse, the United Nations (UN, 2018) predicts a global increase in urbanization in the coming decades. With urban centers already under pressure, the need for infrastructure and public services, including roads and hospitals, will need to be improved to accommodate growing local populations.

Local and state governments may lack the resources to undertake high-cost development projects, but they can bridge the gap by borrowing from financial institutions, with repayments spread over several years. The inherent efficiency of this approach lies in spreading financing costs over time, as investment projects benefit both present and future generations.

The federal government can play a key role by providing credit guarantees to local governments, enabling them to access loans on more favorable terms. Lending terms are closely linked to the borrower's credibility, perceived ability to repay, and quality of financial management. Lenders set interest rates based on the municipality's perceived risk of default. In addition, the approval of financial operations may require a guarantor to assume responsibility for debt repayment if the borrower defaults. Assessing the impact of access to credit on the quality of expenditure and the provision of public goods and services at the local level is complex because loans are not randomly distributed across municipalities. Instead, access to credit is correlated with other local characteristics that either facilitate or hinder the allocation of expenditures and the provision of public services.

Brazil offers a unique setting for studying the role of credit in expenditure allocation and municipal development. Recently, the Brazilian National Treasury introduced a single, transparent criterion, known as the Capacity to Pay (CAPAG by its Portuguese acronym),

to evaluate requests from subnational governments seeking collateral for lending operations. CAPAG consists of three financial indicators: indebtedness, savings, and liquidity ratio. Each subnational government is assigned a CAPAG score ranging from A to D. As a general rule, only those classified as CAPAG A or B are eligible to contract loans guaranteed by the federal government. This definition has created idiosyncratic thresholds that categorize municipalities based on their financial indicators and determine eligibility for sovereign guaranteed loans. These thresholds serve as a quasi-experimental source of variation that can be used to assess the impact of access to loans on policy outcomes at the municipal level.

The study employs publicly available data at the municipal level on loan requests and approvals, CAPAG scores, public finances, municipal socioeconomic characteristics, and public policy indicators. The data spans from 2018 to 2022, and the results reliability is tested using information from the years 2013 to 2017. The research design uses a fuzzy regression discontinuity model to analyze the causal relationship between loans and municipal expenditure and policy outcomes. The partial CAPAG savings indicator serves as the running variable to determine eligibility for a guarantee, with a crucial threshold of 0.95. The first stage examines the influence of being eligible for federal government guarantees on borrowing, and the second stage examines how the borrowing affects municipal expenditure and policy indicators. Adopting this approach allows for the consideration of possible endogeneity and concealed variables that may impact the results.

Eligibility for federal guaranteed loans markedly enhances the probability of loan approval (by 60%) and loan amounts (by 83%). The increased uptake of loans has noteworthy implications for local expenditure. Investment-related expenditure almost doubles, and current expenditures linked to maintaining and operating public services increase by 57%, substantiating that this hike sustains the new investment. Access to credit has a positive impact on specific expenditure functions, including health, environmental protection, and housing and community amenities. However, education experiences a negative impact. Furthermore, public policy outcomes demonstrate improvements in healthcare and community infrastructure, but no immediate changes in environmental impacts are visible.

By the design of the study, the results apply to the vicinity of the cutoff of the savings indicator that complies with the treatment assignment, i.e., those municipalities that borrow because they are eligible for the government guarantee but would not have borrowed if they had not been assigned. Typically, these municipalities exhibit a lower per capita GDP, greater reliance on intergovernmental transfers, greater investment constraints, and lower pre-treatment investment rates.

This paper contributes to several areas of the literature, including economic development, political economy, public finance, and applied microeconomics. Specifically, it improves our understanding of fiscal capacity, which is one of the three pillars of state capacity. Fiscal capacity encompasses the range of capabilities necessary for effective government performance (Besley and Persson, 2009, 2014). Existing research on the consequences of increased government revenues in developing countries generally finds little or no positive impact of revenues on public policy outcomes, such as the use of these resources for higher-quality expenditures in health, education, and infrastructure.

In addition, there is ample evidence that public funds received in the form of 'rents'[1] are often wasted, misallocated, or diverted to other purposes (Reinikka and Svensson, 2005; Olken, 2007; Monteiro and Ferraz, 2010; Brollo et al., 2013; Caselli and Michaels, 2013; Ardanaz, 2014; Nunn and Qian, 2014; Ardanaz and Tolsa, 2015; Ardanaz and Maldonado, 2016; Lago et al., 2024). Recent studies indicate that the source of government funding matters; for example, resources derived from tax revenue increases tend to be spent on citizen-beneficial expenditures, while revenues from intergovernmental transfers or natural resource exploitation do not necessarily follow this pattern (Gadenne, 2017; Martínez, 2022). This phenomenon can be explained by principal-agent models of public finance. In such models, money received in the form of rents weakens political accountability and negatively affects government performance (Besley and Smart, 2007)[2].

However, there is limited evidence on the impact of government access to credit on spending and public policy outcomes related to services and infrastructure for citizens.

[1]Windfall revenues, such as royalties from natural resources and unconditional intergovernmental transfers, as defined in the natural resource curse literature.

[2]Empirical evidence on how windfalls and taxes affect citizens' political action supports the theoretical models (Paler, 2013).

Though government borrowing does not immediately trigger tax hikes, the Ricardian equivalence theory implies citizens anticipate future taxes will cover the debt, potentially increasing accountability. Complementing prior literature, I demonstrate that loans have a favorable effect on the quality of local spending and social outcome indicators in a developing country context.

In addition to the findings in public finance, this study holds important implications for public policy design. In the Brazilian Federation, municipalities finance 21%[3] and execute 25% of all primary expenditures[4] (*Balanco do Setor Público Nacional*, 2022). Specifically, municipalities play a crucial role in financing and executing a significant portion of national public investment. Regarding expenditure functions, municipalities bear the primary responsibility for urban planning expenses and contribute approximately one-third of the funds allocated to health, education, and public transportation. Assessing whether the institutional framework for lending to local governments promotes prudent resource allocation and is consistent with public policy objectives is essential to achieving sustainable development.

Since money is fungible, there is a concern that income from lending could potentially be misallocated to low-quality activities or could encourage unsustainable spending in the long run, especially if there is no corresponding flow of income, such as permanent increases in personnel costs. Thus, it is critical to determine whether access to loans actually leads to improvements in investment or whether there is evidence that these funds may be diverted from their intended purpose. In addition, the research examines which expenditure functions are prioritized when loan funds are used, regardless of the purpose originally stated at the time of borrowing, and whether these additional funds lead to better public policy indicators associated with these prioritized functions at the local level. Beyond Brazil, other countries with similar institutional backgrounds and levels of economic development may also benefit from the findings of this work.

The paper is organized as follows: Section 2 presents the institutional background of Brazilian fiscal federalism and the rules for access to loans in Brazil, providing a detailed

[3]Total current revenue.

[4]Excluding debt interest payments, which are highly concentrated at the federal level.

explanation of the CAPAG criteria and its implications. Section 3 presents the database and the empirical strategy, while Section 4 discusses the empirical findings related to public finance and public policy, including their policy implications. Section 5 conducts compiler characterization to analyze the external validity of the results and robustness checks. Section 6 concludes the paper.

2 Institutional Background

2.1 Brazilian Fiscal Federalism

Brazil is a federal republic organized into three levels of government: the federal government, 26 states and the Federal District (state governments), and 5,568 municipalities. The Federal Constitution of 1988 defines the administrative, political, fiscal and financial powers of these federal entities. Brazilian fiscal federalism is characterized by the financial and budgetary autonomy of these three federated entities, making it one of the most decentralized countries with respect to state fiscal practices. Subnational governments in Brazil have the authority to collect taxes, formulate budgets, and execute public expenditures. According to the IMF's Fiscal Decentralization Dataset, Brazil ranks ninth out of 86 countries in terms of fiscal decentralization in 2020, with subnational entities collecting 43% of total tax revenue. On the expenditure side, excluding debt service expenditures, which are highly concentrated at the federal level, subnational entities accounted for 52% of total expenditures in 2022, with states accounting for 27% and municipalities for 25% (*Balanco do Setor Público Nacional*, 2022).

The federal, state, and municipal governments have different spending patterns. Budget expenditures fall into two economic categories[5]. The first category is capital expenditure, which directly contributes to the creation or acquisition of capital assets, thereby improving the capacity and quality of public services. Capital expenditure can be further categorized as 'investment', 'financial investment' and 'debt amortization'. The second category is current

[5]National Treasury of Brazil (2021). *Manual de Contabilidade Aplicada ao Setor Público* (9th edition). Available at: https://www.tesourotransparente.gov.br/publicacoes/manual-de-contabilidade-aplicada-ao-setor-publico-mcasp/2021/26.

expenditure, which consists of recurrent expenses required for the regular functioning of these services. Current expenditure consists of 'personnel and social charges', 'interest and debt charges' and 'other current expenditure', a broad category that includes items such as the purchase of consumables for schools and hospitals and the payment of meals and transport allowances to public servants.

A significant portion of federal government expenditure goes towards debt amortization and interest, accounting for an average of 34% and 8% of the total expenditure, respectively, from 2018 to 2022. Personnel expenses make up for 10% of the total, while other current expenses account for 45% of the total. Public investment represents only 1% of the total federal expenditure. In contrast, approximately half of the subnational governments' expenditure is directed towards personnel and social charges (49% for municipalities and 53% for states), and two-fifths to other current expenses (41% for municipalities and 35% for states), with current expenditure accounting for nearly 90% of the total. States and municipalities play a much more substantial role than the federal government in public investment, with 70% of total public investment executed by subnational governments from 2018 to 2022.

Fiscal imbalances in Brazil are often associated with the growth of rigid expenditures, especially personnel costs, while revenues tend to be cyclical and decline during economic recessions (WB, 2017). Excessive personnel expenses may also indicate the capture of public resources by the bureaucracy (rent-seeking political behavior), clientelism or patronage (Ames et al., 2005; Salomão and Santos, 2022). This can lead to the diversion of resources to budget categories that do not meet the needs and aspirations of citizens (Drazen and Eslava, 2005). Conversely, there is a recognized need to create additional fiscal space to increase investment in infrastructure in Brazil (WB, 2017).

Expenditure execution may also be examined from a functional perspective. Excluding the 'public debt' category, which includes interest and debt payments and accounts for 42% of total expenditure during the 2018-2022 period, mainly due to the cost of the federal public debt, the most important expenditure categories are social security (34%), health (15%), education (14%), social assistance (7.5%), and general administration (4.6%). Subnational

governments play a particularly critical role in implementing social functions, which are policies that have a direct and visible impact on the lives of citizens. While the federal government finances and implements social expenditures that target specific groups, such as 'labour affairs', 'social security', and 'social protection' functions, states and municipalities are primarily responsible for universal access expenditures. As shown in Figure 1 the expenditure functions executed mainly by the Brazilian municipalities between 2018 and 2020 are 'urban planning' (81%), 'sanitation' (80%), 'sports and recreation' (68%), 'general administration' (54%), 'energy', 'housing' and 'culture' (the last three in which the municipal execution corresponds to 53%). Municipal participation is also important in the execution of the functions 'education' (43%), 'environmental protection' (41%) and 'health' (40%).

2.2 Rules to Access Loans

In Brazil, states and municipalities do not have the authority to issue debt bonds as the federal government does[6]. Instead, to invest in relevant projects, subnational governments can contract loans from financial institutions. These financial contracts, as well as their amendments, are subject to a series of limits and conditions, which are closely monitored by the federal government through a process known as the Request for Verification of Limits and Conditions (PVL). The National Treasury is responsible for assessing these requests, and the entire process is recorded in the SADIPEM (System for Analysis of Public Debt, Credit Operations, and Guarantees of the Federal Government, States, and Municipalities). The requirements include a debt limit as a proportion of revenues, compliance with the 'golden rule' (which prohibits credit operations from exceeding capital expenditures, ensuring that debt is not used for current expenses), limiting annual releases to 16% of Net Current Revenue (RCL), ensuring no irregular operations, and complying with the federal government regulations[7]. The validity period of these verifications varies, lasting from 90 to 270 days depending on the municipality's situation. However, if the fiscal year concludes without the credit operation being contracted, a new analysis is necessary. This mechanism encourages subnational governments to contract operations within the same fiscal year of their approval.

[6]Federal Senate Resolution no. 43 of 12/21/2001.

[7]The complete list of requirements for subnational credit operations is available at Table A1.

The federal government can provide guarantees for subnational borrowing, essentially acting as a financial guarantor with lending institutions and paying in the event of default. This mechanism allows states and municipalities to access more favorable borrowing conditions because operations guaranteed by the federal government carry a lower credit risk. Figure 2 illustrates the fact that the average debt interest rate is consistently lower for municipalities with federally guaranteed operations, although rates have fluctuated considerably over the years. To ensure comparability, the mean debt interest indicator is calculated by dividing debt service expenditure by consolidated local debt. The results are separated into municipalities with at least one approved sovereign guaranteed loan in the year (denoted by 1) and those without any approval (denoted by 0).

Eligibility for such transactions depends not only on meeting the general requirements for credit operations but also on additional requirements, including the Payment Capacity Assessment (CAPAG). The CAPAG is a rating calculated annually by the National Treasury based on the previous year's financial results. It assigns a grade from A to D according to the financial condition and risk that a credit operation of the subnational entity would pose to the federal government. States and municipalities with CAPAG ratings of A and B are eligible for federal guarantees of credit operations, while those with ratings of C and D are not eligible.

The calculation of a rating to assess the financial situation of Brazilian states, the Federal District, and municipalities by the National Treasury has a long history[8]. Previous methodologies carried a higher level of complexity and resulted in lengthy reports on the fiscal situation of these subnational entities. However, until 2017, there was a waiver rule that allowed entities with poor ratings to contract credit operations, if the project in question was of national interest and there were sufficient counter-guarantees and funds for financial contributions, making room for political decisions. Since 2018[9], the CAPAG has been simplified and calculated based on three financial indicators: Debt (DC), Savings (PC), and Liquidity (IL). Each financial indicator is assigned a letter (A, B, or C) that represents the entity's partial rating, and the final payment capacity rating is determined

[8]Ministry of Finance Ordinance no. 276 of 10/23/1997 and no. 306 of 09/10/2012.
[9]Methodology given by the Ministry of Finance Ordinance no. 501 of 11/23/2017.

from the combination of the partial ratings of the three indicators, as illustrated in Table 1. In addition, in this period the CAPAG rule for allowing sovereign debt loans began to be followed more strictly, with only one well-defined exception[10].

