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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. Empirical results based on a newly assembled dataset of 80 countries over the 1970-2010 period suggest that particularly when institutions prompt governments to be accountable to the general citizen does public *capital* spending promote growth. Taking account of the type of financing for this spending, we show that the growth-promoting effect under an accountable government appears to prevail for various financing sources, including a reallocation from current spending, an increase in revenue, and a rise in the budget deficit. However, government accountability does not seem to play a key role in the growth effects of *current* spending.

Keywords: Public spending, Economic growth, Institutions, Government accountability, Financing method
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 institutions that prompt a government to be accountable to the general public are critical for policies to yield the desired outcomes.[2]

Acknowledging this, the present paper examines the impact of institutions, particularly those affecting government accountability to the general public, on the effectiveness of public spending as a growth-promoting policy. One strong motivation behind this investigation lies in the lack of consensus in the literature regarding the effects of different spending components on economic growth, as 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, focusing on developing countries, Gupta et al. (2005) and Bose et al. (2007) show that capital spending enhances growth, whereas Devarajan et al. (1996) and Ghosh and Gregoriou (2008) argue that this spending has a growth-

[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.

[2] This paper defines institutions as the rules and organizations of a society that affect economic incentives of different agents and thus shape interactions among them.

retarding effect.[3] Further, 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 positive effects.

However, examining the role of institutions in the growth effects of different spending components entails at least three challenges. First, disaggregated public spending 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. Further, we assemble corresponding data series on total revenue, and obtain the budget deficit as a difference between total spending, a sum of current and capital spending, and total revenue. This means that our dataset with disaggregated spending items respects the government budget constraint perfectly, enabling us to examine the growth effects of different spending components for different financing sources.

Second, measuring the extent to which institutions prompt governments to be accountable to the public is not a straightforward task. To tackle this, we consider a range of different possible proxies. Specifically, the main proxies used below 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.[4] Further, we examine other possible proxies for government accountability, including "freedom of the press", which assesses the degree of both print and broadcast freedom.[5]

Third, even with the data at hand, which covers 80 countries over the 1970-2010 period in our reference analyses, estimating the role of government accountability in the growth effects of public spending entails a few

[3]Strictly speaking, a few important differences in these studies, such as the sources of financing capital spending, make it difficult to compare their results. However, the different results, even at the qualitative level, are still indicative of the absence of consensus on the growth effects of capital spending.

[4]"Constraints on executives" and "democracy/autocracy" measures are from Polity IV, while " voice and accountability" is from the Worldwide Governance Indicators (WGI).

[5]This variable is from Freedom House.

concerns for endogeneity, including fiscal variables' association with business cycles. To address this, we base our reference analyses on 8-year non-overlapping averages, yielding 5 periods per country. Also, we use the Generalized Method of Moments (GMM) dynamic panel data estimation approach developed by Holtz-Eakin et al. (1988), Arellano and Bond (1991), and Blundell and Bond (1998), to tackle other endogeneity issues. Further, robustness checks address the possible reverse causality problem explicitly, by using a lag structure in fiscal variables.

We find that institutions that prompt governments to be accountable to the general public play an important role in the growth effects of capital spending, but not in the effects of current spending. Specifically, the effects of capital spending under governments with high accountability are significantly larger than the ones under governments with low accountability. We highlight that it is this type of institutions affecting the vertical relation between a government and its citizens that plays a role in the capital spending-growth nexus, not the country's income level or the type of institutions governing the horizontal relations between citizens.[6] Only under accountable governments, capital spending appears to promote growth for different financing methods, including a reallocation from the current component, a rise in total revenue, and a rise in the budget deficit. Meanwhile, the growth effects of current spending do not seem to differ across different accountability levels. There is some indication that this spending fosters growth particularly when financed by revenue, regardless of accountability levels.

We conduct the following robustness tests. First, as mentioned, we 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 (from the 8-year averages). Fourth, we disaggregate current spending and total revenues further, particularly highlighting the public wages and taxes subcomponents, respectively. Last, we consider a specification which exploits the time variations in government accountability levels.

Importantly, while providing extensive evidence for the proposition that government accountability plays a key role in the public capital spending-

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

growth nexus, we do not claim to have proven this proposition. This is firstly because the three challenges put forward above cannot be met perfectly: the disaggregated spending data series assembled, though rendered comparable across methodologies, is an approximation; the concept of government accountability, for which we use various proxies, is intrinsically difficult to quantify; and an endogeneity concern, though tackled in various manners, is likely to remain. Secondly, the association between capital spending and growth under high accountability becomes weaker, albeit still significant, when apparent outliers are excluded. Thus, our claim is rather that the evidence for the proposition is strong enough to enhance awareness of the role of accountability in the public spending-growth nexus.

The likely role of government accountability in the growth effects of public capital spending is interpreted as follows. 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 critically 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 compromise the quality of contractors or inflate the size of projects unnecessarily. Turning to why government accountability may not play a key role in the current spending-growth nexus, our view is that 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 and thus yields smaller efficiency loss.

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 is wider, capturing also the inefficiency

due to their pure inability to conduct an efficient investment management.[7] 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.[8] This suggests the existence of politically-induced inefficiencies inherent in capital spending. This paper complements the above studies by directly estimating the impact of institutions on the relationship between public capital spending and 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. For example, Acemoglu and Johnson (2005) unbundle institutions into "property rights institutions", which protect citizens against expropriation by the government and elites, and "contracting institutions", which facilitate private contracts between citizens, and show that the worsening of the former type of institutions has larger adverse effects on growth by discouraging private investment.[9] Given that the institutions we consider, the ones prompting governments to be accountable to citizens, are essentially property rights institutions, our results add to the literature by proposing a complementary channel through which this type of institutions affects growth, i.e., the efficiency of public capital spending.

The rest of this paper is structured as follows. Section 2 describes the data and shows key stylized facts. Section 3 sets up the hypotheses to be tested and discusses empirical specification and methodology. Section 4 presents, interprets, and discusses the results. Finally, Section 5 concludes with policy implications.

[7] In fact, this way of differentiating the sources 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 highlights the importance of the former.

[8] 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.

[9] They explain this result by arguing 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.

2. Data and Stylized Facts

First, we provide a brief description of key variables, namely, fiscal variables and institutional proxies. We then present stylized facts that motivate the subsequent econometric analysis.

