

Institutional Changes, Incentive Schemes and the Decision to Undertake Fiscal Adjustments

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Abstract

This paper seeks to determine whether institutional changes implemented by federal governments have created incentives and influenced the decision of state governments to undertake fiscal adjustments. Furthermore, it examines how these changes contributed to the success or failure of said adjustments. After evaluating and confirming the independence of irrelevant alternatives, a Multinomial Logit model was used to estimate how these changes affected choices (using ‘no adjustments’ as the base outcome at all times). We found, as international literature has suggested, that changes to budget institutions do affect fiscal results, and we noted that impacts depend on the rigidity of the budget rule under analysis. In addition, in the case of Brazil, institutional changes noticeably created previously nonexistent incentives for state governments to make fiscal adjustments.

Keywords: institutional changes; fiscal adjustments; Multinomial Logit Model.

Resumo

Este artigo busca determinar se mudanças institucionais implementadas por governos federais criaram incentivos e influenciaram a decisão de governos estaduais efetuarem ajustes fiscais. Além disso, examina como essas mudanças contribuíram no sucesso ou no fracasso desses ajustes. Após avaliar e confirmar a independência das alternativas irrelevantes, utilizamos um modelo Logit Multinomial para estimar como essas mudanças afetam as escolhas (utilizando ‘não ajuste’ como *outcome* base em todos os casos). Encontramos, como a literatura internacional sugere, que mudanças nas instituições orçamentárias afetam resultados fiscais, e que o impacto depende da rigidez da regra orçamentária em análise. Adicionalmente, no caso do Brasil, mudanças institucionais criaram, de forma notável, incentivos previamente não existentes para que governos estaduais efetuassem ajustes fiscais.

Palavras-chave: mudanças institucionais; ajustes fiscais; modelo Logit Multinomial.

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1. Introduction

Researchers have recently identified a trend of redirecting fiscal-responsibility issues to subnational administrative levels and concurrent efforts to set up budgetary institutions to impose fiscal discipline on these government levels (municipalities and states, according to Bails and Tieslau, 2000). Furthermore, the literature on fiscal results emphasizes the role of budgetary institutions on fiscal outcomes (Stein *et alli*, 1998) and has found evidence that, in Latin American countries, “budgetary institutions have had an important effect on primary deficits” (Alesina *et alli* 1996).

What makes Brazil an extremely interesting case is the responsive behavior of state governments to the institutional changes put in practice. Since implementation of the anti-inflation plan in 1994, Brazil, a federative republic in which the central government has the power to impose budget legislation on subnational governments¹, has implemented three changes to budgetary institutions. These changes sought to reduce the dependence level of subnational governments (on the federal government, in terms of financing) by reconstructing their budget constraint and inducing positive fiscal results. According to data published by the National Treasury Secretariat (STN – Secretaria do Tesouro Nacional), it seems that these institutional changes, implemented by the federal government from 1995 on, have induced this responsive behavior and motivated states to make fiscal adjustments.

Table 1: Average fiscal result for 1986-1994 and 1995-2001

States	Average fiscal result (1986 – 1994) % of state GDP	Average fiscal result (1995 – 2001) % of state GDP
Acre (AC)	-2.267	0.002
Alagoas (AL)	-0.294	1.269
Amazonas (AM)	-0.322	0.412
Amapá (AP)	-1.843	1.721
Bahia (BA)	-0.095	-0.787
Ceará (CE)	-0.556	-1.085
Distrito Federal (DF)	-0.062	0.017
Espírito Santo (ES)	-0.888	-0.935
Goiás (GO)	-2.646	-1.191
Maranhão (MA)	2.056	1.873
Minas Gerais (MG)	-0.232	-0.768
Mato Grosso do Sul (MS)	-1.393	-0.109
Mato Grosso (MT)	-3.220	0.063
Pará (PA)	0.315	-0.180
Paraíba (PB)	-1.664	0.317
Pernambuco (PE)	0.008	-1.150
Piauí (PI)	-1.432	1.063
Paraná (PR)	0.135	-2.263
Rio de Janeiro (RJ)	-1.046	-1.380
Rio Grande do Norte (RN)	-1.653	-1.387
Rondônia (RO)	-2.363	-1.945
Roraima (RR)	-3.587	-0.189
Rio Grande do Sul (RS)	0.097	-1.302
Santa Catarina (SC)	-0.359	-0.341
Sergipe (SE)	-0.263	-1.025

¹ Articles 22 and 24 of the Brazilian Federal Constitution list subjects that the federal government is exclusively entitled to legislate on, and subjects that it is entitled to legislate concurrently with states and municipalities.

São Paulo (SP)	-1,481	0,041
Tocantins (TO)	-13,021	-0,793

Source: Data for primary results were obtained from the STN, and for state GDP, from the IBGE (retrieved from IPEADATA). Unlike other states, the average fiscal result for the state of Tocantins was calculated for the period from 1990 to 1994, because we did not have a longer time series.

Considering the twenty six states and the Federal District, just five produced positive fiscal results, on average, between 1986 and 1994². Taking into account the period in which these changes were put into effect, between 1995 and 2001, the number of “adjusting” states increased to ten. Additionally, sixteen states were found to have made some fiscal effort at reducing deficits. Given this undeniable finding, we intend to analyze whether the implemented institutional changes actually created incentives for state governments to undertake fiscal adjustments.

The existing literature has only analyzed how budgetary institutions affect fiscal results³. However, this impact has yet to be investigated in terms of incentives, decision-making processes and their influences.

