On the Sustainability of Subnational Government Finance - A Panel Data Approach

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Abstract: Institutional influences of borrowing constraints on subnational financing decisions are examined using a broad panel dataset of 43 developing and industrial countries. Dummy variables for the institutional design of national restrictions are tested using most recent dynamic panel data techniques, in order to account for rigidities in deficit allocation and to allow for a more comprehensive analysis. The results are mixed. Self-imposed rules seem to have a significant influence on the financing decision, while other institutional arrangements do not. Furthermore countries where bailouts by the superior jurisdiction occurred in the past tend to have higher deficits.

JEL classification: H10, H62, H74

Keywords: Federalism, Public Debt, Panel Data

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# Table of Contents

1. Introduction ..................................................................................................................1

2. Theoretical Considerations .............................................................................................2

   2.1 Devolution tendencies .................................................................................................2

   2.2 Institutions to contain indebtedness ...........................................................................5

3. Empirics ..........................................................................................................................9

   3.1 Data Description .........................................................................................................9

   3.2 Empirical Model and Econometric Methods ..............................................................11

      3.2.1 Static Analysis .......................................................................................................12

      3.2.2 Dynamic Analysis .................................................................................................13

   3.3 Results .......................................................................................................................13

      3.3.1 Descriptive Statistics Results ...............................................................................13

      3.3.2 Static Estimation Results .......................................................................................14

      3.3.3 Dynamic Estimation Results ................................................................................17

4. Conclusion .......................................................................................................................17

5. Bibliography ....................................................................................................................19

6. Appendix ..........................................................................................................................21
1 Introduction

Subnational financing in Federal States has been a controversial political topic in most developed and developing countries, as incentives between different government layers are often intertwined and do not yield the desired sustainability of state finances. Various authors argue that federations tend to accrue higher debt levels and follow less sustainable fiscal policies. The theoretical political economy literature on the subject is broad and discusses inter alia common pool, free rider and coordination problems. In essence those problems might arise horizontally between the different subnational entities as well as vertically between the entities and the central government. Incentives to deviate from a sustainable financing path may arise for the agents. In pure form two organization principles need to be distinguished: the autonomy principle, which allows the subnational governments to decide independently and the principle of vertical integration, where the superordinate entity allocates the resources to lower levels. Both principles share a transparent perception of responsibilities for public finance and the accumulation of debt. However, between the two pure forms, varieties of mixed forms exist; also know as systems of vertical imbalances, which create disincentives and irresponsibilities. Mixed forms evolved more rapidly during the last decades in most federations ranging from Argentina as an emerging economy to Germany as an industrialized country, where subnational governments are free to borrow in spite of the fact that the central governments are perceived as the 'lender of last resort'. As a result the borrowing costs are reduced and the market mechanism, which sanctions the rising indebtedness with higher yield spreads, is abandoned. The overall debt load of the state is thus increased, which leads to inefficient high levels of debt.

As a consequence of polit-economic problems, various different institutions have been developed to contain excessive indebtedness by subnational entities to avoid bailout strategies through the subordinate government. Drivers of the success of different institutions require a closer identification with respect to its ability to attain long-run sustainability. Hence the paper will focus on subnational financing and feasible institutions to contain excessive indebtedness.

This paper analyzes the arrangements met in different international countries from an empirical perspective and expands the existing literature to give a broad picture on solutions and their resulting effects on the overall state financing posi-
tion. A comprehensive dataset of subnational finances of 43 countries was accumulated and tested using panel data analysis. Hereby the most recent panel data estimators, as e.g. Hausman Taylor estimator and Blundell-Bond linear dynamic panel-data estimator are applied. The paper is organized as follows. Following the introduction, theoretical aspects of the subject are discussed. Thereafter the dataset and the econometric methods are described. In the fourth part the results and robustness checks are being presented and finally a conclusion is drawn.

