

# Growth friendly fiscal rules? Safeguarding public investment from budget cuts through fiscal rule design\*

Martin Ardanaz      Eduardo Cavallo      Alejandro Izquierdo      Jorge Puig

## Abstract

Fiscal adjustment episodes tend to be accompanied by large public investment cuts, contributing to the well documented procyclical bias in public capital expenditures. We study patterns of public investment behavior during fiscal consolidations in a sample of 75 advanced and emerging economies during 1990-2018 and find that results differ significantly depending on fiscal rule design. Fiscal rules can be “flexible”, which are rules that include mechanisms to accommodate exogenous shocks (e.g. cyclically adjusted fiscal targets, well defined escape clauses, and differential treatment of investment expenditures) or “rigid” –i.e., establish numerical limits on fiscal targets without taking into account flexible features. We find that in countries with either no fiscal rule, or with a rigid fiscal rule, a fiscal consolidation of at least 2% of GDP is associated with a 9% reduction in public investment, on average. Instead, in countries with flexible fiscal rules, the decline in public investment is less than 2% on average. The results hold after controlling for possible endogeneity bias in the estimations. We show that by reducing procyclical biases in public investment spending, flexible fiscal rules can add a growth enhancing dimension to the fiscal sustainability concerns that have been the focus of fiscal rules to date.

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KEYWORDS: Fiscal Rules, Public Investment, Fiscal Consolidations, Spending Cyclicity.

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# 1 Introduction

There is consensus in the economic literature about the growth enhancing potential of public investment, especially during economic downturns (Abiad et al., 2016); when investment efficiency is high (Furceri and Li, 2017); and when the initial stock of public capital is low (Izquierdo, Lama, et al., 2018). Building up a country’s public capital stock can increase private investment and productivity.<sup>1</sup> Yet, despite its growth boosting potential, the literature has shown that when countries undertake fiscal adjustments, public investment cuts usually take a disproportionate share of the adjustment. This has been shown to be a common behavior across countries that is particularly strong among developing countries (Serven 2007; Easterly and Serven 2003). This behavior in turn has been attributed to the fact that capital expenditure cuts may prove to be more politically palatable than cuts in current expenditures (Ardanaz and Izquierdo 2017; Arezki and Ismail 2013). Therefore, designing tools to protect productive public investment during fiscal adjustment periods is a relevant and timely policy issue.

Among the policy toolkit, rules-based fiscal frameworks have traditionally been under scrutiny for unintendedly encouraging fiscal procyclicality (Clemens and Miran 2012; Fatas and Mihov 2006; Alesina and Bayouni 1996) and large cuts in public investments (Blanchard and Giavazzi 2004). This is so because pressure to comply with rigid fiscal targets provide incentives for policymakers to reallocate spending away from spending items with longer-term benefits (Beetsma and Debrun 2007; Peletier et al. 1999). In the language of optimal fiscal rule theory, higher commitment to fiscal discipline, in the form of a fiscal rule, usually comes at the expense of lower adaptability to shocks, including less responsive public good provision in the short-run (Azzimonti et al. 2016), such as for example, the over-compression of public investment during fiscal consolidations. However, this does not need to be the case.

A survey by Eyraud et al., (2018) shows there is great variation in fiscal rule design around the world (see also IMF 2009). Countries have been implementing fiscal rules with more “flexible features”, such as, for example, cyclically adjusted fiscal targets; well-defined escape clauses in the case of unanticipated shocks<sup>2</sup>; and investment friendly provisions, which are rules that exclude capital expenditures from the numerical targets imposed on fiscal aggregates (Guerguil et al., 2017; Schaetter et al., 2012). Figure 1 shows these types of rules have become increasingly popular

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<sup>1</sup>However, distortions in the public investment management process may generate countervailing (crowding out) effects (Cavallo and Daude 2011)

<sup>2</sup>These include (i) a very limited range of factors that allow such escape clauses to be triggered in legislation, (ii) clear guidelines on the interpretation and determination of events (including voting rules), and (iii) specification on the path back to the rule and treatment of accumulated deviations (see IMF, 2009).

