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Do Fiscal Rules Foster Fiscal Discipline in Resource-Rich Countries?

Ablam Estel Apeti, Olivier Basdevant, and Véronique Salins

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Prepared by Ablam Estel Apeti, Olivier Basdevant, and Véronique Salins*

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ABSTRACT: This paper investigates the performance of fiscal rules in resource-rich countries (RRC). Using panel data for 57 commodity exporting countries from 1976 to 2021, we find that fiscal rules: (i) reduce the procyclicality of real public expenditures with terms of trade in oil exporting countries, and (ii) improve non-resource primary balances in all RRC, especially during terms of trade upturns. The rules' design matters. Addressing the procyclicality of public expenditures with terms-of-trade can be achieved with expenditure rules, and, for oil-exporters, revenue rules (althoug limited data on the latter calls for taking the results cautiously). To improve non-resource fiscal balances, debt rules and fiscal balance rules are shown to have a positive impact, especially in oil exporting countries. We further investigate the effect of fiscal rules and other features of the fiscal framework through case studies (for Botswana, Mongolia, and Timor-Leste). These cases highlight that even when fiscal rules are not fully complied with, they lead to some degree of fiscal discipline. The case studies also highlight the importance of the quality of fiscal frameworks: frequent revisions, lack of compliance or low stringency of the rules can significantly hamper their effectiveness.

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Author's E-Mail Address:	aapeti@IMF.org; obasdevant@IMF.org; vsalins@IMF.org.

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WORKING PAPERS

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Glossary

BBR	Budget Balance Rules
BOM	Bank of Mongolia
DBM	Development Bank of Mongolia
DR	Debt Rule
ER	Expenditure Rules
ESI	Estimated Sustainable Income
FSL	Fiscal Stability Law
GDP	Gross-Domestic Product
GMM	Generalized Method of Moments
IMF	International Monetary Fund
OLS	Ordinary Least Squares
PF	Petroleum Fund
PFM	Public Financial Management
PIH	Permanent Income Hypothesis
RCC	Resource-Rich Countries
RR	Revenue Rules
SBI	Sustainable Budget Index
ToT	Term-of-Trade
WEO	World Economic Outlook

Introduction

Could fiscal rules bring fiscal discipline to resource-rich countries (RRC)? By putting lasting constraints on aggregate indicators of fiscal performance, fiscal rules are correlated with greater fiscal discipline and lesser procyclical fiscal policy fiscal policy (Alesina and Perotti, 1995; Alesina et al., 1999; Debrun et al., 2008; Tapsoba 2012, Guerguil et al., 2017). As such, they could be very relevant for RRC, who have to deal with large swings in commodity prices, which in turns can lead to procyclicality and fiscal sustainability issues (IMF, 2012). However, existing literature found it difficult to establish a clear causality between fiscal rules and fiscal discipline due to potential endogeneity bias. Endogeneity could reflect selection bias if the country implementing a fiscal rule displays preference for fiscal discipline, or reverse causality if, for instance, fiscal rules tend to be adopted in periods of economic or crisis leading to a fiscal adjustment. Using a meta-regression analysis of this literature, Heinemann and al (2018) show that, when addressing potential identification issues, the statistical significance of the impact of fiscal rule on fiscal outcomes significantly weakens. For RRC, anecdotal evidence suggests a mixed experience with fiscal rules. While some countries have efficiently reduced the procyclicality of their fiscal stance,[1] many RRC have had a history of short-lived rules, and/or prolonged periods of suspension of their applications.[2] Weak institutional framework, political pressures, insufficient coverage of the rule leading to a rise of extra-budgetary spending, and limited enforcement mechanisms are additional factors that have impaired the well-functioning of fiscal rules in a number of RRC.

Empirical investigations of how RRC fared in implementing fiscal rules is scarce. Studying the behavior of fiscal variables across the commodity cycle, Céspedes and Velasco (2014) show that the procyclicality of fiscal policy during the 2000s resource windfall was reduced in comparison with previous episodes in a number of countries. They also find that fiscal rules are one of the significant determinants of the cyclicality of both government expenditures and fiscal balance. On the other hand, Coutinho et al (2022) find that fiscal rules are ineffective in limiting procyclicality of government real consumption with GDP growth (instrumented by the growth rate in the main commodity price for each resource-dependent country) and that the presence of a Sovereign Wealth Fund has a more stabilizing effect. Similarly, assessing the reaction of government spending to changes in commodity prices, Bova et al. (2018), do not find that adoption of fiscal rules reduces procyclicality in a significant way in resource-rich countries.

This paper analyzes the impact of fiscal rules on fiscal outcomes (procyclicality and fiscal discipline) for RRC, building on the approach of Bova et al. (2018), taking advantage of the addition of more recent data (1976–2021). Given the specificity of oil exporters, who are usually a lot more dependent on their natural resource, we also assess the benefits of fiscal rules in their specific case. Using Ordinary Least Squares and GMM system on 57 countries over 1976–2021 we find the following three main results.

- A rise in trade term is associated with increase in real public expenditure growth and a drop in non-resource primary balance, thus confirming the procyclicality of public spending and pressures for running lower primary balances.
- Fiscal rules help reduce procyclicality following the rise in term of trade, but only in oil exporting countries.

[1] See below for the specific case of Botswana, IMF 2015 and Ossowski et al. (2008).

[2] See below for the case of Mongolia and Timor-Leste.

- Fiscal rules improve primary balances across all resource-rich countries, with a larger impact in oil-exporting countries.

Turning to the performance of different type of rules, namely expenditure rules (ER), revenue rules (RR), budget balance rules (BBR) and debt rule (DR), our results suggest a significant impact of budget balance and debt rule in improving fiscal balances. Results for both expenditure rule and revenue rule are more mixed and should be taken prudently given the limited number of countries having adopted either one.

While our results find a significant impact of the presence of fiscal rules in RRC, we cannot test for compliance with fiscal rules or assess the impact of the fiscal framework design, because of lack of adequate data. We therefore investigate these aspects through cases studies (for Botswana, Mongolia, and Timor-Leste). These cases highlight that even if fiscal rules are not fully complied with, they lead to some degree of fiscal discipline. Nevertheless, frequent revisions, absence of long-term fiscal strategy, lack of compliance or low stringency of the rules can significantly hamper their effectiveness and undermine the sustainability of the fiscal framework.

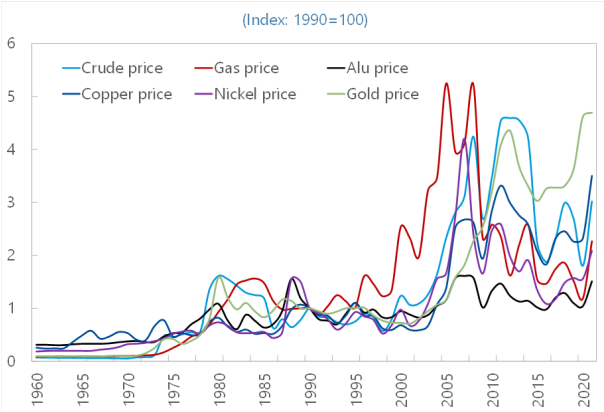
The rest of the paper is organized as follows. The next section highlights the common challenges faced by resource-rich countries affecting their fiscal performance. The data used in our empirical analysis are described in section 3 and the methodology in section 4. Section 5 presents the results of our baseline models, the results by rules design and an analysis of the effect of fiscal rules during periods of terms of trade upturns and downturns. The experiences of Botswana, Mongolia and Timor-Leste are discussed in section 6 and section 7 concludes.

Stylized Facts: Common Challenges Affecting the Conduct of Fiscal Policy in Resource-Rich Countries

RRCs face large, persistent and unpredictable commodity price shocks. Figure 1 underlines the correlation between various commodity prices but also their large volatility. The large movements in commodity prices are difficult to forecast (Figure 2). It compares actual crude oil average prices for each year (solid line) with the vintages WEO projections of the corresponding year showing that forecasts tend to systematically underestimate the variations in oil prices[3] over the entire period 1976–2021.

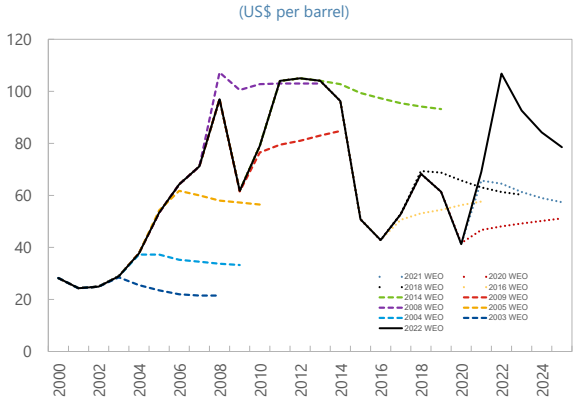
[3] A similar result is obtained by using by market rather than WEO forecasts in IMF (2015).

Figure 1. Commodity Prices Co-Movement



Sources: World Bank, and IMF staff estimates.

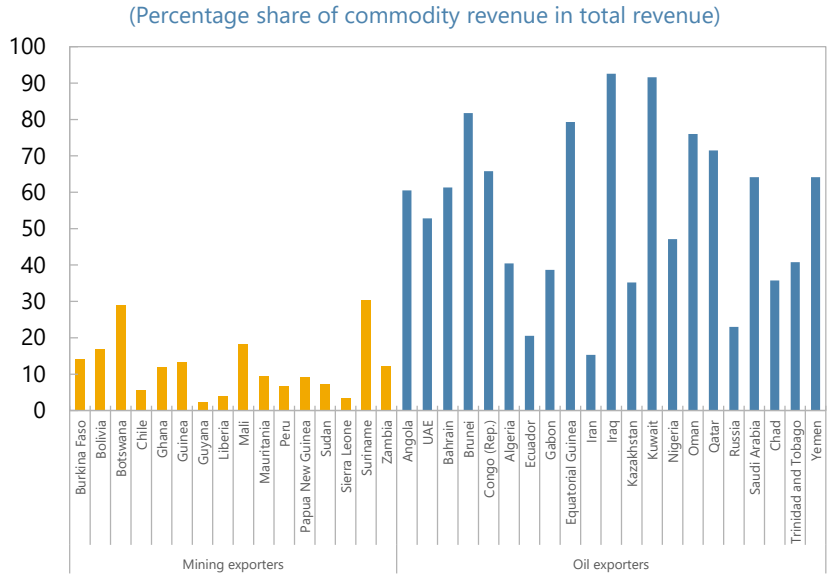
Figure 2. Difficulty in Forecasting Commodity Prices: The Case of Oil Prices



Source: IMF WEO.

