

Now or Later? The Political Economy of Public Investment in Democracies



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By Sanjeev Gupta, Estelle Liu, and Carlos Mulas-Granados

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I N T E R N A T I O N A L M O N E T A R Y F U N D

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Fiscal Affairs Department

Now or Later? The Political Economy of Public Investment in Democracies*

Prepared by Sanjeev Gupta, Estelle Liu, and Carlos Mulas-Granados

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Abstract

This paper explores the impact of political and institutional variables on public investment. Working with a sample of 80 presidential and parliamentary democracies between 1975 and 2012, we find that the rate of growth of public investment is higher at the beginning of electoral cycles and decelerates thereafter. The peak in public investment growth occurs between 21 and 25 months before elections. Cabinet ideology and government fragmentation influence the size of investment booms. More parties in government are associated with smaller increases in public investment while left-wing cabinets are associated with higher sustained increases in investment. Stronger institutions help attenuate the impact of elections on investment, but available information is insufficient to draw definitive conclusions.

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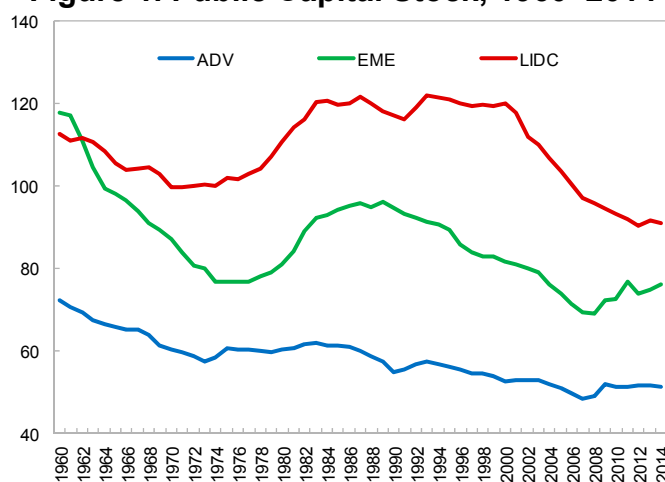
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I. INTRODUCTION

Public investment and the resulting public capital stock as a share of GDP in advanced, emerging and low-income economies has been declining since the mid eighties (IMF, 2014b). While still valid for advanced economies, recent spikes in public investment have succeeded in reversing the fall in the capital stock of emerging market and developing economies (Figure 1).¹ In all country groups, however, infrastructure gaps and bottlenecks persist. And with large output gaps coupled with an environment of exceptionally low interest rates, it is not uncommon for analysts to advocate higher public investment to promote growth (IMF, 2014b; Summers, 2014).

Figure 1. Public Capital Stock, 1960–2014



Source: IMF staff, and IMF (2014a).

Even when shovel-ready projects are available and budget processes are sufficiently strong for implementing public investment programs, public investment may not occur. We argue that it could be attributable to political considerations. This is because public investment is less noticeable before the elections than certain other types of public spending, such as increases in public sector wages and transfers. When elections approach, policymakers may seek to provide immediate benefits to voters at the expense of public investment.

Other considerations could also influence public investment decisions. For example, left-wing governments tend to prefer higher levels of public investment given their inclination for a larger role for the state. The opposite holds for governments with a right-wing orientation. Government fragmentation, fiscal rules and budget institutions may further affect the budget composition and public investment growth.

¹ Public capital stock is calculated using the Permanent Inventory Method (PIM), as described in Gupta and others (2014).

The contribution of this paper lies in using a unique database and more precise electoral cycle measures to study the impact of electoral dynamics and other political variables on public investment growth. It covers a sample of 80 advanced, emerging and low-income economies with presidential and parliamentary democracies. Different from previous studies which used election year dummies, we use months to the next election to capture more precisely the electoral cycle. Our results show that public investment starts to decelerate around two years before elections, and public investment deceleration is accompanied by an acceleration of current spending.² One year closer to the next election the growth rate of public investment declines by 0.3–0.6 percentage point. This effect is independent of whether the country is in a fiscal consolidation or fiscal expansion mode. Fiscal rules do not seem to safeguard public investment from electoral cycles. Finally, in the long run, government fragmentation and cabinet ideology are more important than elections in explaining the size of sustained investment booms. We also find some evidence stronger institutions help attenuate the impact of elections on investment, but available information is insufficient to draw definitive conclusions.

The paper is organized as follows. Section II reviews the relevant literature. Section III presents the data and some stylized facts. Section IV reports the results of the regression analysis on the baseline model and various robustness tests. Section V extends the analysis to episodes of investment boom. And section VI summarizes the main findings and concludes.

II. LITERATURE REVIEW

Since the concept of political business cycles (PBC) was first proposed by Nordhaus (1975), the literature on the political economy of fiscal policy has mainly focused on the political and institutional factors behind budget deficits. The literature can be grouped into three approaches (Eslava, 2006). The first would be the *opportunistic* approach, according to which electoral incentives influence government's budget balance. The second one could be labeled as *ideological*, and would include all the papers that see fiscal deficits as arising from conflicts of interest among different political parties with heterogeneous preferences. The third approach—which would focus on *rules and institutions*—highlights their importance behind fragmentation in the decision-making process, thereby affecting budget composition and damaging public investment. The literature on the political economy of public investment can be grouped along the same lines;

- *Opportunistic/electoral approach*: Rogoff (1990) provided a firm theoretical foundation for electoral shifts leading to changes in the composition of public spending. He showed

² Our results confirm at an aggregate multi-country level what other studies suggested at the single-country level. For example, Klein (2004) examined the political cycles in Israel, and found that in the 1980s and 1990s (a period that includes six general elections) about two years before an election public civilian consumption rose significantly, especially in the last six months before an election. Fiva and Navik (2013) also explore these issues at the municipal level in Norway.

that electoral incentives may induce the incumbent to shift public spending towards more “visible” government consumption and away from public investment. Government consumption expenditures are more “visible” before elections, while capital expenditures (e.g., infrastructure) are mostly long-term projects that increase voters’ utility upon completion. Drazen and Eslava (2010) developed this idea further and predicted that changes in composition of public spending during election periods were the result of incumbents attempting to signal that their preferences were closer to those of voters. Empirical evidence in this regard is mixed.³ Most multicountry studies at the general government level show that elections tend to shift public spending in favor of current spending and away from public investment (Schuknecht, 2000; Block, 2002; Vergne 2009; Katsimi and Sarantides, 2012). However, the evidence from single country studies (e.g., Canada, Colombia, Portugal, and Norway) suggests that at the local government level opposite forces are at play. Local elections are correlated with a shift toward “visible” investment (which at the subnational level takes the form of local infrastructure) together with targeted public transfer programs (Blais and Nadeau, 1992; Kneebone and McKenzie, 2001; Veiga and Veiga, 2007; Alesina and Paradisi, 2014).

- *Ideological/partisan approach*: In theoretical models parties of the left are expected to favor a larger government and have less aversion to public deficits than parties of the right (Tufte, 1978; Alesina and Tabellini, 1990; Alt and Lassen, 2006). The greater preference for redistribution of left-wing parties would imply more spending, on social transfers. In addition, their preference for a more activist role of the state in the provision of public physical and human capital would imply higher public investment on infrastructure, health and education. Empirical findings support the effect of partisanship on the composition of public spending (Boix, 1997; Francese, 2002; Brauning, 2005; Protrafke, 2006, 2010, 2011; Angelopoulos and others, 2012) and during fiscal adjustments, with left-wing parties opting for revenue-based adjustments and right-wing parties opting for expenditure-based ones (Perotti, 1998; Mulas-Granados, 2003, 2006; Mierau and others, 2007).⁴
- *Rules/Institutional approach*: Most of the remaining literature deals with a variety of issues, such as the role that rules and institutions play in constraining or facilitating public investment decisions. In certain cases, the focus is on the way they shape the

³ It should be stressed that PBC models are all based on the assumption of competitive elections, which is more applicable to developed established democracies, rather than to emerging and low-income countries, many of which are “new” democracies.