As such, the question that we intend to answer is: do institutional changes create incentives and influence the decisions of state governments to undertake fiscal adjustments? Moreover, do they influence the odds of an adjustment being successful?⁴ This study seeks to contribute to the literature on the incentives and decision-making processes behind fiscal adjustments by testing the importance of institutional changes on them.

Of course, this is not a simple task. There are different measures of adjustment⁵ and varying definitions of successful adjustments⁶ in the literature.

The literature focused on country studies uses several measures of fiscal adjustments: a) 1.5% of GDP (Lambertini and Tavares, 2000), with different time horizons; b) an improvement, for two years in a row, of the budget balance by 1250 basis points (von Hagen and Strauch, 2001); c) a 250 basis-point improvement of the budget balance as a trigger, and a total improvement of, at least 2000 basis points after at least two years (Heylen and Everaert, 2000); or d) a cut in the primary spending/GDP ratio of at least 5% of GDP over seven years (Hauptmeier *et alli*, 2006)⁷. According to Mierau *et alli* (2007), the definition in von Hagen and Strauch (2001) is meant to capture rapid adjustments, and the one in Heylen and Everaert (2000), gradual ones.

On the other hand, if we consider adjustments at the state administrative level, researchers have used 1.0% of state GDP as a standard measure (Feld and Schaltegger, 2005).

This paper uses two measures of adjustment (1.5% and 1.0% of state GDP, which are more appropriate for Brazilian standards, based on a substantial sample analysis) and three

² Brazil was ruled by a military government from 1964 to 1985. Although elected by the Congress, a civilian president came to power in 1986.

³ See Poterba (1996a,b), Bohn and Inman (1996), Poterba and Rueben (1997) and Bails and Tieslau (2000).

⁴ Our research questions are similar to those asked by Alesina and Perotti (1996). However, our focus is on the decision-making process behind fiscal adjustments, defining what influences the choices and the decision of state governments to undertake a fiscal adjustment. Mierau *et alli* (2007) is a recent exception and analyzes decision-making processes behind fiscal adjustments.

⁵ A threshold must be specified in order to limit our analysis to cases in which adjustments result from intentional actions, rather than from cyclical fluctuations.

⁶ Alesina and Perotti (1995) define success as a relatively permanent consolidation of the budget.

⁷ This is the definition of “ambitious reformers”, as opposed to “timid” ones. The period of adjustment begins “with the year of maximum total expenditure in relation to GDP” (Hauptmeier *et alli*, 2006, pp.5).

different definitions of what makes an adjustment successful (two intended to capture rapid adjustments – two and three years – and one to capture gradual ones: more than four years)⁸.

The decision to evaluate the fiscal-adjustment process, from the institutional change that triggers it, to the adjustment outcome, requires a merger of two research fields into one study: the literature on how institutional changes affect fiscal adjustments; and the literature on what makes an initial adjustment succeed. From this merger follows our decision to use a multinomial logit model to capture the three possibilities involved: no adjustment, successful adjustment and failed adjustment.

We acknowledge the restrictive weakness of using previously specified measures of adjustment⁹, but empirically, and based on existing literature, we found it to be the only feasible option.

One must keep in mind, though, that while governments are responsible for fiscal results, they also assume responsibility for the welfare of their citizens. If state governments maximize the welfare function of their residents, then the highest welfare function proves to be the highest probability of a choice j , such that $P(U_j > U_k), j \neq k$. Considering the Independence of Irrelevant Alternatives (Greene, 2003)¹⁰, and following a simultaneous decision-making process, alternative Y_i indicates the government's choice, considering all existing alternatives. The probability of variable j being selected is given by $P(Y_i = j)$. This choice will depend on each state's set of characteristics (fiscal, social and economic), represented by vector X_i . The use of a Multinomial Logit model to estimate equations provides us with a set of probabilities for $J+1$ choices for the decision maker.

In order to achieve this objective, this paper has been organized into five sections, including this introduction. Section two provides a brief literature review of the importance of budgetary institutions in determining fiscal results. This section also contains a brief synopsis of Brazilian institutional changes in the 1990s and turn of the 21st century. The third section describes the empirical analysis. The empirical results, reported in section four, demonstrate that institutional changes influenced the decision-making process behind fiscal adjustments. Finally, in section five, we discuss our primary results and make some brief conclusions.

2. Changes to budgetary institutions and state-government budget constraints

First of all, we need to standardize a few definitions. We define budgetary institutions as “all the rules and regulations according to which budgets are drafted, approved, and implemented” (Alesina and Perotti., 1996, pp.401). Moreover, they identify types of rules and regulations: a) numerical targets; b) procedural rules; and c) rules of transparency.¹¹ The literature focuses on two levels when analyzing fiscal results: a) federal; and b) state. Our analysis concentrates on the latter.

From this point, we can establish a theoretical comparison¹², for illustrative purposes only, between a federative country, such as Brazil, and the European Union. This theoretical assumption allows us to say that states, in the case of Brazil, and member governments, in the case of the E.U., expect the monetary authority to bail out insolvent members, thus reducing

⁸ A successful adjustment occurs whenever the budget deficit is reduced by at least a certain rate, after a defined period. See the appendix for definitions of successful fiscal adjustments under use.

⁹ There may be some intended adjustments that the proposed model will not be able to capture due to an empirical time-horizon constraint.

¹⁰ The disturbances are independent and homoskedastic. Hausman tests have been performed.

¹¹ For a detailed definition, please refer to the original paper.