2.1. Disaggregated public spending and other fiscal variables

Facing the limited availability of disaggregated public spending data at the national level, 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 due to the replacement of GFSM1986 with GFSM2001. Specifically, referring to Wickens (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 detailed exposition of the data assembling procedure is found in the Online Appendix.[10] The dataset also covers the total revenue series spanning the two methodologies. Then, ensuring that data on both capital and current spending items, and total revenue, are all available in a given year for a country, we obtain the budged deficit as a difference between total spending (a sum of current and capital spending) and total revenue. The level of government covered is the consolidated central government (CG), supplemented by budgetary CG level data.[11] The analysis is not based on the general government level data, because under GFSM1986 countries reported data at most at the CG level.

2.2. 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

[10] The Online Appendix is available at: `http://www1.eeg.uminho.pt/economia/fjveiga/Papers/EER-D-15-006`

[11] 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, so 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)).

the degree of institutionalized constraints on the decision making powers of chief executives.[12] Our next proxy is the measure of "democracy/autocracy" ("democracy"), 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.[13] 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"), 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.

2.3. Stylized facts

Before conducting the econometric analysis, we present simple evidence indicative of the key role of government accountability in the nexus between public spending and growth. Fig.1 plots the share of capital spending in total spending against the growth rate of real GDP per capita, for countries with high and low government accountability.[14] Consistent with the reference regressions below (Table 3), the total of 80 countries are classified by accountability using the median of the national averages of "constraints" over the 1970-2010 period as a threshold. The share of capital spending is a non-overlapping average over 8 years (as in the regression analysis).

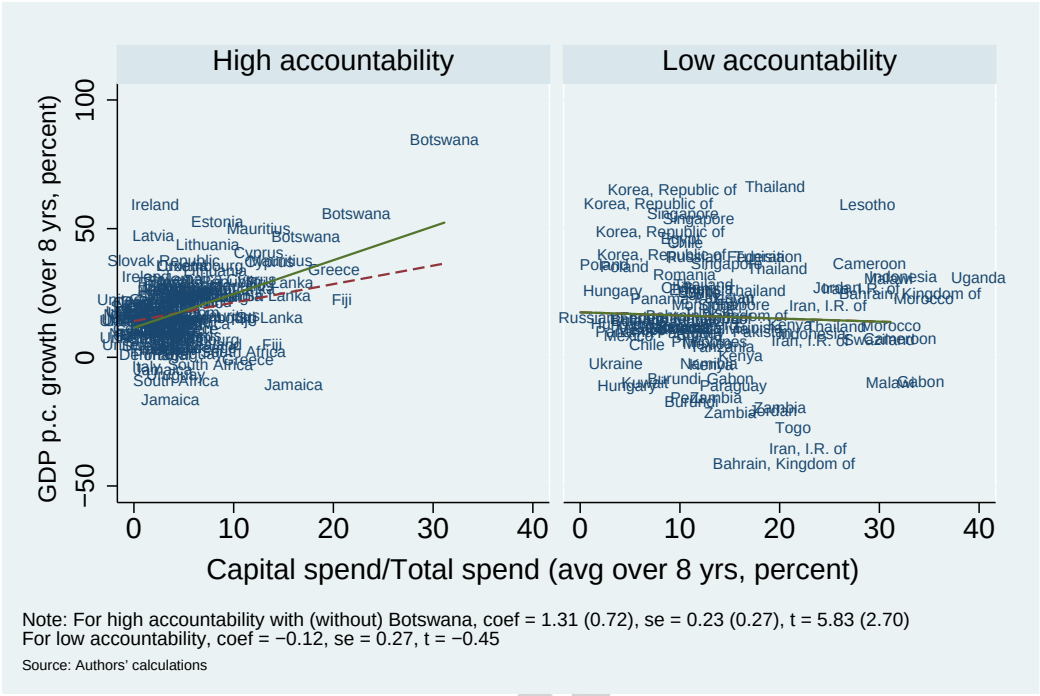
The solid OLS fitted line in the left subfigure shows that, under high accountability, the association between the share of capital spending in total spending and GDP per capita growth is positive and significant (at the 1 percent level). However, the dashed line shows that when we exclude three observations for Botswana which appear to be outliers, located in the north-eastern part of the subfigure, the association weakens noticeably, although the positive relation still remains statistically significant.[15] Turning to the low-accountability group, however, the fitted line does not exhibit any sig-

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

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

[14]The data sources are found in the Online Appendix.

[15]Even when standard errors are clustered by country, the positive and significant coefficients of capital spending under high accountability stand with or without Botswana.



Note: For high accountability with (without) Botswana, coef = 1.31 (0.72), se = 0.23 (0.27), t = 5.83 (2.70)
For low accountability, coef = −0.12, se = 0.27, t = −0.45

Source: Authors' calculations

Figure 1: Growth rates and public capital spending as a share of total spending

nificant relation. Thus, a higher capital spending share, corresponding to a lower current spending share, is associated with higher growth only under accountable governments. This suggests that institutions play a role in the public spending-growth nexus, albeit with a caveat on the potentially important effect of outliers.

3. Econometric Analysis

This section sets up the main hypotheses to be tested econometrically, presents summary statistics for the sample used in the regressions, and explains the empirical model and estimation method.

3.1. Main testable hypotheses

- *Government accountability matters in the public spending-growth nexus.* This is motivated by the stylized facts suggesting that public capital spending may be particularly growth-enhancing under governments with high accountability. This is also consistent with the previous

studies surveyed in the introduction, which indicate that the quality of institutions is positively associated with public investment efficiency.

- *The type of financing for public spending matters for economic growth.* This is based on the observation from various studies (detailed below) that different fiscal variables, including revenue and the budget deficit, affect growth differently. Testing this is important, since it helps identify the financing methods with which public spending fosters growth.

3.2. Summary statistics

We test the hypotheses conducting 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 delayed growth effects of public 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 analysis, we take the period average of fiscal variables only if at least 3 observations are available within each 8-year period.[16]

Table 1 describes the dataset using the 8-year averages, based on 228 observations from 80 countries corresponding to the reference regression equations (Table 3). The average growth rate of GDP per capita 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 spending to GDP is about 29.7 percent on average, decomposed into current and capital spending shares of 27.2 and 2.5 percent, respectively. Further, with the average total revenue of 27.7 percent, the total deficit is 2 percent. Last, 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 data sources are found in the Online Appendix.