2 Theoretical Considerations

2.1 Devolution tendencies

Most economist assess competition as positive, however a broad discussion on the efficiency of system competition within a state is ongoing.\(^1\) The broad theory of political failures to promote fiscal discipline may lead to the impression that federal systems will have higher debt levels than unitary states, since all influences on an increasing budget, such as fiscal illusion by politicians, political business cycles and fragmented governments, which lead higher deficits, may occur on each federal level separately and hence multiplier effects evolve. Decentralized countries are therefore particularly susceptible to overspending as subnational governments are likely to put their own interests and those of their constituents before those of the larger entity, hence a common pool problem arises (Rodden, 2006). Furthermore a cooperation problem evolves, which refers to the game played by the multiple subnational and national political actors (Braun and Tommasi, 2004). The accumulation of debt will increase ceteris paribus in federal rather than in unitary states if subnational governments are not facing hard budget constraints. Thus formal policies, coordination and the institutional design describing the interactions between state levels in a multtier federal state are main parameters affecting the accumulation of debt by politicians and the expectation on the hardness of budget constraints (Rodden, 2004).

Despite various arguments against decentralisation tendencies, most developed countries followed a devolution strategy during the last decades (Sutherland,

\(^1\) Sinn (2003) gives an overview on the main arguments.
Price and Joumard, 2005). The shift of expenditure and revenues from the central to the subnational level is shown in Graph 1.

Graph 1: Changes in share of sub-national government’s revenue/spending 1985-2005

The main reasoning for further decentralisation traces back to the economics of information. Information is often private and not fully observable by market participants. If this was not the case and all information was entirely available, the problem could be resolved in a mathematical unique form. However, “knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess” (Hayek 1945). Hence it is noteworthy to develop institutions, which allow the use of decentralised information, while containing problems, as discussed above.

For the organisation of a state, basically two pure principles exist how to organise federal structures: Firstly, the principle of vertical public administration, where the central government controls both taxation and borrowing and assigns all duties to the subnational governments. Subnational jurisdictions are therefore integrated branches of the central government and have to balance their budget at any time (Blankart and Klaiber, 2006). The central government levies all taxes and allocates means according to the delegated tasks to the subnational governments. The local governments have their own political legitimization, but the model allows little room for local democracy and accountability, as the central government needs to control and supervise all actions (Rattsø, 2003). Consequently the federal state is the only jurisdiction which is allowed to raise debt,
thus the restriction and control of indebtedness is also solely concentrated on the central government. Secondly, the principle of autonomy may be installed, where subnational governments are self-governed, politically legitimated through elections and free in their political decisions on the allocation of public goods on the local level. The central state fulfils all tasks assigned by the local levels. A bottom-up approach determines the duties which are more efficiently provided by the central government. This principle requires fiscal congruency i.e. that the circles of decision makers, taxpayers and beneficiaries coincide (Blankart, 2005). Jurisdictions are responsible for the spending as well as the financing of the expenses and may not shift their tax burden to other jurisdictions, thus the budget process is internalized and the autonomous principle may work efficiently.

Both principles share an transparent perception of responsibilities for debt and its repayment in the market: The citizens are able to evaluate the financial position of the subnational jurisdictions – under the autonomous principle – and the central government – under the principle of vertical integration, which induces the market to require higher interest rates with an increase in the risk of insolvency for each governmental layer.

As obvious as the choice between the two principles might be, the more astonishing is the fact that the rule is broken in most federations ranging from Argentina as an emerging economy to Germany as an industrialized country, where subnational governments are free to borrow in spite of the fact that the central governments are perceived as the ‘lender of last resort’. A mixed system arose which is known as the system of vertical fiscal imbalances. The central government is specialised and more efficient in collecting taxes, and the local authority is spending as it is better capable to determine the local needs of the people. The responsibilities are neither clear to the political actors, nor to the financial market, which is in turn not able to determine the actual value of the contracted jurisdiction and expects a bailout by the central government in the event of financial distress. Transaction costs and rigidities are built into the system (Braun and Tommasi, 2004) which may ultimately result in financial unsustainable behaviour and fiscal crisis. Spiller and Tommasi (2001) summarize determinants which affect the cooperation probabilities in the federal decision games and the attached cost. Eichengreen and von Hagen (1996) show that the larger the fiscal imbalance the higher the probability of non-cooperative fiscal behaviour. Thus the mixed system is not sustainable and increases the dilution of the restrictive design of the pure forms of either autonomy or vertical integration. The market
will not limit the subnational governments in accruing debt, since the responsibilities are not clear and the central government will likely bailout defaulting jurisdiction. Consequently one of the two pure principles of subnational governance should be favoured to establish sustainable public finances.