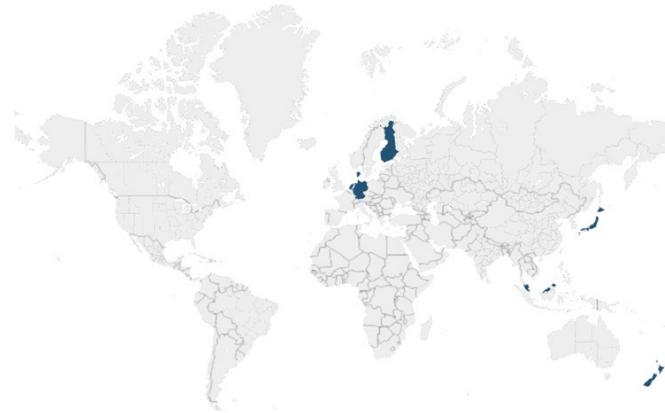
around the world. While by 1995 there were less than fifteen countries that had adopted at least one such flexible feature, by 2015 the figure increased to 52 countries. By then, 55% of countries that had implemented a fiscal rule, had adopted in the rule at least one of the flexible feature, and oftentimes more than one such feature at the same time (Figure 2). For example, 60% of countries with fiscal rules that incorporate escape clauses, also have either investment-friendly provisions or cyclically adjusted targets, or both.

This paper explores if those flexibility mechanisms been effective to safeguard public investment during budget cuts. The answer is yes. The empirical exercises are undertaken using a sample of 75 advanced and developing countries during 1990-2018. The results show that the response of public investment during fiscal adjustment episodes differs significantly depending on the fiscal rule design. In countries with either no fiscal rule, or with a rigid fiscal rule – i.e., a fiscal rule that establishes numerical limits on fiscal targets without taking into account flexible features–, a fiscal consolidation episode equivalent to at least 2% of GDP is associated with a 9% reduction in capital expenditures, on average. However, in countries where the fiscal rule includes flexibility mechanisms, the ensuing decline in investment is less than 2%, and it is not statistically significant. These results are robust to a battery of sensitivity analyses; and they hold after controlling for possible endogeneity in the estimations. The results suggest that flexibility features contribute to reduce public investment procyclicality. Moreover, we find that this positive feature of the design of fiscal rules does not compromise the sustainability objectives as further results show that flexible fiscal rules are associated to lower probability of debt crisis to the same extent as rigid fiscal rules.

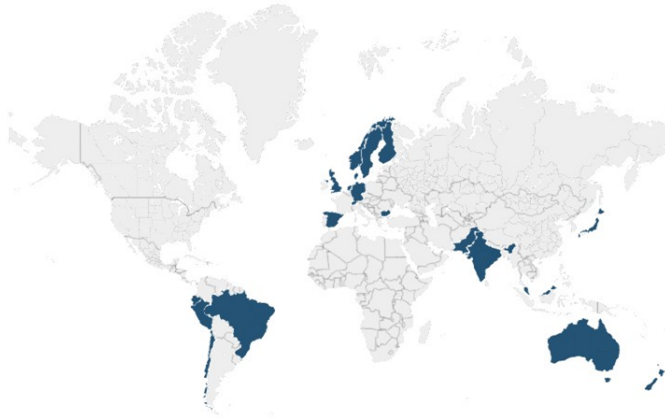
The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the data and describes the empirical strategy. Sections 4 reports the main results. Sections 5 and 6 provide sensitivity analyses. Section 7 explores a possible mechanism linking fiscal rule design to improved public investment management over the business cycle. Section 8 explores whether there are trade-offs between the ability of fiscal rules to protect public investment and ensuring fiscal sustainability. Section 9 concludes by discussing the policy implications of the results.