⁴ For further evidence on the existence of partisan effects in public spending and tax policies and on the impact of partisanship on specific categories of public spending, such as social and welfare policies, see Cusack (1997). Regarding the impact of ideology on the composition of fiscal revenues, see Hallerberg and Basinger (1998) and Belke and others (2007).

political and economic context in which governments operate. These contributions can be grouped in three broad areas:

- First, the role of electoral rules and political traditions in generating fragmented party systems and weak governments. Minority governments, divided legislatures, coalitions and multiparty cabinets, with a large number of ministers, and with a weak coordinating role for the Ministry of Finance, are all associated with fiscal profligacy and low productive investment (Hallerberg and Von Hagen, 1997; Von Hagen, Hallett and Strauch, 2001; Perotti and Kontopoulos, 2002; Hallerberg, Strauch, and Von Hagen, 2007). Institutional frameworks that reinforce and centralize budget commitments help eliminate electoral manipulation of budget cycles (Saporiti and Streb, 2008), and frequent changes in government are associated with lower average public investment (De Haan and Sturm, 1997).
- Second, the impact of good governance on the level and composition of public finances. Better governance, more transparency, less corruption, and a smaller amount of veto players are all correlated with better quality of public finances. This is true not only at the national but also at the sub-national level, where transparency helps restrict electoral manipulation of spending (Schneider, 2010; Bove and Efthyvoulou, 2013). In this respect, higher levels of public investment could just be the result of corrupt processes and inefficient public management systems.
- Finally, the impact of budget rules and institutions on the sustainability of public finances (IMF, 2014b). While the presence of golden rules have not had a differential impact in sustaining higher levels of public investment, there is some evidence that strong budget institutions have been successful in preserving investment from budget cuts during the crisis (IMF, 2014c).

III. DATA AND STYLIZED FACTS

As noted earlier, this study uses data from 80 democracies during 1975 and 2012, covering countries from all regions and income levels.⁵ We focus on elections for a national executive figure or a national legislative body, and restrict the sample to countries and periods where competitive elections have taken place. The sample excludes countries where data on public fixed capital formation are not available. Additional details on sample size and selection criteria can be found in Appendix I.

Data on fiscal variables are drawn from the *World Economic Outlook (WEO)*, including total government expenditure, interest payments and current spending. All these variables are

⁵ As fiscal data prior to 1990 are generally regarded with poor quality, we replicate our analysis using data after 1990, and find similar conclusions.

estimated at the general government level.⁶ Data on public gross fixed capital formation comes from three sources: *WEO*, World Development Indicators (WDI) and Haver Analytics.⁷

In addition, we use a number of socio-economic variables, following Shi and Svensson (2006) and Katsimi and Sarantides (2012), including real GDP growth, real GDP per capita and debt-to-GDP ratio. These variables help control for the state of the economy that might affect both the political cycle and investment decisions. Data on macroeconomic control variables, including real GDP and debt-to-GDP ratio were collected from *WEO*, while data on fiscal decentralization comes from the World Bank.⁸ Data on official development assistance (ODA) are from OECD.

We follow Katsimi and Sarantides (2012) and define our dependent variable as the annual percent change of public investment (in percent of GDP), to better capture the dynamic behavior as election time approaches. On average, the annual percent change of public investment in the sample is 0.8 percent (Table 1).

Table 1. Summary Statistics for the Main Variables

Variables 1/	Obs	Mean	Std.Dev.	Min	Max
% Δ PI/GDP	1956	0.8	19.3	-73.8	82.8
% Δ PC/GDP	1146	2.9	22.0	-88.3	229.6
% Δ RGDP	2543	3.2	4.1	-30.9	24.7
Public Debt/GDP	1510	54.1	32.1	0.0	237.3

Sources: *WEO*, WDI, Haver Analytics, and IMF staff.

1/ PI stands for public investment, or public capital formation. PC stands for public non-interest current expenditure.

Our sample confirms the evidence that public investment has declined over the last three decades across most economies (see Figure 2). At the same time, public consumption has

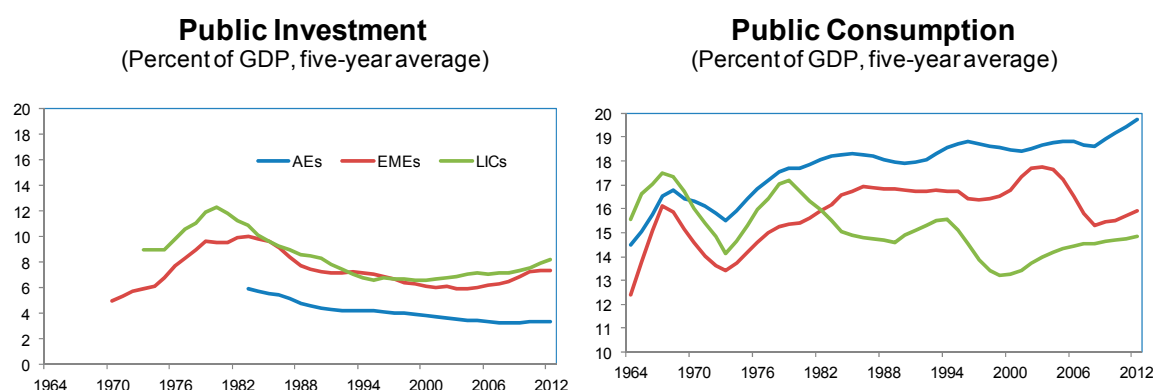
⁶ Previous studies in this area are mainly based on central government data. This is the case in papers that study aggregate fiscal variables (see, e.g., Brender and Drazen, 2005; Shi and Svensson, 2006) as well as in papers that look at the composition of public spending (see, e.g., Schuknecht, 2000; Block, 2002; Brauninger, 2005; Vergne, 2009; Katsimi and Sarantides, 2001). However, the reason why we use general government data on public gross fixed capital formation is because we have a wider sample of countries and this variable is available for a larger number of countries at that level.

⁷ Public investment is equivalent to public gross fixed capital formation in this study. Fiscal data on public investment and current spending are taken from two different sources to maximize data availability. This could however create some inconsistencies between the two components. To minimize them, we recalculated non-interest current expenditure as total government spending minus interest payments and minus public investment to ensure mathematical identity. Our series are robust to alternative matching options.

⁸ As the data on fiscal decentralization does not change dramatically for most countries over time, we take historical average for each available country.

increased moderately, in part reflecting rising health care and pension costs as well as other transfers associated with changing demographics. The long-term tradeoff between current spending and public investment seems more acute in advanced economies, especially after the recent financial crisis, when public investment suffered stronger cuts than current spending.

Figure 2. Historic Trends of Public Investment and Current Expenditure

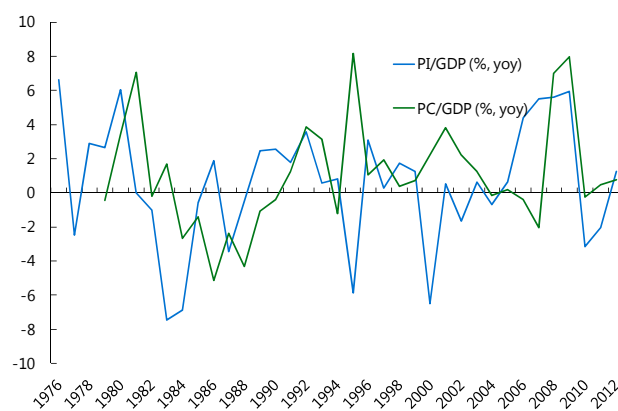


Sources: *WEO*, *WDI*, and Haver Analytics.

Note: Public consumption is non-interest current expenditure. AEs, EMEs, and LICs stand for advanced economies, emerging-market economies, low-income economies, respectively.

When we look at the annual changes in public investment and consumption, the picture shows that these two variables tend to move in opposite directions (see Figure 3). Exceptionally, these variables increased simultaneously in years of fiscal stimulus when governments sought to raise public spending during recessions (1981, 1992, and 2008). The annual change in public investment and consumption peaked at around 8 percent in 2009.

Figure 3. Annual Percent Change in Public Investment and Current Expenditure
(Sample Average)



Sources: *WEO*, *WDI*, Haver Analytics and staff calculations.

Note: PI is public investment, and PC is non-interest current expenditure.

To analyze the impact of politics on public investment dynamics, we collected data on three different independent variables:

- Our main focus is on election cycles. While previous studies used election year as a dummy variable (e.g., Katsimi and Sarantides, 2012), we created a variable which measures the months remaining to the next election to better capture the impact of election cycles. For example, if an election was held in November 2012, the variable “months to the next election” would take the value 11 in 2011, and value 23 in 2010. Data on elections dates by month and year are from the Database of Political Institutions (DPI).⁹ For countries with parliamentary system, we use legislative elections, while for countries with presidential system, we use executive elections.¹⁰ As elections approach we observe a deceleration of public investment as a share of GDP, coupled with a slight acceleration in current expenditures (Figure 4).¹¹ The observed pattern is consistent with previous findings that electoral incentives may induce the incumbent to shift public spending towards more “visible” government consumption and away from public investment goods.
- In addition, we control for the ideology or “color” of the government. The indicator for “color” comes from the DPI, and takes value 0 for right-wing governments, 1 for left-wing governments and 0.5 for center parties.
- Finally, we try to capture the role of fragmentation of the government. We use the number of ruling parties in the current government from DPI.¹²

Table 2 shows that, on average, countries in our sample held elections every four years (five years in emerging and low-income countries). Right-wing governments held office 46 percent of the time, and the average number of parties in government was 2.4.

