DISCUSSION PAPER SERIES

No. 9672

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INTERNATIONAL MACROECONOMICS

Centre for Economic Policy Research

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ISSN 0265-8003

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Discussion Paper No. 9672
October 2013

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CEPR Discussion Paper No. 9672

October 2013

ABSTRACT

Limiting Fiscal Procyclicality: Evidence from Resource-Rich Countries*

We provide evidence that fiscal policy in resource-rich countries is strongly procyclical. The empirical analysis reveals that on average real government consumption in these countries tends to significantly rise (fall) in good (bad) times. To control for endogeneity we use an instrumental variable for GDP growth that arises naturally, namely the growth in commodity prices of the main natural resource export. We also find that fiscal policy procyclicality is lower in more democratic regimes, and that operating a sovereign wealth fund is more successful in limiting fiscal policy procyclicality than introducing fiscal rules.

JEL Classification: E62 and H30
Keywords: commodity prices, fiscal procyclicality, fiscal rules, natural resources and sovereign wealth funds

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*We thank the Research Promotion Foundation of Cyprus for a research grant in pursuing this research project (contract ANTROPISTIKES/OIKON/0311(BIE)/04). We also thank seminar participants at various universities for comments.

Submitted 25 September 2013

1 Introduction

Fiscal procyclicality in resource-rich countries has been identified as a possible source of business cycle volatility that increases macroeconomic uncertainty and in turn negatively affects economic growth (Frankel (2010)). Consistent with the idea that policy responses to commodity revenue windfalls determine economic performance in subsequent decades, understanding the behavior of volatile commodity prices has been a major research goal in the development economics literature (Deaton and Laroque, 1996). Despite the importance of fiscal policy decisions in resource-rich countries, however, there have not been many empirical studies on this topic. We contribute to this literature by building a large dataset of 84 resource-rich countries for the period 1960-2011, and investigating empirically fiscal policy cyclicality in these countries.

We note that there is a growing empirical literature analyzing the cyclical properties of fiscal policy. A range of recent studies show that fiscal policy tends to be procyclical among Latin American countries (Gavin and Perotti (1997)). There is also a growing evidence that this phenomenon may not be specific to Latin America but more widespread among developing countries, as documented in Kaminski, Reinhart, and Vegh (2004), Talvi and Vegh (2005), Alesina et al. (2008) and Ilzetzki and Vegh (2008). Some studies point out that fiscal procyclicality can also be found among industrial countries, although the number of cases may be more restricted[1].

Nevertheless, the empirical analysis of fiscal policy cyclicality suffers from various lim-

[1]Studies identifying fiscal procyclicality for at least a sub-set of industrial countries include Arreaza et al (1999), Lane (2003), Ilzetzki and Vegh (2008), and Beetsma and Giuliodori (2010).

itations. First and foremost is the issue of endogeneity. If the true model is a standard neo-Keynesian model in which fiscal policy affects income, a simple OLS regression of fiscal policy on the output gap, or on output growth, may produce a biased estimate, capturing the government multiplier rather than fiscal procyclicality alone. One solution to the endogeneity problem is to instrument the country's output gap or GDP growth with an instrument correlated with the country's cyclical conditions but not directly related to the country's fiscal policy.

The problem associated with this approach, however, is to find the appropriate instruments. Recent studies have used the GDP growth of neighboring, or trading partner, countries (Alesina et al. (2008), Ilzetzki and Vegh (2008), and Jaimovich and Panizza (2007)). In our empirical investigation we use an instrument proxying for the business cycle (GDP growth) that arises naturally. Specifically, since we focus on countries rich in natural resources, we argue that an exogenous variation in the price of the main natural resource export (a price that is determined in international markets) can provide a textbook-type exogenous variation in GDP growth to identify the effect of the business cycle on fiscal policy. We use this instrument both as an alternative and in combination with the growth rate of neighboring countries' GDP, the instrument more commonly used in the literature.

A second important difficulty with analyzing the cyclical behavior of fiscal policy is that a number of alternative variables can be used to describe a country's fiscal stance, the main dependent variable in the analysis. While tax rates would be ideal to use, they are usually not available, and procyclical variations in the tax base render tax revenues not very informative for this analysis. As a result, real government expenditures and real government consumption

have been the preferred candidates to measure fiscal policy cyclicality. The results using these variables have clear-cut conclusions: a positive correlation with the cycle implies that the government is increasing expenditure/consumption in good times and reducing it in bad times[2]. A related issue is whether to scale, or not to scale, fiscal variables with GDP. Looking at the ratio between total government expenditure and GDP can tell us whether expenditure has increased by more, or less than, GDP. Recently, Kaminsky et al. (2004) and Ilzetzki and Vegh (2008) argue that little can be inferred by looking at ratios to GDP; while Gavin and Perotti (1997), Alesina et al., (2008), and Bénétrix and Lane (2010) focus on scaled variables[3].

Based on these considerations, we use two measures of fiscal policy (the dependent variable) in our analysis. The first is real government consumption growth: a positive correlation with the business cycle can be readily interpreted as procyclical fiscal policy. The second variable is the growth in the government consumption to GDP ratio[4], and we report empir-

[2]Looking only at expenditures gives no information about the fiscal stance. Hence, several studies also look at the budget balance. The econometric analysis of the fiscal balance, however, is complicated by the fact that the budget balance can take both positive and negative values, precluding the use of percentage changes. Perhaps more importantly, tax revenues affect the budget balance directly, worsening the endogeneity problem from regressing the fiscal stance on GDP growth.

[3]Some studies have also emphasized the importance of using real-time data to evaluate the procyclicality of fiscal policy. Real-time data are not easily available for use in empirical studies, however, hence there have been only limited attempts to use them. Beetsma and Giuliodiri (2010) use real-time data based on economic forecasts to analyze how fiscal policy responds to new information on the business cycle. Their results show marked differences in the procyclicality of fiscal policy between the planning and implementation stages, as well as between the fiscal policy of EU countries and other OECD countries.

[4]This variable is used in the literature (Gavin and Perotti (1997) and Alesina et al. (2008)) but has

ical results using both variables. We view a positive correlation between GDP growth and the growth in the consumption to GDP ratio as implying a stronger form of procyclicality (expenditure increases by more than GDP, when GDP growth is positive; and falls by more than GDP when GDP growth is negative)[5].

We find statistically and also economically significant evidence that fiscal policy is strongly procyclical in resource-rich countries. Our results indicate that a one percent exogenous rise in GDP growth leads to a 2 to 3 percent rise in real government consumption growth. This illustrates quite a large procyclical response of fiscal policy to GDP changes and is consistent with the emphasis on understanding commodity price booms and busts in the literature (for instance, Deaton and Laroque (1996)).

Similar results arise when using government consumption to GDP as a measure of fiscal policy. On average, government consumption increases (decreases) by more than the increase (decrease) in GDP in good (bad) times. This strong procyclicality lends support to the "debt-overhang" hypothesis of Manzano and Rigobbon (2006), according to which overborrowing by resource-rich countries during commodity booms leaves these countries in a difficult financial situation when resource prices fall, leading them to cut expenditures dramatically to be able to service their debt.

We also find that the instrumental variable for GDP growth (the growth rate in the

recently been criticized (Kaminsky et al. (2004), and Ilzetzki and Vegh (2008)) because the scaling variable includes the business cycle variation and therefore the resulting correlation with the business cycle is not readily interpretable.

[5]Notice that an insignificant correlation between the government consumption to GDP ratio and GDP still implies a relatively strong procyclicality meaning that consumption changes by aproximately the same as GDP.

main commodity price in each resource-rich country), exhibits more volatility than the more commonly used rest-of-region GDP growth and more strongly rejects the weak instrument hypothesis. The stronger instrument provides robust evidence supporting the existence of procyclical fiscal policy for this set of countries.

We next investigate whether there are particular country characteristics that can affect these empirical findings. We first analyze the effects of standard institutional variables used in the literature, such as democracy and corruption. Tornell and Lane (1999) show how revenue windfalls from positive terms-of-trade shocks can lead to a disproportionate increase in fiscal redistribution in countries with weak legal-political institutions. The empirical evidence on the impact of corruption on fiscal procyclicality tends to support the existence of a positive relationship in democracies (Alesina et al. (2008)) but the possibility of reverse causality going from government size to corruption also exists (Treisman (2000))[6]. Arezki and Bruckner (2012) also find that fiscal government expenditures tend to increase more in response to commodity price booms under autocracies in a sample of developing countries.

To control for democracy, we use the variable "Polity2" from the IV Project database. We complement this measure by also relying on the presence of checks and balances, using Keefer and Stasavage (2003)'s "checks" variable[7]. The standard problem with investigating the role of institutions is again endogeneity. We instrument institutional variables measuring democracy using ethnic and religious fractionalization and geographical location (see Mauro

[6] Themudo (2012) argues that larger NGO sectors are associated with lower corruption, hence omitting the size of this sector in regression analysis relating the government expenditures to corruption can result in biased estimates.

[7] "Checks" counts the number of veto players in restraining the government.

(1995), Alesina et al. (2003), La Porta et al. (1998) and Easterly and Levine (2003)). Our results are consistent with the idea that resource-rich countries with more democratic institutions and more well-developed checks and balances in their executive bodies can better control fiscal policy procyclicality.

