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Fiscal Space of Brazilian States

Fabiano Bastos, Emilio Pineda**

We estimate the fiscal space of Brazilian States defined as the difference between a State's actual debt and the theoretical debt limit implied by the historical behavior of its policymakers. We estimate fiscal reaction functions and debt limits using publicly available data between 2000 and 2011 for the 26 Brazilian States and the Federal District. The results suggest that, after a decade of fiscal consolidation, a number of States have fiscal space but there remains significant heterogeneity across States. Going forward, enhancing the role of market incentives and strengtheningrules-based approaches governing subnational debt build-up would contribute to a prudent and effective use of existing fiscal space.

JEL Classification: H62, H63, H74
Keywords:Fiscal Space, Fiscal Sustainability, Debt Dynamics, Subnational Borrowing, State Finance.

Estimamos el espacio fiscal de los Estados de Brasil definido como la diferencia entre la deuda real de un Estado y el límite de la deuda teórica implícita en el comportamiento histórico de sus hacedores de política económica. Estimamos curvas de reacción fiscal y los límites de deuda a partir de datos disponibles al público entre 2000 y 2011 para los 26 Estados de Brasil y el Distrito Federal. Los resultados sugieren que, después de una década de consolidación fiscal, varios Estados cuentan con espacio fiscal, pero sigue habiendo una heterogeneidad significativa entre los distintos Estados. De cara al futuro, el fortalecimiento del papel de los incentivos de mercado y enfoques basados en el fortalecimiento de las reglas que rigen la acumulación de la deuda sub-nacional contribuirían a un uso prudente y eficaz del espacio fiscal existente.

* Inter-American Development Bank.

Introduction

Brazilian States and Municipalities underwent a marked fiscal adjustment after1999. In general, they have been able to stabilize nominal deficits at low levels andput their public debt ratios on a declining trajectory. This has been accomplished through strict discipline imposed by the federal government over new subnational borrowing and other key fiscal indicators. Along this process, the main fiscal adjustment variable for subnationals has been public investment, given rigidity of current expenditures and limitations onStates to increase their own revenues. Subnational fiscal consolidation is associated withyears of low public investment but was critical for improving the country's macroeconomic policy framework over the last decade.

The federal government has managed the tension between fiscal consolidation and public investment at the subnational level through periodic revisions of debt accumulation limits. The revisions are discretionary, though informed by technical criteria.As the fiscal position of subnationals improves and infrastructure needs accumulate, the tendency to assume a less conservative bias on debt accumulation increases. In fact, subnational debt levels have started to increase again more recently, particularly in 2012. The debt build-up is associated with State-level investment needs, but also with fiscal stimuli promoted by the federal government. The trend should persist in the nearterm, which will intensify the policy debate around subnational fiscal sustainability and fiscal decentralization issues.

In this context, a policy-relevant analytical agenda regarding subnational debt emergesand two key questions arise. Firstly, how much fiscal space do subnationals actually have? Secondly, what is the best way to use any existing fiscal space? This paper deals with the first question by implementing one possible methodology to identify debt limits at the subnational level. The paper isstructured as follows. The second section discusses the concept of fiscal space and summarizes the associated literature. The third section presents the methodology and data. The fourth section presents the econometric results.And,the final section concludes.

The Concept of Fiscal Space

"Fiscal space" is defined by Heller (2005) as *room in a government's budget that allows it to provide resources for a desired purpose without jeopardizing the sustainability of its financial position or the stability of the economy.* The underlying idea is that fiscal space must exist if extra resources are to be

made available for worthwhile government spending without compromising macroeconomic stability and fiscal sustainability. In other words, making sure that governments have the capacity in the short and longer term to finance theirdesired expenditure programs as well as to service theirdebt.

The concept of fiscal space is, thus, closely related to the concept of debt sustainability. When the debt of a country is deemed sustainable, additional room for government spending might be accommodated without jeopardizing the sustainability of its financial position.[1] However, when the debt ratio is considered unsustainable, policies to reduce it to a sustainable level are necessary, indicating a limited or non-existent fiscal space. Fiscal space, in short, has been understood as the scope for further increases in public debt without undermining sustainability (International Monetary Fund [IMF], 2012; Ostryet al., 2010).