To examine the role of government accountability in the public spending-growth nexus, the reference econometric analysis classifies countries into ones with high- and low-accountability, using the median of the national averages

[16]Robustness checks below examine different threshold values to calculate the period average. However, in general, a too stringent value critically reduces the number of available observations, while a too lenient value may not exactly reflect the actual 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.

of each accountability proxy over the 1970-2010 period.[17] Table A.6 in Appendix A divides the 80 countries used in Table 3 into 40 countries with high- and low-accountability for different proxies.[18] As seen there, while those classifications roughly match across the proxies, the match is not perfect, suggesting that each proxy may capture different institutional aspects.[19]

3.3. 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 level of output (per effective worker). A key prediction of such models is that when the initial position of the economy is controlled for, an increase in the steady-state level of out-

[17]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 persistent over time.

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

[19]The correlations among the different proxies in the form of dummy variables (i.e., a high-accountability dummy takes 1 if classified as highly accountable, and 0 otherwise) are 0.9 (0.75, 0.7) between "constraints" and "democracy" ("constraints" and "voice", "democracy" and "voice").

put leads to a higher per capita growth rate during the (seemingly) long adjustment period towards the new steady state.[20] Based on this prediction, we examine how public spending variables, treated as control variables, affect the steady state and thus the growth rate, under different government accountability levels and for different financing methods.

Formally, our empirical specification is given as

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

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.[21] As the sample covers 80 countries, our panel is characterized as "small T, large N". 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 is regarded as a convergence variable, while the latter is a proxy for initial human capital. Next, $\bar{\mathbf{f}}'_{i,t}$ is a vector of fiscal variables as control variables, all given as average values from year $t - x + 1$ to t. Further, 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.[22] Last, ν_i represents unobserved country-specific effects, and ξ_t is a time dummy, capturing global shocks.

To elaborate, the vector of fiscal variables, $\bar{\mathbf{f}}'_{i,t}\phi$, is given as

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

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

[20] In neoclassical growth models, the steady-sate growth rate is determined exogenously. See Barro and Sala-i-Martin (2004) (chapter 12) for an exposition of empirical growth analysis based on neoclassical growth models.

[21] The robustness section examines alternative settings.

[22] 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, the ratio of credit to private sector to GDP, black market exchange rates, and ruling political party ideology.

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 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 $\bar{d}_{i,t}$, overall budget deficit (i.e., total spending minus total revenue).[23]

Notice, however, that the government budget constraint indicates

$$\bar{d}_{i,t} = \bar{e}_{i,1,t} + \bar{e}_{i,2,t} - \bar{r}_{i,t}. \tag{3}$$

This implies that fiscal variables yield exact multicollinearity in Eq.2. Thus, it is necessary to leave out at least one fiscal component to estimate the model. If, for example, we leave out the budget deficit, $\bar{d}_{i,t}$, the equation we estimate becomes:

$$\begin{aligned} y_{i,t} - y_{i,t-x} = (\alpha - 1)\, y_{i,t-x} + \beta u_{i,t-x} + \sum_{j=1}^{2} (\zeta_j^H + \chi^H) H_i \bar{e}_{i,j,t} + \sum_{j=1}^{2} (\zeta_j^L + \chi^L) L_i \bar{e}_{i,j,t} \\ + (\gamma^H - \chi^H) H_i \bar{r}_{i,t} + (\gamma^L - \chi^L) L_i \bar{r}_{i,t} + \sum_{j=1}^{n} \eta_j \bar{z}_{i,j,t} + \nu_i + \xi_t + \epsilon_{i,t}. \end{aligned} \tag{4}$$

Coefficients on the remaining fiscal variables in Eq.4, estimated separately for different accountability levels, measure the effects of these variables on growth, *particularly when* financed by a change in the budget deficit, the omitted fiscal variable.[24] Specifically, the coefficients on capital and current spending capture the effects of a rise in the respective spending financed by an equal rise in the deficit. The importance of paying attention to the linear restriction implied by the government budget constraint in the estimation of growth effects of fiscal variables was emphasized by Kneller et al. (1999).

[23] 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.

[24] In interaction models with two exclusive discrete dummies such as Eq.4, 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.

Below, we leave out fiscal variables from Eq.2 alternately, to test if financing methods matter in the growth effects of public spending.

3.4. Estimation strategy

We estimate this dynamic panel data model using a GMM approach.[25] 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.[26] 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.[27] 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 level of such spending causes higher growth. Causality could in fact be reverse.

While the GMM approach yields consistent estimators, 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. In fact, as Bond et al. (2001) point out, such biases are likely to be large in the context of empirical growth models, because output tends to be largely persistent. Therefore, we below use 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 where the two equations are separately instrumented.[28]

[25] Fixed effects estimators are not suitable, because the time dimension of our sample is not long enough to make the dynamic panel bias insignificant.

[26] To handle fixed effects in our unbalanced panel, following Roodman (2009a), we transform variables through 'orthogonal deviations' (Arellano and Bover (1995)), rather than first differencing.

[27] Biørn and Klette (1999), for instance, advocate the use of GMM estimator to tackle endogeneity.

[28] Papers using system GMM estimators in growth regressions include Bond et al. (2001), Levine et al. (2000), and Rodrik (2008). Alternatively, some other 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

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 the control variables, including fiscal variables, as endogenous. To avoid the problem of instrument proliferation, we only use one lag as an internal instrument.[29] We ensure the validity of this system approach in our context, by conducting 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

First, we examine the public spending-growth nexus without taking account of institutions. Next, we consider the role of institutions in the nexus. Last, we check the robustness of the key findings and provide discussions.

4.1. Without the role of institutions considered

We study here the growth effects of public spending without taking account of countries' institutional qualities. The idea is to focus on testing the hypothesis that financing methods of public spending matter for economic growth. To see why they may matter, consider the growth effect of public capital spending. This spending, in theory, is expected to have a growth-promoting potential, by contributing to the accumulation of public capital and thus raising the productivity of private firms (Turnovsky and Fisher (1995) and Glomm and Ravikumar (1997)). However, different types of financing for this spending, including a fall in current spending, a rise in rev-

and short-run adjustment processes, with key parameters allowed to be heterogeneous (in the case of PMG, the heterogeneity is 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 disaggregated fiscal dataset is unbalanced practically prohibits us from using either of these alternative estimators.