**Figure 1:** Flexible rules around the world: 1995-2015.

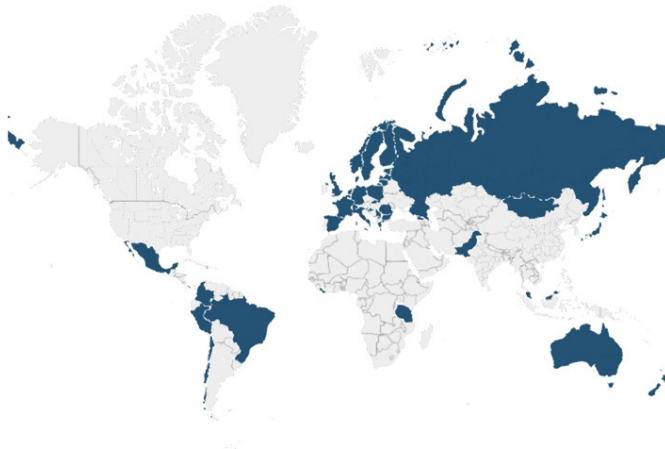
Panel A. 1995



Panel B. 2005

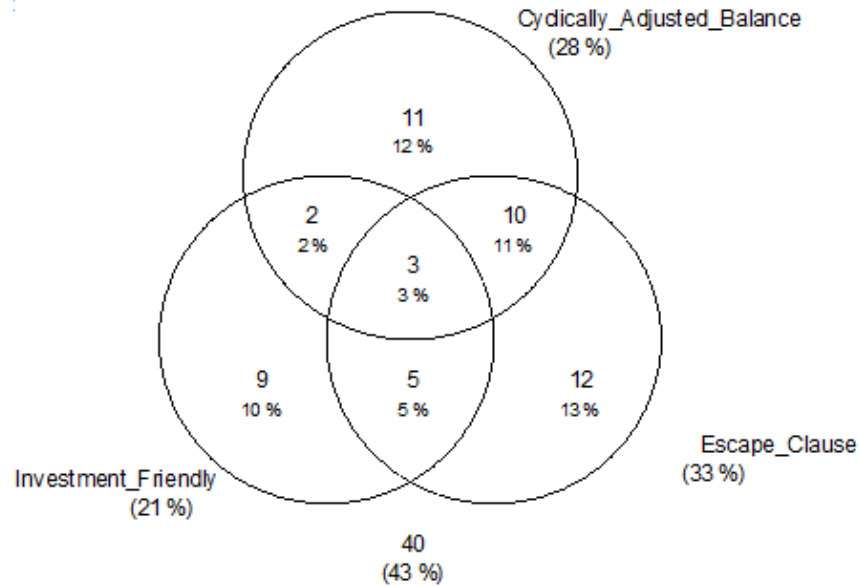


Panel C. 2015



*Source:* Own elaboration based on IMF fiscal rules dataset (IMF 2017).

**Figure 2:** Overlaps between flexibility features



Source: Own elaboration based on IMF fiscal rules dataset (IMF 2017).

## 2 Related Literature

There is theoretical and empirical literature studying the effects of budget institutions on fiscal performance.<sup>3</sup> The theoretical literature on optimal design of fiscal rules discusses the benefits and costs of rules-based fiscal frameworks, with a focus on the trade-off between commitment vs flexibility (Azzimonti et al. 2016; Halac and Yared 2014; Armador et al. 2006).<sup>4</sup> On the one hand, fiscal rules act as a commitment device to constrain excessive deficit accumulation arising from distorted political incentives, while on the other, rules reduce the scope for adjusting policy to unexpected shocks.<sup>5</sup>

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<sup>3</sup>Budget institutions affect fiscal policy outcomes by either imposing restrictions on the results of the budget process (fiscal or numerical rules), by distributing agenda power and responsibilities among the various actors that participate in budget negotiations (procedural rules), or by increasing access and quality of information (transparency rules) (Alesina and Perotti 1999). In this paper, we concentrate on numerical fiscal rules.

<sup>4</sup>In addition to flexibility and commitment, the international experience with fiscal rules suggests an additional desirable feature: simplicity. For complications in striving the right balance between such properties in practice, see Eyraud et al. (2018) and Debrun and Jonug (2018).

<sup>5</sup>Using subnational level data across the US states, Fatas and Mihov (2006) provide evidence that fiscal rules, even though they limit the ability to react to changes in economic conditions, are also useful in restricting discretionary policy changes.

Theoretical papers that focus on fiscal sustainability usually abstract from discussing the effects of fiscal rules on the behavior of specific expenditure categories. An exception is Peletier et al. (1999). The paper draws on Alesina and Tabellini (1990) seminal political economy model of budget deficits<sup>6</sup> to assess the implications of balanced-budget rules on public investment outcomes; it shows that a balanced-budget rule can coexist with suboptimal levels of public investment. In a similar context, Basetto and Sargent (2006) assess the potential efficiency gains of “golden rules”, namely a type of balanced budget rule that allows deficits to finance public investments but not current expenditures.

