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Fiscal Policy and Economic Activity in South Asia

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Abstract

This paper analyzes whether fiscal policy in South Asia amplifies or smooths business cycle fluctuations. The paper estimates several econometric models to explore the cyclicality of government spending and tax buoyancy. The findings show that fiscal policy is procyclical in most countries. In South Asia, tax revenue increases less than one to one with gross domestic product, but public spending increases more than proportionally. While changes in tax revenue have no significant impact on economic activity, the government spending multiplier is positive and significant: an additional 1 USD of spending leads to an immediate increase in gross domestic product of 0.3 USD and a cumulative increase of 0.6 USD. The impact of public spending on economic activity is entirely due to capital expenditure, which is also more procyclical. Procyclical public spending and a positive expenditure multiplier imply that fiscal policy in South Asia amplifies boom-and-bust cycles.

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Fiscal Policy and Economic Activity in South Asia*

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1. Introduction

Fiscal challenges are at the core of development challenges across South Asian countries. In Bangladesh, the energy mix is becoming increasingly expensive, at a time when demand for electricity is surging. Passing on the high costs to consumers is politically difficult, which results in an increasing subsidy burden. In Bhutan, exports of electricity from large hydropower projects are an important source of government revenue, but they are lumpy. Without a mechanism to smooth out public spending due to big investment projects, turbulence could arise as other large dams start operation. In India, fiscal discipline seems to be stronger at the center than in the states. And some states are a source of contingent liabilities, for example due to borrowing by utilities or due to waivers of bank debts for specific groups. In Nepal, low capacity prevents full spending of the budget. Compared to the federal level, capacity is even lower in the provinces and local governments and the move toward fiscal federalism may hence result in even stronger underspending. In Pakistan, the recent economic history is one of slow growth punctuated by recurrent macroeconomic adjustments. Adjustment programs brought in macroeconomic stability, but often at the cost of a temporary and substantial deceleration in economic activity. And once the economy was back on track, fiscal pressures mounted again, triggering the next boom-and-bust cycle. Finally, in Sri Lanka population aging could make the country's generous social programs unaffordable in a not-so-distant future.

The fiscal room to maneuver is limited, as tax revenues in South Asian countries are lower than could be anticipated given the region's level of economic development. South Asian countries are not different from other developing countries in terms of the tax instruments they use, but their tax bases are small, tax exemptions are common, and tax evasion is widespread. Government spending is not as low as tax revenue and consequently fiscal deficits are larger than in most other regions. Fiscal deficits in several South Asian countries have been large for quite some time. The average deficit over the last three years has been around 5.5 percent in Pakistan and above 6 percent in India and Sri Lanka. Furthermore, public debt levels are remarkably high in some countries. South Asia's public debt is projected to be above 55 percent of GDP in 2018 (World Bank 2018). Debt sustainability analysis jointly conducted by the World Bank and the IMF suggests that the public debt as percent of GDP of most South Asian countries should decline in the coming years.

Prudent fiscal policy ensuring macroeconomic stability is a key prerequisite for sustainable growth, determines the distributional effect of growth, and is crucial for external and currency stability (Easterly and Rebelo 1993; Mundle 1999, Park 2010, Gumus 2016, Badinger et al. 2017). In addition, fiscal policy should strive to smooth out business cycle fluctuations by strengthening the automatic adjustment of taxes and by adjusting government expenditures (Clements, Gupta, and Inchauste 2004). In other words, government spending should decrease during growth accelerations and increase in economic downturns. Good times ought to provide the fiscal space necessary to maneuver during downturns. This is especially important in South Asia, where the level of fiscal deficits is often affected by developments beyond the control of policy makers. Between 1980 and 2017, South Asian countries experienced over 100 downturns in key global and domestic variables.[1] During the troughs, fiscal

[1] We considered global GDP growth, growth of world trade, international oil price, remittances, and terms of trade.

deficits were on average 0.75 percentage point of GDP larger than two years earlier and 0.85 percentage point higher than two years later. In addition, fiscal deficits in South Asia are also amplified in times of intense political competition. In the year before elections, the fiscal deficit rose on average by 0.5 percent of GDP and it remained accelerated in the year of the election.[2] Both findings are documented in more detail in Table A1 in the Appendix. Finally, the current uncertain external environment makes preserving fiscal space even more important (World Bank 2019).

In this paper, we examine the fiscal policy in South Asia and whether it amplifies boom-and-bust cycles. To do so, we first explore the cyclicality of tax rates, tax revenue and government spending. Next, we estimate a structural vector autoregression (VAR) model to uncover South Asia's fiscal multipliers. We hence contribute to the literature on procyclical fiscal policy in developing countries (Gavin and Perotti 1997; Kaminsky, Reinhart and Végh 2004; Ghatak and Sánchez-Fung 2007; Ilzetzki and Végh 2008; Ilzetzki 2011; Frankel, Végh and Vuletin 2013) and on the size of fiscal multipliers in developing countries (Ilzetzki, Mendoza and Végh 2012; Kraay 2012, 2014; Huidrom et al. 2016). Rather than looking at either a large sample of countries or a single country, we study six South Asian countries that share important characteristics and exploit the panel dimension.[3] While there have been attempts to study fiscal policy in South Asia in a similar manner before, these analyses are either only partial or face methodological issues (Hussain and Siddiqi 2013; Zakaria and Junyang 2015; Hayat and Qadeer 2016).

The paper proceeds as follows: Section 2 provides a very brief overview of closely related literature and Section 3 describes the dataset constructed for this study. In Section 4 we analyze the cyclicality of public spending and taxes. Section 5 presents the estimation of fiscal multipliers and Section 6 disentangles current and capital spending. Section 7 provides robustness checks and Section 8 concludes.

2. Literature

A vast empirical literature suggests that developing countries tend to follow procyclical fiscal policy: they increase spending (or curb taxes) in good times and cut spending (or raise taxes) during periods of recession (Gavin and Perotti 1997; Kaminsky, Reinhart and Végh 2004; Ilzetzki 2011; Frankel, Végh and Vuletin 2013, Martorano 2017). Ilzetzki and Végh (2008) find overwhelming evidence that fiscal policy is indeed procyclical in developing countries. They use various econometric methods to address this issue using a quarterly data set comprising 49 countries and spanning the period from 1960 to 2006.[4] The procyclical bias in fiscal policy is arguably a reflection of two fundamental challenges faced by developing countries. These are the inability to access external finance timely and weak institutions that cannot contain overspending when growth is high.

[2] Between 1990 and 2015, 39 national elections took place in Bangladesh, India, Pakistan, and Sri Lanka. Of these elections, 20 were parliamentary elections and 19 were presidential elections. While the pattern holds both for presidential and parliamentary elections, it is stronger for the latter.

[3] The countries covered in this paper are Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka

[4] They employ instrumental variables, GMM, OLS estimation of simultaneous equations, Granger causality tests, and impulse responses from an estimated VAR.

