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Access to credit and quality of expenditure: evidence from Brazilian municipalities

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Resumo

The literature suggests that extra revenues received without counterpart by local governments in developing countries have little impact on the provision of public goods and services. Access to credit is considered a major obstacle to sustainable municipal development, but empirical evidence on the effectiveness of this instrument is scarce. In this paper, we evaluate the impact of loan operations on the quality of public expenditure, based on data from Brazilian municipalities between 2018 and 2021. We explore a discontinuity in the eligibility requirements for the Federal Government guarantee, which improves the financial conditions of the loan and makes it possible to contract a greater number of operations, and of greater value. Using a discontinuous regression design, it is found that loans have a positive impact on the quality of local expenditure, increasing investment while keeping personnel expenditure constant, and privileging health, urbanism, and sanitation functions.

Keywords: Fiscal Federalism; Subnational Public Finance; State Capacity; Social Expenditure; Municipal Development.

JEL: H71; H75; R51.

SUMMARY

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1. Introduction

Access to credit is a major obstacle to municipal development, especially in the case of developing countries. Local governments often face difficulties due to limited fiscal capacity, rigid transfers from the federal government, and legal restrictions to issue bonds and access international credit markets. Even if they could borrow or issue bonds without legal restrictions, many municipalities in poor and developing countries are unlikely to find lenders to finance them directly, at least at the low interest rates offered to federal governments. Moreover, according to the United Nations[1], the level of urbanization is expected to increase worldwide in the coming decades. Already under pressure, infrastructure and public services, such as road building, schools and hospitals, will need to be improved to serve growing populations at the local level.

The state or local government may not have sufficient resources to build the high-cost projects necessary for local development. But it can obtain these funds through a loan from a financial institution, with installments to be paid over several years. Since structuring projects will be enjoyed not only by present generations, but also by future generations, it is intrinsically efficient that their financing cost is spread over time. With public indebtedness, the government uses part of its current revenues and part of its future revenues to pay for a development project.

The Federal Government can offer a guarantee in credit operations of local governments, providing them access to loans and/or allowing more favorable conditions. Financing conditions are closely related to the credibility of the borrower, the perceived capacity to repay the debt, and the quality of fiscal management. Lenders set the interest rate according to the municipality's perceived risk of default. Furthermore, in order to approve a financial operation, they may require a guarantor, who will be responsible for the payment of the debt in case the borrower does not honor its payments. The effect of access to loans for the provision of public goods at the local level is difficult to measure because loans are not randomly distributed among municipalities. Rather, access to credit is correlated with other local characteristics that favor or hinder the allocation of expenditure and the provision of public services.

Brazil offers a unique setting to study the role of loans in expenditure allocation and municipal development. Recently, the National Treasury Secretariat implemented a uniform, simple and transparent criterion to evaluate requests from subnational governments to provide collateral for loan operations. The Capacity to Pay (CAPAG) is composed of three indicators: indebtedness, current savings, and liquidity ratio. Each subnational government receives a CAPAG score from A to D. As a general rule, only those classified with CAPAG A or B are eligible to contract credit operations guaranteed by the Federal Government. By definition, CAPAG has created idiosyncratic thresholds that divide municipalities - according to their financial indicators - into eligible and ineligible for sovereign guar-

1 United Nations World Urbanization Prospects (2018). Available at: https://population.un.org/wup/. Accessed on: 12/10/2022.

anteed loans. These thresholds provide a quasi-experimental source of variation that can be leveraged to assess the impacts of sovereign guarantees on policy outcomes at the municipal level.

This paper contributes to the literature of economic development, political economy, public finance, and applied microeconomics. In particular, it contributes to increasing knowledge about fiscal capacity-one of the three pillars of state capacity (Besley and Persson, 2009; 2014)-defined as the range of capabilities needed for a government to perform effectively. The literature on the consequences of increased government revenues in developing countries generally finds no or only a small positive impact of revenues on public policy outcomes, such as the use of these resources for higher quality expenditure in health, education, and infrastructure. Moreover, evidence abounds that public funds are often wasted or diverted (Svensson, 2000; Reinikka and Svensson, 2005; Olken, 2007; Monteiro and Ferraz, 2010; Brollo et al., 2013; Nunn and Qian, 2014). Recent studies suggest that how governments are funded matters for the outcome. For example, governments tend to use resources derived from increases in tax revenues on expenditure that benefits citizens, while increases in revenues from intergovernmental transfers or derived from natural resource exploitation are not necessarily applied in this way (Gadenne, 2017; Martinez, 2022). Although relevant, evidence on the effect of access to credit by governments on expenditure related to services and infrastructure provided to citizens is lacking.

Labor also has important implications for public policy. The role of municipalities in the Brazilian Federation is relevant, as they finance 20% and execute 23% of all primary expenditures (Siga Brasil, 2019)[2]. In particular, municipalities are responsible for funding and executing almost entirely urbanism expenditure and contribute approximately one-third of expenditure on health, education, and public transportation. Assessing whether the institutional framework for lending to local governments generates incentives for sound resource allocation and contributes to public policy objectives is key to ensuring sustainable development. Are these loans used to improve local infrastructure, education, and health? Or is there evidence that these loans are used to boost low-quality expenditures, such as personnel expenses? Besides Brazil, other countries with similar institutional structure and level of economic development may benefit from lessons learned from the Brazilian experience.

2. Institutional Context

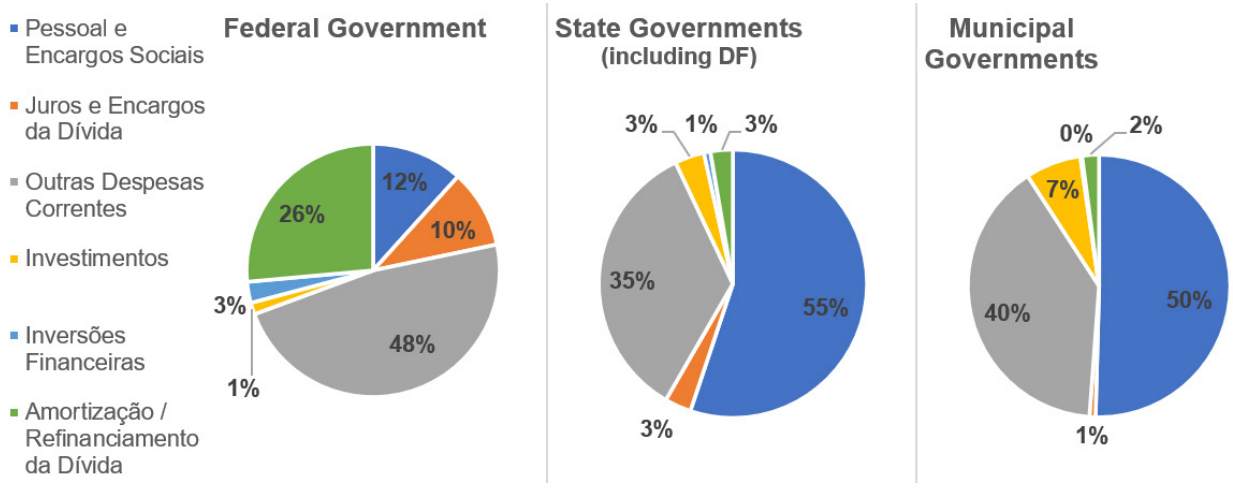
Brazil is a Federative Republic organized into three levels of government: Federal Government (represented by the Federal Government), 26 States and the Federal District, and 5,570 Municipalities. The Federal Constitution of 1988 established the competencies of the entities of the federation in administrative, political, fiscal, and financial aspects. Brazilian federalism is characterized by financial and budgetary autonomy of the three federated entities, being one of the most decentralized countries

2 SIGA Brazil is a federal public budget information system, which allows access to data from the Integrated System of Financial Administration-SIAFI and other databases on public plans and budgets. Available at: https://www12.senado.leg.br/orcamento/sigabrasil. Accessed on 09/15/2022.

in the world. The subnational governments have the competence to collect taxes, formulate the budget, and execute public expenditures. According to IMF data[3], Brazil occupied, among 79 countries, the ninth position of greatest fiscal decentralization, from the point of view of tax revenues, with 42% of total tax revenue collected by subnational entities in 2019. On the expenditure side, excluding expenditure on debt service, highly concentrated in the federal government, the subnational entities were responsible for the execution of 48% of expenditure in 2019, 26% by states and 22% by municipalities[4].

Federal Government, states and municipalities exhibit different expenditure patterns. The budget expenditure is classified according to the economic category[5] in current expenditure, composed of the expenditure groups "personnel and social charges", "interest and debt charges" and "other current expenses", and capital expenditure, divided into "investments", "financial investments" and "amortization and refinancing of the debt". A relevant portion of federal government expenditure goes to debt refinancing and interest (the two categories added up to 36% of the total in 2019) and to the other current expenditure category (48%), while investment expenditure accounts for only 1% of the total (Figure 1). In contrast, at least half of subnational governments' expenditure is directed to personnel and social charges (50% in the case of municipalities and 55% in the case of states) and current expenditure exceeds 90% of the total. States and municipalities make a more expressive contribution than the federal government in public investment (in 2019, approximately 65% of total public investment was executed by subnational governments).

Figure 1 - Expenditure execution by economic category at each level of government (2019)



3 MFI's Fiscal Decentralization Dataset (2022). Available at: https://data.imf.org/?sk=1C28EBFB-62B3-4B0C-AED-3-048EEEBB684F. Accessed on: 12/10/2022.

4 National Public Sector Balance Sheet - BPSN, National Treasury Secretariat (2019). Considers the total expenditure committed (except intra-budgetary), excluding special charges.