[29]The key issue, as explained by Roodman (2009b), is that having "too many" instruments weakens the Hansen test of instruments' joint validity (mentioned below).

enue, and a rise in the budget deficit, are likely to affect growth differently, leading to different final effects of public capital spending on growth.

First, how may a fall in current spending affect growth? Although the diverse economic characteristics of current spending make it less straightforward to discern its overall effect, certain items, such as operations and maintenance (O&M) spending and wage payments in public education, may have distinct growth-promoting effects, by helping retain the functioning of public capital (Rioja (2003) and Kalaitzidakis and Kalyvitis (2004)) and fostering the accumulation of human capital (Glomm and Ravikumar (1997) and Blankenau and Simpson (2004)). Thus, although other current items such as social benefits may not be productive, current spending, in total, may still have a growth-fostering effect, implying that its fall may lower growth.[30]

A rise in revenue, another possible financing source, may also negatively affect growth, as taxes are often distortionary. For instance, corporate income taxes, often shown to be particularly distortionary, are expected to discourage firms' investment in productivity improvements and capital accumulation, and also have an adverse effect on foreign investment and entrepreneurship (Arnold et al. (2011) and Djankov et al. (2010)). Further, a rise in budget deficits can also have negative effects through various channels: by reducing capital accumulation and productivity growth; by undermining responsible decision making in spending and thus creating economic waste; and by generating more public debt and reducing fiscal flexibility as a result (Elmendorf and Mankiw (1999), Fischer (1993), and Feldstein (1995)).

To note, while it thus appears reasonable to hypothesize that financing methods of public spending items may matter, conjecturing *how* they matter (i.e., how the growth effects of spending may differ across financing methods) is not straightforward. To illustrate, while a rise in capital spending may promote growth on its own, each of the different financing methods can have an offsetting effect, making it difficult to infer a priori which of the opposing effects dominates. Acknowledging this difficulty, however, our tentative conjecture is that deficit financed-spending has the least growth-promoting potential: when persistent deficits go on too long or become too large, they may lead to sovereign debt crises, which are generally followed by sharp falls

[30]Social benefits such as pension payments may actually reduce growth, by discouraging physical capital accumulation (Feldstein (1974) and Docquier and Paddison (2003)).

in output.[31]

Having motivated the hypothesis on financing methods, Table 2 presents the results.[32] As indicated, due to the linear restriction implied by the government budget constraint (Eq.3), the coefficients of spending variables capture their growth effects, when financed by an omitted fiscal variable, an implicit financing factor. Columns (1) and (2), omitting total revenue and the overall deficit (both relative to GDP) from the respective regression equations, show the growth effect of total spending, when it is financed by a rise in these fiscal variables. Columns (3) to (5) indicate the effects of capital and current spending components separately, for different financing sources.

Column (1) shows that a rise in total spending, when financed through revenue, has a positive effect on growth, with statistical significance at the 1 percent level. Specifically, a rise in the ratio of total spending to GDP by 1 percentage point throughout the 8-year period, financed by an equal rise in revenue, leads to a 1.13 percentage points increase in the growth rate over the period, corresponding to an annual rise by about 0.14 percentage points. Meanwhile, Column (2) reveals that higher total spending has an insignificant effect on growth when financed by higher budget deficits. Further, the significantly negative coefficient on the deficit in Column (1) shows that a rise in the deficit, matched by a fall in revenue (keeping expenditure constant), reduces growth. This implies that tax cuts, which tend to stimulate the economy in the short run, may be detrimental to long-run growth when they lead to higher budget deficits. The coefficient on revenue in Column (2) is of identical magnitude with the opposite sign, because a rise in revenue, corresponding to a fall in the deficit, has exactly the opposite effect.

Column (3) shows that the effect of capital spending, when financed by a fall in current spending, is insignificant, albeit the sign is positive. This implies that, when the role of institutions is ignored, the growth effects of both

[31] See Eichengreen and Lindert (1992) on the debt crisis of the 1980s in developing countries, and Reinhart and Rogoff (2009) on a variety of crises, including government debt crises, over the last eight centuries. The recent experiences of European Union countries such as Greece and Portugal also illustrate how persistent high deficits can result in sovereign debt crises with large output costs. Even when a crisis is avoided, rising levels of public debt will increase the costs of borrowing, adversely affecting the private sector, reducing investment and growth.

[32] To facilitate comparison with the subsequent regressions where government accountability is taken into account, this table only covers observations for which all the accountability proxies are available.

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 years, 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.

types of spending are not significantly different.[33] Next, with revenue as a

[33]Note that it is difficult to isolate particular current spending components using a wide cross-country panel dataset. For example, although the GFSM2001 classification indicates that O&M spending and wage payments in the public education sector are a part of "Use of goods and services" and "Compensation of employees", respectively, the latter wider categories are not necessarily good proxies of the former ones, since they include several other current spending elements.

financing source, both capital and current spending items have significantly positive effects (Column (4)), which suggest that their growth-promoting effects dominate (possibly) growth-retarding effects of a revenue increase. Last, Column (5) shows that when the budget deficit is the financing source, both spending items have insignificant effects, implying that their growth-promoting effects are offset by the negative effects of the deficit. The symmetric nature of the analysis is again observed, as exemplified by the identical coefficients on revenue in Column (3) and current spending in Column (4).

These estimation results show the relevance of taking the financing method into account. Capital spending does not have a growth-promoting effect when financed by a fall in current spending or a rise in budget deficits, whereas it has when revenue is the financing source. Current spending also seems to foster growth, particularly when financed by a rise in revenue. In the light of the above discussions on how different fiscal variables may affect growth, these results indicate that the apparent growth-promoting effects of capital and current spending may be strong enough to dominate the possible growth-reducing effect of a rise in revenue, but not strong enough to dominate the effect of a rise in the deficit. This is in line with our prior that the budget deficit is potentially the most growth-retarding of the financing sources.[34]

Commenting on the other explanatory variables of the regressions of Table 2, the coefficient on the initial GDP per capita (expressed in percent) is significantly negative, being consistent with the conditional convergence hypothesis. The convergence rates between 12 and 13 percent (over the 8 years) imply annual average convergence rates of about 1.5 percent. 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 (Arellano-Bond, AR(2)) and validating the internal instruments in the system as a whole (Hansen test) and their subsets in the level part of the system (Difference Hansen tests).