¹² This comparison is based on the one made by von Hagen (1991) between European Union member states and American state governments.

their fiscal discipline. As a consequence, overall success is put in jeopardy (the Brazilian Federal Government or the European Union).¹³

On the other hand, according to von Hagen (1991), the design of formal fiscal restraints must be done with care, given that they have an impact on fiscal policies, although without affecting extreme cases.

Based on findings from Hallerberg *et alli* (2006), whose study focused on the European Union, we would expect more stringent fiscal rules to contribute to fiscal discipline. However, the authors add, "...the choice of institutions to strengthen fiscal discipline and their impacts depend critically on the type of government and, hence, the political environment and constitutional characteristics such as the electoral system" (Hallerberg *et alli*, 2006, pp. 20). Since we are dealing with state governments in our proposed study, the type of government, the political environment, and constitutional characteristics such as the electoral system are all identical, or at least extremely similar.

At this point it is interesting to highlight the conclusion of Hauptmeier *et alli* (2006), since it corroborates the initiative of implementing changes to budget institutions and imposing these changes on subnational governments in Brazil: "Virtually all episodes of ambitious reform featured the strengthening of national and sub-national budgetary procedures and institutions" (Hauptmeier *et alli*, 2006, pp. 42).

Analyzing American state governments, Bohn and Inman (1996) showed that balanced budget rules, when appropriately constructed and with appropriate enforcement, reduce the propensity of these states to run deficits. Their analysis leads to four main conclusions:

"1) balanced-budget constraints that apply to an audited, end-of-year fiscal balance are significantly more effective than constraints requiring only a beginning-of-the-year balance; 2) all state balanced-budget rules are ultimately enforced by a state's Supreme Court. Those states whose supreme courts are directly elected by citizens have 'stronger' constraints (which lead to larger average surpluses) compared to those states whose supreme court justices are political appointments of the governor or legislature; 3) there is tentative evidence that constraints grounded in the state's constitution are more effective than constraints based upon statutory provisions; 4) budget surplus states are slightly less responsive to cyclical swings in income and unemployment than are surpluses in states with weak requirements" (Bohn and Inman, 1996, pp. 64).

Poterba and Rueben (1997) also investigated the effects of state fiscal institutions on state bond costs in American state governments, using a panel of forty US states, during the period from 1973 to 1996. They found that the American states with tighter anti-deficits rules, and more restrictive provisions on the authority of state legislatures to issue debt, paid lower interest rates on their bonds. States with binding revenue-limitation measures tend to face higher borrowing rates by approximately the same amount, while states with expenditure limits face lower borrowing costs. The fiscal laws that control expenditures or restrict taxes have different impacts on borrowing costs. In the first situation, the cost is higher than in the second.

In addition, Bails and Tieslau (2000), using a panel of forty-nine American states, with data from 1969 to 1994, demonstrated that the imposition of a balanced budget requirement is not an effective tool for reducing government expenditures, unless it is combined with tax and spending limitations.

And finally, Alt and Lowry (1994), as well as Poterba (1994), recommend balanced-budget laws as suitable tools for the state level, but not for the federal level.

¹³ Please note, however, as von Hagen (1991) stated, that the degree of economic integration is much higher in a federative government than in an economic union.

2.1. The institutional framework that created an incentive scheme and induced fiscal adjustments in Brazil

Three changes to budgetary institutions have impacted state-level budget constraints since the mid-nineties¹⁴, ending (or at least reducing) past fiscal profligacy, and at the same time ending a history of soft-budget constraints: a) the Bacha Effect¹⁵, which results from severe reductions of inflation rates; b) the restructuring of states' debt; and c) the law of fiscal responsibility.

The Real Plan, with effects from 1994 on, imposed changes on budget institutions at all levels of government. It involved fiscal adjustment, a wage adjustment, an exchange-rate anchor, and tight monetary policy, while seeking not only to control inflation, but also to balance national and subnational government accounts - "it provided the federal government with leverage to constrain the capacity of subnational actors to affect Brazil's economy" (Samuels, 2003, pp. 547). With falling inflation rates, the possibility of managing fiscal accounts artificially, using seigniorage, was no longer feasible.¹⁶

Furthermore, according to Bevilacqua (2002) and Stein (1999), control of inflation confirmed the impossibility of maintaining federal financing for states' increasing debt. Given that the majority of state governments (25 out of 27)¹⁷ owned commercial banks to manage their cash, they were able to finance deficits via these banks. The issuing of state debt was controlled by state treasuries and easily absorbed by state-run banking institutions. When a state-run bank had liquidity problems, the Central Bank of Brazil offered emergency credit lines. This was the easiest way to manage state finances, making all these state-run banking institutions, at least pragmatically, money issuers. With the implementation of the Real Plan, and the consequent drop in inflation rates, the Central Bank could not continue to bail out failed banks.

As a consequence, after 1994, the Central Bank of Brazil intervened in several state-run banks, leading many to privatizations and negotiated agreements to refinance state debts. According to Bevilacqua (2002), this process began with the federal intervention of Brazil's most powerful state-run bank – BANESPA (Banco do Estado de Sao Paulo) or the Sao Paulo State Bank – in December, 1994. After the intervention, the bank was privatized, and the state of Sao Paulo was the first to sign a binding agreement with the federal government, through which it agreed to assume all of Sao Paulo's debt.^{18 19} Afterwards, "Sao Paulo [became] one of the reform states, making it more technically feasible to impose budget constraint[s] on the states as a group" (Dillinger and Webb, 1999, pp.33). In other words, the act of intervening into the most powerful state banking institution reinforced the central government's credibility.

¹⁴ After 1994, with the implementation of the anti-inflation plan known as the Real Plan.