Oates (1972) was one of the first who underlined the importance of efficiency gains in decentralized public spending. He argued that spending which is closer to the citizens is more likely to match local preferences, than in case of an allocation process which is mainly driven by a central government. “Elections by foot” by the citizens will also allow them to choose residences where their personal preferences are matched best. Therefore one might gain in developing a decentralized public spending system, despite the addressed political economy problems. Further problems might arise due to the allocation of public goods between different state entities, distortionary national taxation, pro-cyclical fiscal behaviour, rigidities in national tax policies and inadequate risk-sharing for regional authorities etc. Also expectations on a bailout by the superior entity might lead to an unsustainable use of the discretionary power of budget policymakers, as the costs for the reduction of the additional rents is distributed among all jurisdictions. Hence institutional congruency fails.

As a consequence various institutional designs were developed to solve those problems and to allow for high levels of sovereignty, while maintaining low deficit levels. Fiscal rules, budget rules, public banks, which are the only source of financing for the respective entities, and ultimately the financial market mechanism are often quoted as main sources of restrictive institutions, which allow for sustainable developments in decentralised states. The following section will discuss pros and cons of implemented institutional frameworks more closely.

2.2 Institutions to contain indebtedness

Kopits and Symansky (1998, p. 7) define fiscal rules as “a permanent (or long lasting) constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance, such as the government budget deficit, borrowing, debt, or a major component thereof”. Broader definitions often additionally include budget procedures, such as the structure of the committees through which budget deliberations must proceed or the institutions which are used to prepare the budget. Kopits (2001, p.8) argues that “the primary usefulness of a well-designed and appropriately implemented set of permanent fiscal rules, that prevents a deficit bias, consists of establishing a depoliticized framework for fiscal policy –
much like the depoliticisation of monetary policy under successful inflation targeting.” Therefore the fiscal policy should be independent from the misleading intervention of politicians in order to restrict excessive deficits.

Mainly two critical questions are evaluated in respect to fiscal rules. First, whether they are effective in enforcing fiscal discipline and cannot easily be circumvented e.g. by creative accounting. Second, if these rules are effective, what are the benefits in terms of budget discipline versus their costs in terms of lost flexibility in fiscal policy? Whereas the first question might be answered empirically, without much dissent, the second question is harder to grasp. The discussion on how much fiscal policy is required not only varies between different academic schools, but also between different political tendencies. Hence, we are concentrating on the first question, the effectiveness of fiscal rules.

Ultimately under any system the market rations credit in cases where the probability of default is higher than the compensation which might be assigned in a credit contract. Some countries do solely rely on the market discipline and installed clear systems which signal that any jurisdiction is responsible for its own debt accumulation and no bailout is allowed. Lane (1993) stresses in his seminal work on market efficiency four general conditions which effectively implement market discipline. Namely free and open markets, adequate information about the borrower’s existing debts and the prospect repayment, no bailout in case of default and finally borrowers have to respond to the market signals. This is clearly the case in Switzerland\(^2\) and the United States, where a bankruptcy code for municipalities is installed. As an example, the federal US government even refused to bailout cities which were hit by the 2005 hurricane Katrina, as the finance minister Snow expected the bond spreads for the federation to hike. The bonds of the state and most cities had strong ratings before the catastrophe and therefore investors were hardly expecting a loss of their investments. However the remaining small risk occurred and they had to take a share in the restructuring process. Similarly a jurisdiction in Switzerland called Leukerbad, accumulated massive amounts of debt and was finally insolvent in 1998. Subsequently, the creditors sued the superior jurisdiction to support the defaulted jurisdiction financially, as the supervision mechanism had failed. The Swiss Supreme Court ruled that there was no need for further financial aid, as investors had a chance to review all the books of the municipality at any given time and were free to invest in risky projects. Losses should not be borne collectively.