Hussain and Siddiqi (2013) analyze the cyclicality of government expenditure in six South Asian countries using data from 1980 to 2010. While they find evidence that fiscal policy was procyclical during this period, they find no evidence that the strength or quality of political systems or institutions affected the procyclicality. Similarly, Zakaria and Junyang (2015) study the cyclical properties of fiscal policy in seven South Asian economies and explore possible factors explaining fiscal cyclicality. They find strong procyclicality of government expenditure and argue that limited access to domestic and international borrowing and a wider dispersion of political power are contributing to procyclicality.

The empirical evidence on the size of fiscal multipliers in developing countries is relatively scarce, but it suggests that multipliers are quite small. Using a Panel VAR model and quarterly data for a large set of countries, Ilzetzki, Mendoza and Végh (2012) find that the government spending multiplier in developing countries is insignificant for consumption spending, but 0.6 on impact and 1.6 in the long-run for investment spending. In addition, they show that multipliers tend to be larger in advanced economies, in countries with fixed exchange rates, in more closed economies, and in economies with lower levels of public debt. Huidrom et al. (2016), using an Interactive Panel VAR model, conclude that fiscal multipliers depend on fiscal positions. They find that multipliers tend to be larger when government debt and deficits are low. Using a large sample of developing countries, Kraay (2012, 2014) obtains an average government spending multiplier somewhere between 0.4 and 0.5.

Hayat and Qadeer (2016) estimate fiscal multipliers for Bangladesh, India, Pakistan and Sri Lanka over the period from 1982 to 2014 using a Panel VAR model. They find an initial impact close to 0.4 and a surprisingly large long-run effect. Tax multipliers, on the other hand, are statistically insignificant. Yadav et al. (2012) estimate the impact of fiscal shocks on the Indian economy using quarterly data from 1997 Q1 to 2009 Q2. They argue that unexpected changes in tax revenue have a much larger effect on GDP on impact than unexpected changes in government spending. Jain and Kumar (2013) estimate the size of the expenditure multiplier in India at the center and the state level using annual data for the period from 1980 to 2011. The size of the multiplier for all categories of expenditure by state governments is estimated to be larger than that of the central government. Furthermore, capital spending has a higher multiplier than current spending. Depending on the model specification, the aggregate tax multiplier is found to be between 0.1 to 0.5, which is lower than the expenditure multiplier. Finally, Bose and Bhanumurthy (2015) present a structural macroeconomic model for the estimation of fiscal multipliers in India. Based on annual data from 1991 to 2012, they find a large capital expenditure multiplier of 2.5, a transfer payment and current spending multiplier of 1, and a tax multiplier of -1.

3. Data

The dataset constructed for the analyses in this paper comprises annual data from 1987 to 2017 for the following six South Asian countries: Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. We rely mostly on the World Development Indicators (WDI) from the World Bank. This is the case for real GDP values in US dollars for all the countries and for the tax revenue measured as percent of GDP for Bhutan, Pakistan, and Sri Lanka. The WDI tax series for Bhutan and Pakistan have some missing values. Since the correlation for overlapping years of the WDI and Asian Development Bank (ADB) series is very high for these countries (0.99 and 0.96 respectively), we exploit the ADB tax data to extend the WDI series using the growth rates. This is the case for 2017 in Bhutan, as well as for years 1991-1996 and 2012-2017 in Pakistan. In the case of Bangladesh and Nepal, we rely on the full tax series from the ADB, which cover more years than the WDI. For India, we compute consolidated tax revenue from IMF and Reserve Bank of India data. Data on government total expenditure measured as a percentage of GDP is taken from the IMF for all countries, given that the WDI report only central government final consumption. Finally, values for the share of current and capital expenditure in total expenditure come from the ADB. Detailed sources and time coverage for countries are provided in Table A2 in the Appendix.

4. Cyclicality of fiscal policy

The cyclicality of government spending is typically defined in terms of how spending moves relative to the output gap. If government spending decreases with a positive output gap, i.e. when output is above its potential, it is countercyclical. If the spending increases instead, it is procyclical. If public spending increases more than proportional with GDP, there is a so-called “voracity” effect (Tornell and Lane 1999). For taxes, it is important to differentiate between tax rates and tax revenue. Since the tax rate is an instrument rather than an outcome, the former is the correct variable to study instrument cyclicality. For many countries, including those in South Asia, systematic data on tax rates is not available, however. The inflation tax has been proposed as a viable alternative (Phelps 1973; Chari and Kehoe 1999; Calvo and Végh 1999; Kaminsky, Reinhart and Végh 2004).[5] The response of the tax revenue to changes in GDP, on the other hand, is an outcome and depends on the tax buoyancy, which for clarity is referred to as revenue buoyancy from now on. It depends on the structure of the tax system and can be influenced only indirectly by changing the tax structure. The revenue buoyancy together with the cyclicality of government spending is fundamental to assess whether fiscal policy stimulates or dampens demand with the business cycle. A proportional change of tax revenue and government spending leaves the tax-to-GDP ratio unchanged. A more than proportional response of the tax revenue leads to a reduction in the deficit ratio. A large short-run revenue buoyancy means that taxes act as automatic stabilizers. The long-run revenue buoyancy is important for the impact of economic growth on long-term fiscal sustainability.

In the following we will analyze the relationship of government spending, the inflation tax and tax revenue with respect to changes in economic activity. To do so, we first look at simple correlations before estimating different regression models.

4.1 Correlations between GDP and fiscal variables

In Table 1, we report correlation coefficients between the fiscal variables and GDP. The correlations are reported in terms of cyclical components and in terms of growth rates. For the former, we follow the typical procedure and detrend variables with the Hedrick-Prescott filter using the standard

[5] The inflation tax is defined as $\left(\frac{\pi}{1+\pi}\right) * 100$, where π is inflation.

smoothing parameter for annual data. In the robustness section, we also present results for a different filter that avoids many of the shortcomings of the typical procedure (Hamilton, 2018).

When GDP growth accelerates, most governments in South Asia also tend to spend more. The cyclical components of public spending and GDP move strongly together in Nepal (0.40), Pakistan (0.37), Bhutan (0.36), and Bangladesh (0.33). The analysis of the co-movements between growth rates, rather than cyclical components, yields similar results. By this metric, however, Pakistan's government spending is the most procyclical in the region (0.37). Except for Sri Lanka, the procyclicality of public spending increased after the Global Financial Crisis (see Table A3 in the Appendix).

The inflation tax seems acyclical in most South Asian countries, as no statistically significant relationship in either direction emerges. The two exceptions are Bhutan and Nepal, in which the inflation tax declines with stronger economic activity. In terms of deviations from trend, the elasticities are -0.33 and -0.44 respectively. In terms of growth rates, the relationship is only significant in Nepal.

