Why some countries can escape the fiscal pro-cyclicality trap and others can't [1]

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Abstract
We analyze the procyclicality of fiscal policy in a sample of 114 developing countries between 2000 and 2016. About 20 percent of the countries in our sample switched from a procyclical to a countercyclical policy stance. Thirty of the thirty-eight Sub-Saharan African (SSA) countries remained caught in the procyclicality trap and SSA is the region that, on average, has the highest degree of procyclicality. MENA switched from a countercyclical policy stance to a procyclical one over time, while both ECA and LAC reduced significantly the degree of procyclicality. To explain these changes in the fiscal stance and the differences across regions, we use covariates of procyclicality from both the economic and the political economy literature: The main economic variables that affect procyclicality are financial depth, tax base variability, and the natural resource dependence. In line with political economy literature, we find that the perception of corruption robustly determines procyclicality, as well as social fragmentation, and inequality in resource distribution. We also find that the quality of *fiscal institutions* is associated with procyclicality. For instance, countries with fiscal rules have smaller procyclical bias, but the effect is not homogeneous: fiscal rules with clauses on sustainability of policies or estimations on the costs of measures are associated with countercyclicality; fiscal councils are also associated with counter-cyclical fiscal stance. The degree of budget rigidity is positively associated with procyclicality, as it reduces the policymaker's ability to react to shocks. We also find asymmetric policy stances along the business cycle, with procyclicality being more pronounced during recessions. Similarly, we show that the political cycle affects procyclicality, as the procyclical bias increases in electoral years. We also find that most features of decentralized political regimes are associated with lower degrees of procyclicality.

JEL codes: E62, E32, E02, F41, Q32

I. Introduction

Discretionary fiscal policy can help stabilize the economy, but there is evidence that in some developing countries fiscal policy plays a destabilizing role (Suescun, 2007) and in developed economies the stabilizing properties have been questioned (Debrun, et,a. 2008). The procyclical nature of fiscal policy, by which countries use contractionary policy during recessions and expand while in booms, has been associated with more volatility and has been studied for decades. Still, we observe procyclical fiscal behavior, more common in developing economies than in developed ones, more prevalent in some regions, such as Africa, than in others, and countries move from procyclical to countercyclical behavior over time but vice versa too. This report describes procyclical behavior in a large set of countries, along the lines of previous literature (Frankel et. al. 2013) with several extensions: 1) expanding the time period to 20016 and hence includes the fiscal expansion witnessed by most countries to tackle the great Recession and the growth recovery that should witness savings increases for the bad times. 2) including more specific variables to examine the quality of institutions to provide more granularity to the discussion. 3) Adding a set of explanatory variables to capture social fragmentation or polarization which may complement the traditional macro explanations such as borrowing constraints or volatility of revenues (Ilzetzky, 2011). 4) focusing on regional differences, between Africa, Latin America and the Middle East where the more salient features and changes in procyclicality take place.

[1] *This paper is individually authored and should be cited accordingly. The findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of the World Bank or those of its Executive Directors or the governments they represent.*

The literature from the last two decades provides significant insights regarding the procyclical fiscal stance in the developing world. The first generation of papers highlighted the lack of access to credit and international capital markets to explain such a behavior, with the seminal contribution of Gavin and Perotti (1997) focusing on Latin American countries. The second generation of papers, illustrated by Talvi and Vegh (2005) demonstrated the role of political distortions, and particularly the political polarization, to explain the "voracity effects" on the budget during booms. This explanation was found to be the most relevant empirically (Ilzetzki, 2010). Alesina et al. (2008) showed that higher (perceived) levels of corruption (especially with a lack of fiscal transparency) led to a rational decision of the voters to "starve the Leviathan", i.e. to reduce political rents by optimally demanding more public goods (and/or lower taxes) during booms.
More recent developments in the literature have examined the resource-led boom of many developed economies and concluded that procyclical behavior was stronger in resource dependent nations (Arezki and Bruckner, 2012), with further examination and focus on Sub-Saharan Africa (SSA) (Konuki and Villafuerte, 2016). Another recent paper (Frankel et al. 2013) displayed a useful approach to correlate the countries' fiscal procyclical stance over time with different determinants. In this paper we adopt this innovative methodology on the broader sample of developing countries.

The paper has four sections. The first one describes the data and stylized facts of procyclicality in the period 2000-2016. The second one presents the methodology and econometric results. The third section explains the cross-regional differences in procyclicality and two extreme cases of individual country results, namely Nigeria and Egypt. The last section presents a discussion on policy options to mitigate procyclicality, with a particular focus on the effect of fiscal institutions related to budget rigidity and fiscal rules on procyclicality.

II. Data and stylized facts

To examine the correlation between a country's fiscal policy stance and the business cycle, the standard procedure is to regress the cyclical real GDP on the cyclical real primary general government expenditures.[2] We run regression (1) in our sample of 114 developing countries for the 2000-2016 period.[3]

$$Cycl.rggpx_{it} = \alpha + \beta Cycl.rgdp_{it} + \gamma_i + \delta_t + \varepsilon_{it}, \quad (1)$$

where α refers to the intercept, and subscripts i and t stand for country and year. γ_i and δ_t are country and year fixed effects (regional fixed effects are absorbed by country fixed effects). β, the coefficient of interest, captures the variation of cyclical spending (in local currency) due to, changes in the cyclical GDP by *x* units of local currency.

To examine how fiscal policy management evolved over time, we split the sample into two subperiods: 2000-2008 (pre-global recession) and 2009-2016 (post-global recession) and examine how each country's correlation coefficient changed over time. In the first subperiod, 64% of the countries had a procyclical fiscal stance, while in the second one the percentage fell to 60% (Figure 1).[4] Hence, only 40% of developing countries ran countercyclical fiscal policy in the second subperiod, but in SSA the

[2] Alessina et. al. (2008) Frankel et.al.2013. The cyclical components of GDP and expenditures are estimated using the Hodrick-Prescott (HP) filter with a smoothing parameter of 6.25, as done by Ravn and Uhlig (2002). Though correlation cannot be interpreted as causation, Ilzetsky and Vegh (2008) show that output causes government spending when properly instrumented. Konuki and Villafuerte (2016) also conclude that output shocks drive fiscal policy.
[3] See Appendix 1 for a detailed description of the data set and the sample selection process.
[4] Figures 1 and 2 replicate the format employed by Frankel et. al (2013) and WB (2017).

proportion was only 20% (8 out of 38) (Fig. 2). In LAC, 50% of the countries ran countercyclical fiscal policy. Over time, SSA countries did not change their procyclical stance, while ECA and LAC reduced their procyclical stance, and MENA switched from a countercyclical to a procyclical stance, while South and East Asia maintained their countercyclical stance on average (Table A.4). In the remainder of the paper we seek to explain why procyclicality is more prevalent in some countries and regions than in others and why some countries can switch from procyclical to countercyclical fiscal policy management.

Figure 1: Progress in Fiscal Policy Management 2009-20016 (entire sample)

In red, resource-rich countries

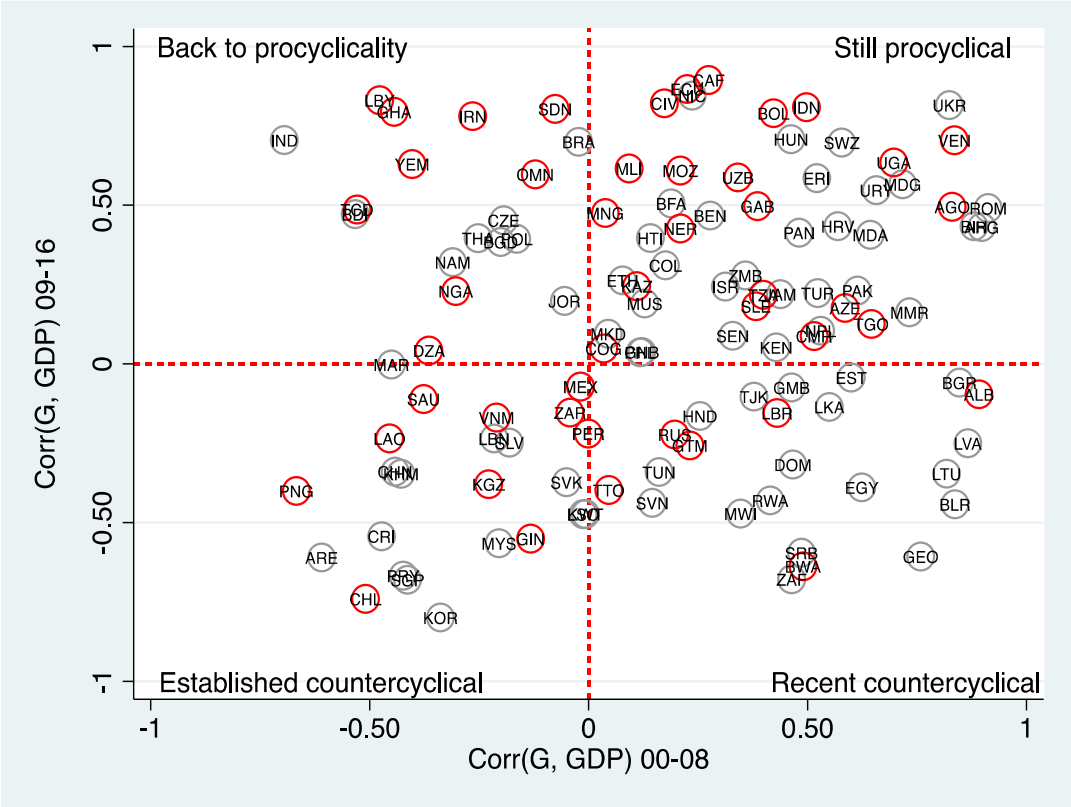
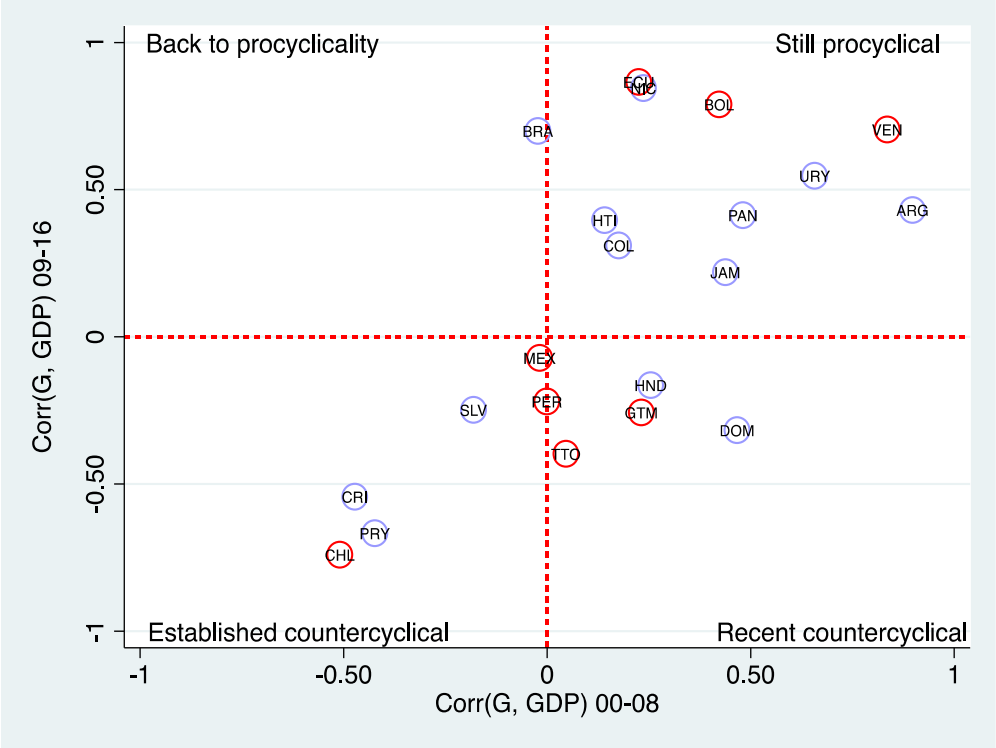


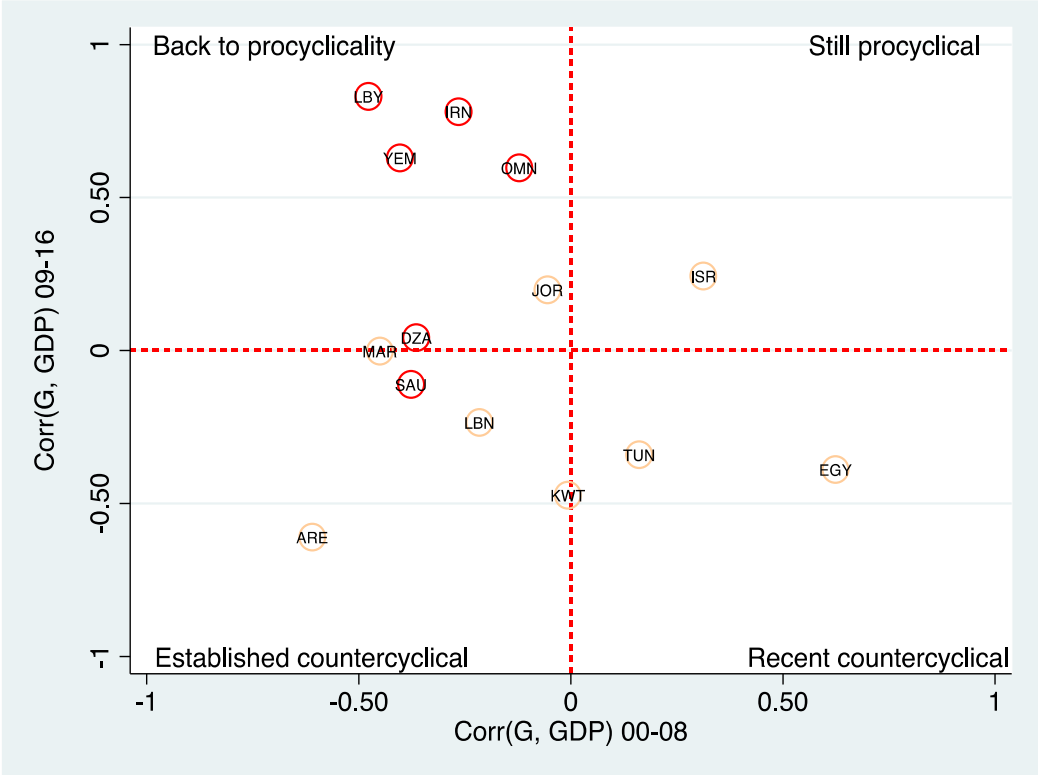
Figure 2: Progress in Fiscal Policy Management , by Regions