Significant differences persist among RRCs, as oil exporters are, on average, particularly regarding the rents the government extracts from commodity exports. It tends to be higher in oil exporting countries making governments revenue more dependent on commodity exports revenues as illustrated in Figure 3. In 2019, commodity export revenues represented 55 percent of government revenues in oil exporting countries on average compared to 11 percent for mining exporters.

Figure 3. Oil Exporters are More Dependent on Commodity Revenue than Other Commodity Exporters



Source: IMF.

Historically, it has proven difficult for most RRCs to isolate the conduct of the fiscal policy from the commodity price cycle. Figures 4 and 5 illustrate, in the case of Nigeria, the relationship between the terms of trade and commodity prices (Figure 4) as well as the procyclicality of fiscal behavior (Figure 5) with the commodity price

cycle. Figure 5 also illustrates, with the case of Nigeria, the deficit bias with expenditures increasing sharply during commodity price boom while being stickier during commodity prices downturns.

Figure 4. Nigeria: Co-Movement of Term of Trade and Commodity Prices, 2000–21

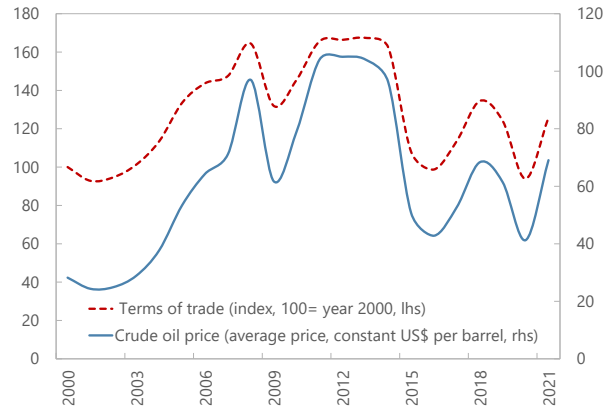
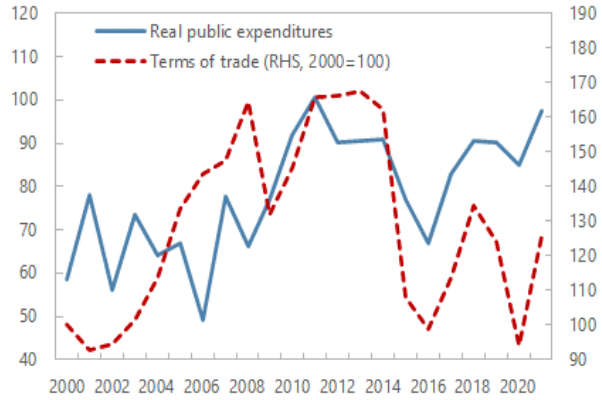


Figure 5. Nigeria: Expenditure Procyclicality, 2000–21

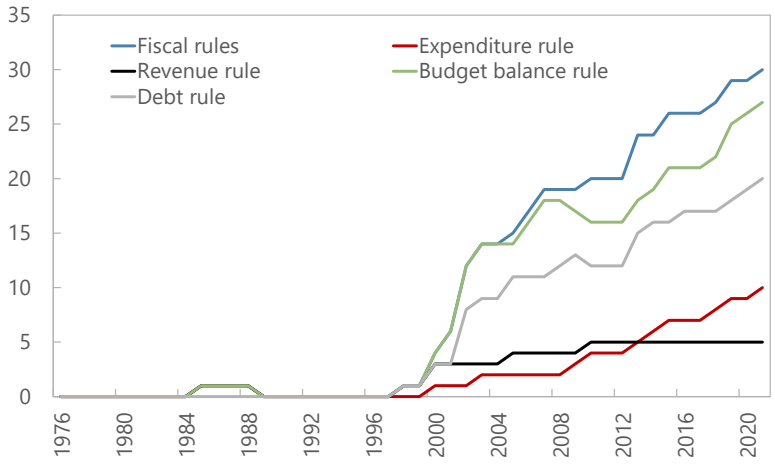


Source: IMF.

To foster fiscal discipline, the adoption of fiscal rules has become increasingly common in RRCs since the 2000's (Figure 6). Although fiscal rules were first adopted in the mid-1980s, especially in 1985, they started gaining popularity in late 1990s and early 2000 and grew rapidly over time, from 1 country, or (2 percent of all RRC) in 1985 to 30 countries (53 percent) in 2021. Moreover, a look at the design of fiscal rules shows that BBR remains the most popular followed by DR. The ER experienced a small surge at the end of the 2000s, while RR adoption stabilized since the end of the last decade.

Figure 1. Fiscal Rules Adoption, 1975–2021

(Blue line: number of countries with at least one fiscal rule, other lines: number of countries with that type of fiscal rule)



Source: Davoodi et al. (2012).

Description of Data Used

Our study is based on a sample of 57 resource-rich countries–with 28 classified as oil exporters–using annual data from 1976 to 2021. Economies are classified as resource-rich if natural resources exceed 20 percent of total export earnings (IMF, 2012 a,b, 2015), on average between 2016 and 2020.

Two main dependent variables are used in this paper, namely real expenditure growth and non-resource primary balance to non-resource GDP, to test, respectively, the procyclicality of fiscal policy and the discipline effect.

A critical variable used to measure procyclicality and fiscal (in)discipline is the term-of-trade (ToT), defined as the change in the logarithm of the term of trade. We use this variable lagged by one year to assess the procyclicality of public expenditure, as annual budgets are typically executed based on budget laws approved the previous year and relying on previous year assumptions regarding commodity prices which tend to display little variation with the contemporaneous prices (figure 2). When testing the discipline hypothesis, we use ToT variable both lagged and current to capture the fact that the primary balance will be affected by expenditure (and thus the lagged variable) but also revenue, which will be affected by current terms of trade shocks.

We define the fiscal rule variable as a dummy taking the value 1 if in a given year a country placed a numerical constraint on fiscal aggregates (budget balance, spending, debt or revenue) at the national and/or subnational level. The variable enters in the models lagged by one year to capture how year t-1 fiscal rules constrain the budget of year t.

Control variables choice is based on empirical literature and include: the presence of an IMF program and real non-resource GDP growth in the procyclicality model and, for the fiscal discipline model we use the same two control variables together with real GDP per capita, and the ratio of debt to non-resource GDP. IMF program and real non-resource GDP growth are included to capture their potential role on the conduct of fiscal policy (see Caselli and Reynaud, 2020). Real GDP per capita and debt to non-resource GDP are selected to capture the role of the level of development and to control the role of government debt on the behavior of the primary balance in line with Caselli and Reynaud (2020). The full description and source of all variables in this paper are in Annex III.

Estimation Methodology

To assess the effectiveness of fiscal rules, we test two complementary models. In the first one, we test whether the presence of fiscal rules reduce the procyclicality of public spending with term of trade. In the second one, we test if fiscal rules promote fiscal discipline, i.e., if they tend to improve non-resource primary fiscal balances.

Model 1: Procyclicality of Public Expenditures

The first model we run sought to address (i) whether public spending is indeed procyclical with term of trade, and (ii) whether fiscal rules reduce this procyclicality. To do so, we estimate the following model using the Ordinary Least Squares (OLS) with fixed effects.

$$\Delta logRG_{it} = \alpha + \beta \Delta logToT_{it-1} + \gamma(rule_{it-1} * \Delta logToT_{it-1}) + \phi X_{it} + \eta_i + \mu_t + \varepsilon_{it} \quad (1)$$

where i indicates countries and t years. The dependent variable RG is real public expenditure,[4] ToT is term of trade index,[5] $rule$ is dummy taking the value 1 if a fiscal rule is present and 0 otherwise, and X is a set of control variables.[6] The parameters η_i, μ_t, and ε_{it} denote, respectively, country fixed effects, time fixed effects and the error term.[7]

Our coefficients of interest are β and γ:

- We test if $\beta>0$ to assess if public spending is procyclical with the term of trade. We expect β to be positive and statistically significant when procyclicality is present.
- We test if $\gamma<0$, as a negative and significant value correspond to the reduction of procyclicality when a fiscal rule is present.

Identifying the effect of fiscal rules is generally not straightforward because the adoption of rules may be endogenous. Indeed, if the adoption of a rule reflects a preference for fiscal discipline, then countries running lower deficits would be more prone to adopt fiscal rules.[8] While endogeneity bias are typically addressed with instrumental variables, adequate instruments for fiscal rules, especially for commodity exporting countries, are difficult to find. Indeed, the commonly used instruments would be indicators of the quality of institutions or government fragmentation (Badinger and Reuter, 2017), but such indicators reflect fiscal preferences on fiscal outcomes and thus are not independent from our endogenous variables (Kontopoulos and Perotti, 1999; Perotti and Kontopoulos, 2002; Ricciuti, 2004; Woo, 2009; Fatás and Mihov, 2013; Bergman and Hutchison, 2015; Combes et al., 2018; Caselli and Reynaud, 2020). Instead, we tested the presence of a selection bias following the methodology of Autor (2003) and Asatryan et al. (2018), by examining trends in real expenditures growth in the periods leading to the introduction of the fiscal rules, i.e. over a period of 1–5 years (using the same controls as in our baseline regression), to assess whether or not countries that ultimately adopted a rule had already better fiscal performances than countries who did not adopt rules. The presence (absence) of selection bias would be characterized by a statistically (non-)significant effect of this indicator of forthcoming fiscal rule.[9]

[4] We use real expenditure growth instead of the non-resource primary fiscal balance in percent of non-resource GDP because the procyclicality in RRC, would typically manifests itself through public spending and consequently affecting the non-resource fiscal balance (IMF, 2015).