[34]The seemingly weak growth-reducing effect of total revenue is probably due to some of the less distortionary components. For example, Arnold et al. (2011) rank property and consumption taxes as less distortionary than personal income, and corporate income, taxes.

4.2. The role of institutions

4.2.1. Institutions affecting government accountability

We now test the hypothesis on the role of institutions in the public spending-growth nexus. Our focus is on the interaction terms between spending variables and government accountability levels of each country. We first examine "constraints" and "voice" as accountability proxies.

Columns (1) and (2) of Table 3 indicate that capital spending, when financed through a fall in current spending, has a significantly 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. The effect under accountable governments appears to be economically significant: 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 the case of "constraints").[35] Next, while Columns (3) and (4) show that capital spending, financed by revenue, promotes growth in both accountability groups, a Wald test suggests that the coefficients on this spending are again significantly larger under accountable governments. Last, Columns (5) and (6) reveal that under accountable governments, even a deficit-financed rise in capital spending fosters growth, with significantly larger coefficients than the ones under unaccountable governments.

However, government accountability appears to play a more limited role in the current spending-growth nexus. When financed through revenue, this spending enhances growth regardless of the accountability level (Columns (3) and (4)), while in the cases of deficit-financing, it has a negative (albeit often insignificant) effect for both accountability levels (Columns (5) and (6)). Moreover, the Wald tests for these cases reveal that the differences in the coefficients are statistically insignificant, with the p-values ranging from 0.19 to 0.97.

[35]Notice, however, that 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 the 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
Wald, Revenue, p-value	0.21	0.19			0.25	0.61
Wald, Deficit, p-value	0.41	0.97	0.25	0.61		

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 years, 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, Revenue, Deficit) tests the equality of coefficients on capital spending (current spending, revenue, deficit) across different accountability levels.

Thus, institutions affecting government accountability appear to play a key role particularly in the *capital* spending-growth nexus. However, what is the economic reasoning behind this result? At first glance, it may seem puzzling that public capital spending fails to promote growth under unaccountable governments, as public investment has substantial growth potential through the accumulation of public capital and thus the promotion of private firms' productivity. Our response, 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.[36] 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.

However, why does government accountability not play a key role in the current spending-growth nexus? Our interpretation is that, unlike capital spending, this type of spending tends to leave only small room for discretion by officials, because it is often governed by explicit entitlements/commitments (e.g., wages, pensions, and interest payments on the public debt). This characteristic is likely to make the rent-seeking induced inefficiencies less distinct.

Besides, Table 3 still illustrates the relevance of the financing method. First, while capital spending seems to promote growth under high accountability for all financing sources, the lowest estimated coefficients are obtained when the financing source is the budget deficit, and the highest when it is revenue. Second, current spending appears to foster growth only when funded by revenue, regardless of government accountability levels.

To finish commenting on Table 3, Columns (3) and (4) (and Columns

[36]This opportunity for rent seeking usually 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.

(5) and (6), due to the symmetric nature of the analysis) show that a rise in the deficits, matched by a fall in revenue, reduces growth regardless of the accountability levels, with the Wald tests suggesting that the effects are not significantly different across them. Regarding the coefficients on the non-fiscal variables, results are in line with the ones in Table 2, except that population growth rates now have significantly negative effects. All the diagnostic tests again support the use of system GMM estimators.

4.2.2. Institutions, or income levels?

Although government accountability appears to matter in the public capital spending-growth nexus, because 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 possibility, 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.[37] Then, making high- (and low-) income country dummies, which take 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. With this double-interaction approach, we examine if income levels themselves play a significant role.

The results are summarized in Table 4, which only shows coefficients on fiscal variables for brevity.[38] The first and second rows show 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 for the respective coefficients (0.79 and 0.98 for each proxy). A similar ob-

[37] 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 33rd percentile, between the 33rd 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 33rd percentile most frequently as high-income countries. Likewise, countries that appear between the 33rd and 67th most frequently are grouped as middle-income countries, and the remaining countries as low-income countries. This way, income classifications reflect countries' income levels over the whole sample period. Last, we combine medium- and low-income countries and re-categorize them as low-income as opposed to high-income countries, so that the analysis covers a sufficient number of low-income countries.

[38] 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 years, 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.

servation can be made for unaccountable governments with different income levels. Thus, the indication is that income levels themselves appear to have limited impact on the growth effects of capital spending, as long as the level of government accountability is controlled for.

4.2.3. If institutions, does the type of institutions matter?

Next, although institutions affecting government accountability seem to influence the growth effects of public 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 between regular citizens, through the formalism of law enforcement. This type of institutions appears to be different from the one focused above, which affects 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.

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 source is the World Bank's Doing Business database.[39] To proceed, we create dummy variables by classifying countries into ones with high- and low- level of law enforceability with the median of national averages as a cut-off, and then let them interact with the government accountability dummies for the public capital spending component.[40] Note that the fact that the correlations of this enforceability dummy with the government accountability dummies are relatively low (0.22 with "constraints", and 0.27 with "voice") implies that they may indeed reflect different types of institutions.

Table 5 suggests that institutions affecting the citizen-citizen relations do not play an important role in the capital spending-growth nexus. Specifically, the first and second rows indicate that, as long as governments are account-

[39] 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, we find that whether institutions hinder the citizen-citizen relations through excessive regulations does not play a key role in the capital spending-growth nexus. The detailed results are available from the authors upon request.

[40] To be consistent with the previous analyses, we only look at the countries for which all the government accountability proxies are available, leaving a total of 79 countries.

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 years, 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.

able, capital spending tends to have a growth-promoting effect, regardless of the degree of legal enforcement. Consistently, Wald tests suggest that, for accountable governments, the differences in coefficients on capital spending across different degrees of legal enforcement are statistically insignificant. A

similar message applies when comparing coefficients across enforcement levels for unaccountable governments (see the third and fourth rows).

4.3. Robustness of the role of government accountability

We repeated the above exercises (Tables 3, 4, and 5), using "democracy" as an alternative proxy for institutions affecting government accountability. 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)), these exercises were also conducted using Vreeland's XPOLITY correction. We report that the results based on these democracy proxies (estimation results are in Tables 2 and 3 of the Online Appendix) are consistent with the ones based on the other accountability proxies. In what follows, in relation to the reference regressions of Table 3, we check the robustness of the results on the role of government accountability in the public spending-growth nexus, using the three proxies ("constraints", "voice", and "democracy").