Finding evidence for strong fiscal policy procyclicality in countries rich in natural resources indicates that fiscal policy in such countries should be very carefully designed to avoid the pitfalls associated with strong procyclicality. Indeed, some of these countries have taken measures in that direction. For example, many countries have passed legislation to introduce fiscal rules (expenditure, revenue, debt, and/or budget deficit rules) and set up sovereign wealth funds (SWF). Our dataset and sample period allow us to test which of these policies are potentially more successful in limiting fiscal policy procyclicality. By adopting the same instrumental variable methodology, our results indicate that fiscal policy rules may not be very effective in limiting fiscal policy procyclicality but operating a SWF seems to better achieve this goal.

The remainder of the paper is organized as follows. In Section 2, we discuss the construction of the dataset and variables of interest and present descriptive statistics on the assembled data set. In section 3 we present our empirical methodology and discuss our results and robustness checks. In Section 4 we examine how our results differ across fiscal institutional regimes. Section 5 provides a summary of the main findings, discusses policy implications and concludes with avenues for future research.

2 Data and Descriptive Statistics

To explore the question of fiscal procyclicality in resource-rich countries we utilize an annual frequency[8] data set that includes government spending, business cycle statistics, and a number of institutional and political variables. The data set comprises 84 countries classified as resource rich according to the definition adopted and described below. The coverage spans the period from as early as 1962 to as late as 2011, but not all data are available for all countries for this sample period, giving rise to an unbalanced panel. A detailed description of the data and sources is provided in the Data Appendix.

Before proceeding, we first explain how we classify countries into resource rich and resource poor, as it is perhaps important to recognize that there is some variation in the definitions used in the literature. The most widely used proxy for resource dependence is the ratio of resource exports to GDP (see, among others, Sachs and Warner (2001) and Arezki and van der Ploeg (2011)), but other measures are also used in the literature, including the ratio of commodity exports in total exports, and the ratio of resource revenues in total fiscal revenues[9].

We construct the resource-rich sample using a combination of definitions that generate

[8] We use annual data to avoid the selection bias that might arise from focussing on countries for which only quarterly data are available. This allows us to extend substantially both the number of countries and the time span, resulting in a relatively large dataset.

[9] For instance, IMF (2010), Kalyuzhnova (2008) and Tsani (2013) define as resource rich the countries where the share of resource exports (fuels, ores, minerals, metals) over total merchandise exports is equal or more than 40%. Collier and Hoeffler (2009) define as high-rent countries those where resource revenues account for 10% or more of GDP.

aggregate dependence on natural resource revenues. Specifically, we define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%. This last condition ensures that we do not include in the sample countries that are relatively diversified in their commodity trade. Such countries might not be considered as dependent on a major revenue source and therefore might be significantly less affected by fluctuations in a particular commodity price. This leaves a sample of 87 resource-rich countries out of 192, three of which are dropped from the analysis due to data restrictions, resulting in a set of 84 resource-rich countries[10].

Note that we consider a relatively high share of commodity exports in total exports as one of our benchmarks because our averages include data from the 1960s and 1970s when the share of commodity exports to total exports was relatively high for all countries in general[11]. As a validation check, we compare the resulting classification with the IMF definition of resource-rich countries, provided in the Fiscal Rules Dataset 2012 (Schaechter et al., 2012), and find a similar categorization for the countries that appear in both samples.

In terms of fiscal policy we use two different measures. The first is real government consumption growth, created by deflating the nominal government consumption series using the consumer price index (CPI) deflator for each country. The second measure is the growth

[10] We drop from the resource-rich sample The Bahamas, because the export share in GDP is above 100%; and Greenland and Somalia, due to lack of fiscal data.

[11] The average share of commodity exports to total exports between 1962 and 2011 for the whole sample of countries is about 62%.

in the real government consumption to GDP ratio. We report results using both variables. All growth rates are calculated taking the difference of the natural logarithm.

The main explanatory variable of interest is real GDP growth constructed by deflating the nominal series obtained from the World Bank database (WDI) using the GDP deflator. To correct for potential bias in the results due to the endogeneity of GDP growth, we use two instrumental variables, namely the real commodity price growth for the country's main commodity export, as well as (the more conventionally used) rest of the region GDP growth. The real commodity price growth is created by first using the exchange rate from the WDI to turn the nominal price of each commodity (expressed in US dollars) into local currency. The real commodity price index is then derived by deflating the nominal, local currency commodity price with the local CPI. The second instrument, real rest-of-the-region GDP, is constructed by first classifying each country into a specific region using the World Bank's definition of regions and then computing the real regional GDP in 2005 PPP-adjusted terms, excluding country i's GDP[12].

In our analysis we also use a number of other explanatory variables to better understand the determinants of fiscal policy procyclicality. One measure motivated by the recent work of Alesina et al. (2008) is the control of corruption. This variable measures perceptions of the extent to which public power is exercised for private gain. Given that the control of corruption variable does not vary a lot over time, we take the average of the available years (Alesina, et al., 2008).

[12]The Word Bank defines the regions in the following way: High-Income OECD, High-Income non-OECD, East Asia and Pacific, Eastern Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

Another measure is the quality of democratic institutions. To capture how democratic a country is, we use the variable "Polity2" from the IV Project database. We take the average of "Polity2" for each country over the available years, and then create the dummy variable "Democracy" which takes the value one when the average is strictly positive. Relatedly, the presence of checks and balances might also affect fiscal policy responses to GDP changes. We use the variable developed by Keefer and Stasavage (2003) called "Checks", which counts the number of veto players in restraining the government. The index ranges from 1 (few veto players) to 17 (high number of veto players).

Operating a SWF might imply that the decision on the magnitude of total funds available for fiscal policy expenditures is insulated from the political process, or made more transparent. The existence of such funds in resource-rich countries that are exposed to large price volatility, may serve both as a financial stabilizer and as a mechanism for a more balanced and diversified global exposure. To investigate the influence of SWFs on fiscal procyclicality we use a dummy variable indicating the existence of an operational fund engaged in the management of revenues from non-renewable natural resources (oil, gas, mineral, metals and ores) for each country and time period using recently available data. Our regressions use a time invariant version of this variable by taking the average over the available sample.

Fiscal rules (on expenditure, revenue, debt and balanced budget) are also thought to affect fiscal procyclicality. We use three sets of variables capturing different fiscal rules. The first is a dummy for having either expenditure rules, or budget balance rules or debt rules; the second is a dummy for having either expenditure rules or budget balance rules; the third is a dummy for imposing expenditure rules only. Time invariant versions of the variables,

by taking averages, are used in the regressions.

As a prelude to the empirical analysis, Table 1 reports descriptive statistics for the main variables used in the paper. The means and standard deviations are reported for the full sample, for the sample of resource-rich countries, those resource-rich countries that operate a SWF and those resource-rich countries that have adopted some type of fiscal rules. The sample of resource-rich countries exhibits higher volatility in real GDP and government consumption growth compared to the full sample.

Table 1 also reports the standard deviation of the growth in the price of the two primary commodities and the results illustrate the large volatility that these series exhibit. It is this variability that will be one of the main exogenous determinants of GDP variation when determining the extent of fiscal policy procyclicality. It is also important to observe that volatility in real government consumption growth is notably lower in the subsample operating a SWF and in the sample of countries that use budget rules. Lastly, we report the first and second moments of the rest of the region GDP, another variable to be used as a potential instrumental variable in our analysis. The variability in this instrument is notably lower than the commodity price growth one.

3 Empirical Results

3.1 Motivation

To motivate the paper we start by investigating potential relationships between variables using a number of different figures. Figure 1 plots, for different sets of countries, the volatility

of GDP (measured by the standard deviation of real GDP growth) against different measures of natural resource dependence. The top (bottom) row uses average resource exports (revenues) scaled by GDP as the measure of resource dependence. Panel A plots the full sample of countries, while panel B only plots the resource-rich ones, defined on the basis of resource exports, as explained in the previous section. Both panels illustrate the positive correlation between resource dependence and the volatility in output growth, using either measure of resource dependence[13].

Figure 2 plots our preferred measure of fiscal policy volatility (the standard deviation of real government consumption growth) against the two measures of resource dependence for the sample of resource-rich countries only. We observe a positive relationship between resource dependence and fiscal policy volatility using either definition of dependence.

Figure 3 confirms what one would expect from combining the information in figures 1 and 2. That is, for resource-rich countries there is a positive relationship between the standard deviation of GDP growth and the standard deviation of real government consumption growth. This graph is consistent with Fatas and Mihov (2003), who find that volatile discretionary fiscal policy contributes to increasing the volatility of output.

In response to the volatility in fiscal policy induced by the volatility in resource revenues (and therefore GDP growth), various governments have taken steps to decouple the two variables and limit the volatility in fiscal policy. One policy is to start a sovereign wealth fund (SWF) and use that as a vehicle to smooth expenditures over time (see Caner and Grennes (2010) on the Norwegian experience). Figure 4 plots the volatility of fiscal policy

[13]Similar evidence can also be found in van der Ploeg and Poelhekke (2009) for a different sample period and country set.

against the volatility of GDP growth but makes the distinction between countries operating a SWF and countries not operating a SWF. Interestingly, fiscal policy is more volatile relative to GDP in countries without a SWF, indicating that the presence of a SWF might work well in mitigating the volatility in fiscal policy.

Another prominent policy is to introduce budget rules as a way to discipline and commit policy makers into not spending temporary windfalls. Figure 5 reproduces the volatility of fiscal policy against the volatility of GDP but distinguishes between countries with and without fiscal rules. Unlike what one might expect from the motivation behind introducing fiscal rules, there does not seem to be the case that countries with fiscal rules tend to have a less volatile fiscal policy. Nevertheless, more work is needed to establish whether this is the result of endogeneity bias or omitted variables, issues that we turn to next.