[5] The term-of-trade variable appears as lagged, as annual budgets are typically executed based on budget laws approved the previous year. We nevertheless tested if ToT had contemporary effects and it turned out that only the lag of order 1 had a significant coefficient.

[6] We included in the final model the following two control variables, as they are the ones that showed significant coefficient in a wide range of specifications: the presence of an IMF-supported program, to capture its potential effect on fiscal policy behavior; and real non-resource GDP growth to control for the impact of the business cycle. Note that we also tested other control variables, notably measures of the quality of public institutions (multiplied by the lagged ToT growth index), but they turned out to be non-significant.

[7] To deal with heteroskedasticity and autocorrelation and obtain unbiased standard errors, we cluster the standard errors by country.

[8] There is, however, a theoretical counter argument. The cost from deviating from a fiscal rule is typically much larger than deviating from a simple promise. Thus, shifting to a fiscal rule would still represent a major change in the conduct of fiscal policy, which cannot necessarily be predicted by a certain track record (see Debrun et al., 2018).

[9] Another option would have been to use a treatment effects approach as in Caselli and Wingender (2021). However, the large institutional heterogeneity of the countries of our sample makes more challenging its implementation (which requires to estimate the probability for a country to adopt a fiscal rule).

Our results are consistent with the rejection of the hypothesis that fiscal behavior was different prior to adopting a rule, and thus support the use of OLS estimations since no selection bias effect is detected (Annex I).

Endogeneity issue could also come from reverse causality between the fiscal stance and term of trade index, i.e., if changes in term of trade index are a result of changes in fiscal stances in commodity producers. However, for commodity exporters this bias is unlikely arise as most resource-rich countries don't have enough market power at an individual level to influence prices of commodities they export. Coordination among big producers such as the Organization of the Petroleum Exporting Countries (OPEC) on the oil market can have an impact on commodity prices but unless countries have similar fiscal preferences, these cartel behaviors can be captured by time-fixed effects included in our regressions. Thus, the term of trade index would remain, for each country, exogenous to fiscal variables (see Krogstrup and Wälti, 2008 and Caselli and Reynaud, 2020). Moreover, using lagged term of trade index (instead of contemporary ones) structurally strengthens the exogeneity of term of trade.

Finally, a last source of potential endogeneity is the omitted variables bias. The inclusion of control variables and fixed effects help mitigate this bias.

Model 2: Fiscal Discipline

The second model tests if fiscal rules improve the fiscal discipline in resource-rich countries, measured by non-resource fiscal primary balance, using the following model:

$$\begin{aligned} \mathrm{F}_{it} = \sigma + \upsilon_1 \Delta ToT_{it} + \upsilon_2 \Delta ToT_{it-1} \\ + \upsilon_3 (rule_{it-1} * \Delta ToT_{it-1}) + \rho \mathrm{Y}_{it} + \vartheta_i + \pi_t \\ + \omega_{it} \end{aligned} \quad (2)$$

Where our dependent variable F is a measure of the fiscal stance, either the non-resource primary balance to non-resource GDP ratio, or its components, the primary expenditure to non-resource GDP ratio and the non-resource revenue to non-resource GDP ratio. Y is a set of control variables[10] that includes the first and second order lags of the dependent variable to capture inertia of the dependent variable and also to control the fact that fiscal rules are constraints on past levels of fiscal aggregates (Caselli and Reynaud, 2020). The variables ϑ_i, π_t, and ω_{it}, denote, respectively, country fixed effects, time fixed effects and the error term. Since the primary balance is composed of income and expenditure, we include the lagged term of trade index to capture expenditure behavior following term of trade change as in the previous specification. In addition, we include the change in term of trade index at time t to assess its contemporaneous effect on revenues.

Our coefficients of interest are ϑ_1, ϑ_2, and ϑ_3:

[10] The variables tested that turned out to have significant coefficient in at least some of our regressions are: first and second order lags of PB, the presence of an IMF-supported program (as they tend to be relevant in explaining fiscal consolidation episodes, but also why countries introduce fiscal rules, see Caselli and Reynaud, 2020), real non-resource GDP growth, real GDP per capita (in log), and the first-order lag of the debt-to-non-resource-GDP ratio (see Bohn, 2008, and Debrun et al., 2008). While the literature also highlights the role of institutions on the fiscal stance, these variables are reported in our final results as they do not have a significant effect in our estimations.

- We test if $\upsilon_1<0$ and $\upsilon_2<0$. If both coefficients are significantly negative, then there is a deficit bias in the sense that term of trade index increases are associated with a deterioration of non-resource primary balances, an increase in government primary expenditures and a decrease in non-resource revenue.
- We test if and $\upsilon_3>0$. A significantly positive value indicates that the presence of a fiscal rule improves the fiscal balance.

Similar potential endogeneity issues as those mentioned in our previous specification and are dealt accordingly. Our results (Annex I, Table 9) and we can rule out a selection bias.

There is, however, an additional source of endogeneity in this model, because of its dynamic nature.[11] To account for this potential bias, we complement our OLS estimations by using the Blundell and Bond (1998) two-step system-GMM dynamic estimator, as it avoids the bias inherent dynamic panels (Nickell, 1981). This method combines equations in levels and first differences in a system and estimated them with an extended system-GMM estimator that allows the use of lagged differences and levels of explanatory variables as instruments. Compared to the difference GMM estimator, system-GMM estimator allows introducing more instruments by adding a second equation, which should improve estimation efficiency. To tackle the problem of instrument proliferation raised by the above method (Roodman, 2009) and given the relatively long time span of our estimations, the instrument matrix is collapsed and we limit the number of lags to three. Moreover, to avoid that the standard errors are downward-biased, we use the Windmeijer (2005) finite-sample correction to reduce the possibility of spurious precision.

Results

Our results confirm the procyclicality of government expenditures with terms of trade, and, consequently, commodity prices (see model 1). The impact is stronger in oil exporting countries where the share of commodity revenue in government revenue tends to be larger. The procyclicality of government expenditures also contributes to a deficit bias (see model 2). In both cases we find that the presence of fiscal rules improves fiscal outcome by (i) reducing the procyclicality of public expenditures, and (ii) improving non-resource primary fiscal balances. Both the deficit bias and the disciplinary effect of fiscal rules are higher for oil exporting countries.

We also highlight how the issue of procyclicality (and consequently the impact of fiscal rules) is more pronounced during upturns of terms of trade. The propensity to relax the fiscal stance is more prevalent during good times, fueling procyclicality and excessive deficits (as the adjustment during downturn tend to be proportionally lower than the initial relaxation of the fiscal stance). Fiscal rules appear to be particularly effective during upturns, to bring more discipline during good times, and thus preserving room for maneuver during bad times.

[11] The dynamic panel model creates another potential source of endogeneity through the correlation between the error term and the lagged dependent variable.

Model 1 Confirms the Procyclicality of Expenditures and the Counter-Cyclical Role of Fiscal Rules

We begin our analysis by presenting the results of equation 1 estimated by OLS with country and time fixed effects which assess the role of fiscal rule to limit the procyclical behavior of real public expenditure.

Our results confirm the procyclicality of government expenditures with terms of trade (and consequently commodity prices). The results are reported in Table 1, in Column [1] for the full sample of resource-rich countries and in Column [2] for the specific case of oil exporting countries. The impact is stronger in oil exporting countries where the share of commodity revenue in government revenue tends to be larger.

Fiscal rules helped reduce the procyclicality of spending in oil exporting countries (see column [4])[12] But their impact is not statistically significant in the full sample if commodity exporters. So, interestingly, while the procyclicality of spending is more pronounced in oil exporting countries, fiscal rules also appear to have a stronger impact for them as well. Finally, we control for the impact of the business cycle by including the growth of the non-resource GDP in our regressor as well as the presence of an IMF program (which can help promote fiscal discipline). The impact of the business cycle public spending growth is found to be significant but of lesser magnitude of commodity prices growth and IMF programs do not appear to significantly tame procyclicality.

Table 1. Fiscal Policy Procyclicality and Fiscal Rules

	Full sample	Oil exporters	Full sample	Oil exporters
Real public expenditure growth	[1]	[2]	[3]	[4]
Lag term of trade growth	0.108**	0.150*	0.0953	0.1753
	(0.053)	(0.0845)	(0.0759)	(0.1057)
Lag (term of trade growth*rule)			-0.0649	-0.1558*
			(0.0594)	(0.0768)
Real non commodity GDP growth			0.0060***	0.0051***
			(0.0011)	(0.0013)
IMF program			-0.0091	-0.0183
			(0.0155)	(0.0382)
Observations	1403	670	1112	565
R^2	0.105	0.175	0.19	0.231

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.

Model 2 shows that the Presence of Fiscal Rules Improve Non-Resource Primary Fiscal Balances

We now turn to the impact of fiscal of rule on fiscal discipline measured by the non-resource primary fiscal balance (in percent of non-resource GDP). Results are reported in Table 2 for the OLS regressions with fixed

[12] The impact of fiscal rules is estimated by adding the interaction of the term of trade growth with a dummy indicating the presence of the rule.

effects and in Table 3 for the two-step system GMM estimator. In both table, Column [1] (for the full sample) and Column [2] (for oil-exporting countries sample) display the results for the non-resource primary balance (as a percentage of non-resource GDP) as the dependent variables. Results for government primary expenditures and non-resource revenues (as a percentage of non-resource GDP in both cases) are displayed respectively in Columns [3] and [4], and in Columns [5] and [6].