Table 1 Correlation coefficients between fiscal variables and GDP

Country		**Government expenditure**	Obs.	**Inflation tax**	Obs.	**Tax revenue**	Obs.
Bangladesh	cyclical components	0.33*	28	-0.25	24	-0.07	28
	growth rates	0.31	27	-0.09	23	0.06	27
Bhutan	cyclical components	0.36*	28	-0.33*	28	0.19	28
	growth rates	0.36*	27	-0.13	27	0.06	27
India	cyclical components	-0.28	28	0.04	28	0.66***	28
	growth rates	0.02	27	0.05	27	0.65***	27
Nepal	cyclical components	0.40**	28	-0.44**	28	0.48**	28
	growth rates	0.33*	27	-0.33*	27	0.43**	27
Pakistan	cyclical components	0.37**	28	0.16	28	0.20	28
	growth rates	0.37*	27	0.16	27	0.25	27
Sri Lanka	cyclical components	0.05	28	0.11	27	0.27	28
	growth rates	0.12	27	0.01	27	0.12	27

Note: Based on annual data from 1990 to 2017. Cyclical components are calculated as the deviation of the actual data from a trend computed using the Hedrick-Prescott filter with the standard smoothing parameter for annual data (6.25). ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Sources: ADB, IMF, World Bank, and own calculations.

Like for public expenditure, the cyclical components of tax revenue and GDP move closely together in most countries in the region. In India, for example, the correlation between the two variables is 0.66 and in Nepal it is 0.48. In Bangladesh, on the other hand, there is no correlation between the two series (-0.07). The results are similar when analyzing the coefficient between growth rates of the tax revenue and GDP (0.65, 0.43, and 0.06 respectively). The correlation between these two variables is statistically significant in India and Nepal. It is also positive in Bhutan, Sri Lanka, and Pakistan, but not statistically significant.

4.2. Regression analysis

In analyzing fiscal cyclicality, we additionally rely on regression-based results. As pointed out by Lane (2003), the reduced-form relation may be the most appropriate concept, since there is no strong reason to exclude any equilibrium feedback from fiscal policy to the level of output. Short-term tax buoyancy and spending cyclicality can therefore be assessed by regressing the growth rate of government expenditure, the inflation tax, and tax revenues on the growth rate of GDP:

$$\Delta(\ln(X_{it})) = \alpha_i + \theta \times \Delta(\ln(GDP_{it})) + \varepsilon_{it}, \qquad (1)$$

where Δ indicates the change between two consecutive years, X_{it} is the government expenditure, inflation tax, or tax revenue of country *i* in year *t*, α_i is the change when growth remains on trend, and θ is the estimated short-term spending, inflation tax or tax revenue cyclicality. Rather than estimating this expression for every country separately, we construct a data panel for all South Asian countries and estimate the model with country fixed effects. In all regressions we use robust standard errors clustered by country.

Table 2 Simple regression results

Dependent variable	α	θ	Observations
Government expenditure	-0.006	1.16**	162
Inflation tax	0.008	-0.25	157
Tax revenue	0.023	0.85*	162

Note: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

For every additional percentage point of growth, public spending increases by 1.16 percentage points and the relationship is statistically significant at the 5 percent level. Such a more-than-proportionate increase in expenditures is referred to as voracity effect. The inflation tax is decreasing with higher growth, but the relationship is not found to be statistically significant. Tax revenue increases less than proportionally with economic activity and is statistically significant only at the 10 percent level. A 1 percent increase in GDP growth translates into a 0.85 percent increase in tax revenue, i.e. the tax buoyancy is below one.[6]

Next, we modify the model to account for cointegration. The simple model above considers only short-term movements and is not taking into consideration the possible long-run relationship between the two variables. To address this concern, we employ an error-correction model, which allows a distinction between the short- and long-term effects between fiscal variables and output. The panel error-correction model with fixed effects is estimated in the following form (Akitoby et al. 2006; Belinga et al. 2014):

$$\Delta(\ln(X_{it})) = \mu_i + \theta \times \Delta(\ln(GDP_{it})) + \gamma \times (\ln(X_{i,t-1}) - \beta \times \ln(GDP_{i,t-1})) + \varepsilon_{it}, \qquad (2)$$

where θ refers to the short-run effect, β to the long-term relationship between the variables, and γ represents the rate of convergence to the established long-term relationship.

The voracity effect, measured by the short-run coefficient θ, is now even larger. For every additional percentage point of economic growth, government spending in South Asia increases by 1.28 percent. Of the 51 developing countries studied by Akitoby et al. (2006), only 20 percent have a higher short-run procyclicality than that. The result for the short-term inflation tax cyclicality does not differ

[6] Rather than the model above, an alternative specification could employ the cyclical components of GDP, like in Bénétrix and Lane (2012). Due to the strong similarity of the correlations discussed above, we abstract from such a specification.

significantly from the estimate above, whereas the tax revenue buoyancy, at 0.95, is getting closer to one. In addition, it is now statistically significant at the 5 percent level.

Estimates of the long-run relationship (β) suggest roughly proportional movements in the long run for spending and tax revenue, although the latter does not seem to be statistically significant. In the robustness section, we will also provide estimates from a Pooled Mean Group (MG) estimator.

Table 3 Error-correction model results

Dependent variable	μ	θ	γ	β	Observations
Government expenditure	-0.014	1.28**	-0.21*	0.94*	162
Inflation tax	0.033	-0.51	-0.24***	0.18***	157
Tax revenue	0.015	0.95**	-0.06	0.91	162

Note: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

5. Fiscal multipliers

5.1. Estimation strategy

To estimate fiscal multipliers, we use a three-dimensional panel vector auto-regression (PVAR) model with country fixed effects. The PVAR methodology combines the traditional VAR technique with panel data. Using panel data increases the number of observations, but it assumes a homogenous fiscal multiplier across countries.

The model includes the first differences of the logarithmic values of real government expenditure (Δg_{it}), GDP (Δy_{it}), and tax revenues (Δt_{it}). This specification turns out to be proper, given that all the variables are unit-root processes and the hypothesis of panel cointegration between them is rejected.[7] The model is estimated using OLS, given that the time dimension is relatively large compared to the cross-sectional dimension. The optimal lag length is determined in accordance with standard information criteria and the model has the following reduced-form:

$$\Delta Z_{it} = \Gamma_{0i} + \Gamma_1 \times \Delta Z_{it-1} + \cdots + \Gamma_l \times \Delta Z_{it-l} + \varepsilon_{it}, \tag{3}$$

where $\Delta Z_{it} = \begin{pmatrix} \Delta g_{it} \\ \Delta y_{it} \\ \Delta t_{it} \end{pmatrix}$ and Γ are matrices of the VAR model parameters.