¹⁵ Also known as the Tanzi Effect, in which politicians reduce real expenditures by delaying disbursements, so inflation can erode their value.

¹⁶ Bacha (1994) argues that asymmetric price-level restatement of the public budget – keeping the real value of revenue from changing, and depreciating expenditures – enabled the existence of an artificial balance of public accounting, concealing a huge potential deficit. This effect is known in Brazil as the "Bacha Effect".

¹⁷ According to Werlang and Novaes (1993).

¹⁸ Elevation of the federal interest rate in 1995 was one of the reasons Bevilacqua (2002) mentioned as being responsible for the states' debt restructuring. An appreciated exchange rate was one of the anchors of the stabilization plan, avoiding pressure on price indexes. Despite this policy leading to a higher fiscal effort, the Central Bank of Brazil raised interest rates in order to keep exchange rates appreciated. Several states were unable to endure this policy, combined with the changes to budgetary institutions already mentioned.

¹⁹ Despite the fact that negotiation of the State of Sao Paulo's debt took place between 1995 and 1996, the specific law, promulgated on September, 1997, established the criteria for renegotiation between states and the federal government.

In general, after consolidation of state debts at the federal level²⁰, subnational governments agreed to pay 12% of their current net revenue as debt service. If total interest exceeded this amount, then the excess would be capitalized and deferred until repayment of the principal. In order to help states, the federal government negotiated a debt extension, and the Senate established a resolution: state governments, which had an indebtedness threshold of more than two times their current net revenue, had fifteen years to adjust it to this level. The adjustment had to occur in a specific way: 1/15th of the total maladjustment per year. If states did not pay the debt service, then the federal government had legal support to confiscate transfers in order to guarantee payment.

In 2000, the federal government passed the Law of Fiscal Responsibility, aimed at solidifying incentives for fiscal discipline at all levels of government and all branches of power: Executive, Legislative and Judicial. The Law of Fiscal Responsibility has sought to push more public-sector responsibilities onto state and local governments. According to Alesina *et alli* (1996), the Fiscal Responsibility Law can be interpreted as a law that establishes fiscal constraints and requires transparency of documents and procedures²¹, while imposing penalties for abuses.

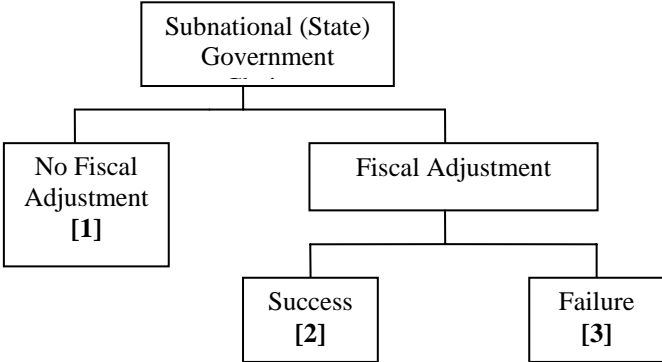
Alesina *et alli* (1996) consider Brazil a middle-group country in terms of transparency and legislative constraints on the deficit (along with Paraguay, Costa Rica, Venezuela, Ecuador and Guatemala).

3. Empirical Analysis

3.1. The model

Our objective is to analyze incentives and the decision-making processes of state governments when undertaking fiscal adjustments. Once the decision to make an adjustment has taken place, the adjustment can either succeed or fail. Figure 1 shows the game tree that state governments face.

Figure 1: State Government Decision Tree Model



Since we are dealing with fiscal institutions and fiscal performance, we must also consider potential endogeneity problems with budget rules (Poterba, 1994, 1996b, Alesina and Perotti, 1995). However, since our model analyzes federal rules imposed on state

²⁰ State debt was swapped for federal debt on financial markets.

²¹ Mendes (1999).

budgetary institutions²², we assume, at least for the state level, that budget rules are exogenous.²³

The Multinomial Logit model describes the likelihood that a certain event j will occur, for a specific set of characteristics included in vector X_i . The Multinomial Logit model, in this case, estimated three equations, taking the value [1] (No Fiscal Adjustment) of the dependent variable as the base outcome. The estimated equations provide the likelihood of choosing a $J+1$ alternative. In this case, there are three alternatives: [1] No Fiscal Adjustment, [2] Successful Fiscal Adjustment and [3] Failed Fiscal Adjustment. As such, the probabilities are:

$$\text{Pr ob}(Y_i = j \setminus X_i) = \frac{e^{x_i \beta_j}}{1 + \sum_{j=1}^2 e^{x_i \beta_j}}, \text{ for all } j=1, 2.$$

$$\text{Pr ob}(Y_i = 0 \setminus X_i) = \frac{1}{1 + \sum_{j=1}^2 e^{x_i \beta_j}},$$

The coefficients of the model are not interpreted directly, nor are marginal effects directly obtained from the estimation. Marginal effects can be obtained by differentiation:

$$\frac{\partial \text{Pr ob}(Y_i = k)}{\partial X_i} = \text{Pr ob}(Y_i = k) \left[\beta_k - \sum_{j=0}^j \beta_j \text{Pr ob}(Y_i = j) \right]$$

For continuous variables, the marginal effect is the change in likelihood of event j occurring due to a change in the independent variable (average value). For dummy variables, the marginal effect represents the effects of a discrete change from 0 to 1²⁴.