Both the OLS (Table 2) and GMM (Table 3) results highlight the presence of deficit bias with a significant coefficient associated with the term of trade (Column [1] and Column [2]) that the presence of a fiscal rule helps mitigating. Both the deficit bias and the disciplinary effect of fiscal rules are higher for oil exporting countries (column [2]).

The statistically significant control variables are consistent with the literature. Specifically, the IMF program and the level of debt seem to influence favorably fiscal discipline in the OLS estimations (but their impact is not significant in the GMM estimations). In columns [3]–[6], we decompose primary balance into primary expenditure and non-resource revenue to determine the component that drives our results. The results show that the effects discussed above are essentially driven by primary expenditure behavior. The inertia of the fiscal stance is confirmed in both type of regressions but for one period only.

Table 2. Fiscal Discipline and Fiscal Rules: Fixed Effects OLS Estimations

	Full sample	Oil exporters	Full sample	Oil exporters	Full sample	Oil exporters
	Non-commodity primary		Non-commodity primary expenditure		Non-commodity revenue	
	[1]	[2]	[3]	[4]	[5]	[6]
Lag dependent variable	0.659***	0.658***	0.770***	0.692***	0.463***	0.672***
	(0.0733)	(0.0816)	(0.0775)	(0.078)	(0.0957)	(0.0647)
Lag2 dependent variable	-0.058**	-0.049*	-0.100***	-0.047*	0.206***	0.101
	(0.0219)	(0.0238)	(0.0209)	(0.0235)	(0.0421)	(0.0693)
Δterm of trade	-0.024	-0.039	0.027**	0.038	0.009	0.005
	(0.0164)	(0.0242)	(0.0109)	(0.0259)	(0.0083)	(0.0089)
Lag Δterm of trade	-0.081***	-0.101***	0.057***	0.106***	0.003	0.007
	(0.0192)	(0.0287)	(0.0193)	(0.0254)	(0.0058)	(0.0047)
Lag (Δterm of trade*rule)	0.073***	0.097***	-0.062**	-0.104***	-0.011	-0.009
	(0.0204)	(0.0214)	(0.0248)	(0.0265)	(0.0082)	(0.0068)
Log real gdppc	-1.914	0.227	2.229	1.563	-0.342	-0.448
	(2.1116)	(2.7782)	(1.9669)	(2.6899)	(1.2804)	(1.2695)
Real non commodity GDP growth	0.016	0.002	0.000	0.021	0.013	0.003
	(0.0647)	(0.0704)	(0.0607)	(0.0609)	(0.0159)	(0.0162)
IMF program	2.561**	5.695**	-1.802**	-4.420**	-0.251	0.102
	(1.1578)	(2.4596)	(0.785)	(1.8243)	(0.4708)	(0.4838)
Lag debt to non commodity GDP	0.012*	0.028**	-0.010*	-0.008	-0.005	-0.004
	(0.0067)	(0.0114)	(0.0056)	(0.0157)	(0.0031)	(0.0035)
Observations	693	422	945	488	700	429
R^2	0.528	0.61	0.611	0.638	0.449	0.594

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Fiscal Discipline and Fiscal Rules: GMM Estimations

	Full sample	Oil exporters	Full sample	Oil exporters	Full sample	Oil exporters
	Non-commodity primary balance		Non-commodity primary expenditur		Non-commodity revenue	
	[1]	[2]	[3]	[4]	[5]	[6]
Lag dependent variable	0.535***	0.567***	0.615***	0.649***	0.699***	0.754***
	(0.1464	(0.1308	(0.1665)	(0.1838)	(0.1321)	(0.0918)
Lag2 dependent variable	-0.012	-0.042	-0.060**	-0.020	0.244***	0.115
	(0.0284	(0.0293	(0.0286)	(0.0408)	(0.0595)	(0.1370)
∆term of trade	-0.017	-0.044	0.040*	0.063*	0.016	0.009
	(0.0190)	(0.0411)	(0.0207)	(0.0330)	(0.0112)	(0.0094)
Lag ∆term of trade	-0.090***	-0.092**	0.070**	0.128**	0.007	0.011***
	(0.0259)	(0.0439)	(0.0327)	(0.0597)	(0.0076)	(0.0040)
Lag (∆term of trade*rule)	0.091***	0.118**	-0.097**	-0.187***	-0.011	-0.014**
	(0.0240)	(0.0459)	(0.0456)	(0.0578)	(0.0087)	(0.0070)
Log real gdppc	-1.973	-0.766	1.844	2.686	0.194	-0.003
	(4.1605)	(8.3316)	(5.2626)	(6.9552)	(0.9557)	(0.6456)
Real non commodity GDP growth	0.106	0.024	0.020	0.055	0.053*	0.036
	(0.0961)	(0.1066)	(0.0607)	(0.0985)	(0.0297)	(0.0221)
IMF program	-0.124	2.179	-0.531	-2.690	-0.321	0.180
	(1.1872)	(3.4712)	(0.8203)	(2.7545)	(0.9086)	(0.8146)
Lag debt to non commodity GDP	-0.006	-0.005	-0.000	-0.014	-0.007*	-0.006
	(0.0377)	(0.0618)	(0.0469)	(0.1074)	(0.0043)	(0.0090)
Observations	693	422	945	488	700	429
AR(1)/AR(2)	0.021/0.213	0.032/0.219	0.017/0.631	0.017/0.460	0.018/0.329	0.003/0.659
Hansen test p-value	0.131	0.141	0.278	0.413	0.285	0.501
Country/instrument	36/20	20/20	44/19	21/19	36/20	20/20

Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Investigating the Effectiveness of Fiscal Rules Across Different Types

Our results rely on whether or not a fiscal rule is present but do not inform on what type of fiscal rule may be more effective in reducing procyclicality and/or fiscal discipline. In this section, we perform more granular analysis by breaking fiscal rules according to fiscal aggregate targeted, namely expenditure rule, revenue rule, budget balance rule, and debt rule. Because of data limitations (the sample of countries does not always offer enough observations for each type of rule investigated) our results should be taken with caution and represents avenues for future research.

In the full sample of resource-rich countries, only expenditure rules seem to mitigate fiscal procyclicality (Table 4, column [1]–[4]). This result is particularly relevant as the effect of fiscal rules on the full sample (Table 1 column [3]) is not statistically significant. Focusing on the oil exporting countries (column [5]–[8]) we show that the revenue rule matters while expenditure rules do not have a significant effect. Again, considering the scarcity of expenditures rules in our sample of oil exporting countries, this result should be taken with caution.

Following the same approach of Table 4, we assess the effect of rules design on fiscal discipline. Based on the full sample and using the OLS approach, the results in Table 5 (columns [1]–[4]) show that all rules except the

revenue rule are effective in improving primary balances in resource- rich countries following term of trade index increases. For oil-exporting countries, results in columns [5]–[8] show that the revenue, balanced budget, and debt rules are effective in these countries, while no evidence is found for the expenditure rule, in contrast to results observed in the full sample (column [1]). Again, the scarcity of expenditures rules in oil exporting countries may explain this conflicting result.

Finally, the results in columns [1]–[7] of Table 10 in Annex II replicate the approach in Table 5 using the GMM system. Consistently with OLS regressions, the expenditure, balanced budget, and debt rules show a positive coefficient for the full sample and the revenue, balanced budget, and debt rules are positive for the sample of oil-exporting countries. However, and contrarily to OLS findings, the results of expenditure rule for the full sample and revenue rule for the sample of oil-exporting countries are not statistically significant. Put differently, only the balanced budget, and debt rules–the most popular rules in resource-rich countries (see Figure 6) are statistically significant in both samples with larger coefficients in the oil-exporting countries.

Table 4. Fiscal Policy Procyclicality and Fiscal Rules Design

	Full sample	Full sample	Full sample	Full sample	Oil exporters	Oil exporters	Oil exporters	Oil exporters
Real public expenditure growth	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lag term of trade growth	0.084	0.091	0.088	0.08	0.144	0.151	0.161	0.15
	(0.0696)	(0.0698)	(0.0763)	(0.0757)	(0.1016)	(0.0982)	(0.11)	(0.1117)
Lag (term of trade growth*ER)	-0.185*				-0.039			
	(0.0932)				(0.1919)			
Lag (term of trade growth*RR)		-0.221				-0.612***		
		(0.171)				(0.0603)		
Lag (term of trade growth*BBR)			-0.029				-0.087	
			(0.0611)				(0.0869)	
Lag (term of trade growth*DR)				0.023				-0.034
				(0.0628)				(0.0899)
Real non commodity GDP growth	0.006***	0.006***	0.006***	0.006***	0.005***	0.005***	0.005***	0.005***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0013)	(0.0013)	(0.0013)	(0.0013)
IMF program	-0.009	-0.009	-0.009	-0.009	-0.017	-0.018	-0.018	-0.017
	(0.0154)	(0.0154)	(0.0155)	(0.0154)	(0.0373)	(0.0373)	(0.0377)	(0.0373)
Observations	1112	1112	1112	1112	565	565	565	565
R^2	0.19	0.191	0.19	0.189	0.227	0.234	0.228	0.227

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

ER: expenditure rule, RR: revenue rule, BBR: balance budget rule, DR: debt rule.