5 Manual of Accounting Applied to the Public Sector, National Treasury Secretariat (2021).

Pessoal e Encargos Sociais = Personnel and Social Security Charges

Juros e Encargos da Dívida = Interest and Debt Charges

Outras Despesas Correntes = Other Current Expenses

Investimentos = Investments

Inversões Financeiras = Financial Investments

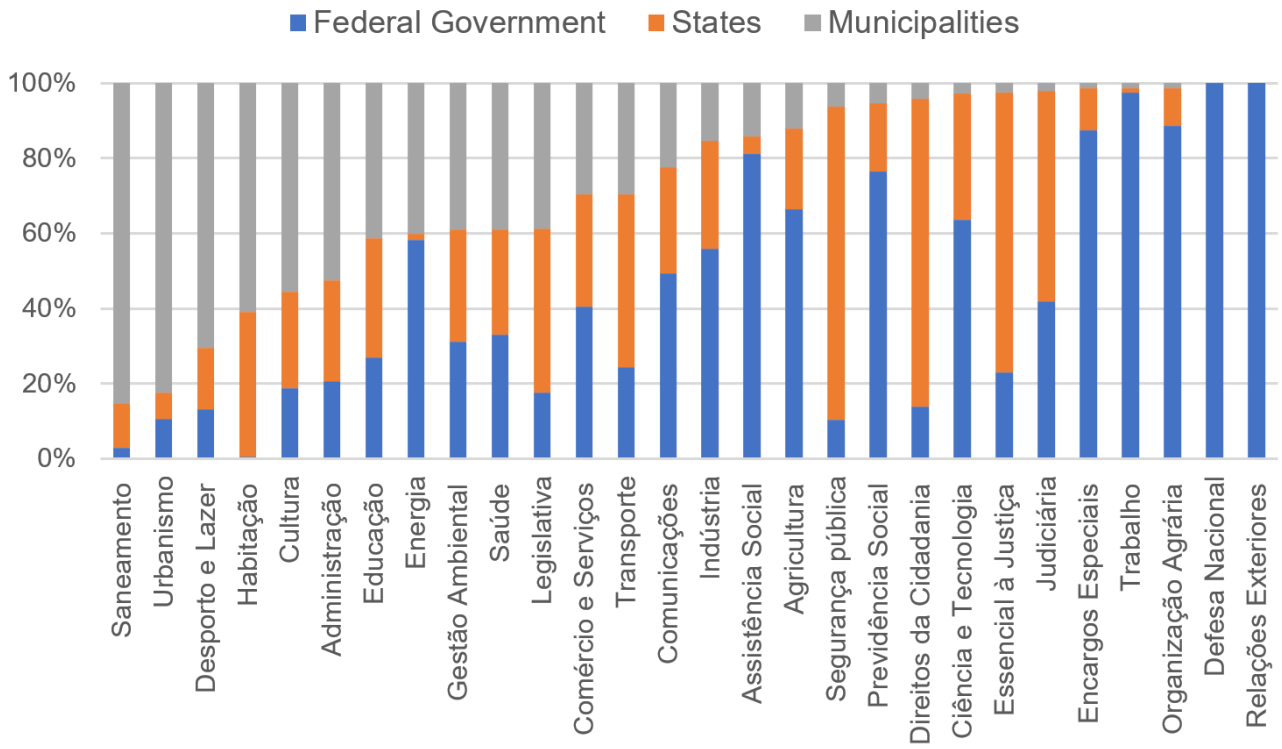
Amortização / Refinanciamento da Dívida = Debt Amortization / Refinancing

Source: BPSN, National Treasury (2019). Note: Considers the total budget expenditure committed.

The execution of the expenditure can also be analyzed from the functional perspective. Excluding the "special charges" category, which represents the payment of debts, compensations and indemnities, adding up to 39% of the total spent in 2019 due mainly to the cost of the federal public debt, the most relevant expenditure categories are social security (22%), education (9%), health (9%), administration (3%) and social assistance (3%)[6].

Subnational governments have an especially important role in the execution of social functions, that is, of policies with a direct and visible impact on the lives of citizens. If, on the one hand, the federal government finances and executes social expenditures for which there is a defined and well-focused target audience, such as the "labor", "social security", and "social assistance" functions, states and municipalities are largely responsible for universal access expenditures, such as "health", "education", "transportation", "urbanism", and "public security" (Figure 2).

Figure 2 - Execution of expenditure functions by level of government (2019)



6 Figure A1, in the appendix, brings the total expenditure by function considering the three levels of government (2019).

Figure 2 translation: Saneamento = Sanitation / Urbanismo = Urbanism / Desporto e Lazer = Sports and Leisure / Habitação = Housing / Cultura = Culture / Administração = Administration / Educação = Education / Energia = Energy / Gestão Ambiental = Health / Saúde = Environmental Management / Legislativa = Legislative / Comércio e Serviços = Trade and Services / Transporte = Transportation / Comunicações = Communications / Indústria = Industry / Assistência Social = Social Welfare / Agricultura = Agriculture / Segurança pública = Public Safety / Previdência Social = Social Security / Direitos da Cidadania = Citizenship Rights / Ciência e Tecnologia = Science and Technology / Essencial à Justiça = Essential to Justice / Judiciária = Judiciary / Encargos Especiais = Special Charges / Trabalho = Labor / Organização Agrária = Agrarian Organization / Defesa Nacional = National Defense / Relações Exteriores = Foreign Relations

Source: BPSN, National Treasury (2019). Note: Considers the total budget expenditure committed.

In Brazil, states and municipalities cannot issue debt bonds as the federal government does[7]. In order to invest in relevant projects that improve the quality of life of citizens, subnational governments can contract loans and financing from financial institutions, if necessary. These contracts are subject to compliance with a series of limits and conditions, which are verified by the federal government through a Request for Verification of Limits and Conditions (PVL). The analysis of the request is carried out by the National Treasury and the process is registered in SADIPEM - System for Analysis of Public Debt, Credit Operations and Guarantees of the Federal Government, States and Municipalities. The verifiable requirements include a debt limit as a proportion of revenues, compliance with the golden rule (credit operation revenues cannot be greater than capital expenditures, i.e. the government cannot take on debt to meet current expenditure), releases limited to 16% of Net Current Revenue (RCL) each year, no irregular operations, and compliance with the federal government[8]. The validity period of the verifications is from 90 to 270 days, depending on the municipality's situation, but if the fiscal year ends without contracting the credit operation, a new analysis is required. This mechanism encourages the contracting of operations in the same fiscal year in which they were approved.

The Federal Government can provide guarantees to the credit operations of subnational governments, that is, act as a guarantor with financial institutions, making the payment in case of default. This mechanism allows states and municipalities to access better contracting conditions, since operations guaranteed by the federal government have a lower credit risk. The contracting of operations guaranteed by the federal government depends on compliance with the requirements for credit operations in general and additional requirements. An essential factor for an entity to contract a new loan guaranteed by the Federal Government is the Payment Capacity (CAPAG). The CAPAG is a kind of rating, calculated annually by the National Treasury based on the previous year's financial results,

7 Federal Senate Resolution no. 43 of 12/21/2001.

8 See the complete list of limits and conditions for contracting credit operations in Table A1 of the Annex.

which assigns a grade from A to D according to the financial situation and the risk that a credit operation guaranteed by such entity represents to the Federal Government. States and municipalities with CAPAG A and B are eligible to obtain a guarantee from the Federal Government in credit operations, while those with C and D are not eligible[9]. Since 2018[10], the CAPAG is calculated based on three economic-financial indicators: Indebtedness (DC), Current Savings (CP) and Liquidity (IL). Each economic-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 from the combination of the partial ratings of the three indicators, as illustrated in Table 1.

Table 1 - Ability to Pay (CAPAG) classification methodology

Classificação da Capacidade de Pagamento (Portaria MF nº 501/2017)

INDICADOR	FAIXA	CLASSIFICAÇÃO PARCIAL
Endividamento (DC) (Dívida Consolidada / Receita Corrente Líquida)	DC < 60%	A
	60% ≤ DC < 150%	B
	DC ≥ 150%	C
Poupança Corrente (PC) (Despesa Corrente / Receita Corrente Ajustada)	PC < 90%	A
	90% ≤ PC < 95%	B
	PC ≥ 95%	C
Liquidez (IL) (Obrigações Financeiras / Disponibilidade de Caixa)	0 ≤ IL < 1	A
	IL ≥ 1 (ou valor negativo)	C

CLASSIFICAÇÃO PARCIAL			CAPAG FINAL
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
Demais combinações			C

Classificação da Capacidade de Pagamento (Portaria MF n. 501/2017)	Classification of the Payment Capacity (Ordinance Ministry of Finance #501/2017)
INDICADOR – FAIXA - CLASSIFICAÇÃO PARCIAL Endividamento (DC) (Dívida Consolidada/Receita Corrente líquida) Poupança Corrente (PC) (Despesa Corrente / Receita Corrente Ajustada) Liquidez (IL) Obrigações Financeiras / Disponibilidade do Caixa) IL ≥ 1 (ou valor negativo) CLASSIFICAÇÃO PARCIAL DC – PC – IL -CAPAG FINAL Demais combinações	INDICATOR – RANGE - PARTIAL RATING Indebtedness (DC) (Consolidated Debt / Net Current Revenue) Current Savings (PC) (Current Expenditure / Adjusted Current Revenue) Liquidity (IL) (Financial Obligations / Cash Availability) IL ≥ 1 (or negative value) PARTIAL RATING DC – PC – IL - FINAL CAPAG Other combinations

Source: MF Ordinance No. 501, of November 23, 2017. Note: MF Ordinance No. 5,623 of June 22, 2022, changed the cut-off value for the Indebtedness indicator between grades B and C to 100% and the cut-off value for the Current Savings indicator between grades A and B to 85%.

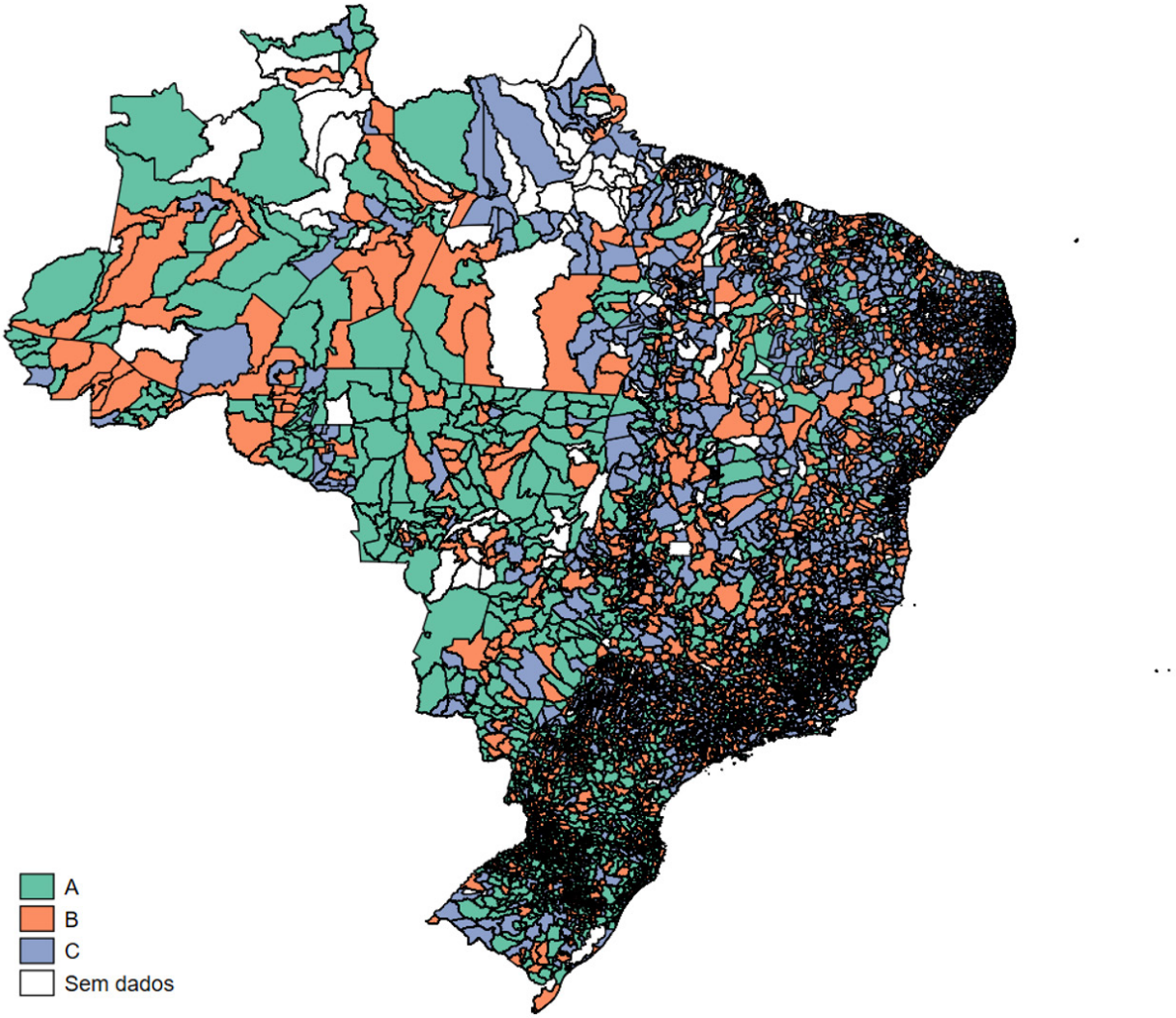
9 The exception are credit operations to finance investment projects for debt refinancing, improvement of revenue administration and fiscal, financial and asset management, or in the scope of the National Program for Efficient Public Lighting (RELUZ), 2014 FIFA World Cup and 2016 Olympic and Paralympic Games, eligible for the Federal Government guarantee even with CAPAG C or D.