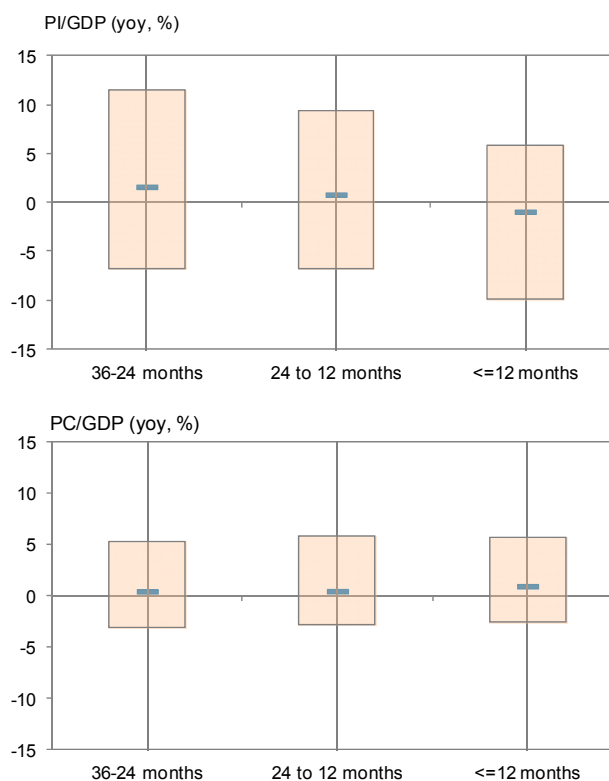
⁹ DPI is compiled by the Development Research Group of the World Bank.

¹⁰ Note that some election dates might be endogenous. For example, elections might be called earlier than its predetermined date due to adverse economic conditions arising from a slump in investment.

¹¹ The increase in public consumption in percent of GDP does not match exactly the decrease in public investment. This provides evidence in favor of the political business cycle hypothesis, according to which governments affect both the size and the composition of the budget to ameliorate GDP and increase their probability of reelection. The simultaneous increase in GDP which typically follows short-term increases in public spending, affects both the numerator and denominator of both public consumption and public investment ratios. Because the spending multipliers are different for public consumption and investment, the changes in their respective GDP ratios do not exactly match each other.

¹² We also used a coalition dummy as an alternative.

Figure 4. Public Investment and Current Expenditure
(Over 36 Months Before Elections)



Sources: WEO, and IMF staff.

Table 2. Summary Statistics for Political Variables

	Election Cycles 1/			Ideology 2/		Fragmentation	
	Number of Countries	Avg. Number of Years between Adjacent Elections	Number of Elections	Number of Observations	Percent of Time with Right-leaning Government	Number of Observations	Average Number of Government Parties
Total	80	4	611	2233	46	2721	2.4
AEs	31	4	303	1042	43	1145	2.2
EMEs	37	5	239	940	48	1201	1.8
LICs	12	5	69	251	51	375	3.2

Sources: Database of Political Institutions, staff calculations.

1/ Executive elections are used for presidential system, while legislative elections are used for presidential system.

2/ The underlying variable is 0 for right-wing government, 1 for left-wing government, and 0.5 for center parties.

Aside from the above political variables, we also examine the impact of electoral rules, various institutional variables and the existence of fiscal rules. These data come from World Development Indicators (WDI) and the Database of Political Institutions (DPI) of the World Bank, and from the fiscal rules database of the IMF.

IV. EXPLAINING SHORT-TERM CHANGES IN PUBLIC INVESTMENT

Following previous studies, we analyze the impact of politics on public investment in a dynamic fixed effects model specification.¹³

$$\% \Delta \frac{PI_{i,t}}{Y_{i,t}} = \alpha_0 + \alpha_1 * \% \Delta \frac{PI_{i,t-1}}{Y_{i,t-1}} + \beta X_{i,t} + \delta * Z_{i,t-1} + \mu_i + \varepsilon_{i,t}, \quad (1)$$

where $\frac{PI_{i,t}}{Y_{i,t}}$ is the public investment to GDP ratio in country i in year t , $X_{i,t}$ is the vector of political variables (including months to the next legislative or executive election, the government's ideology, and the number of government parties), $Z_{i,t-1}$ is the vector of other control variables (including both macroeconomic and institutional variables), μ_i is country-specific fixed effects and $\varepsilon_{i,t}$ is the error term.

Different from Katsimi and Sarantides (2012) and Potrafke (2010) who use the first difference, we use the percent change of public investment to GDP as the dependent variable so that the dynamic behavior of the variable does not depend on the level of public investment.¹⁴ We believe that the rate of growth of public investment better captures the annual changes in budget preferences of newly-elected governments. In addition, growth rates of public investment reflect future changes in public investment levels and are typically used by the private sector to identify future investment opportunities.¹⁵

On the right-hand side of the equation, we include the lagged dependent variable, since public investment dynamics might display a great deal of persistence. Consistent with the literature, macroeconomic control variables include real GDP growth, public investment-to-GDP ratio, debt-to-GDP ratio and annual change in structural fiscal balance. To avoid simultaneity bias, we use one-period lagged values. As suggested by previous findings, higher real GDP growth rate is expected to have a positive impact on public investment as growing economic activity generates more resources for capital investment; higher public investment-to-GDP ratio tends to indicate that sufficient resources are allocated for public capital stock accumulation and there is a lower need for further investment boost; higher debt-to-GDP ratio tends to be related to smaller fiscal space thus leading to lower public investment; structural fiscal balance is used as a proxy for budget constraints, and a higher fiscal balance in the previous period might indicate that there are more budget resources

¹³ See for example: Schuknecht (2000), Persson and Tabellini (2003), Brender and Drazen (2005), Katsimi and Sarantides (2012).

¹⁴ Fixed effects alone could not capture all country specific characteristics, if these characteristics do not have a high correlation. Also, when analyzing the impact of months-to-election, which is a time-variant variable, the percent change in public investment is more suitable to capture the dynamics rather than the level.

¹⁵ Our results are robust to the use of public investment-to-GDP ratio as the dependent variable. The results are available from authors on request.

available but may also be a sign of an ongoing fiscal consolidation thus impacting public investment negatively.

Three political variables are introduced on the right-hand side of the equation as potential explanatory variables, including months-to-next election, the ideology of the government, and the number of government parties.¹⁶ We expect that distance from elections, left-wing cabinets and multiparty governments to be associated with growing rates of public investment. Our baseline model focuses first on the role of months-to-next elections, both in standard and squared terms.

Before estimating the model, we test for unit roots in our data, given the presence of the lagged dependent variable. Test results (Appendix Table A3) show that we can reject the null hypothesis of non-stationarity at the 1 percent significance level.¹⁷

Baseline model: the role of elections

We use fixed-effect panel regressions in our benchmark model, and complement it with OLS and GMM estimations.¹⁸ The inclusion of a lagged dependent variable introduces a potential bias by not satisfying the strict exogeneity assumption of the error term, and this is why the model is also estimated by using GMM, following Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998).¹⁹

Additional bias might exist in the benchmark model. First is reverse causality. As fiscal variables are closely linked to macroeconomic variables, such as real GDP growth, reverse causality exists. As an attempt to address this issue, we use lagged macroeconomic variables in the model and use system GMM with instruments (i.e., sample average debt-to-GDP ratio as instrument for the debt-to-GDP ratio, and sample average real GDP growth as instrument for the real GDP growth) to double check the robustness of the model. Second, with large N and small T panel data, there is potential cross-section dependence. We tested for cross-sectional dependence in the fixed-effects models. The test results strongly reject the null hypothesis of no cross-sectional dependence. Therefore, we use an adjustment proposed by

¹⁶ When there is a multiparty government, the government's ideology corresponds to the party with the highest number of posts in the cabinet.

¹⁷ The qualitative results in all regressions do not significantly change when we exclude year effects.

¹⁸ We tested for cross-sectional dependence in the fixed effects and OLS models. The test results strongly reject the null hypothesis of no cross-sectional dependence.

¹⁹ Note that applying Arellano and Bond (1991) or Arellano and Bover (1995)/Blundell and Bond (1998) GMM estimators does not alter our results. Note also that the estimated bias of this formulation is of order $1/t$, where T is the time length of the panel, even as the number of countries becomes large (see among others Nickell, 1981; Kiviet, 1995). The average time series length of our panel depends on the fiscal indicator, but in general is around 10 years and the bias is probably not large, but we still use the system GMM as a sensitivity test.