Table 5. Primary Balance and Term-of-Trade Index Growth: Effects by Rules Design

	Full sample	Full sample	Full sample	Full sample	Oil exporters	Oil exporters	Oil exporters	Oil exporters
Non-commodity primary balance	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lag dependent variable	0.670***	0.670***	0.660***	0.661***	0.677***	0.677***	0.660***	0.661***
	(0.0782)	(0.0782)	(0.0743)	(0.0754)	(0.0961)	(0.0953)	(0.0848)	(0.0859)
Lag2 dependent variable	-0.085***	-0.086***	-0.062***	-0.066***	-0.093***	-0.090***	-0.055**	-0.058**
	(0.0206)	(0.0209)	(0.0217)	(0.0211)	(0.0242)	(0.0244)	(0.0243)	(0.0241)
Δterm of trade	-0.021	-0.022	-0.024	-0.023	-0.04	-0.039	-0.041	-0.041
	(0.0152)	(0.0152)	(0.0163)	(0.0162)	(0.0239)	(0.024)	(0.0242)	(0.0242)
Lag Δterm of trade	-0.052***	-0.051***	-0.077***	-0.072***	-0.054*	-0.057*	-0.094***	-0.091***
	(0.0159)	(0.0166)	(0.0188)	(0.0181)	(0.0275)	(0.0278)	(0.0288)	(0.0287)
Lag (term of trade growth*ER)	0.099***				0.065			
	(0.0251)				(0.1033)			
Lag (term of trade growth*RR)		0.005				0.086***		
		(0.0352)				(0.0221)		
Lag (term of trade growth*BBR)			0.067***				0.085***	
			(0.0205)				(0.0222)	
Lag (term of trade growth*DR)				0.058***				0.080***
				(0.0203)				(0.0221)
Log real gdppc	-2.017	-2.102	-1.928	-1.99	-0.083	-0.059	0.183	0.131
	(2.1732)	(2.1721)	(2.1208)	(2.1333)	(2.9099)	(2.894)	(2.8119)	(2.8238)
Real non commodity GDP growth	0.015	0.014	0.015	0.016	0.001	0.002	0.002	0.001
	(0.0656)	(0.066)	(0.0649)	(0.0652)	(0.0732)	(0.0725)	(0.0712)	(0.0713)
IMF program	2.473**	2.521**	2.545**	2.570**	5.721**	5.722**	5.696**	5.693**
	(1.1573	(1.1545	(1.158	(1.1565	(2.4312	(2.4233	(2.4578	(2.4509
Lag debt to non commodity GDP	0.011*	0.011*	0.012*	0.012*	0.024**	0.025**	0.027**	0.027**
	(0.0063)	(0.0064)	(0.0066)	(0.0066)	(0.0109)	(0.011)	(0.0113)	(0.0113)
Observations	693	693	693	693	422	422	422	422
R^2	0.52	0.519	0.526	0.524	0.598	0.599	0.607	0.606

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Investigating if Fiscal Rules Are More Effective During Term-of-Trade Upturns

In the results presented with models 1 and 2, we did not differentiate between upturns and downturns in terms of trade shocks. During upturns, there are greater political and social pressures to spend more during terms of trade upturns, which can translate into inadequate relaxation of the fiscal stance. On the other hand, adequately implemented fiscal rules should also reduce the need for procyclical fiscal adjustment during downturns.

Accordingly, we evaluate more formally the fiscal behavior in times of rising and falling term of trade index. The results presented in Tables 6 show that the effect of term of trade index on the procyclicality of public spending appears to be essentially relevant in times of price decrease, significantly limiting the

spending cuts (columns [5]-[8] of Table 6 where β and γ are negative).[13] Nevertheless, the disciplinary effect of fiscal rules on the deficit bias appears more pronounced during periods of price upturns (columns [1]-[2] of Table 7 and Table 11 in Annex II).

Table 6. Real Expenditure Growth During Term-of-Trade Index Rise and Fall

	Full sample	Oil exporters	Full sample	Oil exporters	Full sample	Oil exporters	Full sample	Oil exporters
	Price increase				Price decrease			
Real public expenditure growth	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lag term of trade growth	-0.009	0.046	0.010	-0.0592	0.2979**	0.3872***	0.353**	0.488***
	(0.0529)	(0.1359)	(0.1007)	(0.2164)	(0.1051)	(0.0784)	(0.1335)	(0.0910)
Lag (term of trade growth*rule)			-0.058	-0.028			-0.157	-0.243*
			(0.2167)	(0.2901)			(0.1155)	(0.1395)
Real non commodity GDP growth			0.007***	0.006***			0.006***	0.004
			(0.001)	(0.001)			(0.0020)	(0.0028)
IMF program			0.014	-0.037			-0.039	-0.031
			(0.0246)	(0.0486)			(0.0253)	(0.0363)
Observations	764	378	619	337	636	289	490	228
R^2	0.09	0.201	0.225	0.320	0.189	0.359	0.285	0.415

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Non-resource Primary Balances During Term-of-Trade Index Rise and Fall

	Full sample	Oil exporters	Full sample	Oil exporters
	Price increase		Price decrease	
Non-commodity primary balance	[1]	[2]	[3]	[4]
Lag dependent variable	0.632***	0.657***	0.600***	0.562***
	(0.0562)	(0.0595)	(0.1470)	(0.1606)
Lag2 dependent variable	0.063	0.058	-0.052	-0.021
	(0.0508)	(0.0571)	(0.0329)	(0.0485)
Δterm of trade	-0.058*	-0.090	-0.005	-0.028
	(0.0339)	(0.0537)	(0.0223)	(0.0213)
Lag Δterm of trade	-0.117***	-0.105	-0.093***	-0.131**
	(0.0426)	(0.0688)	(0.0290)	(0.0506)
Lag (Δterm of trade*rule)	0.128***	0.151**	0.059	0.066
	(0.0417)	(0.0568)	(0.0353)	(0.0419)
Log real gdppc	-2.958	-0.986	-0.850	2.660
	(2.5270)	(2.9734)	(2.8450)	(5.5211)
Real non commodity GDP growth	0.056	0.033	-0.037	-0.053
	(0.0824)	(0.0936)	(0.0687)	(0.0914)
IMF program	2.462	5.979	2.580*	6.313***
	(1.4672)	(3.6125)	(1.3027)	(1.2287)
Lag debt to non commodity GDP	0.024**	0.050***	-0.003	0.008
	(0.0116)	(0.0173)	(0.0055)	(0.0202)
Observations	408	265	285	157
R^2	0.629	0.692	0.500	0.631

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.

[13] Period of upturn (downturn) are here defined as the period during which the one period lagged term of trade growth is positive (negative) as the lagged terms of trade is more likely to impact the budget. However, we also tested the impact of fiscal rules during period contemporaneous terms of trade upturn (downturn): in this case the effects of fiscal rules are only significant during term of trade upturn, limiting the relaxation of the fiscal stance. Additional estimations differentiating capital and current expenditures (not reported here) show that in our framework our results are essentially driven by the procyclicality of capital expenditures (and the impact of fiscal rules in limiting it). A better assessment of the impact of fiscal rules on current expenditures may require an alternative model, more focused on the dynamic effects of term of trade changes, based for instance, on local projections (which also allow for the analysis of the state dependency of the model).

Country Cases

Three country case studies are analyzed in this paper namely Botswana, Mongolia (both non-oil exporters), and Timor-Leste (oil exporter, see Annex IV for additional details on their experience). The choice was mostly drivenby these countries mixed experiences with fiscal rules, offering useful insight to RRC considering implementing fiscal rules; or revising existing ones (for cases of well-functioning fiscal rules, cases such as Norway or Chile could also offer helpful insights, which are discussed in great details in the literature (see also IMF 2012a,b and 2015). In the case of the three countries presented here, their mixed outcomes have been due to different reasons. In Botswana, the compliance with the main rule (a debt ceiling) was easily achieved, but the rule failed at providing an effective guide for fiscal policy. For Timor-Leste and Mongolia, a key issue has been compliance with the rule. A fundamental lesson from these experiences is the need to frame fiscal rules within a broad fiscal framework, which would, in particular, focus on financial assets, the non-resource fiscal balance, and would be underpinned by an adequate Public Financial Management (PFM) system.

Rules Are Usually Set Up as a Mix of Formal and Indicative Ones

Botswana has fiscal rules mostly set in terms of non-binding political commitments. There are four main rules, targeting public spending, the fiscal balance and debt.

- An indicative expenditure rule through the Sustainable Budgeting Index (SBI). Set in the mid–1990s, the SBI computes the ratio of recurrent spending (excluding development spending)[14] over non-diamond revenue, with the goal of keeping ratio below 1. Adhering to this rule would leave diamond revenue to finance the accumulation of financial assets and development spending.
- Another indicative target on the composition of spending: development spending ought to make at least 30 percent of total spending.
- In 2003, the authorities set as an indicative target a non-negative fiscal balance.
- In 2005, a formal cap on debt (to be kept below 40 percent of GDP) was introduced.[15]

Mongolia adopted a Fiscal Stability Law (FSL) in 2010, which defined binding fiscal rules from 2013 onwards.

- A ceiling on the structural deficit of 2 percent of GDP. The structural deficit is predicated on structural revenue, where resource revenues are evaluated with a 16-year moving average of mineral prices. The long time-horizon for the moving average was set to avoid the rule being affected by short-term volatility in commodity prices.

[14] The definition of development spending is broad, as it covers infrastructure investment and human capital (health and education).

[15] The rules on the deficit and debt have been subject to several changes or interruptions in their implementation (IMF. 2021a). The ceiling on the structural deficit has been met only twice since 2013 and has now been delayed until 2025.The expenditure rule to limit excessive expenditure was implemented from 2017 (instead of 2013), owing to proactive spending policies between 2013 and 2016. The debt ceiling has been subject to numerous changes as well. In 2015, the definition of the debt rule was narrowed from public debt to general government debt, excluding the debt of state-owned enterprises, state contributions to mining, energy, and railway projects, and state guarantees that are fully backed by government securities. In 2016, the debt ceiling was raised from 40 percent of GDP to 60 percent of GDP (in NPV terms).