In red, resource-rich countries

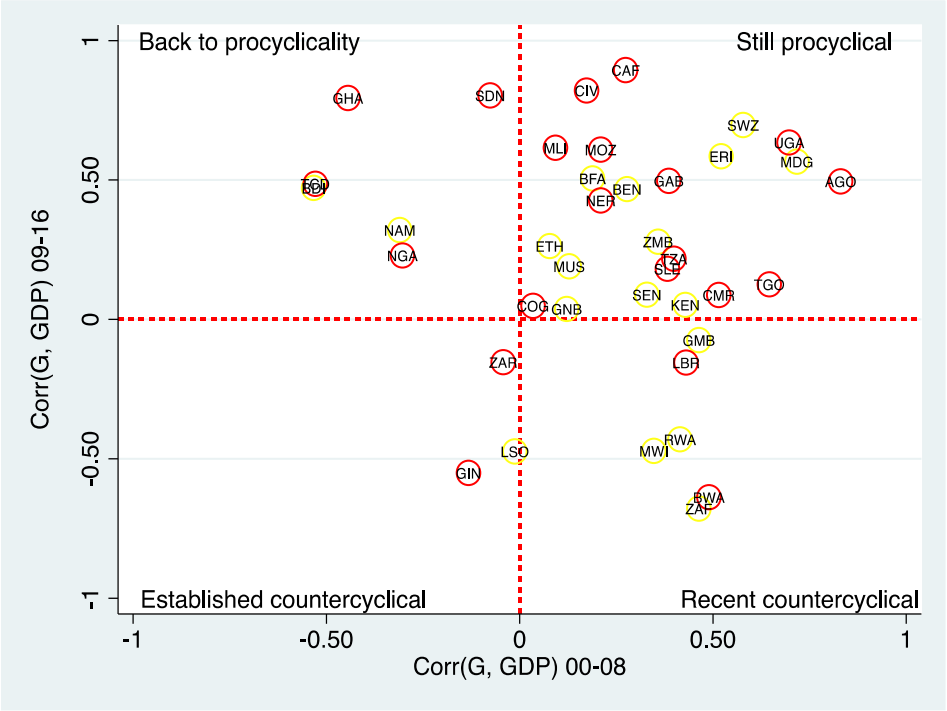
A. Latin America and the Caribbean (LAC)



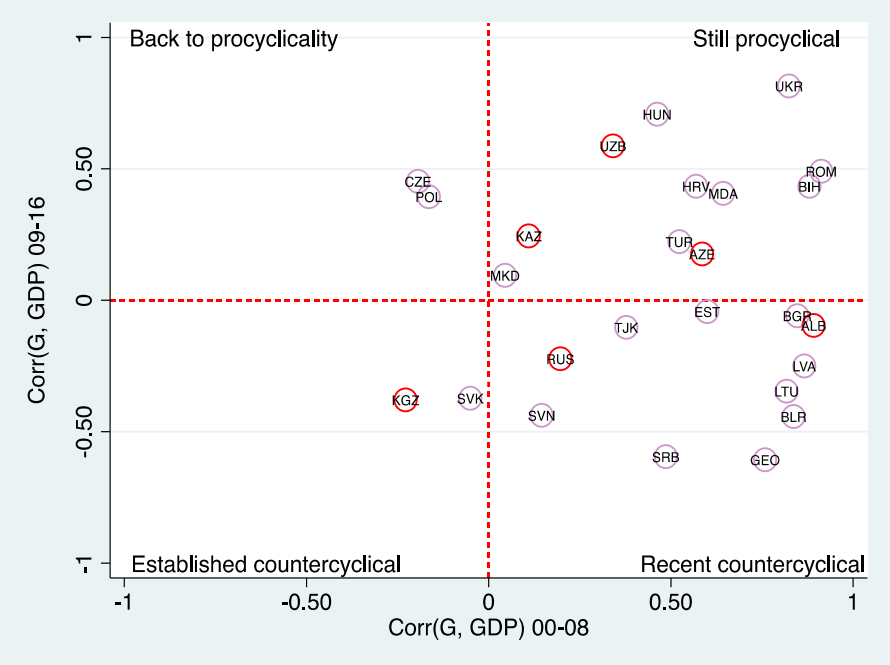
B. Middle East and North Africa (MENA)



C. Sub-Saharan Africa (SSA)



D. Eastern and Central Europe (ECA)



III. Empirical methodology and results

To analyze the determinants of fiscal procyclicality regression (1) is expanded to include as covariates interacting terms of the output gap with the conditioning explanatory variables, following Alessina et al. (2008) and Frankel et.al (2013). Eq. (2) captures the effects of conditional factors on procyclicality as follows:

$$Cycl.rggpx_{it} = \alpha + \beta Cycl.rgdp_{it} + \varphi Cycl.rgdp_{it} \times W_{it} + \mu W_{it} + \boldsymbol{\rho_x} \boldsymbol{X}_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad (2)$$

The variable W_{it} refers to conditional effects of procyclicality and enables to capture the non-linearity of the cyclical GDP on spending. We check for the following possible conditioning factors considered in the literature:

1. Financial depth effects: The first generation of papers on the determinants of procyclicality focused on the role of liquidity constraints as main explanatory factor. Gavin and Perotti (1997) and Mendoza and Oviedo are classic examples of this literature. Along these lines, several measures of financial depth or access to international credit markets is used. Financial depth is proxied by the ratio of credit to private sector over GDP and capital openness with the Kaopen index by Chinn and Ito (2006),

2. Tax base variability effects: some of the pioneer studies on procyclicality stressed how the volatility of the revenue base, in the presence of political constraints of generating higher surpluses during boom periods, lead to borrowing less during recessions to maintain intertemporal budget constraints, and hence, configuring the procyclical nature of policy (Talvi and Vegh, 2005).

3. Quality of institutions. The classic paper of political economy factors that determine fiscal outcomes fiscal emphasized the role of perceived corruption in a system of low transparency and limited fiscal monitoring leading a rational of voters to "starve the Leviathan" in order to mitigate the principal-agent problem (Alesina et. al. 2008). Hence, during booms, the rational voter would demand more public goods and services, leading to the procyclical bias. Besides perceived corruption, other institutional factors may affect procyclical bias. Some authors consider averages of several indicators (Frankel et. al. 2013), which has the advantage of parsimony, though at the cost of reduced granularity for policy implications. Here we include fiscal institutions, and examine the role of rigidities in the budget as well as that of fiscal rules and fiscal councils on procyclicality.

4. Level playing field: A branch of the literature examines the role of political and social fragmentation or the poor rule of law and, more generally, unequal distribution of resources within societies, which may lead to "voracity effects" on the budget and accentuate the common pool problem, and hence the procyclical bias. (Ilzetzky, 2011; Stein.

5. Natural resources: as highlighted by recent papers, natural resources imply huge political rents and potential elite captures problem, so we might expect the procyclicality even higher in resource-dependent and resources-rich countries due to exacerbated political distortions.

6. Other potential factors: we examine whether the procyclical behavior is symmetric along the business cycle, i.e. if governments increase spending during recessions but do not cut it during booms. Hence, we explore whether there is an asymmetry along the business cycle. We also examine the impact of political cycles on the fiscal policy reaction function. Another factor which may be associated with procyclicality of fiscal management is the existence of buffers

to accommodate shocks, such as the level of public debt or the stock of international reserves. Higher public debt reduces the fiscal space to absorb shock and hence would lead to a more procyclical policy (Frankel et. al. 2013).

Results

Equation 2 is estimated in multiple stages to examine separately the role of each factor (Table 1). The main results to be highlighted are: 1) Without conditioning for any factor, fiscal policy is procyclical (columns 1-3)[5]; 2) the degree of procyclicality decreases with the level of development (column 4).[6] 3) The effect remains large even after introducing conditioning variables. The sign, of the β coefficient changes when results are conditioned on the perception of corruption variables, but when the average values of those variables are used, then the total effect of the business cycle is about the same order of magnitude, between 0.4 and 0.6. Below we discuss the impact of the different conditioning factors in the sequential stages summarized in Table 1.

The tax base variability variable has the expected positive sign (Column 7), in line with predictions from the literature (Talvi and Vegh, 2005).[7] That is, countries with higher tax base variability are associated with a higher procyclical bias. Talvi and Vegh show that in the presence of political distortions which make costly generating budget surpluses, tax base fluctuations will lead to procyclical policy. We analyze the role of political economy variables later in this section.

The hypothesis of credit constraints being associated with procyclicality cannot be rejected when using the domestic financial depth: larger ratios of credit to the private sector to GDP are associated with lower procyclicality (column 8). At the mean level of the ratio, 35 percent, the total effect of the business cycle is 0.62, which is procyclical. But in countries where the credit ratio is higher, for instance close to the maximum level (160 percent), fiscal policy is countercyclical and the reverse happens in countries close to the minimum. The threshold level for switching from procyclical to countercyclical is 68%, which is significantly higher than the median of 21% for developing countries. The external credit availability, measured by the Chinn-Ito capital openness variable (column 9) is found to be not significant, similar to previous findings for African countries (Konuki and Villafuerte, 2016), but different from studies with broader samples (Frankel et.al.2013).

The role of the quality of institutions is proxied by two variables which capture the impact of the (perceived) corruption in both the political sphere and in the public services (columns 10 and 11): higher indices of perceived corruption are associated with higher degrees of procyclicality, in line with previous literature (Alesina et al., 2008). Fiscal policy becomes procyclical when the perceived corruption indexes exceed .53 (in the political sphere) and .66 (in the public services), as summarized in Table 2. Other papers that explore the role of quality of institutions aggregate different variables to measure the quality of institutions, which has the benefit of parsimony in the analysis but does not allow granularity (Frankel. e. al. 2013). On fiscal institutions, we include a discussion on the rigidity of the budget and fiscal rules in the last section of this paper. For the moment, we note that higher rigidity is associated with higher procyclicality. (Column 21; this result needs to be verified with alternative measures of rigidity).

[5] Columns 2 and 3 control for different sets of missing observations as described in Appendix 1, using Set 1 and Set 2 of dummy variables.

[6] The level of development is a discrete categorical variable with values from 1 to 4, with 1 assigned to the least developed group and 4 to the most developed.

[7] Variability was measured as the absolute deviation from the mean for each year. Given limited degrees of freedom, it was impossible to calculate other statistics.

In a fourth stage, we examine the role of variables derived from the political economy literature such as the degree of social fragmentation (Ilzetzky, 2011) or the absence of a level-playing filed such as the strength of the rule of law, the power distribution among social groups, the distribution of resources within societies, and the level of ethnical-religious tensions (see columns 12 to 16). All these variables are considered as proxy to the social polarization, to capture the impact of "voracity effect" on the budget. Indeed, social polarization is mostly captured by ethnic/linguistic/religious polarization indicators. We find that more equal distribution of resources and more ethnical-religious stability are associated with less procyclicality.

Results also allow differentiating the fiscal behavior of resources-dependent or resource-rich countries from other countries' (columns 17 and 18). In both cases, we find a strong-procyclical bias in resources-dependent and resources-rich countries, suggesting a procyclical resource curse, in line with the recent literature (Arezki and Bruckner, 2012; Konuki and Villafuerte, 2016).

Finally, we find asymmetric effects of procyclicality, with the bias being larger during recessions (Column 19). The "bad times" dummy was constructed as 1 when the cyclical component of GDP was below the potential level, and zero otherwise. Hence, we find that governments tend to cut spending more during recessions than raise it during booms. We also found evidence of larger procyclicality bias during election years (Column 20). This effect is more pronounced in AFR than in LAC or MENA We need to verify this. Our results do not show any changes in the procyclical bias when the debt level is used as a conditioning variable, contrary to previous findings by Frankel, et. al. 2013,) but similar to Konuki and Villafuerte for AFR.

[insert Tables 1 and 2]

Instrumental Variable Estimation

Our identification strategy in Table 1 has two problems: the omitted variable bias and endogeneity of the cyclical real GDP. Regarding the omitted variable bias, a significant number of potential covariates might affect both cyclical spending and cyclical GDP, and here we have included a large number of covariates analyzed in the literature. Still, there is uncertainty regarding the true model underlying the determination of procyclicality. Future versions of the paper can consider a Bayesian approach to estimation.

Regarding the endogeneity of cyclical real GDP, one might infer the reverse causality in the empirical specification, due to multipliers effects (IMF, 2014). To address these problems, we adopt an instrumentation strategy in the spirit of Fatas and Mihov (2013). So, we collapse our panel data over the period 2000-2016 and use instruments from the year 1999, the year before the start of our sample period. As the main instrument, we consider the initial cyclical real GDP, and in successive columns we consider the initial values for each conditioning factor highlighted in Table 1, so the initial values for the tax ratio; the credit ratio; the perceived corruption of politicians; the perceived corruption in public services; the rule of law; the power distribution; the resource distribution; and the ethnic/religious stability. The multivariate regressions are summarized in Table 3. Irrespective to the set of instruments, we find procyclicality coefficients comprised between 0.32 (column (5)) and 0.33 (column (7)).[8]

[8] Note that with the collapse of the data, all BD variables refer not to the presence of a condition (i.e. a missing variable), but to the percent of time with the considered condition (i.e. the percent of time with a missing variable over 2000-2016.

We also support our analysis and results on findings from previous literature (Ilzetzky and Vegh, 2008 Alesina et. al.,2008; and Konuki and Villafuerte, 2016), which show that when output growth is properly instrumented, output shocks drive fiscal policy results.