Driscoll and Kraay (1998) to ensure that standard errors are robust to heteroscedasticity. Third, as we use months-to-next election as an independent variable, there might be a common time trend across countries which might bias the coefficient of the election variable. To deal with this potential bias, we add a time dummy to check the robustness of the results.

Table 3 summarizes the main model specifications estimated for the sample period.²⁰ Columns (1)–(4) use country fixed effects with Driscoll-Kraay robust standard errors, while column (5) adds time fixed effects and column (6) controls the level of structural budget balance in the previous period. Column (7) uses simple OLS and Column (8) uses system GMM with lagged explanatory variables and sample average debt to GDP ratio as instruments. Significance levels are indicated by the standard star notation and standard errors are included in parenthesis.

Table 3. Benchmark Results: Impact of Election Cycles

Dependent Variable	(1)	(2)	(3)	%ΔG.investment/GDP		(6)	(7)	(8)
			Country Fixed Effects	(4)	(5)	with time dummy	with SFB	System GMM
# of Months before Election	0.660*** [0.184]	0.624*** [0.187]	0.626*** [0.188]	0.642*** [0.208]	0.642*** [0.205]	0.511*** [0.133]	0.647*** [0.199]	0.374* [0.21]
# of Months before Election ²	-0.013*** [0.005]	-0.012** [0.005]	-0.012** [0.005]	-0.015*** [0.005]	-0.014*** [0.005]	-0.011*** [0.004]	-0.013** [0.005]	-0.008* [0.004]
L.dependent Variable		0.013 [0.039]	0.042 [0.039]	0.024 [0.045]	0.016 [0.044]	-0.031 [0.056]	-0.009 [0.053]	0.037 [0.197]
L.PI/GDP			-1.134** [0.540]	-3.420*** [0.532]	-3.321*** [0.530]	-4.994*** [0.741]	-0.511** [0.213]	-5.764** [2.649]
L.%ΔRGDP				0.394** [0.154]	0.439*** [0.132]	0.315 [0.199]	0.805*** [0.137]	0.536 [0.716]
L.Debt/GDP				-0.072* [0.042]	-0.074* [0.042]	-0.105** [0.039]	-0.007 [0.024]	-0.223 [0.141]
%Δstructural balance/GDP						0.068 [0.272]		
Constant	-5.261*** [1.505]	-4.968*** [1.403]	0.706 [2.864]	-4.277** [1.935]	8.282** [3.639]	16.917*** [4.992]	-13.781*** [3.180]	8.2 [12.871]
Hansen test								0.11
AR(1)								0.04
AR(2)								0.35 38
# of instruments				0.10	0.10	0.14	0.06	
R-square	0.02	0.01	0.00	0.10	0.10	0.14	0.06	
Countries	80	80	80	76	76	44	76	76
Observations	1285	1220	1220	844	844	580	844	844
Peak investment growth (# of month before election)	26	26	27	21	23	23	25	22

Note: Column (1)–(4) presents regression with Driscoll-Kraay standard errors. Column (5) uses sample average debt-to-GDP ratio as instrument. The number of months at which public investment growth peaks is calculated using the coefficients of the standard and square terms of the months-to-election variable.

All models point to a significant impact of elections on the pace of public investment, confirming our hypothesis that distance from elections is associated with investment

²⁰ We concentrate on the 36 months before the election in order to help us capture the impact of a new government following elections.

acceleration.²¹ Higher real GDP growth rate is significantly linked to higher public investment growth. High initial public investment and high public debt have a negative impact on subsequent public investment growth. These results suggest that when the next election is one year (12 months) closer, the annual change of public investment is likely to decrease by 0.3 to 0.6 percentage points. The negative coefficients on the squared term of months-to-next election suggest a nonlinear dynamic behavior of public investment before elections. Using both coefficients for the standard and squared terms of the electoral variable, we see that the growth rate of public investment peaks around 21–25 months before the elections (See Figure 5).

Results are consistent with Rogoff's (1990) hypothesis that rents from staying in office and information asymmetry induce incumbents to manipulate fiscal policy towards "visible" public goods.²²

In our view, the nonlinear pattern suggests that governments tend to frontload investment in capital projects at the beginning of their terms, shifting spending towards other items as the next election approaches. This said, we recognize that the observed pattern may be attributable to overlapping of capital project cycles with electoral cycles. The initial phase of the project cycle tends to be time consuming (in terms of project appraisal and selection) and the newly elected governments may require time to start implementing capital projects. However, no project level data are available to test the validity of this hypothesis in diverse set of countries, such as those included in the study. The only evidence on 258 rail, bridge, tunnel, and road projects in twenty countries suggests that the average project cycle is different from the standard electoral cycle (Flyvberg, 2009).

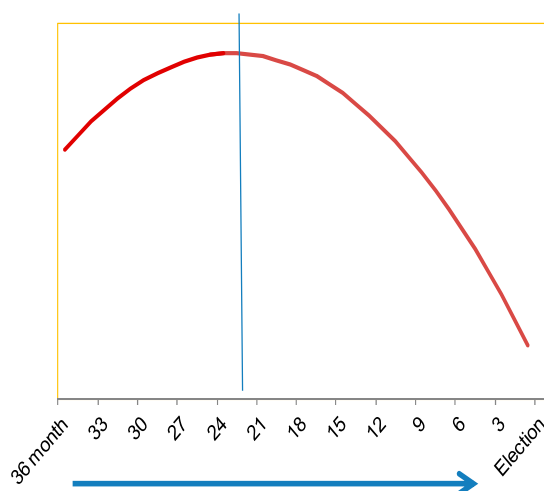
Table 4 provides additional tests on the nonlinear impact of months-to-next election on public investment. Instead of the squared term, we added the interaction of the electoral variable with three dummy variables, capturing periods within 36-to-28 months, 28-to-18 months and 18-to-0 months before the next elections.²³ The coefficients of the interaction terms suggest that between 28 and 36 months (2¼ and 3 years) prior to elections public investment accelerates, and this trend lasts until 18 months (1½ year) before the election takes place. Thereafter, public investment decelerates rapidly. Figure 5 plots the estimated behavior of the pace of public investment over 36 months before elections.

²¹ The high statistical significance of the "months-to-election" variables combined with a low R-squared in all regressions shows that there is high-variability in the data around the fitted regression line. This calls for the need to take into account country specificities when using these regression coefficients for making predictions. Note, however, that higher R-squared values (of around 0.6) are obtained when the dependent variable is redefined in terms of public investment level (see footnote 16).

²² Appendix IV provides a simple test for the tradeoff between public investment and current expenditure.

²³ 28 and 18 months are equivalent to 75 and 50 percentile of months-to-next election variable, within a three-year period prior to the election.

Figure 5 and Table 4. Public Investment Deceleration
(Percent of GDP)



Dependent Variable	%ΔG.investment /GDP
# of Months before Election	1.551** [0.567]
# of Months * dummy (=1 if 28-36 months to election)	-1.702** [0.735]
# of Months * dummy (=1, if 18-28 months to election)	-2.582*** [0.570]
# of Months * dummy (=1, if within 18 months of the election)	0.578 [0.757]
Dummy=1 (if 28-36 months to election)	16.182 [18.786]
Dummy=1 (if 18-28 months to election)	30.983*** [6.544]
Dummy=1 (if within 18 months to election)	0.154* [0.079]
..	..
R-square	0.15
Countries	76
Observations	844

Standard errors in brackets.
* p<0.10, ** p<0.05, *** p<0.01.

Note: The figure is derived from results in column (3), Table 3. The regression is controlled with country and time fixed effects. Lagged dependent variable, real GDP growth, public investment-to-GDP ratio and debt-to-GDP ratio are other control variables.

Robustness: controlling for potentially omitted variables

As discussed above, the baseline specification may suffer from omitted variables' bias. To check the robustness of our results, we include additional variables in our baseline model. These variables include the ratio of official development assistance (ODA) to GDP, the degree of expenditure decentralization, the shares of seniors (>65 years old) and youngsters (<16 years old) in total population. The inclusion of these variables is motivated by the need to control for specific country characteristics related to the level of development and the demographic profile, which are likely to introduce structural rigidities in the size and composition of public spending. The inclusion of the degree of expenditure decentralization tries to test the potential bias in the use of central government election to analyze general government investment decisions. Results in Table 5 show that our benchmark model is mostly robust and the coefficients of the variable that measures the number of months-to-next election are largely stable.²⁴ In particular, when the level of expenditure decentralization is used as a control, the coefficient for the standard term of electoral cycles goes up (column 4). This confirms our earlier hypothesis that by focusing on central government elections, we underestimate the impact of electoral cycles.