According to Greene (2003), the Multinomial Logit model assumes that disturbances are independent and homoskedastic. If a model includes a subset of irrelevant alternatives, then the estimates become inefficient, although not inconsistent. Whenever irrelevant alternatives are not independent, the estimators are inconsistent. The Hausman test (Chi-square) proposed by Hausman and McFadden (1984) is presented, in order to assure the independence of irrelevant alternatives. The Multinomial Logit model is estimated by maximum likelihood.

3.2. Data

A random variable (Y_i) defines the choice of Brazilian state governments. It has been constructed based on identified adjustment episodes within the period under study, as shown in Table 2, prepared by the authors:

²² Known as “top-bottom” formulation of budget rules.

²³ Alesina *et alli* (1996), in order to use budgetary institutions as explanatory variables for fiscal results, assume that they are exogenous or predetermined. This derives from the fact that they cannot be easily changed in response to current or past fiscal results.

²⁴ Marginal effects of estimated coefficients have been estimated and are available upon request.

Table 2: Identified adjustment episodes

	Adjustments - 1.5% of state GDP	Adjustments - 1.0% of state GDP
Adjustments - 1.0% of state GDP	N/A	75
Adjustments - 1.5% of state GDP	52	N/A
Successful adjustments - two years definition	20	24
Successful adjustments - three years definition	14	15
Successful adjustments - more than four years definition	13	19

Source: National Treasury Secretariat (STN)

Table 3 shows how the dependent variable (Y_i) was derived for this study.

Table 3: Description of the dependent variable

Y_i (depending on the measure used, 1.5% or 1.0% of state GDP)	= 1 No Fiscal Adjustment
	= 2 Success (after the initial adjustment, proceed with one of the definitions of success – two, three, four or more than four years)
	= 3 Failure (after the initial adjustment, the state government is not able to maintain a successful adjustment, according to the definitions presented – two, three or more than four years)

The independent variables (X_i) used as determinants of state-government choices are *GINI*, *GRANTS*, *ELECTIONS* and *FRAC*.

The *GINI* variable (GINI index) describes income inequality. Although it is uncommon to use this variable in subnational models, Persson and Tabellini (1994) found out its relevance when studying the relationship between inequality and growth. Inequality increases the demand for social expenditures (via median voter)²⁵, even though it does not lead to unbalanced budgets. The tax burden on capital owners rises in order to maintain a balanced budget, but it ends up reducing return on capital, investment and growth rates. Since the balanced-budget hypothesis was not empirically investigated, we do not have any intuition regarding expected results.

The *GRANTS* variable is a proxy of subnational governments' degree of dependence from vertical transfers from the federal government – it is calculated as a percentage of state revenues comprised of federal transfers. It is used as a control variable due to the fact that a significant portion of these transfers are earmarked, and the fact that many states depend heavily on them.^{26 27} Since the calculation of coefficients that stipulate transfers to each state takes per-capita income, inhabiting population and demographic density into account, these variables cannot be used separately without running into multicollinearity problems. Given some states' heavy dependence, one might expect a significant flypaper effect: expenditures would grow more than revenue, thus worsening fiscal results.²⁸ The database used to construct this variable was obtained from the National Treasury Secretariat.

The *FRAC* variable, used to represent political fragmentation, was calculated according to the fragmentation of the Lower House immediately after elections. Since a more fragmented legislature hinders political negotiations, we expect a negative impact.

²⁵ Prominent inequality makes the median-voter income similar to the income of the poor. This makes both choose the same alternatives.

²⁶ The 1988 Constitution earmarked a substantial proportion of revenue.

²⁷ The average share of transfers in states' total revenue, from 1986 to 2001, was 39.50%. The minimum was 0.39% and the maximum was 99.82%.

²⁸ Hines and Thaler (1995).

Lastly, the *ELECTIONS* variable was constructed as a dummy variable, with value 1 for election years, and 0 otherwise. According to the political-cycle theory (Nordhaus, 1975, Rogoff and Silbert, 1988 and Rogoff, 1990), we expect a negative impact for this variable, since election years tend to have budget deficits.

Table 4 shows the descriptive statistics of independent variables used in the proposed econometric specification.

Table 4: Descriptive statistics of independent variables

Variable	Obs	Mean	Standard Deviation	Min	Max
<i>GINI</i>	347	0.5798395	0.0406696	0.4255667	0.6664805
<i>GRANTS</i>	430	0.3953705	0.2359057	0.0039047	0.9982
<i>FRAC</i>	417	0.7942686	0.0885368	0.498	0.92

Source: National Treasury Secretariat.

As discussed above, we wish to test whether or not three institutional changes have had an impact on state budget constraints. As such, they will be used in empirical tests: *BACHA*, *DEBTRESTRUCTURE* and *LAW2000*.^{29 30}

The Bacha-effect variable, *BACHA*, was constructed as a dummy variable, with value 0 until 1994, and 1 from 1995 on. We expect a positive effect on the likelihood of state governments undertaking fiscal adjustments.

Considering that the effects of restructuring state debt would have a real impact from 1998 on, the *DEBTRESTRUCTURE* variable, which represents this change, will have value of 0 until 1997, and a value of 1 from 1998 on. Since renegotiation is based on a commitment with state governments, we expect a positive impact on the likelihood of state governments undertaking fiscal adjustments.

The *LAW2000* variable was also constructed as a dummy variable, with value 0 until 2000 and value 1 from 2001 on. We expect a positive effect on the likelihood of state governments undertaking fiscal adjustments, based on the law's design.

4. Empirical Results

Tables 5 and 6 illustrate the results from the Multinomial Logistic model estimation, with fiscal adjustment measures of 1.5% and 1.0% of state GDP, using the three definitions of successful adjustments (two, three or more than four years). The Hausman test, used to confirm the independence of irrelevant alternatives, ensures that the properties of the estimators are not violated.