4.3.1. Robustness tests

Modelling lagged fiscal effects explicitly. First, we examine an empirical specification with an explicit lag structure in fiscal variables. Specifically, instead of taking the period average of fiscal values, we use their initial values in each 8-year period.[41] 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 today.

Controlling for additional variables. Second, we control for various additional variables, to address omitted variable issues. In our context, it may be particularly worth controlling for demographic variables, because while aging societies tend to raise social benefits spending, a prominent part of current spending, they also imply a smaller fraction of the population in the working age category of 15-65, which can affect growth negatively (Barro and Sala-i-Martin (2004)). Accordingly, we add the percentages of the population below 15 and

[41] For example, if it is the first period of 1971-78, we only take the average of the values in 1970 and 1971, rather than taking the average over the entire 8 years. Accordingly, the system GMM procedure treats fiscal variables as predetermined, rather than endogenous.

above 65 years old to the reference specification.[42] Besides, we control for other commonly-used variables in growth regressions, such as inflation rates, the degree of trade openness, the ratio of credit extended to the private sector to GDP, and black market exchange rates.[43]

Assembling datasets in alternative ways. Third, we 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).[44] Second, while the reference analyses take the 8-year period average with at least 3 annual observations (in view of unbalanced fiscal data series), we here change the threshold value to 4 observations to make each observation closer to the real (but not observed) average, albeit losing observations.[45] Third, realizing the possibility that the use of central government (CG) level data may yield a distortion in case of a significant decentralization movement over the sample period, we re-estimate the reference regression (cf. Table 3) excluding highly-decentralized countries.[46] Last, since the analysis

[42] We assume that these two variables are exogenous, to avoid instrument proliferation.

[43] Assuming that these variables are endogenous, we add them in turn, rather than together, again to avoid instrument proliferation. We also examined the ideology of the ruling political party (left, right, or center) as an additional control. Although similar results (to adding the other controls) are obtained, its limited availability reduces the number of observations substantially.

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

[45] 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.

[46] Note that it is not feasible to repeat the analysis using only general-government (GG) level data, simply due to the severely limited data availability. To order our sample countries by the degree of decentralization, we calculate the national average of the World Bank's fiscal decentralization indicators on total spending (indicators based on capital spending are not available), using all the available, albeit limited, data over our sample period. The results below are based on estimations excluding the top 5 decentralized countries within our sample (Guatemala, Uganda, Canada, Colombia, and Denmark).

is based on the fiscal datasets which supplement consolidated CG data with budgetary CG data, we repeat the estimations using only the consolidated CG data, to ensure the legitimacy of merging the two types of CG data.

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

Exploiting time variations in government accountability. Last, 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.[47] Indeed, in the context of our dataset, strong persistence in the degree of government accountability is generally confirmed. However, in low-income countries, time variations particularly in "democracy" appear to be relatively large (not shown for brevity). Thus, we examine if the alternative approach of using time variations in accountability levels yields consistent results.

Specifically, we conduct this robustness test by adjusting Eq.2 to:

$$\bar{\mathbf{f}}'_{i,t}\phi = \sum_{j=1}^{2} \zeta_j \bar{e}_{i,j,t} + \sum_{j=1}^{2} \kappa_j \bar{e}_{i,j,t}\bar{a}_{i,t} + \gamma \bar{r}_{i,t} + \kappa_3 \bar{r}_{i,t}\bar{a}_{i,t} + \chi \bar{d}_{i,t} + \kappa_4 \bar{d}_{i,t}\bar{a}_{i,t} + \tau \bar{a}_{i,t}, \quad (5)$$

$\bar{e}_{i,1,t}$ ($\bar{e}_{i,2,t}$), $\bar{r}_{i,t}$, and $\bar{d}_{i,t}$ represent the shares of capital (current) spending, total revenue, and budget deficit to GDP, respectively, as 8-year period averages

[47] For example, Keefer and Knack (2007) and Alfaro et al. (2008) use cross-country, rather than panel, regressions to estimate the role of institutions in the level of public capital spending and in capital flows, respectively. Although Acemoglu et al. (2008) use panel regressions to examine 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.

in country i, while $\bar{a}_{i,t}$ is the accountability proxy, also as period averages. All the fiscal variables are interacted with the accountability proxy, while the latter is added separately to include all the constitutive terms of the interactions. In this setup, the marginal effect of capital (current) spending on growth depends on the accountability level: $\partial(y_{i,t}-y_{i,t-8})/\partial\bar{e}_{i,1,t} = \zeta_1+\kappa_1\bar{a}_{i,t}$ ($\partial(y_{i,t}-y_{i,t-8})/\partial\bar{e}_{i,2,t} = \zeta_2+\kappa_2\bar{a}_{i,t}$). Then, by omitting a fiscal component, we estimate the marginal effect of each type of spending, when it is financed by the particular component omitted, across different accountability levels.[48] This way, we test the consistency of the results with the previous setup with time-invariant accountability dummies.

4.3.2. Robustness test results

Tables B.7 and B.8 in Appendix B present summary results for all the robustness tests except for the last (on time-varying accountability).[49,50] Each cell in these tables shows, 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. 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. Overall, the p-values suggest that government accountability plays a key role in the capital spending-growth nexus. This is still largely the case even when wages (a part of current spending) and taxes (a part of revenue) are highlighted as financing factors (Table B.8). Regarding the effects of current spending, however, accountability does not appear to matter, for both revenue and deficit as financing sources. Again, the results indicate that the financing method matters. In particular, while current spending shows a sign of growth-promoting effects when financed by revenue, its effects are always

[48] For example, when we omit current spending from Eq.5, 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, as a function of accountability.

[49] Regarding tests with additional variables, Table B.7 only shows the results with demographic variables for brevity. The key messages remain the same even when the other additional variables mentioned above are controlled for.

