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Public spending and growth: the role of government accountability

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Abstract

This paper examines the role of institutions in the nexus between public spending and economic growth. Using a newly assembled dataset of 80 countries over the 1970-2010 period, we show that only when institutions prompt governments to be accountable to the general citizen does the capital component of public spending significantly promote growth. The critical role of accountability remains regardless of the financing sources of capital spending, including a reallocation from current spending, an increase in revenue, and a rise in the budget deficit. Meanwhile, current spending does not show a robust growth-fostering effect, for any level of government accountability. We highlight that it is the type of institutions affecting the state-citizen relations that plays a key role in the capital spending-growth nexus, not the country's income level or the type of institutions affecting citizen-citizen relations. Our interpretation of the distinct role of government accountability in this nexus is that inefficiencies induced by unaccountable officials' rent-seeking behavior in public investment mitigate otherwise growth-fostering effects of capital spending.

Keywords: Economic growth, Public spending, Public investment efficiency, Institutions, Accountability **JEL:** O43, H50, O11

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1 Introduction

When do public policies have the desired outcomes? For example, suppose that the government's objectives are to raise citizens' education attainment and reduce mortality rates. Then, would increased education and health spending always help achieve these objectives? Rajkumar and Swaroop (2008) suggest that it may not, showing that for those policies to work, they need to be accompanied by good governance, namely by a government that is accountable for its actions or a bureaucracy with a professional ethos. Further, suppose that the objective is to control inflation rates. Would policy reforms aimed at increasing central bank independence necessarily help achieve this objective? Acemoglu et al. (2008) suggest that it may not, arguing that whether the reform works or not depends on institutions. For example, if incumbent policymakers are unconstrained to pursue personal rents, they may not properly implement reforms which could jeopardize their own privilege, resulting in the failure of these reforms.[1] Thus, the general message appears to be that the state of institutions, through which authority in a country is exercised, is critical for policies to yield the desired outcomes.

Acknowledging this, the present paper investigates how institutions, particularly those which prompt a government to be accountable to the general public, may interact with the effects of public spending on economic growth, an economic outcome of major importance. One strong motivation behind this question lies in the lack of consensus in the literature regarding the effects of different spending components on growth, as recently summarized by Gemmell et al. (2013). In particular, although capital spending may be expected to enhance growth by accumulating public capital and thus promoting private firms' productivity, the empirical results offered thus far are not consistent, even qualitatively. For example, regarding studies focusing on developing countries, Gupta et al. (2005) and Bose et al. (2007) show that

[1]Further, they argue that political reform is unlikely to have a significant impact when the quality of political institutions is highest, because in such cases, there should not be much distortion in existing policies in the first place, leaving little room for the reform to have any impact. Thus, their overall finding is that the reform has a maximum impact when implemented in countries where the quality of institutions is intermediate.

capital spending enhances growth, whereas Devarajan et al. (1996) and Ghosh and Gregoriou (2008) argue that this spending has a retarding effect.[2] Additionally, the empirical evidence on growth effects of current spending also appears to be inconclusive. For instance, while Gupta et al. (2005) show that this spending, particularly on wages, has negative growth effects, Devarajan et al. (1996) find evidence of its growth-promoting effects.

However, examining the role of institutions in the nexus between public spending and growth entails a few challenges. First, it is not straightforward to measure the extent to which institutions prompt governments to be accountable to the public. To tackle this, we use different proxies for the level of constraints political officeholders face. Specifically, these proxies are the measures of "constraints on executives", as a proxy for existing constraints on politicians, the degree of "democracy/autocracy", as a wider measure reflecting citizens' political participation, and the index of "voice and accountability", as an aggregate of various elements relating to citizens' participation in selecting governments.[3] Second, disaggregated fiscal data at the national level is scarce. To address this, using historical data reported to the IMF's Government Financial Statistics (GFS) yearbook, yet reconciling two different methodologies present in GFS, we assemble a new dataset, which offers *comparable* spending data series in both current and capital components, at the central government level over the 1970-2010 period. Together with the government accountability proxies, the final dataset contains 80 countries. Third, even with the data in hand, estimating the role of government accountability in the growth effects of public spending entails a few concerns for endogeneity, including fiscal variables' association with business cycles. To address this, we base our main analyses on 8-year non-overlapping averages, yielding 5 periods per country. Further, we use the Generalized Method of Moments (GMM) dynamic panel data estimation approach

[2]Strictly speaking, a few important differences in these studies make it difficult to compare their results, such as the differences in the sources of financing capital spending, which includes a fall in current spending, a rise in non-tax revenue, and a rise in the budget deficit. However, the different results, even at the qualitative level, are still strongly indicative of the absence of consensus on the growth effects of capital spending.

[3]"Constraints on executives" and "democracy/autocracy" measures are from Polity IV, while " voice and accountability" are from the Worldwide Governance Indicators (WGI). More precise variable information is given below.

developed by Holtz-Eakin et al. (1988), Arellano and Bond (1991), and Blundell and Bond (1998), to tackle any other endogeneity issues.

Our main findings are twofold. First, *only when* institutions prompt governments to be accountable to the general public does the capital component of public spending have substantial scope for growth promotion. Importantly, this is the case *regardless of* the sources of finance, including a reallocation from the current component, a rise in total revenue, and a rise in the budget deficit. We emphasize that it is this type of institutions affecting the vertical relation between a government and its citizens that plays a key role in the capital spending-growth nexus, *not* the country's income level or the type of institutions governing the horizontal relations between citizens.[4] Second, institutions do not play a distinct role in terms of the growth effects of current spending. Specifically, regardless of the level of government accountability, a rise in this spending does *not* show clear-cut growth-promoting effects for *any* financing source. These results are robust to the following tests. First, we explicitly tackle the possible reverse causality issues by considering the lagged effects of fiscal variables. Second, we add various controls, including demographic variables related to population aging. Third, we base our analyses on various alternative datasets, for example, by changing the way the entire sample period is divided. Fourth, we disaggregate current spending and total revenues further, particularly highlighting the public wages and taxes subcomponents, respectively. Fifth, we consider a specification which exploits the time variations in government accountability levels.

Our interpretation of the result on public capital spending is that, while this spending *potentially* has a large growth-promoting effect by accumulating public capital and thus promoting private firms' productivity, its positive effect can be mitigated by inefficiencies in capital spending under unaccountable governments. Specifically, these inefficiencies may arise when unaccountable officeholders attempt to receive "commissions" by granting private enterprises public capital projects. For instance, these rent-seeking officeholders may com-

[4]This way of classifying institutions into the ones governing "vertical" and "horizontal" relations roughly follows Acemoglu and Johnson (2005), as explained below.

promise the quality of contractors or inflate the size of projects unnecessarily. Turning to the second result, government accountability does not play a critical role in the current spending-growth nexus, mainly because even when officeholders are less constrained, this spending, often based on explicit entitlements/commitments (e.g., wages and pensions), provides them with smaller room for discretion.

Broadly, our paper highlights the importance of the quality/efficiency of public (particularly capital) spending rather than its quantity. In this regard, this study is related to several papers in the literature discussing the importance of the former. For instance, Pritchett (2000) emphasizes that not all actual accounting costs of public investment necessarily contribute to the creation of economically valuable capital. Subsequently, Dabla-Norris et al. (2012) create a cross-country index of public investment efficiency for 71 countries, considering several aspects of investment management over the four different stages: project appraisal, selection, implementation and evaluation. While their index reflects the degree of inefficiency relating to governments' rent expropriation, its coverage appears to be wider, capturing also the inefficiency due to their pure inability to conduct an efficient investment management.[5] Further, Tanzi and Davoodi (1997) and Keefer and Knack (2007) find that the level of capital spending increases in the worsening of corruption and institutional quality, respectively.[6] This suggests the existence of politically-induced inefficiencies inherent in this type of spending. This study complements the above papers by directly addressing the role of institutions in the efficiency of public capital spending in the context of economic growth.

This paper is also closely linked to the literature on institutions and their long-run economic outcomes. In particular, since Hall and Jones (1999) and Acemoglu et al. (2001) showed the effect of the former on the latter, various papers examined this relation further.

[5] In fact, this type of distinction of the source of public policy inefficiency is considered by Bandiera et al. (2009), who define the "active" and "passive" waste of public policy as, respectively, a waste involving benefit for policy makers and one caused by simple inability, lack of incentives, or excessive bureaucracy. While they emphasize the particular importance of the latter as a source of waste in the case of Italy, this paper reminds the importance of the former.

[6] Keefer and Knack (2007) argue that what is correlated with the level of capital spending is institutions that limit government's rent seeking, such as competitive elections and political checks/balances, rather than the level of corruption.

For example, Acemoglu and Johnson (2005), unbundling institutions into "property rights institutions", which protect citizens against expropriation by the government and elites, and "contracting institutions", which facilitate private contracts between citizens, show that the worsening of the former type of institutions has larger adverse effects on growth by discouraging private investment.[7] Given that the institutions we consider (i.e, the ones prompting governments to be accountable to citizens) are essentially "property rights institutions", our results propose a complementary channel through which this type of institutions affects growth, namely the efficiency of public capital spending.[8]

The rest of this paper is structured as follows. Section 2 describes the dataset. Section 3 discusses empirical specification and methodology. Section 4 presents and interprets the results. Finally, Section 5 concludes with policy implications.

2 The Dataset

We first provide a brief exposition of key variables, namely proxies for institutions affecting the degree of government accountability to its citizens and the decomposed public spending. We then present summary statistics for the subsequent regression analyses.

2.1 Institutions affecting government accountability

To select proxies for institutions affecting government accountability, we assume that political officeholders are less accountable when they are less constrained. Based on this assumption, our first main proxy is the measure of "executive constraints" ("constraints", for short) from Polity IV, measuring the degree of institutionalized constraints on the decision making powers of chief executives.[9] Although these constraints are not the same as the ones

[7] They explain this result by pointing out that while individuals often manage to mitigate the adverse effects of weak contracting institutions by altering the terms of their contracts, they find it difficult to mitigate states' expropriation in this way since the state is the ultimate arbiter of contracts.

[8] Strictly, since we focus on expropriation by government officials, and not by elites in general, the institutions of our focus are more restricted than what they mean by "property rights institutions".

[9] The variable name in Polity IV is "XCONST".

on political officeholders, they are likely to be correlated. Our next proxy is the measure of "democracy/autocracy" ("democracy", for short), also from Polity IV, reflecting not only the previous measure of "constraints" but also other democratic elements including the degree to which citizens' political participation is guaranteed.[10] We believe that freedom of citizens to pursue alternative political preferences clearly constrains politicians' irresponsible behavior. The third proxy is the measure of "voice and accountability" ("voice" , for short), from the World Governance Indicators (WGI). This variable aggregates various existing measures concerning citizens' political participation and other elements promoting government accountability, including freedom of the press and the transparency of public policies.

In the main regression analyses below, we classify countries by government accountability levels, based on the national average of each accountability proxy during the 1970-2010 period, for which disaggregated public spending data is assembled.[11] Specifically, Table 9 in Appendix A divides the 80 countries covered in the regression analyses into 40 countries with high- and low-levels of accountability.[12] As seen there, while those classifications roughly match across the proxies, the match is not always perfect, indicating that each proxy may capture different institutional aspects.

2.2 Disaggregated public spending and other fiscal variables

Next, facing the limited availability of disaggregated public spending data in the cross-country context, we assemble a dataset based on the IMF's Government Finance Statistics (GFS) yearbook. The key innovation of this dataset is to bridge major methodological changes in the GFS manual (GFSM) which happened from mid 1990s to early 2000s with the introduction of GFSM2001 replacing old GFSM1986. Specifically, referring to Wick-

[10]The official name of this measure in Polity IV is "POLITY2". We consider Vreeland (2008)'s XPOLITY correction as well, to address the criticism that the anocracy part (values close to zero) of POLITY2 does not capture elements of political institutions.

[11]While "constraints" and "democracy" are available for the full sample period, "voice" becomes available only in 1996. Thus, by using this variable, we implicitly assume that it tends to be very persistent over time.