Insert table 5 here

Insert table 6 here

The estimated coefficients, β_j , reflect the effect of X on the likelihood of each possible outcome [2] (Successful Fiscal Adjustment) and [3] (Failed Fiscal Adjustment) relative to the alternative [1] (No Fiscal Adjustment).

²⁹ Demographic variables (size of population over sixty-five years old over total population, among others), have been tested, but did not produce significant results.

³⁰ We did not use lagged states' indebtedness as a control variable, because data are only available from 1994 on. We would like to have used state inflation rate and state unemployment rates as control variables, but data are only available for select capital cities.

The variable representing inequality (*GINI*) did not produce robust results with the 1.5% of state GDP measure of adjustment, since the signals of estimated coefficients oscillated with the use of different definitions of success. When the 1.0% of state GDP was used, the *GINI* variable revealed a trend of lower odds of a fiscal adjustment occurring (despite the estimated coefficients not being significant). This may be due to the fact that, in the presence of higher inequality, state governments face a greater demand for social expenditures, thus worsening fiscal results. However, we are unable to attest that this effect leads to unbalanced budgets (Persson and Tabellini, 1994).

The relevance of transfers to state budgets (*GRANTS*) turned out to be important, increasing the odds of state governments making an adjustment. One might expect a different result for this variable, based on existing literature: given that a higher degree of dependence on the federal government by subnational governments generates the flypaper effect, the higher that *GRANTS* are, the harder it would be for a state government to undertake an adjustment.

The *BACHA_EFFECT* variable was significant in two cases: increasing the odds of a gradual, successful adjustment at 1.5% of state GDP (more than four years), and decreasing the odds of a rapid, successful adjustment at 1.0% of state GDP (two years). We do not have any insight, or even literature, to explain these alternate results.

The restructuring of state-government debts (*DEBTRESTRUCTURE*) was the institutional change that most influenced subnational governments when deciding whether to undertake fiscal adjustments³¹, rather than not undertaking any – it was a determining factor for both measures of adjustment (1.5% and 1.0% of state GDP). Nevertheless, one cannot affirm that it was decisive when the success of the adjustment was put into question – the significance of the *DEBTRESTRUCTURE* variable varied for successful and unsuccessful adjustments. Depending on the definition of success, debt restructuring produced different results.

According to the literature, “more transparent and hierarchical budgetary procedures lead to lower deficits and debt” (Stein *et alli*, 1998, pp. 17).³² This finding restates our conclusion regarding the *DEBTRESTRUCTURE* variable.

The Law of Fiscal Responsibility (variable *LFR*) increased the odds of rapid (three years) unsuccessful adjustments for both measures of adjustment. Unfortunately, since it has been implemented at the end of our series, we may be underestimating the potential effects of this institutional change. As soon as new data become available, we intend to extend this study in order to better evaluate its effects.

The *FRAC* variable, which represents political fragmentation, only produced the expected results in one case: gradual adjustments at 1.5% of state GDP, but with no significance. Some results were significant, but in opposition to our initial beliefs. This is certainly a case for further study, since we do not have a clear idea of why a higher degree of legislative fragmentation would lead to a higher probability of state governments undertaking fiscal adjustments.

The results for the *ELECTIONS* variable were in line with our expectations (except for one case), showing that, in election years, it is virtually impossible for fiscal adjustments to be

³¹ This might be due to the fact that this institutional change was adequately designed in terms of enforcement. If state governments fail to meet their financial obligations, the federal government has legal support to confiscate transfers. In January, 1999, the Governor of Minas Gerais, Itamar Franco, unilaterally decreed a 90-day moratorium on repayment of the state's estimated \$13.5 billion debt to the federal government, which then decided to confiscate federal transfers to the state. This confirmed the institutional change as credible.

³² One should understand “more transparent and hierarchical budgetary institutions” as “institutions that promote a more comprehensive view of the costs and benefits of government activities” (Stein *et alli*, 1998, pp. 16).

undertaken: this variable was significant, reducing the odds of an adjustment, irrespective of the definition used for adjustment or success.

5. Main Conclusions

We have attempted to determine whether changes to budgetary institutions, implemented by the Brazilian federal government, created incentives and influenced the decisions of state governments to undertake fiscal adjustments, based on the results obtained herein. Moreover, in line with the international literature, we attempted to investigate whether they have influenced the odds of an adjustment succeeding or failing.

In line with Eichengreen (1992), Poterba (1994), Alt and Lowry (1994) and Alesina *et alli* (1996), we found that budget institutions do have an impact on fiscal results; this led us to conclude that budget institutions are relevant when it comes to fiscal outcomes and the degree of fiscal discipline. However, the state governments' choice of undertaking or forgoing a fiscal adjustment does not necessarily result in successful adjustments at all times.

Analyzing the specific case of Brazil, we were able to conclude that the institutional changes implemented by the federal government had created incentives for state governments to make fiscal adjustments. Using data prior to 1995, state governments did not undertake any adjustments, because they did not have any incentive to do so. After 1995, and until 2001, they showed a clear trend that the required incentives may have been created, and they started making fiscal adjustments year after year.

Contrary to our initial expectations, the *BACHA_EFFECT* variable was significant in just two cases: increasing the odds of a gradual successful adjustment at 1.5% of state GDP (more than four years), and decreasing the odds of a rapid successful adjustment at 1.0% of state GDP (two years). Since this result varies, we intend to conduct a more thorough analysis before discussing the efficiency of this institutional change.