10 Methodology given by the Ministry of Finance (MF) Ordinance No. 501, dated November 23, 2017, concepts and variables defined in the National Treasury Secretariat (STN) Ordinance No. 882, dated December 18, 2018, and subsequently in STN Ordinance No. 373, dated July 8, 2020.

Assessments of the ability to pay are made based on the analyses of the previous year's fiscal results and are valid, in the case of municipalities, until April of the following year. Specifically, the municipalities' CAPAG 2021, for example, was calculated based on the annual financial results of 2020 and is valid until April 2022, when the CAPAG 2022, based on the financial results of 2021, becomes valid.

There is great heterogeneity in the financial capacity of subnational governments, as captured by the CAPAG indicators, which results in variation in eligibility for sovereign guaranteed credit operations. Considering municipalities, Figure 3 shows the variation in the CAPAG partial rating resulting from the current savings indicator, calculated by the ratio of expenditure to current revenue. Figure 2B in the appendix visually illustrates the evolution of this indicator between 2018 and 2021 in Brazilian municipalities.

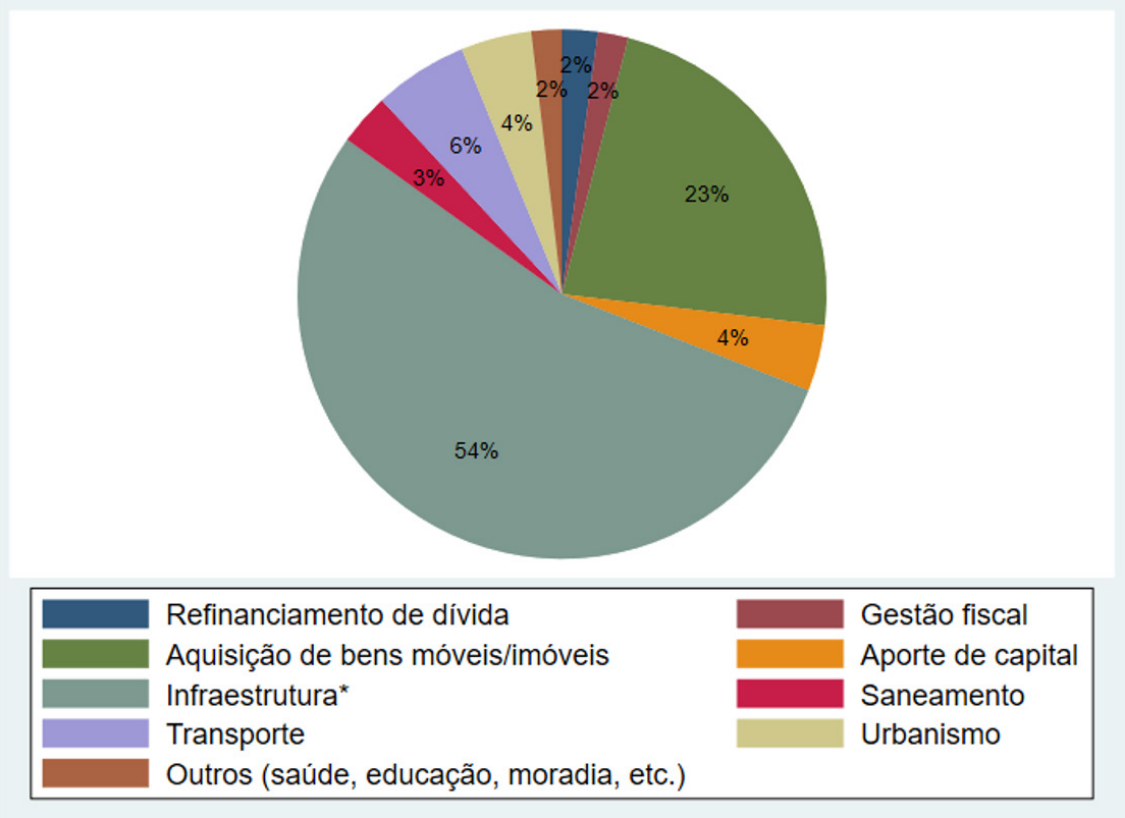
Figure 3 - Partial CAPAG score of the PC indicator in Brazilian municipalities (2018)



Source: Own preparation based on data from the Municipalities Payment Capacity, National Treasury.

From 2018 to 2021, 4,520 credit operations were approved for Brazilian municipalities, totaling approximately R$ 54 billion (at 2021 prices). Most of these operations (54%) have as their purpose registered in the PVL/SADIPEM the broad category "infrastructure", which encompasses, in a generic way, the implementation and execution of works for the construction and maintenance of roads, schools, hospitals, sanitation services, transportation, energy and telecommunications, among others. The second largest category (acquisition of furniture and real estate) refers mainly to the acquisition of machinery, equipment and vehicles (19.4%) or the acquisition of land, real estate and/or construction of facilities (3.4%), and may be linked to the provision of public services in several areas. A small part of the operations appear explicitly linked to specific expenditure functions, such as transportation (6%), urban planning (4%), and sanitation (3%). Capital contribution, including the provision of guarantees to state-owned companies, was the stated purpose in 4% of the credit operations. Operations with the purpose of improving fiscal management or aimed at the refinancing and/or regularization of debts - categories excepted from the requirement of CAPAG A or B for eligibility to the Federal Government's guarantee - corresponded, each one, to 2% of the total of operations approved in the period. Besides the declared purpose of the credit operations, it is important to evaluate if the resources are in fact being applied in structuring investments, promoting an improvement in the quality of the expenditure. As seen in the literature section, simply increasing resources does not guarantee an improvement in the quality of expenditure at the local level, especially in the case of developing countries.

Figure 4 - Purpose of approved municipal operations (2018 to 2021)



Source: Own elaboration from PVL/SADIPEM database. Details of the aggregation are described in Annex

Table A2. *Note: The purpose "Infrastructure" is a broad category that can be related to various expenditure functions, such as urbanism, sanitation, transport, education, health, etc.

Figure 4 translation:

Debt refinancing	Fiscal Management
Acquisition of property / real estate	Capital contribution
Infrastructure	Sanitation
Transportation	Urban planning
Others (health, education, housing, etc.)	

3. Methodology and Data

This paper aims to study the impact of access to credit on the quality of expenditure at the local level. We will use data from Brazilian municipalities that, as detailed in the institutional context section, have relevant responsibilities in the provision of public goods and services and contribute a significant share of national public investment. In particular, we intend to examine whether borrowing and financing by Brazilian municipalities has a positive impact on investment or, on the other hand, increases the amount allocated to current expenditure - particularly the category personnel expenditure, which accounts for 50% of the total expenditure of Brazilian municipalities. In addition, we seek to evaluate which functions are prioritized, in practice, in the execution of loan resources, regardless of the declared purpose at the time of borrowing.

The empirical challenge of studying the effect of borrowing on expenditure outcomes at the local level is that the decision and/or ability of the municipality to contract credit operations is correlated with other characteristics that influence expenditure and the provision of public services. For example, a capable municipal government that is interested in improving the quality of expenditure can conduct a fiscal management that decreases personnel expenditure and increases investment while acting to borrow. Or, if the municipal government is eager to improve public health services, it can prioritize expenditure on this function and, at the same time, contract a loan for the acquisition of new beds or the construction of a hospital. In other words, there may be unobserved factors that influence both the treatment (borrowing) and the outcome we want to measure (local expenditure), which would make the estimates obtained by ordinary least squares (OLS) regressions biased[11].

One strategy to overcome this problem is to make use of an instrument that is strongly 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, creates arbitrary limits that allow the use of a fuzzy

11 The MQO model in question is given by $Y_{it} = \alpha Empréstimo_{it} + h(r_{it}) + \epsilon_{it}$ where Y_{it} is a local expenditure outcome (category or function) in municipality i year t, $Empréstimo_{it}$ is a dummy indicating approved loan, and $h(r_{it})$ is a function of the PC indicator similar to that given in equations (1) and (2).

("fuzzy") discontinuous regression design[12] (RDD) to determine the causal effect between borrowing and municipal expenditure.

Although the CAPAG is composed of three partial indicators, only the outcome of the current savings and liquidity indicators influence eligibility for the Federal Government guarantee, 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 guarantee on credit operations drops from about 60% to zero (Figure A3). If, on the one hand, municipal managers have relative control over the execution of expenditures (numerator), revenues are subject to positive and negative shocks (denominator) that influence the result[13]. Municipalities with discrepant results for the PC indicator, calculated from the ratio between expenditures and current revenues of the previous year, are probably not comparable. The main hypothesis is that, in a neighborhood of the 0.95 threshold in the PC indicator, the assignment of municipalities on either side is as good as random. From this hypothesis, it is possible to estimate a local average treatment effect comparing observations near each side of the threshold from the two-stage least squares (MQ2E) method. The design assumes that in the absence of the rule assigning eligibility to collateral in credit operations, some of those who undergo the treatment (borrowing) would not have done so. The higher eligibility acts as a "push" for borrowing. Moreover, the neighborhood of 0.95 of the PC indicator is especially interesting, since it identifies municipalities that face strong resource constraints to undertake structuring investments and are therefore prone to borrowing.