[12]To ease the comparisons among different accountability proxies, we focus on the countries for which all the proxies are available.

ens (2002), who details the methodological differences between the two manuals, we create *comparable* disaggregated public spending data series, consisting of current and capital components over the 1970-2010 period. The level of a government covered is at the consolidated central government (CG) level, supplemented by budgetary CG level data.[13] Further, to ensure that our empirical analyses respect the government budget constraint (so that financing sources of public spending are specified), the dataset also covers the total revenue and budged deficit, as a difference between total spending and revenue. Appendix B provides a further explanation of the data assembling procedure.

2.3 Summary statistics

To consider the role of institutions in the nexus between public spending and growth, we below undertake panel regression analyses. Our reference specification adopts 8-year non-overlapping averages, creating a maximum of 5 observations per country (i.e., 1971–78, 1979–1986, ..., 2003–2010). The purpose of taking this measure is two-fold. First, we attempt to abstract from the effects of business cycles on fiscal variables. Second, this measure helps address the possible lagged effects of public (particularly, capital) spending. Note also that since our disaggregated annual fiscal data are unbalanced, we need to choose when we calculate each 8-year average. In our main analyses, we take the period average of fiscal variables only if at least 3 observations are available within each 8 year.[14]

Table 1 describes the dataset using the 8-year averages, based on 228 observations corresponding to the reference regression equations (e.g., Table 3). The average growth rate is 17.5 percent over the 8 years, corresponding to an annual growth rate of above 2 percent. Turning to the fiscal variables, the share of total expenditure is about 29.7 percent on aver-

[13]To explain, the consolidated CG level can be divided based on whether the institutional unit is financed by the legislative budget or by extrabudgetary sources. Budgetary CG is the CG unit based only on the legislative budget, indicating that the consolidated CG level is more general. Note that combining data from both CG levels is a common practice in the literature (e.g., Devarajan et al. (1996)).

[14]We conduct a robustness check below, with different threshold values to take the period average. However, in general, a too stringent value turns out to critically reduce the number of available observations, while a too lenient value may not exactly reflect the sample average.

Table 1: Descriptive Statistics: 8-year non-overlapping averages

Variable	Mean	Standard deviation	Minimum	Maximum
Growth rate (8 years)	17.5	17.6	−41.3	84.8
Total spend/GDP	29.7	9.4	11.8	54
Capital spend/GDP	2.5	2.2	0.3	13.7
Current spend/GDP	27.2	9.8	11.3	51.5
Total rev/GDP	27.7	9	11.4	48.8
Budget deficit/GDP	2	3.7	−14.1	14.8
Initial GDP p.c. (log)	9	1.1	6	10.9
Initial level of schooling	7	3.2	0.6	13.4
Private investment/GDP	19.9	5.3	3.7	39.6
Population growth	1.4	1.3	−1	9

Note: Statistics are based on 228 observations. The Initial GDP is the log of 2005 US$. Initial level of schooling years are the average years of schooling of the population aged between 25 and 64. The other figures are in percent.

age, decomposed into current and capital spending shares of 27 and 2.3 percent, respectively. Further, with the average total revenue of 27.7 percent, the total deficit is obtained as 2 percent. Lastly, the other explanatory variables, whose rationale is commented below, include initial GDP, initial level of schooling, private investment (relative to GDP), and population growth rates. The detailed data sources are found in Appendix C.

3 Empirical Specification and Methodology

First, we present our empirical model, highlighting the interaction between institutions and public spending in regression equations. We then explain our estimation method, with particular emphasis on how we tackle the potential endogeneity issues.

3.1 Empirical specification

Our empirical specification is motivated by neoclassical growth models. The models generally relate the growth of real GDP per capita to two types of variables: state and control/ environmental (hereafter, denoted as control) variables. The former variables describe the initial position of the economy, whereas the latter determine the steady state. A key pre-

diction of such models is that when the initial position of the economy is controlled for, an increase in steady state output leads to higher growth rates during the (seemingly) long adjustment period towards the steady state.[15] Based on this prediction, we examine how public spending, decomposed into current and capital spending, affects the steady state and thus the growth rate depending on the levels of government accountability.

Formally, our empirical specification is given as

$$y_{i,t} - y_{i,t-x} = (\alpha - 1)y_{i,t-x} + \beta u_{i,t-x} + \bar{f}'_{i,t}\phi + \sum_{j=1}^{n} \eta_j \bar{z}_{i,j,t} + \nu_i + \xi_t + \epsilon_{i,t}. \tag{1}$$

The left-hand side (LHS), $y_{i,t} - y_{i,t-x}$, is the difference in the log of real GDP per capita between year t and $t-x$ in country i. For our main analyses based on 8-year non-overlapping averages, we set $x = 8$ with $t = 1978, 1986, ..., 2010$, thus yielding 5 observations per country at maximum.[16] Explanatory variables on the right-hand side (RHS) include initial real GDP per capita, $y_{i,t-x}$ and initial average years of schooling, $u_{i,t-x}$, as state variables. The former variable is used as a proxy for initial physical capital, while the latter is used for initial human capital. Next, $\bar{f}'_{i,t}$ is a vector of fiscal variables as control variables, all given as average values from year $t-x+1$ to t. In turn, motivated by the Solow growth model, $\bar{z}_{i,j,t}$ contains control variables such as private investment rates and population growth rates, again as period averages.[17,18] ν_i represents unobserved country-specific effects. Finally, ξ_t is a time dummy, capturing global shocks.

Focusing on the vector of fiscal variables, $\bar{f}'_{i,t}\phi$, it is expressed as

$$\bar{f}'_{i,t}\phi = \sum_{j=1}^{2} \zeta_j^H H_i \bar{e}_{i,j,t} + \sum_{j=1}^{2} \zeta_j^L L_i \bar{e}_{i,j,t} + \gamma^H H_i \bar{r}_{i,t} + \gamma^L L_i \bar{r}_{i,t} + \chi^H H_i \bar{b}_{i,t} + \chi^L L_i \bar{b}_{i,t}. \tag{2}$$

[15] The steady state growth rate is determined exogenously in these growth models.
[16] In the robustness section, we also report results for 7-year periods.
[17] We exclude public investment rates to avoid double-counting.
[18] In robustness tests, we additionally consider the shares of population below 15 and above 65 years old, the degree of trade openness, the inflation rate, and the ratio of credit to private sector to GDP.

In the RHS, H_i is a dummy variable which takes the value of 1 if the average government accountability level is high in country i, whereas L_i, also a dummy, equals 1 if the accountability is low (both H_i and L_i are constant over time). These constant dummies interact with all the fiscal variables considered, all as a ratio to GDP: $\bar{e}_{i,j,t}$, the different spending components, i.e., capital ($j = 1$) and current spending ($j = 2$); $\bar{r}_{i,t}$, total revenue; and $\bar{b}_{i,t}$, overall budget deficit (i.e., total expenditure minus total revenue).[19]

Notice, however, that because the government budget constraint implies that fiscal variables yield exact multicollinearity in Eq. 2, it is necessary to leave out at least one fiscal component to estimate the model. If, for illustration, we leave out the budget deficit, $\bar{b}_{i,t}$, the equation we estimate becomes:

$$\begin{aligned} y_{i,t} - y_{i,t-x} = (\alpha - 1)\, y_{i,t-x} + \beta u_{i,t-x} + \sum_{j=1}^{2} (\zeta_j^H + \chi^H) H_i \bar{e}_{i,j,t} + \sum_{j=1}^{2} (\zeta_j^L + \chi^L) L_i \bar{e}_{i,j,t} \\ + (\gamma^H - \chi^H) H_i \bar{r}_{i,t} + (\gamma^L - \chi^L) L_i \bar{r}_{i,t} + \sum_{j=1}^{n} \eta_j \bar{z}_{i,j,t} + \nu_i + \xi_t + \epsilon_{i,t}. \end{aligned} \tag{3}$$

Importantly, coefficients on the remaining fiscal variables in Eq. 3 represent the effects of these variables on growth, particularly when financed by a change in $\bar{b}_{i,t}$, the omitted fiscal variable.[20] This point, first emphasized by Kneller et al. (1999), illustrates the importance of taking the budget constraint into account when estimating the growth effects of fiscal variables. Specifically, the coefficients on capital and current spending thus capture the effects of a rise in the respective spending financed by an equal rise in the deficit, while the coefficient on the revenue shows the effect of its rise corresponding to a fall in the deficit. In what follows,

[19] This approach of examining the role of institutions using time-invariant dummies is similar to the one employed by Acemoglu et al. (2008). While this approach can be justified by the general lack of time variations in institutional variables, we check the robustness of results by utilizing their time variations (albeit small).

[20] In interaction models with two exclusive discrete dummies such as Eq. 3, it is generally necessary to include one of the interaction dummy variables as a separate explanatory variable to differentiate the intercepts across groups (see Brambor et al. (2006), p.69). However, in our panel regression with fixed effects, those time-invariant dummies are collinear with them, so that it is not possible to add one of the dummies as an explanatory variable.

we will compare the growth effect of each spending component for the alternative financing sources, between countries with high- and low-government accountability.

3.2 Estimation strategy

We estimate this dynamic panel data model using a GMM approach. There are various reasons for this choice. First, the framework is flexible enough to accommodate our unbalanced panel. Second, it allows us to handle country fixed effects.[21] Third, most notably, it enables us to tackle the potential endogeneity of all fiscal variables through the use of internal instruments (i.e., instruments based on lagged values of those variables). This is important because endogeneity issues of fiscal and institution proxies appear to be a non-trivial concern. For example, even if a positive correlation is observed between capital spending and growth, this does not necessarily imply that a higher amount of such spending causes higher growth. Causality could in fact be reverse.[22]

While the GMM approach yields consistent estimators, however, the original 'difference' GMM estimators developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991) may suffer from finite sample biases. These biases arise particularly when time series are persistent. Indeed, Bond et al. (2001) point out that such biases are likely to be large in the context of empirical growth models, as output tends to be a largely persistent variable. They thus recommend the alternative 'system' GMM estimators developed by Arellano and Bover (1995) and Blundell and Bond (1998), which augment the difference estimator by combining the regression in differences with the regression in levels in a system in which the two equations are separately instrumented. We use this system procedure below.[23]

[21] To handle fixed effects, we transform variables through 'orthogonal deviations' (Arellano and Bover (1995)) rather than first differencing. We use this measure because it maximizes the sample size in our unbalanced panel.

[22] We below attempt to address this issue more explicitly, by estimating the lagged effects of fiscal variables.

[23] Alternatively, some recent works on fiscal policy and growth use the Mean-Group (MG) and/or Pooled Mean-Group (PMG) estimators developed by Pesaran and Smith (1995) and Pesaran et al. (1999), respectively (e.g., Gemmell et al. (2011) and Arnold et al. (2011)). These estimators have their own advantages. Notably, they allow for simultaneous investigation of long-run equilibrium relations and short-run adjustment processes, with key parameters allowed to be heterogeneous (in the case of PMG, the heterogeneity is

Specifically, we treat the state variables of the model, i.e., $y_{i,t-x}$ and $u_{i,t-x}$ as predetermined variables, while treating all the control variables as endogenous. Further, to ensure the validity of this system approach in our context, we conduct various specification tests. The first is the Arellano-Bond test, whose purpose is to examine the hypothesis that the error term is not serially correlated, which is implicitly assumed in the orthogonality conditions. The second is the Hansen test, which checks the overall validity of the various instruments of the system. The third is the difference-in-Hansen test, which examines the validity of the different sets of instruments used in the level part of the system.

4 Results

We first examine the nexus between public spending and growth without taking account of the role of institutions. Next, we consider the possible role of institutions in the nexus, depending on their type. Lastly, we interpret and discuss the key robust findings.