²⁴ The variable months-to-next election turns less significant only in the model with ODA, due to a reduced number of observations.

Table 5. Robustness Check: With Omitted Variables

Dependent Variable	%ΔG.investment/GDP				
	(1) Baseline	(2) With ODA	(3) Expenditure Decentralization	(4) Old Population Share	(5) Young Population Share
# of Months before Election	0.642*** [0.205]	0.962* [0.498]	0.724*** [0.210]	0.839*** [0.231]	0.491** [0.203]
# of Months before Election ²	-0.014*** [0.005]	-0.021 [0.013]	-0.013** [0.005]	-0.016*** [0.005]	-0.016*** [0.005]
L.ODA/GDP		0.878* [0.505]			
# of Months before Election*Expenditure Decentralization			-0.005*** [0.002]		
# of Months before Election*Old Population share				-0.015* [0.007]	
# of Months before Election*Old Population share					0.008 [0.005]
Countries	76	52	60	75	75
Observations	844	406	710	835	835
R-square	0.10	0.11	0.14	0.10	0.11
Peak investment growth (# of month before election)	21	23	27	27	15

Standard errors in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

Note. All models include country and year fixed effects. Other control variables not shown in the table are lagged public investment to GDP ratio, lagged real GDP growth, lagged debt to GDP ratio, and lagged annual change in structural fiscal balance.

Robustness: controlling for country and election characteristics

An additional concern when working with a heterogeneous sample has to do with the potential presence of group characteristics that cannot be captured using country fixed effects. We therefore perform an additional round of robustness checks to control for the level of development (advanced vs. emerging economies), the age of each democratic country (old vs. new democracies) and the relative efficiency of public investment (high vs. low efficiency).²⁵ In addition, since election dates may not be exogenous, and can be called earlier in many parliamentary and presidential democracies, we perform alternative tests to make sure that our results are also robust to the presence of endogenous elections.²⁶ Table (6) compares our baseline results with additional regressions along the lines discussed above. Our results are robust to these additional tests, but interesting nuances emerge.

²⁵ Data for public investment efficiency is taken from IMF (2015).

²⁶ Information for endogenous elections is from NELDA database by Hyde and Marinov (2012).

Overall, in advanced economies, old democracies and countries with high investment efficiency public investment growth tends to peak much later during the electoral cycle (see Figure 6). Also, the deceleration of public investment is lower in magnitude, implying a milder investment fluctuation due to electoral cycles. The observed pattern could be explained from three complementary perspectives: (1) public investment processes are more robust in advanced economies which are mostly old democracies, and the scope for manipulating public investment to enhance reelection possibilities is thus lower than in countries with weaker institutions; (2) in mature democracies there are less information asymmetries and the electorate punishes electoral manipulation of spending by the government; and (iii) in mature democracies incumbent governments have other means to show their “competencies” to the electorate and do not need to signal them through spending manipulation as predicted by Rogoff (1990).²⁷

Table 6. Robustness Check: With Different Samples

Dependent Variable	%?G.investment/GDP							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline	Aes	EMs	Old Democracy	New Democracy	Non-endogenous Elections	Higher Public Investment Efficiency	Lower Public Investment Efficiency
# of Months before Election	0.642*** [0.205]	0.511** [0.097]	1.181** [0.480]	0.320* [0.163]	0.780* [0.387]	0.583** [0.253]	0.831*** [0.275]	0.381 [0.442]
# of Months before Election*2	-0.014*** [0.005]	-0.012*** [0.003]	-0.027** [0.012]	-0.008** [0.004]	-0.017** [0.010]	-0.012* [0.007]	-0.024 [0.007]	-0.008 [0.011]
L.dependent Variable	0.016 [0.044]	0.053 [0.064]	-0.008 [0.066]	0.029 [0.105]	0.015 [0.042]	-0.01 [0.060]	-0.11 [0.096]	0.008 [0.054]
L.PI/GDP	-3.321*** [0.530]	-5.042*** [0.874]	-3.344*** [0.705]	-4.227*** [1.124]	-3.280*** [0.524]	-3.382*** [0.489]	-2.045** [0.851]	-4.096** [1.533]
L.%?RGDP	0.439*** [0.132]	0.324** [0.124]	0.405* [0.203]	0.21 [0.235]	0.527*** [0.172]	0.660*** [0.130]	0.856*** [0.234]	0.434 [0.288]
L.Debt/GDP	-0.074* [0.042]	-0.177*** [0.026]	0.133 [0.090]	-0.156*** [0.028]	-0.01 [0.065]	0.04 [0.066]	-0.08 [0.126]	-0.077 [0.141]
Constant	8.282** [3.639]	20.197*** [4.366]	-11.528 [7.291]	17.822*** [5.930]	0.997 [7.237]	0.324 [4.663]	2.357 [10.860]	7.598 [13.194]
Countries	76	31	45	19	57	57	26	32
Observations	844	459	385	308	536	567	233	294
R-square	0.10	0.19	0.09	0.15	0.10	0.11	0.11	0.09
Peak investment growth (# of month before election)	21	21	22	20	23	17	18	23

Standard errors in brackets.

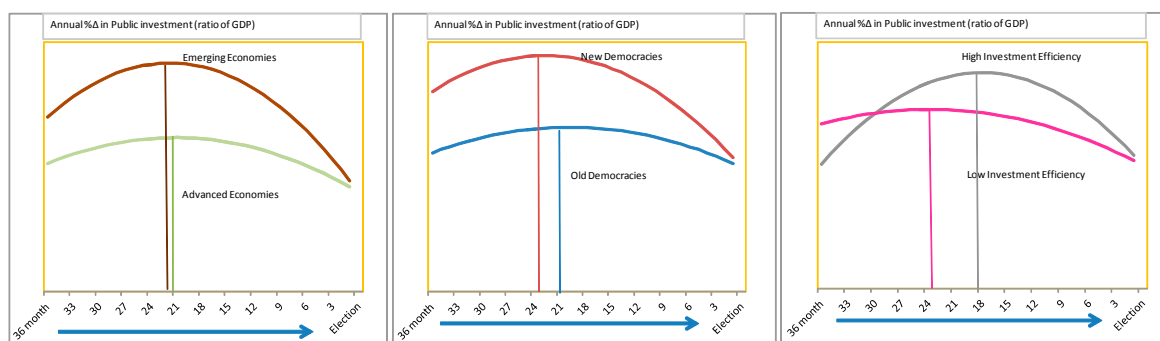
* p<0.10, ** p<0.05, *** p<0.01.

Note: All models include country and year fixed effects. Other control variables not shown in the table are lagged public investment to GDP ratio, lagged real GDP growth, lagged debt to GDP ratio, and lagged annual change in structural fiscal balance.

Note: AEs and EMs refer to advanced economies and emerging economies, both following the classification used in *World Economic Outlook*.

²⁷ Note that in Rogoff’s model, the government distorts allocations because it is striving to signal its “competence” in the eyes of voters under asymmetric information. Since voters do not observe public investment and economic growth immediately, the only way for a “competent” incumbent to signal its “competence” is to increase readily identifiable transfers ahead of elections, inducing voters to believe that the government will bring economic growth and revenues to finance those transfers.

Figure 6. Public Investment Dynamics of Different Samples
(Annual percent change in public investment, ratio of GDP)



Robustness: controlling for fiscal rules

Finally we test the sensitivity of our baseline results to the existence of different fiscal rules in different countries. A fiscal rule imposes a long-lasting constraint on fiscal policy through numerical limits on budgetary aggregates. Fiscal rules typically aim at correcting distorted incentives and containing pressures to overspend, particularly in good times, so as to ensure fiscal responsibility and debt sustainability. Recent evidence has shown that the golden rule helped preserve public investment following periods of fiscal contraction (IMF, 2014c). However, additional tests performed on our sample suggest that fiscal rules do not have any significant impact on how the election cycle affects public investment growth, and the baseline model remains robust (See appendix Table A4 for details).

Robustness: analyzing the potential role of ideology and government fragmentation

Finally, we turn to the analysis of the role that ideology and government fragmentation have on public investment. We proceed in two steps: first we include those variables in the baseline model which includes the variable months-to-next election in its standard and squared forms, and then we estimate an alternative specification which analyzes the impact of these additional political variables on the accumulated change in public investment before elections.