There is also a limited number of empirical papers on the effects of fiscal rules on public investment outcomes. Some papers examine the pros and cons of the so-called “golden rule”. For example, Blanchard and Giavazzi (2004) show that reformulating the Stability and Growth Pact in terms of a golden rule would allow European Union member countries to increase infrastructure investment without violating the deficit limits. However, Balassone and Franco (2000) suggest golden rules provide leeway for opportunistic politicians to engage in “creative accounting”: namely simply reporting as spending in infrastructures what is really current spending (see also Milesi Ferreti 2003).

Other papers focus on the impacts of fiscal rules on aggregate level fiscal outcomes such as the fiscal balance; debt levels; or the size of government (Heinemann et al. 2018; Asatryan et al. 2018). More recently, the literature has begun to exploit variation in fiscal rule design to explain fiscal performance (Caselli et al 2019). Along those lines, Guerguil et al. (2017) focus on the relationship between different types of fiscal rules and the cyclical behavior of public expenditures. Bova et al. (2014) focus on so-called “second generation” fiscal rules (for example, rules that use cyclically adjusted fiscal targets or well-defined escape clauses) finding that these have contributed to less procyclicality in the developing world.

This paper contributes to the literature on fiscal rules in four ways. First, it incorporates the behavior of public investment to the set of fiscal policy outcomes considered. Second, it exploits changes in fiscal rule design over time and across countries. Third, it explores the mechanism through which flexibility features in the fiscal rule affect the cyclical properties of public investment. Finally, it contributes to debates about the general equilibrium effects of fiscal rules by analyzing the implications of fiscal rule design in terms of the commitment vs. flexibility trade-off surrounding fiscal policymaking.

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<sup>6</sup>In the Alesina and Tabellini (1990) model, electoral uncertainty over the identity of future majorities leads the current median voter to run excessive deficits.

### 3 Empirical Strategy and Data

The way flexible fiscal rules affect public investment changes is estimated using the following empirical specification:

$$\Delta G_{i,t}^{PI} = \alpha_i + \phi_t + \beta_{flxr} FLXR_{i,t} + \beta_{fc} FC_{i,t} + \beta_{fcflxr} FC_{i,t} * FLXR_{i,t} + \theta X_{i,t} + \mu_{i,t} \quad (1)$$

where  $G_{i,t}^{PI}$  is real public investment in country  $i$  at year  $t$ ,  $FLXR_{i,t}$  is a dummy equaling 1 if a flexible rule is in place at time  $t$  and 0 otherwise.  $FC_{i,t}$  is a dummy variable that equals one when country  $i$  has in place a fiscal consolidation in year  $t$ .  $X_{i,t}$  is a vector of control variables, including population and GDP growth rates, debt to GDP level,  $\alpha_i$  are country fixed effects and  $\phi_t$  are time fixed effects.

We define a “flexible” fiscal rule following Eyraud et al., (2018) when at least one of three elements are present: (i) the rule includes explicit provisions to protect public investment from budget cuts; (ii) the rule has cyclically-adjusted fiscal targets; or (iii) the rule contains escape clauses to accommodate exogenous shocks such as for example, natural disasters.

In the case of fiscal consolidation episodes, we follow Alesina and Ardagna (2013) defining a fiscal consolidation as a two-year period in which the cyclically adjusted primary balance/GDP ratio improves in each year and the cumulative improvement is at least 2 percentage points of GDP.

The data covers 75 countries, spanning different regions and levels of economic development, with annual data over the period 1990-2018. Public investment, cyclically adjusted primary balance and control variables were obtained from the World Economic Outlook (WEO) dataset. Data about fiscal rules draws from the IMF fiscal rules dataset (IMF, 2017).

There are 299 episodes of fiscal consolidations between 1990 and 2018 in the sample, of which approximately 60% accrue in developing economies (Figure A1). The unconditional likelihood of a fiscal consolidation episode is larger in countries with fiscal rules (181 cases) than in countries without them (118 cases), which is not surprising considering that fiscal rules impose restrictions on fiscal outcomes. The median size of public investment cuts during fiscal consolidations is similar in countries with fiscal rules (-2.5% of GDP) and without them (-3% of GDP). However, not all types of fiscal rules have equal impacts: the median drop in public investment is smaller in countries with flexible fiscal rules (-0.4% of GDP) than in countries with rigid fiscal rules (-4.6% of GDP). ( Table 1). We probe deeper into this stylized fact through the regression analysis in the next section.