4.1 Without the role of institutions considered

Table 2 examines the effects of public spending on growth without distinguishing countries' institutions.[24] In Columns (1) and (2), where total revenue and overall deficit (both relative to GDP) are left out from the respective regression equations, the coefficient on total spending captures its effect on economic growth, particularly when it is financed by a rise in these fiscal variables, respectively. An increase in total spending has a positive effect on growth only when financed through revenue, with statistical significance at the 1 percent level. To interpret the coefficient, a rise in the ratio of total spending to GDP by 1 percentage point

assumed only in the short-run coefficients), while the GMM approach only considers the long-run relation and does not allow for heterogeneity other than the intercept. However, one potential downside of these alternative approaches is that because the use of annual data is often required (to have a large number of time series observations), the effect of business cycles can be more problematic than in our 8-year average framework. In addition, the fact that our highly disaggregated fiscal expenditure dataset is unbalanced does not allow us to practically use either of these alternative estimators.

[24]To facilitate comparison with the subsequent regressions where government accountability is reflected, this table only covers observations for which the all the institution proxies are available.

throughout the 8-year period, financed by an equal rise in revenue, leads to a 1.13 percentage points rise in the growth rate over the period, corresponding to an annual rise by about 0.14 percentage points. Columns (3) to (5) repeat the exercise after disaggregating total public spending into capital and current spending components. Column (3) indicates that although capital spending has a positive growth effect when financed by a fall in current spending, the effect is insignificant. Column (4) shows that with revenue as a financing source (as in Column (1)), both the capital and current components of spending have a significantly positive effect. Finally, Column (5), treating the budget deficit as a financing source, shows that the sign of the coefficient on current spending is negative in particular, consistent with the one on total spending in Column (1). In short, both items appear to have a limited growth-enhancing scope, except when they are financed by a rise in revenue.

Regarding the remaining fiscal variables, the growth effect of a rise in the deficit, offset by a fall in revenue, is significantly negative (see Columns (1) and (4)), while the symmetric nature of our analyses ensures that the alternative combination, i.e., a rise in revenue, inducing a fall in the deficit, has exactly opposite results (see Columns (2) and (5)).[25] Turning to the other explanatory variables, the coefficient on the initial GDP per capita (expressed in percent) is negative and significant, being consistent with the conditional convergence hypothesis.[26] The years of schooling, a proxy for initial human capital, has a positive, albeit insignificant, effect. Further, as suggested by the Solow model, the ratio of private investment to GDP has a positive effect, while the population growth rate has a negative effect, although the latter is insignificant. Finally, the diagnostic tests support the use of system GMM estimators, indicating the absence of serial correlation of the error term (i.e, Arellano-Bond, AR(2)) and validating the internal instruments in the system as a whole (i.e., Hansen test) and their subsets in the level part of the system (i.e., Difference Hansen tests).

[25]Because of this nature, it is not necessary to show regression equations with all the possible financing components. Table 2 thus does not include the regression result when capital spending is used as a financing source.

[26]The convergence rates between 12 and 13 percent (over the 8 years) imply annual average convergence rates of about 1.5 percent, which are consistent with the rates usually found in growth regressions.

Table 2: Without institutions considered

Dependent variable: GDP per capita growth over 8 years

	Total spending		Total spending decomposed		
Regressors	(1)	(2)	(3)	(4)	(5)
Total spend/GDP	1.126***	−0.938			
	(0.337)	(0.760)			
Cap spend/GDP			2.637	3.435*	1.497
			(2.133)	(1.976)	(2.003)
Cur spend/GDP				0.798**	−1.140
				(0.356)	(0.751)
Revenue/GDP		2.063***	0.798**		1.938***
		(0.610)	(0.356)		(0.588)
Deficit/GDP	−2.063***		−1.140	−1.938***	
	(0.610)		(0.751)	(0.588)	
Initial GDP p.c.	−12.727***	−12.727***	−12.352***	−12.352***	−12.352***
	(3.613)	(3.613)	(3.240)	(3.240)	(3.240)
Initial Schooling	0.400	0.400	1.288	1.288	1.288
	(2.011)	(2.011)	(1.885)	(1.885)	(1.885)
Private inv/GDP	2.462***	2.462***	2.329***	2.329***	2.329***
	(0.673)	(0.673)	(0.630)	(0.630)	(0.630)
Pop growth	−3.788	−3.788	−5.946	−5.946	−5.946
	(3.209)	(3.209)	(3.677)	(3.677)	(3.677)
Financing source	Revenue	Deficit	Cur spend	Revenue	Deficit
Observations	228	228	228	228	228
No. of countries	80	80	80	80	80
No. of instruments	45	45	51	51	51
Arellano-Bond AR(1), p-value	0.01	0.01	0.01	0.01	0.01
Arellano-Bond AR(2), p-value	0.19	0.19	0.20	0.20	0.20
Hansen, p-value	0.59	0.59	0.74	0.74	0.74
Diff Hansen 1, p-value	0.53	0.53	0.68	0.68	0.68
Diff Hansen 2, p-value	0.84	0.84	0.31	0.31	0.31

Notes: System GMM estimations for dynamic panel data models. Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part.

4.2 Role of institutions

4.2.1 Institutions affecting government accountability

We now highlight the possible roles of institutions in the public spending-growth nexus, particularly ones prompting governments to be accountable to citizens. Our focus is thus on the interaction terms between spending variables and government accountability levels of each country (see Eq. 2). Regarding the accountability proxies, we first consider "executive constraints (constraints, for short)" and "voice and accountability (voice)", followed by "democracy/autocracy (democracy)" to ensure the robustness of the results.

Columns (1) and (2) of Table 3 indicate that capital spending, when financed through a fall in current spending, has a significant positive effect under high accountability (accountable, for short) governments for both "constraints" and "voice", whereas under low accountability (unaccountable) governments, it does not have a significant effect for either proxy. This seemingly distinct role of government accountability is supported by the fact that a Wald test rejects the equality of the estimated coefficients on capital spending across accountability levels for both proxies, with the p-values of 0.05 and 0.07, respectively. Moreover, the effect under accountable governments is economically significant too: a percentage point rise in the ratio of capital spending to GDP, offset by an equal fall in current spending, raises the annual growth rate by almost 1 percentage point, corresponding to a 7.06 percentage points rise over the 8-years period (in case "constraints" is used as a proxy).[27] Next, although Columns (3) and (4) show that in both accountability groups, capital spending, financed by revenue, promotes growth, the coefficients on this spending are again significantly larger under accountable governments. Last, Columns (5) and (6) indicate that under accountable governments, even a deficit-financed rise in capital spending fosters growth, again with significantly larger coefficients than the ones under unaccountable governments.

[27]Note that in reality, 1 percentage point increase in the spending share is substantial, corresponding to about 40 percent of the initial average share of capital spending to GDP in our whole sample. See Table 1.

Table 3: Role of institutions affecting government accountability to citizens

Dependent variable: GDP per capita growth over 8 years

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend*Highacc	7.060***	7.672***	7.505***	8.129***	6.168**	6.870**
	(2.308)	(2.874)	(2.234)	(2.786)	(2.518)	(2.995)
Cap spend*Lowacc	2.488	1.960	3.250**	2.883*	0.728	1.116
	(1.668)	(1.723)	(1.588)	(1.607)	(1.338)	(1.384)
Cur spend*Highacc			0.445*	0.457*	−0.892	−0.802
			(0.246)	(0.270)	(0.643)	(0.659)
Cur spend*Lowacc			0.762***	0.923**	−1.760**	−0.844
			(0.286)	(0.389)	(0.840)	(0.997)
Revenue*Highacc	0.445*	0.457*			1.337**	1.259*
	(0.246)	(0.270)			(0.660)	(0.661)
Revenue*Lowacc	0.762***	0.923**			2.522***	1.767**
	(0.286)	(0.389)			(0.819)	(0.876)
Deficit*Highacc	−0.892	−0.802	−1.337**	−1.259*		
	(0.643)	(0.659)	(0.660)	(0.661)		
Deficit*Lowacc	−1.760**	−0.844	−2.522***	−1.767**		
	(0.840)	(0.997)	(0.819)	(0.876)		
Initial GDP p.c.	−11.110***	−11.128***	−11.110***	−11.128***	−11.110***	−11.128***
	(3.184)	(3.142)	(3.184)	(3.142)	(3.184)	(3.142)
Initial Schooling	1.834	2.371	1.834	2.371	1.834	2.371
	(1.460)	(1.468)	(1.460)	(1.468)	(1.460)	(1.468)
Private inv/GDP	1.569***	1.785***	1.569***	1.785***	1.569***	1.785***
	(0.527)	(0.506)	(0.527)	(0.506)	(0.527)	(0.506)
Pop growth	−6.211**	−6.077*	−6.211**	−6.077*	−6.211**	−6.077*
	(2.755)	(3.056)	(2.755)	(3.056)	(2.755)	(3.056)
Financing source	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Voice	Const	Voice	Const	Voice
Observations	228	228	228	228	228	228
No. of countries	80	80	80	80	80	80
No. of instruments	69	65	69	65	69	65
Arellano-Bond AR (1)	0.01	0.00	0.01	0.00	0.01	0.00
Arellano-Bond AR (2)	0.24	0.28	0.24	0.28	0.24	0.28
Hansen	0.60	0.62	0.60	0.63	0.63	0.83
Diff Hansen 1	0.51	0.48	0.50	0.49	0.54	0.77
Diff Hansen 2	0.10	0.15	0.10	0.16	0.12	0.91
Wald, Cap spend, p-value	0.05	0.07	0.05	0.07	0.02	0.04
Wald, Cur spend, p-value			0.21	0.19	0.41	0.97

Notes: System GMM estimations for dynamic panel data models. Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part. Wald, Cap spend (Cur spend) tests the equality of coefficients on capital (current) spending across different accountability levels.

On the other hand, the level of government accountability appears to play a more limited role in the current spending-growth nexus. Specifically, when financed through revenue, this spending enhances growth regardless of accountability levels (Columns (3) and (4)), while in the cases of deficit-financing, a rise in this spending may rather have negative growth effects, under both accountability levels (Columns (5) and (6)). Consistently, results from a Wald test for these cases indicate that the differences in the estimated coefficients are statistically insignificant, with the p-values ranging from 0.19 to 0.97. In short, institutions affecting the government-citizen relations appear to play a particularly distinct role in the nexus between capital spending and growth.

Additionally, Columns (5) and (6) show that a rise in revenue, corresponding to a fall in the deficit, fosters growth regardless of the accountability level. Regarding the coefficients on the other non-fiscal controls, results are in line with the ones in Table 2, except that population growth rates now have significantly negative effects. Lastly, all the diagnostic tests again support the use of system GMM estimators.

4.2.2 Institutions, or income levels?

However, even if public capital spending promotes growth under accountable governments, since high-income countries tend to have more accountable governments, the result may simply reflect the different growth effects of this spending across different income levels. To explore this possible role of income levels, we first classify countries into high- and low-income countries (HICs and LICs for short), based on the PPP-adjusted real GDP per capita over the 1970-2010 period.[28] Then, making high- (and low-) income country dummies, which take

[28]We classify countries by income as follows. For each year of the entire sample period (1970-2010), we first sort 183 countries available in the IMF's World Economic Outlook (WEO) according to their GDP per capita level (PPP prices) into three groups: the highest 33th percentile, between the 33th and 67th percentiles, and the remaining. Next, counting the number of times each country appears in those three groups during the sample period, we classify countries that appear in the top 33th percentile most frequently as high-income countries. Likewise, countries that appear between the 33th and 67th most frequently are grouped as middle-income countries, and the remaining countries as low-income countries. Lastly, we combine medium- and low-income countries and re-categorize them as low-income as opposed to high-income countries. We take this measure to ensure that our analysis covers a sufficient number of low-income countries.

1 if a country is from HICs (LICs) and 0 if LICs (HICs), we further multiply them with high- and low-government accountability dummies for capital spending components in Eq.2. With this double-interaction approach, we examine if income levels play a significant role for countries with the same government accountability level.