\(^2\) For a detailed discussion see Fasten (2006).
In fact, Aisen and Hauner (2008) show for a sample of 60 countries that budget deficits have a highly significant effect on the interest rates in the economy. As on other markets, investors also demand a higher premium for public investments as the debt level, and therewith the risk to default rises - the market discipline hypothesis is also proven empirically.

Despite the ultimately restricting market responds, further mechanism to restrict excessive indebtedness were introduced in various states, which will be briefly described in the following lines:

**Borrowing constraints**

Borrowing constraints are often numerical ceilings, which allow a specific amount of borrowing for the entity each year. Some scholars propose that in case of further indebtedness, the actual debt contract is not enforceable by the debt holder, which would increase the incentive for the creditor to respect the rule – however there is a legal discussion that this would not be in line with property rights which are fundamental in most developed countries.

**Process rules - budget balance requirement**

Budget balance requirements are rules which restrict politicians to either propose a balance budget within a year\(^3\), which might be unbalance in the negotiation process thereafter, or requires politicians actually to pass a balanced budget. Supplementary budgets, which are passed in the budgetary year might nevertheless allow for further indebtedness. Alesina and Perotti (1996) name five main influences undermining balanced budget rules:

1. Optimistic predictions on key macroeconomic variables in order to overestimate revenues and underestimate outlays,
2. Optimistic forecasts of the effects on the budget of various new policies,
3. Creative and strategic use of what is kept in and off budget,
4. Strategic use of budget projections, e.g. by inflating the baseline,
5. Strategic use of multiyear budgeting, where the tough policies are systematically postponed and never be implemented since the plans can be revised every year.

\(^3\) Some countries also moved to multiannual targets (Sutherland, Price and Joumard, 2005).
Hence, the seemingly strict regime might be circumvented in various different ways. Furthermore, off-balance-sheet activities might also be applied to avoid a strict limit.

*Expenditure assignments – administrative constraint*

In centralised states, the central government often has the power to assign expenditures directly to subnational jurisdictions, which themselves are executing the assignments. This assignment can take various forms, ranging from limits on the overall debt to the prohibition of borrowing. Therefore the control for the indebtedness is fully taken by the superior entity, which in turn is also responsible for the fiscal stance. Furthermore expenditure can be coordinated between jurisdictions through the central government. Common pool problems, as discussed above are likely, as sub-national jurisdictions try to attract the maximum resources for their entities. The central government might be under high pressure in politically sensitive areas to allocate the desired resources or to bailout a highly indebted entity. Demand pressure for costly public good provisions will be high and the responsible policy makers on the central level might be reluctant to disapprove those projects.

*Cooperative arrangements*

In several states, the central government and the subnational government coordinate the expenditures and revenues of the subnational entities. The indebtedness is therefore a cooperative game played by all levels of government. Each player has an incentive to attract a high proportion of the budget and thereby increase the own discretionary fiscal policy influence. The flexibility of this approach, where preferences of subnational entities might be incorporated best, is also its main weakness, as hold-up problems and free riding might evolve. Log-rolling and bundling of projects within the decision process will hereby lead to higher deficits.

*Self-imposed rules*

Self-imposed rules are often applied in federations with high levels of autonomy. The subnational government is itself responsible for debt accumulation and therefore has an incentive to reduce credit spreads. In order to get better credit ratings, the sub-national governments restrict themselves to stick to self-imposed rules and thereby signal the sustainability of their public finances to the
market. The rules have to be credible as they are otherwise meaningless for diminishing the risk premium and ultimately the financing costs.

3 Empirics

The recent empirical evidence on the effectiveness of borrowing constraints has been mixed. Clear results are still pending. However, the methodological improvements in the data quality and the estimation techniques promise ongoing progress. Starting with von Hagen (1996), Jin and Zou (2002) and Rodden (2004) the data quality improved. Plekhanova and Singh (2007) as well as Joumard and Sutherland (2007) give the most recent overviews.