Assessments of the payment capacity are conducted based on the fiscal results of the preceding year and are valid until the conclusion of a new financial analysis process. In the case of municipalities, the CAPAG remains valid until the end of April of the subsequent year. For instance, the CAPAG for municipalities in 2022 was calculated based on the financial results of 2021 and remained valid until April 30, 2023, when the CAPAG for 2023, derived from the financial results of 2022, takes effect. The fiscal capacity of subnational governments, as captured by the CAPAG indicators, shows significant heterogeneity, resulting in varying eligibility for sovereign guaranteed loans. Considering municipalities, Figure 3 illustrates the variation in the CAPAG partial rating associated with the savings indicator, which is calculated using the ratio of expenditure to current revenue[11].

From 2018 to 2022, 5,946 credit operations were approved for Brazilian municipalities, totaling approximately USD 15 billion[12]. Figure 4 examines the declared purpose stated at PVL/SADIPEM for these approved operations, excluding the 32 records of contract amendments (0.54% of the total)[13]. The majority of these operations (57%) fall under the broad category of 'infrastructure', which includes the planning and execution of projects for constructing and maintaining roads, schools, hospitals, sanitation services, transportation, energy, telecommunications, and other related infrastructure. The second-largest category (acquisition of movable and immovable property) mainly pertains to the purchase of machinery, equipment, and vehicles (18.1%) or the acquisition of land, real estate, and construction

[10]The only exceptions to this rule are credit operations aimed at financing investment projects related to debt refinancing, improvement of revenue administration and fiscal management, or under specific programs, such as the National Program for Efficient Public Lighting (RELUZ). Such operations remain eligible for federal guarantees even if the state or municipality has a CAPAG rating of C or D.

[11]In addition to displaying inter-municipal disparity, CAPAG demonstrates substantial variation over time. To provide a visual representation of this indicator's evolution from 2018 to 2021 in Brazilian municipalities, please refer to Figure A1 in the Appendix.

[12]The amount is equivalent to BRL 77.6 billion (at 2022 prices), considering the average exchange rate in 2022 of 5.16 BRL/USD.

[13]Table 2 compares the purpose of 5,667 operations approved during the period with 552 loan requests rejected by the National Treasury, excluding the record for contract amendments (32 approved and 4 rejected during this period).

of facilities (3.1%). These acquisitions are often associated with providing public services across various sectors.

A smaller portion of the operations is explicitly linked to specific expenditure functions, such as urban planning (4.7%), transport (4.7%), capital contribution and guarantee for state-owned companies (3.5%), and sanitation (2.9%). Operations aimed at debt refinancing or debt regularization and at improving local fiscal management—categories exempt from the CAPAG A or B requirement for sovereign guarantee eligibility—accounted for 2.1% and 1.6%, respectively, of the total approved operations during the period. Loans whose stated purpose is sustainable development or environmental protection account for 1.2%. The category others (0.7%) includes operations aimed at education, housing, public safety, health, tourism, and institutional strengthening. However, simply increasing financial resources does not guarantee an automatic enhancement in the quality of local-level spending, especially within the context of developing nations. It is crucial to go beyond the stated purpose of credit operations and assess whether the allocated resources are effectively utilized for investments that improve the quality of expenditure and local-level public policy indicators.

3 Empirical Strategy

3.1 Data

This study utilizes publicly available municipal-level data with an annual frequency. The main regressions focus on the period from 2018 to 2022, and robustness tests use data from 2013 to 2017. All monetary values have been adjusted for inflation to reflect 2022 prices and have been converted into Brazilian *Reais* (BRL), in the case of external credit operations. The primary data sources employed are detailed below:

- **PVL/SADIPEM database**[14]: This source provides essential information regarding the approval of loan operations, including details about each operation (type, status,

[14]The PVL (Limits and Conditions Verification Request) database was selected over the Debt Registry (*Cadastro da Dívida Pública, CDP*) database, also on SADIPEM, because of the greater adherence of the instrument. Robustness tests have been conducted, and the results have been validated when using the CDP database. Occasional adjustments were made to the PVL database when the debt signature date was prior to the date related to the last status in the PVL.

date, amount, and purpose). Credit operations were considered approved when they exhibited statuses such as deferred, regularized, or forwarded to the National Treasury Attorney's Office (*Procuradoria Geral da Fazenda Nacional*, PGFN). Loan operations approved in the months of January to April were classified as approved in the previous year, following the CAPAG calculation and review system. Additional information on the classification of the loan requests can be found in Table A2 in the Appendix[15].

- **Payment Capacity (CAPAG) database**: The National Treasury provides the partial rankings for the three indicators (debt, savings, and liquidity), as well as the final CAPAG score. The information covers Brazilian municipalities from 2018 (based on 2017 financial indicators) to 2022.

- **Public finance data**: Revenue, expenditure (total and separated by economic categories and functions), and debt indicators at the municipal level are organized and provided by the National Treasury, through the SICONFI (Brazilian Public Sector Accounting and Fiscal Information System). Particularly, the study relies on data from annual financial statements, available from 2013, and the RGF (fiscal management report), available from 2015.

- **Municipal characteristics**: Includes information on population, municipal GDP figures, state and region categorization, and municipal codes utilized for data manipulation. This data is sourced from the Brazilian Institute of Geography and Statistics (IBGE). The municipal GDP is released with a two-year lag by the IBGE. At the time of writing, the GDP for 2021 and 2022 had not yet been released; therefore, the variable municipal GDP includes the results for 2018 to 2020.

- **Public policy outcomes**: Indicators of local-level public policies related to expenditure functions positively impacted by the loans, namely, health, community and housing amenities, and environmental protection. Health indicators comprise the

[15]The classification of the loan requests follows the rules established in the National Treasury's Manual for the Instruction of Claims. Available at: https://www.tesourotransparente.gov.br/publicacoes/manual-para-instrucao-de-pleitos-mip/2022/26-4. Accessed on October 11, 2023.

number of primary healthcare centers in the municipality[16], the proportion of live births whose mothers received seven or more prenatal visits, and the proportion of live births with low weight (under 2,500 grams or 5.51 pounds). The data is sourced from the *Observatório da Criança e do Adolescente*[17], a data platform of social indicators related to children and adolescents in Brazil, the Live Birth Information System (SINASC), and the Brazilian National Health System (DATASUS/TABNET). Community outcomes encompass the population served by the sewage collection system (up to 2021), the change in the bike lane indicator between 2017 (pre-treatment) and 2020, and traffic deaths per 100,000 inhabitants[18]. This information is provided, respectively, by the *Observatório da Criança e do Adolescente*, the Basic Municipal Information Survey (MUNIC) from IBGE, and DATASUS/TABNET. The environmental outcome refers to the change in the environmental impact indicator between 2017 and 2020, provided by IBGE/MUNIC.

Regarding expenditure functions, this study specifically focuses on the top 10 functions with the highest municipal participation between 2018 and 2022, falling within 40% to 81%, as illustrated in Figure 1. These functions are linked to the corresponding COFOG (Classification of the Functions of Government) from UN/OECD, as elaborated in Appendix Table A3. It is important to note that the terminology used here does not aim to establish a direct one-to-one correspondence between Brazil's expenditure functions and COFOG. Achieving such correspondence would necessitate a more detailed analysis involving granular data and a comprehensive methodology (Clerck and Wickens, 2015). The objective of this framework is to connect the study's findings with a broader audience.

3.2 Research Design

The empirical challenge in studying the impact of loans on expenditure outcomes at the local level lies in the fact that the decision and capacity of a municipality to engage in credit

[16]Include the categories *unidade básica de saúde*, *centros de saúde*, and *postos de saúde*.

[17]Available at https://observatoriocrianca.org.br/. Accessed on June 30, 2023

[18]A death is considered traffic-related if it is classified within the Statistical Classification of Diseases and Related Health Problems (ICD) V01 to V99.

operations are often associated with other characteristics that affect both expenditures and the delivery of public services. For example, a competent municipal government seeking to improve expenditure quality can adopt fiscal management practices that lower personnel expenses and increase investments, while actively pursuing borrowing opportunities. Likewise, if a municipal government is committed to enhancing public health services, it can allocate more funds to the sector while concurrently seeking loans for initiatives such as procuring additional hospital beds or constructing healthcare facilities. In essence, hidden variables could affect both the loans as a treatment and the local expenditure and public policy indicators as the target, possibly causing bias in the estimates derived from ordinary least squares (OLS) regressions.

One strategy to overcome this problem is to make use of an instrument that is highly correlated with the treatment but that is neither correlated with the unobserved factors nor directly influences the outcome variable. The rule for defining the CAPAG (Table 1), a determining condition for obtaining the federal government guarantee in credit operations, creates arbitrary limits that allow the use of a fuzzy discontinuous regression design (RDD)[19] to determine the causal relationship between loans and municipal expenditure and policy outcomes. Although the CAPAG is composed of three partial indicators, only the results from the savings and liquidity indicators determine eligibility for the sovereign guaranteed loan, i.e. the receipt of a final CAPAG score of A or B. In particular, upon crossing the 0.95 threshold in the savings indicator, the probability of being eligible for a sovereign guaranteed loan drops from about 60% to zero (see Figure A2 in Appendix). While municipal managers have some, yet not full, control over expenditure execution (numerator), revenues are subject to positive and negative shocks (denominator) that can greatly impact the results[20].

Municipalities exhibiting large differences in the PC indicator, calculated from the ratio of expenditure to current revenue from the previous year, are unlikely to be directly comparable. The main hypothesis is that within a neighborhood near the 0.95 threshold of

[19]For an introduction to regression discontinuity designs, see (Cattaneo et al., 2018a).

[20]Most municipalities heavily rely on current transfers from the federal government and states, with little decision-making power over them and vulnerability to economic and institutional shocks. Alongside transfers, municipal current revenues also encompass tax revenues (levied on services, urban property, and heritage), service fees and improvement contributions, royalties, and social security contributions.

the PC indicator, the assignment of municipalities on either side is essentially random. By employing the two-stage least squares method (2SLS), observations located in the vicinity of both sides of this threshold can be compared to estimate the local average treatment effect based on this hypothesis. The design of the study assumes that in the absence of the rule governing eligibility for federal government guarantees in credit operations, some of those who ultimately undergo the treatment (i.e., obtained loans) would not have done so. Eligibility serves as an incentive for borrowing, while the lack of eligibility acts as a deterrent. Moreover, the neighborhood of 0.95 of the PC indicator is notably interesting, since it identifies municipalities facing substantial financial constraints when it comes to undertaking critical infrastructure investments, thus making them more inclined to seek loans.

The fuzzy RDD explores discontinuities in the probability or expected value of treatment conditional on a variable and is an empirical design in which discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke, 2009). In this sense, the empirical strategy comprises two stages: (i) determine whether there is indeed a discontinuity in borrowing behavior at the 0.95 threshold of the PC indicator; and (ii) examine how this discontinuity is reflected in municipal expenditure and public policy indicators. The primary causal relationship of interest is the effect of being eligible for a federal government guarantee (CAPAG A or B) on actual borrowing, measured as a dummy variable ($Anyloan_{it}$), which indicates whether municipality i in year t received approval for at least one loan operation from the National Treasury. This first stage effect is identified through the following specification:

$$Anyloan_{it} = \gamma * Z_{it} + f(r_{it}) + \epsilon_{it} \quad \text{(First Stage)} \tag{1}$$

Where γ identifies the causal effect of interest, $Z_{it} = I(r_{it} < 0)$ is an indicator variable that equals 1 if the PC indicator of municipality i in year t is below 0.95 (centered at zero) and 0 otherwise, $f(rit)$ represents a function of the PC indicator centered at zero - a continuous variable denoting treatment eligibility (running variable) - and ϵ_{it} is the error term. Specifically, the estimation involves conducting local linear regressions of r_{it} using

triangular kernel weights, comparing observations to the left and right of the cutoff within a predetermined interval. The same Equation (1) is also estimated for another dependent variable, which indicates the amount in Brazilian Reais (BRL) per capita of loans approved for municipality i in year t ($Amountpercapita_{it}$). This second specification analyzes the overall effect of eligibility on loan amounts[21].

The second relationship of interest is the effect of taking up loans on various categories and functions of local expenditure and public policy indicators. To mitigate endogeneity concerns, the variables $Anyloan_{it}$ and $Amountpercapita_{it}$, represented below as L_{it} are instrumented as in Equation 1. The second stage of the 2SLS is represented in the following model:

$$Y_{it} = \beta * L_{it} + g(r_{it}) + \varepsilon_{it} \tag{2}$$

Where Y_{it} denotes the municipal expenditure or public policy indicator, $g(r_{it})$ is a linear function of the indicator PC with different slopes on either side of the cutoff value and ε_{it} the error term. Under standard assumptions[22], the 2SLS estimate of β identifies the causal effect of interest and may be interpreted as a local average treatment effect (LATE) for compliers. In a fuzzy RDD, the compliers are the observations whose treatment status changes as we move the running variable from one side of the cut-off value to the other.

To address the potential sensitivity to the choice of the interval, the first-stage results will be presented for two predefined intervals around the threshold value, as well as the optimal interval, as recommended by (Cattaneo et al., 2016). The optimal interval method optimizes the trade-off between bias and variance, by minimizing the minimum square error of the RDD estimator given the choice of polynomial order and kernel function (Imbens

[21]Note that this estimation considers both municipalities that have an approved loan and those that do not (in which case the value of $Amountpercapita_{it}$ will be zero). Restricting the sample to consider only observations with an indicator $Anyloan_{it}$ equal to 1 would undermine the power of the estimate, by drastically reducing the number of observations.

[22]The standard LATE assumptions aim to ensure that loan uptake is random within a bandwidth of the running variable cutoff value. In this setting, it requires the instrument (PC indicator) to only influence municipal expenditure and public policy outcomes through the borrowing channel. Additionally, a strong correlation exists between eligibility for guaranteed loans indicated by the PC indicator and actual loan uptake.

and Kalyanaraman, 2012)[23]. For conciseness, the second-stage results are reported for the optimal interval but are robust to variations in the interval.

3.3 Descriptive Statistics

Table 3 shows descriptive statistics for the 5,569 Brazilian municipalities with available data from 2018 to 2022, encompassing panels of economic, political and fiscal data and access to loan indicators. The columns (1) to (3) cover the complete database, which contains 27,845 observations, and columns (4) to (6) focus on the optimal interval, covering 19,075 observations. The municipalities have an average of 37 thousand inhabitants in the period under analysis, presenting great heterogeneity (minimum of 771 inhabitants and maximum of 12.3 million inhabitants), and are composed mainly of smaller municipalities (median of 11.5 thousand people). The municipal GDP per capita[24] also presents great variation, ranging from BRL 5,446 to BRL 974 thousand (at 2022 prices). The municipal GDP per capita mean is BRL 31,888 (equivalent to USD 6,180) but this figure is skewed upwards by the richest municipalities since the median is BRL 23,019 (USD 4,460).