The results are summarized in Table 4, which only shows coefficients on fiscal variables for brevity.[29] The first and second rows indicate that, for countries with accountable governments, capital spending tends to foster growth regardless of its income level, supported by the high p-values from Wald tests (0.79 and 0.98 for each proxy) for the respective coefficients in each row. Likewise, a similar observation can be made for counties with unaccountable governments with different income levels. Therefore, the overall indication is that the difference in income levels itself appears to have little impact on the growth effects of capital spending, as long as the level of government accountability is controlled for. This observation, in turn, may partly explain why the literature, as mentioned in the introduction, has not found consistent results on the effect of capital spending by focusing on country groups from the same development level (e.g., Devarajan et al. (1996) and Gupta et al. (2005)).

[29]The results on the other controls, including initial GDP p.c., are in line with Table 3.

Table 4: Further interaction with income levels

Dependent variable: GDP per capita growth over 8 years

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend*Highinc*Highacc	6.294***	6.576**	6.539***	6.910***	5.344**	5.654**
	(2.251)	(2.533)	(2.210)	(2.514)	(2.349)	(2.569)
Cap spend*Lowinc*Highacc	7.234**	6.667*	7.480**	7.002**	6.285	5.745
	(3.591)	(3.654)	(3.388)	(3.439)	(3.881)	(3.871)
Cap spend*Highinc*Lowacc	−0.859	0.322	−0.132	1.095	−2.796	−0.407
	(2.634)	(2.972)	(2.460)	(2.750)	(2.530)	(2.809)
Cap spend*Lowinc*Lowacc	1.777	1.249	2.504*	2.023	−0.160	0.520
	(1.351)	(1.499)	(1.280)	(1.416)	(1.240)	(1.161)
Cur spend*Highacc			0.246	0.335	−0.950	−0.922
			(0.318)	(0.310)	(0.585)	(0.632)
Cur spend*Lowacc			0.727**	0.773**	−1.937**	−0.729
			(0.319)	(0.371)	(0.753)	(1.080)
Revenue*Highacc	0.246	0.335			1.195*	1.257*
	(0.318)	(0.310)			(0.669)	(0.678)
Revenue*Lowacc	0.727**	0.773**			2.664***	1.502
	(0.319)	(0.371)			(0.807)	(1.070)
Deficit*Highacc	−0.950	−0.922	−1.195*	−1.257*		
	(0.585)	(0.632)	(0.669)	(0.678)		
Deficit*Lowacc	−1.937**	−0.729	−2.664***	−1.502		
	(0.753)	(1.080)	(0.807)	(1.070)		
Financing source	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Voice	Const	Voice	Const	Voice
Observations	228	228	228	228	228	228
No. of countries	80	80	80	80	80	80
No. of instruments	79	75	79	75	79	75
Arellano-Bond AR(1)	0.01	0.00	0.01	0.00	0.01	0.00
Arellano-Bond AR(2)	0.19	0.21	0.19	0.21	0.19	0.21
Hansen	0.97	0.90	0.97	0.99	0.98	0.95
Diff Hansen 1	0.98	0.92	0.98	1.00	0.99	0.97
Diff Hansen 2	0.31	0.15	0.37	1.00	0.52	0.31
Wald, Cap spend, Highacc	0.79	0.98	0.79	0.98	0.79	0.98
Wald, Cap spend, Lowacc	0.27	0.72	0.27	0.72	0.27	0.72

Notes: System GMM estimations for dynamic panel data models. Initial GDP p.c., Initial Schooling, Private inv/GDP, Pop growth, Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part. Wald, Cap spend, Highacc (Lowacc) tests the equality of coefficients on capital spending across different income levels for countries with accountable (unaccountable) governments.

4.2.3 If institutions, does the type of institutions matter?

Although institutions affecting government accountability seem to influence the growth effects of capital spending, are they necessarily the only types of institutions which do that? While the broad nature of institutions makes it difficult to classify them, one potentially distinct type of institutions is the "contracting institutions" defined by Acemoglu and Johnson (2005), which is primarily about the horizontal relations in society between regular citizens, through the formalism of law enforcement. On the other hand, the institutions focused above rather affect the vertical relations between the state and citizens, similar to the "property rights institutions" defined by the same authors. We now check if "contracting institutions" also play a role in the effectiveness of capital spending, using the double-interaction approach as above.

As a main proxy for the contracting institutions, we use "legal enforcement of contracts" from the Economic Freedom of the World Annual Report (EFW), the aggregate of the estimates for the time and money required to collect a debt through court, whose original sources are the World Bank's Doing Business database.[30] Note that the fact that the correlations of national averages of this proxy with the government accountability proxies are relatively low (0.33 with "executive constraints" and 0.46 with "voice and accountability") implies that they may indeed capture different aspects of institutions.[31] To proceed, we create dummy variables by classifying countries into ones with high- and low- law enforceability with the

[30] One issue of using this measure is that the figures are available only after 2002 onwards. Thus, as a complement, we also consider the aggregate measure of regulations in credit market, labor market, and business environment, also from EFW. This measure, available from 1970 onwards (yet only intermittently till 2000), reflects the extent to which various regulations may restrict economic interactions among citizens, e.g., through regulations regarding hiring/firing workers. Being in line with the results based on the main proxy shown below, we find that whether institutions hinder the citizen-citizen relations through excessive regulations does not play a role in the capital spending-growth nexus. The detailed results are available from the authors upon request.

[31] To be consistent with the previous analyses, we only look at the countries for which all the proxies for "property rights institutions" (i.e., ones affecting government accountability) are available, leaving a total of 79 countries available for this enforcement proxy, which also takes a higher value when the institutional factor is of better quality (i.e., the level of law enforcement is higher).

median of national averages as a cut-off, and then let them interact with the government accountability dummies for the public capital spending component.

Table 5: Further interaction with contracting institutions

Dependent variable: GDP per capita growth over 8 years

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend*Highenf*Highacc	5.876**	7.836**	6.235**	8.264**	4.794	6.980*
	(2.682)	(3.383)	(2.641)	(3.337)	(2.928)	(3.593)
Cap spend*Lowenf*Highacc	6.108**	6.323**	6.467***	6.751**	5.026*	5.467*
	(2.533)	(3.126)	(2.367)	(2.953)	(2.628)	(3.193)
Cap spend*Highenf*Lowacc	1.630	1.445	2.271	2.265	0.096	0.484
	(1.764)	(2.204)	(1.657)	(1.960)	(1.664)	(1.802)
Cap spend*Lowenf*Lowacc	1.927	1.569	2.568	2.389	0.393	0.608
	(1.652)	(1.709)	(1.589)	(1.581)	(1.397)	(1.513)
Cur spend*Highacc			0.359	0.428	−1.082*	−0.856
			(0.292)	(0.314)	(0.615)	(0.655)
Cur spend*Lowacc			0.642**	0.820*	−1.534**	−0.960
			(0.301)	(0.436)	(0.757)	(0.990)
Revenue*Highacc	0.359	0.428			1.441**	1.284**
	(0.292)	(0.314)			(0.619)	(0.612)
Revenue*Lowacc	0.642**	0.820*			2.175***	1.780**
	(0.301)	(0.436)			(0.743)	(0.805)
Deficit*Highacc	−1.082*	−0.856	−1.441**	−1.284**		
	(0.615)	(0.655)	(0.619)	(0.612)		
Deficit*Lowacc	−1.534**	−0.960	−2.175***	−1.780**		
	(0.757)	(0.990)	(0.743)	(0.805)		
Financing source	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Voice	Const	Voice	Const	Voice
Observations	227	227	227	227	227	227
No. of countries	79	79	79	79	79	79
No. of instruments	79	75	79	75	79	75
Arellano-Bond AR(1)	0.01	0.00	0.01	0.00	0.01	0.00
Arellano-Bond AR(2)	0.16	0.24	0.16	0.24	0.16	0.24
Hansen	0.98	0.96	0.91	0.96	0.95	0.99
Diff Hansen 1	1.00	0.97	0.97	0.97	0.99	0.99
Diff Hansen 2	0.45	0.48	0.10	0.36	0.20	0.99
Wald, Cap spend, Highacc	0.92	0.56	0.92	0.56	0.92	0.56
Wald, Cap spend, Lowacc	0.87	0.95	0.87	0.95	0.87	0.95

Notes: System GMM estimations for dynamic panel data models. Initial GDP p.c., Initial Schooling, Private inv/GDP, Pop growth, Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part. Wald, Cap spend, Highacc (Lowacc) tests the equality of coefficients on capital spending across different law enforcement levels for countries with accountable (unaccountable) governments.

Table 5 suggests that institutions affecting the citizen-citizen relations do not play a particularly important role in the capital spending-growth nexus. Specifically, the first and second rows indicate that capital spending generally has a growth-promoting effect regardless of the degree of legal enforcement, as long as governments are accountable to citizens. Consistently, the p-values from Wald tests of 0.92 and 0.56 for "constraints" and "voice", respectively, imply that for accountable governments, the differences in coefficients on capital spending across different degrees of legal enforcement are statistically insignificant. Again, a similar message applies when comparing coefficients across enforcement levels for unaccountable governments (see the third and fourth rows). In short, institutions that affect the government-citizen relations are the ones which particularly matter in the nexus between public capital spending and growth.

4.2.4 "Democracy" as an accountability proxy

With the indication that what matters in the capital spending-growth nexus is the institutions affecting government accountability to its citizens, we repeat the above exercises (Table 3, Table 4, and Table 5), using "democracy" as an alternative proxy. As argued, the rationale for using this wider measure is that, not only the previous proxy of constraints on politicians, but also other democratic elements including the degree to which citizens' political participation is guaranteed, are relevant to capture the level of government accountability. Table 10 in Appendix D confirms that the results based on this proxy are consistent with the ones based on the other proxies. Further, acknowledging the criticism that the anocracy part (values close to zero) of the democracy variable does not capture elements of political institutions (see Vreeland (2008)), we also repeat the exercises using Vreeland's XPOLITY correction as an accountability proxy. Since the results essentially remain the same, they are not presented for brevity.[32]

[32]Results are available from authors upon request.

4.3 Robustness of the role of government accountability

4.3.1 Modelling lagged fiscal effects explicitly

We first check the robustness of the findings on the role of government accountability in the public spending-growth nexus, by examining an empirical specification with an explicit lag structure in fiscal variables. Specifically, in Eq.2, instead of taking the period average of fiscal values, we use their initial values in each 8-year period.[33] One advantage of taking this measure, albeit reducing the sample/observations size, is that the estimation becomes less prone to reverse causality problems, because it appears less likely that governments' anticipation of higher future growth rates over the next 8 years prompts them to spend more, for example, on capital spending today.

4.3.2 Controlling for additional variables

Next, we control for various additional control variables, to address omitted variable issues. In our context, it may be worth controlling for demographic variables, because while aging societies tend to raise social benefits spending, a prominent part of current spending, this demographic feature, implying a smaller fraction of the population in the working age category of 15-65, can affect growth negatively (e.g., Barro (2004)). Specifically, we add the percentages of the population below 15 and above 65 years old to the reference specification (cf. Eq. 1).[34] Besides, we also control for other commonly-used variables in growth regressions, such as inflation rates, the degree of trade openness, and the ratio of credit extended to the private sector to GDP.[35]

[33] If it is the first period of 1971-78, for example, we only take the average of the values in 1970 and 71, rather than taking the average over the entire 8 years. Accordingly, in the system GMM procedure, we assume that fiscal variables are predetermined, rather than endogenous.

[34] We assume these variables as exogenous, to keep the number of internal instruments below the number of countries.

[35] Assuming that each variable is considered endogenous, we add them in turn, rather than together, to avoid a substantial increase in the number of internal instruments under the system GMM estimations.

4.3.3 Assembling datasets in alternative ways

We then check the results by assembling datasets in various different ways. First, to ensure that the results are not specific to the way the sample period is divided, we consider 7-year averages, starting from 1971 (till 2005) and alternatively, from 1976 (till 2010).[36,37] Second, while with unbalanced fiscal data series, the reference analyses take the 8-year period average with at least 3 annual observations, we here change the threshold value to 4 observations to make each observation closer to the real (but not observed) average, albeit losing observations.[38] Third, we exclude possible outliers from the disaggregated spending series assembled, just in case the unification process of the two GFS manuals still leaves unintended gaps.[39] Last, while the reference analyses are using the fiscal datasets which supplement consolidated central government (CG) data with budgetary CG data, we also conduct analyses using only the consolidated CG data, to ensure the legitimacy of merging the two types of CG data.