This concept of fiscal space, while intuitively appealing, has been measured in different ways. A first group uses the difference between the current fiscal balance and the medium-term debt-stabilizing balance to estimate the fiscal space or the adjustment needed (fiscal gap). These estimates are based on the projected debtpath determined by predefined assumptions for key variables, such as the overall fiscal balance, the discount rate, and the macroeconomic outlook. This methodology is frequently used by the IMF in publications such as *Fiscal Monitors*, the European Commission (2007), and different sustainability indexes, such as Blanchard et al. (1990); Buiter, Corsetti, and Roubini (1993); and Auerbach and Gale (2011). The main advantage of this methodology is that it is forward looking—just like the concept of debt sustainability—and, therefore, it can incorporate fiscal plans announced by governments. Its main limitation is that its macroeconomic forecasts tend to rely on ad hoc assumptions rather than on formal, testable models. Furthermore, since it is forward looking,this methodology implicitly ignores a country's track record of willingness to adjust while markets pay close attention to this track record.

A second group of methodologies uses stationarity and structural tests of fiscal sustainability. Hamilton and Flavin (1986) argue that sustainability is related to the stationarity of the primary deficit and debt levels.

[1] The IMF considers the fiscal stance of a country sustainable if the intertemporal budget constraint is satisfied at all times, meaning that the current debt is less than or equal to the discounted value of future primary surpluses at all times (IMF, 2012).

Hakkio and Rush (1991) argue that if debt and primary deficits are cointegrated, fiscal sustainability is maintained. Uctum and Wickens (2000) assume a time-varying discount factor and show that stationarity of the primary balance with a zero mean is sufficient for fiscal sustainability.

Bohn (1998, 2005, and 2007) adds a behavioral dimension to the assessments done by the fiscal gap methodologies by drawing implications about how a country's fiscal policies have reacted historically to increases in its public debt. The main idea of this approach is to define fiscal solvency as being fulfilled when the response of the primary surplus to debt is positive. A positive response intuitively means that a country increasesits primary surplus when its debt load increases—because of shocks such as recessions, financial crises, or natural disasters—or, conversely, runs a lower surplus whenever debt is at a relatively lower level.Under this approach, sustainability is assured if the primary fiscal balance increases sufficiently to match increases in debtlevels to avoid a Ponzi scheme,ensuring the public debt is repaid in the long run.

Bohn's seminal contribution, however, has some drawbacks (Ostry et al., 2010; IMF 2012). First, it casts infinitely growing debt ratios as sustainable as long as they are supported by infinitely growing primary balances, implying a potentially unlimited fiscal space, which is clearly unrealistic since at some point primary surpluses would have to be as large as a country's GDP. To address this shortcoming, a new group of papers refined Bohn's approach by testing for the possibility of a non-linear relationship between debt and the primary surplus. This could occur, for example, if a country finds it more difficult to generate primary balances that ensure sustainability when debt gets very high (i.e., fiscal fatigue). A number of papers find evidence of a non-linear response.A stronger response of the primary surplus to greater debt levels is found for a large sample of industrialized countries in IMF (2003), while Abiad and Ostry (2005), IMF (2003), Celasunand Kang (2006), and Mendoza and Ostry (2008) find that fiscal responses tend to weaken among emerging economies when debt exceeds 50 percentof GDP. Ostry et al. (2010) foundthat, for a large set of industrialized economies,fiscal reaction functions are better characterized by a cubic function, where at low levels of debt the primary surplus does not respond to debt increases, while at about 40 percent of GDP debt increases are followed by significant increases of the primary balance.Eventually, however, the response of the primary balance begins to flatten out and then decreases as debt rises even further.

A second refinement to Bohn's framework done by Ostry et al. (2010) is conceptualizing the rise ininterest rates and the debt limits simultaneously. They do so by assumingthat, as a country's debt-to-GDP ratio increases, interest rates will rise since markets will factor in the higher probability that a country will be caught on the wrong side of the debt limit. Thehigher lending rates will then increase the probability that the debt load spirals out of control.In short, they integrate the modeling of the probability of default, the interest rate faced by the sovereign, and the debt limit.