[insert Table 3]

IV. Differences across Regions and Country case studies

Using the Mean Group (MG) estimator by Pesaran and Smith (1995) we estimate the individual country coefficients of cyclicality of the real GDP on the cyclicality of primary spending for the entire sample. Equation (2) is adapted for the MG estimator:

$$Cycl.rggpx_{it} = \alpha_i + \beta_i Cycl.rgdp_{it} + \boldsymbol{\rho_{ix}} \boldsymbol{X}_{it} + \varepsilon_{it} \quad (3)$$

To facilitate comparison of the across regions, we first compute the MG coefficient for the entire sample and then estimate the same model for each region. That is, we compute the procyclicality coefficient for the 112 countries, similar to Table 1, but relaxing the fixed effects constraint.[9] The disadvantage is the limited degrees of freedom when applying this estimator, as it basically consisting to estimate OLS regressions at the country level.[10] Table 4 summarizes the results for the entire sample and the different regions. For the overall sample, the effect is positive indicating the procyclicality effect. Across different regions, the effect is larger in SSA, followed by LAC, and then ECA. The effect is not significant for the overall MENA region.

Table A-5 allows comparing the different determinants of procyclicality across regions.
SSA and LAC, the more procyclical regions, show the lowest credit to private sector ratios. SSA has the highest perception of corruption. Also, it is the region with the highest degree of ethnic and religious fragmentation. Also, SSA has the most unequal distribution of resources, after MENA. All the conditioning factors point at SSA as the one with the highest procyclicality bias.

MENA is a puzzling case. It has the highest inequality and second highest level of corruption, and it is on average not procyclical despite its resource richness. The level of credit to the private sector is the second highest, suggesting that financial depth may be compensating the negative impact of the other two factors. Maybe the extreme cases of the United Arab Emirates, Saudi Arabia, and Kuwait, that are strongly countercyclical, drive the results for the region. This result needs further analysis, probably by introducing the level of international reserves as a control variable, which provides a cushion that allows policy to be managed countercyclically.

Across countries
We compute individual coefficient, and individual standard errors for the 38 SSA countries in Table 5. Using such a methodology we find five to six countries which are countercyclical over the whole period: Guinea, Lesotho and Democratic Republic of Congo, Mauritius, South Africa and Botswana.
Table A-3 reports the cyclicality coefficients for the entire sample of counties in both subperiods.

[9] This is equivalent to relaxing the common know-how (common intercept for each countries), and of common technology (common coefficient for each countries) which are critical when using macro data.
[10] When balanced, we have 17 observations per country (2000-2016), and six coefficients to be estimated, excluding the intercept. The **xtmg** command by Markus Eberhardt (https://sites.google.com/site/medevecon/code) is considered to regress the MG estimator on STATA software.

Based on the individual country-coefficients, we examine whether procyclicality is different in the sample of SSA countries for resource-dependent economies.[11] We find that the procyclical bias is higher in resource-rich or resource-dependent economies. The average coefficient for SSA economies is .31, for resource-dependent economies is .33 and for the other SSA economies it is .27 (Figure 3).

The comparison between resource dependent (and resource-rich) countries in SSA and resource dependent countries in other regions shows that the procyclicality bias is bigger in SSA. While the SSA resource-dependent economies have a procyclicality coefficient of .33 the analogous category in other regions has .23. But the resource-rich countries show an even larger contrast: the SSA resource-rich show a procyclicality coefficient of .33 while those of other regions register .08. This is due to the one-to-one mapping between the two groups of countries (resource-rich and resource-dependent), while in other regions the correspondence is not as clear. In other regions there are resource-rich countries, such as Chile and Mexico, which are not resource--dependent; both show countercyclical behavior (Table A-3). This topic will be explored further in future versions of this paper.

[insert Tables 4 and 5; Figures 3 and 4]

We explore two case studies, Nigeria and Egypt. Figures A-4 and A-5. This section is to be developed, to explain the puzzling results in Egypt and including other countries.

V. How to mitigate the procyclicality bias: policy options budget composition, decentralization, and fiscal rules

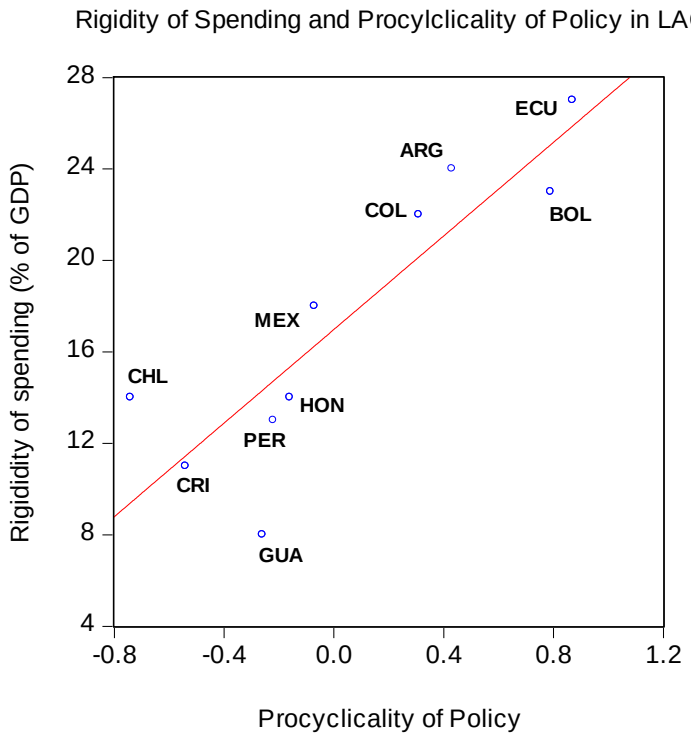
Top-down solution: reduce rigidity in budget composition

Many countries have entitlements and earmarked revenues which make them rigid. Taking a series of detailed studies of budget rigidity in some LAC countries there is a clear positive correlation between the individual country coefficient of procyclicality (Table A-3) and the ratio of rigidity in the budget (Figure 5). Budget rigidity in LAC countries comes mainly from the wage bill, pension payments, interest payments on debt, and transfers to subnational governments.

To explore systematically the role of budget rigidity in explaining cross-country differences in procyclicality, we constructed several proxies for budget rigidity. We tried several proxies, such as the ratio of consumption spending to capital spending, which shows a clear association in LAC and MENA, but not in other regions (Fig. 6). The coefficient was not statistically significant, but the measure based on government consumption has problems as it includes much spending that is not rigid.

[11] Table 1 shows that the variable is significant for the entire sample, assuming homogeneous coefficients and FE.

Figure 5 **Rigidity of Spending and Procyclicality in LAC**

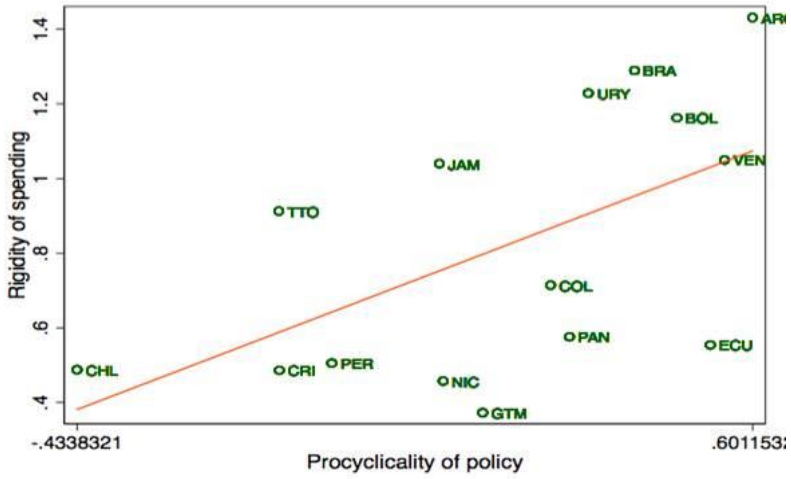


Source: Table A-3 for measures of procyclicality and WB for measure of rigidity in LAC countries.

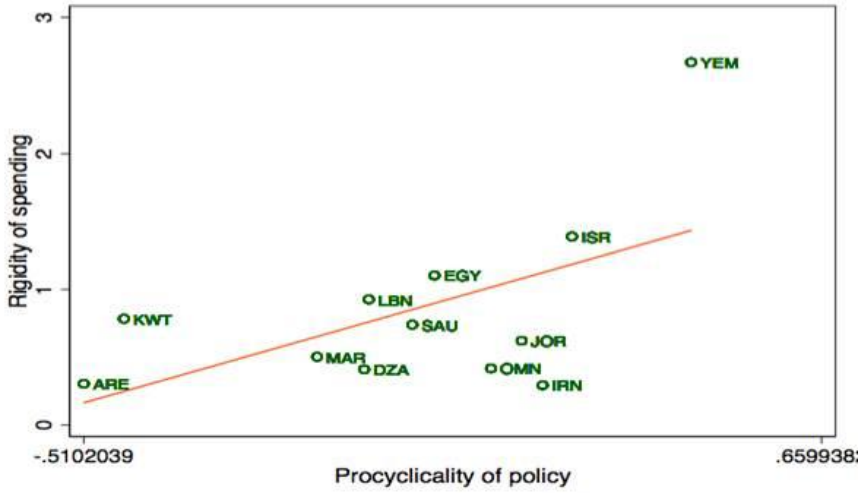
Of the variables that are clearly associated with rigidity, we have only found the interest payments on debt. The coefficient is positive and significant.

Figure 6. Rigidity Proxy and Procyclicality in 3 regions, 2000 - 2016

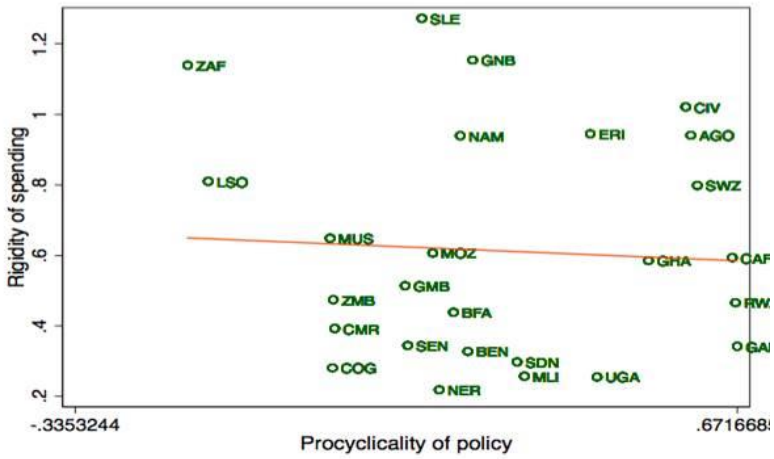
A. LAC



B. MENA



C. SSA



Top-down solution: fiscal rules

Among the potential factor to mitigate the procyclicality bias we explore the role of fiscal rules.[12] National fiscal rules are generally recognized to be more effective than supranational fiscal rules (Tapsoba, 2012). Indeed, supranational rules generally suffer from a problem of insufficient enforcement and compliance. Fiscal rules (FRs) are often criticized to enhance the procyclical bias,[13] but Guerguil et al. (2016) suggest that the design of the rules matters. Taking advantage of the fiscal rules dataset from the Fiscal Affairs Department, we consider several characteristics for the national FRs, namely (i) if a fiscal council also exists; (ii) the presence of effective monitoring mechanisms; (iii) the presence of effective enforcement mechanisms; (iv) the coverage on general government for the rules; (v) the existence of a written legal basis for the rules (statutory or constitutional); (vi) the presence of escape clauses; and (vii) the presence of other kind of flexibility -investment-friendly rules and cyclically-adjusted rules- (see Guerguil et al., 2016). The correlations computed for the period 2009-2015 (Table 6 and Figure 7) show that countries with national FRs associated with (i) fiscal councils; (ii) monitoring mechanisms; (iii) enforcement mechanisms; (iv) a written legal basis; (v) the presence of escape clauses, and (vi) flexibility features, are associated with less procyclicality than non-FRers countries, highlighting the relevancy to explore further the design of national FRs to mitigate procyclicality.

[insert Table 6; Figure 7]

Top-down solution: fiscal councils

The other potential top down solution we explore is another fiscal institution, namely the fiscal councils. Fiscal councils (FCs) are defined as independent, non-partisan agencies with an official mandate to assess fiscal policies, plans, rules, and performance (Debrun et al., 2013). They do not have a direct role in setting policy instruments, but they can influence fiscal behavior through three main channels. First, by fostering transparency on fiscal policy, a FC might reduce the rational for voters to ``starve the Leviathan''. Second, they can increase the reputational costs for politicians on unsound policies and broken commitments. Third, they can provide direct inputs to the budget process, with forecasts or assessments of structural positions; as suggested in the previous paragraph they can close technical loopholes that allow governments to circumvent numerical fiscal rules. For further discussion, see Debrun et al. (2017). Taking advantage of the Fiscal council dataset from the Fiscal Affairs Department, we check (i) whether the FC encompasses a large coverage (i.e. general government); (ii) whether the FC make forecasts; (iii) whether the FC makes forecasts on the preparation of the fiscal policy; (iv) whether the FC makes forecasts assessments on the fiscal policy; (v) whether the FC makes recommendations to the government; (vi) whether the FC makes long-term sustainability analyses; (vii) whether the FC establish consistency with the objectives; (viii) whether the FC evaluates the costs of fiscal measures; (ix) whether the FC makes ex-post analysis; (x) whether the FC publish public reports; and (xi) whether the FC has a high media impact. We focus on the period 2009-2016 to evaluate the efficiency of post-crisis policies. The correlations (Table 7 and Figure 8) show that the technical competencies feature appears to be the most important one to dampen procyclicality; transparency through public reports and the media exposure seems to also matters, in line with predictions by Alesina et al. (2008).

[insert Table 7; Figure 8]

[12] We account for numerical fiscal rules. . For a literature review on procedural rules, see Alesina and Perotti (1999).

[13] On procyclical bias, a petition signed by 1,100 economists and 11 Nobel in the New York Times claimed that attempts to strictly keep the budget balance (in US states) would aggravate recession (see Levinson, 1998).