3.2 Econometric Model

To investigate fiscal procyclicality we use the assembled panel dataset for resource-rich countries that includes N countries observed over a sample period of T_i years. We focus on how fiscal policy responds to aggregate economic activity and the empirical specification adopted generally follows the literature. Formally, we estimate the following baseline regression:

$$G_{it} = \alpha_i + \mu_t + \beta Y_{it} + \gamma G_{it-1} + \varepsilon_{it}, \qquad i = 1, 2, \ldots N, \quad t = 1, 2, \ldots T_i \tag{1}$$

where G_{it} is a measure of country i's fiscal policy for year t, and Y_{it} is a measure of a country's business cycle. In addition, we include the lagged dependent variable to capture empirically observed policy persistence. Country fixed effects denoted by α_i are included to account for

differences in the average fiscal stance across countries, while time-decade effects (μ_t) are also included to control for unobserved factors that are common across countries and might be influencing fiscal policy over time. The error term is denoted by ε_{it}.

Such a regression clearly suffers from endogeneity since GDP and government expenditures (one measure of fiscal policy) are jointly determined. One possible way of identifying the causal effect from GDP growth to fiscal policy is to use instrumental variable techniques. The problem associated with the instrumental variables approach, however, is finding appropriate instruments. For an instrument to be valid, it needs to fulfill both the criteria for instrument relevance (in our case sufficiently correlated with GDP growth) and of exogeneity (that the instrument is not correlated with the error term, that is, the instrument has no partial effect on the fiscal stance once GDP growth is controlled for).

In the fiscal policy procyclicality literature, a number of instruments have been used. For example, Gali and Perotti (2003) analyze European countries and the US and suggest using the US output gap to instrument the output gap of EU countries, and EU GDP as an instrument for the US output gap. Jaimovich and Panizza (2007) suggest instead using as instrument the trade-weighted average of rest-of-the-world GDP. In several cases lagged GDP growth (or the lagged output gap) is also used as an additional instrument, but as pointed out by Ilzetzki and Vegh (2008) the strong serial correlation of GDP may make lagged GDP an imperfect instrument, as GDP at time $t-1$ may still be correlated with the error term at time t. Alesina et al. (2008) use a version of this methodology and instrument the output gap of each country with the output gap of its neighbors (regional output gap excluding the country)[14].

[14]Ilzetzki and Vegh (2008) also propose as an instrument for GDP a measure of international financial

We also use this instrument for comparison purposes but we extend this approach by using the main commodity price of a resource-rich country, as both an alternative and an additional instrument. Arguably commodity prices are determined in world markets and can thus provide a textbook-type exogenous variation to the income earned by a particular country. We use this exogenous variation to give a causal interpretation on how fiscal policy reacts to GDP changes. More specifically, we use the lagged resource price growth to instrument for current GDP growth. We use the lagged, and not the contemporaneous commodity price growth, to account for possible delays in the transmission of commodity price shocks to the economy and to guard against the effects of serially correlated measurement error. We also compare results with using the lagged regional GDP growth rate to instrument for a country's GDP growth, as done in previous studies.

3.2.1 Results

Table 2 presents the baseline results from regressing our preferred measure of fiscal policy (real government consumption growth) on real GDP growth. Column (1) shows that the positive correlation exists even with an OLS regression. Column (2) reports the results when the growth rate in the main commodity price export is used to instrument for GDP growth. The positive coefficient is statistically significant at the 1% level, and indicates that a one percent increase in GDP generates a 2.7 percent increase in real government consumption growth. The weak instrumental variables (WID) hypothesis is rejected when

conditions, given by the real return on 6-month Treasury bills weighted for each country based on the Chinn and Ito (2007) measure of capital account openness, rescaled to range between 0 and 1 and averaged over the relevant sample for each country (giving one index of financial openness per country).

using the Cragg-Donald F-Statistic for i.i.d. error disturbances since it exceeds the Staiger and Stock (1997) rule of thumb of ten to reject the hypothesis of weak IVs, therefore passing the instrument relevance test (see Cragg and Donald, 1993).

Column (3) uses the regional GDP growth as an IV and the results are similar in terms of sign, as the procyclicality coefficient remains positive and statistically significant but rises from 2.7 to 3.8 (but with wider confidence intervals). Comparing the first stage F-statistics across the two specifications, it looks like the commodity price IV is more relevant than the regional GDP one (the first stage F-statistic is 21.10 in the first case versus 4.21 in the second). Thus, the rest-of-region GDP turns out to be a weaker instrument for our particular sample of resource-rich countries. This is also illustrated by the p-value in the Angrist-Pischke (AP) test statistic that rises from 0 to 0.04 (still a valid IV nevertheless at the five percent level of statistical significance).

Using both IVs in (4) we get similar results, with the coefficient remaining strongly statistically significant at the one percent level and remaining stable at around 2.6. The Cragg-Donald and AP statistics illustrate how both instruments remain relevant. Also, according to the Sargan (1958) test for overidentified restrictions, where the joint null hypothesis is that the instruments are valid, the p-value is 0.1549, suggesting that we cannot reject instrument validity.

The estimates from Table 2 are also economically significant. They indicate that a one percent exogenous rise in GDP growth leads to a 2.6 percent rise in real government consumption growth. This illustrates quite a large procyclical response of fiscal policy to GDP changes and justifies the focus on understanding commodity price booms and busts to

guide policy makers (for instance, Deaton and Laroque, 1996).

Table 3 performs the same regression but with our second measure of fiscal policy: government consumption to GDP growth. This second measure is slightly more difficult to interpret because it is scaled by GDP. Even if the coefficient on GDP growth is negative, this cannot be interpreted as countercyclical fiscal policy. A negative coefficient here means that government consumption either falls, or rises less, than the increase in GDP. This therefore may still represent procyclical fiscal policy but not as strong as it would be if the coefficient from this regression comes out positive.

Column (1) presents OLS results showing a negative and statistically significant coefficient. We do not interpret this coefficient as it is likely contaminated by endogeneity bias. Column (2) reports the IV results using commodity price growth as the instrumental variable for GDP growth. The coefficient turns positive and is statistically significant at the 10% level: at 1.12 it also implies a very strong procyclicality in fiscal policy. On the other hand, the results from using regional GDP growth as an IV do not generate a coefficient statistically different from zero. Finally, when using both IVs (since both pass the instrument relevance test), the coefficient rises to around 1.06 and remains statistically significant at the 10% level. According to the p-value (0.0853) of the Sargan (1958) test for overidentified restrictions, we do not reject the H_0 of the validity of the instruments at the 5 percent level. In line with the estimates reported in Table 2, these results imply that on average government consumption increases by more than the increase in GDP in good times, and contracts by more than the fall in GDP in bad times.

Overall, these results support the hypothesis that fiscal policy is strongly procyclical

in resource-rich countries, both in terms of statistical significance and economic magnitude. Interpreting jointly the results from tables 2 and 3, we can argue that a one percent exogenous increase in GDP growth leads to around a two percent increase in government consumption expenditure, on average. This interpretation seems consistent with the coefficients of around 2.6 in table 2 for real government consumption growth, and the coefficients around 1.0 in table 3 for the growth in the real government consumption to GDP ratio.

3.3 Determinants of Fiscal Procyclicality

Are there certain characteristics of a particular country that affect the extent of fiscal procyclicality? We test three different hypotheses that exist in the literature in this section, while at the same time checking the robustness of our empirical findings by including additional explanatory variables in the regressions. Specifically, we use variables that measure the control of corruption and level of democracy in a particular country (Alesina et al., 2008). Additionally, we also control for the extent to which checks and balances exist in the executive process in a given country, using Keefer and Stasavage (2003)'s "Checks" variable.

Formally, we simply augment the specification in the previous section to include interaction terms between GDP growth and our different measures of institutional characteristics.

$$G_{it} = \alpha_i + \mu_t + \beta_1 Y_{it} + \beta_2 (Y_{it} * I_i) + \gamma G_{it-1} + \varepsilon_{it}, \qquad i = 1, 2, \ldots N, \quad t = 1, 2, \ldots T_i \quad (2)$$

where I stands for time-invariant institutional characteristics. The coefficient β_2 captures the heterogeneity of fiscal policy cyclicality due to institutional differences.

To guard against the problem of multiple endogenous variables (GDP growth and the

interaction term between GDP growth and the institutional variables) we estimate our models using IV methods. In particular we continue to use the real commodity price growth to instrument for GDP growth in all specifications. Moreover, to account for the possible endogeneity of the interaction between GDP growth and institutions, we follow two approaches. In the first approach we use the interaction of real commodity price growth with the institution variable as an instrument: results are reported in table 4A. In the second approach we additionally instrument the interaction of GDP growth and institutions, with real commodity price growth interacted with variables typically used as instruments for institutional quality. Examples of such variables are ethnic and religious fractionalization, and a zero-one indicator for a country being landlocked (see Mauro (1995), La Porta et al. (1998), Alesina et al. (2003) and Easterly and Levine (2003)).