Reduced form residuals of the estimated model are a linear combination of: 1) automatic responses of government expenditure and tax revenue on innovations in output, 2) discretionary measures of policy makers on changes in output and 3) unexpected changes due to structural shocks, which are unrelated to each other. If the vector of structural shocks of government expenditure, GDP, and tax revenue is denoted by u_{it}, the relationship between reduced form residuals and structural shocks can be written as:

$$A\varepsilon_{it} = Bu_{it} \tag{4}$$

or equivalently:

[7] Results of appropriate tests are presented in Tables A4 and A5 in the Appendix.

$$\begin{bmatrix} 1 & -a_{gy} & -a_{gr} \\ -a_{yg} & 1 & -a_{yr} \\ -a_{rg} & -a_{ry} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{igt} \\ \varepsilon_{iyt} \\ \varepsilon_{irt} \end{bmatrix} = \begin{bmatrix} b_{gg} & 0 & b_{gr} \\ 0 & b_{yy} & 0 \\ b_{rg} & 0 & b_{rr} \end{bmatrix} \begin{bmatrix} u_{igt} \\ u_{iyt} \\ u_{irt} \end{bmatrix}$$

We identify structural shocks following broadly the identification approach proposed by Blanchard and Perotti (2002). This methodology relies on the assumption that, due to the institutional and economic constraints, governments cannot react to changes in economic activity within the same period. Originally, this approach was applied to advanced economies with quarterly data. Due to limited data availability, we have to implement it with annual data. While stronger assumptions are needed for the results to be valid in this case (Beetsma et al. 2014), there are also advantages from using annual data. First, shocks from annual data are more likely to capture actual fiscal shocks, since government spending decisions usually follow an annual cycle and new fiscal impulses typically do not appear at quarterly frequency (Beetsma et al. 2008, Beetsma and Giuliodori 2011). This is especially true for many developing countries with larger lags in implementing fiscal policy (Diop and Ben Abdallah 2009). In addition, anticipation effects are usually present in VAR models estimated with quarterly data (Ramey 2011). With annual data, the role of anticipation effects is less relevant as a given shock is less likely to be anticipated one year before. Third, with annual data there are no seasonality effects, which can be important in many developing countries. Beetsma et al. (2006) and Beetsma et al. (2009) compare the results from quarterly and annual data for several countries for which non-interpolated quarterly fiscal data are available and show that recursive identification restrictions for spending shocks in a VAR with annual data delivers plausible results. Born and Müller (2012) provide further evidence that the identification assumptions are not too restrictive for annual data.

The identification of the system is achieved by introducing restrictions that can be divided into four segments. First, we assume that there are no contemporary responses of discretionary measures of policy makers in response to each other (a_{gr}= a_{rg}= 0) and the previous matrix is hence equivalent to the following system of equations:

$$\varepsilon_{igt} = a_{gy}\varepsilon_{iyt} + b_{gg}u_{igt} + b_{gr}u_{irt} \tag{5}$$

$$\varepsilon_{iyt} = a_{yg}\varepsilon_{igt} + a_{yr}\varepsilon_{irt} + b_{yy}u_{iyt}$$

$$\varepsilon_{irt} = a_{ry}\varepsilon_{iyt} + b_{rg}u_{igt} + b_{rr}u_{irt}$$

The first equation states that unexpected changes in the government expenditure can be attributed to unexpected changes in GDP ($a_{gy}\varepsilon_{iyt}$) and reactions to structural shocks in expenditures ($b_{gg}u_{igt}$) and taxes ($b_{gr}u_{irt}$). Unexpected changes in tax revenues are explained in a similar way in the third equation. Finally, unexpected changes in tax revenue, government expenditure and/or structural shocks in output account for unexpected GDP movements.

Second, parameters a_{gy} and a_{ry} can include in principle two types of effects of economic activity on tax revenue and expenditure: automatic responses within the existing fiscal rules, as well as discretionary fiscal policy reactions on unexpected events within the same period. However, as explained, we assume that it takes more than one period to react to a possible shock in economic activity and hence these parameters refer exclusively to automatic responses. The parameter values of a_{gy} and a_{ry} can hence be determined based on the elasticity of government expenditure and tax revenue with respect to GDP. In the baseline, we assume that there is no automatic response of public spending to unexpected changes in economic activity within the same period and hence the parameter value of a_{gy} is 0. In the robustness checks, however, we allow both for a negative and positive relationship. In line with the empirical results for developing countries, we assume that the elasticity of tax revenues in the baseline is equal to 1, which defines a_{ry}. In the robustness checks, we examine alternative elasticity values of 0.75 and 1.25.

Third, after defining the parameter values of a_{gy} and a_{ry}, it is possible to determine cyclically-adjusted reduced-form residuals of taxes and expenditures:

$$\varepsilon'_{igt} = \varepsilon_{igt} - a_{gy}\varepsilon_{iyt} = \varepsilon_{igt} \quad (6)$$

$$\varepsilon'_{irt} = \varepsilon_{irt} - a_{ry}\varepsilon_{iyt}$$

Cyclically-adjusted residuals can be mutually correlated, but they are no longer correlated with structural shocks in economic activity u_{iyt}. It is therefore possible to use them as instrumental variables to estimate parameters a_{yg} and a_{yr} in a regression of ε_{iyt} on ε_{igt} and ε_{irt}.

Fourth, the values of the parameters b_{gr} and b_{rg} need to be determined. The question is whether tax policy decisions precede decisions on expenditures, or the other way around. Following Blanchard and Perotti (2002), we assume in the baseline that tax decisions come first (b_{gr}= 0), so that only the value of b_{rg} needs to be estimated. In the robustness checks, we present results for the alternative ordering, i.e. when expenditure decisions precede tax decisions ($b_{rg} = 0$).

The resulting baseline relationship between residuals and structural shocks has the following form:

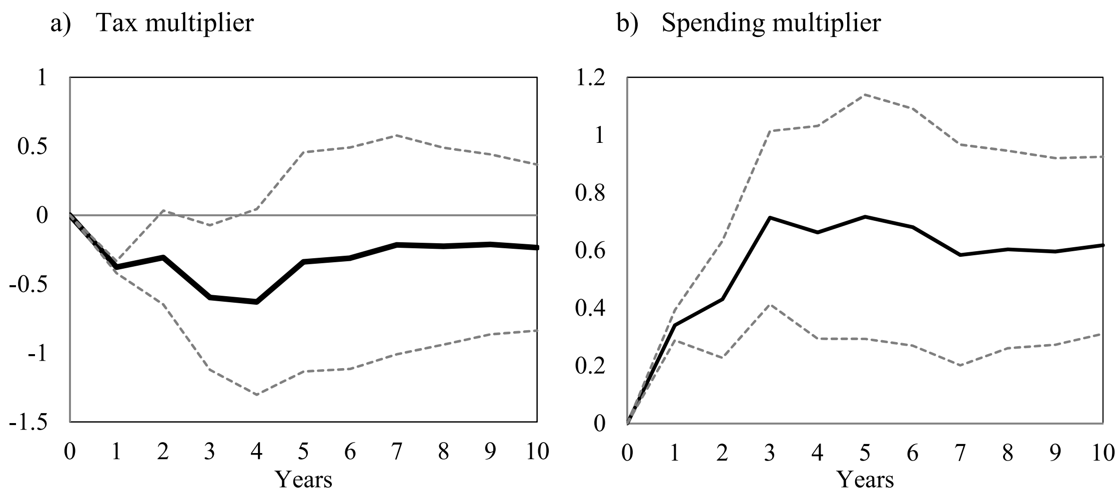
$$\begin{bmatrix} 1 & 0 & 0 \\ -a_{yg} & 1 & -a_{yr} \\ 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{igt} \\ \varepsilon_{iyt} \\ \varepsilon_{irt} \end{bmatrix} = \begin{bmatrix} b_{gg} & 0 & 0 \\ 0 & b_{yy} & 0 \\ b_{rg} & 0 & b_{rr} \end{bmatrix} \begin{bmatrix} u_{igt} \\ u_{iyt} \\ u_{irt} \end{bmatrix} \quad (7)$$