A key advantage of the fiscal reaction framework is that it allows debt thresholds to be defined beyond which a country will default unless policymakers take fiscal steps thatare outside of anything they have done historically. Current debts are evaluated against those thresholds to measure fiscal space. Consequently, those countries that have reacted more aggressively to debt increases will have higher debt limits and thus more fiscal space. In contrast, countries that have shown less resolve will have lower debt limits and thus less fiscal space. As emphasized by Ostry et al. (2010), while a country's fiscal space and debt threshold are not immutable, theydefine a critical juncture beyond which a country's fiscal response to rising debt becomes insufficient to maintain fiscal sustainability. Policymakers must then break with the past practice or their government will default. Ostry et al. (2010) also caution that debt limits do not define an optimal level of public debt. Since the debt limit is the point at which a country's fiscal solvency is in jeopardy, prudence dictates that debt levels should remain well below those debt thresholds.

Methodology

We follow the approach of Ostry et al. (2010) to define fiscal space for Brazilian States as the difference between a State's actual debt and the theoretical debt limit implied by the historical behavior of its policymakers.[2] To determine a country's debt limit and fiscal space, the first step is to determine a standard government budget constraint:

$$d_{t+1} - d_t = (r_t - g_t)d_t - pb_{t+1} \qquad [1]$$

where d is one period of debt (as a share of GDP) at the end of the period, g is the growth rate of real GDP, which is assumed to be exogenous and constant, pb is the primary balance (in percent of GDP), and r_t is the real

[2] A more detailed discussion of the specification is found in Gosh et al. (2011).

interest rate on debt contracted in period t and due in period t+1,which we assumed to be exogenous and constant.[3] A country's growth-adjusted interest payment is thus determined by $(r_t - g_t)d_t$.

We then assume that governments are generally responsible in managing their fiscal affairs. While at very low debt levels their primary surpluses might not respond to debt increases, they respond sensibly to rising deficits by tightening their fiscal policy once their debt levels start to approach moderate levels. Large increases on debt stocks associated with shocks, thus, are stabilized since governments respond with fiscal discipline. Yet, there is a point when a country's debt-to-GDP ratio and interest payments rise so much that policymakers are tempted to give up. This, for example, could happen when the share of national income going to paying taxes has become so onerous, or cuts in government spending have been so extreme, that further tax hikes or spending cuts become politically unfeasible.

This dynamic is characterized by the following cubic-shaped fiscal reaction function:

$$pb_{t+1} = \mu + f(d_t) + e_t \qquad [2]$$

where μ captures all systematic determinants of the primary balance other than lagged debt.[4] Based on the above-described reaction of policymakers to changes in their debt load, the $f(d_t)$ term is assumed to be a cubic function.

The intersection between the primary balance reaction function and the growth-adjusted interest payment curve determine the debt limits as an equilibrium condition under which the debt ratios stabilizes:

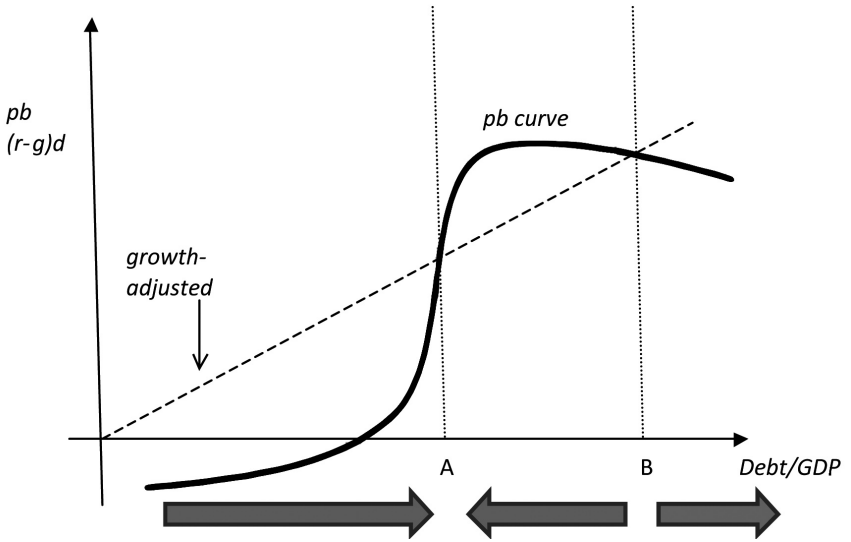
$$(r_t - g_t)d_t = \mu + f(d_t) + e_t \qquad [3]$$