Table 7 presents the results of adding to the baseline model two variables that measure the number of government parties and the cabinet's ideology (both in isolation and in interaction with the electoral variables). Overall, the coefficients of months-to-next election remain stable. Ideology does not seem to affect public investment significantly, but government fragmentation does have a significant impact on public investment.²⁸ A large number of

²⁸ Ideology of the government is used for parliamentary system, while ideology of the executive is used for presidential system. However, as there is a high correlation between the government and executive ideology, our results do not change significantly by using either of the two ideology variables as an alternative.

government parties are associated with higher rates of public investment growth.²⁹ At the same time, when this variable is interacted with months-to-next election, the negative impact is stronger than in the baseline specification. This suggests that more fragmented governments seek to satisfy multiple constituencies at the same time. As a consequence, at the beginning of each term a fragmented government has a higher rate of public investment, but as elections approach it reduces public investment rapidly in order to create space for current spending to satisfy different electoral constituencies.

Table 7. The Baseline Model with Ideology and Fragmentation

Dependent Variable	%ΔG.investment/GDP		
	baseline	Interaction with Color	# of Government Parties
L.dependent Variable	0.016 [0.044]	-0.008 [0.055]	0.070** [0.031]
L.PI/GDP	-3.321*** [0.530]	-3.164*** [0.562]	-2.558*** [0.563]
L.%ΔRGDP	0.439*** [0.132]	0.522*** [0.165]	0.526*** [0.176]
L.Debt/GDP	-0.074* [0.042]	-0.067 [0.042]	-0.137*** [0.021]
# of Months before Election	0.642*** [0.205]	0.639*** [0.178]	0.828*** [0.215]
# of Months before Election ²	-0.014*** [0.005]	-0.015*** [0.004]	-0.018*** [0.005]
# of month before election*political variables		0.037 [0.089]	-0.027* [0.015]
political variables		0.587 [2.283]	0.594 [0.500]
Constant	-347.952** [158.938]	-397.317** [148.664]	-462.075*** [151.863]
Countries	76	70	52
Observations	844	707	638
R Square	0.10	0.11	0.12

Standard errors in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

Note: we only consider months within three years of elections. All regressions include country and time fixed effects.

²⁹ The number of government parties might not be a precise representation for fragmentation. For example, the degree of fragmentation is likely lower in a parliament where one party takes the majority, regardless of the number of parties in government. In addition, government fragmentation might have different implications in presidential and parliamentary systems. We conducted additional tests, with the existence of a majority government as a control and divided the sample into parliamentary and presidential systems. The results remained robust.

Table 8 presents the results of an alternative specification in which we use a different dependent variable. Instead of using the annual percent change in public investment (in percent of GDP), we use as a dependent variable the change in the share of public investment over a three-year period (in percent of in GDP and in percent of total spending). In addition, we focus only on the role of ideology and fragmentation in the entire sample and in a subsample of pre-electoral years. In the latter case, the dependent variable describes the change in public investment before each election. In this specification, the variable that measures government fragmentation loses explanatory power in favor of the cabinet's ideology. These results provide additional support to the hypothesis that left-wing governments are associated with larger changes in public investment.

Table 8. Alternative Specification for Ideology and Fragmentation

Dependent Variable	As Share of GDP		As Share of Total Expenditure	
	Entire Sample	Before Election	Entire Sample	Before Election
L.% of RGDP	2.297*** (0.249)	2.448*** (0.452)	2.837*** (0.376)	3.532*** (0.667)
# of Government Parties	-1.130* (0.684)	-1.348 (1.222)	0.301 (0.684)	0.337 1.563
Ideology of Government (1=left, 0=right)	8.296*** (0.684)	9.173** (1.222)	8.598*** (0.684)	11.188*** (4.827)
Constant	-5.427*** (2.159)	-5.234 (3.978)	-12.543*** (2.889)	14.118*** (5.325)
N	1404	336	764	188
R-sq	0.07	0.102	0.087	0.161
Log. Likelihood	-7000	-1600	-3800	-908

Standard errors in brackets.

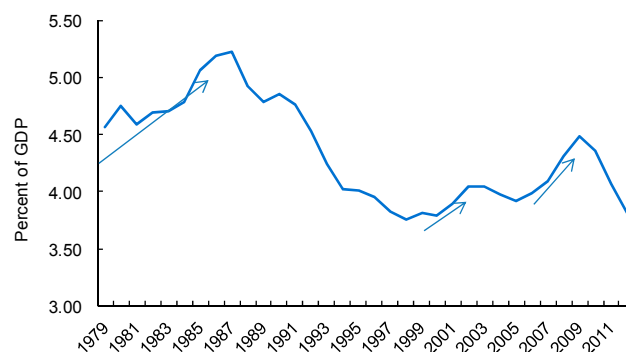
* p<0.10, ** p<0.05, *** p<0.01.

Note: Dependent variable is the total change of public investment over three-year period.

"Before election" refers to 36 months before the election. We obtain similar results for time period of 48–60 months before the election.

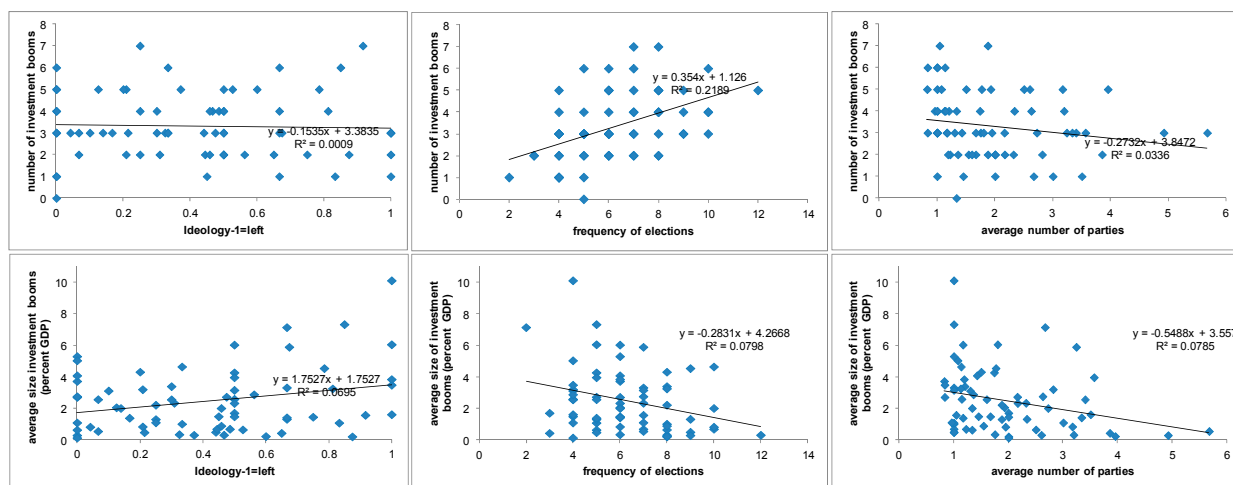
V. THE ROLE OF POLITICAL VARIABLES DURING MULTIYEAR INVESTMENT BOOMS

Episodes of sustained public investment are normally longer than short-term electoral cycles. In general, they are the result of long-term strategies to expand the productive capacity of economies. Attempting to expand potential output, governments invest in public capital for several years. For example, between 1980 and 2012, the United States had three episodes of sustained increase in public investment (Figure 7). Therefore, while electoral cycles may affect short-term public investment as shown in previous sections, it is unclear if elections affect the number and the size of sustained public investment cycles.

Figure 7. Public Investment in the United States, 1975–2012

In order to explore these long-term dynamics, we reorganize our sample and redefine our dependent variable in this section. We identify multiyear episodes of sustained expansion in public investment by coding major trough-to-peak cycles and calculate the change in public investment during each of these booms. Between 1975 and 2012, we identify a total of 264 episodes of investment booms in the 80 countries in our sample. In this section, the new dependent variable is the change in public investment from the lowest level of the episode (trough) to the highest level of the episode (peak). The average size of those investment booms is 3.8 percent of GDP, with a maximum increase of 26 percent of GDP in Lesotho between 1978 and 1982 and a minimum increase of 0.3 percent of GDP in the United States between 1998 and 2003.

Looking at different episodes on a country-by-country basis, bilateral correlations show a positive association between the number of elections and the number of investment booms in each country. At the same time, a higher number of elections are correlated with a lower average size of each investment boom (Figure 8). Similarly, a lower number of government parties and left-wing governments seem to be correlated with a larger size of investment booms.