3.1 Data Description

The dataset is compiled using IMF Government Finance Statistics Yearbooks on the financial position of the second highest government layer of the observed 43 countries between 1980 and 2005. Remarkably, two methodological changes were introduced in the dataset during the considered time frame. This might lead to small variations between time series data for each country separately. However robustness checks within the dataset confirm consistency within time series. The main dependent variable in the following analysis is the deficit per revenue ratio, accumulated for all subnational governments within a state. This might cause some scepticism, since differences between subnational governments within a state may not be considered and might outweigh important factors.

To control for the macroeconomic environment we use growth rates of GDP, short-term and long-term interest rates and inflation. Growth rates of GDP capture the functions of automatic stabilizers in the budget and allow us to use cyclically unadjusted deficits as the dependent variable. Short-term and long-term interest rates reflect the financial market position in the respective year. Increas-

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4 For a detailed overview of changes refer to IMF (2001).
5 One could imagine a state where partly subnational governments heavily run deficits, whereas others follow a more sustainable public finance policy, due to e.g. different political governments in the entities.
6 Long-term interest rates show a similar pattern, but are not available for all countries.
7 One would expect deficits to differ within a business cycle, being lower in a hausse of the economy and higher in a baisse.
ing values will mount public financing costs and hence reduce the incentives to accumulate further debt.\textsuperscript{8} Inflation is of importance as expansive monetary policy might have been used to reduce the real debt load of the governments. In our case the subnational governments most likely did not have a direct influence on the central bank’s monetary policy decision, however, one could imagine, that parallel to an expansive central government’s policy, which might have been able to influence money creation, subnational governments have also accumulated higher deficits during times of high inflation. Furthermore, world GDP allows to control for the strength of the overall world economy and their influence on the deficit positions.\textsuperscript{9} To capture differences in the institutional design dummy variables are defined. Data for institutional design of the rules in the respective country were compiled by Plekhanov and Singh (2007). Several other authors developed alternative classifications for the respective countries, which range from ordinal single indexes\textsuperscript{10} to multidimensional questionnaires. The major advantage for choosing a dummy variable approach is the resulting possibility to determine the most efficient borrowing constraint, while this is rather unclear in case of single indexing. However it is noteworthy that the data accumulation procedure is accompanied by an information loss. An overview of the institutional arrangements which are used in the dataset is presented in Table 1.

<table>
<thead>
<tr>
<th>Regime rule</th>
<th>Total</th>
<th>Emerging</th>
<th>Industrial</th>
<th>Bailout</th>
<th>No bailout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>13</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Self-imposed</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Centrally imposed</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Administrative</td>
<td>14</td>
<td>12</td>
<td>2</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Cooperative</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>26</strong></td>
<td><strong>24</strong></td>
<td><strong>24</strong></td>
<td><strong>26</strong></td>
</tr>
</tbody>
</table>

Table 1: Classification of Institutional Differences

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\textsuperscript{8} Risk premia and yield spreads are not considered here due to data unavailability.

\textsuperscript{9} This might not be relevant in all countries, as subnational governments usually do not depend on global influences as much as central governments positions, but it is relevant in some countries, where the autonomy is relatively high.

\textsuperscript{10} Firstly introduced by the Inter-American Development Bank in 1997 and thereafter applied by several authors.
The bailout history as a proxy for the bailout expectations is also shown. Given institutional differences we construct 8 dummy variables, which combine on the one hand the implemented rule and on the other hand the bailout history.\textsuperscript{11} Therefore we differentiate between 8 groups, where restrictive mechanisms are installed, and the remaining countries, where no rules are in place.