The restructuring of states-government debt (*DEBTRESTRUCTURE*) was the institutional change that most influenced subnational governments to undertake fiscal adjustments³³, rather than not undertaking any – it was a determining factor for both measures of adjustment (1.5% and 1.0% of state GDP). Nevertheless, one cannot affirm that it was decisive when the success of the adjustment was put into question – the significance of the *DEBTRESTRUCTURE* variable varied for both successful and unsuccessful adjustments. Depending on the definition of success, debt restructuring produced different results.

Establishing a Law of Fiscal Responsibility did not have a significant impact on the decision to undertake a fiscal adjustment.³⁴ This finding is in line with Bails and Tieslau (2000), for whom “the imposition of a balanced requirement by itself does not seem to be an effective weapon for use in decreasing government expenditures” (Bails and Tieslau, 2000, pp.271). We may need to extend our analysis as soon as new data become publicly available.

We also obtained four secondary results. Firstly, a higher amount of transfers from the federal government in the state's budgets (represented by the *GRANTS* variable) increases the odds of the state government making an adjustment. One might expect a different result for this variable, based on existing literature: given that a higher degree of dependence on the

³³ The reader may be puzzled and led to believe in the odds of the federal government having bought a state-level adjustment: given that the *DEBTRESTRUCTURE* variable had produced extremely significant estimated coefficients, one might speculate that the federal government had federalized state debt in exchange for fiscal adjustments at the state level. However, after analyzing the full text of the Fiscal Responsibility Law, one finds that the federal government brilliantly designed an enforcement device: it is able to force highly dependent states to service their debt; otherwise it can retain federal transfers to these states. However, when it comes to the largest states, since they rely on local taxes, enforcement is not as efficient.

³⁴ This may also be due to the fact that the Law of Fiscal Responsibility was put into effect in 2001, at the end of our period of analysis.

federal government by subnational governments generates the flypaper effect, the higher the *GRANTS* variable, the harder it is for a state government to make an adjustment, and the less incentive it would have.

Secondly, the variable representing inequality (*GINI*) did not produce robust results with the 1.5% of state GDP measure of adjustment, since the signals of estimated coefficients varied with the use of different definitions of success. When the 1.0% of state GDP measure of adjustment was used, the *GINI* variable tended to lower the odds of fiscal adjustments (even though the estimated coefficients were not significant). We believe that this might be due to the fact that in the presence of higher inequality, state governments face greater demand for social expenditures. However, we are unable to attest that this effect leads to unbalanced budgets (Persson and Tabellini, 1994).

Thirdly, political fragmentation (*FRAC*) only produced the expected results in one case: gradual 1.5% of state GDP adjustments, but with no significance.

Lastly, the results for election years (*ELECTIONS*) are in line with our expectations (except for one case), showing that, in election years, it is virtually impossible for fiscal adjustments to be undertaken: it significantly reduced the odds of an adjustment, irrespective of the definition used for adjustment or success.

APPENDIX

In this study, the definitions of fiscal adjustment, and consequently, the definitions of successful fiscal adjustment, abide by those set out in Lambertini and Tavares (2001), save for the fact that one more specification of adjustment (1.0% of state GDP) and one more definition of length for successful adjustments (more than four years) have been included. It follows then that:

1. Fiscal adjustment – 1.5% of state GDP:

A period of fiscal adjustment is a year in which the primary deficit is reduced by at least 1.5% of state GDP from the previous calendar year (fiscal and calendar years are coincidental for Brazilian government entities). Let D_t be the primary deficit-to-GDP ratio in year t.

There is a fiscal adjustment in period t if

$$D_t - D_{t-1} \leq -0.015$$

2. Fiscal adjustment – 1.0% of state GDP:

A period of fiscal adjustment is a year in which the primary deficit is reduced by at least 1.0% of state GDP from the previous calendar year. Let D_t be the primary deficit-to-GDP ratio in year t.

There is a fiscal adjustment in period t if

$$D_t - D_{t-1} \leq -0.010$$

3. Successful Fiscal adjustment - two years definition:

A fiscal adjustment is defined as successful if the average change in the primary deficit-to-GDP ratio is less than or equal to zero in the two calendar years following the year the deficit was cut. Following the definitions above, it follows then that:

The fiscal adjustment in period t is successful if

$$\frac{\{[D_{t+1} - D_t] + [D_{t+2} - D_{t+1}]\}}{2} \leq 0$$

4. Successful Fiscal adjustment - three years definition:

A fiscal adjustment is defined as successful if the average change in the primary deficit-to-GDP ratio is less than or equal to zero in the three calendar years following the year the deficit was cut. Following the definitions above, it follows then that:

The fiscal adjustment in period t is successful if

$$\frac{\{[D_{t+1} - D_t] + [D_{t+2} - D_{t+1}] + [D_{t+3} - D_{t+2}]\}}{3} \leq 0$$

5. Successful Fiscal adjustment - more than four years definition:

A fiscal adjustment is defined as successful if the average change in the primary deficit-to-GDP ratio is less than or equal to zero in the n (as long as $n > 4$) calendar years following the year the deficit was cut. Following the definitions above, it follows then that:

The fiscal adjustment in period t is successful if

$$\frac{\{[D_{t+1} - D_t] + [D_{t+2} - D_{t+1}] + [D_{t+3} - D_{t+2}] + [D_{t+4} - D_{t+3}] + \dots + [D_{t+n} - D_{t+n-1}]\}}{n} \leq 0$$

Use of this definition is crucial because it includes political-cycle implications in our model. Considering a measure of success that analyses periods of more than four years, we implicitly analyze two different cabinets, or a reelected state governor.