4.3.4 Disaggregating spending and revenue further

We also examine if the results depend on the sub-components of current spending and revenue. Although this exercise is often implausible due to the limited availability of such highly disaggregated data in the original GFS yearbook, we still highlight public wages and

[36]With this shorter period, the results shown below are based on the lag structure considered above to address the possibility of delayed fiscal effects. However, estimations based on the period averages with at least three observations in each 7 year-period yield similar results.

[37]Using 5-year averages, with lagged fiscal variables, yields similar results to the 7-year (and 8-year) cases. However, with 8 periods at maximum in this case, the instrument count tends to become too high.

[38]Using the threshold value of 2, instead, gives similar results to the cases with the thresholds of 4 (and 3), albeit the validity of internal instruments is sometimes lost, with the Arellano-Bond test implying the existence of serial correlation in the error term. This may be related to the fact that each 8-year average is too far away from the real average.

[39]Specifically, we examined if there are any unusual "jumps" in both capital and current spending series over time. Investigating the distributions of changes between adjacent 8-year periods in both series (when they are unbalanced, the interpolated values are used), we detected one distinct outlier in the capital spending series (a fall by almost 10 percentage points in Gabon, between the 2nd and 3rd 8-year periods), thus eliminated this jump from the series (by dropping the country's capital spending figure in the 3rd period). To be symmetric, we also eliminated the highest rise of 3.3 percentage points across periods in this spending. Meanwhile, such a strong outlier was not found in the current spending series, so that we did not exclude any observation from this spending. The respective histograms are available from authors upon request.

tax revenues, prominent subcomponents of current spending and total revenues, respectively, by taking advantage of the relatively high availability of these fiscal variables.

4.3.5 Summary results

Presenting only summary results for brevity, each cell in Table 6 and Table 7 indicates, under different accountability levels and proxies, whether a rise in a respective type of spending, financed by different fiscal components, promotes/reduces growth, denoted by $+/-$ signs with star-superscripts for statistically significant effects.[40,41] Further, to highlight the role of accountability, the tables also show the p-values of the Wald tests, examining the equality of respective coefficients across different accountability levels for each financing source, as the averaged values across the different proxies.

These tables confirm the critical role played by government accountability in the capital spending-growth nexus, showing that only under accountable governments, a rise in capital spending promotes growth, regardless of its financing sources. Moreover, the averaged p-values clarify that the differences in respective coefficients on capital spending across accountability levels are often statistically significant, despite of higher standard errors of individual coefficients in these cases, with the smaller sample size and/or added controls. Turning to the growth effects of current spending, we do not observe a distinct role of accountability, for both revenue and deficit as financing sources. Specifically, a rise in this spending does not have a robust growth-enhancing effect regardless of the accountability level. This observation is consistent with the high p-values from Wald tests, not rejecting the equality of coefficients across accountability levels. Finally, as the third and forth sub-tables in Table 7 suggest, even when focusing on wages and taxes, prominent subcomponents of current spending and total revenue, respectively, similar results are obtained.[42]

[40] All the underlying/full estimation results are available from the authors upon request.

[41] Because results of a rise in current spending, financed through a fall in capital spending, are the exact opposites of the ones of a rise in the latter offset by the former, they are not shown.

[42] In those sub-tables, the signs of the coefficients on the rests of current spending and total revenues (i.e., apart from wages and taxes) are not shown for brevity.

Table 6: Robustness: lag structure, additional controls, alternative datasets

Financing source	**Spending component increased**						
Using lag structure with 8-year periods							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+***	+***	−	−	−	0.01
Revenue	+***	+***	+***	−	−	−	0.00
Budget deficit	+***	+***	+***	−**	−*	+	0.01
	Current spending						
Revenue	+	+	−	+**	+*	−	0.24
Budget deficit	+	+	−	−	−	+	0.43
Controlling for demographic characteristics							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+**	+***	+	+	+*	0.15
Revenue	+***	+***	+***	+**	+*	+**	0.13
Budget deficit	+**	+**	+**	+	+	+	0.10
	Current spending						
Revenue	+**	+**	+**	+***	+**	+***	0.68
Budget deficit	−	−	−	−	−	−	0.80
7-year periods, 1976-2010 (1971-2005)							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+*(+)	+**(+**)	+*(+)	−*(−)	−(−)	−*(−)	0.01 (0.03)
Revenue	+*(+)	+**(+**)	+*(+*)	−*(−)	−(−)	−*(−)	0.02 (0.02)
Budget deficit	+(+)	+*(+)	+(+)	−(−*)	−(−)	−(−*)	0.08 (0.09)
	Current spending						
Revenue	−(−)	−(−)	−(−)	+(−)	+(+)	+(−)	0.14 (0.41)
Budget deficit	−(−***)	−(−***)	−(−***)	+*(−)	+(−)	+*(−)	0.15 (0.35)
Using different cut-offs to form period averages							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+**	+***	+**	+*	+**	0.18
Revenue	+***	+**	+***	+***	+**	+**	0.16
Budget deficit	+**	+**	+**	+	+	+	0.10
	Current spending						
Revenue	+	+	+	+	+	+	0.75
Budget deficit	−**	−*	−*	−**	−	−**	0.53

Notes: For the case with lag structure (additional controls, 7-year periods from 1976 to 2010, 7-year periods from 1971-2005, different cut offs), results are based on 74 (80, 76, 79, 75) countries covering 189 (228, 217, 194, 207) observations. + (−): growth enhancing (reducing). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The underlying estimation results are available from the authors upon request.

Table 7: Robustness: alternative datesets (cont.), further disaggregation

Financing source	**Spending component increased**						
Without outliers							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+***	+***	+	+	+	0.04
Revenue	+***	+***	+***	+	+	+	0.04
Budget deficit	+**	+**	+**	−	+	+	0.02
	Current spending						
Revenue	+	+	+	+**	+**	+**	0.14
Budget deficit	−	−	−	−*	−	−**	0.62
Without budgetary central government data							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+**	+**	+**	+*	+	+	0.12
Revenue	+***	+**	+***	+**	+	+*	0.12
Budget deficit	+**	+**	+**	+	−	+	0.05
	Current spending						
Revenue	+**	+**	+**	+***	+**	+***	0.47
Budget deficit	−	−	−	−**	−*	−**	0.41
Wages among current spending are highlighted							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Wages	+**	+	+*	+	+	+	0.13
Revenue	+***	+**	+**	+	+	+*	0.09
Budget deficit	+*	+	+*	+	+	+	0.17
	Wages						
Revenue	+	+	+	+	+	+*	0.49
Budget deficit	−	−	−	+	+	+	0.31
Total taxes among total revenues are highlighted							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+**	+***	+	+	+	0.04
Taxes	+***	+***	+***	+	+	+	0.02
Budget deficit	+**	+**	+**	+	+	+	0.03
	Current spending						
Taxes	+	+	+	+	+	+	0.70
Budget deficit	−	−	−	−	−	−*	0.58

Notes: For the case without outliers (without budgetary central government data, with wages highlighted, with taxes highlighted), results are based on 80 (71, 76, 79) countries covering 226 (209, 209, 222) observations. + (−): growth enhancing (reducing). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The underlying estimation results are available from the authors upon request.

4.4 Exploiting time variations in government accountability

Finally, we check if our main results hold when using a specification which exploits the time-variation of institutional variables. To clarify, our empirical specifications so far did not exploit their possible variations over time, since we divided countries into the ones with high- and low-accountability governments, based on the averages of the proxies over the sample period. The justification for this approach is the relative lack of time variation in countries' institutional characteristics, consistent with the fact that various prior studies on institutions also do not attempt to exploit their variations.[43] Indeed, in the context of our dataset, the strong persistence over time of government accountability is confirmed, except for some variations observed particularly in low-income countries, especially when "democracy" is used as a proxy (not shown for brevity).

Nonetheless, we examine if the alternative approach of using time variations in government accountability, even when they are small, yields consistent results. Specifically, we adjust the fiscal part (Eq.2) of equation (Eq.1) to:

$$\bar{f}'_{i,t}\phi = \sum_{j=1}^{2} \zeta_j \bar{e}_{i,j,t} + \sum_{j=1}^{2} \kappa_j \bar{e}_{i,j,t}\bar{a}_{i,t} + \gamma \bar{r}_{i,t} + \kappa_3 \bar{r}_{i,t}\bar{a}_{i,t} + \chi \bar{b}_{i,t} + \kappa_4 \bar{b}_{i,t}\bar{a}_{i,t} + \tau \bar{a}_{i,t}, \tag{4}$$

$\bar{e}_{i,1,t}$ ($\bar{e}_{i,2,t}$), $\bar{r}_{i,t}$, and $\bar{b}_{i,t}$ represent the shares of capital (current) spending, total revenue, and budget deficit to GDP, respectively, as 8-year period averages in country i, while $\bar{a}_{i,t}$ is the accountability proxy, also as period averages. All the fiscal variables are interacted with accountability, while the latter is added separately to include all the constitutive terms of the interactions. With this setup, the marginal effect of capital spending on growth is given as:

$$\frac{\partial(y_{i,t} - y_{i,t-8})}{\partial \bar{e}_{i,1,t}} = \zeta_1 + \kappa_1 \bar{a}_{i,t}, \tag{5}$$

[43] For example, Keefer and Knack (2007) and Alfaro et al. (2008) use cross-country, rather than panel, regressions to estimate the relation between institutional qualities and the level of public capital spending and the role of institutions in capital flow, respectively. Besides, although Acemoglu et al. (2008) use panel regressions to consider the role of institutions in the effect of central bank independence on inflation rates, they divide the level of institutional qualities based on the entire period averages, as we do above.

while the effect of current spending is $\partial(y_{i,t} - y_{i,t-8})/\partial\bar{e}_{i,2,t} = \zeta_2 + \kappa_2\bar{a}_{i,t}$.