The empirical MQ2E strategy consists of two stages: (i) assess whether there is indeed a discontinuity in borrowing at the 0.95 threshold of the PC indicator; (ii) assess whether this discontinuity is reflected in municipal expenditure variables. The first causal relationship of interest is the effect of being eligible for the Federal Government guarantee (CAPAG A or B) on actual borrowing, measured as a dummy variable ($Empréstimo_{it}$) that indicates approval of at least one loan operation for municipality i in year t by the National Treasury. This effect is identified from the following specification (first stage):

$$Empréstimo_{it} = \gamma Z_{it} + h(r_{it}) + \varepsilon_{it} \qquad (1)$$

Where γ identifies the causal effect of interest, $Z_{it} = I(r_{it} > 0)$ is an indicator equal to 1 if municipality i's PC indicator in year t is below 0.95 (centered at zero) and 0 otherwise, $h(r_{it})$ is a function of the PC indicator centered on zero - a continuous variable denoting treatment eligibility (running variable) - and ε_{it} the error. Specifically, we estimate local linear regressions of r_{it} with triangular kernel

12 For an introduction to discontinuous regression designs, see Cattaneo and Titiunik (2018).

13 Most municipalities are extremely dependent on current transfers from the States and the Federal Government, over which they have little decision-making power and are subject to economic and institutional shocks. Besides transfers, municipal current revenues include, among others, tax revenues, property contributions, industrial, agricultural, and services.

weights using observations to the left and right of the cutoff within a predetermined interval. The same equation (1) is estimated for a dependent variable indicating the amount in Brazilian Reais per capita of loan approved for municipality i and year t ($Valor\_pc_{it}$)[14].

For the second stage, we instrumented the variables $Empréstimo_{it}$ e $Valor\_pc_{it}$ using a dummy L_{it} that indicates the treatment and we check the effect on different categories and functions of local expenditure Y_{it} as in the model below:

$$Y_{it} = \pi L_{it} + g(r_{it}) + \eta_{it} \qquad (2)$$

Where $g(r_{it})$ is a linear function of the indicator PC with different slope on either side of the cutoff value. A fuzzy RDD explores discontinuities in the probability or expected value of a treatment conditional on a variable and is an empirical design in which the discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke, 2009). Because in discontinuous regressions the results can be sensitive to the choice of h-interval, the first-stage results are presented for two fixed intervals around the threshold value and for the optimal interval[15] (Cattaneo and Vazquez-Bare, 2016). For conciseness, the second-stage results are reported for the optimal interval but are robust to variations in the interval.

Public data at the municipal level of annual frequency (2018 to 2021) are used. All values have been corrected for inflation to 2021 prices and converted to Brazilian reals where necessary. Primary sources are listed below:

- PVL/SADIPEM database for information regarding the approval of loan operations (operation, status, date, amount and purpose)[16]. Operations were considered approved when the status deferred, regularized, regularized or forwarded to the PGFN was registered. Loan operations approved in the months of January to March were classified as approved in the previous year, following the CAPAG calculation and review system. Table A3 in the annex details the classification of operations[17].

14 The amount of loan approved in Brazilian Reais per capita (at 2021 prices) cannot be interpreted as the "intensive" margin of access to credit because the estimation also considers those observations that do not register an approved loan in the year (in this case the value of the variable $Valor\_pc_{it}$ will be zero). Restricting the sample to consider only observations with an indicator $Empréstimo_{it}$ equal to 1 undermines the power of the estimates, by drastically reducing the number of observations.

15 The optimal intervals method, developed by Imbens and Kalyanaraman (2012), seeks to minimize the minimum square error of the RDD estimator given the choice of polynomial order and kernel function, optimizing the trade-off between bias and variance. It was implemented in Stata from the rdbwselect function (Calonico, Cattaneo, and Titiunik, 2014).

16 We chose to use the Limits and Conditions Verification Request (PVL) database instead of SADIPEM's Cadastro da Dívida Pública (CDP) database because of the greater adherence of the instrument. Robustness tests confirm the results when using the CDP database. Spot adjustments were made to the database when it was identified that the debt signature date was prior to the date registered with the last status in the PVL.

17 The classification of approved operations follows the rules in the National Treasury's Manual for the Instruction of Claims (MIP). Available at: https://www.tesourotransparente.gov.br/publicacoes/manual-para-instrucao-de-pleitos-mip/2022/26-4. Access on 10/15/2022.

- Municipal finance data (revenues and expenses) from the Annual Accounts Statement, available on SICONFI/FINBRA.
- Payment Capacity data (partial and final scores and value of the indicators), made available by the National Treasury.
- Municipal characteristics, such as population and GDP, from the Brazilian Institute of Geography and Statistics (IBGE).

Table 2 shows a descriptive section of the complete database, which contains 22,276 observations (N). The municipalities have an average of 37 thousand inhabitants in the period under analysis, presenting great variation (minimum of 812 inhabitants and maximum of 12.3 million inhabitants). The municipal GDP also presents great heterogeneity, ranging from R$ 17 million to R$ 879 billion (at 2021 prices). In order to be comparable, expenditure data by category and function will be presented in per capita terms. In line with the discussion in previous sections, the set of municipalities is highly 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 7.8%. On the other hand, 90% of the average total expenditure refers to current expenditure, while investment stands at 8%. As for the variables related to loans, it is noted that most of the loans requested are in fact approved, being requested in 14.9% of the city-year observations and approved in 14.2%, which indicates an anticipation effect of the PVL analysis that influences the decision to request a loan. The statistics for the partial indicators of CAPAG are strongly influenced by extreme values (outliers), which will be treated as described below. On average, 30% of the observations have CAPAG A or B, being eligible for loans with Federal Government guarantee.

Table 2 - Descriptive analysis of the database (untreated)

Variables	(1) N	(2) Average	(3) Standard Deviation
Population	22.016	37.121	217.150
Municipal GDP (R$ 2021)	11.138*	1,46 billion	13,9 bi
Tax Revenue / Current Rec	21.842	0,078	0,072
Current Transfers / Current Rec	21.854	0,870	0,104
Current Expenditure / Total Expenditure	21.879	0,903	0,055
Investment / Total Expenditure	21.838	0,083	0,055
Approved Loan Indicator	22.276	0,142	0,349

Denied Loan Indicator	22.276	0,015	0,122
Loan Requested Indicator	22.276	0,149	0,356
Indebtedness Indicator (DC)	19.967	0,194	0,978
Current Savings Indicator (CP)	21.103	359 bi	131 tri
Liquidity Indicator (IL)	16.980	24.400	2 mi
Eligibility Indicator / CAPAG A or B	22.276	0.317	0,465
Current Revenue per capita (R$ 2021)	21.669	4,754	2.419
Current Expenditure per capita (R$ 2021)	21.678	4,348	2.006

Note: Data from Brazilian municipalities from 2018 to 2021. *The Municipal GDP is released with a two-year lag by IBGE. At the time of this study, the GDP for 2020 had not yet been released; therefore, the variable Municipal GDP includes the results for 2018 and 2019.

The interval selection process for the RDD occurred as follows: (i) observations whose final CAPAG score was not calculated were excluded (the absence of computation of a final CAPAG score indicates low reliability of the fiscal results reported by the municipality)[18]; (ii) the ten observations whose reported CP indicator is a value above 1000 were excluded (indicates low reliability of the fiscal results reported by the municipality and hinders the optimal interval selection); (iii) the optimal interval is selected. In the case of the indicator variable of approved loan, the optimal interval is 0.181, that is, observations whose CP indicator is between 0.769 and 1.131 make up the RDD neighborhood. Table 3 shows the descriptive analysis of the data from the optimal interval. There is no significant variation with the full database. At the margin, the subset of the optimal interval is, on average, wealthier and more populous, less dependent on transfers, and borrows more. The average PC indicator in the optimal range is 0.927.

Table 3 - Descriptive analysis of the data (optimal range)

Variables	**(1)** **N**	**(2)** **Average**	**(3)** **Standard Deviation**
Population	14.885	45.095	262.149
Municipal GDP (R$ 2021)	6.549*	2,06 billion	18 bi
Tax Revenue / Current Rec	14.710	0,087	0,077

18 Keeping the range fixed, the results do not change substantially if observations without a CAPAG final score and with extreme values for the current savings indicator are not excluded.

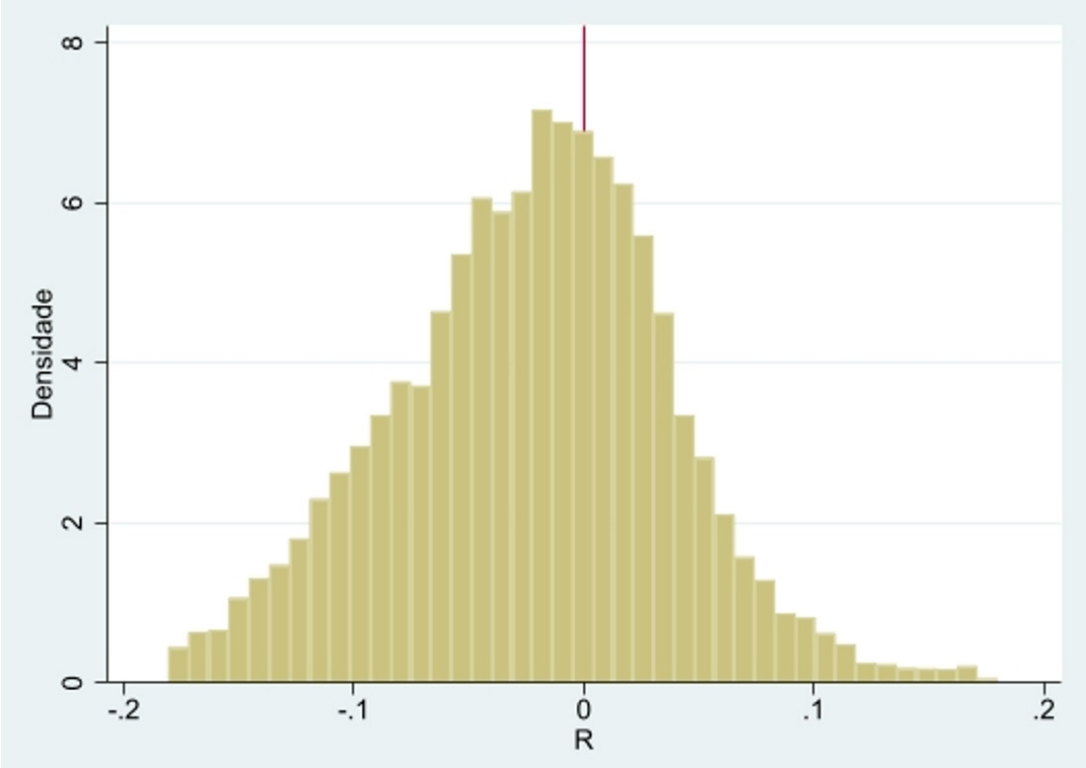
Current Transfers / Current Rec	14.711	0,857	0,110
Current Expenditure / Total Expenditure	14.720	0,900	0,052
Investment / Total Expenditure	14.712	0,085	0,053
Approved Loan Indicator	14.885	0,181	0,385
Denied Loan Indicator	14.885	0,019	0,138
Loan Requested Indicator	14.885	0,189	0,392
Indebtedness Indicator (DC)	14.885	0,192	1,044
Current Savings Indicator (CP)	14.885	0,927	0,060
Liquidity Indicator (IL)	14.885	27.768	2,2 mi
Eligibility Indicator / CAPAG A or B	14.885	0,460	0,498
Current Revenue per capita (R$ 2021)	14.719	4.829	2.290
Current Expenditure per capita (R$ 2021)	14.720	4.389	1.913

Note: Data from Brazilian municipalities from 2018 to 2021, considering the optimal range for the PC indicator (values between 0.769 and 1.131). *The Municipal GDP is released with a two-year lag by IBGE. At the time of this study, the GDP for 2020 had not yet been released; therefore, the Municipal GDP variable includes the results for 2018 and 2019.