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Table 5: Multinomial Logistic Regression with adjustments of 1.5% of state GDP

Type of adjustment	Two years		Three years		More than four years	
	[2]/[1]	[3]/[1]	[2]/[1]	[3]/[1]	[2]/[1]	[3]/[1]
GINI	-0.129 -0.521	1.505 -0.967	-0.257 -0.529	-0.379 -0.828	-0.175 -0.437	0.731 -0.898
GRANTS	2.946 (1.621)*	5.235 -3.392	3.222 (1.785)*	3.579 (1.858)*	2.172 -1.753	8.492 (2.170)***
BACHA_EFFECT	-0.688 -0.497	-0.470 -1.078	0.081 -0.461	-1.115 -1.269	0.662 (0.373)*	-19.477 0.000
DEBTRESTRUCTURE	1.020 (0.532)*	1.059 -1.142	0.330 -0.502	1.805 -1.146	-0.071 -0.400	21.266 (0.919)***
LFR	0.321 -0.557	0.026 -1.053	-0.091 -0.630	1.168 (0.691)*	0.279 -0.480	-0.240 -0.799
FRAC	2.444 -1.803	5.611 -4.555	0.384 -1.798	8.822 (4.755)*	-0.225 -1.510	-0.384 -4.354
ELECTIONS	-0.698 (0.375)*	-0.022 -0.736	-0.160 -0.358	-0.480 -0.543	0.006 -0.305	-0.794 -0.671
Constant	-3.635 (1.366)***	-8.174 (3.687)**	-2.202 (1.319)*	-10.384 (3.898)***	-1.382 -1.109	-3.335 -3.044
Observations	417		417		417	
LR χ^2	23.38		22.53		-	
Pseudo-R-squared	0.05		0.06		0.06	
Log-likelihood	-210.77		-229.88		-266.24	
Hausman-type test of IIA (χ^2) [#]	0.805 (for Ho)		0.245 (for Ho)		0.2 (for Ho)	
Hausman-type test of IIA (Prob > χ^2) [#]	0.9990		1.0000		0.0620	
Hausman-type test of IIA (χ^2) ⁺	-4.176 (for Ho)		-3.593 (for Ho)		13.435 (for Ho)	
Hausman-type test of IIA (Prob > χ^2) ⁺	1.0000		1.0000		1.0000	

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Multi = 1 (No Fiscal adjustment) is the base outcome

IIA means Independence of Irrelevant Alternatives

Ho: odds (outcome-J vs. outcome-K) are independent of other alternatives. (for Ho) means evidence.

Full multinomial logit model versus restricted multinomial model, excluding alternative 3 (Failure)

+ Full multinomial logit model versus restricted multinomial model, excluding alternative 2 (Success)

Table 6: Multinomial Logistic Regression with adjustments of 1.0% of state GDP

Type of adjustment	Two years		Three years		More than four years	
	[2]/[1]	[3]/[1]	[2]/[1]	[3]/[1]	[2]/[1]	[3]/[1]
GINI	-0.07 (0.4480)	-0.096 (0.7430)	-0.322 (0.4900)	-1.009 (0.6250)	-0.2 (0.3710)	-0.446 (0.8630)
GRANTS	1.458 (1.5330)	2.559 (1.9520)	2.685 (1.9040)	2.338 (1.4240)	1.072 (1.4190)	3.847 (1.784)**
BACHA_EFFECT	-0.981 (0.457)**	-0.217 -0.748	-0.329 -0.442	-1.052 -0.904	0.477 -0.328	-19.741 0.000
DEBTRESTRUCTURE	0.98 (0.496)**	0.829 -0.715	0.216 (0.5050)	1.748 (0.838)**	-0.148 -0.368	20.504 (0.730)***
LFR	0.402 -0.508	0.697 -0.743	-0.328 -0.696	1.435 (0.599)**	0.290 -0.449	1.037 -0.793
FRAC	3.962 (1.882)**	6.418 (3.604)*	1.525 (1.8930)	8.479 (3.641)**	1.478 -1.368	7.743 -5.653
ELECTIONS	-0.666 (0.345)*	-0.734 -0.522	-0.251 (0.3530)	-1.167 (0.443)***	-0.082 -0.279	-0.789 -0.556
Constant	-4.412 (1.447)***	-7.913 (2.864)***	-2.692 (1.409)*	-9.334 (2.945)***	-2.125 (1.021)**	-9.057 (4.388)**
Observations	417		417		417	
LR χ^2	26.88		35.22		-	
Pseudo-R-squared	0.05		0.08		0.05	
Log-likelihood	-265.48		-267.31		-314.88	
Hausman-type test of IIA (χ^2) [#]	0.039 (for Ho)		-0.468 (for Ho)		.097 (for Ho)	
Hausman-type test of IIA (Prob > χ^2) [#]	1.0000		1.0000		1.0000	
Hausman-type test of IIA (χ^2) ⁺	.430 (for Ho)		-3.853 (for Ho)		3.180 (for Ho)	
Hausman-type test of IIA (Prob > χ^2) ⁺	1.0000		1.0000		0.8680	

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Multi = 1 (No Fiscal adjustment) is the base outcome

IIA means Independence of Irrelevant Alternatives

Ho: odds (outcome-J vs. outcome-K) are independent of other alternatives. (for Ho) means evidence.

Full multinomial logit model versus restricted multinomial model, excluding alternative 3 (Failure)

+ Full multinomial logit model versus restricted multinomial model, excluding alternative 2 (Success)