Looking at the political variables, it can be seen that there is political alignment in the sense that the mayor belongs to the same party as the country's president in only 3-4% of the cases over the period, and belongs to the same government coalition in 17% of the cases for the entire sample and 14% within the bandwidth[25]. About 54-55% of the mayors in the sample have a university degree.

Current revenue per capita averages BRL 5,341 (USD 1,035). In line with the discussion in previous sections, municipalities are heavily dependent on transfers from the states and the federal government, variables subject to shocks and the discretion of other levels of government, representing on average 87% of current revenue, while tax revenue totals 8.6%[26]. On the other hand, total expenditure per capita averages BRL 4,924 (USD 954), 90% of which is spent on current expenses, including about half corresponding to personnel

[23]It was implemented in STATA software using the rdbwselect function (Calonico et al., 2014)

[24]Data on municipal GDP per capita is available up to 2021.

[25]The low percentage of mayors with a political alignment with the federal government during this period can be attributed to the fact that in 2020 and 2021, then President Jair Bolsonaro was without a party and political coalition.

[26]Other sources of revenue include social security contributions and royalties.

expenses. Public investment stands at 9%.

As for the variables related to loans, it should be noted that most of the loans requested are actually approved, being requested in 14.6% of the city-year observations and approved in 14%. This indicates an anticipation effect of the PVL analysis results that influences the decision to request a loan. Partial CAPAG indicators indicate low indebtedness but low savings and liquidity, which means that a high proportion of current income is consumed by current expenditure. On average, 34% of the observations have CAPAG A or B, making them eligible for loans guaranteed by the federal government. As shown in Table 4, the optimal interval is representative of the entire sample in terms of the stated purpose of the loans.

The interval selection process for the RDD proceeded as follows: (i) observations which final CAPAG score was not calculated by the National Treasury were excluded (the absence of calculation of a final CAPAG score indicates low reliability of the fiscal result reported by the municipality); (ii) fourteen observations which reported PC indicator is a value above 1000 were excluded (indicates low reliability of the fiscal results reported by the municipality and would hamper the optimal interval selection)[27]; (iii) the optimal interval is selected.

The optimal interval for the loan indicator variable (*Anyloan*) is 0.183, which means observations with a PC indicator between 0.766 and 1.134 form the RDD neighborhood. Table 3 shows the descriptive analysis of the optimal interval data considering (*Anyloan*) as the dependent variable in Equation 1. There is no significant variation compared to the full database. At the margin, the subset of the optimal interval is, on average, wealthier and more populous, slightly less dependent on transfers, and takes out more loans. The average PC indicator in the optimal interval is 0.922. The optimal interval for the amount of loan variable (*Amountpercapita*) is 0.175.

For RDD to be valid and adequate for causal interpretation, it is essential that agents cannot manipulate the value of the control variable, in this case, the savings indicator score. The cut-off value should not be set at a particular point so as to include or exclude certain individuals. Similarly, agents should not manipulate its value to be included or excluded

[27]Keeping the range fixed, the results do not change significantly if observations without a final CAPAG score and with extreme values for the savings indicator are not excluded.

from the treatment. Figures 5 and 6 show, respectively, the histogram at the optimal range for (*Anyloan*), and the density manipulation test as proposed by (Cattaneo et al., 2018b)[28]. Both show no evidence of manipulation of the PC indicator, which would be reflected in a discontinuity in the density, with a clustering of observations just below the cutoff.

4 Results

4.1 First Stage

Eligibility for sovereign guaranteed loans increases the complier's probability of having an approved loan within the optimal bandwidth by 60% (6 p.p. from an ineligible mean for units above the threshold value of 0.95). In terms of the loan amounts, there is an increase of 83% (BRL 23.30 from an ineligible mean of BRL 27.80). Considering the average population of 44,679 in the optimal bandwidth, as in Table 3, the total increase in the loan amounts is BRL 1,041,020 (at 2022 prices), equivalent to USD 201,748.

Figure 7 provides a graphical representation of the first stage results. This result is consistent across different specifications that include year, year-state, and year-region[29] fixed effects, as shown in Tables 5 and 6. Equation 1 is also estimated for alternative bandwidths, namely, 0.15 (PC indicator above 0.8 and below 1.1) and 0.30 (PC indicator above 0.65 and below 1.25). In general, the larger interval (0.3) slightly increases the effect, while the smaller interval (0.15) slightly decreases it.

4.2 Effects in Public Finance

Table 7 shows the estimates of the impact of access to credit (approved loans and amount of loan per capita in BRL) on local expenditure, considering the corresponding optimal interval.

[28](McCrary, 2008) introduced the idea of manipulation testing in the context of discontinuous regression designs. The goal is to check whether individuals, because they knew the allocation criteria between control and treatment, strove to fall short of or beyond the discontinuity point. The test proposed by McCrary (2008) requires preselection and intervals for histogram construction, introducing additional adjustment parameters. (Cattaneo et al., 2018b) developed manipulation tests based on a new local polynomial density estimator, which does not require interval preselection, and has greater power than (McCrary, 2008) test.

[29]Brazil is divided into five main regions with more homogeneous socioeconomic characteristics: North, Northeast, South, Southeast and Center-West.

Since the execution of the expenditures derived from a credit operation may take several years, the expenditure variable was calculated as the average per capita expenditure in a given category or function in year t (the year the loan was approved) and in the following four years (t+1, t+2, t+3, t+4), whenever data are available[30][31].

Panel A shows results for the expenditure categories current expenditure, personnel expenditure, mean debt interest (calculated by dividing the debt service expenditure by the consolidated local debt), other expenditure, and investment. The expenditure functions were selected based on the relative responsibility of the local government in carrying out the expenditure function and followed the COFOG classification (Table A3). Panel B shows the results for the following expenditure categories: general public services; education; health; environmental protection; recreation, culture and religion; housing and community amenities. Since the dependent variable is measured logarithmically in per capita terms, we can interpret the effect as a percentage impact, for compliers, in the corresponding expenditure category or function relative to the ineligible mean.

Column (1) reports reduced form estimates and the two-stage least squares results are reported in columns (4) (for the first stage using the *Anyloan* indicator) and (5) (for the first stage using the *Amountofloan* variable). In the present precisely identified instrumental variable model, the 2SLS estimates correspond to the reduced form effects scaled by the first stage coefficient. Column (3) presents the estimates obtained by OLS[32], which may be biased by unobserved factors affecting both the dependent variable (local expenditure) and the independent variable (access to loans). Column (2) shows the mean of the expenditure categories and functions for the municipal-year observations whose PC indicator is above the cut-off value of 0.95 in BRL per capita. Figure 8 visually illustrates the 2SLS effect of the municipality having an approved loan on local expenditure.

[30]The annual financial execution data for Brazilian municipalities are available until 2022. Therefore, only for loan operations approved in 2018 does the average take into account the five years indicated, i.e. 2018 (t), 2019 (t+1), 2020 (t+2), 2021 (t+3) and 2022 (t+4). For operations approved in 2019, the four-year average is calculated as follows: 2019 (t), 2020 (t+1), 2021 (t+2) and 2022 (t+3), etc. For operations approved in 2022, only year t is available.

[31]Disaggregated estimates for each year are available upon request.

[32]The OLS model is given by $Y_{it} = \alpha * Anyloan_{it} + h(r_{it}) + eta_{it}$ where Y_{it} is either the expenditure category, expenditure function or the public policy indicator in municipality i year t, $Anyloan_{it}$ is a dummy indicating at least one approved loan in municipality i year t, and $h(r_{it}$ is a linear function of the savings indicator similar to equations 1 and 2.

In terms of the economic expenditure categories, there is a 12.2% increase in per capita investment and a 3.49% increase in the 'other expenditure' category in the 5-year average when the municipality becomes eligible for a sovereign guaranteed loan, i.e. falls below the 0.95 threshold for the savings indicator. Given the ineligible mean (column 2), this corresponds to a BRL 39.40 (USD 7.64) per capita increase in investment and a BRL 59.78 (USD 11.59) per capita increase in other expenditures. Other categories, such as rigid personnel expenditure, mean debt interest, as well as the total current expenditure category, show no significant impact. This is consistent with the actual allocation of the additional resources from the loans to infrastructure, as additional spending in the 'other expenditure' category are needed to maintain and operate the new investment.

The 2SLS estimates in column (4) show the effect of loan uptake in the expenditure categories using the *Anyloan* indicator in the first stage. For compliers, investment almost doubles and the other expenditure category experiences an increase of 57%. The results in column (5) using the *Amountofloan* variable in the first stage point in the same direction.

Note that the OLS estimates for the category of personnel expenditures produce a negative and significant result corresponding to about 5.6% of the average expenditure of the ineligible group in the optimal range. This spurious result can be explained by unobservable factors that influence both borrowing and reducing the allocation of resources to personnel expenditure. For example, a local government seeking to improve resource allocation can both act to reduce inefficient personnel expenditure and obtain a loan to invest, but there is no causal relationship between access to credit and personnel expenditure. In general, the results suggest that access to credit contributes to higher-quality expenditures, such as structural investment, which is desirable from a societal point of view.

The analysis of the expenditure functions reveals a positive impact of eligibility for sovereign guarantee in health (3.14%), environmental protection (14%), and housing and community amenities (7.8%). Given the average expenditure of observations with a PC indicator above 0.95, this corresponds to BRL 34.93 (USD 6.77), BRL 5.75 (USD 1.11) and BRL 36.43 (USD 7.06) per capita, respectively. On the other hand, there is a negative impact on education (-3%) amounting to BRL 38.86 (USD 7.53), indicating a substitution

effect within expenditure functions when accessing credit. The remaining expenditure functions show no significant effect. The OLS regression shows rather biased results, such as a decrease in per capita expenditure on general administration, an increase in recreation, no effect on health, and stronger results for the other functions. The results of the 2SLS using both the indicator of approved loans and the amount of loans per capita in the first stage point in the same direction.

The effect of the loan on the expenditure categories over the years is illustrated in Figure 9. In the year of loan approval (t), the effect is usually smaller than in the following years (t+1 and t+2). Then it starts to decrease, in line with the execution of the project associated with the loan. The significant variance of the results in year t+4 is due to the limited number of observations.

4.3 Effects in Public Policy Outcomes

Analogous to Table 7 on expenditures, Table 8 shows the average 5-year impact of access to credit on public policy indicators related to the expenditure functions positively affected by loan uptake (health, housing and community amenities, and environmental protection). The standardized coefficients are presented, expressing the average change in standard deviations of the outcome variable associated with a one standard deviation change in a predictor variable. Figure 10 visually illustrates the 2SLS effect of the municipality having an approved loan on these indicators.

Regarding public health policies, loan uptake significantly increases the number of primary health care units in municipalities (1.8 standard deviations) and the proportion of live births in which mothers received seven or more prenatal visits (0.852 standard deviations), indicating an improvement in the infrastructure and the provision of local health services related to investment. On the other hand, at least in the case of the proportion of live births with low birth weight, there is no immediate improvement in the health outcome. Housing and community amenity indicators indicate an improvement in the municipal coverage of sewage collection (2.08 standard deviations) and construction of bike lanes from 2017 to 2020 (1.41 standard deviations), denoting better community infrastructure.

The traffic deaths per 100,000 inhabitants indicator shows no significant reduction given these investments. At last, there is no effect on the occurrence of environmental impacts in municipalities between 2017 and 2020 due to access to loans.

5 Additional Analysis

5.1 Complier Profiling

In a fuzzy RDD, the results apply to the compliers, in this case, the municipalities that took the treatment (loan) because they were assigned to it (i.e., they were eligible for the sovereign guaranteed loan, measured by the savings indicator below 0.95), but would not have taken it if they had not been assigned. Profiling compliers and non-compliers can play an important role in understanding what subpopulation the study is making inferences about and the external validity of the LATE results. It also allows for a better understanding of the 'always-takers' category, who do not need the assignment to take the treatment, and the 'never-takers' group, who cannot be pushed to take the treatment.

Figure 11 shows descriptive statistics (means and 95% bootstrap confidence intervals) for compliers, never-takers, and always-takers compared to the full sample, using the method described in (Marbach and Hangartner, 2020). The proportion of compliers is 11.7% of the sample, while the proportion of never-takers is 78.9% and the proportion of always-takers is 9.2%. In general, complier municipalities face higher resource constraints and have lower investment rates in the pre-treatment period.

Panel (a) shows that smaller municipalities, typically with less than 40,000 inhabitants, never take loans, regardless of their CAPAG score. Compliers and always-takers have heterogeneous populations, although always-takers are slightly more populous than compliers. Panel (b) shows that compliers have lower GDP per capita (BRL 6,500 for compliers versus more than BRL 30,000 for the full sample). Panel (c) shows the share of current expenditure in total expenditure, and shows that compliers face higher investment constraints, as this share is on average 0.95%, while it is 0.89 for the full sample. On the revenue side, as in panel (d), compliers have lower tax revenues as a share of total revenues (5.4%) than the

full sample (8.7%). Interestingly, always-takers have a higher tax revenue share (11.4%) than the full sample. In the pre-treatment period, which is considered to be the year 2017, a smaller proportion of total expenditure is allocated to investment in complying municipalities (2.9%) compared to the whole sample (5.5%).

5.2 Robustness Checks

As a robustness test, the same regressions were run for the 5 years prior to the treatment, from 2013 to 2017. Although the National Treasury already calculated the payment capacity of states and municipalities to grant guarantees in credit operations during this period, the calculation followed a more complex methodology and could be waived if the project was considered of national strategic interest (see the Institutional Section above for details). Therefore, in practice, the manual calculation of a partial savings indicator analogous to the one used in CAPAG calculations since 2018 should not produce significant results for loan uptake, local expenditure, or public policy indicators.

The first step in this exercise was to calculate an indicator analogous to the CAPAG savings indicator for the years 2013 to 2017 by dividing current expenditures by current revenues. Figure B1 compares a proxy indicator with the original one published by the National Treasury for the period from 2018 to 2022, showing a good fit. Table B1 shows the results of an alternative first-stage regression, using the proxy for savings indicator to predict the probability of *Anyloan*. The proxy produces a significant first-stage effect and even proves to be superior to the original CAPAG indicator (Table 5), which includes adjustments by the National Treasury in the calculation process. Table B2 repeats this exercise for the period from 2013 to 2017, and it is evident that there is no statistical significance for the first stage-like regression. Table B3 presents the summarized results of the effect of the savings proxy indicator on expenditure for the period from 2013 to 2017. Once again, we find no significant results for any of the expenditure categories or functions. This result reinforces the causal attribution of the results in this study, as it does not indicate a pre-treatment trend.