For RDD to have validity and causal interpretation, it is essential that agents cannot manipulate the value of the control variable, in this case the current savings indicator score. The cut-off value should not be set at a particular point so as to include or exclude specific individuals. Likewise, stakeholders should not tamper with its value in order to be included or excluded from the treatment. Figures 5 and 6 show, respectively, the histogram at the optimal range, and a density manipulation test as proposed by Cattaneo, Jansson, and Ma (2018)[19]. Both show no evidence of manipulation of the PC indicator, which would be reflected in discontinuity in density, with bunching (bunching) of observations just below the cutoff value.

19 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, Jansson, and Ma (2018) developed manipulation tests based on a new local polynomial density estimator, which do not require interval preselection, and have greater power than McCrary's (2008) test.

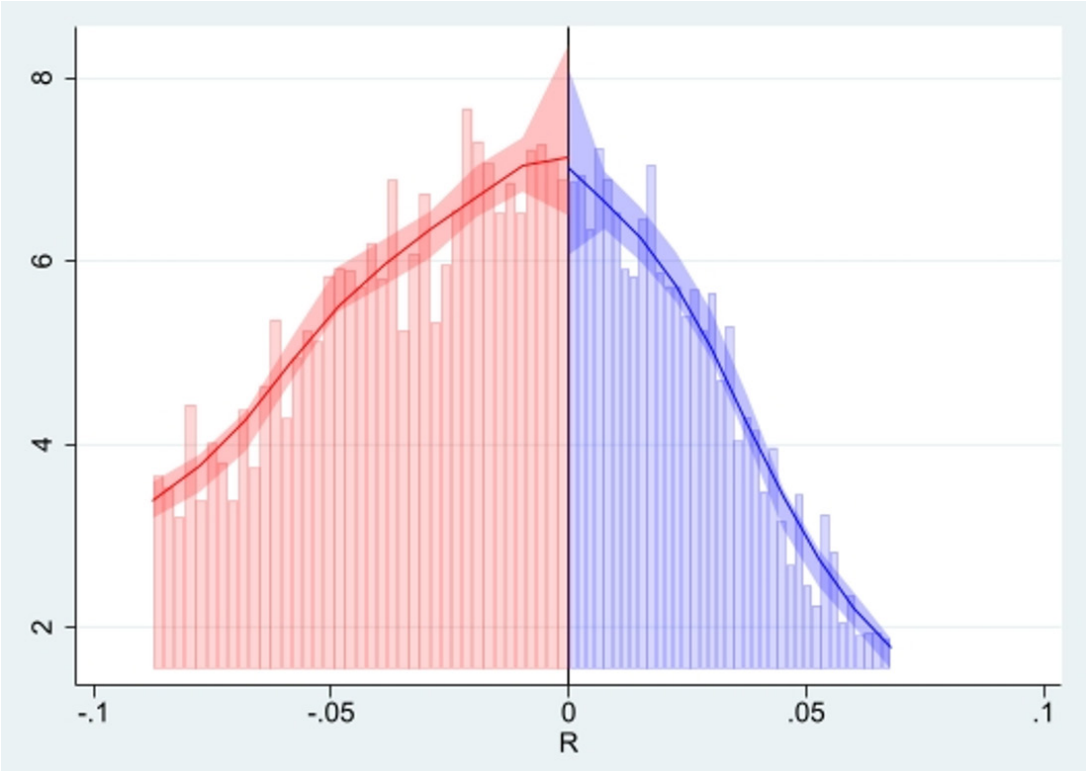
Figure 5 - Histogram of the indicator PC (optimal range)



Densidade = Density

Note: Data from Brazilian municipalities from 2018 to 2021. The horizontal axis refers to the result of the PC indicator with the cut-off score between B and C (0.95) centered on 0 - variable R. The vertical axis registers the density for the R value intervals, considering the optimal interval (between -0.181 and 0.181).

Figure 6 - Density manipulation test (optimal range)



Note: Data from Brazilian municipalities from 2018 to 2021. The test was implemented from the rdddensity command using Stata software (Cattaneo, Jansson and Ma, 2018) considering the optimal range (R between -0.181 and 0.181). The horizontal axis refers to the result of the PC indicator with the cut-off score between B and C (0.95) centered on 0 - variable R.

4. Results

Tables 4 and 5 present the result for the first stage, which measures the effect of obtaining a PC indicator below 0.95 on access to credit (approved loan and per capita amount in Brazilian Reais) within a given range. We use the interval margins as 0.15 (PC indicator above 0.8 and below 1.1), 0.30 (PC indicator above 0.65 and below 1.25) and 0.181 (PC indicator above 0.769 and below 1.131) - the latter representing the optimal interval[20]. Column (1) indicates that, relative to the average probability of borrowing for units above the threshold value (10%), the estimated local effect is an increase of 5.8 pp. i.e., an increase of 58%. In the case of the per capita loan amount, relative to the average approved per capita loan amount for units above the threshold amount ($24.86), the estimated local effect is an increase of $22.46 per capita, i.e., a 90% increment. The introduction of fixed effects in columns (2), (3) and (4), respectively of year, year groups and state, and year groups and region, does not substantially change the result, but may reinforce it in part of the cases. Figure 7 visually illustrates, in the optimal range, the increment in the probability of an approved loan at the cutoff between observations with a PC indicator above and below 0.95. Figure 8 is analogous for the amount of loan approved per capita in Brazilian Reais (2021 prices).

Table 4 - First stage: effect of indicator PC on approved loan

	(1)	(2)	(3)	(4)
Optimum range (0.181)				
γ_it	0,059***	0,062***	0,060***	0,058***
	(0,01)	(0,01)	(0,01)	(0,01)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	0,13***	0,116***	0,145***	0,126***
	(0,01)	(0,01)	(0,01)	(0,01)
Remarks	14.885	14.885	14.885	14.885
R Square	0,030	0,047	0,031	0,030

20 The optimal range for the regressions with the loan amount variable ($Valor\_pc_{it}$) is 0.184, that is, PC indicator above 0.766 and below 1.134.

	(1)	(2)	(3)	(4)
Range (0,3)				
γ_it	0,074***	0,077***	0,075***	0,073***
	(0,0095)	(0,0095)	(0,0096)	(0,0096)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	0,13***	0,12***	0,25***	0,09*
	(0,01)	(0,01)	(0,05)	(0,05)
Remarks	15.169	15.169	15.169	15.169
R Square	0,029	0,045	0,030	0,029
Interval (0,15)				
γ_it	0,049***	0,052***	0,051***	0,049***
	(0,01)	(0,01)	(0,01)	(0,01)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	0,13***	0,12***	0,25***	0,09*
	(0,01)	(0,01)	(0,05)	(0,05)
Remarks	14.520	14.520	14.520	14.520
R Square	0,031	0,048	0,032	0,031

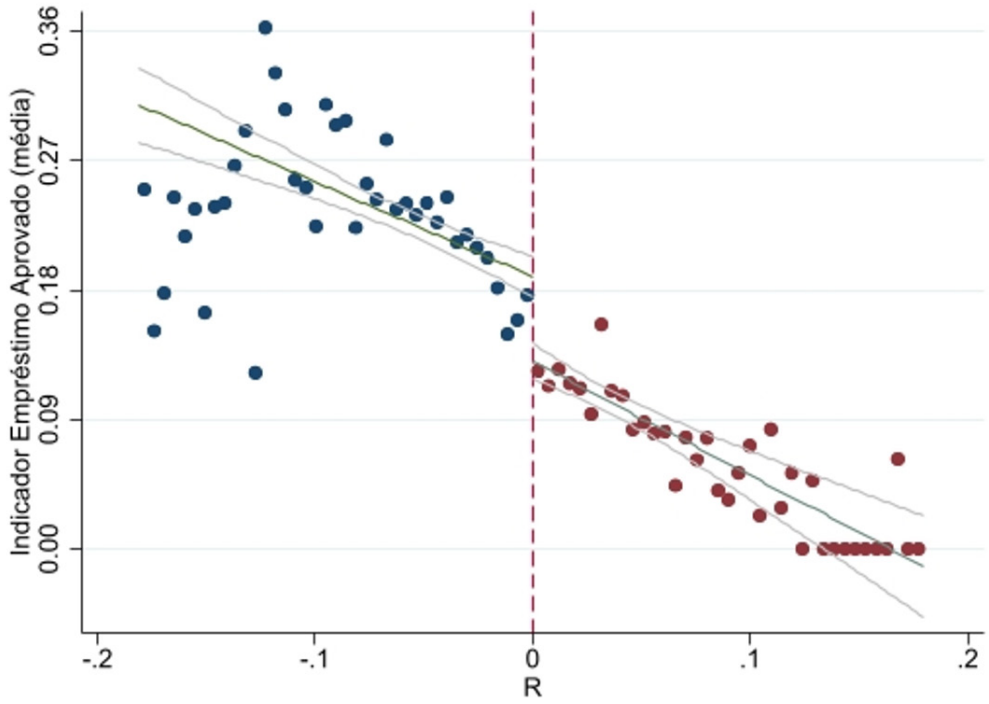
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Optimal range has F-test above 30. Data from Brazilian municipalities from 2018 to 2021.

Table 5 - First stage: effect of the PC indicator on the per capita amount

	(1)	(2)	(3)	(4)
Optimum range (0.184)				
γ_it	22,46***	23,65***	22,70***	22,31***
	(5,04)	(5,01)	(5,05)	(5,05)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	34,86***	21,33***	53,81**	23,90
	(3,86)	(4,96)	(23,72)	(24,17)
Remarks	14.896	14.896	14.896	14.896
R Square	0,03	0,04	0,03	0,03
Range (0,3)				
γ_it	28,24***	29,81***	28,52***	28,10***
	(4,71)	(4,69)	(4,72)	(4,73)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	33,21***	20,55***	54,09**	24,50
	(3,56)	(4,72)	(23,50)	(23,93)
Remarks	15.169	15.169	15.169	15.169
R Square	0,02	0,04	0,02	0,02
Interval (0,15)				
γ_it	18,95***	20,03***	19,13***	18,75***
	(5,20)	(5,17)	(5,21)	(5,21)
Fixed effect Year	N	S	N	N
Fixed effect Year and UF	N	N	S	N
Fixed effect Year and Region	N	N	N	S
Constant	35,36***	21,27***	50,64**	20,61
	(3,98)	(5,07)	(23,90)	(24,36)
Remarks	14.520	14.520	14.520	14.520
R Square	0,03	0,04	0,03	0,03

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Optimal range has F-test above 19.5. Data from Brazilian municipalities from 2018 to 2021.