Figure 8. Political Variables and the Number and Size of Investment Booms

We estimate a reduced form model in which the dependent variable is the size of investment booms in an unbalanced panel of 264 episodes of sustained increases in investment. Among the independent variables we include a dummy variable to capture if the country was hit by an earthquake or a flood in the two years preceding the investment boom, together with the initial level of public investment and GDP per capita.³⁰ We also include the three standard political variables already described in the previous sections to measure the number of elections held during each investment boom, the degree of government fragmentation proxied by the average number of governing parties during each investment episode, and the average color of the governments that were in office during those periods. Finally, we also run a regression where we include a qualitative variable to test if stronger budget institutions are associated with larger investment booms.³¹

The model is estimated using robust standard errors and fixed effects. Results in Table 9 show that a higher number of elections has a negative and significant impact on the size of multiannual investment booms, suggesting that electoral cycles affect both short and longer term public investment. Interestingly, cabinet ideology and government fragmentation have a significant impact on the size of multiannual investment booms, while they were not relevant explanatory factors in the baseline model that we used earlier in the paper to study the short-term dynamics of public investment. A growing number of parties are strongly associated with lower size of investment booms, while left-wing cabinets tend to increase the size of

³⁰ Data on earthquakes and floods is available at the Center for Research on the Epidemiology of Disasters (<http://www.emdat.be/>).

³¹ Data on the strength and quality of budget institutions covering 35 countries is limited to one observation per country, and is based on IMF (2014b).

those episodes.³² The variable that measures the strength of budget institutions shows a positive sign but is not statistically significant.

Table 9. The Political Economy of Public Investment Booms

Episodes of Investment Boom (Change through-to-peak)	Δ PublicInvestment/GDP				
Initial Natural Disasters	0.4886 [1.12]	0.473 [1.09]	0.5029 [1.18]	0.3918 [0.95]	-0.0153 [0.02]
GDP per capita	-0.0001*** [5.28]	-0.0001*** [5.47]	-0.0001*** [4.62]	-0.0001*** [4.67]	-0.0001*** [3.09]
Initial Public Investment	0.0574*** [8.09]	0.0570*** [8.03]	0.0544*** [7.74]	0.0507*** [7.40]	0.0587*** [5.51]
Number of Elections		-0.3165 [1.48]	-0.3323 [1.58]	-0.3496* [1.72]	-0.6794* [1.84]
Number of Parties			-0.3954*** [3.14]	-0.3467*** [2.83]	-0.5081** [2.00]
Ideology of Government				1.5712*** [4.33]	1.4342* [1.91]
Quality of Budget Institutions					0.5851 [1.29]
Constant	2.6841*** [9.84]	2.4958*** [8.31]	3.1371*** [8.73]	2.2860*** [5.72]	1.5751 [1.52]
Observations	264	264	264	264	105
Adj. R-squared	0.3301	0.3357	0.3601	0.4035	0.4707

t-statistics in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

VI. CONCLUSION AND POLICY IMPLICATIONS

This paper explored the impact of political and institutional variables on public investment. Using a sample of 80 presidential and parliamentary democracies between 1975 and 2012, the paper finds that the rate of growth of public investment is higher at the beginning of electoral cycles and decelerates as the next election approaches. We estimate that the peak in public investment growth occurs between 21 and 25 months before elections. Thereafter, the tradeoff between consumption and investment accelerates, and public spending shifts in favor of more “visible” current spending. In addition, we find that cabinet ideology and government fragmentation are not important explanatory factors of short-term public investment dynamics, but play a significant role in explaining the size of multiyear investment booms. More parties in government are associated with smaller increases in public investment while left-wing cabinets are associated with higher sustained increases in

³² The results are sensitive to the exclusion of advanced economies. In a subsample of developing economies, the negative role of elections on the size of public investment booms is higher than the role government fragmentation and ideology (Table A6). The latter is however the strongest political factor influencing the size of investment growth in a reduced sample of large investment booms (above 2 percent of GDP from through to peak)—Table A7.

investment. Preliminary evidence on budget institutions suggests that stronger institutions help attenuate the impact of elections on investment, but available information is insufficient to reach definitive conclusions.

Two important policy implications can be drawn from this paper. First, even when macroeconomic conditions in terms of fiscal space and monetary policy are appropriate and effective “shovel ready” investment projects are available, it may not be possible to expand public investment closer to elections. The incentive for incumbent governments is to increase “visible” current spending on tax cuts or transfer programs to shore up political support. Going forward, such spending may be difficult to unwind, thereby creating a deficit bias. It may also impact on the long-term potential of the economy. Second, adjustment programs would need to explicitly recognize the bias in favor of current spending about two years prior to elections. A strengthening of fiscal frameworks during this period could help in restraining a permanent ratcheting of certain spending items.

Appendix I. Sample and Selection Criteria

We select countries and time periods based on the following criteria. First, voters must directly elect the person or persons appearing on the ballot to the national post in question. Second, mass voting must take place. Third, over the sample period, countries should have a multi-party system. Presidential elections which involve an Electoral College such as United States are included because the Electoral College mechanically implements the outcome of a popular vote. Fourth, each election in the sample should be generally regarded as being sufficiently competitive, meaning that there is a real possibility of change in government. Two major criteria apply in this aspect: a) there were no significant concerns before elections that elections will not be free and fair; b) there were no allegations by Western monitors, if any, of significant vote-fraud. For example, although elections in Mexico never resulted in a change of government before 2000, since there were competitive running parties, we included these elections in our sample. Finally, we excluded pre-election years of the first democratic election in each country's history. Using above criteria, 80 countries were selected, with 55 of these countries being parliamentary democracies, and 25 of them being presidential democracies.

Primary sources of electoral data include the National Elections across Democracy and Autocracy (NELDA) by Hyde and Marinov (2012), the World Economic Yearbook, the Economic Intelligence Unit, the CIA World Fact Book and the Freedom House.

This methodology differs from most previous studies. Previous studies often focus on old democracies to ensure competitiveness of elections e.g., Katsimi and Sarantides (2012). A few other studies covered a wide range of countries, but didn't make enough effort to identify competitive elections. For example, Brender and Drazen (2005) studied 102 countries, including 68 democracies with competitive elections using level of democracy from POLITY IV project as the only criteria. Ebeke and Olcer (2013) used a sample of 68 low-income economies, but didn't differentiate competitive elections from the rest.

Table A1. Parliamentary System: 55 Countries

Country	Starting Year	Country	Starting Year
Advanced Economies		Emerging Economies	
Australia	1975	Albania	1992
Austria	1975	Bahamas, The	1975
Belgium	1975	Barbados	1975
Canada	1975	Belize	1982
Czech Republic	1993	Bosnia and Herzegovina	2003
Denmark	1975	Botswana	1975
Estonia	1992	Bulgaria	2002
Finland	1975	Cabo Verde	1976
France	1975	Croatia	2001
Germany	1975	Fiji	1975
Greece	1987	Guyana	1992
Iceland	1975	India	1975
Ireland	1975	Jamaica	1975
Israel	1975	Macedonia, FYR	1992
Italy	1975	Mauritius	1975
Japan	1975	Panama	1979
Latvia	1994	Poland	1991
Luxembourg	1975	Romania	1990
Malta	1975	Sri Lanka	1990
Netherlands	1975	St. Lucia	1980
New Zealand	1975	Trinidad and Tobago	1975
Norway	1975	Turkey	1981
Portugal	1983		
Slovak Republic	1993		
Slovenia	1992	Low-income Economies	
Spain	1978	Bangladesh	1976
Sweden	1975	Lesotho	1975
Switzerland	1975	Moldova	1992
United Kingdom	1975	Mongolia	1991

Table A2. Presidential System: 25 Countries

Country	Starting Year	Country	Starting Year
Advanced Economies		Low-Income Economies	
Cyprus	1975	Bolivia	1975
United States	1975	Ghana	1992
		Honduras 1/	1982
Emerging Economies		Malawi	1994
Argentina	1975	Mali	1992
Brazil	1986	Mozambique	1990
Chile	1989	Nicaragua	1975
Colombia	1991	Senegal	1990
Costa Rica	1975		
Dominican Republic	1978		
Ecuador	1975		
Guatemala	1996		
Mexico	1975		
Namibia	1995		
Paraguay	1993		
Peru 2/	1975		
Philippines	1987		
Uruguay	1975		
Venezuela	pre 1999		

1/ In Honduras, elections in 2009 and onward are not counted.

2/ In Peru, elections in 1995, 2000-01 are not counted.

Appendix II. Panel Unit Root Test

Given the presence of the lagged dependent variable in our model, if our dependent variable is not stationary, we are faced with spurious relationship when that variable is entered on the right-hand side of the equation. Only a few tests for unit roots are directly applicable to unbalanced data (see Breitung and Pesaran, 2008). Here we rely on the Fisher test to check for the presence of a unit root. We conduct unit-root tests for each panel individually, and then combine the p-values from these tests to produce an overall test. The test assumes that all series in the panel are stationary under the null hypothesis against the alternative that at least one series in the panel is stationary.

Table A3. Fisher-type Panel Unit Root Test

Variables 1/	Test Statistics	Probability Value
% Δ PI/GDP	671.9	0.00
% Δ PC/GDP	339.0	0.04
PI/GDP	409.5	0.00
% Δ RGDP	658.4	0.00
Public Debt/GDP	646.1	0.00

Note: The null hypothesis of all panels contain unit roots can be rejected at the levels of the variables.