6 Summary and Conclusions

This paper aims to study the impact of access to credit on local public expenditures and public policy outcomes, based on data from Brazilian municipalities between 2018 and 2022. I took advantage of a discontinuity in the eligibility requirements for the federal government guarantee in credit operations (CAPAG), which reduces the risk and improves the financial conditions of the operations. The value of the savings indicator changes discontinuously by 0.95 from B to C, which in turn affects the final CAPAG and thus the eligibility for government-guaranteed loans. The main hypothesis is that around the 0.95 threshold, the assignment of municipalities to either side is as good as random. From this hypothesis, the local average treatment effect is estimated using two-stage least squares. The results are local estimates of the impact of loans on local expenditures and public policy indicators. The complier municipalities are of particular interest because they face higher resource constraints and have lower investment rates in the pre-treatment period.

Near the 0.95 cut-off for the savings indicator, the probability of taking out a loan increases by 60%, and the amount of the loan increases by about 83% for units above the cutoff. The results indicate a good use of resources from credit operations. There is a positive and significant impact of loans on the investment and 'other expenditure' economic categories, suggesting that the additional income from credit operations is actually used for development projects and related maintenance and operating costs. There is no increase in the rigid expenditure category of personnel expenditure, which is usually associated with the misappropriation of funds and fiscal imbalances.

Among the various expenditure functions, there is an increase in health, housing and community amenities, and environmental protection. On the other hand, there is a statistically significant decrease in the allocation of funds to education when taking loans. Both the increase in the health function and the decrease in the education function of municipalities with approved loans may be related to the analysis period, which includes the COVID-19 pandemic. In this case, municipalities with access to credit could count on additional resources to meet the most immediate needs for the provision of public goods and services. The housing and community amenities function includes structural investments

by municipalities, such as spending on urban planning and infrastructure, street lighting, public transportation, and basic sanitation.

No effect was found in the general public services or recreation, culture and religion functions. Expenditure in these functions tends to be current expenditure, unrelated to long-term development projects, and its increase could signal misuse of revenues from credit operations. In terms of public policy outcomes related to the functions that benefited most from access to loans, there is a short-term positive impact on indicators related to better infrastructure and goods and services for citizens. However, no significant effect was found for the indicators measuring the final outcome, i.e. better health, community and environmental indicators.

The findings are relevant for policy design in developing countries since the literature on fiscal capacity states that simply increasing revenue is not enough to promote quality expenditure and improve local development. Increased revenues via grants, oil royalties, international aid, and unconditional transfers find little or no positive impact on the provision of public goods and services. This paper presents evidence that access to loans generates positive impacts in terms of quality of expenditure and outcomes at the local level.

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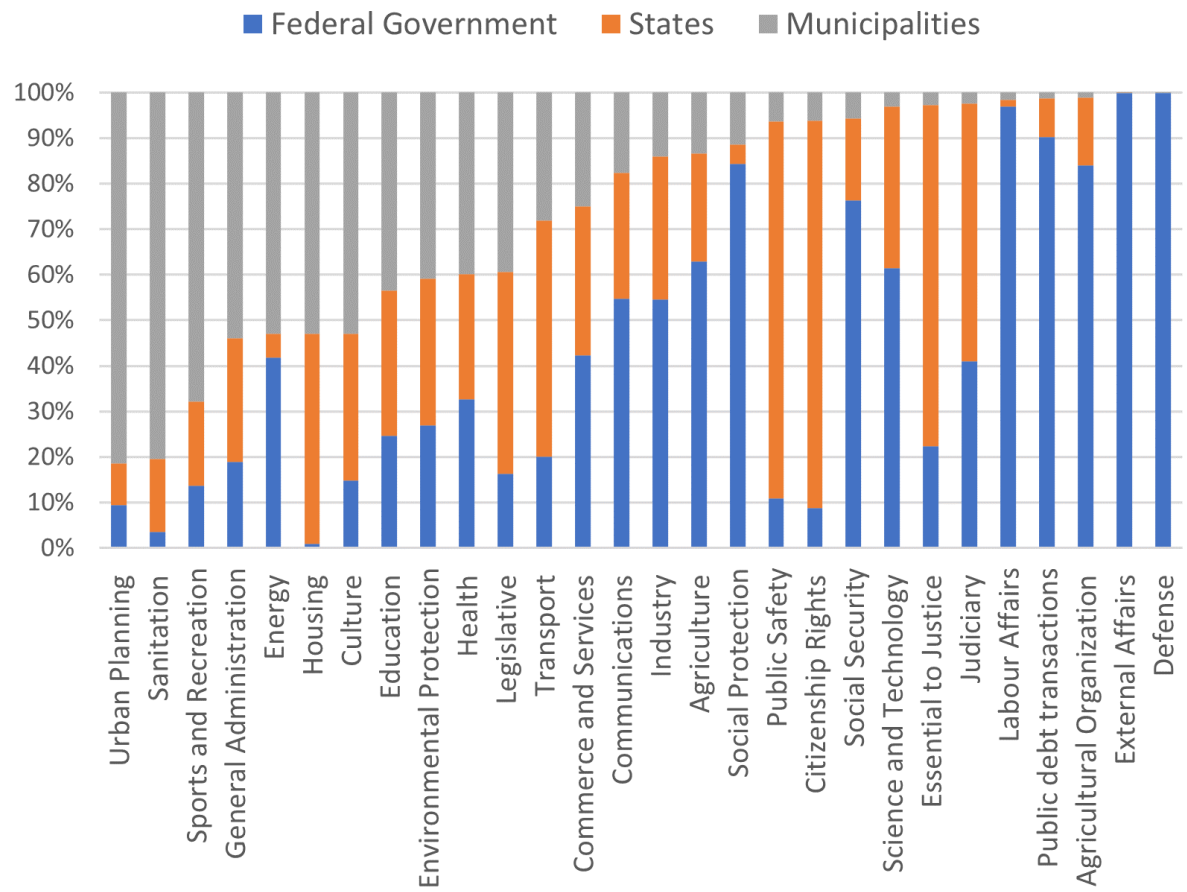
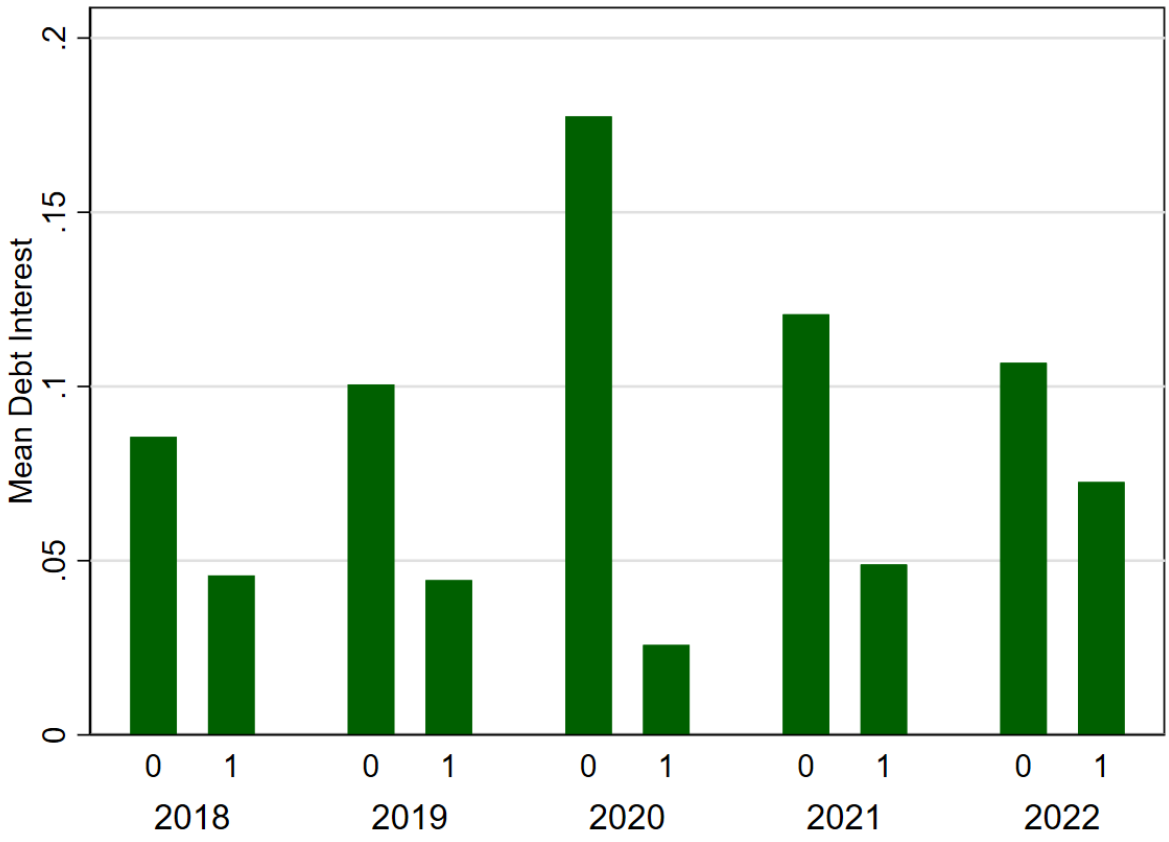
Figures

Figure 1: Participation of Levels of Government in the Execution of Expenditure Functions (2018-2022)



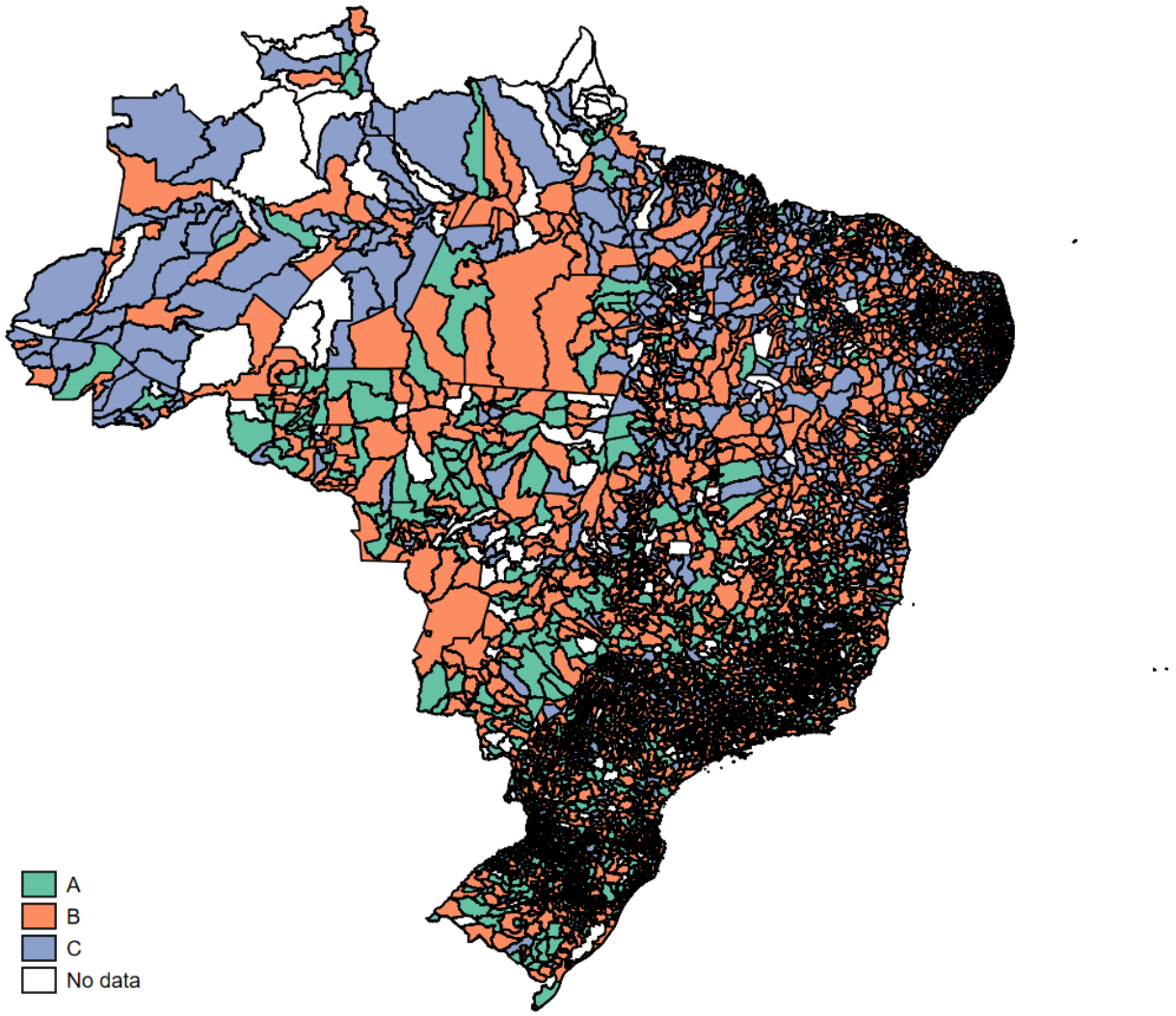
Notes: Average expenditure committed (*despesa empenhada*) for each function, by level of government, from 2018 to 2022. Source: *Balanço do Setor Público Nacional*, *Secretaria do Tesouro Nacional* (National Treasury). The expenditure classification used in Brazil is defined by the Ministry of Finance Ordinance No. 42, of April 14, 1999.