[3] Ostry et al. (2010) assume the interest rate is endogenous and in equilibrium an increasing function of the probability of default. For the Brazilian States, however, we assume interest rates to be exogenous because above 90 percent of their debt is with the federal government as a result of several roundsof bailouts and debt-renegotiations. The interest rate for these obligations is fixed and not market determined.

[4] The two most frequent determinants used in the literature are the output gap, to account for the business cycle, and the temporary component of public expenditure (i.e., military outlays during wars).

This equilibrium condition is illustrated in Figure 1.The solid curve represents the cubic (non-linear) fiscal reaction function, while the dotted line represents the growth-adjusted interest payments. The different debt thresholds are given by the intersection between the two curves (A and B).[5] To exemplify this, suppose that a country's debtratio lies between A and B, which means that its primary balance is greater than the required growth-adjusted interest payments (the primary balance curve lies above the interest-payment curve). This corresponds to the case where policymakers are still able to match higher interest payments with higher primary surpluses. The excess of the primary surplus over the interest payments is used to pay down debt until point A is reached and the primary balance equals the interest payments.

Figure 1



In contrast, if a country's debt-to-GDP ratio lies to the right of B, the country is on the brink of becoming insolvent. From B onward, the primary balance curve is permanently lower than the interest payment

[5] Gosh et al. (2011) find that for industrial economies in general there will be two stationary equilibriums; however, the number of equilibriums can range between 1 and 3 depending on the particular shape of each cubic reaction function and the growth-adjusted interest payments.

schedule, meaning that, because of fiscal fatigue, the government can no longer increase the primary surplus to honor interest payments. Consequently, the government would have to borrow increasing amounts just to service the debt, enlarging the future wedge between interest payments and the primary balance. As a result, the intertemporal fiscal sustainability is compromised.

It follows that a country's debt-to-GDP ratio will be sustainable as long as it is lower than B. Furthermore, the fiscal space is the difference between the current debt level and B. If the current debt level is higher than B, then there is no fiscal space but a fiscal gap.

Estimation of the Fiscal Space

We apply the aforementioned methodology to the Brazilian States and its Federal District.[6] Fiscal reaction functions and debt limits are estimated using publicly available data between 2000 and 2011. As a result, our database comprises a matrix of 27x11 (NxT) and thus a maximum number of observations of 297; however,the unavoidable missing data usually leaves our regressions with a number of observations in the neighborhood of 270. A larger sample that included fiscal performance during the 1990s would allow a richer characterization of the fiscal behavior of the States;unfortunately, this information is not publicly available. Additionally, it could be argued that fiscal institutions governing the behavior of subnational governments during the 2000s are substantially different than the ones from the previous decade because of the reforms in the late 1990s.

The main source of subnational fiscal information was a dataset published by the National Treasury thatprovides consolidated and harmonized yearly information on the States' fiscal accounts. The data set is fairly detailed, covering revenues, expenditures, assets, and liabilities. We adopted a concept of gross public debt constructed from the liability block of the dataset.[7] The gross debt includes contractual debt and bonds, but excludes debt associated with judicial disputes and other types of liabilities.[8] For a few States and years, we found data inconsistencies that we corrected by considering all liability line items in the data set and by

6 From this point onward, the term "States" includes the Federal District.

7 In particular, we considered the domestic and external debt operations line items.

8 Public debt is mostly contractual and States are forbidden to issue new bonds due to the 1997 subnational debt renegotiation.

resorting to alternative publicly available reports. When a solution was not possible, the information was dropped from the sample.[9] State-level GDP was obtained from the National Statistics Office (Instituto Brasileiro de Geografia e Estatística [IBGE]) until 2010, the last publicly available data point. For the 2011 GDP, we used national GDP growth and constant State shares to extrapolate the State GDP. Brazil's General Price Index – Domestic Availability (Índice Geral de Preços – Disponibilidade Interna [IGP-DI]) was used as the inflation measure.[10]