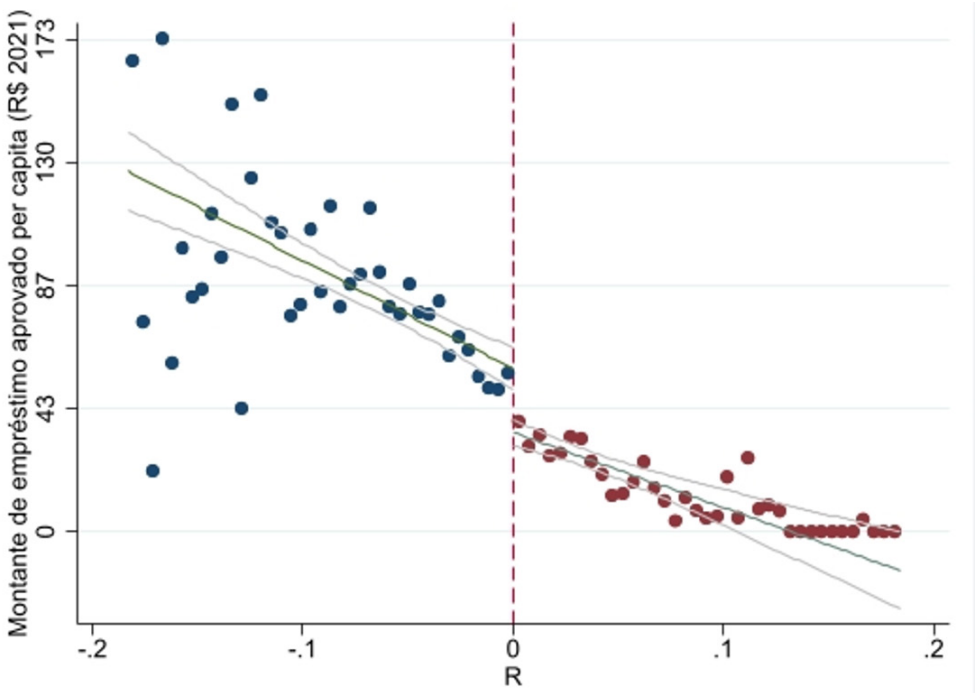
Figure 7 - First stage: effect of the PC indicator on an approved loan



Indicator Approved Loan (Average)

Note: Data from Brazilian municipalities from 2018 to 2021. Considers the optimal range (R between -0.181 and 0.181).

Figure 8 - First stage: effect of the PC indicator on the per capita amount



Loan Amount approved per capita

Note: Data from Brazilian municipalities from 2018 to 2021. Considers the optimal range (R between -0.184 and 0.184).

Table 6 shows the estimates of the effect of access to credit (approved loan and per capita amount in Brazilian Reais) on local per capita expenditure in Brazilian Reais, considering the optimal interval. As the execution of the expenses 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 three years (t+1, t+2, t+3), whenever data is available[21]. The expenditure categories analyzed are: current expenditure, personnel expenditure, capital expenditure and investment. The expenditure functions were selected based on the relative responsibility of the municipal government in the execution of the expenditure function and the total amount spent in relation to the other functions (see institutional context section). They are: Administration, Education, Urban Planning, Health, Sanitation, Environmental Management, Sports and Culture - the latter aggregates the functions of "Sports and Leisure" and "Culture".

Reduced form estimates in column 1 and two-stage least squares estimates in columns 2 (approved loan) and 4 (per capita amount) are presented. In the present exactly identified instrumental variable model, the MQ2E estimates correspond to the reduced form effects scaled by the first-stage coefficient. Also presented are the estimates obtained via MQO in columns 3 and 5, which may exhibit bias due to unobserved factors that influence both the dependent variable (local expenditure) and the independent variable (access to credit). Figures 9 and 10 visually illustrate the effect of the municipality having an approved loan on local expenditure (reduced form).

Regarding the economic categories of expenditure, we observe in column 1 an impact of R$39.62 per capita on capital expenditure and R$35.74 per capita on investment, respectively, an increase of 11.8% and 12.9% considering that the average expenditure of the observations with CP indicator above 0.95 in these categories is R$334.89 and R$277.44 per capita. There is a small and not very significant positive effect for the current expenditure category, which indicates an imprecise increase of about 2% in relation to the average expenditure of the observations with CP above the cutoff value in the optimal range (R$ 3608.67). This effect does not refer to an increase in personnel expenditure and may therefore be linked to a small and imprecise increase in the costing arising from the projects for which the loan operations are intended. Disaggregated regressions for each period[22] indicate a small and not very significant increase only in t and t+1, but not in the following periods (t+2, t+3). Note that the MQO estimate for the personnel expenditure category pointed to a significant negative

21 The annual financial execution data for Brazilian municipalities are available until 2021. As such, only in the case of loan operations approved in 2018 does the average value consider the four years indicated, that is: 2018 (t), 2019 (t+1), 2020 (t+2) and 2021 (t+3). For loan operations approved in 2019, the three-year average is calculated: 2019 (t), 2020 (t+1) and 2021 (t+2), and so on. For operations approved in 2021, only year t is available.

22 Disaggregated estimates for each period are available on demand.

result corresponding to about 5% of the average expenditure of the ineligible group in the optimal range (R$2098.16). The spurious result can be explained by unobservable factors that influence both the borrowing and the reduction of the allocation of resources with personnel expenditure. For example, a municipal government that aims to improve resource allocation can either act to reduce inefficient personnel expenditure or obtain a loan to make an investment, but there is no causal relationship between access to credit and personnel expenditure. In general, the results indicate that taking out credit operations contributes to higher quality expenditure, such as structuring investments, which is desirable from a social point of view. The MQ2E results using as instrument both the approved loan indicator and the per capita loan amount in Brazilian Reais (columns 2 and 4) point in the same direction.

As for the selected expenditure functions, column 1 shows a positive impact of borrowing in the Health, Urban Planning, and, more weakly, in Sanitation functions, respectively, increases of 10%, 8%, and 6%, considering that the average expenditure of the observations with a PC indicator above 0.95 in these functions is R$ 427.72, R$ 261.65, and R$ 126.12 per capita. The other expenditure functions do not show significant results. The MQO regression shows quite biased results. The regression with the approved loan indicator, for example, indicates a reduction in per capita expenditure in the administration and education functions, points to an increase in expenditure in the environmental management and sports and culture functions, and does not capture the impact on the health function. The MQ2E results using both the approved loan indicator and the per capita loan amount in Brazilian Reais (columns 2 and 4) point in the same direction.

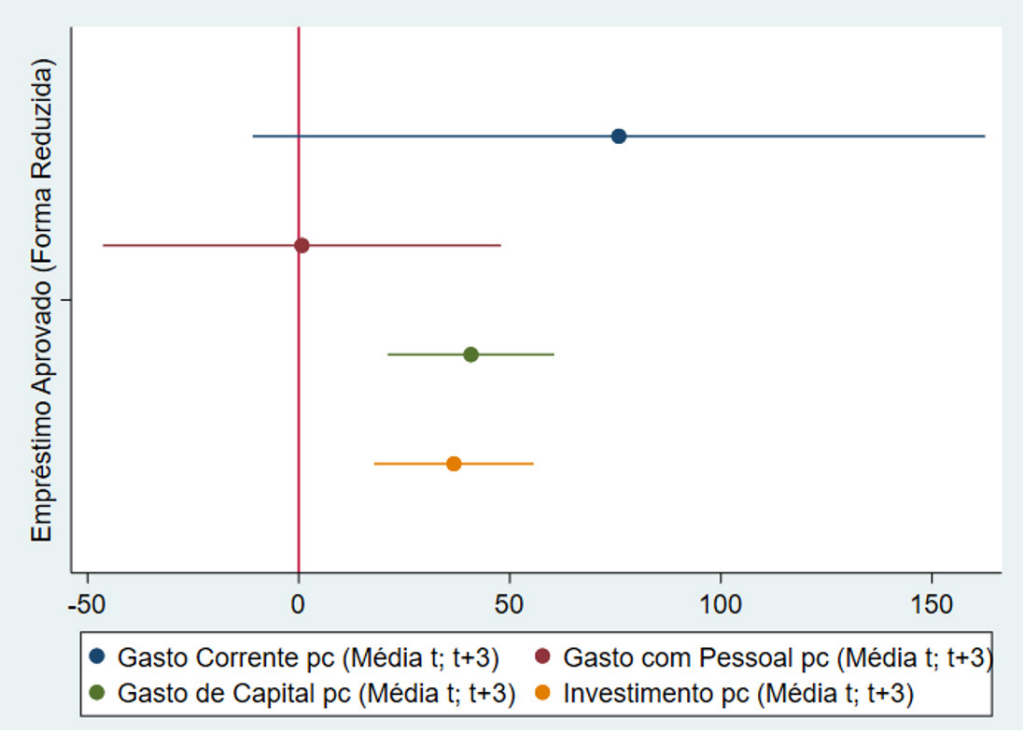
Table 6 - Effect of access to credit on local expenditure

		Approved Loan		Loan Amount pc	
	Reduced Form	MQ2E	MQO	MQ2E	MQO
	(1)	(2)	(3)	(4)	(5)
First Stage			0,0588***		22,46***
			(0,0103)		(5,037)
Panel A. Expenditure Categories					
Current expenditure pc	74,83*	1.259	-57,17	3,20	1,02***
(Average t, t+1, t+2, t+3)	(44,40)	(781,1)	(35,41)	(1,99)	(0,071)
Capital expenditure pc	39,62***	666,40***	77,66***	1.74***	0.43***
(Average t, t+1, t+2, t+3)	(10,16)	(198,7)	(8,08)	(0.52)	(0.016)
Personnel Expenditure pc	-0,94	-15,79	-109,3***	-0,10	0,43***
(Average t, t+1, t+2, t+3)	(24,13)	(405,8)	(19,22)	(1,06)	(0,039)

Investment pc	35,74***	601,20***	70,83***	1,57***	0,40***
(Average t, t+1, t+2, t+3)	(9,76)	(187,7)	(7,76)	(0,49)	(0,016)
Remarks			14.885		
Panel B. Expenditure Functions					
Expenditure Administration pc	0,07	1,21	-54,96***	-0,05	0,19***
(Average t, t+1, t+2, t+3)	(12,49)	(210,3)	(9,947)	(0,55)	(0,02)
Education Spend pc	-15,20	-255,7	-76,15***	-0,70	0,15***
(Average t, t+1, t+2, t+3)	(11,09)	(188,7)	(8,83)	(0,52)	(0,02)
Urban Expenditure pc	21,16**	352,8**	33,77***	0,92**	0,17***
(Average t, t+1, t+2, t+3)	(8,41)	(150,4)	(6,71)	(0,40)	(0,01)
Health Expenditure pc	42,24***	710,4***	1,56	1,83***	0,23***
(Average t, t+1, t+2, t+3)	(12,67)	(246,0)	(10,11)	(0,69)	(0,02)
Sanitation Expenditure pc	7,72*	145,7	22,57***	0,33	0,06***
(Average t, t+1, t+2, t+3)	(4,52)	(90,39)	(3,46)	(0,20)	(0,01)
Environmental Management Expenditure pc	3,49	53,00	3,56**	0,15	0,02***
(Average t, t+1, t+2, t+3)	(2,19)	(34,45)	(1,66)	(0,10)	(0,003)
Sports and Culture Expenditure pc	-1,77	-29,80	4,91***	-0,08	0,04***
(Average t, t+1, t+2, t+3)	(1,81)	(31,11)	(1,44)	(0,08)	(0,003)
Remarks			14.896		

Note: Data from Brazilian municipalities, 2018 to 2021. Considers the optimal interval (R between -0.181 and 0.181). Values in R$ of 2021. Without fixed effects. Explanation of results in the text.