- A ceiling on expenditure growth tied to the non-mineral GDP growth. Thus, expenditures face two complementary constraints: the one derived from the structural deficit rule (which, coupled with the structural revenue provides a ceiling for expenditure), and an additional ceiling tied to the non-mineral GDP growth. This additional rule was deemed necessary as the activity of new mines would otherwise mechanically increase the space for expenditure growth, thus leading to excessive growth.
- A ceiling on public debt (amended each year over the period 2014–21). The gross debt rule is a secondary constraint that ensures that policy under the fiscal rules is consistent with maintaining a sustainable debt (IMF, 2013a).

Timor-Leste adopted two rules to guide the use of oil revenue, without making them binding. A Petroleum Fund (PF), established in 2005, manages the country's petroleum revenue, investing its assets abroad. All petroleum revenue goes into the fund, and the Fund can only be used to finance the budget (and thus has no direct spending authority, avoiding quasi-fiscal activities).

- Transfers from the PF to the budget are guided by a principle of maintaining the real value of government wealth following a methodology broadly consistent with the PIH: transfers are equal to the Estimated Sustainable Income (ESI) which is set at 3 percent of total government wealth (defined as financial assets in the Fund plus the net present value of future oil revenue). Transfers in excess of the ESI are allowed, but only after the government provides a justification that has to be approved by Parliament. The intention is to place reasonable constraints on the ability of governments to spend government resources without accounting for long-term fiscal sustainability.
- The rule on transfers was complemented by a political commitment to maintain a ceiling on the cost of external debt at 3 percent per year. This rule also required the government to benchmark the costs of external borrowing against the average rate of PF's investment returns (Davoodi et al., 2022).

Rules Can Have a Positive Impact on Fiscal Discipline Even if they Are Not Fully Complied With, but Non-Compliance and Design Flaws Can Undermine the Sustainability of the Fiscal Framework

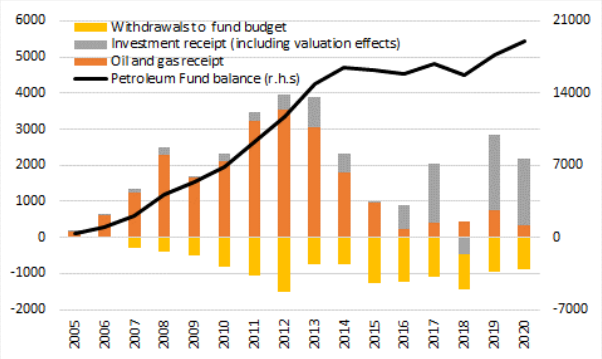
Both Botswana and Timor-Leste have maintained significant level of net financial assets, despite not meeting strictly their rules. In Botswana, diamond revenue has been sustained at a high level, which led the country to keep public debt at a low level (even in the aftermath of the pandemic gross public debt (including was only around 24 percent of GDP in 2021–22) while implementing expenditure plans that were generally above the levels recommended by their rules. While fiscal policy did not pose immediate fiscal risks, it also created some tensions during the pandemic, as Botswana was left with much lower financial assets,[16] due to a combination of diamond revenue loss and exceptional spending to combat the pandemic impact. Up to 2008, the Timor-Leste's government spending of oil revenue was conservative with transfers to the State budget to finance the non-oil budget deficit smaller than ESI. As a result, the net assets of the Petroleum Fund grew rapidly from USD 371 million in 2005 to USD 4.2 billion in 2008 (647 percent of non-oil GDP). Since 2009, the country started withdrawing fund from the PF in excess of the ESI (IMF, 2021b) to finance large infrastructure projects. This led to a significant slowdown in accumulation of assets, but the PF still reached a level of USD billion 19.6

[16] The Government Investment Account at the Bank of Botswana falling from 45 percent of GDP in 2007/08 to 6 percent of GDP in 2021/22.

in 2021 (about 1,100 percent of non-oil GDP). Still, the country fiscal sustainability is currently challenged with active oil fields nearly depleted, limited progress in diversifying the economy and still sizable development needs (IMF 2022b).

Figure 7. Timor-Leste: Fund Revenues and Withdrawals

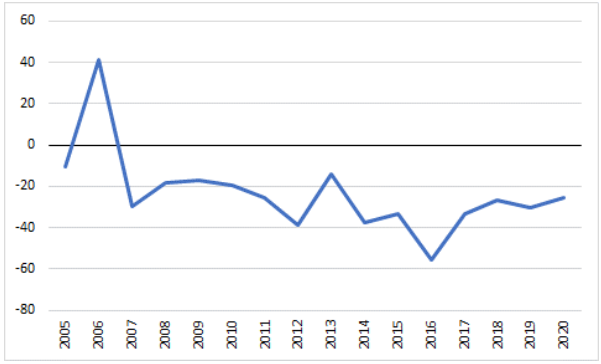
(USD million)



Sources: Timor-Leste authorities, and IMF staff.

Figure 8. Timor-Leste: Total Government Balance

(Percent of non-oil GDP)



Source: IMF staff.

Despite having more formal rules, Mongolia did not comply better than either Botswana or Timor-Leste. The frequent revisions of the rule often guided by spending policy concerns rather than the fiscal prudence underpinning the rules. Fiscal outcomes also suffered from quasi-fiscal spending by the Development Bank of Mongolia (DBM) and the Bank of Mongolia (BOM), which further exacerbated consolidated budget deficits and debt. Non-compliance and frequent revisions undermined the rules' credibility and led to volatile expenditure and a sharp increase in public debt.

Some Lessons: Strengthening the Design of Fiscal Rules and Incentives for Compliance

Shortcomings in the rules design can explain why they are not fully complied with. In the cases of both Botswana and Mongolia, for instance, a concern regarding long term sustainability was addressed through a recommended level for public debt. While commendable, the efforts were partly misguided by design, as fiscal policy for resource rich countries should be more guided by net financial assets (i.e., financial assets net of public debt), as underscored in IMF (2012, 2015) and summarized by Basdevant, Imamoglu, and Hooley (2021).

Fiscal rules design can be improved through anchoring a long-term fiscal policy strategy on adapted versions of the permanent income hypothesis (PIH) and building fiscal buffers (IMF 2012, 2015, Basdevant, Imamoglu, and Hooley, 2021). The PIH provides an anchor by taking the net financial wealth of the country (existing financial assets, net present value of future resource revenue, minus public debt) and turning this wealth into a constant stream of income. However, implementing the PIH per se would mostly likely not be feasible, and strong consideration for a transition period (to avoid an unnecessary upfront adjustment and to ensure that the country can continue to meet its diversification and development objectives) would be needed. Furthermore, while a fiscal rule setting a cap on the non-resource primary fiscal balance would be helpful, the design should also

factor how to deal with unexpected shocks, which call for (i) building fiscal buffers, usually in the form of accumulated liquid financial assets, and (ii) planning for escape clauses.

Fiscal rules need to be consistent with broader development objectives. In this respect, the experience of Botswana and Timor-Leste are useful as they highlight the difficult balance to find between spending now to support growth objectives (e.g., investing in infrastructure), and saving for the future (shocks, intergenerational equity). To improve fiscal discipline, Timor-Leste is currently considering adopting a Fiscal responsibility Law that would require the government to commit to a monitorable fiscal objectives based on a well-defined strategy to achieve them (IMF, 2022b).

Fiscal councils, when tasked with supervising fiscal rules implementation, can foster compliance (IMF, 2013b). The experience in these three countries also highlight the importance of supporting institutions to foster compliance. In particular, it is notable that none of these countries has had some form of fiscal watchdog that could have supervised the implementation of fiscal rules.

Fiscal rules could also be articulated with medium-term fiscal frameworks (MTFF), to provide additional support for the underlying objectives (IMF, 2022c). Countries adopting fiscal rules often find themselves dealing with potential tensions between short-term concerns at the annual budget level (shocks, ad-hoc measures) and long-term goals set by fiscal rules, which typically translate into permanent constraints on quantitative fiscal indicators (debt, primary fiscal balance). In particular in the case of Botswana and Mongolia, care should be given to have rules put in place in consistency with the overall PFM system. An important aspect in bringing the connection between annual budgets and fiscal rules objectives is to develop MTFF, which would outline a strategy for converging towards the long-term objectives underpinning the rules, and for complying with them. Additionally, when resource-rich countries want to prepare for the exhaustion of resources by implementing fiscal adjustment strategies, they could also use MTFF to design and implement such an adjustment. The fiscal objectives set in the context of MTFF could first be used as informal rules, and once the authorities can achieve said objectives, they can turn them into formal rules. A MTFF could also be used to guide broader fiscal reforms, in terms of transparency (disclosing fiscal accounts), coverage of fiscal accounts (to avoid quasi-fiscal activities outside the scope of the rules).

Conclusion: Should RRC Adopt Fiscal Rules?

In this paper we investigated the impact of fiscal rules on both fiscal procyclicality and fiscal discipline in resources rich countries. Our econometric analysis, which controls for potential endogeneity issues, shows that fiscal rules: (i) reduce the procyclicality of real public expenditures with terms-of-trade in oil exporting countries, and (ii) improve non-resource primary balances, especially during terms of trade upturns. We also find that the design of the rules matters, with expenditure rules having the largest impact in the full sample of commodity exporters. While we find that revenue rules can be effective in oil exporting countries, the limited observations for this kind of rules/countries require taking the results prudently.

Turning to the experience of three countries with fiscal rules, Botswana, Mongolia and Timor-Leste, we show that there is nevertheless ample room to improve fiscal rules effectiveness. In two countries, Botswana and Timor-Leste, fiscal rules have supported the accumulation of sizable financial assets and help maintained public debt at a relatively low level. However, in the three cases, lack of compliance, frequent revisions of the rule, loopholes in the fiscal framework and/or missing medium-term fiscal strategy have undermined the

efficiency of the rule. These experiences demonstrate that it is essential to (i) develop a comprehensive fiscal framework anchored on the PIH (thereby covering net financial assets, i.e. debt and gross financial assets), (ii) define clear escape clause to avoid ad-hoc suspension of the rule, (iii) consider relying on an independent fiscal council and (iv) cast the fiscal framework in a broader fiscal strategy. This strategy should address both the development needs of resource-rich countries and the necessity to accumulate sufficient buffers to weather the economy against large and unpredictable commodity price shocks and ensure adequate revenues for future generations. This could involve supporting economic diversification, mobilizing non-resources revenues and ensuring public investment efficiency.