Estimation of the structural VAR model gives us the opportunity to obtain impulse response functions and values of multipliers. Given the specification of the model, the impulse response function shows a percentage change in the corresponding variable due to the structural shock of one standard deviation. However, we prefer displaying multipliers in monetary values, i.e. by how many units GDP changes if government spending or tax revenue increases by one unexpected unit. Since we are estimating a PVAR for countries with different currencies, we propose to think about USD. Since the model consists of growth rates of variables, the multiplier values in units are obtained by multiplying the estimated value of the impulse response function by the ratio of the arithmetic mean of the GDP and the mean of government expenditure and tax revenues.

5.2. Results

In our panel of six South Asian countries, the tax multiplier suggests a negative, but insignificant impact of taxes on economic activity (Figure 1, left panel). An additional USD in tax revenue for the government reduces growth initially by 0.33 USD. The effect is most negative after four years, when it falls below -0.63 USD. It then recedes again and after seven years the cumulative effect on growth is negligible. The tax multiplier is insignificant for most of the years and the band of two standard errors after 10 years goes from -0.8 USD to 0.4 USD. The spending multiplier, on the other hand, implies that the effect of public spending on economic activity is positive and significant (Figure 1, right panel). An additional USD of government spending leads to an immediate increase in GDP of 0.34 USD. Over time, the effect builds up and each USD of additional spending results in 0.71 USD additional GDP three years later. In the long-run, the cumulative effect settles at 0.62 USD. The expenditure multiplier is statistically significant at the 5 percent level throughout all periods. However, the uncertainty is large and the two-standard-error band after 10 years goes from 0.3 USD to 0.9 USD. The size of the multipliers is very much in line with the one-year spending multiplier of 0.4 that Kraay (2014) finds in a large sample of 102 developing countries. Tang, Liu, and Cheung (2013) find similar results for Thailand but not for other Southeast Asian countries, for which the spending multiplier is insignificant.

Figure 1 Multipliers in South Asia: impulse response function to an unexpected one USD shock.



Note: Unbalanced panel VAR model with four lags and fixed effects is estimated using the annual data from 1987 to 2017 for six South Asian countries (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka). The dashed lines show +/- two standard errors.

Sources: ADB, IMF, World Bank, and own calculations.

6. Differences for current and capital expenditure

As mentioned above, it has been shown that government consumption and government investment affect economic activity differently (Ilzetzki et al. 2012). We therefore analyze current and capital expenditure separately. First, we compare their cyclicality and, second, their impact on economic activity.

We re-estimate the error-correction (2) described above separately for current and capital expenditure. Especially in economic downturns, the former is typically harder to adjust due to political policy reasons and we hence expect it to be less pro-cyclical. In addition, some components like social security spending or work programs may be inversely related to economic growth. And indeed, the short-run coefficient for current expenditure is only 0.69 and not statistically significant at the 10 percent level.

The coefficient for capital expenditure, on the other hand, is 2.74 and significant at the 1 percent level. The correlation of capital expenditure with GDP growth is much stronger than that of current expenditure especially in Pakistan, where periodical macroeconomic adjustments are usually characterized by a simultaneous slowdown in GDP growth and reductions of capital expenditure.

Table 4 Short-run coefficient for capital and current expenditure

Dependent variable	μ	θ	γ	β	Observations
Total expenditure	-0.014	1.28**	-0.21*	0.94*	162
Current expenditure	0.022	0.69	-0.06	0.92	161
Capital expenditure	-0.09**	2.74***	-0.31***	0.88***	161

Note: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Next, we compare the spending multipliers for current and capital expenditure. The former is only 0.12 on impact, never surpasses 0.15, and after four years the cumulative effect is basically 0. Given the small effect, it is little surprising that it is not statistically significant in any year. The expenditure multiplier of capital expenditure, on the other hand, is very large and always statistically significant. On impact, an additional USD of public capital expenditure results in an increase of GDP by 0.62 USD. Over time, additional benefits drive up the cumulative effect close to 1 USD. Our results hence suggest that positive impact of public spending on economic activity in South Asia comes entirely from capital expenditure. These results are very much in line with the findings of Ilzetzki et al. (2012) for developing countries in general. They find an insignificant multiplier for government consumption and a significant impact of public investment. The latter is 0.6 on impact and 1.6 in the long run. While we find nearly the same initial impact, the long-run effect seems lower in South Asia compared to other developing countries.

Table 5 Multipliers of current and capital expenditures

Multiplier	Current expenditure	Capital expenditure
Impact	0.12	0.62**
Peak	0.15	0.96*
Cumulative (4 years)	0.02	0.96*

Note: Both models are balanced panel VAR models with variables current and capital expenditure respectively, instead of the total expenditure. The model with 3 lags is estimated using the annual data from 1990 to 2017. ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Sources: ADB, IMF, World Bank, and own calculations.

7. Robustness checks

In the following, we present some robustness checks that provide additional support for the findings discussed above. We present an alternative measure of cyclical components for the correlation exercise, a different estimation procedure for the error-correction model, and a couple of alternative PVAR specifications.

7.1 Correlations from alternative cyclical components

The Hedrick-Prescott filter employed in section 4.1 to estimate the correlation of the cyclical components of GDP and the different fiscal variables is often criticized for its so-called end-point problems and spurious dynamics. These issues seem to be especially important when real output is far from its potential value. Recently, Hamilton (2018) suggested an alternative procedure to filter variables that avoids many of the shortcomings of the Hedrick-Prescott filter while preserving many of its advantages. He proposes a "linear projection", in which a variable at date $t+h$ is regressed on the four most recent values as of date t, resulting in stationary residuals that represent a cyclical component. The value of h is suggested to be 2 for annual data, given that the primary reasons for being wrong in predicting macro variables at a horizon of 2 years ahead are cyclical factors.