Figure 9 - Effect of approved loan on per capita expenditure categories



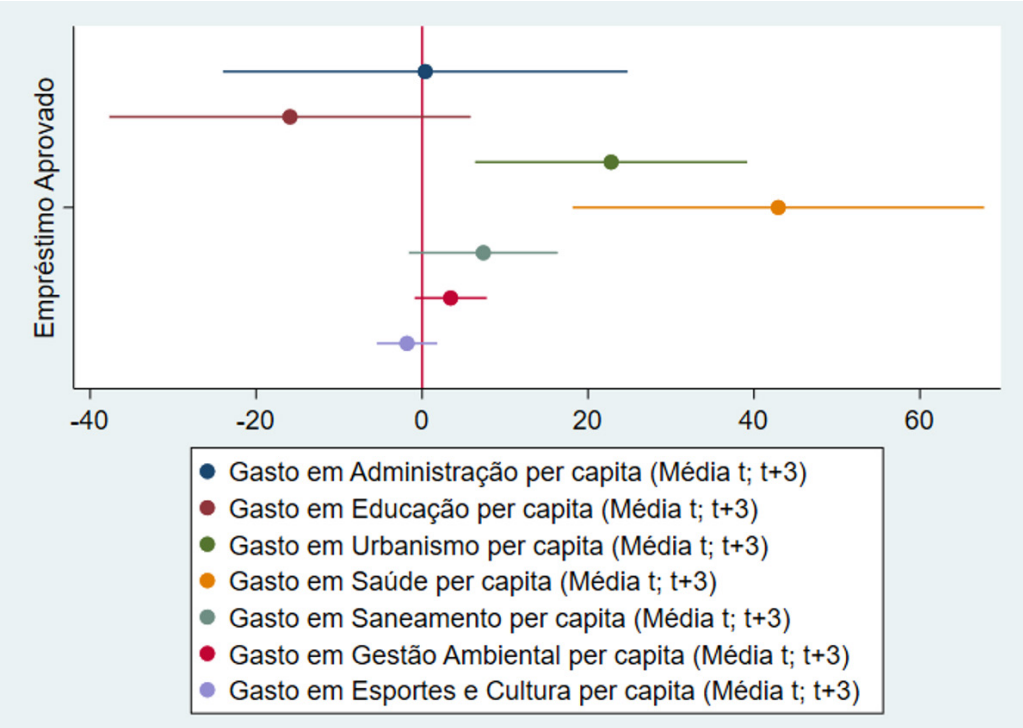
Approved Loan (Reduced Form)

- Current expenditure pc (Average t; t+3) - Personnel expenditure pc (Average t; t+3)

- Capital expenditure pc (Average t; t+3) - Investment pc (Average t; t+3)

Note: Data from Brazilian municipalities from 2018 to 2021. Considers the optimal range (R between -0.181 and 0.181). Reduced form estimations, without fixed effects. Explanation of results in the text.

Figure 10 - Effect of approved loan on per capita expenditure functions



Approved Loan

- Administration Expenditure per capita (Average t; t+3)

- Education Expenditure per capita (Average t; t+3)

- Urban Planning Expenditure per capita (Average t; t+3)

- Health Care expenditure per capita (Average t; t+3)

- Sanitation expenditure per capita (Average t; t+3)

- Environmental Management expenditure per capita (Average t; t+3)

- Sports and Culture expenditure per capita (Average t; t+3)

Note: Data from Brazilian municipalities from 2018 to 2021. Considers the optimal range (R between -0.181 and 0.181). Reduced form estimations, without fixed effects. Explanation of results in the text.

5. Final considerations

This paper aimed to study the impact of access to credit on public expenditure, based on data from Brazilian municipalities between 2018 and 2021. A discontinuity in the eligibility requirements for the Federal Government guarantee in credit operations (CAPAG A or B) was explored, which reduces the risk and improves the financial conditions of the operations. The score on the current savings indicator discontinuously changes by 0.95 from B to C, influencing the final CAPAG. The main hypothesis is that, in a neighborhood of the 0.95 threshold, the assignment of municipalities on either side is as good as random. From this hypothesis, the local average treatment effect is estimated using the two-stage least squares (MQ2E) method.

The results point to a good application of resources from credit operations. Positive and significant effects were found for contracting and loan amounts on capital expenditure and per capita investment. In turn, a positive and significant effect was found for expenditure in the health, urban planning, and sanitation functions. The urban planning and sanitation functions encompass structural investments by the municipalities, such as expenditure on urban infrastructure, urban services, urban public transportation, and urban and rural basic sanitation. On the other hand, the additional increase in per capita expenditure in the health function - which encompasses basic care, hospital and outpatient care, prophylactic and therapeutic support, sanitary and epidemiological surveillance, and food and nutrition - by the municipalities with approved loans may be related to the analyzed period that encompasses the COVID-19 pandemic. In this case, those municipalities that had access to credit were able to count on extra resources to meet the most immediate needs for the provision of public goods and services.

The findings are relevant for policy design in developing countries, since the literature on fiscal capacity points out that simply increasing revenue is not enough to promote quality expenditure and increase local development. Increased revenues via grants, oil royalties, or transfers in general find little or no positive impact on the provision of public goods and services. This paper suggests that the institutional framework for borrowing by subnational governments in Brazil is capable of generating

positive impacts, a finding that can serve as inspiration for other federal countries with similar levels of development.

As next steps for this research agenda, it is proposed to test the effect of loans on concrete outcomes for public policies at the subnational level, in line with the results found in this paper. For example, one can test whether there is an impact for the number of basic health units, number of nursing and Intensive Care Unit (ICU) beds, paving of streets, and sanitary sewage coverage. Another extension of this research agenda refers to the study of political variables that influence and are influenced by borrowing operations. Some relevant questions are: (i) what is the profile of the mayor who seeks access to credit operations, (ii) what is the impact of access to credit on electoral results, (iii) whether obtaining loans impacts indicators of local corruption. Theoretical models that rationalize the results and make their mechanisms explicit can also be worked out.

6. Attachments

Table A1 - Verifiable requirements for contracting credit operations by the subnational entities

Limits for contracting credit operations
- Compliance with the Golden Rule in the previous and current fiscal year
- Resource releases limited to 16% of the Net Current Revenue (RCL) in each fiscal year
- Average expenditure on debt servicing cannot exceed 11.5% of Gross National Income
- Net Consolidated Debt stock limited to 200% of RCL (States) and 120% of RCL (Municipalities)
- Compliance with personnel expenditure limits (proportion of RCL) by all Powers and agencies
- Not having a debt honored by the State or Federal Government
- No irregular or forbidden operations
- To be in compliance with the Federal Government regarding financing, refinancing and guarantees received
- Service to the Single Registry of Agreements (Cauc)
- Compliance with refinancing agreements with the Federal Government, in the case of states in the Fiscal Restructuring and Adjustment Program (PAF) or municipalities covered by MP 2,185-35.
Conditions for granting the Federal Government guarantee
- Compliance with the requirements for credit operations in general
- Payment capacity (CAPAG) "A" or "B"
- Cost of the operation within the Maximum Acceptable Cost established by the National Treasury
- Balance of the obligations guaranteed by the Federal Government less than or equal to 60% of the RCL
- Presentation of sufficient counter-guarantees
- Absence of honors and delays
- Compliance with Public-Private Partnership (PPP) limits
- Compliance with the minimum constitutional application of resources in the health and education func-tions
- Fulfillment of full tax competence
- Contractual drafts in accordance with the parameters required by the Ministry of Economy

Table A2 - Aggregation of the purposes of credit operations

Purpose declared in the PVL/SADIPEM base	**Purpose group (Figure 4)**
1. Debt refinancing	Debt Settlement - Electricity Debt Settlement - Water and Sewage Debt Settlement - Others Debt Settlement - RELUZ Renegotiation of debts Debt Repayment
2. Fiscal management	Program for Modernization of Tax Administration and Management of Basic Social Sectors (PMAT) National Program to Support the Administrative and Fiscal Management of Brazilian Municipalities (PNAFM)
3. Acquisition of furniture/real estate	Acquisition of machinery, equipment and vehicles Acquisition of land, real estate and/or construction of facilities
4 Capital contribution	Capital contribution Granting a guarantee to a non-dependent state-owned company
5. Infrastructure	Infrastructure
6. Sanitation	PAC 2 - Sanitation Basic sanitation Sanitation for All
7. Transportation	Pro-Transport PAC 2 - Pro-Transportation PAC 2 - Pro-Transportation - Paving and Roadway Qualification
8. Urbanism	Integrated Multisector Project (PMI), a line exclusively focused on urbanization programs Multisector Master Plan
9. Other	Health Education Public Safety Tourism PAC 2 - Pro-Housing Sustainable Development Environmental preservation and recovery Institutional Strengthening Contractual Amendment

Table A3 - Classification of Credit Operations

Classification of the operation	**SADIPEM/PVL Status**
Approved	Granted Granted (PVL-IF) Regularized Forwarded to PGFN with a favorable technical opinion Forwarded to PGFN (court decision) Granted (court decision) Regular by court decision
Not Approved	Filed under Archived on request Filed due to expiration of time Rejected Pending regularization Returned In rectification by the interested party Canceled Filed by STN In rectification by the creditor (PVL-IF) Rejected (PVL-IF) In rectification by the interested party (PVL-IF) Filed for expired (PVL-IF) Filed on Request (PVL-IF) In rectification by the creditor Under analysis (PVL-IF) PVL cancelled Under review In triage PVL pending distribution In legal consultation (Federal Government guarantee) Sent to the financial institution (PVL-IF) Signed by the interested party (rectification)

Figure A1 - Total expenditure of the Brazilian Federation, by function (2019)