While our empirical results show that fiscal rules support fiscal discipline, our framework did not allow us to assess their impact on fiscal sustainability in a comprehensive way. This is an avenue for future research and would need to be assessed against the benchmark of a suitable fiscal long-term fiscal anchor that would not only account for the exhaustibility of natural resources but also long-term challenges resource-countries face, including climate change. For fossil fuel exporting countries, there are indeed significant downside risks to production from potential policy action to combat climate change that would affect both global demand and production costs.

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Annex I. Testing Selection Bias

Results of selection bias tests are presented in Tables 1 and 2 based on equations 1 and 2 in which fiscal rules is replaced by its last five leads. Our coefficient of interest is the interaction between each of these leads variables and term of trade index. The results in columns [1]-[5] of Tables 1 and 2 show that no interaction is statistically significant suggesting absence of pre-treatment trends and thus no systematic bias coming from selection subject. Consequently, Ordinary Least Squares (OLS) could be used as estimation method in this study.

Table 1. Term-of-Trade Index and Procyclicality of Fiscal Policy

Real public expenditure growth	[1]	[2]	[3]	[4]	[5]
Lag term of trade growth	0.061	0.057	0.056	0.077	0.07
	(0.0636)	(0.0609)	(0.0636)	(0.0835)	(0.085)
Lag term of trade growth*adopt lead1	-0.008				
	(0.2072)				
Lag term of trade growth*adopt lead2		0.114			
		(0.1228)			
Lag term of trade growth*adopt lead3			0.149		
			(0.1325)		
Lag term of trade growth*adopt lead4				-0.168	
				(0.2081)	
Lag term of trade growth*adopt lead5					0.008
					(0.2116)
Real non commodity GDP growth	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.0019)	(0.0018)	(0.0016)	(0.0017)	(0.0016)
IMF program	0.005	0.005	0.003	0.006	0.001
	(0.0237)	(0.0237)	(0.0236)	(0.0231)	(0.0221)
Observations	819	819	840	859	878
R^2	0.205	0.205	0.205	0.207	0.205

Jnreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 2. Term-of-Trade Index and Non-resource Primary Balance

Non-commodity primary balance (Non commodity GDP)	[1]	[2]	[3]	[4]	[5]
Lag non-commodity primary balance	0.699***	0.700***	0.704***	0.688***	0.697***
	(0.0843)	(0.0833)	(0.0747)	(0.0858)	(0.0836)
Lag2 non-commodity primary balance	-0.068***	-0.068***	-0.070***	-0.061**	-0.072***
	(0.0230)	(0.0235)	(0.0248)	(0.0232)	(0.0208)
Δterm of trade	-0.021	-0.021	-0.021	-0.024	-0.028
	(0.0269)	(0.0273)	(0.0265)	(0.0270)	(0.0257)
Lag Δterm of trade	-0.091***	-0.091***	-0.085***	-0.088***	-0.078***
	(0.0244)	(0.0247)	(0.0236)	(0.0243)	(0.0225)
Lag Δterm of trade* adopt lead1	-0.136				
	(0.2248)				
Lag Δterm of trade* adopt lead2		-0.027			
		(0.0717)			
Lag Δterm of trade* adopt lead3			-0.072		
			(0.1078)		
Lag Δterm of trade* adopt lead4				0.108	
				(0.1165)	
Lag Δterm of trade* adopt lead5					0.046
					(0.0914)
Log real gdppc	-0.458	-0.362	-0.060	-0.178	0.087
	(3.5922)	(3.6420)	(3.7096)	(3.3581)	(3.4908)
Real non commodity GDP growth	0.044	0.045	0.021	0.003	-0.004
	(0.0649)	(0.0638)	(0.0737)	(0.0856)	(0.0847)
IMF program	3.312*	3.277*	3.331*	3.067*	2.855*
	(1.8663)	(1.8453)	(1.8233)	(1.6558)	(1.5795)
L.debt to non commodity GDP	0.025**	0.025**	0.020**	0.016*	0.015*
	(0.0106)	(0.0103)	(0.0088)	(0.0084)	(0.0075)
Observations	477	477	492	506	520
R^2	0.542	0.542	0.543	0.543	0.538

Unreported constant included. Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Annex II. Results From GMM Estimations

Table 1. Fiscal Discipline and Rules Design: GMM Estimations

Non-commodity primary balance	Full sample [1]	Full sample [2]	Full sample [3]	Full sample [4]	Oil exporters [5]	Oil exporters [6]	Oil exporters [7]	Oil exporters [8]
Lag dependent variable	0.558***	0.554***	0.527***	0.551***	0.563***	0.568***	0.558***	0.581***
	(0.1663)	(0.1660)	(0.1426)	(0.1380)	(0.1358)	(0.1713)	(0.1273)	(0.1228)
Lag2 dependent variable	-0.030	-0.061**	-0.016	-0.022	-0.063	-0.120***	-0.048*	-0.054**
	(0.0251)	(0.0256)	(0.0275)	(0.0271)	(0.0466)	(0.0305)	(0.0266)	(0.0239)
Δterm of trade	-0.011	-0.027	-0.018	-0.018	-0.029	-0.048	-0.044	-0.046
	(0.0335)	(0.0199)	(0.0200)	(0.0193)	(0.0913)	(0.0390)	(0.0415)	(0.0427)
Lag Δterm of trade	-0.071***	-0.044**	-0.084***	-0.082***	-0.068*	-0.019	-0.082**	-0.083**
	(0.0274)	(0.0223)	(0.0256)	(0.0203)	(0.0384)	(0.0301)	(0.0387)	(0.0364)
Log real gdppc	-4.166	-2.766	-2.365	-2.121	2.028	1.709	-2.327	-0.022
	(3.7905)	(3.8492)	(4.4854)	(3.5845)	(10.4032)	(11.3114)	(8.3517)	(9.0997)
Real non commodity GDP growth	0.094	0.062	0.097	0.100	0.097	-0.001	0.013	0.017
	(0.0985)	(0.0923)	(0.0990)	(0.0926)	(0.1551)	(0.1145)	(0.1010)	(0.1061)
IMF program	-0.150	0.132	-0.066	-0.057	-0.418	1.054	2.120	2.345
	(1.1337)	(1.0931)	(1.1911)	(1.2304)	(7.1516)	(3.0181)	(3.3410)	(3.6946)
Lag debt to non commodity GDP	-0.023	-0.015	-0.009	-0.006	0.008	-0.018	-0.017	-0.002
	(0.0539)	(0.0382)	(0.0423)	(0.0327)	(0.0739)	(0.0613)	(0.0608)	(0.0652)
Lag (term of trade growth*ER)	0.037				0.134			
	(0.0873)				(0.5640)			
Lag (term of trade growth*RR)		0.020				0.010		
		(0.0416)				(0.1448)		
Lag (term of trade growth*BBR)			0.087***				0.109**	
			(0.0249)				(0.0477)	
Lag (term of trade growth*DR)				0.082***				0.114**
				(0.0255)				(0.0461)
Constant	31.081	16.690	12.833	10.781	-36.947	-30.900	8.930	-13.431
	(36.2765)	(35.9470)	(43.0849)	(34.5031)	(105.5889)	(111.1495)	(80.8614)	(89.4200)
Observations	621	693	693	693	350	422	422	422
AR(1)/AR(2)	0.013/ 0.153	0.014/ 0.197	0.020/0.201	0.016/0.200	0.043/0.238	0.031/0.202	0.030/0.224	0.029/0.220
Hansen test p-value	0.259	0.153	0.118	0.112	0.209	0.212	0.125	0.121
Country/instrument	35/20	36/20	36/20	36/20	19/18	20/20	20/20	20/20

Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 2. Term-of-Trade Rise and Fall: GMM Estimations

	Full sample	Oil exporters	Full sample	Oil exporters
	Price increase		Price decrease	
Non-commodity primary balance	[1]	[2]	[3]	[4]
Lag dependent variable	0.818***	0.803***	0.535***	0.543***
	(0.1131)	(0.0900)	(0.1604)	(0.1750)
Lag2 dependent variable	-0.012	-0.029	-0.069**	-0.093**
	(0.0546)	(0.0659)	(0.0353)	(0.0403)
∆term of trade	-0.055	-0.067	-0.016	-0.004
	(0.0559)	(0.1205)	(0.0220)	(0.0645)
Lag ∆term of trade	-0.159***	-0.146**	-0.033	-0.029
	(0.0536)	(0.0708)	(0.0509)	(0.0583)
Lag (∆term of trade*rule)	0.196***	0.150**	0.111	0.137
	(0.0610)	(0.0693)	(0.0824)	(0.1170)
Log real gdppc	-0.255	-2.737	-10.649*	-12.000
	(2.3701)	(3.0520)	(5.6251)	(9.0925)
Real non commodity GDP growth	0.055	0.062	-0.076	-0.061
	(0.1449)	(0.1624)	(0.1288)	(0.0909)
IMF program	1.962**	2.876	2.419	5.661
	(0.9314)	(4.5232)	(3.1478)	(5.8207)
Lag debt to non commodity GDP	-0.031	-0.062	-0.071	-0.170
	(0.0780)	(0.0920)	(0.0769)	(0.1657)
Constant	0.908	24.386	93.057*	112.498
	(21.3316)	(30.8488)	(53.0775)	(95.5860)
Observations	408	265	285	157
AR(1)/AR(2)	0.016/0.556	0.027/ 0.681	0.096/0.164	0.293/0.619
Hansen test p-value	0.029	0.163	0.048	0.157
Country/instrument	35/20	19/20	36/20	20/20

Standard errors clustered by country in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Annex III. Data

Term of trade index. Ratio of export prices to import prices. The data come from World Economic Outlook (WEO).