Bottom-up solution: fiscal decentralization

Though fiscal decentralization may be an effective mechanism to enhance the provision of public service delivery in developing countries, such as the access to primary education, the access of drinking water, the access of refuse and sewage disposal facilities. The discussion still exists around the optimal level of fiscal decentralization for both spending and expenditures. So the decentralization might be also effective to struggle the fiscal procyclicality of the general government because of the application of subsidiarity principle. Indicators of fiscal decentralization generally refer to fiscal composition ratio established by the IMF's Government Finance Statistics Yearbooks (see Blume and Voigt, 2008, for more details). Instead of establishing arbitrary thresholds on fiscal ratio, we focus on indicators of political decentralization (PD) established by the Database of Political Institutions provided by the World Bank Group. Namely, we focus, (i) whether there are contiguous autonomous regions; (ii) whether local governments and legislature are elected; (iii) whether state/provinces governments and legislature are elected; (iv) whether states/provinces have authority over taxing, spending, or legislating; and (v) whether the constituencies of the upper house members are the states/provinces. We focus on the period 2009-2015 (2016 not available yet in data) to evaluate the efficiency of post-crisis policies. The correlations (Table 8 and Figure 9) show that the closest proxy of fiscal decentralization (i.e. the authority of states/provinces over spending, taxing or legislating) is negatively correlated with fiscal procyclicality, suggesting that decentralization may be a tool to mitigate the procyclicality bias.

[insert Table 8; Figure 9]

Bottom-up solution: direct democracy

Since the classic Alessina et.al 2008 paper shows that procyclicality (associated with corruption) is a feature of democracies, we explore the role of democratic institutions on procyclicality. Taking advantage of the Varieties of Democracy (V-dem) database, we identify (i) whether the initiative is permitted at the subnational level, and or at the national level; and (ii) whether the popular referendum is permitted at the subnational level, and or at the national level. We focus on the period 2009-2015 (2016 not available yet in data).. The correlations (Table 9 and Figure 10) show that both initiative and referendum are negatively correlated with fiscal procyclicality, but the effect seems stronger for the initiative rights. This finding echoes results of Matsusaka (2014) regarding the effects of initiative on fiscal congruence and fiscal conservatism in U.S. states. Hence, delegating more fiscal legislation to the citizens may be a tool to reduce the procyclical bias..

[insert Table 9; Figure 10]

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Table 1: Fiscal (pro)cyclicality, whole sample (2000-2016)

	Cyclicality of real general government primary spending																				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Variables																						
Cyclicality of re	0.425**	0.425**	0.425**	2.124***	0.107	0.279***	1.070**	-0.089	-1.320***	0.829***	1.730***	-0.114	0.496***	1.825***	1.557***	-0.159**	-0.154**	-0.159**	0.38	0.385**	0.393*	0.183
	(0.199)	(0.199)	(0.199)	(0.706)	(0.378)	(0.092)	(0.313)	(0.310)	(0.479)	(0.533)	(0.118)	(0.414)	(0.174)	(0.569)	(0.453)	(0.073)	(0.075)	(0.073)	-0.272	(0.191)	(0.232)	(0.619)
Development level																						
Crgdp*dvpt.level (polytomic)				-0.612***																		
				-0.229																		
Tax base effect																						
Crgdp*tax					0.041																	
					-0.057																	
Crgdp*tax.base.variability						0.091***																
						(0.002)																
Credit constraints																						
Crgdp*credit.ratio							-0.013***															
							-0.004															
Crgdp*kaopen								1.178														
								-0.92														
Perceived corruption																						
Crgdp*pol.corruption									2.808**													
									-1.107													
Crgdp*pub.service.corruption										2.452***												
										-0.927												
Equality of conditions																						
Crgdp*law.order											-0.350***											
											-0.042											
Crgdp*rule.of.law												1.212										
												-1.153										
Crgdp*power.distribution													0.364									
													-0.326									
Crgdp*resource.distribution														-2.292***								
														-0.625								
Crgdp*ethnic&rel.stability															-0.416***							
															-0.152							
Natural resources																						
Crgdp*resource.dependant (bd)																0.610**						
																(0.243)						
Crgdp*resource.rich (bd)																	0.605**					
																	(0.240)					
Crgdp*resource																		0.610**				
																		(0.244)				
Other factors																						
Crgdp*bad.times																			0.611***			
																			(0.031)			
Crgdp*elections																				0.161**		
																				-0.066		
Crgdp*debt.ratio																					0.001	
																					-0.003	
Crgdp*rigidity																						11.063**
																						(5.495)
Constant	-420.643	-477.301	-377.001	152.592	-1,680.682	-804.944	-66.903	-8.790	186.951	114.892	575.096	-158.364	-269.523	-270.481	482.975	-330.074	-325.467	-298.574	-440.653	-413.932	-434.781	348.510
	(270.633)	(399.656)	(340.819)	(518.802)	(1,848.808)	(1,755.286)	(461.523)	(582.628)	(552.229)	(669.294)	(859.336)	(467.021)	(502.504)	(436.305)	(807.001)	(367.332)	(368.182)	(327.165)	(432.478)	(355.390)	(1064)	()
Adjusted R-squ	0.069	0.067	0.067	0.135	0.083	0.111	0.148	0.105	0.150	0.157	0.122	0.108	0.113	0.094	0.185	0.078	0.078	0.078	0.071	0.069	0.065	0.134
Rmse	5459	5529	5531	5324	9347	9325	5339	5607	5497	5473	5823	5629	5615	5672	5610	5497	5498	5497	5517	5525	5593	5357
Joint significan	-	-	-	-	*0*	*0*	*0.003*	*0*	*0.002*	*0*	*0*	*0*	*0*	*0.036*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
CD test (p-valu	*0*	*0*	*0*	*0*	*0*	*0*	-	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Order of integra	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)/I(1)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*	*I(0)*
Cluster	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*	*country*
Covariates	*No*	*Set1*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*	*Set2*
Observations	2,001	1,954	1,954	1,954	663	646	1,802	1,707	1,639	1,639	1,569	1,639	1,639	1,639	1,569	1,954	1,954	1,954	1,954	1,954	1,913	1,649
# countries	114	112	112	112	41	41	111	111	108	108	95	108	108	108	95	112	112	112	112	112	112	96

Standard errors (in parentheses) clustered at the country level. All interactive variables are also introduce in level but not reported to save space. Removed countries in (2) (3) (4) (5) and (17) to (20): Libya and Nepal. Removed countries in (6) and (7): available upon request. Removed countries in (8): Libya, Nepal and Uzbekistan. Removed countries in (9): Libya, Nepal and Serbia. Removed countries from (10) (11) (13) and (14): Kuwait, Libya, Nepal, Oman, Singapore and United Arab Emirates. Removed countries in (12) and (15): Benin, Bosnia, Burundi, Cambodia, Central African Republic, Chad, Eritrea, Georgia, Kyrgyz Republic, Laos, Lesotho, Libya, Macedonia, Mauritius, Nepal, Rwanda, Serbia, Swaziland, Tajikistan and Uzbekistan. Removed countries in (12) and (15): Benin, Bosnia, Burundi, Cambodia, Central African Republic, Chad, Eritrea, Georgia, Kyrgyz Republic, Laos, Lesotho, Libya, Macedonia, Mauritius, Nepal, Rwanda, Serbia, Swaziland, Tajikistan and Uzbekistan. Removed countries in (21): Libya, Mongolia and Nepal. Set1 includes the volatility of the terms of trade, BD for missing data in real GDP and real expenditure series, BD for one year HP cycle correction. Set2 includes the volatility of the terms of trade, BD for missing data in real GDP and real expenditure series, BD for five years HP cycle correction. See Table A.3 for further discussion on variables definition. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Fiscal (pro)cyclicality, whole sample (2000-2016)

Conditional effects	Threshold level	Median in sample
Development level	3.47	2.00
Revenue.ratio (%)	22.84%	23.64%
Credit.ratio (%)	82.31%	25.99%
Pol.corruption (0-1)	0.53	0.37
Pub.service.corruption (0-1)	0.66	0.71
Law and order (1-6)	4.94	3.00
Resource.distribution (0-1)	0.80	0.59
Ethnic&rel.stability (0-6)	2.55	4.25

Notes: In blue, thresholds to reach a countercyclical policy. Median values are computed on the sample of the respective regresion, not the whole sample of 114 countries.

Table 3: Fiscal (pro)cyclicality, Instrumental Variables Regressions (2000-2016)

	Cyclicality of real general government primary spending						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	IV 2SLS						
Cyclicality of real GDP	0.329***	0.327***	0.322***	0.320***	0.328***	0.324***	0.327***
	(0.067)	(0.063)	(0.063)	(0.063)	(0.068)	(0.063)	(0.068)
Constant	-3.128	-3.862	-4.644	-4.715	-4.009	-4.556	-4.040
	(24.320)	(22.203)	(22.544)	(22.532)	(25.390)	(22.560)	(25.250)
Centered R-squared	0.141	0.145	0.147	0.148	0.144	0.146	0.145
Rmse	156	147	147	147	146	147	158
Weak ID test (stat>10)	103.953	119.327	118.917	120.440	100.334	119.050	100.753
OID test (p-value)	0.813	0.803	0.189	0.177	0.329	0.426	0.948
Intruments	Initial Crgdp	Initial Crgdp	Initial Crgdp	Initial Crgdp	Initial Crgdp	Initial Crgdp	Initial Crgdp
	Initial revenue.ratio	Initial credit.ratio	Initial pol.corruption	Initial pub.service.corruption	Initial law.order	Initial resource.distribution	Initial ethnic&rel.stability
Covariates	Set2	Set2	Set2	Set2	Set2	Set2	Set2
Observations (# countries)	95	108	108	108	108	108	94

Notes: The year 1999 is considered as reference for the initial Crgdp and successive instruments. The full list of removed countries per columns is available upon request. With the collapse of the data, all BD variables refer not to the presence of a condition (i.e. a missing variable), but to the percent of time with the considered condition (i.e. the percent of time with a missing variable over 2000-2016).

	Table 4. MG Estimator (2000-2016)					
	-1	(2)	(3)	(4)	(5)	(6)
VARIABLES	Entire sample	SSA	LAC	MENA	ECA	SEAP
cycl_rgdp	0.164***	0.289***	0.229**	-0.042	0.188***	-0.081
	(0.049)	(0.099)	(0.109)	(0.120)	(0.059)	(0.150)
Observations	1,954	653	357	221	440	283
Number of id	116	39	21	13	26	17
rmse						
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 5: Individual SSA country coefficients (2000-2016)

						Column (1) Table4			Column (2) Table4		
id	Code	Country	Resource-dependent country	Resource-rich country	Average primary exp ratio	Individual coefficient	Individual S.E.	Idividual t-student	Individual coefficient	Individual S.E.	Idividual t-student
1	AGO	Angola	1	1	37.94%	**1.22**	**0.32**	**3.82**	**1.24**	**0.34**	**3.62**
6	BDI	Burundi	0	0	29.17%	0.30	0.33	0.91	0.31	0.34	0.91
7	BEN	Benin	0	0	19.78%	0.61	0.39	1.57	0.62	0.40	1.55
8	BFA	Burkina Faso	1	0	22.64%	0.73	0.50	1.48	0.72	0.51	1.41
14	BWA	Botswana	1	1	39.43%	-0.07	0.33	-0.22	-0.03	0.32	-0.09
15	CAF	Central African Republic	0	1	14.33%	**0.20**	**0.05**	**4.05**	**0.20**	**0.05**	**3.86**
18	CIV	Cote d'Ivoire	1	1	18.06%	**0.41**	**0.09**	**4.47**	**0.43**	**0.09**	**4.76**
19	CMR	Cameroon	1	1	16.83%	0.38	0.51	0.75	0.31	0.55	0.57
20	COG	Congo	1	1	29.00%	0.17	0.78	0.22	0.31	0.81	0.39
27	ERI	Eritrea	0	0	47.43%	**0.66**	**0.34**	**1.94**	**0.88**	**0.32**	**2.77**
29	ETH	Ethiopia	0	0	19.88%	0.09	0.14	0.60	0.08	0.15	0.57
30	GAB	Gabon	1	1	20.48%	**0.53**	**0.33**	**1.61**	0.47	0.33	1.41
32	GHA	Ghana	0	1	19.58%	**0.74**	**0.20**	**3.63**	**0.74**	**0.21**	**3.51**
33	GIN	Guinea	1	1	19.42%	**-1.20**	**0.67**	**-1.79**	**-1.31**	**0.67**	**-1.97**
34	GMB	Gambia	1	0	18.57%	0.16	0.24	0.66	0.14	0.24	0.57
35	GNB	Guinea-Bissau	1	0	18.61%	0.12	0.45	0.27	0.13	0.43	0.30
47	KEN	Kenya	0	0	20.70%	0.15	0.11	1.34	0.15	0.12	1.29
54	LBR	Liberia	1	1	22.75%	0.19	0.18	1.02	0.20	0.19	1.01
57	LSO	Lesotho	0	0	52.44%	-1.28	1.30	-0.99	-1.38	1.29	-1.06
62	MDG	Madagascar	0	0	15.74%	**0.38**	**0.10**	**3.79**	**0.38**	**0.10**	**3.67**
65	MLI	Mali	1	1	19.89%	**0.38**	**0.21**	**1.84**	**0.38**	**0.22**	**1.77**
68	MOZ	Mozambique	0	1	26.72%	1.46	1.00	1.46	1.63	1.06	1.54
69	MUS	Mauritius	0	0	20.97%	-0.01	0.37	-0.02	0.01	0.39	0.01
71	NAM	Namibia	0	0	31.05%	0.14	0.63	0.23	0.16	0.66	0.25
72	NER	Niger	0	1	22.14%	0.30	0.27	1.10	0.30	0.28	1.08
73	NGA	Nigeria	1	1	15.59%	0.02	0.26	0.08	0.03	0.27	0.12
86	RWA	Rwanda	0	0	23.31%	0.04	0.17	0.23	0.04	0.17	0.22
88	SDN	Sudan	1	1	16.16%	0.19	0.15	1.24	0.22	0.16	1.39
89	SEN	Senegal	1	0	24.41%	0.13	0.16	0.82	0.13	0.17	0.79
91	SLE	Sierra Leone	0	1	15.79%	0.02	0.04	0.55	0.02	0.04	0.50
96	SWZ	Swaziland	1	0	28.53%	**1.98**	**0.53**	**3.70**	**2.14**	**0.55**	**3.89**
98	TCD	Chad	1	1	18.26%	0.02	0.12	0.18	0.06	0.13	0.46
99	TGO	Togo	0	1	19.74%	**0.97**	**0.40**	**2.42**	**0.97**	**0.42**	**2.33**
105	TZA	Tanzania	0	1	16.55%	0.31	0.35	0.88	0.33	0.35	0.96
106	UGA	Uganda	0	1	17.15%	**0.55**	**0.20**	**2.69**	**0.56**	**0.20**	**2.73**
113	ZAF	South Africa	0	0	25.70%	-0.08	0.12	-0.73	-0.04	0.13	-0.27
114	ZAR	Democratic Republic of Congo	0	1	10.17%	-0.14	0.24	-0.58	-0.16	0.30	-0.54
115	ZMB	Zambia	0	0	20.74%	0.24	0.28	0.84	0.33	0.27	1.21
Average					**23.04%**	**0.29**	**0.34**	**1.21**	**0.31**	**0.35**	**1.25**
Number/percent countercyclical						**6 (33.33%)**			**5 (27.78%)**		

Notes: In bold, coefficient associated with an absolute t-student over 1.60. Coefficients in blue are negative.