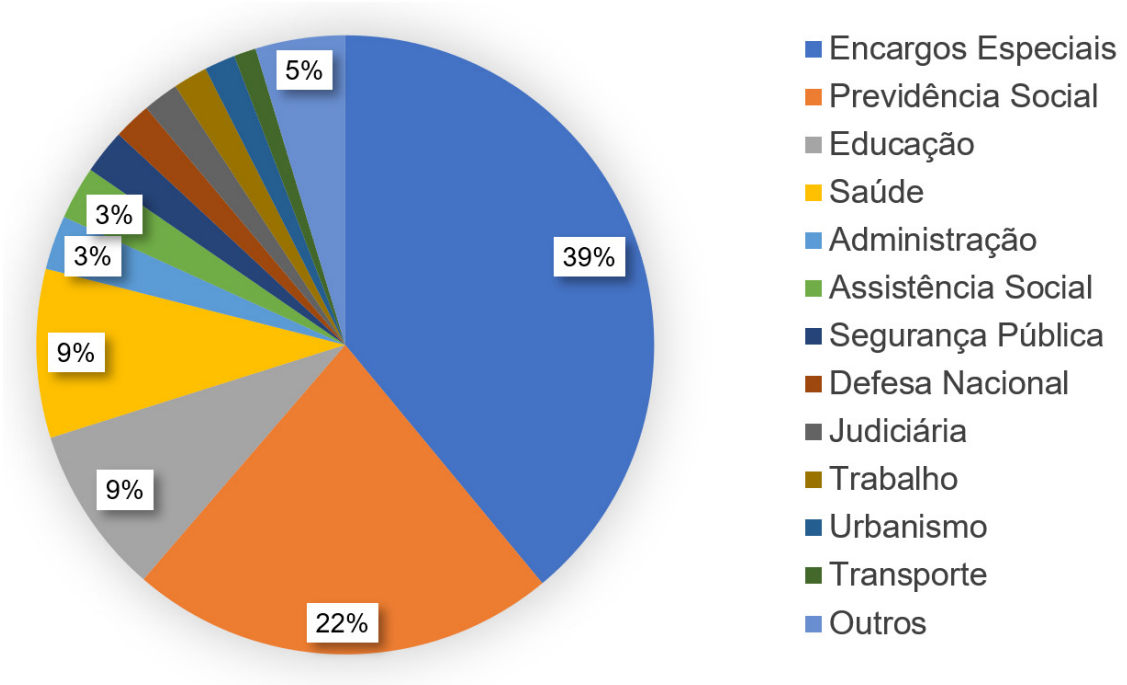
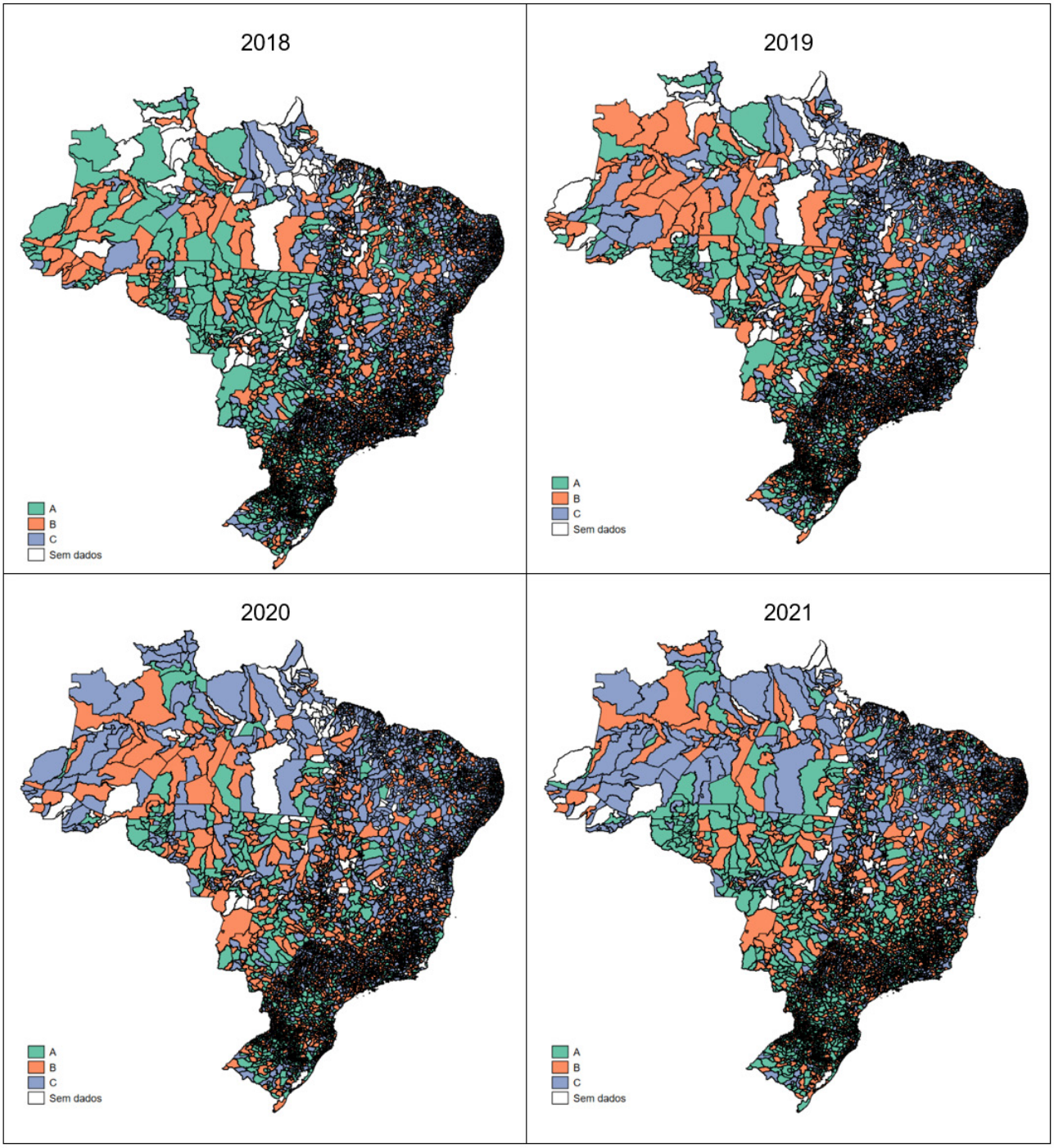


Table translation: Encargos Especiais = Special Charges / Previdência Social = Social Security / Educação = Education / Saúde = Health / Administação = Administration / Assistência Social = Social Assistance / Segurança Pública = Public Safety / Defesa Nacional = National Defense / Judiciária = Judiciary / Trabalho = Labor / Urbanismo = Urbanism / Transporte = Transportation / Outros = Others

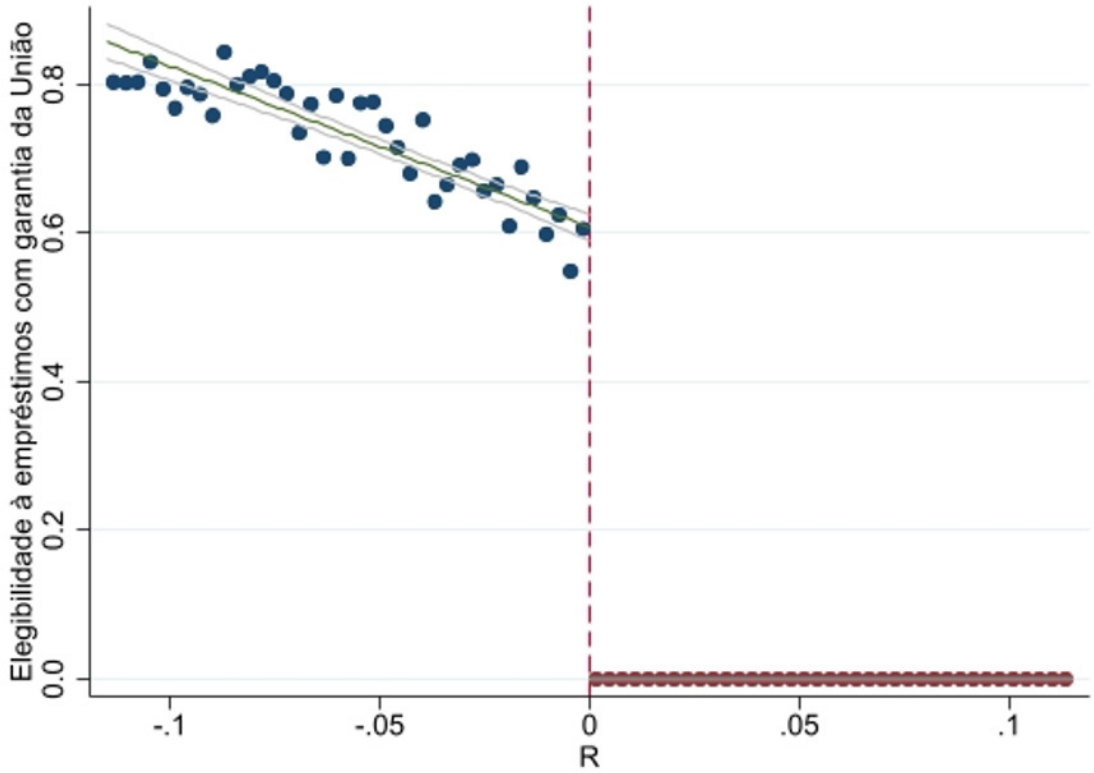
Source: BPSN, National Treasury (2019). Considers the total budget expenditure committed. In "Other" are aggregated the expenditure functions that did not individually reach 1% of the total: Legislative (0.9%), Agriculture (0.7%), Essential to Justice (0.7%), Sanitation (0.4%), Citizenship Rights (0.4%), Environmental Management (0.3%), Science and Technology (0.3%), Culture (0.2%), Commerce and Services (0.2%), Sports and Leisure (0.1%), Energy (0.1%), Housing (0.1%), Foreign Relations (0.1%), Industry (0.1%), Communications (0.1%), Agrarian Organization (<0,1%).

Figure A2 - Partial CAPAG score of the indicator PC in Brazilian municipalities



Source: Own preparation based on data from the Municipalities Payment Capacity, National Treasury.

Figure A3 - Change in eligibility for Federal Government guarantee on credit operations



Eligibility to loans with Federal Government Guarantee

Note: Data for Brazilian municipalities from 2018 to 2021. The vertical axis is the average of the indicator of eligibility to loans with Federal Government guarantee (CAPAG A or B). The horizontal axis refers to the result of the current savings indicator with the cut-off score between partial B and C (0.95) centered on 0 - variable R. When the indicator is equal or greater than 0.95, the partial score on the indicator is C and the final CAPAG score is C or D, which makes the entity ineligible for the Federal Government guarantee. When the indicator is less than or equal to 0.95, the partial score is A or B and the final CAPAG score can range from A to D, depending on the liquidity indicator. The probability of the entity being eligible for the Federal Government guarantee falls from about 60% to 0 when it exceeds the limit value of 0.95 in the current savings indicator.

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