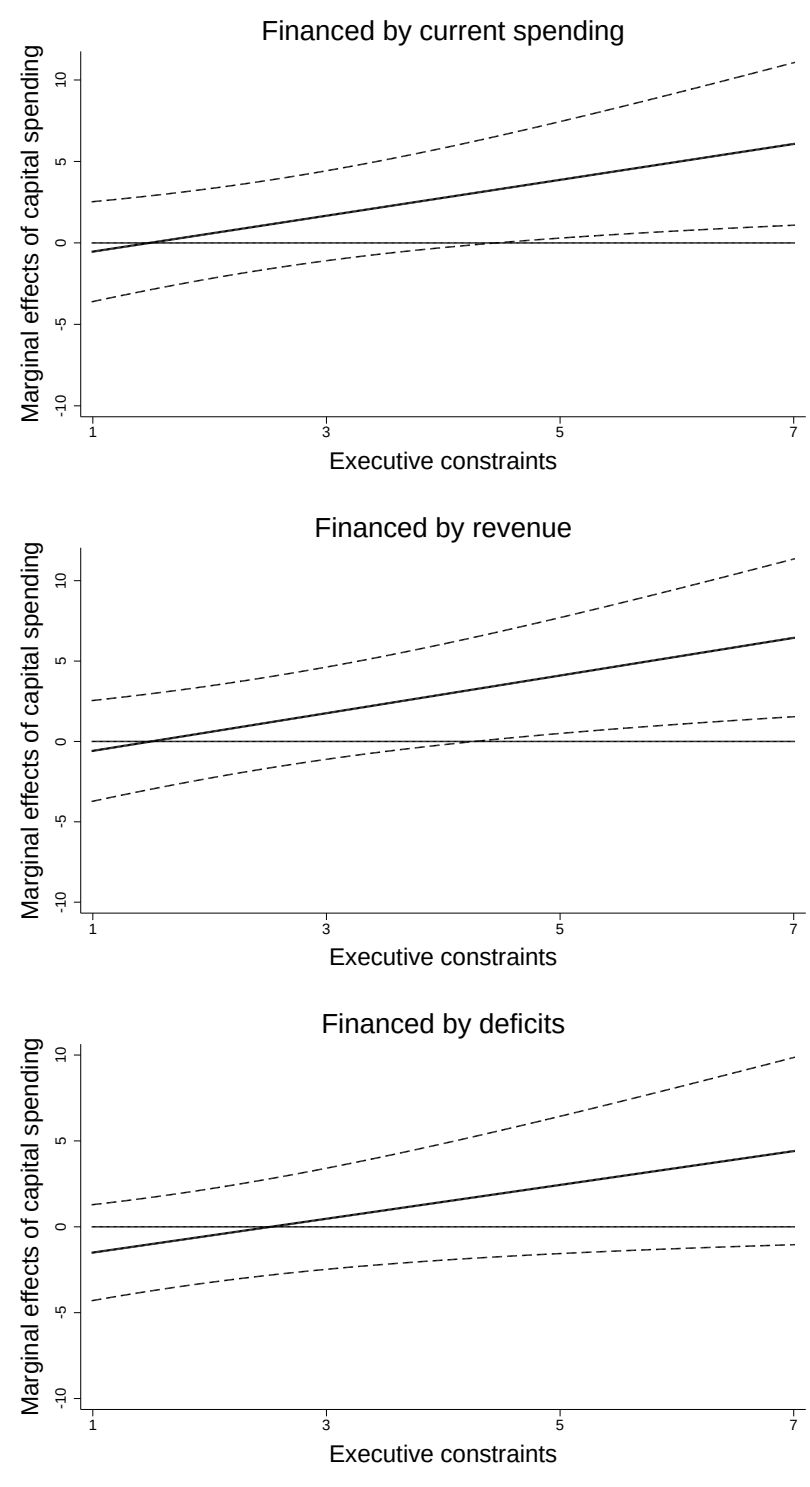
However, similar to the previous setup with time-invariant accountability dummies, exact multicollinearity caused by the government budget constraint does not allow us to estimate the marginal effect of each type of spending *per se*. Instead, by omitting a fiscal component, we estimate the marginal effect of each type of spending, when it is financed by the particular component omitted. For example, when we omit current spending from Eq.4, the estimated marginal effect of capital spending captures $(\zeta_1-\zeta_2)+(\kappa_1-\kappa_2)\bar{a}_{i,t}$, which is the marginal effect of capital spending when financed by a fall in current spending. Likewise, we can measure the marginal effect of both capital and current spending for different financing sources, by adjusting the omitted variable accordingly.

Figure 1 illustrates how, for different financing sources, the marginal effects of capital and current spending change across the different levels of government accountability proxied by "constraints". (The detailed estimation results are presented in Table 11 in Appendix E.) The solid line in the top sub-figure shows that the marginal effect of capital spending, when it is financed by a fall in current spending, becomes larger as accountability becomes higher. In fact, the 95% confidence interval (dashed line) indicates that when the proxy is high enough (specifically, above around 4.5), a rise in capital spending significantly promotes growth. The next figure shows that accountability plays a similar role when capital spending is financed by revenue. Last, in the case of deficit-financed capital spending, although the marginal effect becomes larger as accountability rises, the effect remains insignificant. However, when we allow for a lag structure of the fiscal variables, the effect becomes significant under accountable governments (not shown for brevity).[44] Thus, there still appears to be room for capital spending to promote growth under such governments. Note that we obtained similar results when using "democracy" as an accountability proxy.[45]

[44]One caveat of considering the lag structure in the current setup is, however, that with the limited sample (because only initial fiscal values in each period are used in estimations), the number of instruments tends to be higher than the number of countries.

[45]All the figures are available upon request. Note that we here do not consider "voice", because it is available only since 1996.

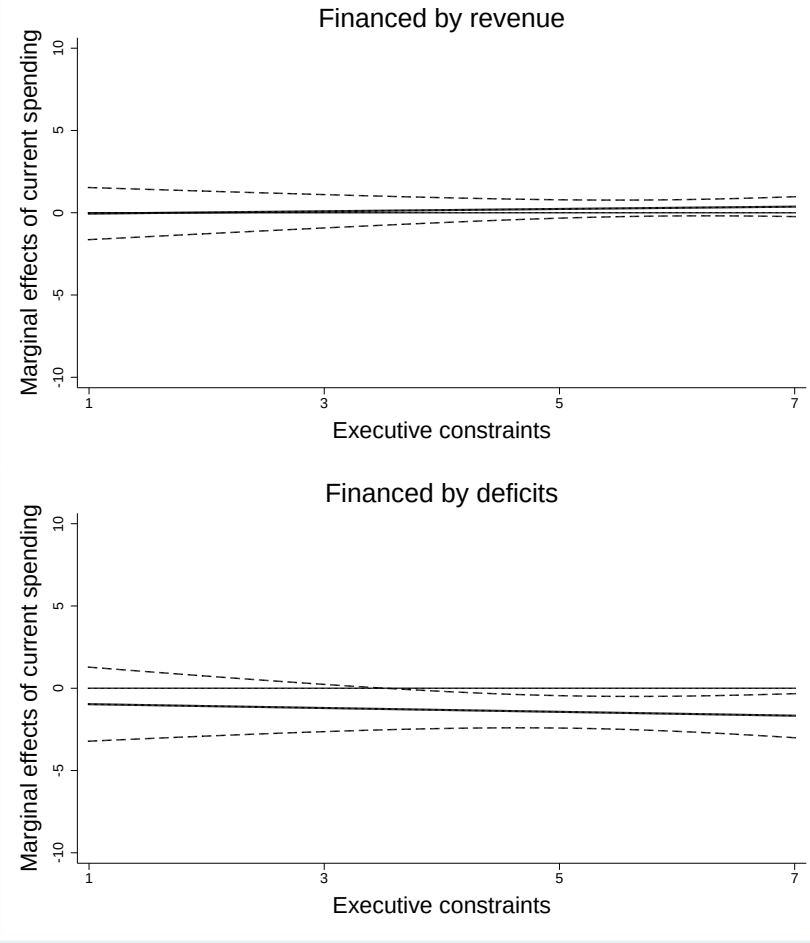
Figure 1: Robustness: marginal effects of capital spending on growth



Note: Solid line represents a marginal effect.
Dashed line represents a 95% confidence interval.

Source: Authors' calculations

Figure 2: Robustness: marginal effects of current spending on growth



Note: Solid line represents a marginal effect.
Dashed line represents a 95% confidence interval.

Source: Authors' calculations

Turning to the marginal effects of current spending, Figure 2 shows that when this spending is financed by revenue, the effects are much less responsive to the degree of accountability (notice that the same scale is used as in Figure 1).[46] In fact, they are not significant, regardless of the degree of accountability. Regarding the deficit-financed case, although we observe some evidence of negative marginal effects under accountable governments, they appear to be quantitatively small. Again, the results are similar in case we use "democracy" as an accountability proxy. Overall, therefore, the indication is that government accountabil-

[46] We do not show the case where current spending is financed by a fall in capital spending, because it is simply the inverse of the case shown in the top graph of Figure 1.

ity plays a critical role in the capital spending-growth nexus, but does not in the current spending-growth nexus. This is largely consistent with the main results obtained above with time-invariant accountability dummies.

4.5 Interpretations

It may seem puzzling that public capital spending fails to promote growth under unaccountable governments, as public investment has a substantial growth potential, by accumulating public capital and thus fostering private firms' productivity. Our answer, closely based on the insightful discussions by Tanzi and Davoodi (1997) and Keefer and Knack (2007), is as follows. To begin with, there tends to be large room for discretion by politicians in capital spending: they often can decide, not only the overall size of this spending item, but also its timing and allocations. This discretionary nature provides officials with considerable rent-seeking opportunities, often in the form of commissions from private enterprises attempting to secure contracts for capital projects.[47] Then, when politicians are unconstrained, the quality of final capital goods can be compromised for various reasons: contractors of low-ability/efficiency may be chosen in the first place; the project itself may be unnecessarily inflated to create more rents; contractors may skimp on the quality of projects to incorporate commissions. Overall, these politically-induced inefficiencies under unaccountable governments are likely to mitigate the innate growth-promoting effects of capital spending.

Next, why does government accountability not play a distinct role in the current spending-growth nexus? First, there appears to be less theoretical clear-cut hypothesis on the growth effects of current spending than capital spending, because, for instance, while wages of teachers/doctors/nurses may help promote growth through human capital accumulation, social spending such as pension payments, may not necessarily foster growth, by discouraging physical capital accumulation (see, e.g., Feldstein (1974) and Docquier and Paddison (2003)).[48]

[47] This opportunity for rent seeking prevails because, even when such payment, often synonymous to bribes, is illegal, the complex nature of the design/contracts of capital projects makes it hard to detect.

[48] As another example of growth-enhancing subcomponent of current spending, Tanzi and Davoodi (1997) suggest spending on operations and maintenance of existing infrastructures.

Moreover, this spending, being often governed by explicit entitlements/commitments (e.g., wages, pensions, and interest payments on the debt), tends to leave only small room for discretion by officials, making the rent-seeking induced inefficiencies less distinct.

4.6 Discussions

4.6.1 Does public spending crowd out/in private investment?

Our results thus far, controlling for private investment rates, were based on the implicit presumption that there is no significant interaction between public spending and private investment. However, if, for instance, public capital spending crowds *out* private investment under accountable governments, the observed positive effects of this spending on growth can be undermined, because private investment itself appears to foster growth on its own (see, e.g., Table 2). Further, if current spending crowds *in* private investment, this spending may actually promote growth, casting a doubt on the above results.

Acknowledging these possibilities, we examine how private investment may be associated with public spending components for different levels of accountability. Specifically, to be compatible with our main specification above (Eq. 1), we consider the following equation:

$$\bar{i}_{i,t} = (\alpha - 1)y_{i,t-x} + \beta u_{i,t-x} + \bar{f}'_{i,t}\phi + \sum_{j=1}^{n} \eta_j \bar{z}_{i,j,t} + \nu_i + \xi_t + \epsilon_{i,t}, \tag{6}$$

where $t = 1978, 1986, ..., 2010$ and $x = 8$. On the LHS, $\bar{i}_{i,t}$ is the ratio of private investment to output between period $t-x+1$ and t (as a period average). On the RHS, $y_{i,t-x}$ and $u_{i,t-x}$ are initial GDP per capital and schooling years, respectively.[49] $\bar{f}'_{i,t}\phi$ contains the fiscal variables, interacted with the level of accountability (either high or low accountability without time variations) exactly as in Eq. 2. $\bar{z}_{i,j,t}$ includes the set of various controls, which, following works such as Servén (2003) and Cavallo and Daude (2011), include the price level of investment, the

[49] Apart from being parallel with Eq. 1, there is perhaps no clear justification of including these controls. Note, however, that the key results below will not be affected by the inclusion/exclusion of these variables.

ratio of credit extended to the private sector to GDP, and real exchange rate uncertainty.[50] ν_i and ξ_t capture country and time specific effects. We estimate this static linear panel model by fixed effects.