Figure 3: (Pro)cyclicality in SSA, Resource Rich vs. Other Countries

Figure 3.a: (Pro)cyclicality in SSA countries, separating for resource-dependent countries

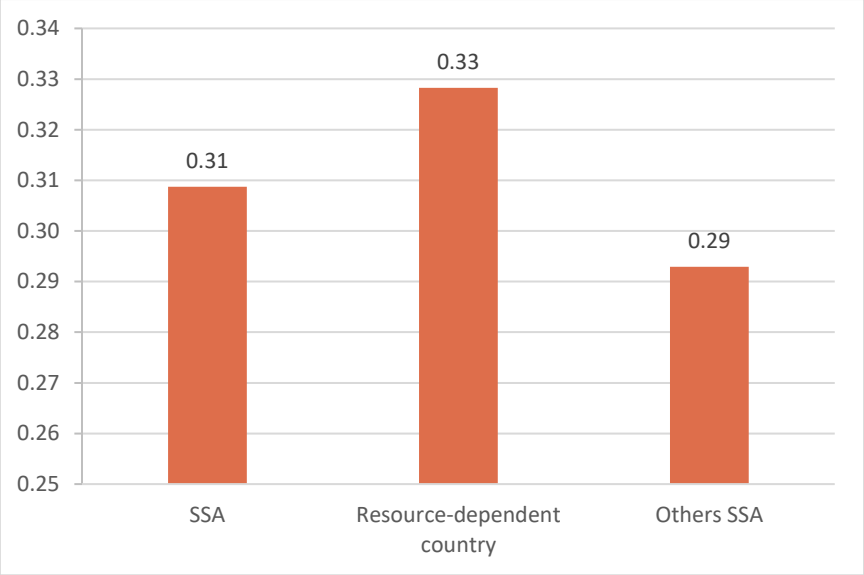


Figure 3.b: (Pro)cyclicality in SSA countries, separating for resource-rich countries

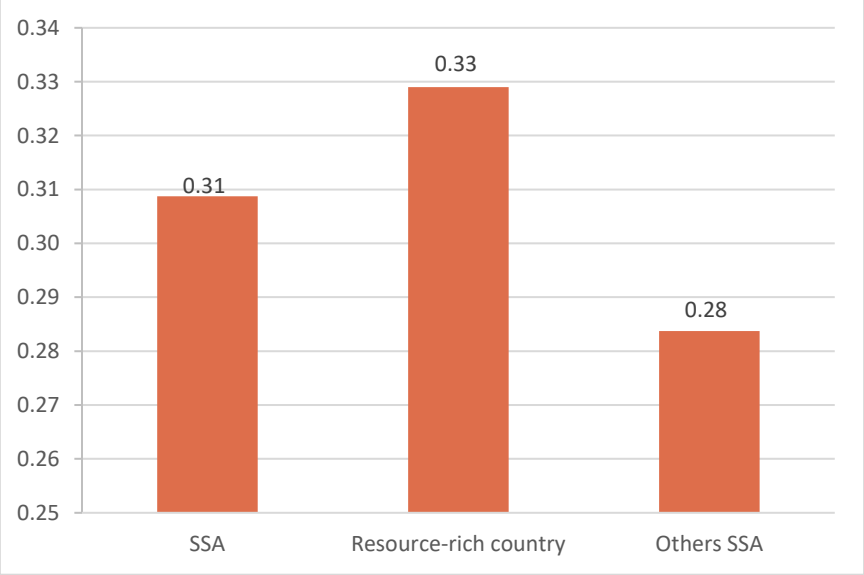


Figure 4: (Pro)cyclicality in Resource- Rich SSA countries vs Resource Rich in other regions

Figure 4.a: (Pro)cyclicality in SSA countries, separating for resource-dependent countries

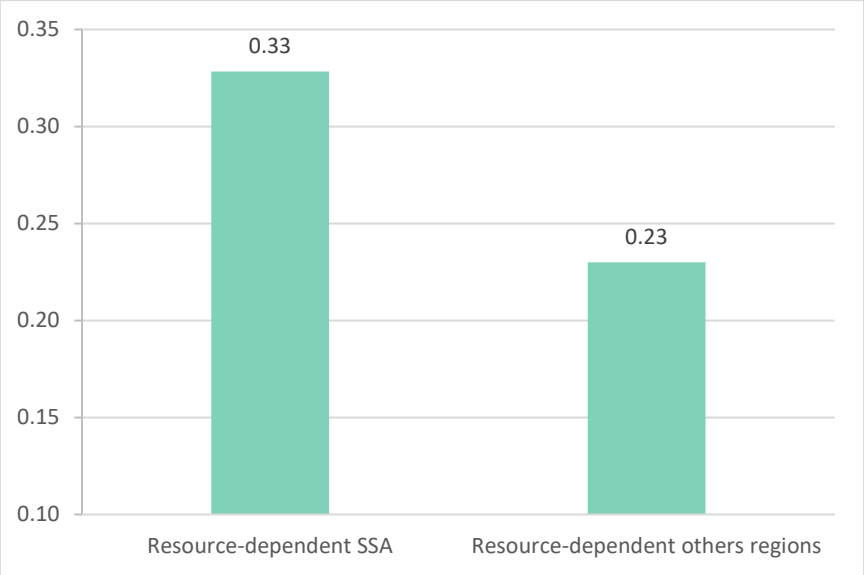


Figure 4.b: (Pro)cyclicality in SSA countries, separating for resource-rich countries

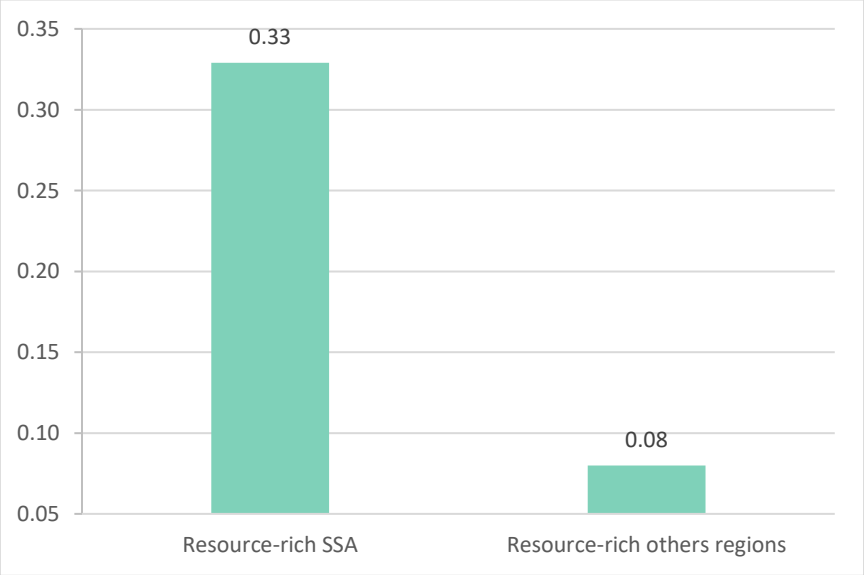


Table 6: Potential top-down solutions: fiscal rules (correlation 2009-2015)

Fiscal rule (FR)	without	N (without)	with	N (with)	p-value ≠ 0
National FR	0.14	582	0.06	214	0.03
	(0.02)		(0.03)		
FR with fiscal council	0.14	574	0.08	128	0.15
	(0.02)		(0.04)		
FR with monitoring	0.14	582	-0.05	81	0.00
	(0.02)		(0.06)		
FR with enforcement	0.14	582	-0.03	96	0.00
	(0.02)		(0.04)		
FR with large coverage	0.14	575	0.20	105	0.22
	(0.02)		(0.04)		
FR with written legal basis	0.14	575	-0.01	185	0.00
	(0.02)		(0.03)		
FR with escape clause	0.14	582	0.02	74	0.04
	(0.02)		(0.04)		
FR with flexibility	0.14	575	-0.04	99	0.00
	(0.02)		(0.05)		

Notes: For consistency, the control group systematically exclude FRers countries, so not any country in the control group has a national FR, irrespective to the specification.

Figure 7: Correlation conditional to FRs characteristics (2009-2015)

Table 7: Potential top-down solutions: fiscal councils (correlation 2009-2016)

Fiscal council (FC)	without	N (without)	with	N (with)	p-value ≠ 0
FC	0.13	813	-0.02	96	0.00
	(0.02)		(0.06)		
FC with large coverage	0.13	813	0.03	66	0.08
	(0.02)		(0.07)		
FC with forecast prep.	0.13	813	0.04	79	0.10
	(0.02)		(0.06)		
FC with forecast asses.	0.13	813	0.04	79	0.10
	(0.02)		(0.06)		
FC with recommendation	0.13	813	-0.06	74	0.00
	(0.02)		(0.07)		
FC with sustainability	0.13	813	-0.38	40	0.00
	(0.02)		(0.07)		
FC with consistency	0.13	813	-0.10	73	0.00
	(0.02)		(0.07)		
FC evaluating costs of measures	0.13	813	-0.29	54	0.00
	(0.02)		(0.06)		
FC with ex-post analysis	0.13	813	-0.08	67	0.00
	(0.02)		(0.07)		
FC with reports	0.13	813	0.01	93	0.01
	(0.02)		(0.06)		
FC with media impact	0.13	813	0.02	67	0.06
	(0.02)		(0.07)		

Notes: For consistency, the control group systematically exclude FCers countries, so not any country in the control group has a FC, irrespective to the specification.

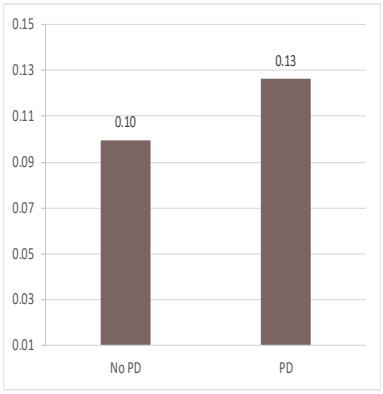
Figure 7: Correlation conditional to FCs characteristics (2009-2016)

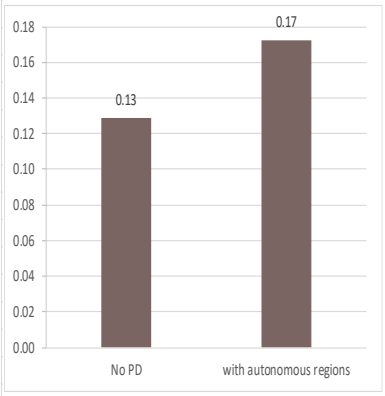
Table 8: Potential bottom-up solutions: Political Decentralization (correlation 2009-2015)

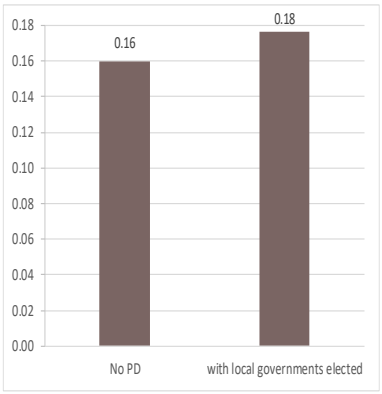
Political Decentralization (PD)	without	N (without)	with	N (with)	p-value ≠ 0
PD	0.10	334	0.13	462	0.41
	(0.02)		(0.02)		
with autonomous regions	0.13	320	0.17	126	0.36
	(0.02)		(0.04)		
with local governments elected	0.16	192	0.18	266	0.69
	(0.03)		(0.03)		
with state governments elected	0.16	215	0.17	112	0.83
	(0.03)		(0.04)		
with state fiscal & legislative authority	0.28	94	0.15	119	0.04
	(0.05)		(0.04)		
with state constituencies in the upper house	-0.02	60	0.12	147	0.05
	(0.06)		(0.04)		

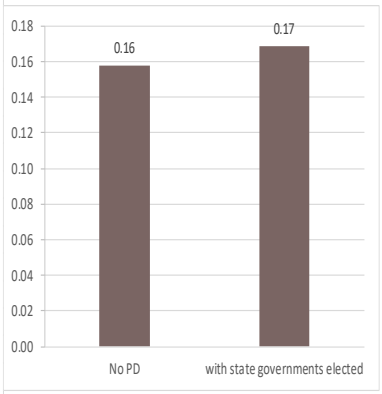
Notes: For consistency, the control group systematically exclude PDers countries, so not any country in the control group has decentralization, irrespective to the specification.