### 3.2 Empirical Model and Econometric Methods

We estimate a linear panel data regression model which is specified as follows:

\[
\begin{align*}
    r_{i,t} &= \alpha + \beta_i D_i + \gamma X_{i,t} + \delta r_{i,t-1} + \varepsilon_{i,t} \\
    &\quad \text{where } r_{i,t} \text{ is the debt/revenue ratio for country } i \text{ at time } t, \quad \alpha \text{ is a constant, } D_i \text{ is a matrix of dummy variables with a vector for each institutional rule (self imposed rule, cooperative rule, central rule, administrative rule all combined with the bailout history of the country). The base case is the unrestricted regime, where no borrowing constraint is in place. With a borrowing constraint, one of the dummy variables is one for each country and the other dummies are zero. The matrix } X_{i,t} \text{ contains the control variables GDP, world GDP, short term and long-term interest rates and inflation. For the dynamic regression we include the lagged dependent variable, } r_{i,t-1}. \\
    &\quad \text{Due to the panel data setup and the chosen variables we assume that there exist some unobservable country specific factors, such that } \\
    &\quad \varepsilon_{i,t} = \nu_{i,t} + \varepsilon_{i,t} \\
    &\nu_{i,t} \text{ is the country specific random effect and } \varepsilon_{i,t} \text{ is the stochastic error term.}
\end{align*}
\]

\textsuperscript{11} For example: A dummy variable is created for all countries which implemented a central rule and at the same time have a no bailout history.
3.2.1 Static Analysis

As a first step we analyzed the data with a static approach. A dynamic approach is presented in the following section.

We analyze the econometric model with different approaches. As base case we estimate a pooled regression on the data with "unrestricted" as a base category. This shows the improvements of an institutional rule towards debt regulation compared to no regulation. As it can be assumed that there is a random country specific effect, the estimation results will be consistent, but inefficient. Therefore we turned our attention to panel data approaches which take country specific effects into account. Under the assumption that the country specific effect is random and uncorrelated with the regressors in our model, we use the random effects estimator. We have to assume that some omitted variables are constant over time, but vary by country and others that might be fixed between countries, but vary over time. Compared to the fixed effects estimator this estimation approach has the advantage that time invariant variables are not eliminated. The Breusch Pagan LM Test for random effects confirms the assumption of unobservable country specific effects. Also the results of the Hausman specification test for random effects suggest the usage of the random effects estimator compared to the fixed effects estimator.

A strong assumption of the random effects estimator is that unobserved country specific effects are uncorrelated with the included regressors. Hausman and Taylor (1981) introduced an estimator that allows for some regressors to be correlated with the country specific effects. In our case there are control variables, such as GDP, inflation, or interest rates, where we cannot assume that they are completely exogenous and not correlated with the unobserved country specific effect. This instrumental variable estimator creates instruments from the uncorrelated regressors for the correlated variables. Time-varying correlated regressors are instrumented by the deviations from the country means, which is the approach of the within estimation. For the time-invariant correlated regressors, the country means of the uncorrelated time-varying regressors serve as instruments. Applying a feasible GLS provides consistent and efficient estimates.

Amemiya and MaCurdy (1986) propose an estimator which is similar to the Hausman Taylor (1981) estimator, but more efficient. This estimator uses a set of lagged and lead values of the uncorrelated time-variant regressors as instru-

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12 Baltagi (2005) claims that random effects may be used when the population is large. As this is a macro panel, this is not an appropriate assumption (p.14).
ments. The requirement that these regressors are uncorrelated with the country specific effect in every time period is stronger. Due to our data constraints resulting in an unbalanced panel with no identical initial time periods for all countries, the estimator by Amemiya and MaCurdy (1986) is not usable.13

3.2.2 Dynamic Analysis

One of our hypotheses is that the deficit/revenue ratio in $t-1$ influences the same ratio in $t$. We therefore additionally estimate a dynamic panel data model. Following the discussion on the static models the obvious approach is to extend the Hausman Taylor estimator and include deficit/revenue ratio in $t-1$ in the set of time-variant correlated variables. As before, the deviations from the mean of the time-variant uncorrelated variables will be used as instruments.14 The GMM estimators proposed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) might therefore increase efficiency in the estimation and yield more reliable results. These estimators use the differencing approach of the within estimator to eliminate the unobserved individual effect and then use differences in leads and lags as well as lagged levels of the regressors, including the lagged dependent variable, as instruments within a GMM framework. This increases the number of moment conditions. Hence the linear dynamic estimator might lead to further efficiency in our analysis.