Figure 2: Comparison of Mean Debt Interest Payments for Municipalities with and without Federal Guaranteed Loans (2018-2022)



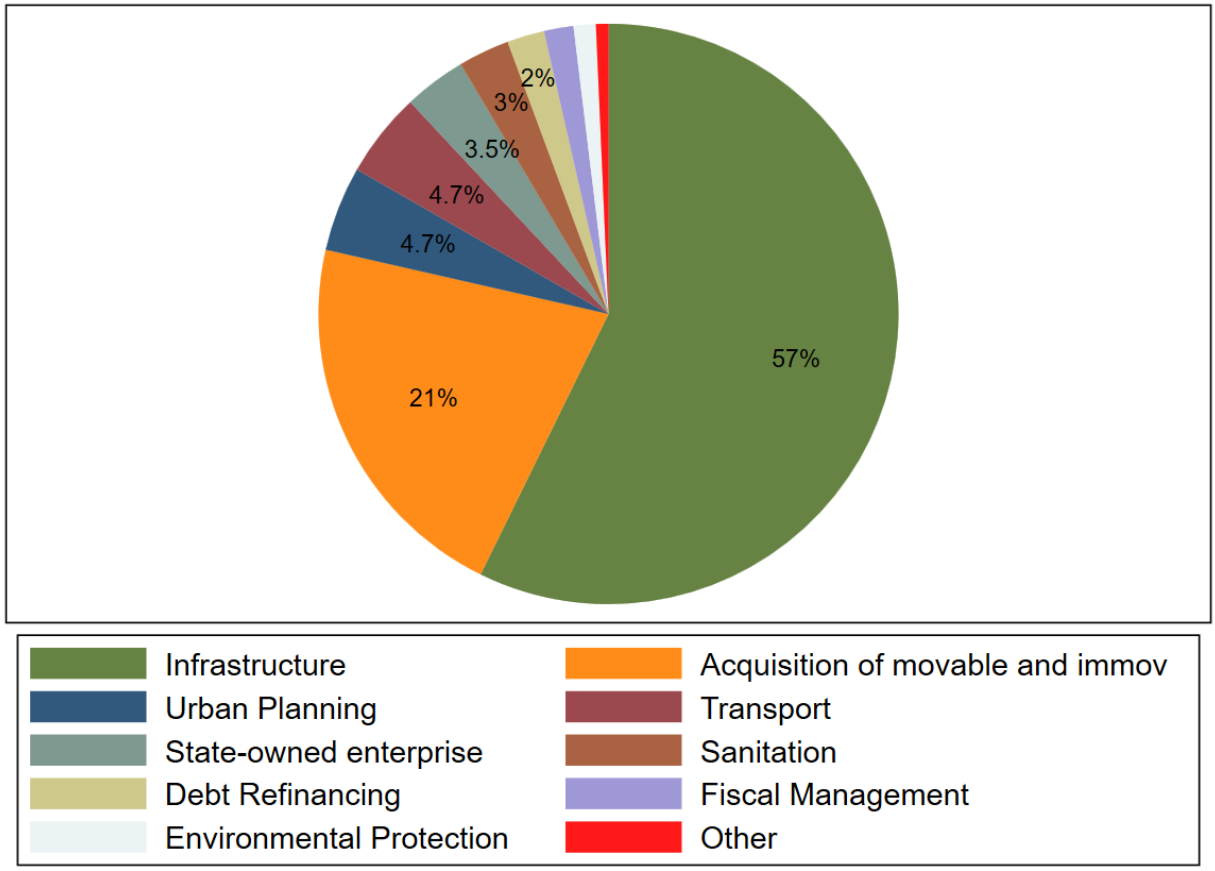
Notes: The Mean Debt Interest in axis Y is calculated by dividing the debt service expenditure by the consolidated local debt. Average annual results are presented on axis X separated by municipalities with at least one approved loan with sovereign guarantee in the year (denoted by 1) and without any approved loan with sovereign guarantee (denoted by 0). Observations with either of these two terms were missing were excluded. Observations with negative values (17 observations) or mean debt interest rate greater than 100 (5 observations) were also excluded to ensure data quality. A total of 12,300 observations of municipalities from 2018 to 2022 were analyzed. Own elaboration based on data from the National Treasury.

Figure 3: Savings Indicator Scores in Brazilian Municipalities (2022)



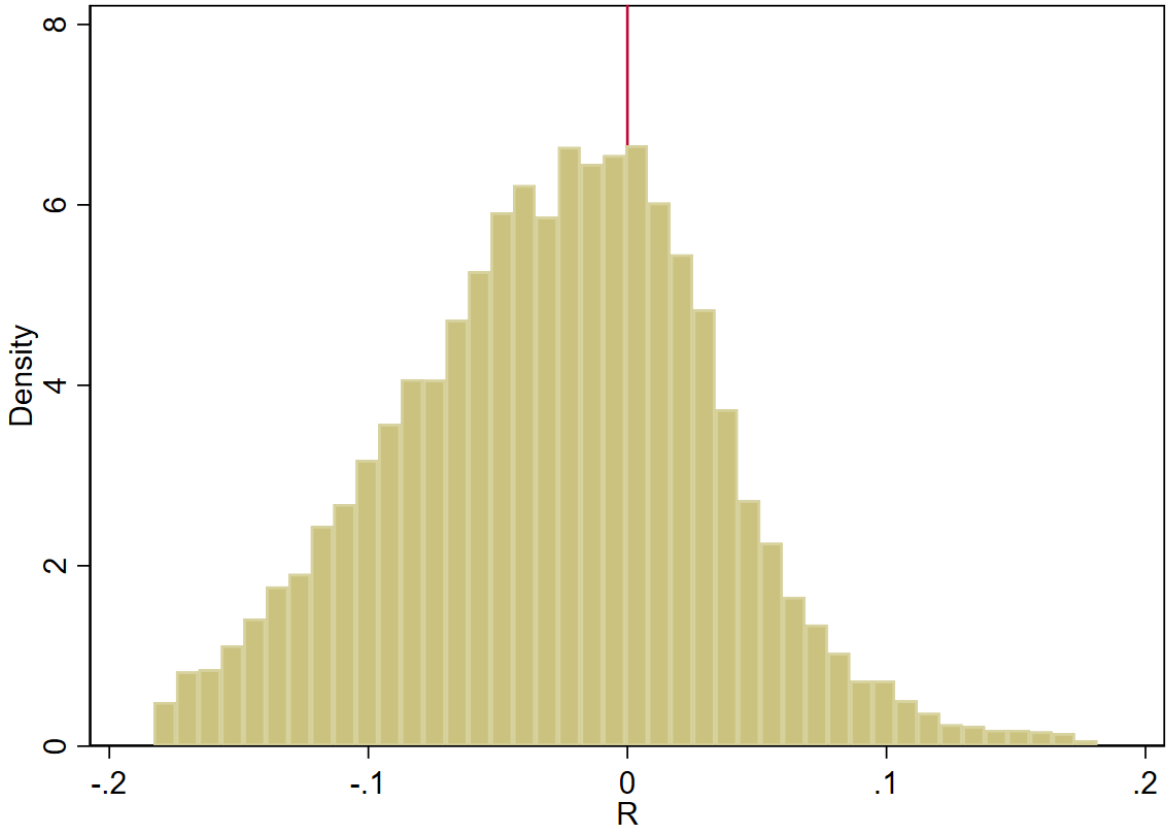
Notes: Own elaboration based on CAPAG database for municipalities, reflecting partial ratings for the savings (PC) indicator.

Figure 4: Purpose of Approved Municipal Loan Operations (2018 to 2022)



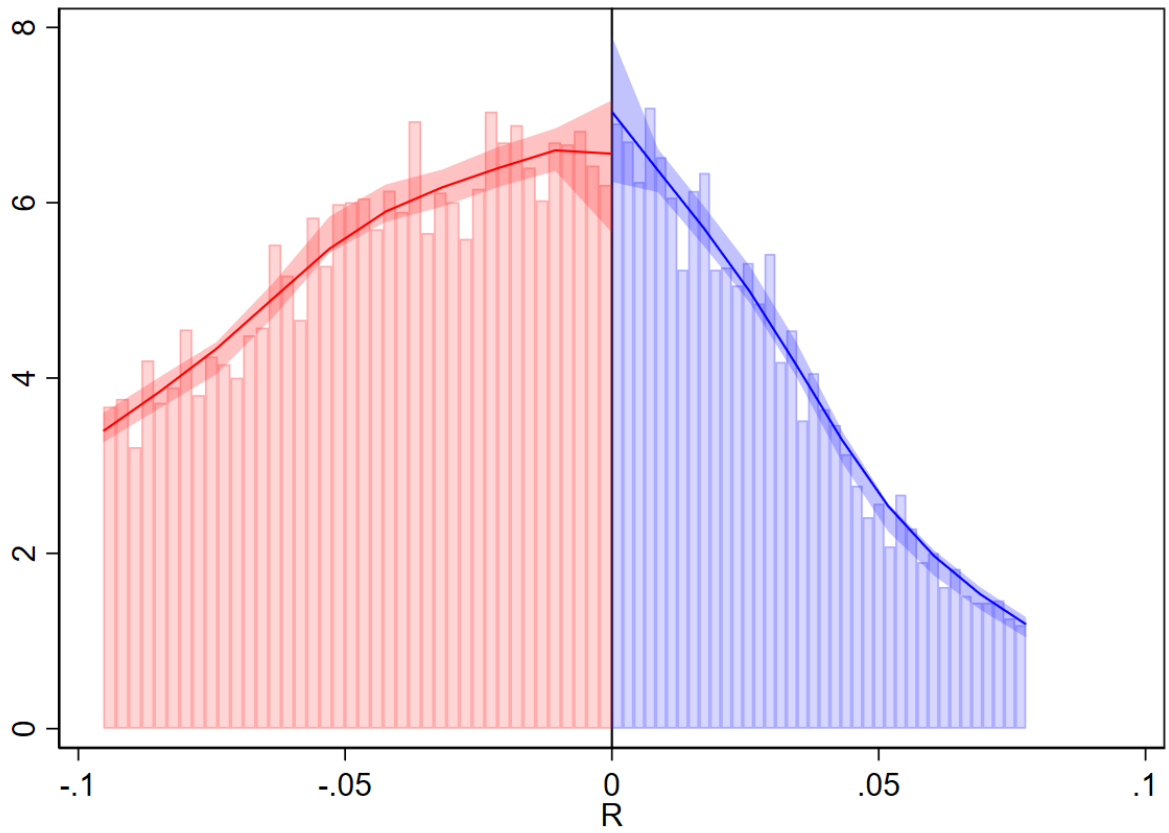
Notes: Own elaboration from PVL/SADIPEM. Considers credit operations approved by the National Treasury for municipalities between 2018 and 2022, excluding the records of contract amendment operations (0.54% of total). 'Infrastructure' is a broad category that encompasses capital investment in various areas, including urban planning, sanitation, transportation, etc. For more details refer to the accompanying text.

Figure 5: Histogram of Partial Savings Indicator



Notes: Data from Brazilian municipalities from 2018 to 2022. The partial savings indicator scores (PC) are displayed on the horizontal axis, with a cutoff score set at 0.95, demarcating the boundary between CAPAG grades B and C. This score is centered around 0 and denoted as variable R. The vertical axis represents the density within specific ranges of R values, encompassing the optimal bandwidth (R: -0.183 to 0.183) for (*Anyloan*) in equation 1.

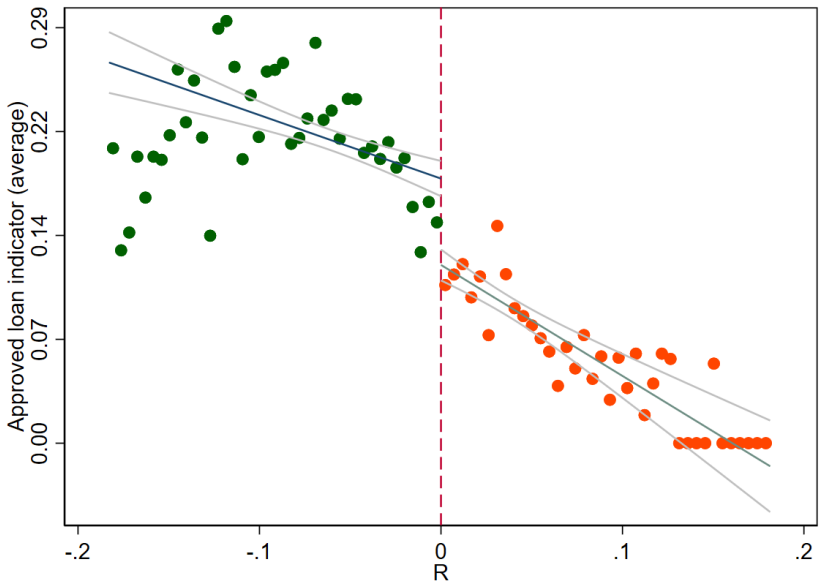
Figure 6: Density Manipulation Test (Optimal Bandwidth)



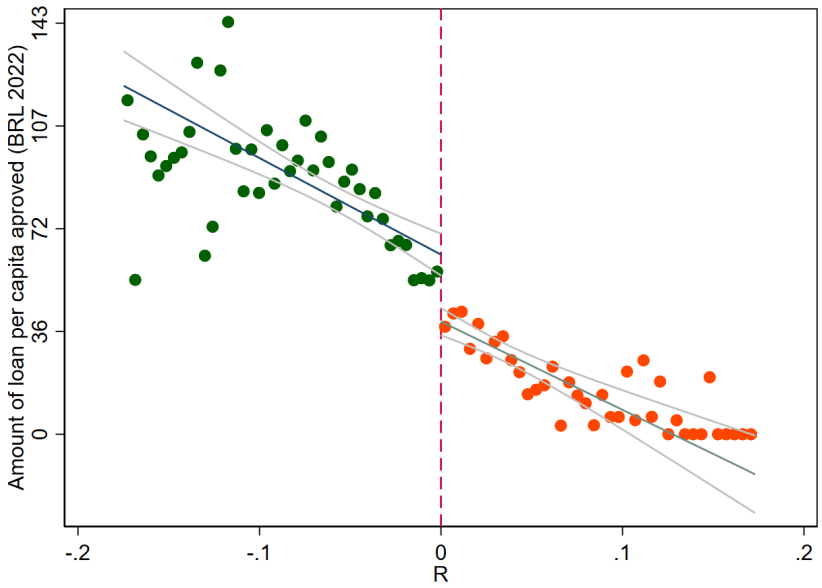
Notes: The test was implemented using the rddensity command in the Stata software (Cattaneo et al., 2018b), considering the optimum bandwidth (R: -0.183 to 0.183). Data from Brazilian municipalities from 2018 to 2022. The partial savings indicator scores (PC) are displayed on the horizontal axis, with a cutoff score set at 0.95, demarcating the boundary between CAPAG grades B and C. This score is centered around 0 and denoted as variable R. The vertical axis represents the density within specific ranges of R values, encompassing the optimal bandwidth (R: -0.183 to 0.183) for (*Anyloan*) in Equation 1.