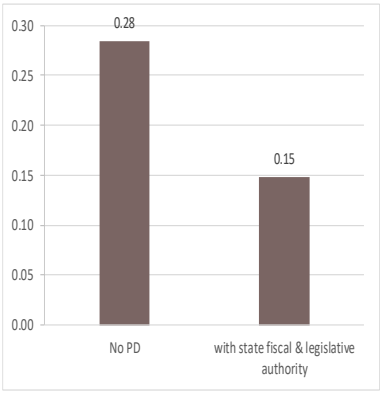
Figure 9: Correlation conditional to PD characteristics (2009-2015)











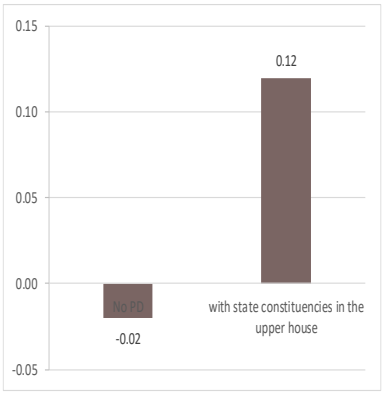
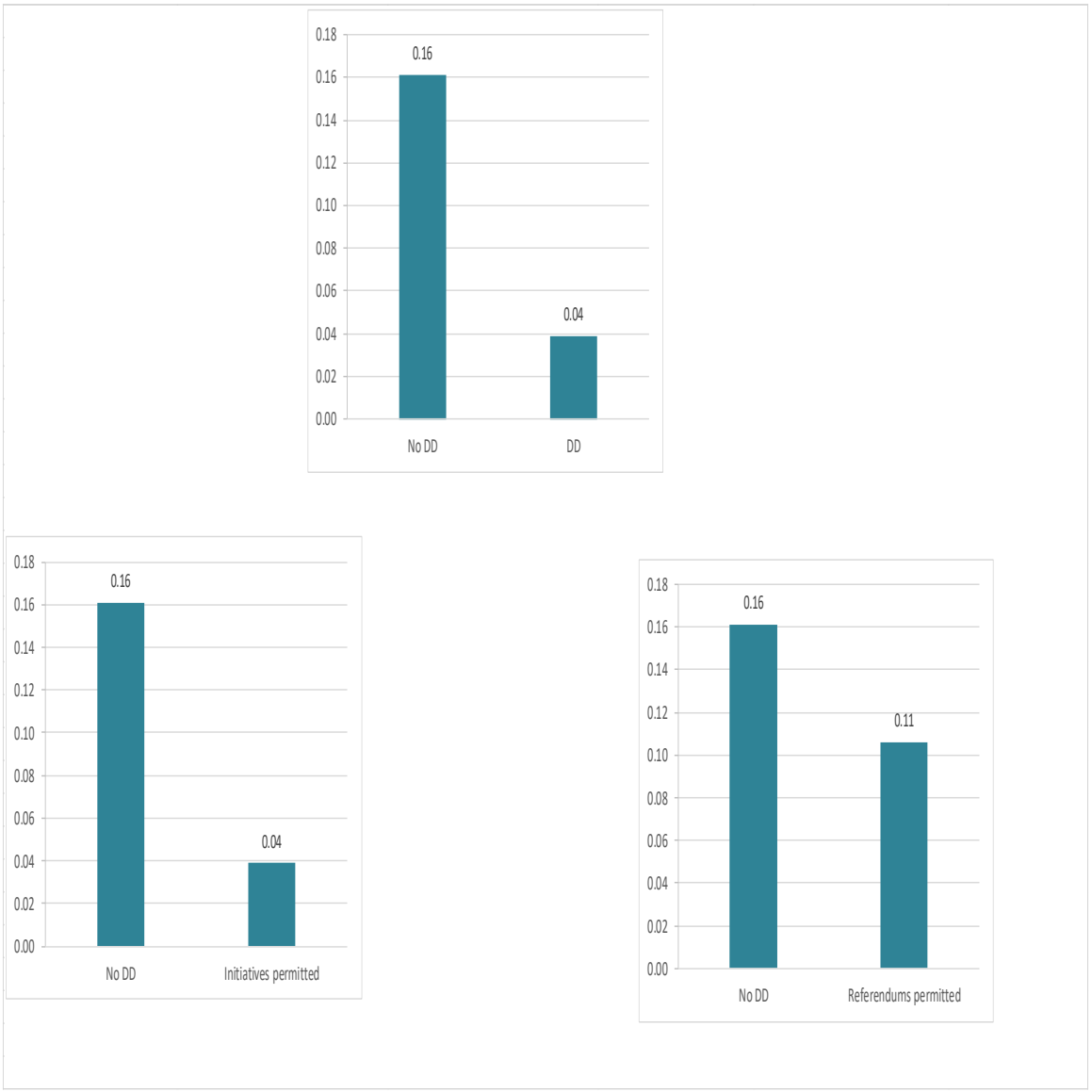


Table 9: Potential bottom-up solutions: direct democracy (correlation 2009-2016)					
Direct democracy (DD)	without	N (without)	with	N (with)	p-value ≠ 0
DD	0.16	448	0.04	184	0.00
	(0.02)		(0.04)		
Initiatives permitted*	0.16	448	0.04	184	0.00
	(0.02)		(0.04)		
Referendums permitted	0.16	448	0.11	103	0.10
	(0.02)		(0.05)		

Notes: For consistency, the control group systematically exclude DDers countries, so not any country in the control group has DD irrespective to the specification. *: Same as DD.

Figure 10: Correlation conditional to DD characteristics (2009-2015)



TableA.1: List of Resource-dependent countries in our sample (2000-2016)

#	Region	Code	Resource-dependent countries	Percent time with RD revenues	Oil exporters	Mineral exporters	Other exporters
1	Sub-Saharan Africa	AGO	Angola	100%	yes		
2	Middle East & North Africa	ARE	United Arab Emirates	100%	yes		
3	Sub-Saharan Africa	BFA	Burkina Faso	86%		yes	
4	Latin America & Caribbean	BOL	Bolivia	100%	yes		
5	Sub-Saharan Africa	BWA	Botswana	100%		yes	
6	Sub-Saharan Africa	CIV	Cote d'Ivoire	100%			yes (cocoa)
7	Sub-Saharan Africa	CMR	Cameroon	100%	yes		
8	Sub-Saharan Africa	COG	Congo, Republic of	100%	yes		
9	Middle East & North Africa	DZA	Algeria	100%	yes		
10	Latin America & Caribbean	ECU	Ecuador	100%	yes		
11	Sub-Saharan Africa	GAB	Gabon	100%	yes		
12	Sub-Saharan Africa	GIN	Guinea	100%	yes		
13	Sub-Saharan Africa	GMB	Gambia	100%			yes (artificial filament)
14	Sub-Saharan Africa	GNB	Guinea-Bissau	65%			yes (coconut, Brazil nuts, cashew)
15	South, East Asia & Pacific	IDN	Indonesia	88%	yes		
16	Middle East & North Africa	IRN	Iran	100%	yes		
17	Middle East & North Africa	KWT	Kuwait	100%	yes		
18	Sub-Saharan Africa	LBR	Liberia	53%		yes	
19	Sub-Saharan Africa	MLI	Mali	100%		yes	
20	Sub-Saharan Africa	NGA	Nigeria	100%	yes		
21	Middle East & North Africa	OMN	Oman	100%	yes		
22	Latin America & Caribbean	PER	Peru	71%		yes	
23	Europe & Central Asia	RUS	Russia	94%	yes		
24	Middle East & North Africa	SAU	Saudi Arabia	100%	yes		
25	Sub-Saharan Africa	SDN	Sudan	88%	yes		
26	Sub-Saharan Africa	SEN	Senegal	94%		yes	
27	Sub-Saharan Africa	SWZ	Swaziland	100%		yes	
28	Sub-Saharan Africa	TCD	Chad	100%	yes		
29	Latin America & Caribbean	TTO	Trinidad and Tobago	100%	yes		
30	Latin America & Caribbean	VEN	Venezuela	88%	yes		
31	South, East Asia & Pacific	VNM	Vietnam	88%			yes (telephone sets)
32	Middle East & North Africa	YEM	Yemen	100%	yes		

Notes: The repartition is based on the principal exportation according to OEC (http://atlas.media.mit.edu/en/visualize/tree_map/hs07/export/fra/all/show/2014/ ; dataset HS07) for the last year available (2014).

TableA.2: List of Resource-rich countries in our sample (2000-2016)

#	Region	Code	Resource-rich countries	Oil exporters	Mineral exporters	Other exporters
1	Sub-Saharan Africa	AGO	Angola	yes		
2	Europe & Central Asia	ALB	Albania	yes		
3	Europe & Central Asia	AZE	Azerbaijan	yes		
4	Latin America & Caribbean	BOL	Bolivia	yes		
5	Sub-Saharan Africa	BWA	Botswana		yes	
6	*Sub-Saharan Africa*	*CAF*	*Central African Republic* [i]			*yes (wood)*
7	Latin America & Caribbean	CHL	Chile		yes	
8	Sub-Saharan Africa	CIV	Cote d'Ivoire			yes (cocoa)
9	Sub-Saharan Africa	CMR	Cameroon	yes		
10	Sub-Saharan Africa	COG	Congo	yes		
11	Middle East & North Africa	DZA	Algeria	yes		
12	Latin America & Caribbean	ECU	Ecuador	yes		
13	Sub-Saharan Africa	GAB	Gabon	yes		
14	Sub-Saharan Africa	GIN	Guinea	yes		
15	*Latin America & Caribbean*	*GTM*	*Guatemala* [i]			*yes (can and beet sugar)*
16	South, East Asia & Pacific	IDN	Indonesia	yes		
17	Middle East & North Africa	IRN	Iran	yes		
18	*Europe & Central Asia*	*KGZ*	*Kyrgyz Republic* [i]		*yes*	
19	South, East Asia & Pacific	LAO	Laos			yes (wood)
20	Sub-Saharan Africa	LBR	Liberia		yes	
21	Middle East & North Africa	LBY	Libya	yes		
22	Latin America & Caribbean	MEX	Mexico	yes		
23	Sub-Saharan Africa	MLI	Mali		yes	
24	South, East Asia & Pacific	MNG	Mongolia		yes	
25	*Sub-Saharan Africa*	*MOZ*	*Mozambique* [i]		*yes*	
26	Sub-Saharan Africa	NER	Niger		yes	
27	Sub-Saharan Africa	NGA	Nigeria	yes		
28	Middle East & North Africa	OMN	Oman	yes		
29	Latin America & Caribbean	PER	Peru		yes	
30	South, East Asia & Pacific	PNG	Papua New Guinea	yes		
31	Europe & Central Asia	RUS	Russia	yes		
32	Middle East & North Africa	SAU	Saudi Arabia	yes		
33	Sub-Saharan Africa	SDN	Sudan	yes		
34	*Sub-Saharan Africa*	*SLE*	*Sierra Leone* [i]		*yes*	
35	Middle East & North Africa	SYR	Syria		yes	
36	Sub-Saharan Africa	TCD	Chad	yes		
37	*Sub-Saharan Africa*	*TGO*	*Togo* [i]	*yes*		
38	Latin America & Caribbean	TTO	Trinidad and Tobago	yes		
39	*Sub-Saharan Africa*	*TZA*	*Tanzania* [i]		*yes*	
40	*Sub-Saharan Africa*	*UGA*	*Uganda* [i]			*yes (coffee)*
41	Europe & Central Asia	UZB	Uzbekistan		yes	
42	Latin America & Caribbean	VEN	Venezuela	yes		
43	South, East Asia & Pacific	VNM	Vietnam			yes (telephone sets)
44	Middle East & North Africa	YEM	Yemen	yes		
45	Sub-Saharan Africa	ZAR	Democratic Republic of Congo		yes	

Notes: The list of ressource-rich countries comes from https://www.imf.org/external/np/pp/eng/2012/082412.pdf. The repartition is based on the principal exportation according to OEC (http://atlas.media.mit.edu/en/visualize/tree_map/hs07/export/fra/all/show/2014/ ; dataset HS07) for the last year available (2014). [i]: prospective resource-rich countries.