Following the fiscal reaction function specified in the previous section—equation [2]—the primary balance as a share of GDP is the dependent variable, while the cubic function of the lagged debt-to-GDP ratio provides the main explanatory variables.In line with the existing literature, systematic determinants of the primary surplus other than the lagged debt include:[11]

- the output gap to account for the business cycle on fiscal policy;
- the cyclical component of government expenditures to account for tax-smoothing considerations in setting fiscal policy;
- inflation to control for potential inflation tax effects; and
- a measure of fiscal vertical imbalances to account for the potential presence of moral hazard when the majority of subnational spending is financed through transfers.

The fiscal reaction function is estimated through a fixed-effects panel-data regression assuming cluster robust standard errors. The Wooldridge

9 The Central Bank of Brazil publishes subnational debt information based on information from financial institutions. This provides cleaner data, but information is only available from 2007 onward. Comparisons between the Central Bank data and the gross debt calculated from the National Treasury dataset for the available years showed that the two measures are close after 2007.

10 While there are a variety of inflation indexes for Brazil, the IGP-DI is used to estimate the real interest rates paid by the States to the federal government in the context of the different rounds of debt-renegotiation.

11 See Bohn (1998) and Mendoza and Ostry (2008) for a discussion of controlling for the effect of temporary fluctuations in GDP, government expenditures, and inflation. See Rodden (2004) and Bahl and Bird (2008) for a discussion of the potential impact of high-level fiscal vertical imbalances on the fiscal effort of subnational governments. See Arretche and Rodden (2004); Figuereido and Limongi (2008); and Miranda and Pereira (2011) for a discussion of how partisanship might affect the access Brazilian States have to federal transfers.

Test for Autocorrelation rejected the presence of AR(1) errors.[12] Results are presented in Table 1.

Table 1. Dependent variable: primary surplus-to-GDP

Specification	FE[1]					
	(1)		(2)		(3)	
Lagged debt	-0.281	***	-0.2792	**	-0.2746	**
	(-4.88)		(-4.55)		(-4.29)	
Lagged debt square	1.2526	**	1.2535	**	1.3314	**
	(3.48)		(3.46)		(3.30)	
Lagged debt cubic	-1.7539	**	-1.7575	**	-1.9463	**
	(-2.78)		(-2.78)		(-2.80)	
Output gap	0.0001		0.0001		0.0002	
	(1.08)		(1.11)		(1.71)	
Government expenditure gap	-0.001	**	-0.001	**	-0.0011	**
	(-3.29)		(-3.28)		(-4.38)	
Inflation			-0.00003		-0.00007	
			(-0.36)		(-0.77)	
Fiscal vertical imbalance					-0.0632	***
					(-6.64)	
Observations	272		272		272	
Number of States	27		27		27	
R-squared	0.3545		0.3548		0.3769	

[1] Fixed effects with cluster robust standard errors and time dummies.

Note: The Wooldridge Test rejects the presence of AR(1) errors.

*** significant at 99 percent

** significant at 95 percent

t-statistics in parenthesis

Source: Authors' estimates.

The estimation indicates the existence of a cubic relationship between the primary surplus and public debt for the Brazilian States, as Ostry et al. (2010) found for developed countries. The primary surplus reaction to debt is very low—potentially negative—when debt ratios are sufficiently small.

12 The results of using alternative estimation methods are shown in the appendix. The different specifications shown in the appendix largely confirm the results of Table 1.

The reaction becomes positive and continues to increase as debt levels rise, eventually reaching a fiscal fatigue point at which the reaction becomes negative. It is not necessary to observe a fiscal fatigue episode to determine its location; the coefficients of the cubic equation are sufficient.

Table 1 presents evidence that when revenue grows less than its trend, the primary surplus is stronger, and viceversa. Thus, negative revenue surprises lead to contemporaneous fiscal tightening. Similarly, positive revenue surprises are contemporaneously consumed.[13] The estimation also suggests that States with a higher share of their total revenues coming from their own revenues have a smaller fiscal surplus. One way to rationalize this result is to consider that such States are more developed and already have relatively high levels of their own revenues. As a result, they would already be closer to the right-hand side of the Laffer curve and thus increasing State taxes would be more difficult. Alternatively, we could also expect that those States tend to face more complex challenges in dealing with large expenditure groups, such as education and health.