To decide which of the three candidate instrumental variables (price growth x ethnic fractionalization, price growth x religious fractionalization, and price growth x landlocked) are more appropriate for each specification, we use weak identification tests as well as tests on redundant instruments (see Baum, Schaffer and Stillman (2010)). In all specifications, we begin by including all three additional instruments and use the redundancy test to check whether a specific instrument is redundant given that the others are present. The procedure is repeated successively until all redundant instruments are eliminated. The reported results are based on the final list of instrumental variables determined as non-redundant using this procedure[15]. The instrument relevance tests point towards using ethnic fractionalization as

[15]For instance, in Table 4b, column (2) we find that in the initial round of elimination price growth x ethnic fractionalization is found to be redundant (has a p-value above 1%) and we proceed to the second round without it. In round 2 we further find that price growth x religious fractionalization is also redundant

an IV for the control of corruption, the zero-one indicator for being landlocked as an IV for democracy and the religion fractionalization for "checks". The results are reported in Tables 4B and 5B for the two different measures of the fiscal policy stance.

The main findings in Table 4B are that the coefficients on the procyclicality of fiscal policy remain statistically and economically significant in all specifications, with similar empirical magnitudes as well. Moreover, our results indicate that our measure of democratic institutions tends to limit fiscal procyclicality, while controlling for corruption or having more checks in the executive process do not appear to be important. According to the Cragg-Donald and Angrist-Pischke tests, the instruments appear to be strong for the democracy variable (see Cragg and Donald (1993), Angrist and Pischke (2009), and Stock and Yogo (2005)). For corruption though, the instruments turn out to be weak and the results become less precise and not significant at the conventional level.

Tables 5A and 5B report estimates based on the same specifications but using the growth rate in government consumption (as a percent of GDP) as a measure of fiscal policy. Except for specification (1), where the inclusion of the control of corruption variable makes the coefficient on GDP growth statistically insignificant (along with the new added variable), the fiscal policy coefficient remains statistically significant and positive. Moreover, in most specifications the empirical magnitudes remain in the range found without these controls (especially in Table 5B where all endogenous variables are instrumented). Democratic institutions again are statistically significant and checks and balances are also statistically

and so the final list of instruments includes only price growth x landlocked out of the initial three variables. The same approach is followed for all instrumental variable estimations and the final list of non-redundant instruments adopted for each specification are reported in the notes section below the tables of results.

significant in these specifications. The results indicate that both democracy and checks and balances reduce the extent of strong fiscal policy procyclicality in resource-rich countries (that is, contribute for changes in government consumption to be smaller than changes in GDP). Moreover, the instrumental variables pass the weak IV test in these two cases.

In summary the econometric evidence so far is consistent with the idea that resource-rich countries with more democratic institutions and more well-developed checks and balances in their executive bodies can better control fiscal policy procyclicality.

4 Limiting Fiscal Policy Procyclicality

Our empirical results are consistent with the idea that fiscal policy tends to be quite pro-cyclical in resource-rich countries. One endogenous policy reaction to these findings might be to try and devise institutional mechanisms to limit procyclicality. The idea would be that policy makers in these countries are aware of these potential problems and would therefore attempt to control them (or their selves).

How do countries try to mitigate this problem? There are two broad candidate policies that have been used for this purpose. First, many countries use different types of budget rules (the Maastricht EU criteria would fall under this category). According to Schaechter et al. (2012), "a fiscal rule imposes a long-lasting constraint on fiscal policy through numerical limits on budgetary aggregates." Nevertheless, even though fiscal rules are designed to help control political incentives to overspend in good times, they can potentially be detrimental to fiscal outcomes. This happens when they distort the choice between spending priorities, while also giving incentives to creative accounting, undermining transparency (see Beetsma and

Giuliodori, 2010, and references therein). There are different ways to measure the presence of fiscal rules and usually this relates to the type of rule in place. The rules can be classified according to the fiscal variable they constrain, namely debt, budget deficit, revenue, and expenditure.

Second, many countries have established sovereign wealth funds (SWFs) to smooth intergenerational government consumption and manage their resource revenues. It is perhaps important to note that sovereign wealth funds have been created with different objectives and have different operational rules (see Ossowski et al. (2008)). Three categories of funds exist: stabilization, savings, and financing funds[16]. Although stabilization and savings funds can most directly reduce government expenditure procyclicality by withdrawing part of the resource windfall from the budgetary process, their rigid rules can also encourage higher borrowing from a government that is not credit constrained. In addition, rigid accumulation rules have been bypassed in many countries by a change in the threshold price, or revenue, that triggers accumulation (according to Ossowski et al. (2008) this has been the case in Algeria, Iran, Libya, Mexico, Russia, Trinidad and Tobago, and Venezuela). Financing funds do not have the explicit objective of restraining fiscal policy, but they may indirectly do that by increasing the transparency of the budgetary process, and promote public awareness of intertemporal choices. Norway's SWF, for instance, receives the net central government re-

[16] Stabilization funds are described by a price- or revenue-contingent deposit and/or withdrawal rules (e.g., Algeria, Iran, Libya, Mexico, Russia, Trinidad and Tobago, and Venezuela). Saving funds are funds where a pre-determined share of total revenues is deposited in the fund (e.g., Equatorial Guinea's Fund for Future Generations, Gabon, and Kuwait). Finally, financing funds are funds for which the accumulation rule is directly linked to the budget's non-oil deficit (Norway and East-Timor).

ceipts from petroleum activities and transfers to the budget the amounts needed to finance the non-oil deficit, with all spending decisions being made within the budgetary process, with the fund run by stringent transparency and accountability provisions.

To empirically investigate these hypotheses we augment model 1 to include interaction terms between GDP growth and the presence of fiscal rules or funds.

$$G_{it} = \alpha_i + \mu_t + \beta_1 Y_{it} + \beta_2 (Y_{it} * F_i) + \gamma G_{it-1} + \varepsilon_{it}, \qquad i = 1, 2, \ldots N, \quad t = 1, 2, \ldots T_i \quad (3)$$

where F is a dummy variable indicating the presence of some type of fiscal rule or the presence of a fund.

We use our IV approach to investigate what types of policies work best empirically in terms of limiting fiscal policy procyclicality. Table 6A reports the results using the real commodity price growth as an instrument for real GDP growth. To analyze the effect of different policies, we use the interaction between these policies and GDP growth. The instrument then becomes the interaction between the policies and real commodity price growth. Policies do not vary much over time and are therefore a cross-sectional variable that stays constant over time.

In the first row, we note that the procyclicality coefficient remains close to the previous estimates in all specifications (here it varies between 2.7 and 2.9) and is statistically significant at the one percent level. In terms of the interaction terms, we can see that none of the budget rules appears to be statistically significant (columns (2), (3) and (4)). Column (1), on the other hand, shows that having a sovereign wealth fund reduces fiscal policy procyclicality substantially, with the coefficient being statistically significant at the 5% level. In

column (5) we test in addition whether rules in combination with funds have any effect on procyclicality, but the effect remains insignificant[17].

Table 6B repeats the same analysis as in table 6A, but an instrumental variable is used for the rules, or fund, variable. In particular we use the interaction between ethnic fractionalization and real commodity price growth to instrument for the interaction between the presence of budget rules/SWFs and GDP growth. The results are almost identical with the ones in Table 6A in terms of statistical significance, with the coefficients for fiscal procyclicality slightly lower (they now range between 2.3 and 2.7, slightly lower from the previous range (2.7-2.9)). All coefficients involving budget rules are again statistically insignificant, but the presence of a SWF again helps mitigate fiscal procyclicality[18]. Instrument relevance conditions are satisfied in most specifications according to the Cragg-Donald and Angrist-Pischke tests.

4.1 Possible Interpretations

Our evidence suggests that sovereign wealth funds may be more effective in limiting fiscal procyclicality than fiscal rules. This corroborates other studies that find evidence that fiscal rules can be easily circumvented and are not effective in restricting fiscal procyclicality ex-

[17] Out of 36 countries with SWF there are 13 which have adopted either budget balance or expenditure rules.

[18] We also obtain significant and negative coefficients on the interaction between GDP growth and resource funds when we use the government consumption to GDP ratio as the dependent variable, whether intrumenting or not for institutions. Similarly, we continue to obtain insignificant coefficients on the interaction between GDP growth and rules when the dependent variable is the government consumption to GDP ratio, indepently of whether institutions are instrumented for or not.

post (Beetsma and Giuliodori (2010)). Evidence on the compliance with fiscal rules among EU countries, for which data are more readily available, shows that several EU countries, from 1999 (or since membership if entering after 1999) until 2009 have been most of the time in breach of the EU fiscal rules. According to Calmfors and Wren Lewis (2011)'s data on compliance, there is a handful of EU countries that have been always in compliance during this period (Denmark, Estonia, Finland, Luxembourg, and Sweden), one country never in compliance (Hungary), and the remaining with non-compliance rates ranging between 17% (Slovenia) to 83% (Poland).

Resource funds, despite possible governance issues (see Aizenmann and Glick (2008)), may be more effective in reducing the link between windfalls that cause GDP booms and fiscal expenditures, possibly because they contribute to making the budgetary process in resource-rich countries more transparent. In a resource fund like Norway's Government Pension Fund-Global (GPF), for instance, oil and gas revenues are transferred from the state budget to the resource fund, creating a clear distinction between oil revenues and non-oil revenues. Government expenditures are defined within the budgetary process, determining the non-oil budget deficit. In this process it becomes clear how much of the oil-related income will be used to finance expenditures. The fund then transfers to the government an amount that is benchmarked at 4% of the value of the GPF's assets, which is estimated to be approximately the long-term return on the fund's investments. This implies that the fund's capital is saved to help finance increasing pension liabilities and to insure that future generations can also benefit from it. Norway's 4% financing benchmark is not a strict ceiling and leaves room for discretion in severe downturns. The government in Norway has used

this flexibility in 2009, when the transfer of funds from the GPF to the budget exceeded the 4% target, so that it was possible to mitigate the effects of the global recession on the Norwegian economy without large cuts in expenditures, or increases in non-oil tax rates. In 2011 the use of petroleum revenues was again brought below the four percent benchmark (see Norway's Ministry of Finance, 2012).