**Table 1:** Public investment growth rates during fiscal consolidations episodes.

	All Episodes	Episodes with Fiscal rules		Episodes w/o Fiscal Rules
		Growth rate public investment		
Median	-2.6%	-2.5%		-3.0%
N	299	181		118
		Of wich, flexible features in place	W/o flexible features	
Median		-0.4%	-4.6%	
N		102	79	

Source: Own elaboration based on WEO-IMF.

## 4 Results

### 4.1 Baseline Results

Table 2 shows the results from the specification in Equation 1. Column 1 shows that public investment falls close to 11 percent during fiscal consolidations. This drop in public investment is reduced to 9 percent if control variables are introduced (Column 2). However, the size and sign of the interaction term suggest that flexible rules mitigate the negative effects of fiscal consolidation on public investment behavior. According to the marginal effects from Column 2, public investment falls by 1.7 percent during fiscal consolidations in countries with flexible fiscal rules; however the estimated effect is not statistically different from zero (Figure 3, panel A).

In the default aggregation, countries without a flexible fiscal rule (i.e., FLXR=0) include countries without fiscal rules, and countries with rigid rules. Columns 3 and 4 separates those cases into two different categories. The results are that public investment drops by 8.9 percent following a fiscal consolidation in countries with rigid rules, and by 9.1 percent following a fiscal consolidation in countries without rules. In both cases however, the fall in public investment is less severe in countries with flexible fiscal rules (see Figure 3, panels B and C).

Is it the *design* of the fiscal rule, or the implementation of a fiscal rule per se what is driving the results? Column 5 shows that introducing any type of fiscal rule does not help to protect public investment. In this specification we define any type of fiscal rule with a dummy equal to 1 if a numerical constraint is imposed on any fiscal aggregates at time  $t$  and 0 otherwise. In the presence of fiscal rules, public investment falls by 4.8 percent (se=1.8 percent), and this



effect cannot be distinguished from a situation without fiscal rules (see Figure 3, panel D). Finally, Column 6 shows that flexible fiscal rules are not useful at protecting other public expenditures. Current primary spending falls during fiscal consolidations approximately between approximately 2 and 4 percent in countries with and without flexible fiscal rules (see Figure 3, panel E).

The bottom line is that the result suggests that fiscal rules that include flexibility features in the design are useful to protect public investment from budget cuts during fiscal consolidations. This has the corollary that the design of fiscal rules can affect the growth-friendliness of fiscal adjustments assuming that the public investment is productive.

**Table 2:** Baseline Panel Regressions. Effect of fiscal rules on public investment and current spending growth rate, during fiscal consolidations.

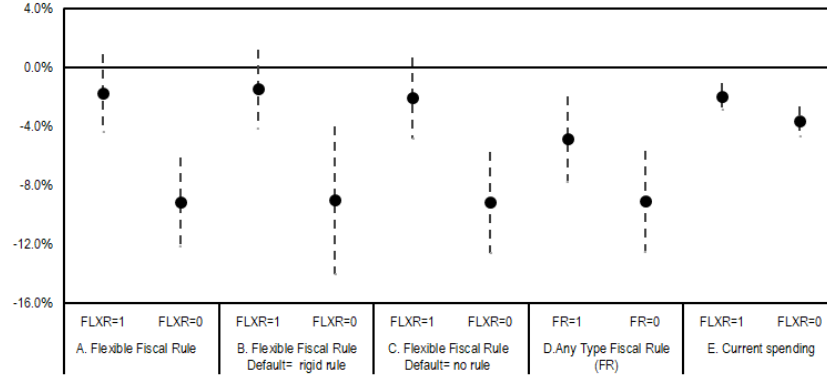
	Dep. Var					
	Public Investment					Current Spending
	[1]	[2]	[3]	[4]	[5]	[6]
Fiscal Consolidation (FC)	-0.107*** (0.0153)	-0.0908*** (0.0183)	-0.0899*** (0.0306)	-0.0914*** (0.0208)	-0.0905*** (0.0207)	-0.0360*** (0.00597)
Flexible Fiscal Rule (FLXR)	-0.00651 (0.0119)	-0.00906 (0.0107)	-0.00919 (0.0156)	-0.00331 (0.0147)		0.00263 (0.00486)
FC * FLXR	0.0829*** (0.0217)	0.0739*** (0.0231)				0.0170** (0.00801)
FC * FLXR (Default = rigid)			0.0756** (0.0344)			
FC * FLXR (Default= no rule)				0.0710*** (0.0247)		
Anytype of Fiscal Rule (FR)					-0.00989 (0.0124)	
FC * FR					0.0423 (0.0254)	
Population		1.201 (1.218)	1.153 (1.500)	1.701 (1.393)	1.314 (1.220)	0.210 (0.352)
Growth Real GDP		2.119*** (0.262)	2.036*** (0.377)	2.318*** (0.337)	2.146*** (0.264)	0.475*** (0.128)
Debt to GDP		0.0183 (0.0337)	-0.00769 (0.0289)	0.0310 (0.0411)	0.0175 (0.0353)	-0.0479*** (0.0128)
Observations	1,530	1,508	844	1,146	1,508	1,458
R-squared	0.080	0.164	0.207	0.148	0.160	0.172
Number of countries	75	75	52	70	75	73
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes

Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

Note: robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively.

Intercepts are included but not reported.

**Figure 3:** Marginal Effects. Effect of fiscal rules on public investment and current spending growth rate, during fiscal consolidations.



Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017). Note: confidence intervals (IC) of 90% (dashed line).

We extend the regression analysis to study the the persistence of the estimated effects through a dynamic version of Equation 1. In particular, using the single-equation approach of Jorda (2005) and Stock and Watson (2007) we build impulse response functions (IRF)of fiscal consolidation episodes on public investment growth. The methodology consists of making linear local projections(LP) of the public investment growth using lags and contemporaneous changes in the right hand side variables of the estimated equation.<sup>7</sup> More specifically, the accumulated response of public investment growth at the horizon h is estimated by modifying Equation 1 as follows:

$$\begin{aligned} \Delta G_{i,t+h}^{PI} = & \alpha_{i,h} + \phi_{t,h} + \beta_{flxr,h} FLXR_{i,t} + \beta_{fc,h} FC_{i,t} + \\ & + \beta_{fcflxr,h} FC_{i,t} * FLXR_{i,t} + \theta_h(L)X_{i,t-1} + \lambda_h(L)\Delta G_{i,t-1}^{PI} + \mu_{i,t,h} \end{aligned} \quad (2)$$

In this approach, each step in the accumulated IRF is obtained from a different individual regression (Riera-Crichton, Vegh and Vuletin, 2014). We thus obtain the IRF values directly from the  $\beta_{fc,h}$  estimated coefficients. The estimated coefficients  $\lambda(L)$  and  $\theta(L)$  are not used to build the IRF values; however they serve as controls, "cleaning" the  $\beta_{fc,h}$  from dynamic effects.

Figure 4 shows the the projections for 6 years under different scenarios. Panels A and Panel B show the estimated behavior of public investment over time in countries with flexible rules

<sup>7</sup>As discussed in Jorda (2005), there are multiple advantages in the use of LP. In particular, LP (i) can be estimated by single-regression techniques (least-squares dummy variables), (ii) are more robust to potential misspecifications, and (iii) can easily accommodate highly non-linear and flexible specifications.