Our focus is on the estimation of the debt limits. The variables output, revenue, and inflation included in the estimation of equation [2] play the main role of mitigating omitted variable biases and help to achieve more reliable estimated coefficients that can be used to solve the cubic equation [3]. In addition, the panel setting contributes to reducing possible biases as the estimated fixed effects pick up untreated cross-section heterogeneity and are also used when calculating the coefficients of the cubic equation.

Establishing the empirical validity of the cubic format of the fiscal reaction function enables the calculation of the debt limits as proposed by Ostry et al. (2010). Before doing so, it is important to recall that the methodology we apply fundamentally depends on the observed history of fiscal performance,thusthe findings are embedded in a specific context. For Brazil, this context involves a period of strong subnational fiscal adjustment, which greatly influences the results in favor of higher debt limits.

To derive the debt limits, the estimated coefficients from equation [2] are plugged into equation [3]. The estimated constant and fixed effects that are not shown in Table 1 are also incorporated. The gap variables are set to zero. It is also necessary to assume a real interest rategrowth (r–g)

[13] States had to adhere to strict fiscal plans between 2000 and 2011. This fact combined with current expenditure rigidity and inability to issue bonds limited their ability to respond to fiscal shocks.

differential, a critical parameter for estimating the debt limits, as discussed below. What is left is a different cubic equation on the debt-to-GDP variable for each State. The largest root of each equation is the debt limit for that respective State.

Table 2. Long run debt thresholds under different interest rate growth scenarios

	Highest observed debt-to-GDP	Latest observed debt-to-GDP	Debt limits r−g=4.5	Debt limits r−g=1
AC	35%	21%	29%	42%
AL	42%	27%	41%	47%
AM	11%	5%	9%	33%
AP	4%	3%	21%	41%
BA	20%	6%	32%	42%
CE	19%	7%	11%	37%
DF	3%	2%	3%	3%
ES	10%	3%	9%	33%
GO	30%	16%	31%	42%
MA	36%	10%	38%	45%
MG	26%	19%	23%	41%
MS	36%	12%	28%	41%
MT	31%	5%	36%	44%
PA	9%	4%	10%	36%
PB	26%	10%	22%	41%
PE	16%	6%	16%	40%
PI	38%	11%	37%	44%
PR	14%	5%	11%	37%
RJ	21%	13%	13%	38%
RN	11%	4%	10%	35%
RO	24%	9%	35%	44%
RS	23%	15%	15%	39%
SC	16%	7%	12%	38%
SE	16%	9%	18%	40%
SP	19%	13%	14%	39%
TO	14%	6%	33%	43%
Average	21%	10%	21%	39%

Source: Authors' calculations.

There is no clear-cut way to choose the (r–g) differential. As a principle, however, it needs to be a realistic average number that will be maintained over the long term. Choosing an excessively low real interest rate or excessively high growth parameter on the basis of temporary economic circumstances would generate artificially high debt limits.[14] In this paper we consider two possible values for r–g: 4.5 percent and 1 percent. The former case is more consistent with Brazilian history (on average) between 2000 and 2011, but recent declines in the real interest rates have arguably approached the latter case.

The results indicate that the average debt-to-GDP limit across all States ranges from 21 to 39 percent depending on the scenario for the r–g differential. The actual average debt-to-GDP ratio observed in 2011 was 10 percent, so fiscal space for further borrowing ranges from 11 (21–10) percent to 29 (39–10) percent. The dispersion between debt limits and actual debt ratios is high across States because of the different debt evolution profiles over the past decade. The history-dependent nature of the methodology tends to assign larger debt limits to those States that had higher debt ratios at one point in time and were able to bring it down substantially. This is a demonstration of a State's capacity to deliver a fiscal response. If a State, however, did not bring down its debt ratio substantially, even if the ratio was already low to start with, the methodology penalizes the State in the derivation of its debt limit.