1/ PI, PC are public investment, and non-interest current expenditure, respectively.

Appendix III. Fiscal Rules and Public Investment

Table A4. Benefit of Fiscal Rules to Safeguard Public Investment

Dependent Variable	%ΔG.investment/GDP				
	Interaction with				
	baseline	Expenditure rule	Budget balance rule	Debt Rule	Golden Rule
L.dependent Variable	0.016 [0.044]	0.015 [0.044]	0.015 [0.044]	1.015 [0.043]	0.016 [0.044]
L.PI/GDP	-3.321*** [0.530]	-3.318*** [0.535]	-3.311*** [0.529]	-3.317*** [0.533]	-3.318*** [0.543]
L.%ΔRGDP	0.439*** [0.132]	0.441*** [0.134]	0.435*** [0.134]	0.445*** [0.134]	0.439*** [0.132]
L.Debt/GDP	-0.074* [0.042]	-0.076* [0.043]	-0.075* [0.042]	-0.074* [0.042]	-0.074* [0.042]
# of Months before Election	0.642*** [0.205]	0.661*** [0.206]	0.646*** [0.228]	0.681*** [0.212]	0.645*** [0.206]
# of Months before Election ²	-0.014*** [0.005]	-0.014*** [0.005]	-0.014*** [0.005]	-0.014*** [0.005]	-0.014*** [0.005]
# of month before election*fiscal rules		-0.09 [0.107]	-0.006 [0.074]	-0.085 [0.080]	-0.01 [0.091]
Fiscal Rule		2.394 [2.723]	0.867 [2.036]	1.402 [1.705]	0 [.]
Constant	-347.952** [158.938]	-334.731* [166.959]	-301.145* [7.614]	-355.583* [180.745]	-348.098** [158.894]
Countries	76	76	76	76	76
Observations	844	844	844	844	844
R Square	0.10	0.10	0.10	0.10	0.10

Standard errors in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

Note: All regressions include time and country fixed effects.

Appendix IV. The Short-term Trade-off Between Current and Capital Spending

We test here if there is a short-term tradeoff between current and capital spending by directly including changes in primary current spending as an additional explanatory variable. Table A5 presents these results. All models use country and time fixed effects, and control for the annual change in the structural fiscal balance to ensure that the observed change in the composition of public spending are independent of fiscal consolidations and expansions. Results confirm that there is a significant negative relationship between public investment and current expenditure.³³

Table A5. The Tradeoff between Public Investment and Current Expenditure

Dependent Variable	%?G.investment/GDP		
	(1)	(2) with time dummy	(3) with SFB
L.dependent Variable	0.031 [0.055]	0.021 [0.054]	-0.001 [0.044]
%?G.current exp./GDP	-0.298*** [0.060]	-0.300*** [0.058]	-0.289*** [0.104]
L.PI/GDP	-2.533*** [0.624]	-2.408*** [0.633]	-4.841*** [1.254]
L.%?RGDP	0.572*** [0.127]	0.653*** [0.117]	0.376 [0.236]
L.Debt/GDP	-0.033 [0.083]	-0.019 [0.080]	-0.095 [0.093]
# of Months before Election	0.764*** [0.234]	0.769* [0.235]	0.630** [0.157]
# of Months before Election^2	-0.017* [0.006]	-0.017*** [0.003]	-0.014*** [0.004]
%?structural balance/GDP			0.112 [0.264]
Constant	6.95 [5.948]	-539.604** [248.444]	-372.034 [326.328]
R-square	0.19	0.21	0.2
Countries	72	72	42
Observations	706	706	478
Peak investment growth (# of month before election)	22	23	23

Standard errors in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

³³ Katsimi and Sarandides (2012) use the first differences of capital expenditure and current expenditure to total expenditure ratio as dependent variable to analyze the impact of election year (dummy variable) on expenditure composition in old democracies, and find that capital expenditure is likely to decelerate during election while current expenditure accelerates. We used a similar methodology in our complete sample of 80 countries and got similar results.

Appendix V. Identifying Multiyear Public Investment Booms

In order to identify public investment booms, we use the cycle dating algorithm introduced by Harding and Pagan (2002).³⁴ The algorithm identifies turning points in public investment series by searching for local maxima and minima over a given period and selecting pairs of adjacent (locally absolute) maxima and minima that meet the following censoring rules: (i) the duration of a complete cycle to be at least five quarters; and (ii) the duration of each phase to be at least two quarters. More specifically, for a series x_t :

- a cyclical *peak* occurs at quarter t if:

$$\{(x_t - x_{t-2}) > 0, (x_t - x_{t-1}) > 0\} \text{ and } \{(x_{t+2} - x_t) < 0, (x_{t+1} - x_t) < 0\} \quad (2)$$

- a cyclical *through* occurs at time t if:

$$\{(x_t - x_{t-2}) < 0, (x_t - x_{t-1}) < 0\} \text{ and } \{(x_{t+2} - x_t) > 0, (x_{t+1} - x_t) > 0\} \quad (3)$$

As a result, we code the through-and-peak cycles and calculate the change in public investment during each of these booms. The dependent variable is the total change in public investment from the lowest level of the episode (through) to the highest level of the episode (peak). Table A4 provides an example of the episode identification system for six major countries. Between 1975 and 2012, we identify a total of 264 episodes of investment booms in the 81 countries of our sample.

ISO	USA		GBR		AUT		BEL		DNK		FRA	
	INV	CONS	INV	CONS	INV	CONS	INV	CONS	INV	CONS	INV	CONS
cycle1990			T									
cycle1991				T								
cycle1992			P		T		T	T				
cycle1993											P	
cycle1994				P								
cycle1995							P	P				
cycle1996					P				P			
cycle1997								T				
cycle1998												
cycle1999			T			T						
cycle2000	T						T				T	
cycle2001				T		P						
cycle2002			T				P	T	T		P	T
cycle2003		T			T							
cycle2004						T					T	
cycle2005	P								P			
cycle2006						P						
cycle2007	T		T	P			P	P			P	P
cycle2008		T			T							
cycle2009				T		T	T	T	T			T
cycle2010												
cycle2011	P	P	P	P	P				P		P	P
cycle2012						P					T	

³⁴ This algorithm extends the so-called “BB” algorithm developed by Bry and Boschan (1971).

Appendix VI. Political Variables and Investment Boom: Additional Tests

Table A6. The Political Economy of Public Investment Booms in Developing Countries

Episodes of Investment Boom Change through-to-peak (Non-Advanced)		?PublicInvestment/GDP		
Initial Natural Disasters	0.6656 [1.15]	0.6134 [1.07]	0.4715 [0.83]	0.3898 [0.71]
GDP per capita	-0.0001*** [2.78]	-0.0001*** [2.78]	-0.0001** [2.52]	-0.0001** [2.23]
Initial Public Investment	0.0523*** [6.37]	0.0511*** [6.25]	0.0494*** [6.11]	0.0449*** [-5.74]
Number of Elections		-0.5398* [1.79]	-0.6086** [2.05]	-0.6760** [2.37]
Number of Parties			-0.4895*** [2.64]	-0.4418** [2.48]
Ideology of Government				1.9797*** [4.22]
Constant	3.2485*** [8.41]	2.9211*** [6.86]	3.5825*** [7.34]	2.4310*** [4.49]
Observations	194	194	194	194
Adj. R-squared	0.2318	0.2447	0.2717	0.335

t-statistics in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

Table A7. The Political Economy of Large Public Investment Booms

Episodes of Investment Boom	ΔPublicInvestment/GDP			
Change through-to-peak (>2%GDP)				
Initial Natural Disasters	-0.1537 [0.19]	-0.141 [0.18]	-0.0872 [0.11]	-0.2465 [0.31]
GDP per capita	-0.0001** [2.32]	-0.0001** [2.24]	-0.0001** [2.03]	-0.0001** [1.98]
Initial Public Investment	0.0483*** [5.32]	0.0477*** [5.25]	0.0468*** [5.14]	0.0434*** [4.81]
Number of Elections		-0.3774 [1.16]	-0.4389 [1.33]	-0.5069 [1.56]
Number of Parties			-0.3405 [1.13]	-0.3283 [1.12]
Ideology of Government				1.4062** [2.39]
Constant	4.4418*** [10.46]	4.1840*** [8.74]	4.5922*** [7.67]	3.7210*** [5.39]
Observations	121	121	121	121
Adj. R-squared	0.2468	0.2553	0.2636	0.2988

t-statistics in brackets.

* p<0.10, ** p<0.05, *** p<0.01.

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