Table A.3: Evolution of (pro)cyclicality over time

#	Region	Code	Country	Corr(G, GDP) 2000-2008	Corr(G, GDP) 2009-2016
1	Europe & Central Asia	ALB	Albania	0.89	-0.10
2	**Middle East & North Africa**	**DZA**	**Algeria**	**-0.36**	**0.04**
3	Sub-Saharan Africa	AGO	Angola	0.83	0.50
4	Latin America & Caribbean	ARG	Argentina	0.90	0.43
5	Europe & Central Asia	AZE	Azerbaijan	0.59	0.18
6	**South, East Asia & Pacific**	**BGD**	**Bangladesh**	**-0.20**	**0.38**
7	Europe & Central Asia	BLR	Belarus	0.87	-0.44
8	**Sub-Saharan Africa**	**BEN**	**Benin**	**0.28**	**0.47**
9	**Latin America & Caribbean**	**BOL**	**Bolivia**	**0.42**	**0.79**
10	Europe & Central Asia	BIH	Bosnia and Herzegovina	0.88	0.43
11	Sub-Saharan Africa	BWA	Botswana	0.49	-0.64
12	Europe & Central Asia	BGR	Bulgaria	0.85	-0.06
13	**Sub-Saharan Africa**	**BFA**	**Burkina Faso**	**0.19**	**0.51**
14	**Sub-Saharan Africa**	**BDI**	**Burundi**	**-0.53**	**0.47**
15	South, East Asia & Pacific	KHM	Cambodia	-0.43	-0.35
16	Sub-Saharan Africa	CMR	Cameroon	0.51	0.09
17	**Sub-Saharan Africa**	**CAF**	**Central African Republic**	**0.27**	**0.89**
18	**Sub-Saharan Africa**	**TCD**	**Chad**	**-0.53**	**0.49**
19	Latin America & Caribbean	CHL	Chile	-0.51	-0.74
20	**South, East Asia & Pacific**	**CHN**	**China**	**-0.44**	**-0.34**
21	**Latin America & Caribbean**	**COL**	**Colombia**	**0.18**	**0.31**
22	**Sub-Saharan Africa**	**COG**	**Congo**	**0.03**	**0.05**
23	Latin America & Caribbean	CRI	Costa Rica	-0.47	-0.54
24	**Sub-Saharan Africa**	**CIV**	**Cote d'Ivoire**	**0.17**	**0.82**
25	Europe & Central Asia	HRV	Croatia	0.57	0.43
26	**Europe & Central Asia**	**CZE**	**Czech Republic**	**-0.19**	**0.45**
27	Sub-Saharan Africa	ZAR	Democratic Republic of Co	-0.04	-0.15
28	Latin America & Caribbean	DOM	Dominican Republic	0.47	-0.32
29	**Latin America & Caribbean**	**ECU**	**Ecuador**	**0.23**	**0.87**
30	Latin America & Caribbean	SLV	El Salvador	-0.18	-0.25
31	**Sub-Saharan Africa**	**ERI**	**Eritrea**	**0.52**	**0.59**
32	Europe & Central Asia	EST	Estonia	0.60	-0.04
33	**Sub-Saharan Africa**	**ETH**	**Ethiopia**	**0.08**	**0.26**
34	**Sub-Saharan Africa**	**GAB**	**Gabon**	**0.39**	**0.50**
35	Sub-Saharan Africa	GMB	Gambia	0.46	-0.07
36	Europe & Central Asia	GEO	Georgia	0.76	-0.61
37	**Sub-Saharan Africa**	**GHA**	**Ghana**	**-0.44**	**0.79**
38	Latin America & Caribbean	GTM	Guatemala	0.23	-0.26
39	Sub-Saharan Africa	GIN	Guinea	-0.13	-0.55
40	Sub-Saharan Africa	GNB	Guinea-Bissau	0.12	0.04
41	**Latin America & Caribbean**	**HTI**	**Haiti**	**0.14**	**0.40**
42	Latin America & Caribbean	HND	Honduras	0.25	-0.16
43	**Europe & Central Asia**	**HUN**	**Hungary**	**0.46**	**0.71**
44	**South, East Asia & Pacific**	**IND**	**India**	**-0.70**	**0.70**
45	**South, East Asia & Pacific**	**IDN**	**Indonesia**	**0.50**	**0.81**
46	**Middle East & North Africa**	**IRN**	**Iran**	**-0.26**	**0.78**
47	Middle East & North Africa	ISR	Israel	0.31	0.24
48	Latin America & Caribbean	JAM	Jamaica	0.44	0.22
49	**Middle East & North Africa**	**JOR**	**Jordan**	**-0.06**	**0.20**
50	Sub-Saharan Africa	KEN	Kenya	0.43	0.05
51	Middle East & North Africa	KWT	Kuwait	-0.01	-0.47
52	Europe & Central Asia	KGZ	Kyrgyz Republic	-0.23	-0.38
53	**South, East Asia & Pacific**	**LAO**	**Laos**	**-0.45**	**-0.23**
54	Europe & Central Asia	LVA	Latvia	0.87	-0.25
55	Middle East & North Africa	LBN	Lebanon	-0.22	-0.24
56	Sub-Saharan Africa	LSO	Lesotho	-0.01	-0.47
57	Sub-Saharan Africa	LBR	Liberia	0.43	-0.15
58	**Middle East & North Africa**	**LBY**	**Libya**	**-0.48**	**0.83**
59	Europe & Central Asia	LTU	Lithuania	0.82	-0.35
60	**Europe & Central Asia**	**MKD**	**Macedonia**	**0.04**	**0.09**
61	Sub-Saharan Africa	MDG	Madagascar	0.72	0.57
62	South, East Asia & Pacific	MYS	Malaysia	-0.20	-0.57
63	**Sub-Saharan Africa**	**MLI**	**Mali**	**0.09**	**0.62**
64	**Sub-Saharan Africa**	**MUS**	**Mauritius**	**0.13**	**0.19**
65	Latin America & Caribbean	MEX	Mexico	-0.02	-0.07
66	Europe & Central Asia	MDA	Moldova	0.64	0.41
67	**South, East Asia & Pacific**	**MNG**	**Mongolia**	**0.04**	**0.48**
68	**Middle East & North Africa**	**MAR**	**Morocco**	**-0.45**	**0.00**
69	**Sub-Saharan Africa**	**MOZ**	**Mozambique**	**0.21**	**0.61**
70	South, East Asia & Pacific	MMR	Myanmar	0.73	0.16
71	**Sub-Saharan Africa**	**NAM**	**Namibia**	**-0.31**	**0.32**
72	South, East Asia & Pacific	NPL	Nepal	0.53	0.10
73	**Latin America & Caribbean**	**NIC**	**Nicaragua**	**0.24**	**0.85**
74	**Sub-Saharan Africa**	**NER**	**Niger**	**0.21**	**0.43**
75	**Sub-Saharan Africa**	**NGA**	**Nigeria**	**-0.30**	**0.23**
76	**Middle East & North Africa**	**OMN**	**Oman**	**-0.12**	**0.60**
77	South, East Asia & Pacific	PAK	Pakistan	0.61	0.23
78	Latin America & Caribbean	PAN	Panama	0.48	0.41
79	**South, East Asia & Pacific**	**PNG**	**Papua New Guinea**	**-0.67**	**-0.40**
80	Latin America & Caribbean	PRY	Paraguay	-0.42	-0.67
81	Latin America & Caribbean	PER	Peru	0.00	-0.22
82	South, East Asia & Pacific	PHL	Philippines	0.12	0.04
83	**Europe & Central Asia**	**POL**	**Poland**	**-0.16**	**0.39**
84	Europe & Central Asia	ROM	Romania	0.91	0.49
85	Europe & Central Asia	RUS	Russia	0.20	-0.22
86	Sub-Saharan Africa	RWA	Rwanda	0.41	-0.43
87	**Middle East & North Africa**	**SAU**	**Saudi Arabia**	**-0.38**	**-0.11**
88	Sub-Saharan Africa	SEN	Senegal	0.33	0.09
89	Europe & Central Asia	SRB	Serbia	0.49	-0.59
90	Sub-Saharan Africa	SLE	Sierra Leone	0.38	0.18
91	South, East Asia & Pacific	SGP	Singapore	-0.41	-0.68
92	Europe & Central Asia	SVK	Slovak Republic	-0.05	-0.37
93	Europe & Central Asia	SVN	Slovenia	0.15	-0.44
94	Sub-Saharan Africa	ZAF	South Africa	0.46	-0.68
95	South, East Asia & Pacific	KOR	South Korea	-0.34	-0.80
96	South, East Asia & Pacific	LKA	Sri Lanka	0.55	-0.14
97	**Sub-Saharan Africa**	**SDN**	**Sudan**	**-0.08**	**0.80**
98	**Sub-Saharan Africa**	**SWZ**	**Swaziland**	**0.58**	**0.70**
99	Middle East & North Africa	SYR	Syria	-0.32	-1.00*
100	Europe & Central Asia	TJK	Tajikistan	0.38	-0.10
101	Sub-Saharan Africa	TZA	Tanzania	0.40	0.22
102	**South, East Asia & Pacific**	**THA**	**Thailand**	**-0.25**	**0.40**
103	Sub-Saharan Africa	TGO	Togo	0.65	0.13
104	Latin America & Caribbean	TTO	Trinidad and Tobago	0.05	-0.40
105	Middle East & North Africa	TUN	Tunisia	0.16	-0.34
106	Europe & Central Asia	TUR	Turkey	0.52	0.22
107	Sub-Saharan Africa	UGA	Uganda	0.70	0.63
108	**Europe & Central Asia**	**UKR**	**Ukraine**	**0.82**	**0.82**
109	Middle East & North Africa	ARE	United Arab Emirates	-0.61	-0.61
110	Latin America & Caribbean	URY	Uruguay	0.66	0.55
111	**Europe & Central Asia**	**UZB**	**Uzbekistan**	**0.34**	**0.59**
112	Latin America & Caribbean	VEN	Venezuela	0.84	0.70
113	South, East Asia & Pacific	VNM	Vietnam	-0.21	-0.17
114	**Middle East & North Africa**	**YEM**	**Yemen**	**-0.40**	**0.63**
115	Sub-Saharan Africa	ZMB	Zambia	0.36	0.28

Notes: In bold, countries that become more procyclical (less countercyclical) over time.

Table A.4: Evolution of (pro)cyclicality at the regional level, over time

#	Code	Region	Corr(G, GDP) 2000-2008	Corr(G, GDP) 2009-2016
1	ECA	Europe & Central Asia	0.48	0.05
2	LAC	Latin America & Caribbean	0.20	0.09
3	**MENA**	**Middle East & North Africa**	**-0.23**	**0.12**
4	**SEAP**	**South, East Asia & Pacific**	**-0.07**	**-0.02**
5	**SSA**	**Sub-Saharan Africa**	**0.23**	**0.22**

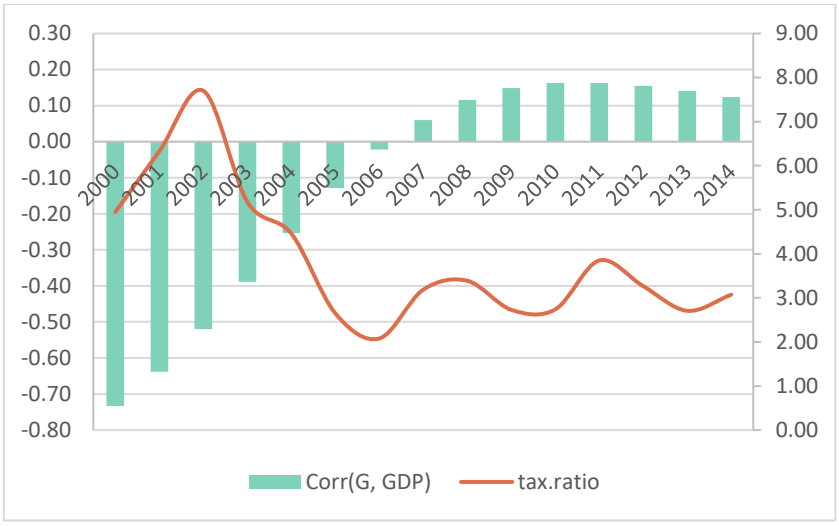
Notes: In bold, region which are performing worse, or stagnate over time.

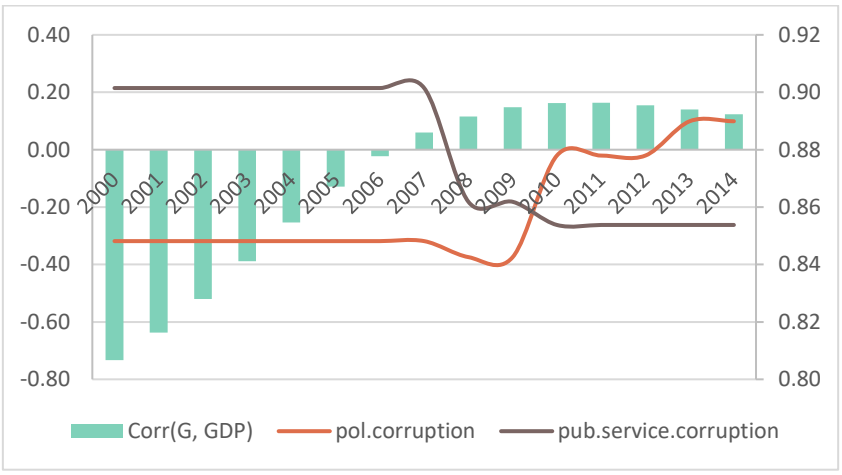
Table A.5: Key indicators by regions				
			Revenue ratio (%)	
#	Code	Region	2000-2008	2009-2016
1	ECA	Europe & Central Asia	34.48	36.52
2	LAC	Latin America & Caribbean	22.01	24.01
3	MENA	Middle East & North Africa	36.97	33.72
4	SEAP	South, East Asia & Pacific	17.72	19.76
5	SSA	Sub-Saharan Africa	22.27	22.49
			Tax (%)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	28.07	24.39
2	LAC	Latin America & Caribbean	24.39	20.16
3	MENA	Middle East & North Africa	8.11	8.50
4	SEAP	South, East Asia & Pacific	13.98	17.27
5	SSA	Sub-Saharan Africa	11.12	12.56
			Credit.ratio (%)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	28.96	47.09
2	LAC	Latin America & Caribbean	32.50	38.75
3	MENA	Middle East & North Africa	43.98	56.29
4	SEAP	South, East Asia & Pacific	48.30	66.43
5	SSA	Sub-Saharan Africa	16.70	23.15
			Pol.corruption (0-1)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	0.46	0.48
2	LAC	Latin America & Caribbean	0.48	0.51
3	MENA	Middle East & North Africa	0.40	0.46
4	SEAP	South, East Asia & Pacific	0.35	0.36
5	SSA	Sub-Saharan Africa	0.33	0.35
			Pub.service.corruption (0-1)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	0.48	0.49
2	LAC	Latin America & Caribbean	0.52	0.54
3	MENA	Middle East & North Africa	0.38	0.42
4	SEAP	South, East Asia & Pacific	0.38	0.38
5	SSA	Sub-Saharan Africa	0.30	0.33
			Law.order (1-6)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	4.13	3.92
2	LAC	Latin America & Caribbean	2.69	2.40
3	MENA	Middle East & North Africa	4.23	4.19
4	SEAP	South, East Asia & Pacific	3.43	3.43
5	SSA	Sub-Saharan Africa	2.96	2.90
			Resource.distribution (0-1)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	0.77	0.75
2	LAC	Latin America & Caribbean	0.57	0.59
3	MENA	Middle East & North Africa	0.49	0.52
4	SEAP	South, East Asia & Pacific	0.55	0.54
5	SSA	Sub-Saharan Africa	0.51	0.53
			Ethnic&rel.stability (0-6)	
			2000-2008	2009-2016
1	ECA	Europe & Central Asia	1.02	0.99
2	LAC	Latin America & Caribbean	4.96	5.04
3	MENA	Middle East & North Africa	3.79	3.97
4	SEAP	South, East Asia & Pacific	3.75	3.46
5	SSA	Sub-Saharan Africa	3.61	3.67
Notes: Average levels are computed for the subperiods 2000-2008; 2009-2016.				