Real government expenditure growth. Growth rate of general government expenditure in local currency adjusted by GDP deflator. The data are from WEO.

Non-resource primary fiscal balance. Non-resource primary balance in percentage of non-resource GDP. The data are from WEO and the United Nations Statistical Database.

Non-resource primary expenditure. Non-resource primary expenditure over non-resource GDP. The data are from WEO and the United Nations Statistical Database.

Non-resource revenue. Non-resource revenue to non-resource GDP. The data are from WEO and the United Nations Statistical Database.

Fiscal rules. A dummy variable that takes 1 if a country i at year t has a numerical rule on expenditure, revenue, budget balance or revenue and 0 elsewhere. Data are from Davoodi et al. (2022).

Expenditure rule. A dummy variable that takes 1 if a country i at year t has a numerical rule on expenditure and 0 elsewhere.

Revenue rule. A dummy variable taking 1 if a country i at year t has a numerical rule on revenue and 0 elsewhere.

Budget balance rule. A dummy variable that takes 1 if a country i at year t adopts a budget balance rule and 0 elsewhere.

Debt rule. A dummy variable that takes 1 if a country i at year t has a numerical rule on debt and 0 elsewhere. These four variables come from Davoodi et al. (2022).

Real Non-resource GDP growth. This refers to real non-resource GDP growth rate. Non-resource GDP is computed by multiplying GDP from WEO by the non- mining sector's share – that is, fuel and other primary products – in total GDP taken from the United Nations Statistical Database (see Wilson, 2021 for similar approach).

IMF program. A dummy variable taking 1 if a country i at date t is under the IMF program and 0 otherwise. Data are from MONA.

Real GDP per capita. Gross domestic product, constant prices, PPP 2017 international dollars, per capita. Data are from WEO.

Debt to Non-resource GDP. General government gross debt (from WEO) as percentage of non-resource GDP. Both variables are in current currency.

Annex IV. Additional Information on Country Cases

Botswana: Making Fiscal Rules More Effective Guides of Fiscal Policy[1]

The experience of Botswana, and the renewed interest from authorities to revisit their fiscal rules (see IMF, 2022a), underscores the criticality of setting rules in a way that is consistent with a broader fiscal strategy, which, in the case of Botswana, is fundamentally about finding an adequate balance between saving diamond revenue (to build financial assets for future generations and for buffers in case of adverse shocks) vs. spending this revenue to finance development spending (which are even more important in the context of meeting the country's needs for economic diversification and adaption/transition to climate change).

Fiscal rules could adequately support the authorities' agenda, and to do so, would need to be brought in support of a comprehensive fiscal strategy. Indeed, a potential vulnerability in the design of the current rules, is that, for example, while there is an important ceiling on gross debt, there is no specific guidance on the net financial position of the government, namely, its total financial assets minus debt. This is, however, critical, as the level of net financial assets is an adequate benchmark to assess fiscal sustainability in a resource-rich countries like Botswana, with a positive net financial assets position. Consequently, the targets on spending are also less directly linked to net financial assets, and instead, care could be given to a target formulated in terms of the non-resource fiscal balance (see Basdevant, Imamoglu, and Hooley, 2021)

The permanent income hypothesis (PIH) model can provide a suitable long-term anchor for fiscal policy, around which Botswana could develop a medium-term operational rule. Fundamentally, the PIH provides an anchor by taking the net financial wealth of the country (existing financial assets, net present value of future resource revenue, minus public debt) and turning this wealth into a constant stream of income. This income can in turn finance a non-resource deficit on a permanent basis. Significant challenges in implementing the PIH include uncertainty on its underlying parameters (notably on future resource revenue), and the typically large fiscal adjustments required to reach the recommended non-resource fiscal balance. However, implementing the PIH per se would mostly likely not be feasible, and strong consideration for a transition period (to avoid an unnecessary upfront adjustment and to ensure that Botswana can continue to meet its diversification and development objectives) would be needed. Furthermore, while a fiscal rule setting a cap on the non-resource primary fiscal balance would be helpful, including during the transition, a complementary floor on net financial assets could be considered, to ensure that throughout the transition Botswana builds financial assets that would provide a source for buffering shocks and financing for future generations.

Mongolia: Making Rules More Binding

In 2013, Mongolia adopted a Fiscal Stability Law (FSL) setting three complementary rules including structural deficit rule, expenditure rule and debt rule to make fiscal policy more predictable in the face of volatile mining revenue and ensure debt sustainability. However, the country's experience with the fiscal

[1] This section draws on Basdevant and Griffiths (2022).

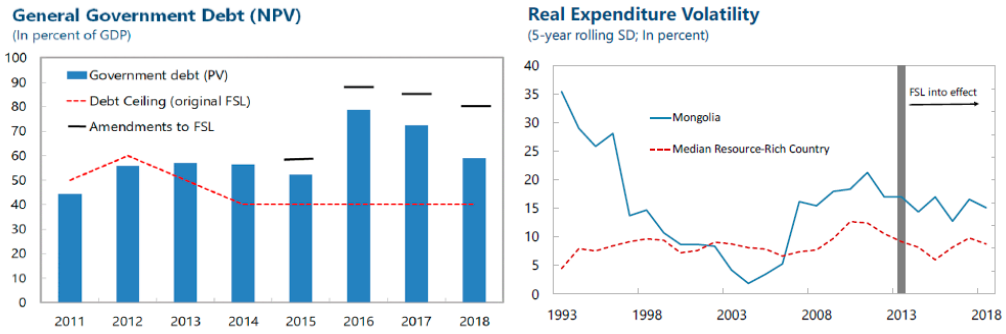
rules remains relatively weak and further adjustments to the fiscal rules are needed to make them more effective.

The rules on the deficit and debt have been subject to several changes or interruptions in their implementation (IMF. 2021a).

- The ceiling on the structural deficit has been met only twice since 2013 and has now be delayed until 2025.
- The expenditure rule to limit excessive expenditure was initially set to be implemented from 2013, but was only implemented from 2017, owing to proactive spending policies.
- The debt ceiling has been subject to numerous changes as well. In 2015, for example, the definition of the debt rule was narrowed from public debt to general government debt, excluding the debt of state-owned enterprises, state contributions to mining, energy, and railway projects, and state guarantees that are fully backed by government securities. In 2016, the debt ceiling was raised from 40 percent of GDP to 60 percent of GDP (in Net Present Value (NPV) terms).

Since its initiation, the implementation of the FSL was assess as inadequate by the IMF (IMF, 2019a, 2021a). Indeed, for most of the period since 2013, governments have not adhered to the original parameters of the rule, either because of loose budget submissions or because of significantly lower-than-expected budgeted outturns, generating political pressure to revise or suspend the rules or modify the targets. In addition, fiscal outcomes suffered from quasi-fiscal spending by the DBM and the BOM, which further exacerbated consolidated budget deficits and debt. Non-compliance and frequent revisions undermined the rules' credibility and led to volatile expenditure and a sharp increase in public debt as shown in Figure 1.

Figure 1. General Government Debt Evolution and Public Expenditure Volatility



Source: IMF, 2019a

Timor-Leste: Balancing development needs financing and fiscal sustainability[2]

Since the start of the production of the Bayu-Undan field in 2004, Timor-Leste economy has relied heavily on petroleum. The fiscal framework adopted the following year has enabled the country to accumulate sizable savings, even though fiscal rules have not always been fully complied with.

Up to 2008, the Timor-Leste's government spending of oil revenue was conservative with transfers to the State budget to finance the non-oil budget deficit smaller than ESI. As a result, and in the context of high commodity prices, the net assets of the Petroleum Fund grew rapidly from USD 371 million in 2005 to USD 4.2 billion in 2008 (390 percent of non-oil GDP).

In 2009, withdrawals from the Petroleum Fund exceeded ESI for the first time and, since then, "excess withdrawals" have been the norm to finance the countries' large infrastructure projects. From 2010 to 2020, the IMF estimates (IMF, 2021b) that withdrawals from the Petroleum Fund averaged 5.2 percent of government wealth, well above ESI benchmark. Over the same period, the government deficit averaged 30.9 percent of non-oil GDP. With declining oil and gas receipts, the accumulation of financial assets by the Petroleum Fund slowed down since 2014, while remaining at a very high level (USD 19 billion in 2020, about 12 times higher than the non-oil GDP).

Nevertheless, the country faces potentially large fiscal adjustment (IMF, 2019b), with (i) expected depletion of oil revenue from active fields as early as end-2023 and (ii) uncertain development prospect of new oil fields.[3] In parallel the country faces development needs, which could require additional fiscal space. Thus, Timor-Leste faces a very difficult balancing act of preserving fiscal sustainability while maintaining efforts to durably improve living standards.

Timor-Leste experience also highlights how fiscal rules in RRC need a careful attention to supporting institutions and fiscal strategies. For example, balancing the potential reduction of fiscal deficits with spending needs could be achieved with the mobilization of domestic revenue, which may require a dedicated strategy. Further, achieving development needs can also be sought by improving spending efficiency. The efficiency of investment is estimated to be low in Timor-Leste with a significant efficiency gap with the most performing countries. About 54 percent of the potential value of public investment is lost in the investment process, well above the average of 24 percent for emerging economies (IMF, 2019b).

[2] This section is based on IMF (2012b, 2019b, and 2021b).

[3] The Greater Sunrise fields holds significant reserves of oil and gas, but their development has long been delayed by a maritime boundary dispute between Australia and Timor-Leste. A treaty has signed between the two countries in 2019 that remove major impediment to their operationalization, but a development strategy is yet to be defined.

PUBLICATIONS

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