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

negative (and sometimes significant) when financed by the deficit.[51]

Next, Fig.B.2 in Appendix B shows how the marginal effects of capital spending, using time-varying accountability, differ across the different levels of accountability, proxied by "constraints" and "democracy".[52] The solid line in the top-left subfigure shows that with "constraints", the marginal effect of capital spending, reallocated from current spending, becomes larger as accountability becomes higher. In fact, the 95% confidence interval (dashed line) indicates that when the proxy is high, a rise in this spending promotes growth. Further, the mid-left subfigure reveals that with the same proxy, accountability plays a similar role when the financing source is revenue. The bottom-left subfigure shows that in the case of deficit-financing, although the marginal effect becomes larger as accountability rises, the effect remains insignificant. However, when allowing for a lag structure of the fiscal variables, the effect becomes significant under high accountability (not shown for brevity).[53] Results are similar when "democracy" is used as a proxy (see right subfigures).[54] Meanwhile, Fig.B.3 in Appendix B reveals that when current spending is financed by revenue, the effects are much less responsive to the degree of accountability, and stay largely insignificant. Next, in the deficit-financed case, the marginal effects still do not appear to be sensitive to accountability. However, there is evidence of negative growth effects under high accountability, implying the relevance of the financing sources. Overall, this exercise utilizing time variations in government accountability conveys similar messages regarding the two hypotheses.

[51] As a further robustness check, we also considered the possibility that the presence of transition countries in the sample affects the results. The Online Appendix reports the results of estimations which exclude 5 ex-Soviet states (Estonia, Latvia, Lithuania, Russia, and Ukraine), and these 5 plus other 8 ex-socialist countries (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovak Republic, and Slovenia). They show that the inclusion of transition countries hardly alters the key messages.

[52] Baseline regression results are found in the Online Appendix (Table 4). "Voice" is not examined, because it is available only since 1996.

[53] One caveat of considering the lag structure in the current setup, however, is 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.

[54] While "democracy" is originally scaled between -10 (pure autocracies) and 10 (pure democracies), we here rescale so that it ranges between 0 and 10. The reason for taking this measure is to avoid the situation in which the interaction term between budget deficits and this proxy becomes positive as a product of budget surplus and autocracies (both taking a negative value), as in the product of budget deficit and democracies.

4.4. Discussions

4.4.1. 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. 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:

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

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 capita and schooling years, respectively.[55] $\bar{\mathbf{f}}'_{i,t}\phi$ 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), contain the price level of investment, the ratio of credit extended to the private sector to GDP, and real exchange rate uncertainty.[56] ν_i and ξ_t capture country and time specific effects. We estimate this static linear panel model by fixed effects.

[55] Apart from being parallel with Eq.1, there may not be a clear justification for including these variables. However, the key results are not affected by their inclusion/exclusion.

[56] 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).

Focusing on the coefficients on the interaction between spending components and accountability levels, Table B.9 in Appendix B suggests that there is no evidence of a crowding-out effect of capital spending, regardless of the degree of accountability and of the financing sources. Thus, the indication that capital spending may promote 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 accountable 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 appear to 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 accountability proxy. Further, the results stand to: 1) the inclusion of real interest rates as an additional control, as in Servén (2003), albeit reducing the number of observations; and, 2) the use of a variant of Eq.6 with a lag structure of the fiscal variables.

4.4.2. Further consideration of institutional proxies

Realizing the difficulty of measuring the degree to which institutions prompt governments to be 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". We here consider a few more potential proxies.

First, one may argue that corruption measures are also relevant proxies for government accountability. To examine this possibility, 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 citizens' political participation and constraints on politicians, 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 institutions, is associated with the level of public investment.

Next, we consider the "freedom of the press" index from Freedom House. Given that this variable, assessing the degree of both print and broadcast freedom, is already taken into account as one of the several components of "voice and accountability", we here highlight the role of this specific component in the nexus. To clarify, high media freedom is particularly associated

with active political participation by citizens (see Leeson (2008)). In this context, Table 5 in the Online Appendix shows that the higher media freedom indeed corresponds to the larger growth-promoting effect of capital spending for all the financing sources.[57]

4.5. Caveats

Lastly, we reiterate that we do *not* insist on selling the main proposition that government accountability plays a key role in the public capital spending-growth nexus. As clarified in the introduction, we openly admit the difficulty of addressing the proposition. Also, we recognize that there is evidence weakening our proposition. One example, hinted in the stylized facts, is the possible importance of outliers. Concretely, the scatter plot in Fig.1 suggests that when Botswana is excluded from the sample, the positive association between public capital spending and growth becomes weaker, albeit still statistically significant.[58] Besides, despite of the overall indication from the different robustness tests (Tables B.7 and B.8 in Appendix B), there are a few cases in which the Wald tests do not reject the equality of the estimated coefficients on public capital spending across accountability levels.

5. Conclusion

This paper examines the role of institutions in the nexus between public spending and economic growth. The results suggest that institutions which prompt political officeholders to be accountable to the general public play an important role in the capital, not current, spending-growth nexus. Specifically, to the extent that governments are rendered 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. The paper also highlights the relevance

[57] Having repeated all the robustness checks in Tables B.7 and B.8, however, we found that in some tests, this proxy does not differentiate the growth effects of capital spending as sharply as the three main proxies. This may be because not only citizens' political participation, but also other democratic features, such as transparency in policy-making processes, help reflect government accountability better.

[58] Table 14 of the Online Appendix shows that when the reference analysis (Table 3) is repeated without Botswana, the growth effects of capital spending across different accountability levels are not significantly different, though its positive and significant effects are still observed under accountable governments.

of taking the financing method of public spending into account. Notably, current spending shows a growth-fostering potential when the financing source is revenue, but not when it is the deficit, irrespective of accountability levels.

The main implication of the results is thus 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 should become mandatory. Overall, these measures would help ensure policymakers to be more accountable, and potentially promote the efficiency of public capital spending and thus economic growth.

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Appendix A. Classification of countries by institutions

Table A.6 classifies the 80 countries used in the reference regressions (Table 3) into 40 countries with high- (low-) government accountability, based on the national averages of respective proxies over the 1970-2010 period.

Table A.6: 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
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

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Country	Executive constraints	Democracy/Autocracy	Voice and accountability
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
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 Federation	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

Appendix B. Further results

See Tables B.7 and B.8, Figs.B.2 and B.3, and Table B.9.