5 Conclusion

We provide evidence that fiscal policy in resource-rich countries tends to be not only procyclical but strongly procyclical, meaning that the increase in government consumption in good times tends to exceed the increase in GDP, and conversely the drop in bad times tends to exceed the fall in GDP. We also find evidence that democracy and checks and balances dampen procyclicality. Finally, we also look at the importance of fiscal institutions in determining procyclicality using newly available data. We test for the effects of fiscal rules on fiscal procyclicality and for the effects of sovereign wealth funds. We find evidence that while fiscal rules do not seem to affect fiscal procyclicality, the presence of a resource fund tends to dampen it.

Although further research is warranted in this area to better understand what characteristics of resource funds may be instrumental in disciplining fiscal policy, we hypothesize that SWFs may act as a disciplining tool by increasing the transparency of the budgetary process, perhaps by clearly separating resource-related revenues from other types of revenues. On the other hand, strict rules might increase the opacity of the budgetary process as a means of circumventing these rules. Other types of institutions like "fiscal councils" may potentially

work to dampen fiscal procyclicality in a similar way to resource funds to the extent that they may also increase the transparency in fiscal policy formulation and implementation.

Data Appendix

The dataset covers the period 1962-2011 and includes data for 84 resource-rich countries. We next describe the variables used in the empirical analysis as well as the data sources.

Real GDP: The nominal GDP variable for each country was obtained from the World Development Indicators (WDI) database. The real GDP variable was constructed using the GDP deflator from WDI using 2005 as the base year. Growth rates were generated by taking the difference of the natural logarithm of real GDP and multiplying the result by 100.

Real rest-of-region GDP (in PPP) Growth: First we categorize each country into a region according to the Word Bank classification[19]. We then calculate GDP in Purchasing Power Parity (PPP) adjusted (year 2005) terms by dividing the Real GDP by the PPP conversion factor for 2005. The Real GDP in PPP-adjusted terms for each region is constructed by summing up the Real GDP in PPP terms of each country within a region. To compute the rest of region GDP for each country i, we simply subtract the real GDP in PPP of country i from the Real GDP in PPP of the region . Taking the difference of its natural logarithm times 100, produces the growth rate of real rest of region GDP.

Real Government Consumption Growth: Real Government Consumption is constructed by deflating the nominal series taken from WDI with the 2005 CPI deflator.

Government Consumption (scaled to GDP Growth): An alternative measure of the fiscal stance is the scaled version of Government Consumption relative to GDP which is also obtained from the WDI. Taking the difference of its natural logarithm times 100

[19] The Word Bank defines the regions in the following way: High-Income OECD, High-Income non-OECD, East Asia and Pacific, Eastern Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

produces the Government Consumption (% of GDP) Growth.

Resource Dependence (SXP): Resource dependence is the ratio of primary exports to GDP (Sachs and Warner, 2001). Both variables are measured in US dollars. Primary exports are defined to be the sum of the UN comtrade categories 0, 1, 2, 3, 4 and 68. We expand this definition to also include category 6672 - "Diamonds, not industrial, not set or strung". The source for primary exports data is revision 1 of the Standard International Trade Classification (SITC).

Total Exports: Total Exports is created by adding up the main UN comtrade commodity categories, namely 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. These categories are from revision 1 of the SITC. Total Exports are measured in US dollars.

Real Commodity Price Growth: The nominal price of each commodity is measured in US dollars (world prices). We use the exchange rate (local currency per US dollar) from the WDI to express the nominal commodity prices in local currency. We then construct an index of commodity prices with 2005 as the base year and derive the Real Commodity Price using the 2005 CPI. Finally, we construct Real Commodity Price Growth taking the difference of the natural logarithm of the Real Commodity Price times 100.

Diamonds: Price data for diamonds was available only for the 2002-2011 period via datastream. Therefore, to construct the nominal price series for diamonds we used information from a graph titled "Historical diamond trade price trend evolution graph" found on the Ajediam (Antwerp Jewels & Diamond Manufacturers) website[20]. The graph plots historical wholesale prices for Average One Carat D Flawless from 1960 to 2013. Comparing the last

[20] http://www.ajediam.com/investing_diamonds_investment.html

10 observations of our constructed data with the "actual data" obtained from datastream we observe that they are quite similar.

Control of Corruption: It measures the perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. The variable ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. The index is available for the years 1996, 1998, 2000 and 2002-2011. The source is the "Worldwide Governance Indicators" (WGI). We use a "standardized measure" of the original variable by subtracting the minimum value of that variable from each observation's value and by dividing by its range. Given that the control of corruption variable does not vary a lot over time, we take the average of the available years (Alesina, et al., 2008).

Democracy: To capture how democratic a certain country is, we use the variable "Polity2" from the IV Project database. "Polity2" ranges from -10 (strongly autocratic) to 10 (strongly democratic). We average "Polity2" over the available years for each country and then create the dummy variable "Democracy" which takes the value one when this time average is strictly positive and zero otherwise.

Checks and Balances: Keefer and Stasavage (2003) develop the variable "Checks" which is a count of the number of veto players, focusing on the ability of other agents to restrain the government. The index ranges from 1 (few veto players) to 17 (high number of veto players). The variable is available from 1975-2012. The country with the highest number of checks (17) is India, which also has a high democracy score.

Sovereign Wealth Fund (SWF): The SWF variable takes the value 1 for country

i in year t if in year t country i has an operational fund engaged in the management of revenues from non-renewable natural resources (oil, gas, mineral, metals and ores). Data on the inception and dissolution years (when applicable) of the funds have been extracted from the individual funds' web sites (where available), the Sovereign Wealth Fund Institute (2012), and Tsani (2013). In our regressions, we use a time invariant version of this variable by taking its average over the available sample for each country.

Fiscal Rules: The variable Fiscal Rules takes the value 1 for country i in year t if in year t country i has imposed long-lasting constraints on fiscal policy through numerical limits on budgetary aggregates. We distinguish among three different cases. First, country i has introduced either expenditure rules, budget balance rules or debt rules. Second, country i has imposed either expenditure rules or budget balance rules where in the third case country i imposed only expenditure rules. The data are obtained from the IMF Fiscal Rules Dataset (Schaechter et al., 2012). In our regressions, we use a time invariant version of the aforementioned variables by taking their average.

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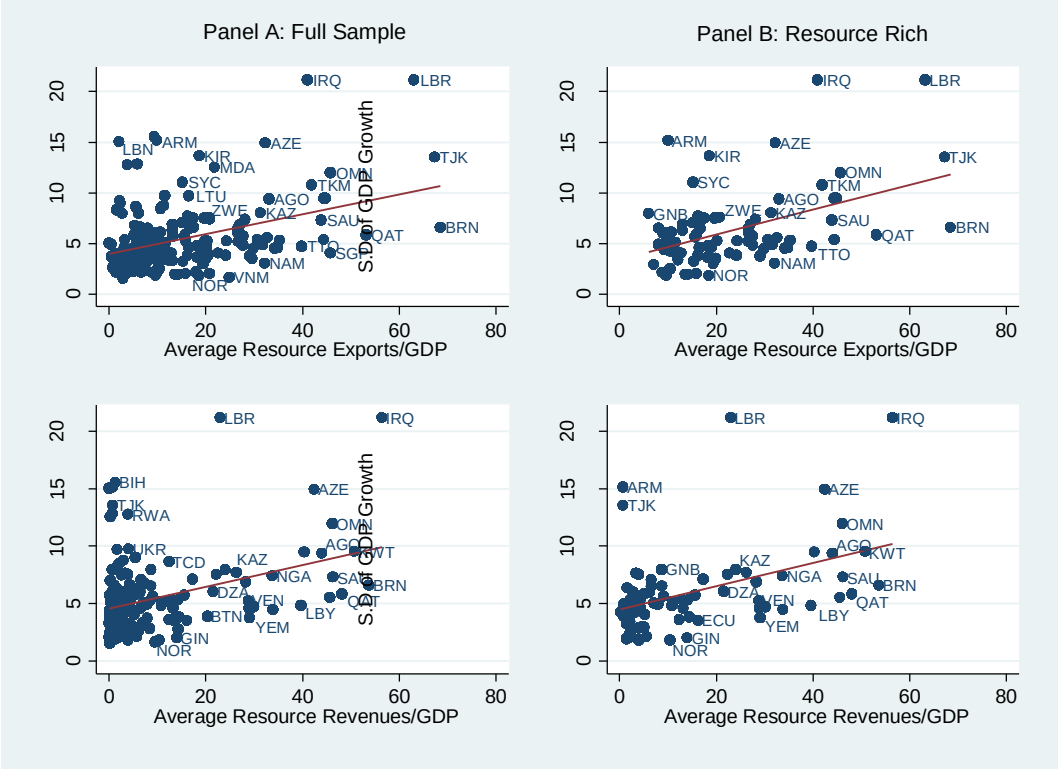
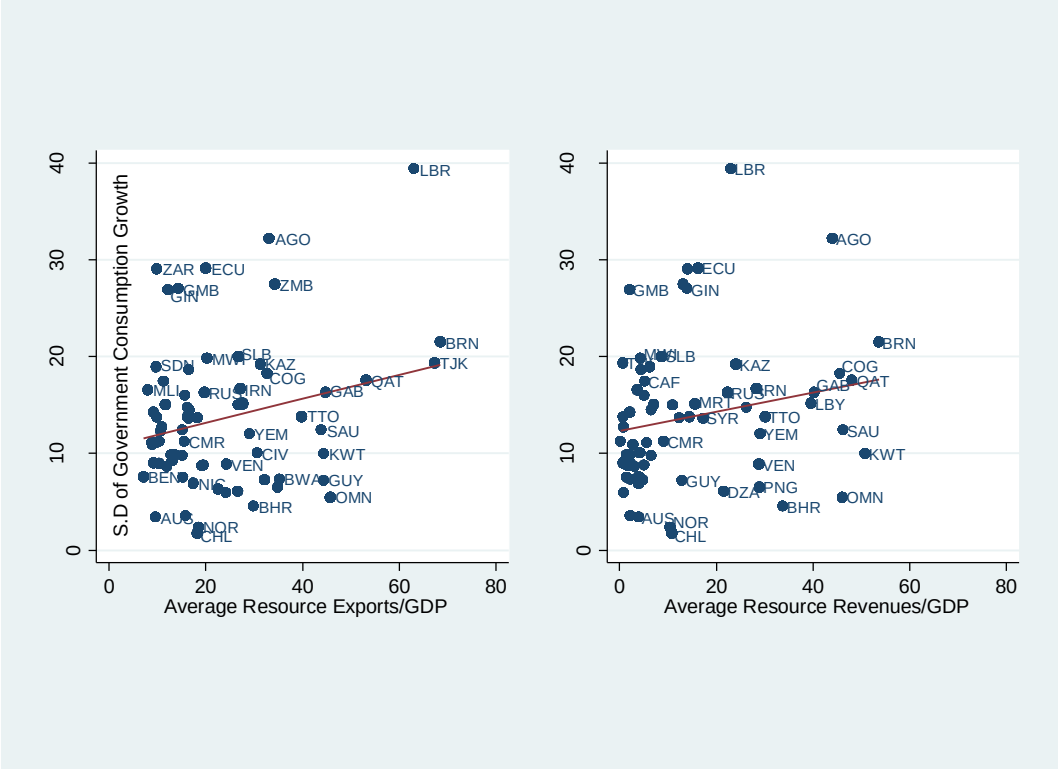
Figure 1: Volatility of GDP Growth and Resource Dependency