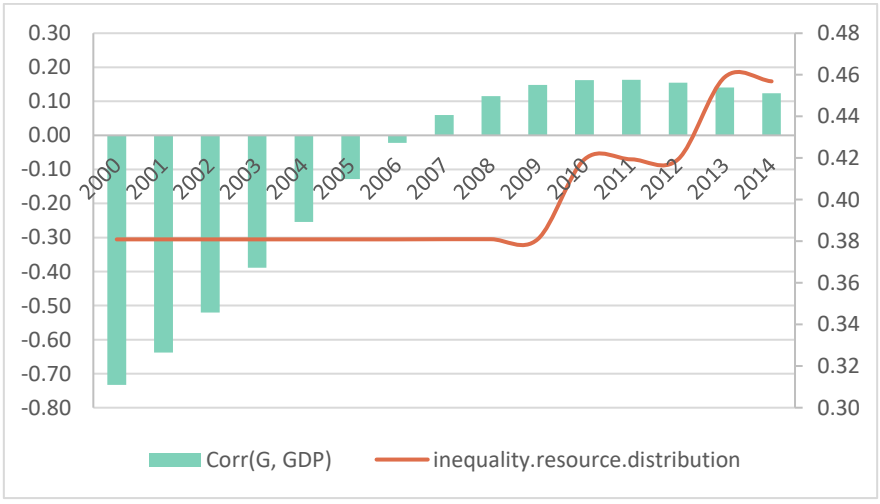
Table A.6: Key indicators by group				
			Revenue ratio (%)	
#	Code	Region	2000-2008	2009-2016
1	EG	Established Graduates	24.63	27.16
2	RG	Recent Graduates	27.14	28.93
3	BS	Back to School	28.30	26.08
4	SS	Still in School	25.07	25.73
			Tax (%)	
			2000-2008	2009-2016
1	EG	Established Graduates	11.53	13.04
2	RG	Recent Graduates	18.18	20.15
3	BS	Back to School	8.25	8.85
4	SS	Still in School	12.79	14.50
			Credit.ratio (%)	
			2000-2008	2009-2016
1	EG	Established Graduates	44.15	60.93
2	RG	Recent Graduates	33.28	45.02
3	BS	Back to School	39.59	56.29
4	SS	Still in School	22.38	31.58
			Pol.corruption (0-1)	
			2000-2008	2009-2016
1	EG	Established Graduates	0.44	0.47
2	RG	Recent Graduates	0.47	0.54
3	BS	Back to School	0.38	0.38
4	SS	Still in School	0.35	0.37
			Pub.service.corruption (0-1)	
			2000-2008	2009-2016
1	EG	Established Graduates	0.42	0.45
2	RG	Recent Graduates	0.49	0.55
3	BS	Back to School	0.36	0.36
4	SS	Still in School	0.37	0.38
			Law.order (0-6)	
			2000-2008	2009-2016
1	EG	Established Graduates	3.72	3.54
2	RG	Recent Graduates	3.35	3.20
3	BS	Back to School	3.48	3.48
4	SS	Still in School	3.19	3.06
			Resource.distribution (0-1)	
			2000-2008	2009-2016
1	EG	Established Graduates	0.54	0.55
2	RG	Recent Graduates	0.68	0.71
3	BS	Back to School	0.53	0.52
4	SS	Still in School	0.57	0.58
			Ethnic&rel.stability (0-6)	
			2000-2008	2009-2016
1	EG	Established Graduates	4.44	4.44
2	RG	Recent Graduates	4.31	4.32
3	BS	Back to School	3.55	3.66
4	SS	Still in School	4.05	4.01

Notes: Average levels are computed for the subperiods 2000-2008; 2009-2016. In bold, potential source of fiscal improvement.

Figure A.4: Some correlates of (pro)cyclicality for Nigeria -- (2000-2016)

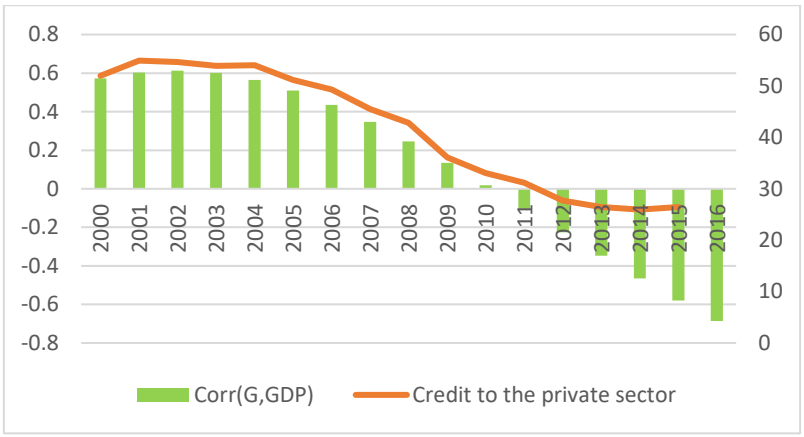


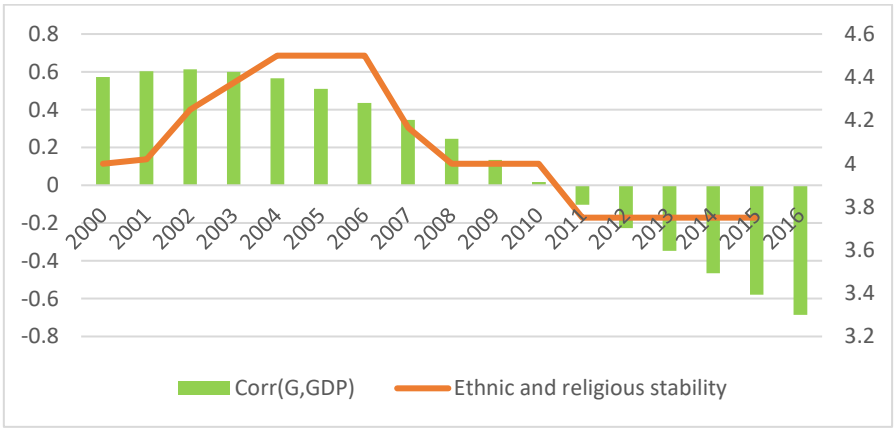




Notes: the annual Corr(G,GDP) is computed using the LGWOLS method derived from Aghion and Marinescu (2007). We consider the original score for perceived political corruption and perceived corruption in public services (i.e. a higher score implies stronger corruption in that case).

Figure A.5: Some correlates of (pro)cyclicality for Egypt -- (2000-2016)





Notes: the annual Corr(G,GDP) is computed using the LGWOLS method derived from Aghion and Marinescu (2007). We consider the original score for perceived political corruption and perceived corruption in public services (i.e. a higher score implies stronger corruption in that case).

TableA.7: Variable Definitions (2000-2016)

#	Name	Description	Souces	N	Mean	S.D.	Min	Max
1	Cyclicality real primary spending*	Cylcicality of real primary general government expenditures (HP filter λ=6.25).	WEO (October, 2016) and Own Construction.	1,933	-20.66	5,755.94	-77,767.53	82,694.79
2	Cyclicality real GDP**	Cylcicality of real gross domestic product (HP filter λ=6.25).	WEO (October, 2016) and Own Construction.	1,933	-26.67	4,832.80	-82,929.94	106,627.20
3	Volatility ToT	5y rolling window standard deviation of the terms of trade (TT series).	WEO (October, 2016).	1,886	10.13	12.58	0.13	135.91
4	Real general government total revenues***	Total real revenue (% of GDP).	WEO (October, 2016) and Own Construction.	1,933	11.06	11.03	0.64	72.47
5	Real general government total tax****	Total real tax (% of GDP).	WEO (October, 2016) and Own Construction.	651	13.07	5.83	0.00	31.48
6	Tax base variability	Annual absolute deviation from mean.	WEO (October, 2016) and Own Construction.	632	1.06	1.15	0.00	12.44
7	Credit to private sector	Domestic credit to private sector (% of GDP).	WDI (February, 2017).	1,779	35.15	30.33	0.00	160.12
8	Kaopen	Index measuring the degree of capital account openness	Chinn and Ito (2006).	1,688	0.48	0.35	0.00	1.00
9	Political corruption	Political corruption (v2x_corr series)	V-dem vers. 6.2.	1,620	0.41	0.23	0.03	0.96
10	Public service corruption	Corruption of the public services (v2x_pubcorr series)	V-dem vers. 6.2.	1,620	0.41	0.25	0.04	0.97
11	Rule of law	v2xcl_rol series.	V-dem vers. 6.2.	1,620	0.66	0.24	0.04	0.99
12	Political Power distribution	v2pepwrsocl series.	V-dem vers. 6.2.	1,620	0.48	1.08	-2.46	3.10
13	Distribution of resources	v2xeg_eqdr series.	V-dem vers. 6.2.	1,620	0.58	0.21	0.10	0.97
14	Ethnic and religious Stability	Average between the indicator of ethnic tensions and religious tensions.	ICRG indicators, PRS group.	1,530	4.11	1.09	0.00	6.00
15	Resource dependent	Binary variable if the country is ressource dependent.	Adapted from Konuki and Villafuerte (2016).	1,933	0.28	0.45	0.00	1.00
16	Resource rich	Binary variable if the country is ressource rich.	IMF (2012).	1,933	0.40	0.49	0.00	1.00
17	Bad times	Binary variable if the GDP below potential.	Own Construction	1,932	0.09	0.29	0.00	1.00
18	Elections	Binary variable for the year of the highest level national election.	DPI (2015) and Own Construction.	1,933	0.18	0.39	0.00	1.00
19	Debt ratio	Gross debt ratio over GDP.	WEO (October, 2016).	1,892	40.83	51.99	1.01	789.83

Notes: *: To compute real general government primary spending we substract GGEI series to GGX series and deflate it with the NGDP_D series. **: To compute real GDP spending we deflate the NGDP series with the NGDP_D series. ***: To compute real revenue over GDP we divide the GGR series to NGDP series. The series are deflated with the NGDP_D series. ****: To compute real internal revenue over GDP we substract GGRG series to GGR series and divide it with the NGDP series. The series are deflated with the NGDP_D series. Information regarding variables used in the section of ``Potential solutions" are available upon request.

Apprendix 1

Data construction

Our dataset of reference is the WEO (October 2016 version) to capture the general government primary expenditures (GGX and GGEI series), gross domestic product, current prices (NGDP series), the GDP deflator (NGDP_D series), and the terms of trade (TT series).[14] We consider the period of reference by Frankel et al. (2013) from 1960-2009, extended to 2016. To select our countries we apply the following criteria:

1. We first drop every observations with strictly less than one million of inhabitants, following Alesina et al. (2008). The underlying idea is that very small countries are exposed to very large shocks, making the comparison with larger countries more difficult.[15]

2. Then, we drop every countries with strictly less than 16 years of data (over 1960-2016) for general government primary spending and gross domestic product series, still following Alesina et al. (2008). The underlying idea is that we need to observe at least two or three cycles in each country as we study fiscal procyclicality.

3. We drop all the countries which are simultaneously (i) classified as "high –income" for the year 2017 by the World Bank (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups); and (ii) were member to the OECD strictly before the fall of the Soviet Union (year 1992). Under this double selection process we safely remove all established developed countries and we keep Turkey, high-income non-OECD countries (such as Saudi Arabia or Singapore) and recent OECD members (such as Israel, Mexico and Slovenia). By keeping these countries in a first step, we are able to capture more variability in our results and eventually to remove them in a second step for robustness checks.

Applying these three criteria leaves us with a sample of 114 developing countries (Syria is removed due to the war) over the period 1960-2016. To maximize the number of countries displayed in our descriptive statistics we focus mainly on the sub-period 2000-2016.[16] We also highlight resource-dependent countries and resource-rich countries in our sample (note that the two lists are not mutually exclusive), as they are highlighted to be particularly procyclical in the recent literature (Arezki and Bruckner, 2012; Konuki and Villafuerte, 2016):

1. Resources-dependent countries, are countries for which commodity revenues (GGRC in WEO dataset) accounting for at least 10 percent of total revenues minus grants (GGR and GGRG series in WEO dataset) at least 50 percent of the time over the considered period. This definition

[14] More details on the variables in Table A.5. We consider the general government primary expenditures, instead of central government, total expenditure and net lending (GCENL series) used by Frankel et al. (2013) as the last one is not available since WEO archives 2009. Accounting for the general government coverage enable us to have comparable spending figures between unitary states and federal states (such as the Democratic Republic of Congo and Nigeria). Accounting for primary spending enable us to account for current performance of administrations, irrespective to the debt service burden.

[15] To capture the population size we use the "Population, total" series from the WDI dataset (updated February 1st, 2017), and removed all observations with a blank in series. We keep Taiwan, which in no longer covered in WDI dataset, as his population size is over the threshold of one million of inhabitants for the whole period.

[16] For example, we do not have data on general government primary expenditures available before 2000 for Nigeria. To avoid confusion, we do not attempt to apply the criteria #2, on the sub-period 2000-2016; as recalled by Alesina et al. (2008), in general, the larger the cutoff for inclusion is –relative to the time horizon we have-, the stronger the results are.

is derived from Konuki and Villafuerte (2016), and enable us to capture countries with a resource-dependent revenue structure. For more details, see Table A.1.

2. Resources-rich countries are defined by the IMF (2012), here's a direct access to the report (https://www.imf.org/external/np/pp/eng/2012/082412.pdf). According to this definition, we capture countries where production on natural resources reached (or expected to reach) significant levels. For more details, see Table A.2.

Treatment of missing data

We expand equation 1 as follows:

$$Cycl.rggpx_{it} = \alpha + \beta Cycl.rgdp_{it} + \boldsymbol{\rho_x X}_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad \text{(A-1)}$$

The vector of covariates $\boldsymbol{X}_{it}$ includes the standard deviation of the terms of trade (TT series in WEO database) measured with five years rolling window, two binary dummy (BD) variables equaling one if the original real primary expenditures and the cyclical components of real GDP were missing, zero otherwise. Last but not least, we include two additional BD variables equaling one if the cyclical components of expenditures and GDP were missing the previous year. This is the Set 1 of covariates. The Set 2 of covariates differs with the inclusion of two BD variables equaling one if the cyclical components of expenditures and GDP were missing from one to five years ago, zero otherwise. With this, we aim to capture inaccurate cycles due to the linear interpolation method.