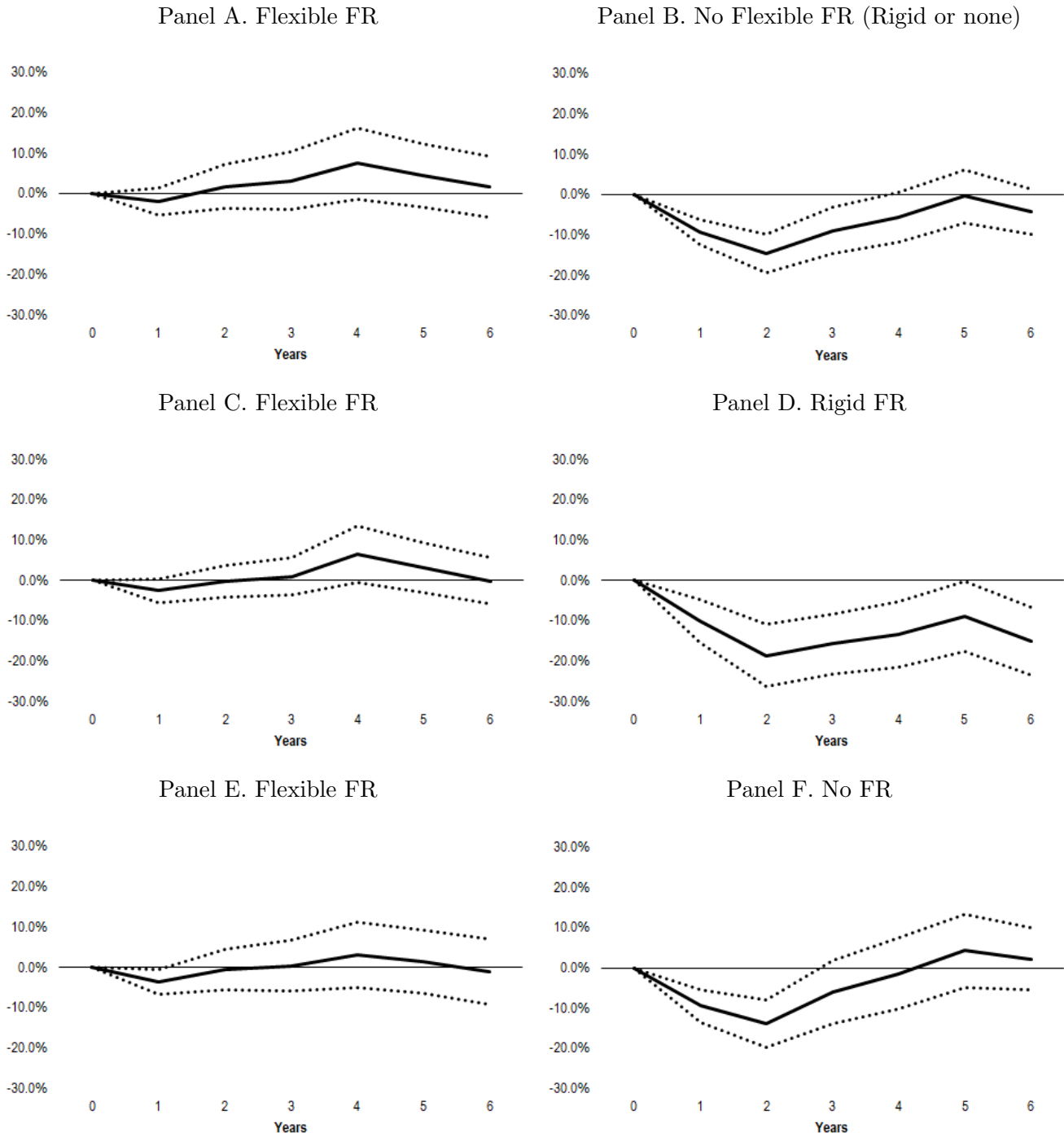
vs that of countries without fiscal rules, or those with rigid rules. Panels C and D compare the performance of public investment *across* fiscal rule adopters: that is, those countries with flexible rules vs. those with rigid rules. Panels E and F do the same thing for the case of countries with flexible rules vs. countries with no fiscal rules. In all panels,  $t = 1$  is the year of the fiscal consolidation shock.

The results show that public investment does not fall during fiscal consolidation periods, neither in the year of consolidation or in subsequent years. However, in countries without flexible features in their rules, or without rules, the cut in public investment is persistent. In particular, public investment falls during two consecutive years, and it does not revert back above zero in a statistically significant way in countries without fiscal rules, or with rigid rules.<sup>8</sup>

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<sup>8</sup>in countries with flexible fiscal rules, public investment cuts are not statistically significantly different from zero, and in one case (panel C) public investment starts *growing* after year 4 under the presence of flexible fiscal rules. Instead, public investment falls in  $t=1$  and all consecutive years in the absence of flexibility mechanisms.

**Figure 4:** Dynamic effect of having a flexible fiscal rule).



*Source:* Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017). *Note:* confidence intervals (IC) of 90% (dashed line).