Figure 7: First Stage: Effect of the Partial Savings Indicator on Loans

Panel A: Effect on Approved Loan Indicator



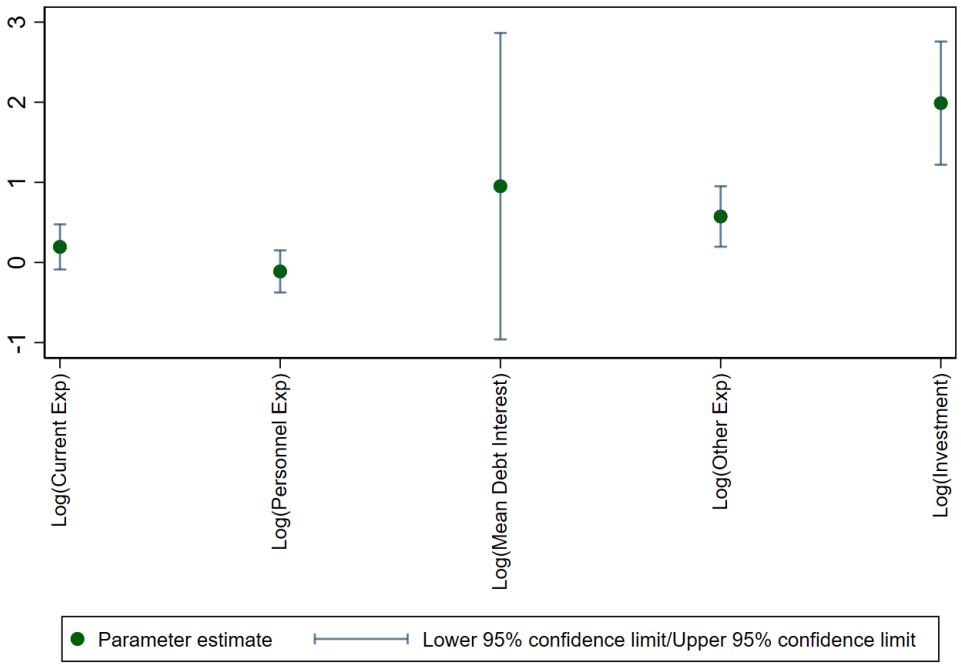
Panel B: Effect on Amount of Loan Approved



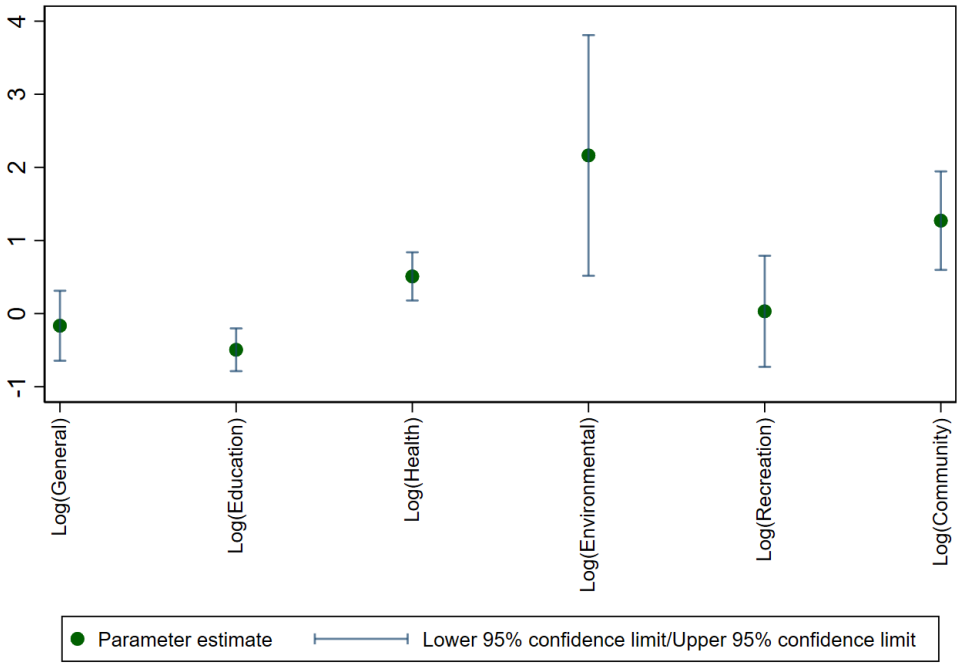
Notes: Data from Brazilian municipalities from 2018 to 2022. Panel A considers the optimum bandwidth for the approved loan indicator (R: -0.183 to 0.183). The probability of having an approved loan increases by 6 p.p. in the cut-off. Panel B considers the optimum bandwidth for the per capita amount of loan variable (R: -0.175 to 0.175). The per capita amount of loan approved increases BRL 23,30 in the cut-off.

Figure 8: Effect of Loan Uptake on Expenditure

Panel A: Effect of Loan Uptake on Expenditure Category



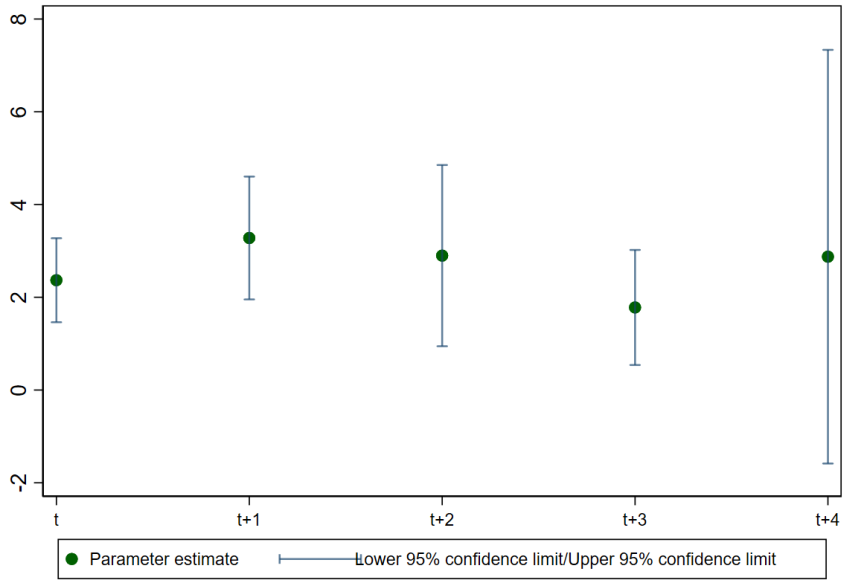
Panel B: Effect of Loan Uptake on Expenditure Function



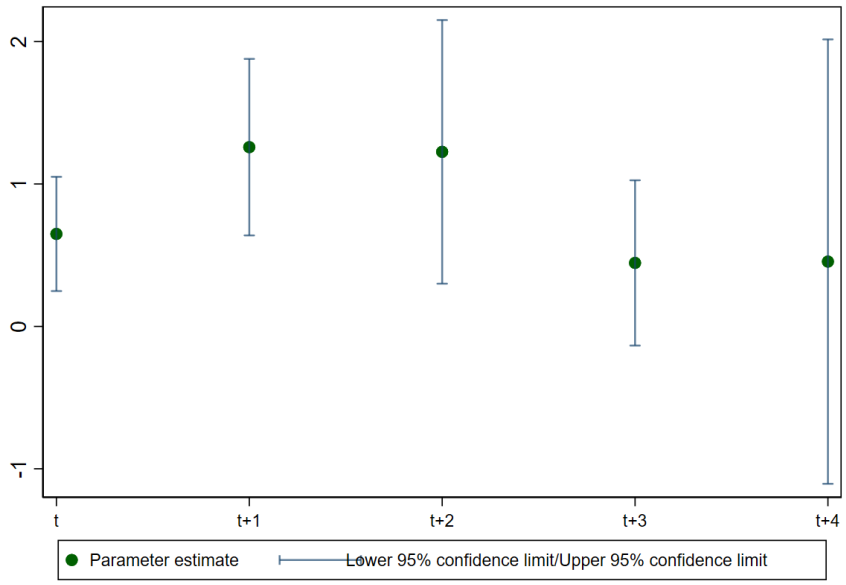
Notes: This analysis assesses the average impact of access to loans on expenditure from year t to t+4 using a 2SLS approach with the *Anyloan* indicator as the instrument. Expenditure variables are measured logarithmically in per capita terms.

Figure 9: Temporal Effect of Loan Uptake on Expenditure

Panel A: Temporal Effect of Loan Uptake on Investment

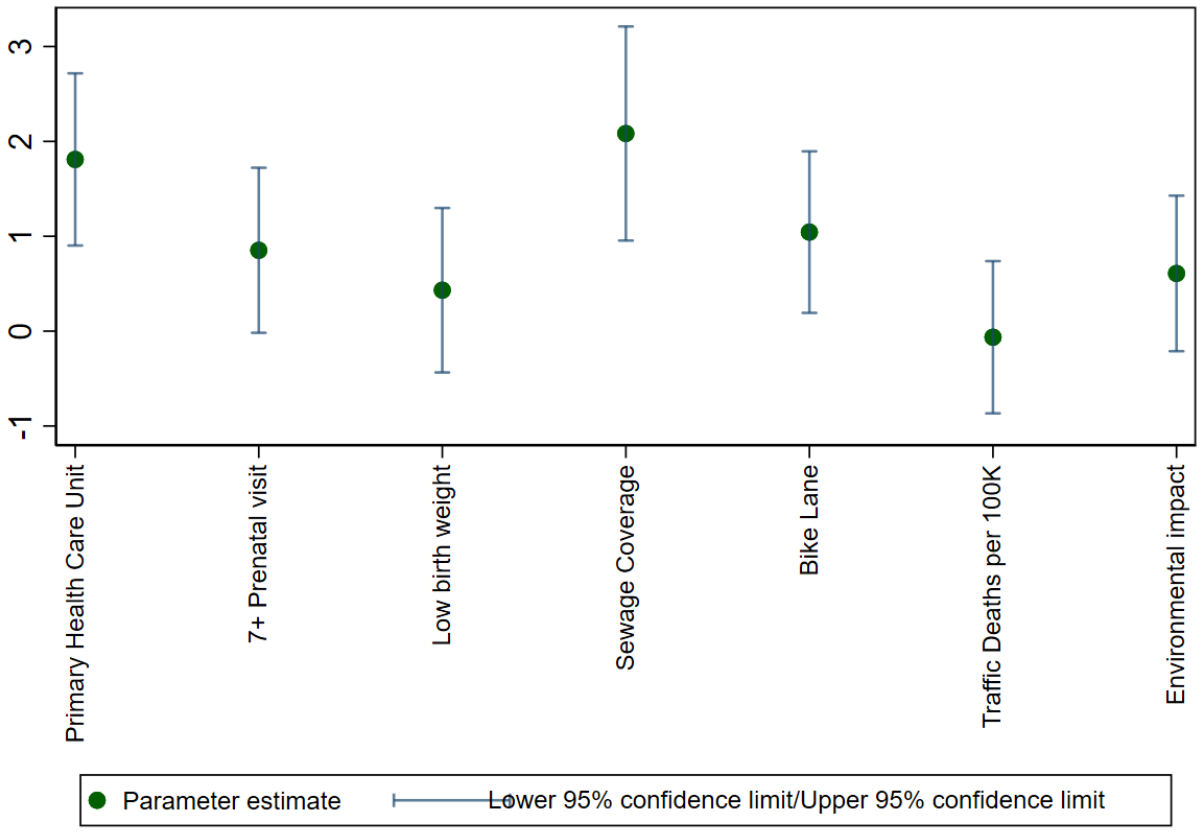


Panel B: Temporal Effect of Loan Uptake on Other Expenditure



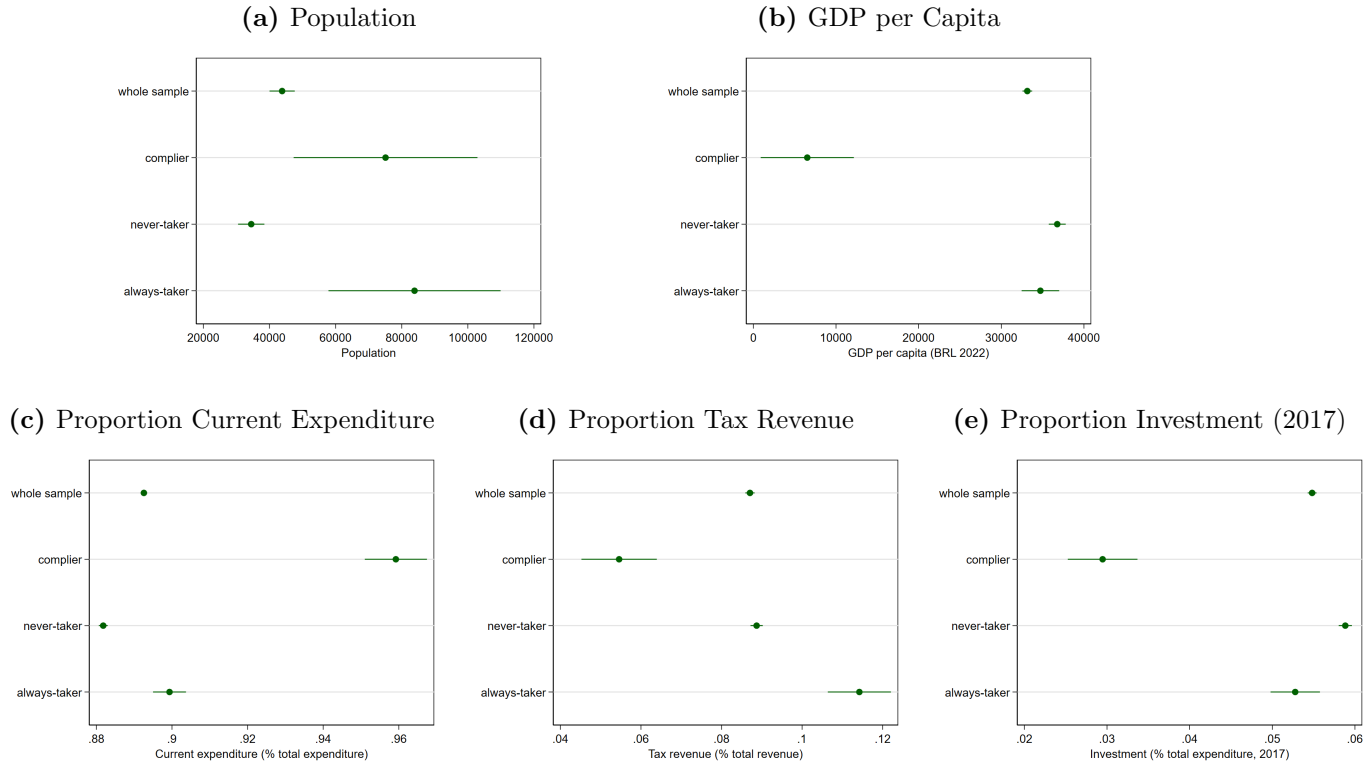
Notes: This analysis assesses the yearly impact of access to loans on expenditure categories from year t to t+4 using a 2SLS approach with the *Anyloan* indicator as the instrument. Expenditure variables are measured logarithmically in per capita terms.

Figure 10: Effect of Loan Uptake on Public Policy Outcomes



Notes: This analysis assesses the average impact of loan access on expenditure from year t to t+4 using a 2SLS approach with the *Anyloan* indicator as the instrument. Public policy outcomes are quantified as standardized scores.

Figure 11: Profiling Compliers and Noncompliers



Notes: Descriptive statistics (mean and 95% bootstrap confidence intervals) for the complier and noncomplier subpopulations. Complier municipalities face significant resource constraints and lower investment in the pre-treatment period (e). They typically demonstrate lower GDP per capita (b), higher current expenditure as a proportion of total expenditure (c), and lower tax revenue as a proportion of total revenue (d). These characteristics make them more inclined to seek borrowing for structural investments.