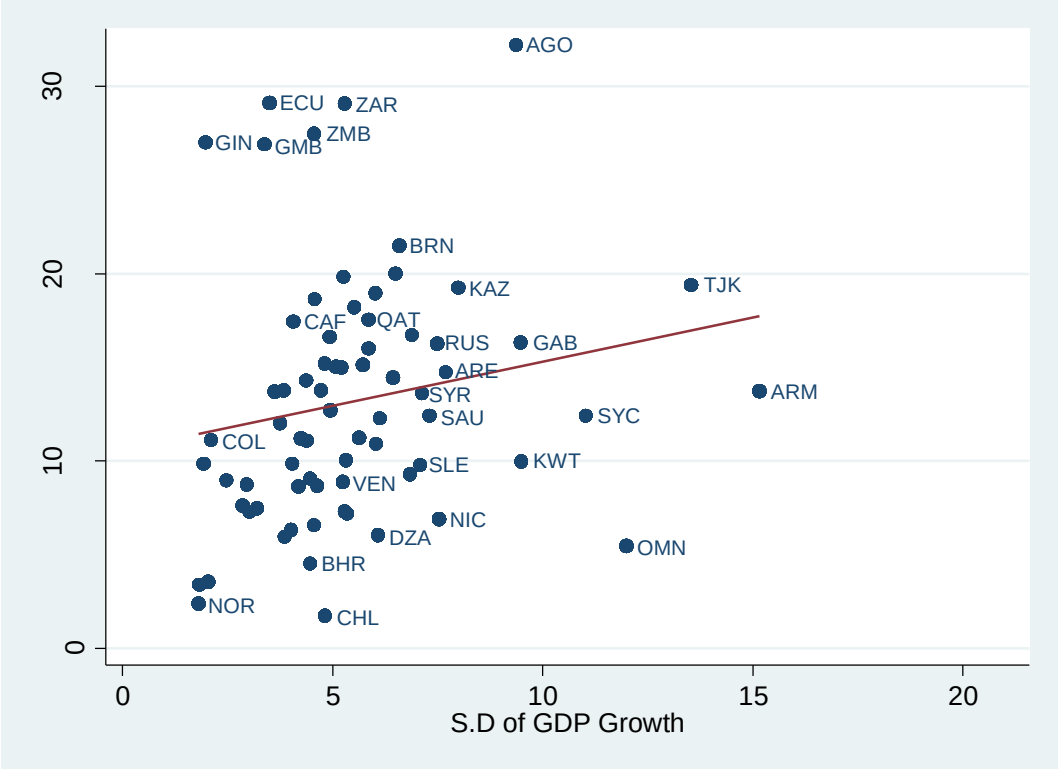
Notes: Resource Exports/GDP is the ratio of primary exports to GDP. Primary exports, are defined according to Sachs and Warner (1995), as the sum of non-fuel commodity categories (UN comtrade categories 0, 1, 2, 4 and 68) and fuels (category 3). We expand the definition by also including category 6672 (diamonds). The resource revenues variable, namely "Total natural resource rents as a percentage of GDP" is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. The source for primary exports is UN comtrade, SITC revision 1, and for GDP and Resource Revenues, the WDI database from the World Bank. We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%.

Figure 2: Volatility of Real Government Consumption Growth and Resource Dependency in Resource-Rich Countries



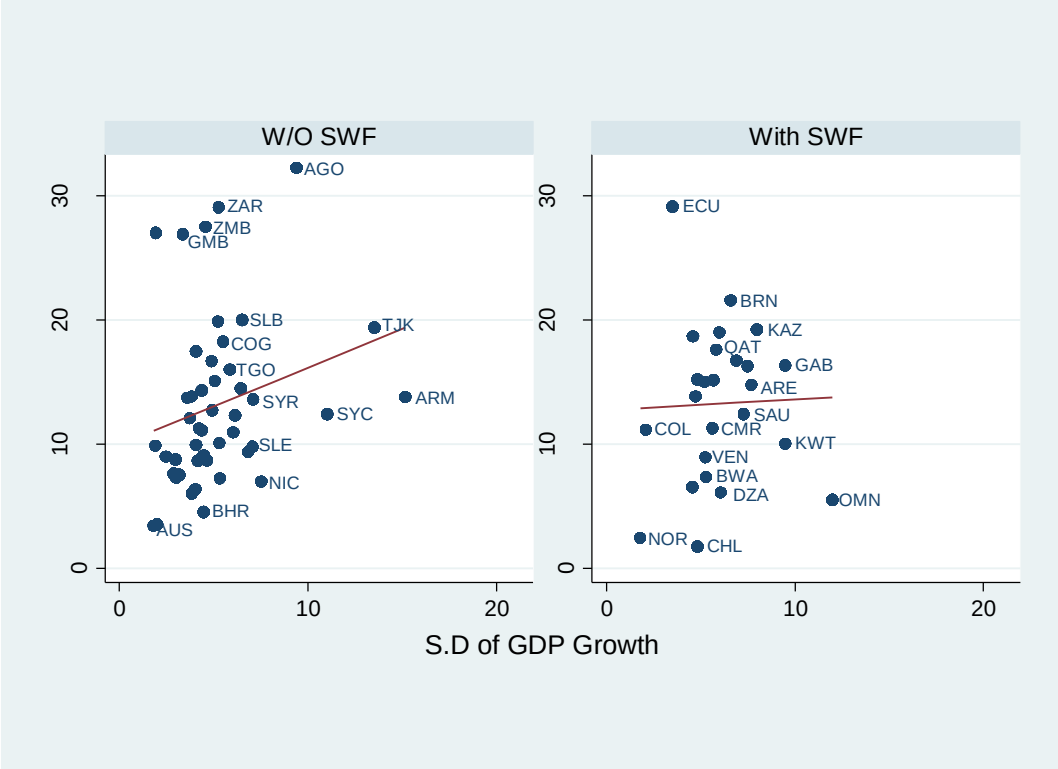
Notes: Real Government Consumption is constructed by deflating using the Consumer Price Index with 2005 as the base year. The source for primary exports is UN comtrade, SITC revision 1 and for GDP, CPI and Resource Revenues, the WDI database from the World Bank. We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%.