3.3 Results

3.3.1 Descriptive Statistics

To give a short overview on the descriptive statistics, Appendix 1 shows screen shots of the dependent variable deficits/revenue ratio for the different institutional regimes for selected years. A negative slope of the regression line is expected, as the institutional arrangements are sorted from the strictest rule (1) to the unrestricted regime (5). This trend is observable in most years, however in the years 1995 the relationship is reversed. Therefore a first descriptive view on the data underlines the assumption of the order of budget institutions. Summary statistics of included variables are presented in Table 2.

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13 See also Baltagi (2005, p.127) and Arellano (2003, p.43).
14 Following Greene (2003) the Hausman Taylor (1981) approach can be to a dynamic panel data model in this way (p. 308). See also Baltagi(2005) for a discussion of this approach.
### Variable Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ratio</td>
<td>-4.077768</td>
<td>13.40706</td>
<td>-160.5709</td>
<td>32.44194</td>
</tr>
<tr>
<td>st_interest</td>
<td>10863.04</td>
<td>305725.8</td>
<td>0.3291675</td>
<td>9695433</td>
</tr>
<tr>
<td>lt_interest</td>
<td>8.673037</td>
<td>4.918933</td>
<td>2.0955</td>
<td>39.9216</td>
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<tr>
<td>gdppc</td>
<td>2.690715</td>
<td>3.715849</td>
<td>-32.1</td>
<td>12.8</td>
</tr>
<tr>
<td>inflpc</td>
<td>61.70706</td>
<td>482.619</td>
<td>-9.8</td>
<td>11749.6</td>
</tr>
<tr>
<td>wgdp</td>
<td>3.559767</td>
<td>1.057771</td>
<td>1.2</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Table 2: Summary Statistics

#### 3.3.2 Static Estimation Results

The results for the formal panel data estimations are reported in Table 3. Four different systems are estimated, which show slightly differing results. The Breusch Pagan LM Test for random effects confirms the assumption of unobservable country specific effects. Endogeneity issues related to the installed rules are minor, as in most cases the rules are relative persistent over time. Therefore, the initial debt load of the jurisdiction is less likely to affect the decision of the setup of the rules.
### Estimation Results

<table>
<thead>
<tr>
<th>Method</th>
<th>OLS</th>
<th>OLS</th>
<th>GLS (RE)</th>
<th>GLS (RE)</th>
<th>GLS (RE)</th>
<th>Hausman - Taylor</th>
<th>Hausman - Taylor</th>
<th>Hausman - Taylor</th>
<th>Blundell - Bond</th>
<th>Blundell - Bond</th>
<th>Blundell - Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional Dummy Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-imposed-No-bailout</td>
<td>5.075**</td>
<td>5.078**</td>
<td>4.886**</td>
<td>5.188*</td>
<td>5.143*</td>
<td>4.993</td>
<td>5.186</td>
<td>5.127</td>
<td>4.995</td>
<td>20.129*</td>
<td>20.508*</td>
</tr>
<tr>
<td></td>
<td>(2.21)</td>
<td>(2.22)</td>
<td>(1.58)</td>
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<td>0.486**</td>
<td>0.674***</td>
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<td>(2.75)</td>
<td>(3.27)</td>
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*** significance on 1 percent level, ** significance on 5 percent level, * significance on 10 percent level
As expected the influence of GDP growth on the deficit/revenue ratio is highly significant throughout all different estimation procedures. This is not astonishing, as economic conditions in the respective country are main drivers for the financing of subnational governments, since automatic stabilizers guarantee in times of a good economy increasing revenues.\(^{15}\) Short-term interest and inflation have solely a small influence and do not contribute significantly to the variations in deficits.\(^{16}\) This is remarkable, as the market hypothesis by Lane (1993) proposes a significant influence of financing costs on the financing positions. Also the findings by Aisen and Hauner (2008) propose that interest rates are significantly influenced by the overall government debt. However, the actual risk premia required by the market for the subnational jurisdictions are not included in the estimation due to data unavailability.