Table 6 Correlation coefficients between differently filtered fiscal variables and GDP

Country		**Government expenditure**	Obs.	**Inflation tax**	Obs.	**Tax revenue**	Obs.
Bangladesh	HP filter	0.33*	26	-0.26	22	-0.08	26
	Hamilton (2018)	0.30	26	0.13	22	-0.15	26
Bhutan	HP filter	0.35*	26	-0.33*	26	0.2	26
	Hamilton (2018)	0.31	26	-0.48**	26	0.33*	26
India	HP filter	-0.23	26	0.03	26	0.66***	26
	Hamilton (2018)	-0.11	26	0.20	26	0.68***	26
Nepal	HP filter	0.29	26	-0.33	26	0.46**	26
	Hamilton (2018)	0.37*	26	-0.16	26	0.60***	26
Pakistan	HP filter	0.37**	26	0.14	26	0.19	26
	Hamilton (2018)	0.43**	26	0.14	26	0.43**	26
Sri Lanka	HP filter	0.04	26	0.11	24	0.26	26
	Hamilton (2018)	0.12	26	0.16	24	0.18	26

Note: Based on annual data from 1990 to 2017. Cyclical components are calculated as the deviation of the actual data from a trend computed using the Hedrick-Prescott filter with the standard smoothing parameter for annual data (6.25). ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Sources: ADB, IMF, World Bank, and own calculations.

In Table 6, we compare the correlations of the cyclical components from the Hedrick-Prescott filter and from the Hamilton (2018) procedure. We correct previously calculated values from the Hedrick-Prescott filter in order to match the sample size used for the Hamilton (2018) approach. For Bangladesh, Bhutan, and Nepal the correlation remains positive and of similar magnitude, but the statistical significance is either weakened or lost. For Pakistan, on the other hand, the correlation coefficient increases and remains statistically significant at the 5 percent level. For the inflation tax the correlation was statistically significant for Bhutan with the HP filter and remains so with the Hamilton (2018) procedure, whereas for Nepal it becomes insignificant in both cases. For the tax revenue, the results are again similar, though with some notable differences. The correlation coefficients increase in India and Nepal, where the relationship is significant at the 1 percent level. In Bhutan, the correlation becomes statistically significant, as well as in Pakistan, where the correlation is now significant at the 5 percent level and as strong as for the government expenditure. Overall, the Hamilton (2018) procedure results in quite similar cyclical correlations of government expenditure and in somewhat stronger correlations of tax revenue.

7.2 Pooled mean-group rather than fixed-effect error correction model

As an alternative to the fixed-effect models presented above, which assume that the slope coefficients across countries are identical, one can assume that only a common long-term relationship holds, whereas short-run coefficients are different in each country. Table 7 presents such pooled mean-group (PMG) estimation results for the error correction model.[8] The short-run coefficient θ for government expenditure increases from 1.28 in the fixed-effect estimation to 1.43, with the highest individual coefficients in Bangladesh and Pakistan. The short-run coefficient for the tax revenue also increases, with the highest individual values found in India and Nepal, but it remains smaller than the expenditure coefficient. Overall, the PMG estimator yields higher estimates, but leads to similar conclusions.

Table 7 Error-correction model results (PMG estimator)

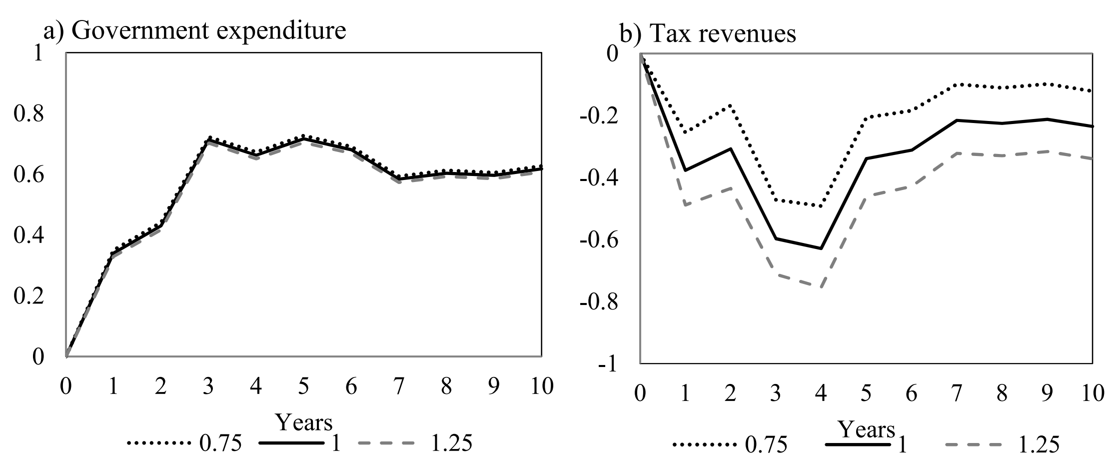
Dependent variable	μ	θ	γ	β	Observations
Government expenditure	1.99*	1.43***	-0.27**	1.23**	162
Inflation tax	0.018	-0.4	-0.24***	0.18***	157
Tax Revenue	-1.13**	1.18***	-0.17**	1.17**	162

Note: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

7.3 Alternative model specifications to estimate fiscal multipliers

In the following, we will modify some of the identification assumptions of the PVAR model to understand how sensitive the results are to these assumptions. First, we will vary the contemporaneous tax elasticity; second, we will vary the contemporaneous government spending elasticity; and, third, we will change the ordering of expenditure and tax decisions.

Figure 2 IRFs for different values of the contemporaneous tax elasticity (a_{ry})



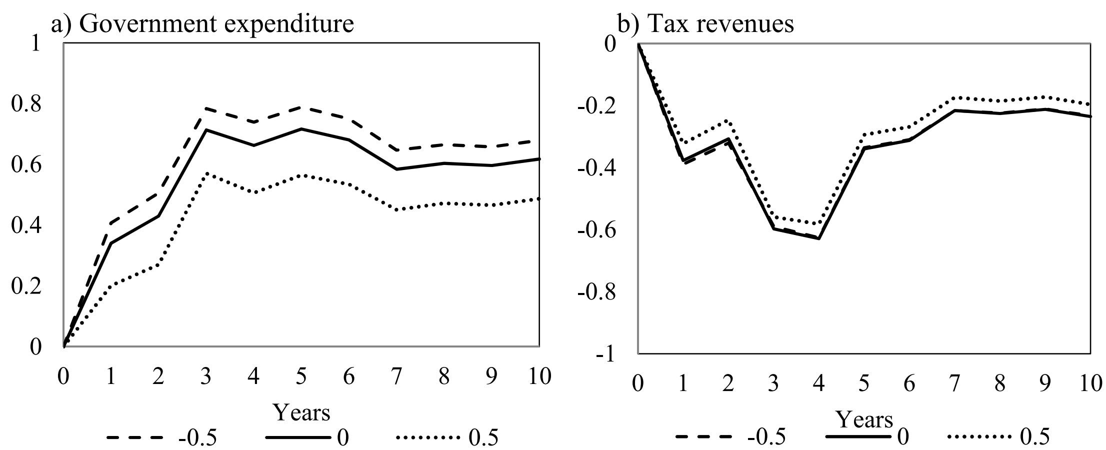
In the baseline analysis, we assume that the elasticity of tax revenues is equal to 1. In Figure 2 we show impulse response functions for alternative values of 0.75 and 1.25. Little surprising, the spending multiplier does not change with different values for the tax elasticity. The tax multiplier, on the other hand, increases in absolute values with higher elasticity values. For an elasticity of 1.25, the impact of

[8] See Pesaran, Shin and Smith (1999) for a discussion of the methodology. The MG estimation of the simple regression is included as Table A6 in the Appendix.

a surprising unit increase of tax revenue on output is -0.49 and the long-run cumulative impact is -0.34. Importantly, the effect is then significant in the first four periods.