Figure 3: Volatilities of Real Government Consumption Growth and GDP Growth for Resource-Rich Countries



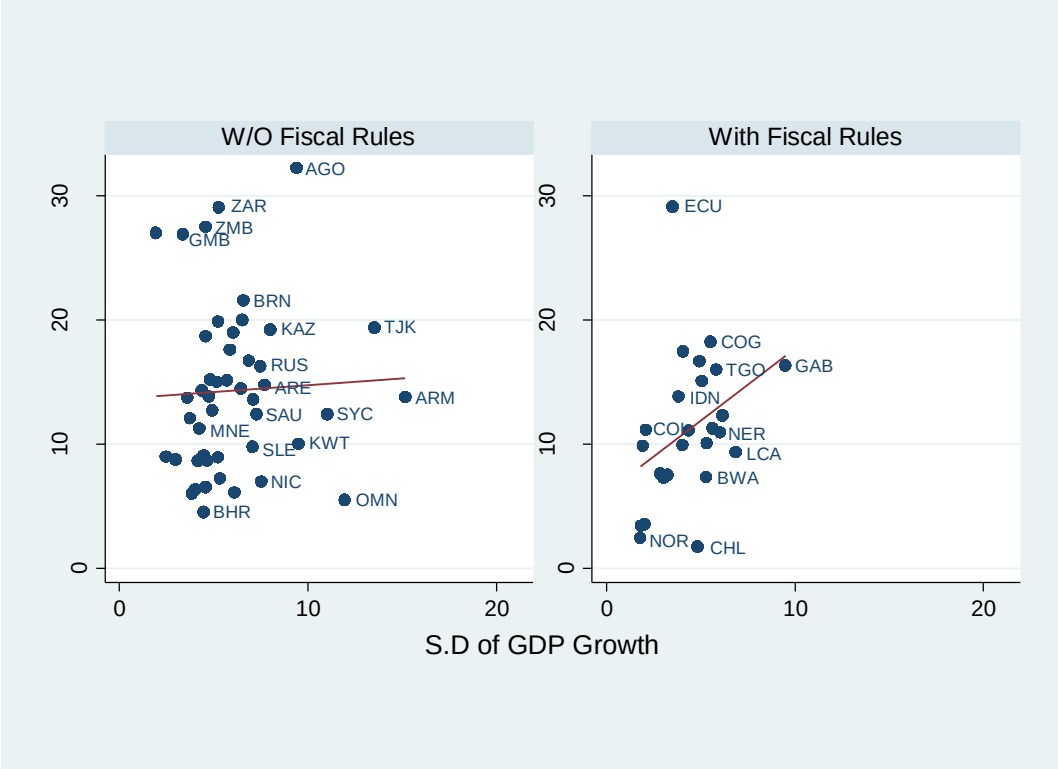
Notes: The source for the Real Government Consumption and GDP is the WDI database from the World Bank. We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%.

Figure 4: Volatilities of Real Government Consumption Growth and GDP Growth with and without SWF in Resource-Rich Countries



Notes: The source for Real Government Consumption and GDP is the WDI database from World Bank. The classification of countries with and without Sovereign Wealth Funds (SWF) is based on Tsani's database (2013). We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%.

Figure 5: Volatilities of Real Government Consumption Growth and GDP Growth with and without Fiscal Rules in Resource-Rich countries



Notes: The source for Real Government Consumption and GDP is the WDI database from World Bank. The classification of countries with and without Fiscal Rules is based on the "IMF Fiscal Rules Dataset (Schaechter, Kinda, Budina and Weber, 2012). We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%.

Table 1: Descriptive Statistics

Variable	Full Sample		Resource Rich		SWF		Fiscal Rules	
	Mean	sd	mean	sd	mean	sd	mean	sd
GDP Growth	3.77	4.86	3.72	5.37	4.12	5.86	3.95	4.36
Real Government Consumption Growth	4.09	13.26	3.52	15.43	5.26	10.15	5.02	11.85
Government Consumption (% GDP) Growth	0.27	11.95	-0.20	13.93	-0.55	13.43	0.26	12.56
Price Growth of 1st Commodity	-	-	1.59	27.14	5.48	26.13	3.02	20.15
Price Growth of 2nd Commodity	-	-	0.71	25.40	2.68	24.33	3.86	21.32
Rest of Region GDP Growth	4.10	5.59	4.21	4.77	4.61	4.18	4.55	2.59
Observations	5334		2228		398		305	

Notes: Descriptive statistics (mean and standard deviation) of the main variables employed in the analysis for the whole sample, resource- rich sample, countries with sovereign wealth funds and countries implementing fiscal rules. We define resource-rich countries as those countries that have a ratio of commodity exports to GDP equal to, or above 8%, combined with revenues from commodity exports to total exports equal to, or above 60%, provided that the revenues from their two main commodity exports as a share of total exports are equal to, or greater than, 40%. The sources for commodity prices are the Global Economic Monitor (GEM) database from World Bank and the World Economic Outlook (WEO) database from IMF. The construction of the variable 'Rest of Region GDP' is discussed in the text.

Table 2: Cyclicality of Real Government Consumption Growth

	(1) OLS	(2) IV Prices	(3) IV RR GDP	(4) IV Prices + RR GDP
GDP Growth	0.778***	2.674***	3.806*	2.615***
	(0.057)	(0.745)	(1.978)	(0.721)
Real Government Consumption Growth (t-1)	0.103***	0.019	0.008	0.014
	(0.019)	(0.040)	(0.051)	(0.037)
Observations	2317	2153	2275	2113
Number of Groups	76	72	74	71
Average Group	30.49	29.90	30.74	29.76
R^2 overall	0.11	0.09	0.09	0.09
First Stage F-statistic	-	21.10	4.209	10.74
AP (p-value)	-	0.0000	0.0403	0.0000
Cragg-Donald F-statistic	-	21.10	4.209	10.74

Notes: Dependent variable: Real Government Consumption Growth, Controls: Real Government Consumption Growth (t-1). All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimation is in Column (1) and IV estimations are in Columns (2), (3) and (4). Column (2) uses Real Commodity Price Growth as an instrument; Column (3) uses Rest-of-Region GDP growth as an instrument, Column (4) uses both Real Commodity Price Growth and Rest-of-Region GDP Growth as instruments. Weak identification tests are also reported. The Cragg-Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test (the Cragg-Donald Wald F-statistic and the F-test from a first-stage regression in the case of a single endogenous regressor are equivalent).

Table 3: Cyclicality of Government Consumption (% of GDP) Growth

	(1) OLS	(2) IV Prices	(3) IV RR GDP	(4) IV Prices + RR GDP
GDP Growth	-0.319***	1.124*	0.396	1.058*
	(0.0472)	(0.640)	(0.570)	(0.628)
Government Consumption (% of GDP) Growth (t-1)	-0.060***	-0.055**	-0.071***	-0.071***
	(0.018)	(0.024)	(0.024)	(0.024)
Observations	2980	2161	2889	2116
Number of Groups	80	72	78	71
Average Groups	37.25	30.01	37.04	29.80
R^2 overall	0.02	0.006	0.004	0.005
First stage F	-	23.07	21.42	11.61
AP (p-value)	-	0.0000	0.0000	0.0000
Cragg-Donald F-statistic	-	23.07	21.42	11.61

Notes: Dependent variable: Government Consumption (% of GDP) Growth, Controls: Real Government Consumption Growth (t-1). All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. OLS estimation is done in Column (1) and IV estimations reported in Columns (2), (3) and (4). Column (2) uses Real Commodity Price Growth as an instrument; Column (3) uses Rest-of-Region GDP growth as an instrument; Column (4) uses both Real Commodity Price Growth and Rest-of-Region GDP Growth as instruments. Weak identification tests are also reported, namely the Cragg-Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test. Note the equivalence of the Cragg-Donald Wald F statistic and the F-test from the first-stage regression in the case of a single endogenous regressor.

Table 4a: Corruption, Democracy and Cyclicality of Real Government Consumption Growth

	(1) IV	(2) IV	(3) IV
GDP Growth	5.051** (2.175)	3.701*** (0.857)	5.165*** (1.988)
GDP Growth x Control of Corruption	-11.31 (7.709)		
GDP Growth x Democracy		-3.685** (1.620)	
GDP Growth x Checks			-1.131 (0.873)
Real Government Consumption Growth (t-1)	0.069** (0.034)	0.004 (0.044)	0.020 (0.045)
Observations	2153	2153	2087
Number of Groups	72	72	69
Average Group	29.90	29.90	30.25
R^2 overall	0.04	0.05	0.07
F_1-statistic (first stage)	21.50	11.09	10.01
AP_1 (p-value)	0.1364	0.0000	0.0582
F_2-statistic (first stage)	12.07	10.31	9.34
AP_2 (p-value)	0.2643	0.0000	0.0673
Cragg-Donald F-statistic	3.010	9.130	7.499

Notes: Dependent variable: Real Government Consumption Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x Control of Corruption; Column (2), GDP Growth x Democracy; Column (3), GDP Growth x Checks and Balances. All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Weak identification tests are also reported, namely the Cragg-Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test. F_1-statistic (first stage) represents the First-stage F of the regression of GDP Growth on all the excluded instruments, F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) it is GDP Growth x Control of Corruption) on all the excluded instruments. AP_1 (p-value) is the p-value of the Angrist-Pischke multivariate F test for GDP Growth. AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth x the respective institutional variable.

Table 4b: Corruption, Democracy and Cyclicality of Real Government Consumption Growth - Instrumenting Corruption, Democracy, and Checks

	(1) IV	(2) IV	(3) IV
GDP Growth	4.169***	2.687***	3.276***
	(1.496)	(0.544)	(1.256)
GDP Growth x Control of Corruption (WGI)	-8.612		
	(5.791)		
GDP Growth x Democracy		-2.982**	
		(1.369)	
GDP Growth x Checks			-0.566
			(0.663)
Government Consumption (Real) Growth (t-1)	0.071**	0.041	0.046
	(0.033)	(0.034)	(0.035)
Observations	2148	2153	2087
Number of Groups	71	72	69
Average Group	30.25	29.90	30.25
R^2 overall	0.053	0.049	0.087
F_1-statistic (first stage)	14.97	13.21	12.68
AP_1 (p-value)	0.2358	0.0000	0.0367
F_2-statistic (first stage)	7.00	6.89	8.14
AP_2 (p-value)	0.5748	0.0001	0.1195
Cragg-Donald F-statistic	2.054	6.513	5.375

Notes: Dependent variable: Real Government Consumption Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x Control of Corruption; Column (2), GDP Growth x Democracy; Column (3), GDP Growth x Checks and Balances. All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Additional instruments for the interaction terms are also used as follows: In (1) the Price Growth times Religion Fractionalization Index and the Price Growth times Landlocked. In (2) and (3) the Price Growth times Landlocked. Weak identification tests are also reported, namely the Cragg-Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test. F_1-statistic (first stage) represents the First stage F of the regression of GDP Growth on all the excluded instruments. F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) is GDP Growth x Control of Corruption) on all the excluded instruments. AP_1 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth and AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth x the respective institutional variable.