The lack of an actual track record of reducing debt (by choice or absence of necessity) limits inference on the State's tolerance and resolve to deal with debt overhangs. Except for the r–g choice, the methodology is eminently backward looking. At the same time that this is a shortcoming, it is also a virtue in the Brazilian case. Firstly, it is objective and less prone to political or ideological dissent. Secondly, it provides a good benchmark for examining the existence of fiscal space among highly indebted States that managed to bring down debt but are still facing non-trivial burdens. In those cases, it is possible to identify ballpark figures for fiscal space if the same resolve demonstrated in the past is maintained.

Table 3 shows the fiscal space for each State whose reduction in the debt-to-GDP ratio between 2000 and 2011 exceeds 5 percent of GDP. The fiscal space is calculated as the difference between the debt limit—using

[14] This is particularly relevant in the current context in which real interest rates are low, influenced by a myriad of factors. We could also account for different growth rates across States, but we do not attempt that in this paper.

the condition that r–g is equal to 4.5 percent—and the respective 2011 debt ratio.

Table 3. Fiscal space and past debt reductions

	Difference between peak and 2011 debt-to-GDP	Fiscal space
AC	14%	8%
AL	15%	14%
AM	6%	4%
BA	14%	26%
CE	12%	4%
ES	7%	6%
GO	14%	15%
MA	26%	28%
MG	7%	4%
MS	24%	16%
MT	26%	31%
PA	5%	6%
PB	16%	12%
PE	10%	10%
PI	27%	26%
PR	9%	6%
RJ	8%	0%
RN	7%	6%
RO	15%	26%
RS	8%	0%
SC	9%	5%
SE	7%	9%
SP	6%	1%
TO	8%	27%
Average	13%	12%

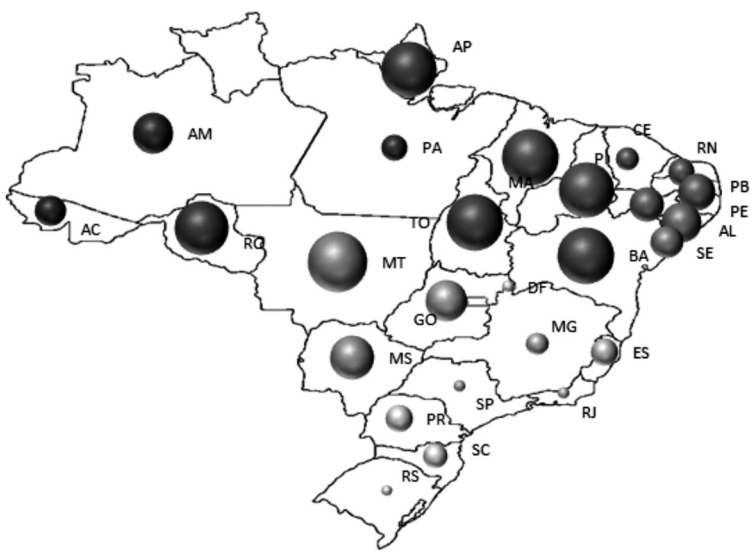
Source: Authors' calculations.

Some States have successfully promoted drastic reductions in their debt ratios and, as a result, have fiscal space. This is a testimony to the effective

institutional framework governing subnational finances over the last decade, which acted as common factor across all States. Hence, consuming the existing fiscal space in a way that dismantles or neutralizes critical aspects of the institutional framework that is in place is risky. Moreover, the methodology shows how critical country-level macroeconomic conditions are for the existence of fiscal space at the State level. This is captured by the r–g condition. A permanent deterioration of the country risk, which could be triggered by a *de facto* dismantling of fiscally responsible practices, would make the r–g condition greater than 4.5 percent and significantly reduce the fiscal space among States regardless of their own commitment to subnational finances.

Figure 2 visually summarizes the results for the estimated fiscal space assuming r–g is 4.5 percent. The larger the bubble, the greater the fiscal space as a percentage of the State's GDP measured as of the end of 2011. The figures hows that the north and northeast regions have the largest estimated fiscal spaces, while the wealthier south has more limited fiscal space.