Table B.7: Robustness: lag structure, additional controls, alternative datasets

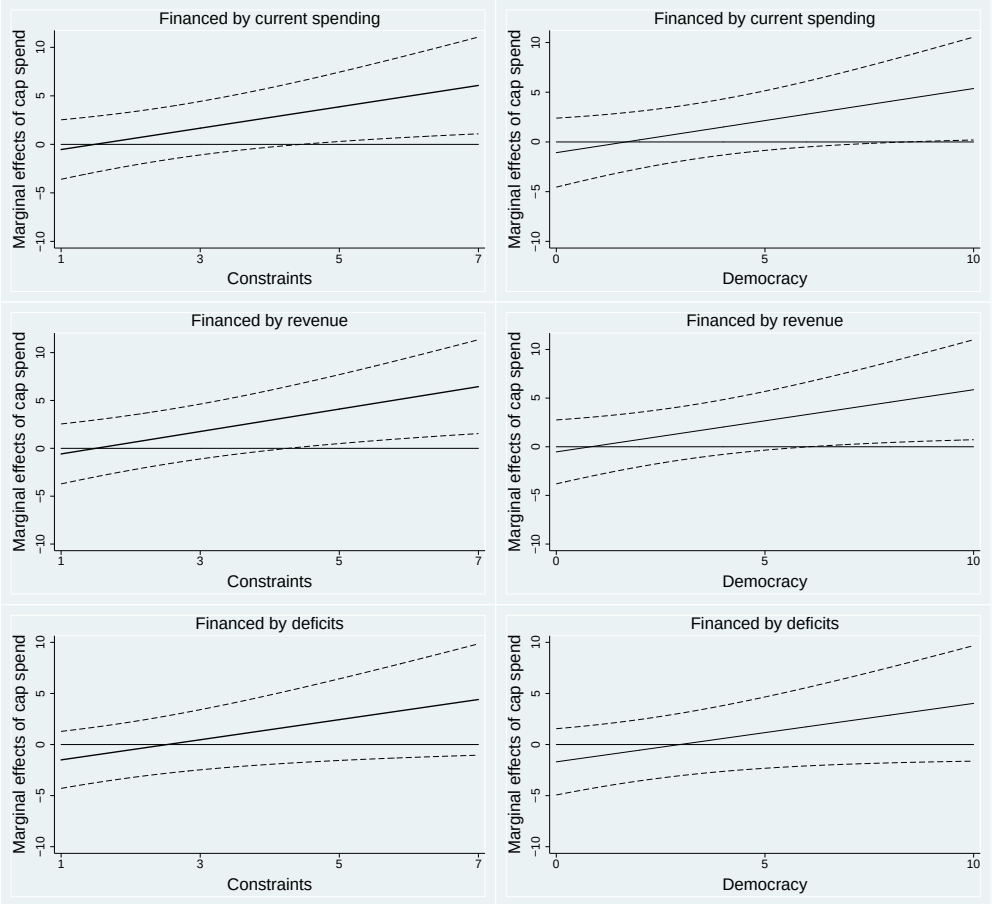
Financing source	**Spending component increased**						
Using lag structure with 8-year periods							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+***	+***	−	−	−	0.01
Revenue	+***	+***	+***	−	−	−	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 B.8: Robustness: alternative datasets (cont.), further disaggregation

Financing source	**Spending component increased**						
Without highly-decentralized countries							
	Capital spending						
	High accountability			*Low accountability*			*Wald, p-value*
	Const	Voice	Democ	Const	Voice	Democ	Average
Current spend	+***	+***	+***	+*	+*	+**	0.09
Revenue	+***	+***	+***	+**	+**	+**	0.08
Budget deficit	+***	+**	+***	+	+	+	0.04
	Current spending						
Revenue	+*	+	+**	+**	+*	+**	0.36
Budget deficit	−	−	−	−*	−	−**	0.53
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

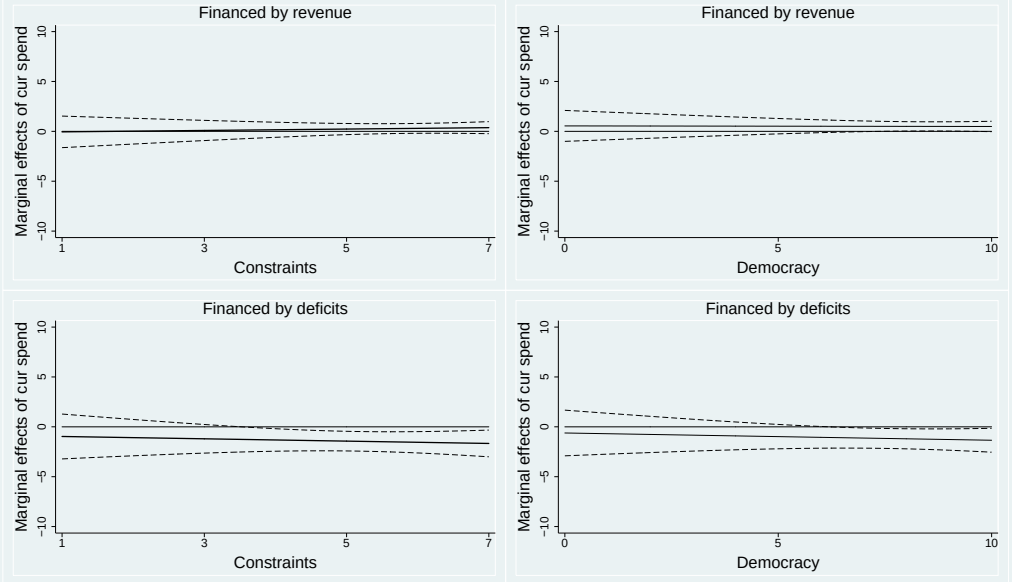
Notes: For the case without highly-decentralized countries (without budgetary central government data, with wages highlighted, with taxes highlighted), results are based on 75 (71, 76, 79) countries covering 217 (209, 209, 222) observations. + (−): growth enhancing (reducing). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The underlying estimation results are available from the authors upon request.



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

Source: Authors' calculations

Figure B.2: 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 B.3: Robustness: marginal effects of current spending on growth

Table B.9: 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)
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	0.22	0.23	0.22	0.23	0.22	0.23
Wald, Cap spend, p-value	0.67	0.67	0.77	0.91	0.46	0.64
Wald, Cur spend, p-value			0.60	0.14	0.41	0.92

Notes: Fixed effects estimations. Constant and time dummies are not shown for brevity. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Only 77 (relative to 80 in Table 3) countries are covered due to the limitation in the availability of the control variables. Wald, Cap spend (Cur spend) tests the equality of coefficients on capital (current) spending across different accountability levels.

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