Table 5a: Corruption, Democracy and Cyclicality of Government Consumption (% of GDP) Growth

	(1) IV	(2) IV	(3) IV
GDP Growth	2.172 (2.048)	2.150*** (0.746)	4.192** (1.835)
GDP Growth x Control of Corruption	-4.802 (7.266)		
GDP Growth x Democracy		-4.287*** (1.577)	
GDP Growth x Checks and Balances			-1.415* (0.825)
Government Consumption (% of GDP) Growth (t-1)	-0.053** (0.023)	-0.078*** (0.030)	-0.063** (0.029)
Observations	2161	2161	2095
Number of Groups	72	72	69
Average Group	30.01	30.01	30.36
R^2 overall	0.0003	0.001	0.004
F_1-statistic (first stage)	22.08	12.41	11.18
AP_1 (p-value)	0.1548	0.0000	0.0544
F_2-statistic (first stage)	12.59	9.52	9.94
AP_2 (p-value)	0.2825	0.0000	0.0697
Cragg-Donald F-statistic	2.834	8.564	7.503

Notes: Dependent variable: Government Consumption (% of GDP) Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x Control of Corruption; Column (2), GDP Growth x Democracy; Column (3), GDP Growth x Checks and Balances. All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Weak identification tests are also reported, namely the Cragg- Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F test. F_1-statistic (first stage) represents the First stage F of the regression of GDP Growth on all the excluded instruments and F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) it is GDP Growth x Control of Corruption) on all the excluded instruments. AP_1 (p-value) is the p-value of Angrist-Pischke multivariate F test for GDP Growth and AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F test for GDP Growth x the respective institutional variable.

Table 5b: Corruption, Democracy and Cyclicality of Government Consumption (% of GDP) Growth – Instrumenting Corruption, Democracy, and Checks.

	(1) IV	(2) IV	(3) IV
GDP Growth	1.585 (1.473)	1.379*** (0.529)	2.680** (1.266)
GDP Growth x Control of Corruption	-2.960 (5.653)		
GDP Growth x Democracy		-3.850*** (1.435)	
GDP Growth x Checks and Balances			-0.961 (0.662)
Government Consumption (% GDP) Growth (t-1)	-0.055** (0.023)	-0.079*** (0.028)	-0.064** (0.025)
Observations	2156	2161	2095
Number of Groups	71	72	69
Average Group	30.37	30.01	30.36
R^2 overall	0.00018	0.00027	0.0027
F_1-statistic (first stage)	14.70	13.72	13.23
AP_1 (p-value)	0.2768	0.0000	0.0476
F_2-statistic (first stage)	7.13	6.35	8.66
AP_2 (p-value)	0.5989	0.0001	0.1364
Cragg-Donald F-statistic	1.999	6.019	5.304

Notes: Dependent variable: Government Consumption (% of GDP) Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x Control of Corruption; Column (2), GDP Growth x Democracy; Column (3), GDP Growth x Checks and Balances. All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Additional instruments for the interaction terms are also used as follows: In (1) the Price Growth times Religion Fractionalization Index and the Price Growth times Landlocked. In (2) and (3) the Price Growth times Landlocked. Weak identification tests are also reported, namely the Cragg- Donald Wald F statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test. F_1-statistic (first stage) represents the First stage F of the regression of GDP Growth on all the excluded instruments. F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) is GDP Growth x Control of Corruption) on all the excluded instruments. AP_1 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth and AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F test for GDP Growth x the respective institutional variable.

Table 6a: SWF and Fiscal Rules

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV
GDP Growth	2.935*** (0.830)	2.705*** (0.950)	2.686*** (0.968)	2.711*** (0.745)	2.588*** (0.766)
GDP Growth x Funds	-6.509** (3.243)				-4.922** (2.076)
GDP Growth x Rules (ER, BBR, DR)		-0.223 (4.078)			
GDP Growth x Rules (ER, BBR)			-0.083 (4.137)		
GDP Growth x Expenditure Rules				-1.845 (6.013)	
GDP Growth x Funds & Rules (ER, BBR)					3.610 (3.615)
Government Consumption (Real) Growth (t-1)	0.057 (0.037)	0.019 (0.040)	0.019 (0.040)	0.022 (0.041)	0.055 (0.034)
Observations	2153	2153	2153	2153	2153
Number of Groups	72	72	72	72	72
Average Group	29.90	29.90	29.90	29.90	29.90
R^2 overall	0.055	0.088	0.088	0.085	0.075
F_1-statistic (first stage)	14.44	10.56	10.60	10.63	12.14
AP_1 (p-value)	0.0000	0.0000	0.0004	0.0000	0.0000
F_2-statistic (first stage)	6.71	8.09	9.73	15.60	13.14
AP_2 (p-value)	0.0044	0.0017	0.0007	0.0000	0.0000
F_3-statistic (first stage)	-	-	-	-	24.90
AP_3 (p-value)	-	-	-	-	0.0000
Cragg-Donald F-statistic	5.599	7.607	8.547	9.897	8.250

Notes: Dependent variable: Real Government Consumption Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x SWF; Column (2), GDP Growth x Rules (ER, BBR, DR); Column (3), GDP Growth x Rules (ER, BBR); Column (4), GDP Growth x Expenditure Rules (ER); Column (5), GDP Growth x SWF, GDP Growth x SWF x Fiscal Rules (ER or BBR). All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Weak identification tests are also reported, namely the Cragg- Donald Wald F statistic and the p-value of the Angrist-Pischke (AP) multivariate F test. F_1-statistic (first stage) represents the First stage F of the regression of GDP Growth on all the excluded instruments and F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) is GDP Growth x SWF) on all the excluded instruments. AP_1 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth and AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth x the respective institutional variable.

Table 6b: SWF and Fiscal Rules using additional instruments

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV
GDP Growth	2.658*** (0.557)	2.163*** (0.577)	2.151*** (0.575)	2.328*** (0.489)	2.519*** (0.543)
GDP Growth x Funds	-4.827** (2.365)				-4.035** (1.650)
GDP Growth x Rules (ER, BBR, DR)		1.285 (3.376)			
GDP Growth x Rules (ER, BBR)			1.454 (3.352)		
GDP Growth x Expenditure Rules				-1.423 (5.521)	
GDP Growth x Funds & Rules (ER, BBR)					2.391 (3.150)
Government Consumption (Real) Growth (t-1)	0.056* (0.031)	0.033 (0.033)	0.032 (0.033)	0.037 (0.034)	0.053* (0.030)
Observations	2148	2153	2153	2148	2148
Number of Groups	71	72	72	71	71
Average Group	30.25	29.90	29.90	30.25	30.25
R^2 overall	0.071	0.090	0.091	0.090	0.084
F_1-statistic (first stage)	12.57	13.20	13.31	11.10	9.68
AP_1 (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000
F_2-statistic (first stage)	4.90	5.40	6.50	8.22	15.39
AP_2 (p-value)	0.0040	0.0014	0.0004	0.0000	0.0000
F_3-statistic (first stage)	-	-	-	-	19.67
AP_3 (p-value)	-	-	-	-	0.0000
Cragg-Donald F-statistic	4.385	5.379	6.493	6.451	7.913

Notes: Dependent variable: Real Government Consumption Growth, Controls: Real Government Consumption Growth (t-1). Column (1), GDP Growth x SWF; Column (2), GDP Growth x Rules (ER, BBR, DR); Column (3), GDP Growth x Rules (ER, BBR); Column (4), GDP Growth x Expenditure Rules (ER); Column (5), GDP Growth x SWF, GDP Growth x SWF x Fiscal Rules (ER or BBR). All regressions include country fixed effects and time-decade effects (not reported). Standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1% levels. IV estimations: All estimations use Real Commodity Price Growth as an instrument for GDP Growth and Real Commodity Price Growth times the respective institutional variable as the instrument for the interaction between GDP Growth and that institutional variable. Additional instruments for the interaction terms are also used as follows: In (1), (4) and (5) the Price Growth times Religion Fractionalization Index and the Price Growth times Landlocked. In (2) and (3) the Price Growth times Landlocked. Weak identification tests are also reported, namely the Cragg-Donald Wald F-statistic and the p-value of the Angrist-Pischke (AP) multivariate F-test. F_1-statistic (first stage) represents the First stage F of the regression of GDP Growth on all the excluded instruments, F_2-statistic (first stage) represents the First stage F of the regression of GDP Growth x institutional variable (for example for the case of regression (1) is GDP Growth x SWF) on all the excluded instruments. AP_1 (p-value) is the p-value of Angrist-Pischke multivariate F-test for GDP Growth and AP_2 (p-value) is the p-value of Angrist-Pischke multivariate F test for GDP Growth x the respective institutional variable.