Overall, no-bailout regimes tend to have a positive influence, while bailout regimes show mostly negative coefficients, which indicates even less sustainability as in the unrestricted regimes. The theoretical expectations that rules have a reducing effect on public spending can be supported empirically, as long as they are in not influenced by bailout expectations. Bailout expectations result in higher spending and higher deficits, as the cost of financing is borne by other taxpayers and coordination problems result.

Most importantly the dummy variables, which account for the different institutional arrangements, show that mainly self-imposed rules and administrative rules have a significant positive influence on the financing decision, when they are combined with a no-bailout regime. Administrative rules even tend to have a positive effect in a bailout regime. The findings for self imposed rules is in line with theoretical considerations, as subnational entities might have to signal sustainable public finances to financial market participants and might seek to establish self-imposed rules. Credible self-imposed rules allow for lower yield spreads of subnational bonds and therefore reduce the financing costs for the respective authority. Moreover increased transparency impedes excessive spending by politicians to satisfy certain voter demands. In combination with a bailout regime they tend to have large negative effects. Administrative rules also have a positive influence, combined with a no-bailout as well as with a bailout regime. The autonomy for the financing decisions is in an administrative regime usually highly

\(^{15}\) Note, that in our analysis deficits are negative numbers. Therefore the positive sign is in line with the theory.

\(^{16}\) Long-term interest rate show a similar pattern for the countries where data is available, but are not included in the estimation due to data constraints.
restricted and the central government seeks to contain lower level debt issuance. Therefore, the bailout history does not play an important role. These findings support the theoretical predictions, since the pure principles are best suited to contain indebtedness.

The setup of the dummy variables, which do not allow for a gradual differentiation of the rules in place, might be a reason for the non-significance in some estimations, as superior governments might have tightened their supervision or the rule, which is not mirrored in the dummies. Overall the results suggest self-imposed rules, combined with a no-bailout regime, as well as administrative rules, to be more efficient than any other limit, which might also be accompanied by that fact that under such rules the responsibility of the entities are usually clear.

3.3.3 Dynamic Estimation Results
The dynamic setting allows for persistence in the debt accumulation process. Since usually a high portion of the budget expenses are relatively fix and cannot be diminished immediately, one would expect a significant influence of the deficit ratio in t-1 on the ratio in t. This is also confirmed in our dataset and shows a rigid restructuring process. The institutional dummy variables are still significant and show a robust affect also in the dynamic model.

4 Conclusion
Subnational financing in selected emerging and industrialized countries are examined in this paper. The results are mixed. It is observable, that most institutional arrangements tend to have no clear influence on the financing behaviour of subnational governments, even though theoretical considerations would expect clear interrelations. However, self-imposed rules and administrative rules, combined with a no-bailout regime show a significant positive influence on the financing decision under most estimation specifications. Administrative rules with a bailout history also show significant lower deficits. This is in line with the existing literature, as these rules are often accompanied by higher degrees of transparency of responsibilities for the subnational entities, who on the one hand seek to signal sustainable public finance policies to the credit market and on the other hand are tied to decisions taken by the central government.
Overall, the bailout history seems to have an important influence on the deficit/revenue ratio. No-bailout regimes have lower deficit levels, as common pool and coordination problems are reduced.

Admittedly, the results have to be assessed with due caution. The coding of the institutional arrangements might lack consistency, even though all available information was being incorporated. Secondly, the data quality and accessibility is restricted, hence important factors, which were not controlled for might have affected the actual deficits in the respective country. However, the relevance of the paper for political decision makers shall be stressed, as often responsibilities between different state layers are mixed, without any clear indication, who will be liable in case of financial distress. Certainly, political decision makers are reluctant to restrictions on their freedom of action, but intergenerational equity might motivate some restrictions on the borrowing decision.
5 Bibliography

Appendix

Appendix 1: Scatterplot with deficit/revenue ratio and the institutional design for the years 1980, 1985, 1990, 1995, 2000 and 2004. The graphs show on the horizontal line the 5 possible institutional rules. On the left is self imposed rule, which is assumed to be most effective against overspending, and on the right unrestricted spending. The trend shows a rough idea on how the institutional rules and the debt revenue ratio are connected.