Tables

Table 1: Methodology for calculating Payment Capacity (CAPAG)

Panel A: Calculation of partial indicators

Indicator	Range	Partial Rating
Debt (DC)	DC <60%	A
(Consolidated Debt /	60% <DC <150%	B
Net Current Revenue)	DC >150%	C
Savings (PC)	PC <90%	A
(Current Expenditure /	90% <DC <95%	B
Adjusted Current Revenue)	PC >95%	C
Liquidity (IL)	0 <IL <1	A
(Financial Obligations /	IL >1 (or negative)	C
Cash Availability)		

Panel B: Computation of the final CAPAG score from the partial indicators

Partial Rating			CAPAG
DC	PC	IL	
A	A	A	A
B	A	A	B
C	A	A	B
A	B	A	B
B	B	A	B
C	B	A	B
C	C	C	D
All other combinations			C

Source: Ministry of Finance Ordinance No. 501 of November 23, 2017. Note: Ministry of Finance Ordinance No. of June 22, 2022 changed the cut-off value for the Debt indicator (DC) between grades B and C to 100% and the cut-off value for the Savings indicator (PC) between grades A and B to 85%.

Table 2: Purpose of Approved and Rejected Municipal Loan Operations (2018 to 2022)

Purpose (%)	All Approved Loans	All Rejected Loans
Debt Refinancing	2.08	8.33
Fiscal Management	1.64	2.90
Acquisition of movable and immovable property	21.29	11.59
State-owned enterprise	3.47	3.08
Infrastructure	57.27	60.33
Transport	4.73	4.71
Sanitation	2.86	2.72
Urban Planning	4.73	5.07
Environmental Protection	1.23	0.72
Other	0.69	0.54
Total	100	100

Note: Own elaboration from PVL/SADIPEM. Considers the 5,667 credit operations approved and the 552 loan requests rejected by the National Treasury to municipalities between 2018 and 2022, excluding the record of contract amendment operations (32 approved and 4 rejected in this period).

Table 3: Descriptive statistics for Brazilian municipalities (2018-2022)

	All municipalities			RD Sample (Optimal bandwidth)		
	Mean (1)	Median (2)	Obs. (3)	Mean (4)	Median (5)	Obs. (6)
Panel A: General economic, political and fiscal data						
Population	37,220	11,547	27,845	44,679	12,082	19,075
GDP per capita (BRL, 2022)	31,888	23,019	22,276	34,037	25,907	14,891
Political alignment with Federal Government (same party)	0.039	0	27,548	0.030	0	18,867
Political alignment with Federal Government (coalition)	0.174	0	27,548	0.145	0	18,867
Mayor has university degree	0.540	1	27,438	0.551	1	18,797
Current revenue per capita (BRL, 2022)	5,314	4,561	27,283	5,370	4,668	18,847
Proportion of current rev. from taxation (%)	0.0801	0.0553	27,250	0.0873	0.0617	18,837
Proportion of current rev. from grants (%)	0.866	0.896	27,238	0.855	0.887	18,817
Total expenditure per capita (BRL, 2022)	4,924	4,275	27,295	4,966	4,365	18,852
Prop. of total exp. from current expenditure (%)	0.896	0.908	27,293	0.894	0.905	18,852
Prop. of total exp. from personnel expenditure (%)	0.513	0.511	27,278	0.509	0.507	18,850
Proportion of total exp. from investment (%)	0.0898	0.0766	27,249	0.0913	0.0788	18,843
Panel B: Access to loans indicators						
Any loans approved within a year	0.140	0	27,845	0.173	0	19,075
Any loans denied within a year	0.0133	0	27,845	0.0165	0	19,075
Any loans requested within a year	0.146	0	27,845	0.179	0	19,075
CAPAG's Debt indicator (DC)	0.189	0.0949	24,965	0.189	0.0993	18,998
CAPAG's Savings indicator (PC)	1.180	0.929	26,177	0.922	0.925	19,075
CAPAG's Liquidity indicator (IL)	1.041	0.336	21,554	3.285	0.371	19,032
Eligible to SGL (CAPAG A or B)	0.342	0	27,845	0.482	0	19,075

Note: Data on municipal GDP per capita is available up to 2021. Optimal bandwidth considers the *Amountofloan* as the dependent variable in Equation 1 (R: -0.183 to 0.183).

Table 4: Approved Loan Distribution for Various Purposes (2018-2022)

Purpose (%)	All Approved Loans	RD Sample (Optimal Bandwidth)
Debt Refinancing	2.08	2.08
Fiscal Management	1.64	1.71
Acquisition of movable and immovable property	21.29	21.37
State-owned enterprise	3.47	3.49
Infrastructure	57.27	56.98
Transport	4.73	4.78
Sanitation	2.86	2.91
Urban Planning	4.73	4.73
Environmental Protection	1.23	1.24
Other	0.69	0.71
Total	100	100

Note: Own elaboration from PVL/SADIPEM. Considers credit operations approved by the National Treasury for municipalities between 2018 and 2022, excluding the records of contract amendment operations (0.54% of the total). The optimal bandwidth considers the *Amountofloan* as the dependent variable in equation 1 (R: -0.183 to 0.183).

Table 5: First Stage: Effect of the Partial Savings Indicator on Approved Loan Indicator

	(1)	(2)	(3)	(4)
Optimal bandwidth (0.183)				
Approved loan indicator	0.0600***	0.0617***	0.0613***	0.0605***
	(0.00908)	(0.00902)	(0.00908)	(0.00909)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		0.0955		
Observations		19,075		
R squared	0.024	0.039	0.025	0.025
Bandwidth (0.3)				
Approved loan indicator	0.0741***	0.0762***	0.0756***	0.0747***
	(0.00844)	(0.00840)	(0.00845)	(0.00846)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		0.0939		
Observations		19,504		
R squared	0.024	0.038	0.024	0.024
Bandwidth (0.15)				
Approved loan indicator	0.0506***	0.0521***	0.0518***	0.0510***
	(0.00945)	(0.00939)	(0.00946)	(0.00946)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		0.0966		
Observations		18,487		
R squared	0.026	0.041	0.026	0.026

Notes: Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1. The optimum range has an F-test above 40.

Table 6: First Stage: Effect of the Partial Savings Indicator on Amount of Loan Approved

	(1)	(2)	(3)	(4)
Optimal bandwidth (0.175)				
Amount of loan per capita	23.30***	24.20***	23.28***	23.03***
(BRL, 2022)	(5.098)	(5.077)	(5.102)	(5.103)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		27.80		
Observations		18,991		
R squared	0.019	0.030	0.019	0.019
Bandwidth (0.3)				
Amount of loan per capita	30.52***	31.68***	30.53***	30.23***
(BRL, 2022)	(4.735)	(4.720)	(4.741)	(4.743)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		27.30		
Observations		19,504		
R squared	0.018	0.029	0.018	0.018
Bandwidth (0.15)				
Amount of loan per capita	20.16***	21.05***	20.15***	19.91***
(BRL, 2022)	(5.229)	(5.205)	(5.231)	(5.233)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		28.10		
Observations		18,487		
R squared	0.020	0.031	0.020	0.020

Notes: Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1. The optimum range has an F-test above 20.

Table 7: Effect of Loan Uptake on Expenditure

	Reduced Form	Ineligible Mean	OLS	2SLS	
				FS: Approved Loan	FS: Amount of Loan per capita
	(1)	(2)	(3)	(4)	(5)
First Stage				0.06***	23.30***
				(0.009)	(5.098)
Panel A. Expenditure Category (Average t to t+4)					
Current Expenditure	0.0120	4007.32	-0.0252***	0.195	0.000466
	(0.00861)		(0.00686)	(0.144)	(0.000360)
Personnel Expenditure	-0.00686	2289.89	-0.0560***	-0.111	-0.000300
	(0.00825)		(0.00657)	(0.134)	(0.000352)
Mean Debt Interest	0.0829	$8.22*10^{-5}$	0.0457	0.952	0.00217
	(0.0839)		(0.0547)	(0.976)	(0.00237)
Other Expenditure	0.0349***	1713.13	0.0132	0.574***	0.00142***
	(0.0105)		(0.00839)	(0.192)	(0.000505)
Investment	0.122***	323.33	0.146***	1.989***	0.00497***
	(0.0174)		(0.0138)	(0.392)	(0.00117)
Panel B. Expenditure Function (Average t to t+4)					
General	-0.0102	628.43	-0.1000***	-0.165	-0.000427
	(0.0151)		(0.0120)	(0.244)	(0.000635)
Education	-0.0305***	1274.36	-0.0925***	-0.494***	-0.00122***
	(0.00849)		(0.00673)	(0.149)	(0.000444)
Health	0.0314***	1112.54	-0.00516	0.509***	0.00124***
	(0.00926)		(0.00738)	(0.168)	(0.000443)
Environmental	0.140***	41.10	0.235***	2.164***	0.00578**
	(0.0503)		(0.0384)	(0.840)	(0.00238)
Recreation	0.00199	75.12	0.0579***	0.0320	0.000110
	(0.0241)		(0.0192)	(0.388)	(0.000968)
Community	0.0782***	465.92	0.118***	1.271***	0.00320***
	(0.0184)		(0.0146)	(0.344)	(0.000968)
Observations	19,067				18,991

Notes: This table presents the average impact of access to loans on expenditure from year t to t+4. Columns (1) to (4) consider the optimal bandwidth for the *Anyloan* indicator (R: -0.183 to 0.183), and column (5) considers the optimal bandwidth for the *Amountofloan* variable (R: -0.175 to 0.175). All expenditure categories and functions are in BRL per capita, with prices from 2022. There are no fixed effects. An explanation of the results is provided in the text. Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Effect of Loan Uptake on Public Policy Outcomes

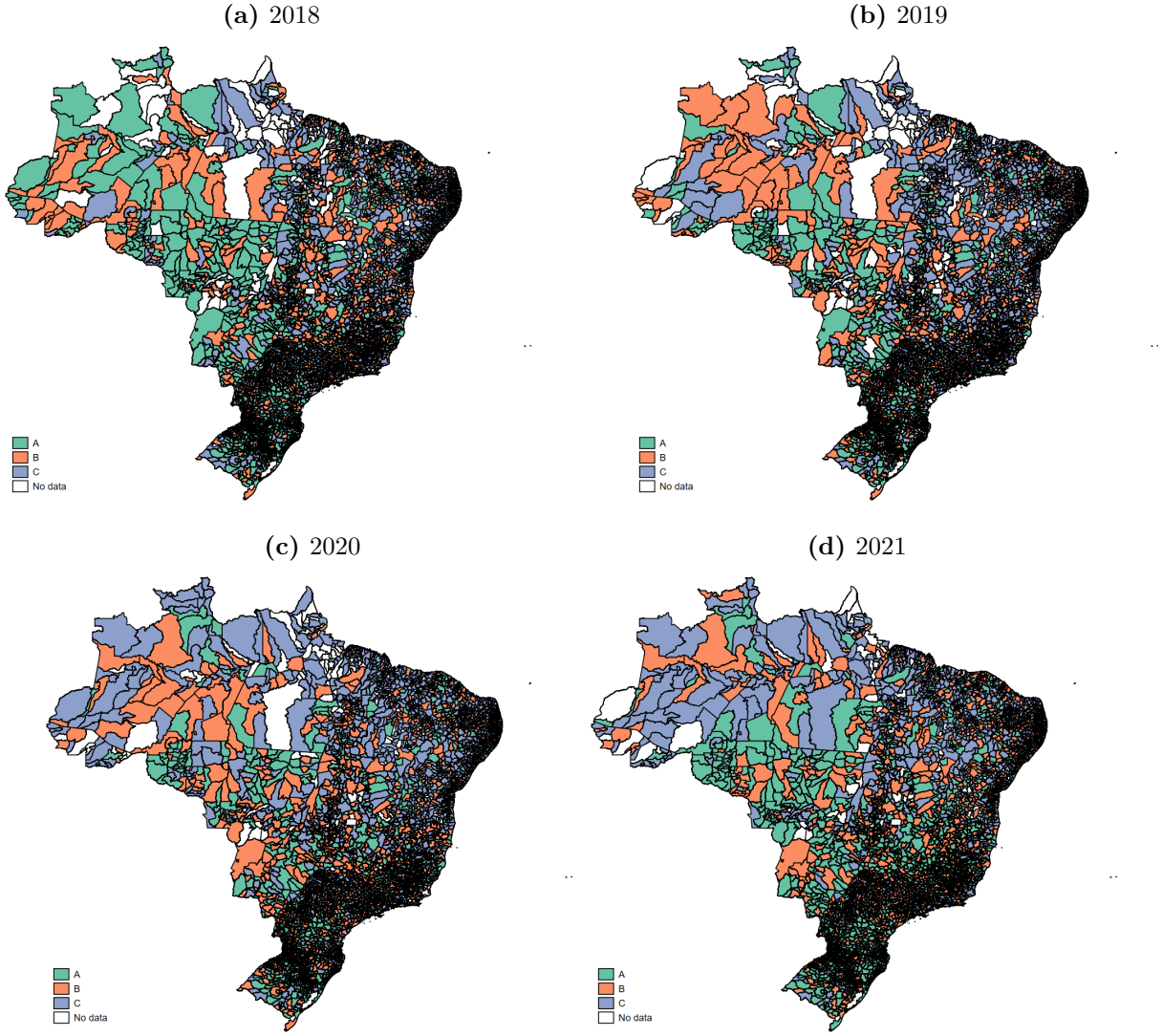
	Reduced Form	Ineligible Mean	OLS	2SLS	
				FS: Approved Loan	FS: Amount of Loan per capita
	(1)	(2)	(3)	(4)	(5)
First Stage				0.06***	23.30***
				(0.009)	(5.098)
Primary Health Care Unit	0.109***	8.86	0.336***	1.810***	0.00461***
	(0.0247)		(0.0195)	(0.463)	(0.00146)
7+ Prenatal Visit	0.0489**	73.23	0.218***	0.852*	0.00230*
	(0.0248)		(0.0198)	(0.444)	(0.00129)
Low Birth Weight	0.0247	8.31	0.0287	0.431	0.00113
	(0.0251)		(0.0200)	(0.442)	(0.00124)
Sewage Coverage (up to 2021)	0.118***	31.17	0.246***	2.083***	0.00511***
	(0.0269)		(0.0217)	(0.576)	(0.00170)
Bike Lane (2017 vs 2020)	0.0602*	0.05	0.122***	1.410*	0.00247
	(0.0324)		(0.0267)	(0.839)	(0.00158)
Traffic Deaths per 100K	-0.00386	22.37	-0.0110	-0.0639	-9.38e-05
	(0.0247)		(0.0197)	(0.409)	(0.00103)
Environmental impact (2017 vs 2020)	0.0416	-0.06	0.137***	0.981	0.00169
	(0.0318)		(0.0262)	(0.785)	(0.00146)
Observations			19,067		18,991