Table 8: Interaction between public spending and private investment

Dependent variable: Ratio of private investment to GDP (8-year averages)

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend*Highacc	0.851	0.427	0.624	0.146	0.632	0.158
	(0.850)	(0.753)	(0.902)	(0.784)	(0.862)	(0.762)
Cap spend*Lowacc	0.451	0.082	0.354	0.235	−0.088	−0.227
	(0.408)	(0.394)	(0.272)	(0.250)	(0.433)	(0.343)
Cur spend*Highacc			−0.227**	−0.281***	−0.219*	−0.268**
			(0.109)	(0.100)	(0.110)	(0.116)
Cur spend*Lowacc			−0.097	0.154	−0.539	−0.309
			(0.225)	(0.284)	(0.383)	(0.402)
Financing source	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Voice	Const	Voice	Const	Voice
Observations	201	201	201	201	201	201
No. of countries	77	77	77	77	77	77
Adjusted R-squared	0.220	0.233	0.220	0.233	0.220	0.233
Wald, Cap spend, p-value	0.668	0.672	0.772	0.911	0.456	0.642
Wald, Cur spend, p-value			0.598	0.135	0.414	0.920

Notes: Fixed effects estimations. Only the interaction terms between spending components and private investment are shown for brevity. Other explanatory variables included are the other fiscal variables (which differ depending on the choice of omitted fiscal variables), the price of investment, the private credit to output ratio, and the volatility of real exchange rates. Time dummies are taken into account. Only 77 (relative to 80 in Table 3) countries are covered due to the limitation in the availability of the control variables. The detailed tables are presented in Table 12 in Appendix F. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Focusing on the coefficients on the interaction between spending components and accountability levels, Table 8 suggests that there is no evidence of crowding-out effect of capital spending, regardless of the degree of accountability and of the financing sources. (See Table 12 in Appendix F for full results.) Thus, our previous finding that capital spending promotes growth only under accountable governments still stands. Turning to current spending, the table shows that, while this type of spending may crowd out private investment under ac-

[50]Real exchange rate uncertainty is calculated based on Servén (2003) and Cavallo and Daude (2011). Specifically, we measure uncertainty by the conditional variance of the residuals resulting from estimating a simple GARCH (1, 1) for the variance and an AR(1) in the conditional mean equation of the real exchange rate (in logs) by country. For some countries, convergence was only achieved after making slight adjustments to the model, such as estimating an ARMA(1,1) for the conditional mean instead of an AR(1).

countable governments (see Columns (3)-(6)), the Wald tests indicate that the effects do not differ significantly across accountability levels. Therefore, our result that accountability does not play a key role in the current spending-growth nexus is still intact. Similar results for private investment are obtained even when using "democracy" as a accountability proxy.[51] Further, the key results stand to the inclusion of real interest rates as an additional control as in Servén (2003), albeit reducing the number of observations. Lastly, acknowledging the possibility that public spending components may be affected by private investments, we examined a variant of Eq. 6 with a lag structure of the fiscal variables and found that the results still stand.

4.6.2 Corruption as a potential accountability proxy?

Realizing the difficulty of measuring the degree to which governments are accountable to citizens, this paper used three different proxies, namely "constrains on executives", "democracy/autocracy" (together with Vreeland's XPOLITY correction), and "voice and accountability". However, one may argue that different corruption measures are also relevant proxies. To address this, we repeated the exercises using the "corruption" variable from the International Country Risk Guide (ICRG), as well as "control of corruption" from WGI. The results are that these variables do not play a distinct role in the capital spending-growth nexus. This apparent lack of the role of corruption in the nexus may indicate that what matters is the institutional features, such as constraints on politicians, citizens' political participation, and freedom of expression, rather than corruption as an outcome of such features. Interestingly, this is in line with Keefer and Knack (2007), who find that, not the corruption measure itself, but a broad measure of governance, is associated with the level of public investment.

[51] They are available from authors upon request.

5 Conclusion

This paper examines the role of institutions in the seemingly elusive nexus between public spending and economic growth. We show that institutions, particularly the ones prompting political officeholders to be accountable to the general public, play a critical role in the capital, not current, spending-growth nexus. Specifically, to the extent that governments are accountable, capital spending has significant growth-promoting effects, for various financing sources including a reallocation from current spending, an increase in revenue, and a rise in the budget deficit. We emphasize that the key factor which brings about these positive effects of capital spending is the particular institutions affecting the state-citizen relation, not income levels or "contracting" institutions. Our main interpretation is that, while capital spending innately has a large growth-fostering potential through the accumulation of public capital, inefficiencies in this type of spending, caused by unaccountable officials' rent-seeking behavior, can mitigate its positive effects.

The key implication of the results is therefore that policies or reforms which reinforce "property rights institutions", and thus reduce room for officials' rent seeking, may help promote growth, by enhancing public investment efficiency. While reforms such as strengthening political checks and balances and ensuring citizens' political participation will certainly help, such fundamental reforms may be difficult and take a long period of time to implement. Therefore, the question is, which *viable and more immediate* policies will have positive effects? We suggest a few measures along the main stages of public investment management, namely, project appraisal, selection, implementation, and evaluation. In the appraisal stage, an independent peer review should be encouraged to help ensure the objectivity and quality of project appraisals; in the project selection stage, key information such as the external audit reports and contract awards can be disclosed to the public; the implementation stage should then be accompanied with the comprehensive expenditure commitment controls; in the evaluation stage, routine evaluation by the auditor general can become mandatory. Over-

all, these measures would help ensure policymakers to be more accountable, and promote the efficiency of public capital spending and thus economic growth.

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Appendix

A Classification of countries by institutions

Table 9 classifies the 80 countries used in the reference regressions (e.g., Table 3) into 40 countries with high- (low-) government accountability, based on the respective national averages of respective proxies over the 1970-2010 period.

Table 9: Classification of countries by accountability levels

Country	Executive constraints	Democracy/Autocracy	Voice and accountability
Australia	High	High	High
Austria	High	High	High
Bahrain, Kingdom	Low	Low	Low
Belgium	High	High	High
Bolivia	Low	Low	Low
Botswana	High	High	High
Bulgaria	Low	Low	High
Burundi	Low	Low	Low
Cameroon	Low	Low	Low
Canada	High	High	High
Chile	Low	Low	High
Colombia	High	High	Low
Costa Rica	High	High	High
Croatia	High	Low	Low
Cyprus	High	High	High
Czech Republic	High	High	High
Denmark	High	High	High
Egypt	Low	Low	Low
El Salvador	Low	Low	Low
Estonia	High	High	High
Fiji	High	High	Low
Finland	High	High	High

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Country	Executive constraints	Democracy/Autocracy	Voice and accountability
France	High	High	High
Gabon	Low	Low	Low
Germany	High	High	High
Greece	High	High	High
Guatemala	Low	Low	Low
Hungary	Low	Low	High
India	High	High	Low
Indonesia	Low	Low	Low
Iran, I.R. of	Low	Low	Low
Ireland	High	High	High
Israel	High	High	High
Italy	High	High	High
Jamaica	High	High	High
Japan	High	High	High
Jordan	Low	Low	Low
Kenya	Low	Low	Low
Korea, Republic	Low	Low	High
Kuwait	Low	Low	Low
Latvia	High	High	High
Lesotho	Low	Low	Low
Lithuania	High	High	High
Luxembourg	High	High	High
Malawi	Low	Low	Low
Mauritius	High	High	High
Mexico	Low	Low	Low
Mongolia	Low	Low	Low
Morocco	Low	Low	Low
Namibia	Low	High	Low
Netherlands	High	High	High
New Zealand	High	High	High

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Country	Executive constraints	Democracy/Autocracy	Voice and accountability
Norway	High	High	High
Pakistan	Low	Low	Low
Panama	Low	Low	Low
Paraguay	Low	Low	Low
Peru	Low	Low	Low
Philippines	Low	Low	Low
Poland	Low	Low	High
Portugal	High	High	High
Romania	Low	Low	Low
Russian Federati	Low	Low	Low
Singapore	Low	Low	Low
Slovak Republic	High	High	High
Slovenia	High	High	High
South Africa	High	High	High
Spain	High	High	High
Sri Lanka	High	High	Low
Swaziland	Low	Low	Low
Sweden	High	High	High
Tanzania	Low	Low	Low
Thailand	Low	Low	Low
Togo	Low	Low	Low
Tunisia	Low	Low	Low
Uganda	Low	Low	Low
Ukraine	Low	High	Low
United Kingdom	High	High	High
United States	High	High	High
Uruguay	High	Low	High
Zambia	Low	Low	Low

Notes: This table contains 80 countries corresponding to the reference case above. The median value is used as a cut-off value of each series, so that each comprises 40 high- and low-accountability countries.

B Construction of the fiscal dataset

To explain how we construct unified disaggregated spending series following economic classifications, we start with clarifying the main differences in the exact definitions of 'current' and 'capital' concepts under GFSM2001 and GFSM1986 (see Wickens (2002) for details). First, the capital expenditure concept under GFSM2001, denoted as 'net acquisition of non-financial assets' adopts a net concept, deducting government revenue from the sales of fixed capital assets, while capital expenditure under GFSM1986, following a gross concept, does not deduct the revenue from capital sales, which is recorded as part of total revenue. Second, while capital transfers were a part of capital expenditure under GFSM1986, they are part of the current expenditure concept, denoted as 'expense', under GFSM2001. Facing these differences, we first retrieved all historical spending data available for all countries that have reported data to the IMF's GFS yearbook from 1970 to 2010 and then converted spending items under GFSM1986 into the concepts defined by GFSM2001, so that the capital spending in our spending series deducts sales revenues and excludes capital transfers, with the latter included in the current spending.

However, there is another key remaining issue to be dealt with, related to the fact that under GFSM 1986, statistics are reported on a cash basis (i.e., flows are recorded at the time cash is received or paid), while under GFSM2001, they are on an accrual basis (i.e., flows are created when economic value is created or extinguished). Specifically, the accrual concept of 'consumption of fixed capital', i.e., a decline in the value of governments' fixed assets due to physical deterioration, obsolescence, or accidental damages, exists only under GFSM2001. This implies that even after the adjustments mentioned above, the capital spending concept under GFSM1986 and GFSM2001 are still not consistent, with the former not deducting this 'depreciation' of capital. To tackle this, for the data originally retrieved from GFSM2001, we move (i.e., add) the consumption of fixed capital, initially categorised as current spending, to the capital spending component, so that the modified capital spending component becomes comparable to the ones from GFSM1986, i.e., without the depreciation deducted.

We also report that the level of government covered in the unified dataset is at the central government (CG) level. This is because under GFSM1986, countries report data at most at the CG level, although under GFSM2001 they also provide data for the general government level. We primarily use consolidated, rather than budgetary, CG level data, yet when no budget deficits data are available at the consolidated level for a country over our sample period (1970-2010), we use budgetary data for that country, to maximize the number of countries and of observations available. Note that this way of using budgetary CG data ensures that when considering fiscal series for a given country, consolidated and budgetary CG data are never mixed over time, thus no potential 'jump' in the series is created due to the usage of data from different CG levels. Nonetheless, our robustness checks consider the case where no budgetary CG level data are included.

Lastly, to construct consistent total revenue series spanning two methodologies, for the total revenue data retrieved from GFSM1986, we exclude the revenue from sales of capital assets, to make it in line with the total revenue concept under GFSM2001. Having made the current and capital spending and total revenue comparable between the methodologies, we subsequently obtain the budget deficit as a difference between total expenditure, as a sum of current and capital spending, and total revenue.

C Data sources

The GDP growth rate is obtained as the log difference over 8 years (for our reference regressions) of real GDP per capita taken from the Penn World Tables (PWT 8.0) (Feenstra et al. (2013)). Initial real GDP per capita is from the same source. All the fiscal variables are originally from the IMF's GFS yearbook. To calculate fiscal data as a ratio to GDP, GDP figures are taken from the World Economic Outlook (WEO), while exchange rate data, required for unit conversion, are from both WEO and the International Financial Statistics (IFS) databases of the IMF.

Turning to the other explanatory variables, years of schooling (for the population aged between 25 and 64) is from Barro and Lee (2010). The private investment ratio is calculated as a difference between the total investment ratio (the ratio of gross fixed capital formation to GDP, from WEO) and the share of capital spending in GDP that we assembled. The population growth rate is from WEO. Percentages of the population below 15 and above 65 years old, used in the robustness checks, are from the World Bank's World Development Indicators (WDI). The inflation rate is calculated as the relevant percentage change in CPI, from WEO. The degree of openness is obtained as the ratio of the sum of values of imports and exports to GDP, all of which are from WEO. Private credit, defined as the ratio of domestic credit to private sector to GDP, is from WDI. Price level of investment (capital formation) is from PWT 8.0, while the real interest rate is from WDI. Last, real effective exchange rates data, used to create the uncertainty measure, are from WDI and WEO.