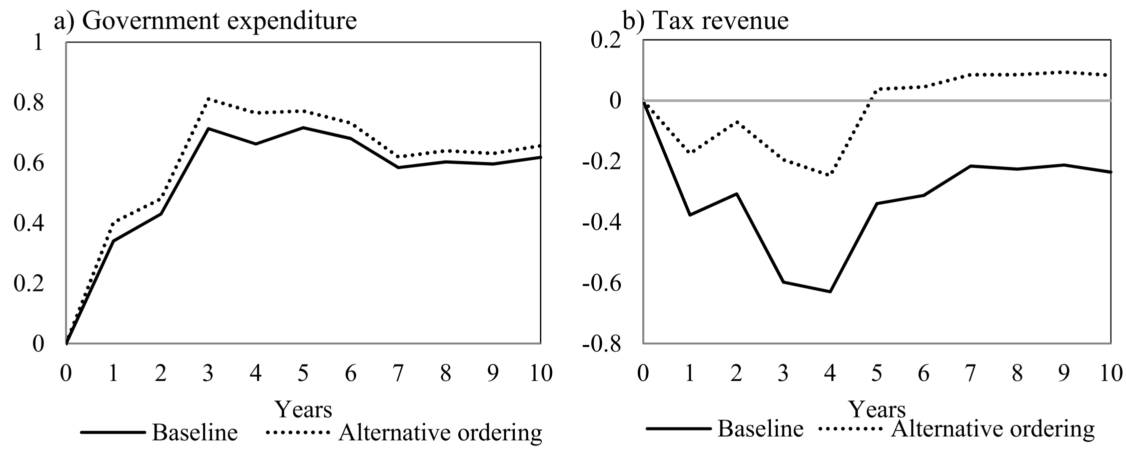
In the baseline analysis, we also assume that public spending does not automatically react contemporaneously to unexpected changes in output. In Figure 3, we show impulse response functions that allow both for a positive and negative elasticity of 0.5. On the one hand, expenditure may contract in reaction to surprising output expansions, as social spending may reduce automatically. While South Asian countries have less sophisticated social security systems than most advanced countries, this effect could still be present. On the other hand, it may be that our identification assumptions that governments cannot adjust their spending within a year may be too strict and that in surprisingly high growth years spending already increases within the same year (and the other way around for surprisingly low growth). By allowing for a positive elasticity, we check how sensitive the results are to weakening the assumption. Importantly, in all cases the government expenditure multiplier remains statistically significant. The long-run effect varies between 0.49 with the positive elasticity and 0.68 with the negative elasticity. For the tax multiplier this elasticity does not matter much.

Figure 3 IRFs for different values of the contemporaneous government spending elasticity (a_{gy})



In the baseline, we assume that tax policy decisions precede decisions on expenditures (b_{gr}= 0) and estimate the value of b_{rg}. Figure 4 shows the results for the alternative ordering with b_{rg} equal to 0 and b_{gr} being estimated. The spending multiplier does not change much but increases somewhat: rather than 0.34, the initial impact now raises to 0.40 and the peak is 0.81 compared to 0.71. The cumulative effect, however, is nearly the same. The changes are much stronger for the tax multiplier, which now becomes much smaller and of course remains statistically insignificant.

Figure 4 Impulse response functions for different ordering of fiscal decisions



The robustness checks hence confirm the main findings presented above. Different estimations of the cyclicality result in somewhat higher pro-cyclicality of both revenues and spending, but the latter always remains more pro-cyclical. And the identification of fiscal shocks seems very much appropriate, given that a whole battery of sensitivity checks results in fundamentally the same conclusions.

8. Discussion

Procyclical public spending and a positive expenditure multiplier imply that fiscal policy in South Asia amplifies boom-and-bust cycles. When growth accelerates, both tax revenue and government spending increase, but spending increases stronger than revenue. The impact of larger tax revenue on subsequent economic activity is not significant but that of larger public spending is, which further accelerates economic growth. And the reverse is true in economic downturns, with the deceleration of economic activity being amplified by contractionary fiscal policy. The correlations between growth and fiscal variables presented above suggest that the amplification of boom-and-bust cycles may be especially severe in Pakistan and Bangladesh, and sizeable in Bhutan. In addition, in some countries in South Asia, tax revenue and economic growth are not significantly correlated, meaning that governments miss out on much needed revenue and that taxes are not acting as automatic stabilizers. In these countries, broadening the tax base and ensuring tax payments by the sectors contributing to growth is crucial. And in Bhutan and Nepal, the inflation tax even decreases in economically good times.

The arguments in favor of a countercyclical fiscal policy can be challenged. In traditional Keynesian models, such fiscal policy is justified by an objective function that penalizes deviations of output from trend. However, some distortions and constraints, like political distortions (Tornell and Lane 1999; Talvi and Végh 2000) or borrowing constraints (Aizeman, Gavin, and Hausmann 1996; Gavin and Perotti 1997), can rationalize a pro-cyclical fiscal policy. Clearly, the spending needs of South Asian countries are immense and postponing spending in times of high growth to preserve fiscal space for times of low growth comes with costs. Developing this argument in a macroeconomic model would allow to assess the welfare implication of South Asia's procyclical fiscal policy.

To limit the adverse impact of spending cuts in times of low growth, governments in need to consolidate should reduce current spending, which has a much lower effect on economic activity than capital expenditure (Clements, Gupta, Inchauste 2004; Bhaumik 2006). Unfortunately, capital spending is often easier to reduce politically than current spending and consequently it is more procyclical than current spending in most countries in South Asia. Overall, the results suggest that re-balancing spending away from current spending towards capital spending could benefit growth. Growth-oriented fiscal expenditure reforms also tend to result in a more stable macroeconomic environment (Carrère and De Melo 2012). It has been argued that fiscal policy in Sub-Saharan African countries would benefit from stronger institutions framing budget implementation, more realistic fiscal plans, and stronger public financial management (Lledó and Poplawski-Ribeiro 2013). The same holds true for many South Asian countries.