Notes: This table presents the average impact of loan access on public policy outcomes from year t to t+4 unless explicitly defined otherwise. Health indicators include the number of primary healthcare centers in the municipality, the proportion of live births in which mothers received seven or more prenatal visits, and the proportion of live births with low weight (under 2,500 grams or 5.51 pounds). Community outcomes encompass the population served by the sewage collection system (up to 2021), the change in the bike lane indicator between 2017 (pre-treatment) and 2020, and traffic deaths per 100,000 inhabitants. The environmental outcome refers to the change in the environmental impact indicator between 2017 and 2020. Columns (1) to (4) consider the optimal bandwidth for the approved loan indicator (R: -0.183 to 0.183), while column (5) considers the optimal bandwidth for the amount of loan per capita (R: -0.175 to 0.175). Public policy outcomes in columns (1), (3), (4), and (5) are quantified as standardized scores. No fixed effects are applied. Further explanation of the results can be found in the text. Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Appendix

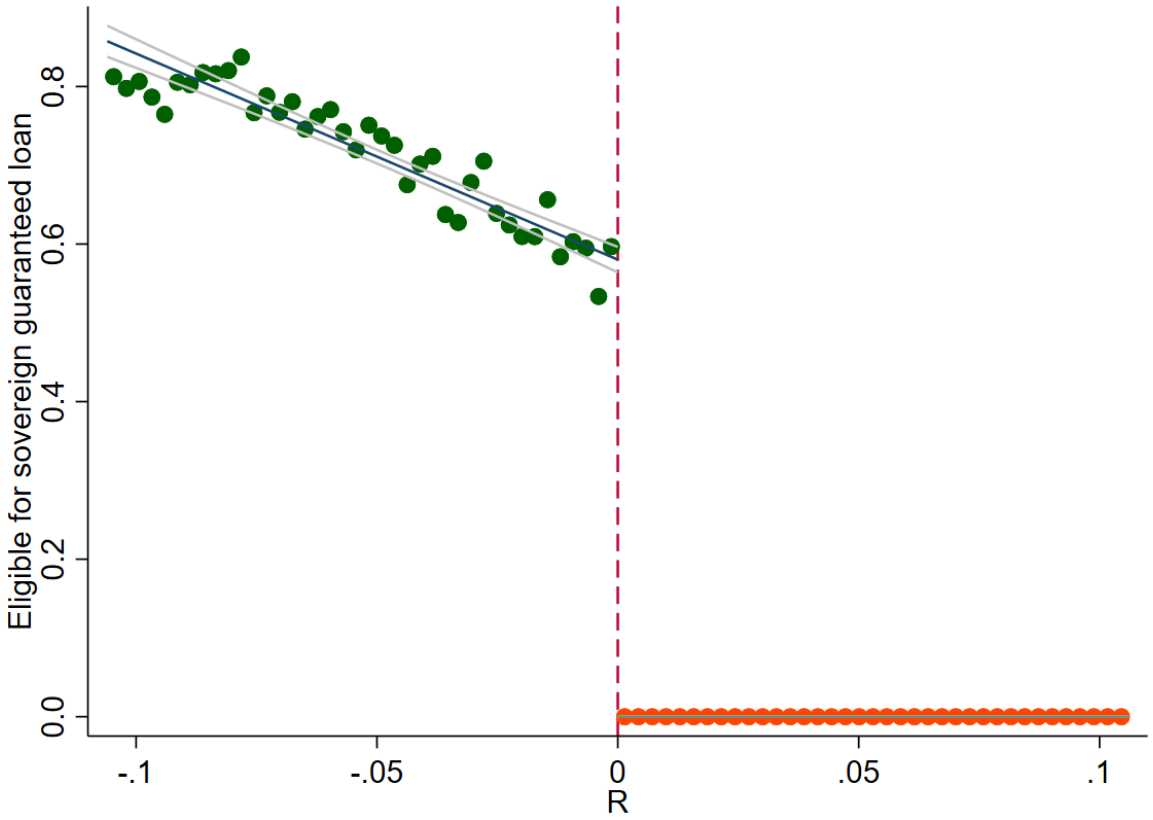
A Additional Figures and Tables

Figure A1: Savings Indicator Scores in Brazilian Municipalities (2018-2021)



Notes: Own elaboration based on CAPAG database for municipalities, reflecting partial ratings for the savings (PC) indicator.

Figure A2: Eligibility for Sovereign Guaranteed Loan Based on CAPAG Savings Indicator



Notes: This figure presents data from Brazilian municipalities from 2018 to 2022, illustrating the relationship between eligibility for sovereign guaranteed loans and the CAPAG Savings Indicator. The vertical axis represents the average eligibility indicator for federal government-guaranteed loans (CAPAG A or B), while the horizontal axis displays the savings indicator outcome with a 0.95 cutoff between partial rating B and C centered at 0 (variable R). When the indicator equals or exceeds 0.95, the partial score within the indicator shifts to C, resulting in a final CAPAG score of either C or D, rendering the municipality ineligible for sovereign guaranteed loans. Conversely, when the indicator falls below or equals 0.95, the partial score ranges from A to B, with the final CAPAG score varying between A and D, depending on the liquidity indicator. As the current savings indicator surpasses the 0.95 threshold, the probability of the municipality being eligible for a guaranteed loan sharply declines, plummeting from approximately 60% to zero.

Table A1: Requirements for Subnational Credit Operations and Sovereign Guarantee

Criteria	**Limits/Conditions**
General Requirements for Credit Operations	
Compliance with the Golden Rule	Previous and current fiscal years
Resource releases limit per fiscal year	Maximum 16% of Net Current Revenue (NCR)
Average debt service expenditure	Maximum 11.5% of NCR
Consolidated Net Debt Stock	States: Max. 200% of NCR, Municipalities: Max. 120% of NCR
Personnel expenditure limits	Maximum 60% of NCR (subject to additional intra-branch limits)
No outstanding debt with an state or the federal government (FG)	Required
Absence of irregular or prohibited operations	Mandatory
Adherence to obligations to the FG regarding loans, refinancing, and received guarantees	Mandatory
Compliance with the Single Registry of Grants (CAUC)	Mandatory
Compliance with refinancing agreements with the FG (if applicable)	States: Restructuring and Fiscal Adjustment Program (PAF), Municipalities: MP 2.185-35
Additional Conditions for Sovereign Guarantee	
Payment Capacity (CAPAG)	"A" or "B" (specific exceptions apply)
Operation financial cost	Maximum Acceptable Cost established by the Brazilian National Treasury
Past financial secured liabilities	Maximum 60% of NCR
Absence of FG honors and delays	Required
Sufficient counter-guarantees	Mandatory
Compliance with Public-Private Partnership limits	Mandatory
Minimum constitutional expenditure in health and education	Mandatory
Compliance with full tax competence	Mandatory
Contract drafts in accordance with Ministry of Finance's parameters	Mandatory

Table A2: Loan Request Status Classification

Classification	**Status in SADIPEM/PVL**
Approved	Deferido
	Deferido (PVL-IF)
	Deferido (decisão judicial)
	Encaminhado à PGFN com manifestação técnica favorável
	Encaminhado à PGFN (decisão judicial)
	Regular por decisão judicial
	Regularizado
Not Approved	Arquivado
	Arquivado a pedido
	Arquivado por decurso de prazo
	Arquivado por decurso de prazo (PVL-IF)
	Arquivado a pedido (PVL-IF)
	Arquivado pela STN
	Cancelado
	Devolvido
	Em consulta jurídica (garantia da União)
	Enviado à instituição financeira (PVL-IF)
	Em retificação pelo interessado
	Em retificação pelo credor (PVL-IF)
	Em retificação pelo interessado (PVL-IF)
	Em retificação pelo credor
	Em análise (PVL-IF)
	Em análise
	Em triagem
	Indeferido
	Indeferido (PVL-IF)
	Pendente de regularização
	PVL cancelado
	PVL pendente de distribuição
	Assinado pelo interessado (retificação)

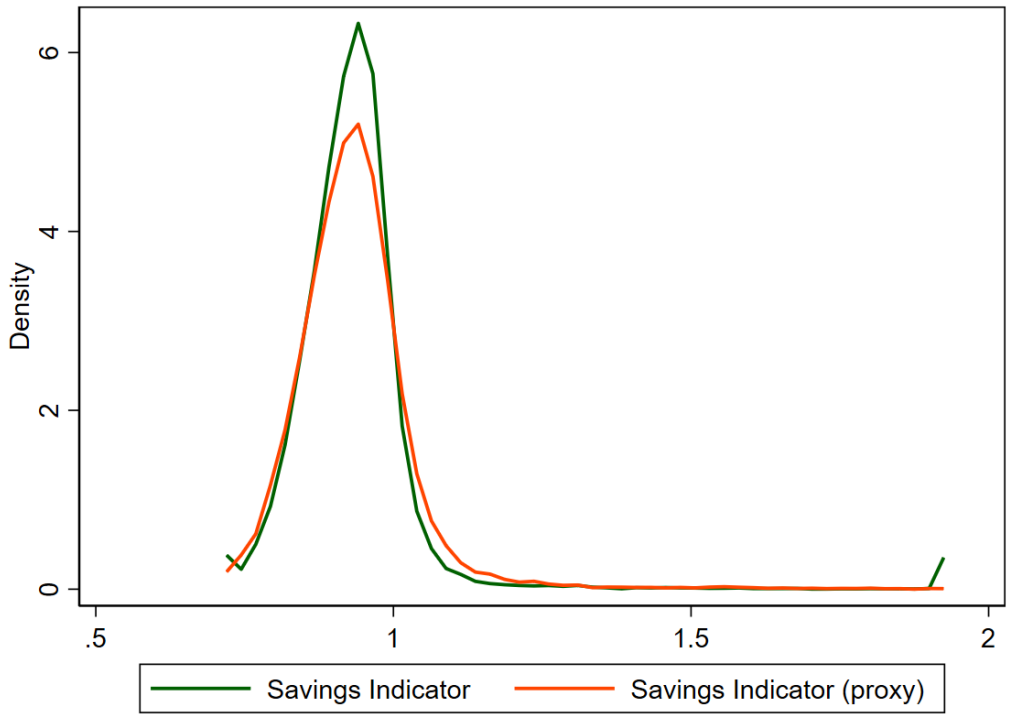
Table A3: Terminology of Expenditure Functions

Functional Classification (based on COFOG/OECD) (1)	**Original Expenditure Function (Brazil)** (2)
General public services	General administration (Administração)
Housing and community amenities	Housing (Habitação) Sanitation (Saneamento) Urban Planning (Urbanismo) Energy (Energia)
Health	Health (Saúde)
Education	Education (Educação)
Recreation, culture, and religion	Culture (Cultura) Sports and Recreation (Desporto e Lazer)
Environmental protection	Environmental protection (Gestão Ambiental)

Notes: This table summarizes the terminology used in this article to classify expenditure functions. The selection in column (2) includes the top 10 functions with the highest expenditure participation by municipalities in expenditure execution between 2018 and 2022 (see Figure 1), according to the classification used in Brazil, as defined by the Ministry of Finance Ordinance no. 42, 1999. The terminology adopted here does not intend to establish a perfect one-to-one correspondence between Brazil's expenditure functions and the Classification of the Functions of Government (COFOG) developed by the UN/OECD, in column (1), which would require an analysis of more granular data and detailed methodology (Clerck and Wickens, 2015). This framing connects the results to a broader audience.

B Robustness checks

Figure B1: Comparing Original and Proxy Savings Indicators (2018-2022)



Notes: The original indicator was extracted from the CAPAG database, whose historical series begins in 2018. For robustness testing involving previous years (2013-2017), a proxy for the savings indicator was created. The figure compares the original and proxy indicators for the years in which both are available (2018-2022). The proxy indicator was calculated by dividing current expenditure, extracted from SICONFI, by current revenue, also extracted from SICONFI, and adding the average error per municipality corresponding to the discrepancy between this ratio and the calculation made by the National Treasury for the CAPAG Savings Indicator.

Table B1: Alternative First Stage: Effect of the Savings Indicator (Proxy) on Approved Loan Indicator (2018-2022)

	(1)	(2)	(3)	(4)
Optimal bandwidth (0,183)				
Approved loan indicator	0.0853***	0.0936***	0.0873***	0.0848***
	(0.00580)	(0.00593)	(0.00585)	(0.00587)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		0.1169		
Observations		18,823		
R squared	0.011	0.027	0.012	0.012

Notes: Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1. The optimum range has an F-test above 200.

Table B2: Robustness Check: Savings Indicator (Proxy) on Approved Loan Indicator (2013-2017)

	(1)	(2)	(3)	(4)
Optimal bandwidth (0,081)				
Approved loan indicator	-0.000705	-0.000657	-0.000989	-0.00144
	(0.00784)	(0.00783)	(0.00784)	(0.00783)
Constant	Y	Y	Y	Y
Year FE	N	Y	N	N
Year and State FE	N	N	Y	N
Year and Region FE	N	N	N	Y
Ineligible mean		0.0672		
Observations		17,895		
R squared	0.005	0.008	0.006	0.008

Notes: Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1. The first stage does not show statistical significance.

Table B3: Robustness Check: Savings Indicator (Proxy) on Expenditure (2013-2017)

	Reduced Form	Ineligible Mean
	(1)	(2)
Panel A. Expenditure Category (Average t to t+4)		
Current Expenditure	-0.00148	3597.20
	(0.0106)	
Personnel Expenditure	-0.00381	2068.82
	(0.00999)	
Mean Debt Interest	-0.0668	$1.86*10^{-5}$
	(0.119)	
Other Expenditure	-0.00699	1524.33
	(0.0124)	
Investment	-0.0155	295.78
	(0.0211)	
Panel B. Expenditure Function (Average t to t+4)		
General	-0.00228	606.40
	(0.0169)	
Education	-0.00549	1203.04
	(0.0101)	
Health	-0.00215	941.00
	(0.0114)	
Environmental	0.0585	33.58
	(0.0649)	
Recreation	0.00200	83.88
	(0.0281)	
Community	0.0105	385.63
	(0.0231)	
Observations	17,895	

Notes: This table presents the average impact of loan access on expenditure from year t to t+4. Columns (1) and (2) consider the optimal bandwidth for the Approved Loan indicator (R:-0,081 to 0,081). All expenditure categories and functions are in BRL per capita, with prices from 2022. Column (1) is measured on a logarithmic scale. There are no fixed effects. Data for mean debt interest is available only from 2015. Standard errors are presented in parentheses. Statistical significance levels: *** p<0.01, ** p<0.05, * p<0.1. The regressions do not show statistical significance.