The government accountability proxies of executive constraints, democracy/autocracy, and voice and accountability are from Polity IV (Marshall et al. (2013)), Polity IV, and the Worldwide Governance Indicators (WGI, Kaufmann et al. (2010)), respectively, while the law enforceability proxy is from the Economic Freedom of the World Annual Report (EFW, Gwartney et al. (2013)). Lastly, PPP-adjusted real GDP per capita data, used to classify countries by income level, are from WEO.

D Estimation results with democracy/autocracy as an institutional proxy

Table 10: Role of government accountability using "democracy/autocracy" as a proxy

Dependent variable: GDP per capita growth over 8 years

	Interaction with accountability level			With accountability and income levels			With accountability and enforcement levels		
Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cap spend*Highacc	7.092***	7.597***	6.286**						
	(2.329)	(2.266)	(2.565)						
Cap spend*Lowacc	2.865*	3.640**	1.025						
	(1.699)	(1.649)	(1.357)						
Cap spend*Highinc*Highacc				6.872***	7.171***	5.921**			
				(2.441)	(2.405)	(2.562)			
Cap spend*Highinc*Lowacc				−0.629	0.109	−2.697			
				(2.579)	(2.390)	(2.496)			
Cap spend*Lowinc*Highacc				6.866*	7.165**	5.915			
				(3.513)	(3.317)	(3.823)			
Cap spend*Lowinc*Lowacc				2.157	2.895**	0.089			
				(1.357)	(1.315)	(1.241)			
Cap spend*Highenf*Highacc							6.166**	6.603**	5.155*
							(2.747)	(2.718)	(2.989)
Cap spend*Highenf*Lowacc							2.239	2.895*	0.646
							(1.797)	(1.715)	(1.701)
Cap spend*Lowenf*Highacc							5.859**	6.296***	4.849*
							(2.531)	(2.379)	(2.644)
Cap spend*Lowenf*Lowacc							2.157	2.812*	0.563
							(1.694)	(1.656)	(1.441)
Cur spend*Highacc		0.505**	−0.807		0.299	−0.951		0.437	−1.010*
		(0.248)	(0.639)		(0.312)	(0.583)		(0.292)	(0.602)
Cur spend*Lowacc		0.775***	−1.840**		0.738**	−2.068***		0.655**	−1.594**
		(0.290)	(0.852)		(0.323)	(0.737)		(0.309)	(0.752)
Revenue*Highacc	0.505**		1.312**	0.299		1.250*	0.437		1.448**
	(0.248)		(0.658)	(0.312)		(0.665)	(0.292)		(0.603)
Revenue*Lowacc	0.775***		2.615***	0.738**		2.806***	0.655**		2.249***
	(0.290)		(0.847)	(0.323)		(0.813)	(0.309)		(0.760)
Deficit*Highacc	−0.807	−1.312**		−0.951	−1.250*		−1.010*	−1.448**	
	(0.639)	(0.658)		(0.583)	(0.665)		(0.602)	(0.603)	

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Regressors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deficit*Lowacc	−1.840**	−2.615***		−2.068***	−2.806***		−1.594**	−2.249***	
	(0.852)	(0.847)		(0.737)	(0.813)		(0.752)	(0.760)	
Initial GDP p.c.	−11.431***	−11.431***	−11.431***	−9.281*	−9.281*	−9.281*	−11.016**	−11.016**	−11.016**
	(3.259)	(3.259)	(3.259)	(5.120)	(5.120)	(5.120)	(4.218)	(4.218)	(4.218)
Initial Schooling	1.778	1.778	1.778	1.844	1.844	1.844	1.610	1.610	1.610
	(1.519)	(1.519)	(1.519)	(1.219)	(1.219)	(1.219)	(1.400)	(1.400)	(1.400)
Private inv/GDP	1.606***	1.606***	1.606***	1.414**	1.414**	1.414**	1.650***	1.650***	1.650***
	(0.557)	(0.557)	(0.557)	(0.581)	(0.581)	(0.581)	(0.443)	(0.443)	(0.443)
Pop growth	−6.487**	−6.487**	−6.487**	−5.720**	−5.720**	−5.720**	−6.253**	−6.253**	−6.253**
	(2.919)	(2.919)	(2.919)	(2.361)	(2.361)	(2.361)	(2.663)	(2.663)	(2.663)
Financing source	Cur spend	Revenue	Deficit	Cur spend	Revenue	Deficit	Cur spend	Revenue	Deficit
Observations	228	228	228	228	228	228	227	227	227
No. of countries	80	80	80	80	80	80	79	79	79
No. of instruments	69	69	69	79	79	79	79	79	79
Arellano-Bond AR(1)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Arellano-Bond AR(2)	0.27	0.27	0.27	0.19	0.19	0.19	0.18	0.18	0.18
Hansen	0.69	0.69	0.71	0.97	0.97	0.95	0.99	0.99	0.99
Diff Hansen 1	0.70	0.69	0.71	1.00	1.00	0.99	1.00	1.00	1.00
Diff Hansen 2	0.09	0.08	0.10	0.15	0.74	0.08	0.62	0.65	0.55
Wald, Cap spend	0.07	0.07	0.03						
Wald, Cur spend		0.28	0.33						
Wald, Cap spend, Highacc, inc				1.00	1.00	1.00			
Wald, Cap spend, Lowacc, inc				0.24	0.24	0.24			
Wald, Cap spend, Highacc, enf							0.89	0.89	0.89
Wald, Cap spend, Lowacc, enf							0.96	0.96	0.96

Notes: System GMM estimations for dynamic panel data models. Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part. Wald, Cap spend (Cur spend) tests the equality of coefficients on capital (current) spending across different accountability levels. Wald, Cap spend, Highacc (Lowacc), inc tests the equality of coefficients on capital spending across different income levels for countries with accountable (unaccountable) governments. Wald, Cap spend, Highacc (Lowacc), enf tests the equality of coefficients on capital spending across different law enforcement levels for countries with accountable (unaccountable) governments.

E Exploiting time variations in institutional proxies

Table 11: The interaction between capital spending and government accountability

Dependent variable: GDP per capita growth over 8 years

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend/GDP	−1.635	1.835	−1.756	2.299	−2.485	0.812
	(1.804)	(1.485)	(1.810)	(1.458)	(1.570)	(1.709)
Cap spend/GDP*Account	1.101**	0.298*	1.172**	0.300**	0.985**	0.264*
	(0.468)	(0.153)	(0.447)	(0.148)	(0.450)	(0.144)
Cur spend/GDP			−0.121	0.464	−0.850	−1.022*
			(0.944)	(0.372)	(1.356)	(0.605)
Cur spend/GDP*Account			0.070	0.002	−0.117	−0.035
			(0.155)	(0.042)	(0.246)	(0.070)
Revenue/GDP	−0.121	0.464			0.729	1.486**
	(0.944)	(0.372)			(1.443)	(0.590)
Revenue/GDP*Account	0.070	0.002			0.187	0.037
	(0.155)	(0.042)			(0.270)	(0.077)
Deficit/GDP	−0.850	−1.022*	−0.729	−1.486**		
	(1.356)	(0.605)	(1.443)	(0.590)		
Deficit/GDP*Account	−0.117	−0.035	−0.187	−0.037		
	(0.246)	(0.070)	(0.270)	(0.077)		
Account	−7.112	−1.368	−7.112	−1.368	−7.112	−1.368
	(4.412)	(1.129)	(4.412)	(1.129)	(4.412)	(1.129)
Initial GDP p.c.	−8.215***	−8.970***	−8.215***	−8.970***	−8.215***	−8.970***
	(2.838)	(2.779)	(2.838)	(2.779)	(2.838)	(2.779)
Initial Schooling	2.864**	2.286*	2.864**	2.286*	2.864**	2.286*
	(1.413)	(1.211)	(1.413)	(1.211)	(1.413)	(1.211)
Private inv/GDP	1.556***	1.660***	1.556***	1.660***	1.556***	1.660***
	(0.447)	(0.419)	(0.447)	(0.419)	(0.447)	(0.419)
Pop growth	−7.235**	−6.460**	−7.235**	−6.460**	−7.235**	−6.460**
	(2.936)	(2.463)	(2.936)	(2.463)	(2.936)	(2.463)
Omitted variable	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Democ	Const	Democ	Const	Democ
Observations	225	225	225	225	225	225
No. of countries	80	80	80	80	80	80
No. of instruments	74	75	74	75	74	75
Arellano-Bond AR(1)	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond AR(2)	0.06	0.06	0.06	0.06	0.06	0.06
Hansen	0.96	0.95	0.96	0.96	0.96	0.98
Diff Hansen 1	1.00	0.98	1.00	0.98	1.00	0.99
Diff Hansen 2	0.62	0.31	0.39	0.40	0.88	0.77

Notes: System GMM estimations for dynamic panel data models. Constant and time dummies are not shown for brevity. All explanatory variables were treated as endogenous except for initial GDP p.c. and initial schooling year, which were treated as predetermined. Orthogonal deviation was used to transform variables. Only one lag was used as an internal instrument to reduce the number of instruments. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Diff Hansen 1 tests the exogeneity of the instruments used in the level part (of the system) as a whole. Diff Hansen 2 tests the exogeneity of the lagged level of output used as an instrument in the level part.

F Public spending and private investment

Table 12: Interaction between public spending and private investment (full results)

Dependent variable: Ratio of private investment to GDP (8-year averages)

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Cap spend*Highacc	0.851	0.427	0.624	0.146	0.632	0.158
	(0.850)	(0.753)	(0.902)	(0.784)	(0.862)	(0.762)
Cap spend*Lowacc	0.451	0.082	0.354	0.235	−0.088	−0.227
	(0.408)	(0.394)	(0.272)	(0.250)	(0.433)	(0.343)
Cur spend*Highacc			−0.227**	−0.281***	−0.219*	−0.268**
			(0.109)	(0.100)	(0.110)	(0.116)
Cur spend*Lowacc			−0.097	0.154	−0.539	−0.309
			(0.225)	(0.284)	(0.383)	(0.402)
Revenue*Highacc	−0.227**	−0.281***			−0.008	−0.013
	(0.109)	(0.100)			(0.149)	(0.151)
Revenue*Lowacc	−0.097	0.154			0.443	0.463
	(0.225)	(0.284)			(0.330)	(0.308)
Deficit*Highacc	−0.219*	−0.268**	0.008	0.013		
	(0.110)	(0.116)	(0.149)	(0.151)		
Deficit*Lowacc	−0.539	−0.309	−0.443	−0.463		
	(0.383)	(0.402)	(0.330)	(0.308)		
Initial GDP p.c.	1.199	0.898	1.199	0.898	1.199	0.898
	(1.678)	(1.654)	(1.678)	(1.654)	(1.678)	(1.654)
Initial Schooling	−0.518	−0.523	−0.518	−0.523	−0.518	−0.523
	(0.776)	(0.761)	(0.776)	(0.761)	(0.776)	(0.761)
Price of investment	0.046	0.440	0.046	0.440	0.046	0.440
	(2.371)	(2.118)	(2.371)	(2.118)	(2.371)	(2.118)
Real ex rate uncertainty	−29.014	−33.070*	−29.014	−33.070*	−29.014	−33.070*
	(19.338)	(19.629)	(19.338)	(19.629)	(19.338)	(19.629)
Private credit	−0.119	−0.193	−0.119	−0.193	−0.119	−0.193
	(0.678)	(0.655)	(0.678)	(0.655)	(0.678)	(0.655)
Financing source	Cur spend	Cur spend	Revenue	Revenue	Deficit	Deficit
Accountability proxy	Const	Voice	Const	Voice	Const	Voice
Observations	201	201	201	201	201	201
No. of countries	77	77	77	77	77	77
Adjusted R-squared	0.220	0.233	0.220	0.233	0.220	0.233
Wald, Cap spend, p-value	0.668	0.672	0.772	0.911	0.456	0.642
Wald, Cur spend, p-value			0.598	0.135	0.414	0.920

Notes: Fixed effects estimations. Constant and time dummies are not shown for brevity. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.