Figure 2. Subnational fiscal space



Concluding Remarks

The results suggest that some States may have fiscal space available. Nevertheless, it is important to continue to enhance our ability to measure

critical thresholds of debt build-up applying other methodologies as well. Only in this way will it be possible to identify reliable benchmarks for debt limits that could provide effective guidance for policymaking. Additionally, it is important to map potential sources of large persistent increases in public expendituresin the future when considering how close to debt limits the States should be.[15]

In this context, there may be scope torefinethe strict government control model applied todaythat is meant to bring subnational debtdown toward an institutional framework that relies more on market incentives. This does not mean that the federal government will facilitate debt build-up and relax oversight. Instead, its role will be to enforce a strengthened and binding rules-based approach, in which States will bear the consequences of their fiscal policy decisions and compete against each other for market access without the expectation of relying on discretionary decisions at the federal level. This rules-based approach needs to have analytical foundations that integrate debt, revenue, and expenditure issues.

Brazil's history of subnationalbailouts requires that such a framework be designed carefully with attention to both political factors and to the feasibility of disciplining mechanisms when a State threatens to default. Additionally, it may require legislative changes, particularly to limit the use of waivers and exceptions to the Treasury's technical assessments. Notwithstanding the difficulties, the time is right for this discussion since there is already momentum in debt build-up. The federal government succeeded in bringing down subnational debt levels through discretionary behavior over the past decade. There is a now fertile ground for steering the framework toward more appropriate dynamics and contributing to the prudent and effective use of existing fiscal space in some States.

[15] A case in point is the demographic transition that Brazil is experiencing. The expected fiscal burden of pensions and health expenditures over the next decades, particularly after 2020, could put an important claim on what looks like fiscal space today.

Table A1. Variable definitions and data sources

Variable	Description	Source
Dependent variable		
Primary balance-to-GDP ratio	In percent	National Treasury
Explanatory variables		
Lagged debt-to-GDP ratio	In percent	National Treasury and IBGE
Output gap	Difference between actual and potential real GDP using a Hodrick-Prescott filter	Author's calculations based on IBGE statistics
Government expenditure gap	Difference between actual and potential government consumption using a Hodrick-Prescott filter	Author's calculations based on National Treasury Statistics
Inflation	Annual inflation national IGP-DI	IBGE
Fiscal vertical imbalance	Ratio of Own Revenues to total Current Revenues	National Treasury

Table A2. Alternative estimation methods of the fiscal reaction function

Specification	FE[1]	FE[2]	RE[3]	PCSE[4]
	(1)	(2)	(3)	(4)
Lagged debt	-0.2746 **	-0.3111 ***	-0.1999 ***	-0.2007 ***
	(-4.29)	(-3.10)	(-2.64)	(-4.61)
Lagged debt square	1.3314 **	1.5647 ***	1.1631 **	1.1762 ***
	(3.30)	(2.73)	(2.56)	(4.10)
Lagged debt cubic	-1.9463 **	-2.5555 ***	-1.7552 **	-1.7835 ***
	(-2.80)	(-2.66)	(-2.27)	(-3.43)
Output gap	0.0002	0.0001	0.0002	0.0002
	(1.71)	(0.49)	(1.24)	(1.54)
Government expenditure gap	-0.0011 **	-0.001 ***	-0.0011 ***	-0.0011 ***
	(-4.38)	(-7.06)	(-8.76)	(-11.07)
Inflation	-0.00007	0.00004	-0.00003	-0.00002
	(-0.77)	(0.18)	(-0.30)	(-0.61)
Fiscal vertical imbalance	-0.0632 ***	-0.00156	-0.027 ***	-0.0272 ***
	(-6.64)	(-0.07)	(-5.05)	(-5.69)
Observations	272	272	272	272
Number of States	27	27	27	27
R-squared	0.3769	0.3687	0.3495	0.3962

[1] Fixed effects with cluster robust standard errors and time dummies.

[2] Fixed effects assuming an AR(1) error structure.

[3] Random effects assuming an AR(1) structure and time dummies.

[4] Panel Corrected Standard Errors assuming an AR(1) structure and time dummies.

*** significant at 99 percent

** significant at 95 percent

t-statistics in parenthesis

Source: Author's estimates.

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