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Appendix

Table A1 Fiscal deficits in economic downturns and before elections

Economic downturns			*National elections*		
Years	**Global shocks**	**Global and domestic shocks**	**Years**	**Presidential and parliamentary**	**Parliamentary**
-2	-4.2	-4.3	**-2**	-5.7	-5.5
-1	-4.3	-4.7	**-1**	-6.2	-6.3
Trough	-4.9	-5.1	**Election year**	-6.2	-6.4
+1	-4.5	-4.6	**+1**	-5.9	-6.0
+2	-4.1	-4.2	**+2**	-5.9	-5.9

Notes: The left panel shows the average fiscal deficit computed from 104 downturns in world GDP growth, world trade, oil prices, countries' received remittances, and terms of trade. The downturn is defined as follows: the value of the respective variable is smaller than 'mean - one standard deviation' in trough, the value which precedes is smaller than the respective mean and the value which follows is bigger than the value in the trough period. The right panel shows the average fiscal deficit computed from 39 national elections between 1990 and 2015 in Bangladesh, India, Pakistan, and Sri Lanka. Of these, 19 were presidential and 20 were parliamentary elections.
Sources: Federal Reserve Bank of St. Louis, IMF, National Election Commissions, World Bank, and own calculations.

Table A2 Data sources and time coverage

		Real GDP in USD	Tax revenues	Total expenditure	Current expenditure	Capital expenditure
Bangladesh	Source	WDI	ADB	IMF	ADB	ADB
	Time span	1980 - 2017	1990 - 2017	1980 - 2017	1990 - 2017	1990 - 2017
Bhutan	Source	WDI	WDI and ADB*	IMF	ADB	ADB
	Time span	1980 - 2017	1982 - 2017	1981 - 2017	1990 - 2017	1990 - 2017
India	Source	WDI	WDI	IMF	ADB	ADB
	Time span	1980 - 2017	1980 - 2017	1988 - 2017	1990 - 2016	1990 - 2016
Nepal	Source	WDI	ADB	ADB	ADB	ADB
	Time span	1980 - 2017	1990 - 2017	1990 - 2017	1990 - 2017	1990 - 2017
Pakistan	Source	WDI	WDI and ADB*	IMF	ADB	ADB
	Time span	1980 - 2017	1980 - 2017	1990 - 2017	1990 - 2017	1990 - 2017
Sri Lanka	Source	WDI	WDI	IMF	ADB	ADB
	Time span	1980 - 2017	1990 2017	1990 - 2017	1990 - 2017	1990 - 2017

Note: In case of Bhutan and Pakistan we exploit the ADB tax data to extend the World Bank series using the growth rates (for year 2017 in case of Bhutan and 1991-1996 and 2012-2017 for Pakistan), since the correlation for overlapping years is very high (0.99 and 0.96 respectively).

Table A3 Correlation coefficients between fiscal variables and GDP

Country		**Government expenditure**	Obs.	**Inflation tax**	Obs.	**Tax revenue**	Obs.
Bangladesh	cyclical components	0.33*	28	-0.25	28	-0.07	28
	after the GFC	0.87***	10	0.28	10	0.20	10
	growth rates	0.31	27	-0.09	23	0.06	27
	after the GFC	0.38	10	0.18	10	0.15	10
Bhutan	cyclical components	0.36*	28	-0.33*	28	0.19	28
	after the GFC	0.65**	10	-0.76**	10	0.73**	10
	growth rates	0.36*	27	-0.13	27	0.06	27
	after the GFC	0.61*	10	-0.55	10	0.67**	10

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India	cyclical components	-0.28	28	0.04	28	0.66***	28

	after the GFC	0.37	10	-0.33	10	0.51	10
	growth rates	0.02	27	0.05	27	0.65***	27
	after the GFC	-0.01	10	-0.21	10	0.61*	10
Nepal	cyclical components	0.40**	28	-0.44**	28	0.48**	28
	after the GFC	0.42	10	-0.60*	10	0.40	10
	growth rates	0.33*	27	-0.33*	27	0.43**	27
	after the GFC	0.47	10	-0.45	10	0.41	10
Pakistan	cyclical components	0.37**	28	0.16	28	0.20	28
	after the GFC	0.41	10	0.12	10	0.13	10
	growth rates	0.37*	27	0.16	27	0.25	27
	after the GFC	0.06	10	-0.15	10	0.34	10
Sri Lanka	cyclical components	0.05	28	0.11	27	0.27	28
	after the GFC	-0.31	10	0.31	10	0.05	10
	growth rates	0.12	27	0.01	27	0.12	27
	after the GFC	-0.26	10	0.14	10	-0.18	10

Note: Based on annual data from 1990 to 2017. Cyclical components are calculated as the deviation of the actual data from a trend computed using the Hedrick-Prescott filter with the standard smoothing parameter for annual data (6.25). ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Sources: ADB, IMF, World Bank, and own calculations.

Table A4 Unit root tests

a) Unit root tests: log-levels of variables

	No time trend			Time trend		
	LLC	**IPS**	**Fisher**	**LLC**	**IPS**	**Fisher**
GDP	5.3(1.00)	7.04(1.00)	2.39(0.99)	-0.23(0.41)	-0.03(0.49)	16.62(0.16)
TE	2.35(0.99)	5.75(1.00)	0.3(1.00)	-1.58(0.06)	-1.19(0.12)	21.08(0.05)
Taxes	2.89(0.99)	5.8(1.00)	0.51(1.00)	0.79(0.78)	0.64(0.74)	9.69(0.64)

b) Unit root tests: first differences of variables

	No time trend			Time trend		
	LLC	**IPS**	**Fisher**	**LLC**	**IPS**	**Fisher**
GDP	-8.83(0.00)	-7.84(0.00)	76.2(0.00)	-8.34(0.00)	-7.53(0.00)	67.88(0.00)
TE	-8.97(0.00)	-9.59(0.00)	95.57(0.00)	-6.9(0.00)	-8.43(0.00)	75.89(0.00)
Taxes	-11.19(0.00)	-10.26(0.00)	101.77(0.00)	-10.33(0.00)	-9.47(0.00)	86.11(0.00)

Note: Values of test-statistics are provided, whereas assigned probabilities are stated in brackets. Null hypothesis is that a series contains a unit root.

Table A5 Westerlund panel cointegration test for all three variables

	Value	**P-value**
Cointegration for panel as a whole Pt	-2.18	0.54
Cointegration for panel as a whole Pa	-2.77	0.45

Note: Null hypothesis is that series are not cointegrated.

Table A6 Simple regression results (MG estimator)

Dependent variable	**α**	**θ**	**Observations**
Government expenditure	-0.007	1.24***	162
Inflation tax	0.013	-0.36	157
Tax revenue	0.17	0.97***	162

Note: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.