## 5 Robustness

We perform a battery of sensitivity analyses, including: (1) introducing additional control variables<sup>9</sup>, (2) using alternative definitions of fiscal consolidations, (3) using alternative measures of the dependent variable, and (4) checking whether there is a particular flexibility feature that is driving all the results. Table A3 of the Appendix shows results from this robustness exercise, and Figure 5 presents the relevant marginal effects.<sup>10</sup>

In Panel A, we show the results for the coefficient estimates of interest after re-defining a fiscal consolidation in a more lenient way compared to the baseline: i.e., as a single year in which the cyclically adjusted primary balance improves by at least 1.5 of GDP (Alesina and Ardagna 2010). Using the alternative definition to define the episodes, we find that public investment falls by approximately 10.4 percent during fiscal consolidations in countries without fiscal rules or with rigid rules; however the negative effect is neutralized when there is a flexible fiscal rule in place. Second, we draw on the so called “narrative” approach to identify fiscal consolidations episodes across developed economies.<sup>11</sup> In particular, data on narrative fiscal consolidation episodes is available from Guajardo et al. (2014) and Alesina et al. (2017) for 17 OECD countries (1978-2014). This dataset is based on a careful reading of fiscal legislation and relevant historical records and measures concrete policy actions taken to affect the budget balance, both on the spending and tax side. Using this data, it is possible to observe reactions to actual policies rather than reactions to variables that may be affected by government actions, such as changes in the cyclically adjusted fiscal balance over a given period of time. In this case the sample is reduced to advanced economies. However, the results on the estimated impacts of flexible fiscal rules on public investment remain unchanged.<sup>12</sup>

Panel B shows the results for the coefficient estimates of interest after re-defining the dependent variable as the change in the public investment to GDP ratio from one year to the next

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<sup>9</sup>We control for the per capita stock of public capital, old age dependency ratio, a measure of the quality of governance (control of corruption), and GDP per capita levels.

<sup>10</sup>We have also checked whether the composition of fiscal adjustment affects our results. Results from restricting the analysis to expenditure driven fiscal consolidations show results consistent with baseline findings (available upon request).

<sup>11</sup>The narrative approach was pioneered by Romer and Romer (2010) to examine the effects on US output of changes in tax rates identified from the historical record.

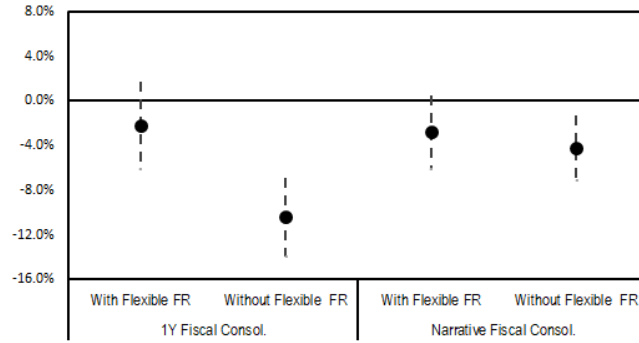
<sup>12</sup>In addition to cyclically adjusted and narrative episodes, we also used the observed primary balance to identify fiscal consolidation episodes, allowing us to expand the sample significantly. Results (available upon request) are consistent with our baseline findings.

(as opposed to the growth rate in the level of real public investment that is used in the baseline). It is estimated that a fiscal consolidation reduces the public investment to GDP ratio by 0.5 percentage points when there is no flexible fiscal rule in place. In contrast, flexibility mechanisms help to neutralize the negative estimated effect. Finally, we replicate the analysis using the share of public investment on total expenditure (TE) as a dependent variable, and find that the results remain unchanged.

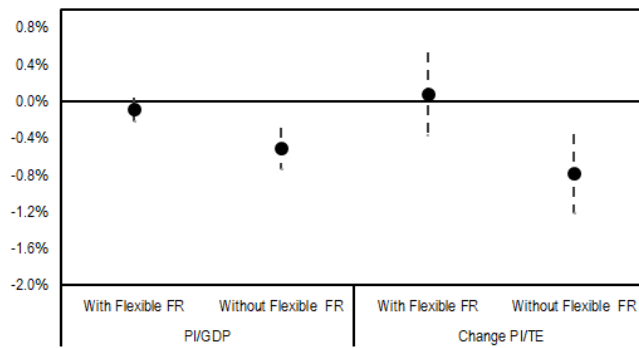
Panel C shows the results from breaking up the flexible fiscal rules into separate constituent parts. In this case, FLXR=1 considers each of the flexibility features separately. The results suggest that the three flexibility mechanisms considered appear to help counteracting the negative effects of fiscal adjustments on public investment; however, the effects are less precisely estimated in the case of rules with escape clause provisions, and balanced-budget rules with cyclically adjusted targets. This may be so because of the reduced number of observations in each category.

**Figure 5:** Robustness checks. Marginal Effects using alternative definitions of independent and dependent variables, and considering flexible mechanisms separately.

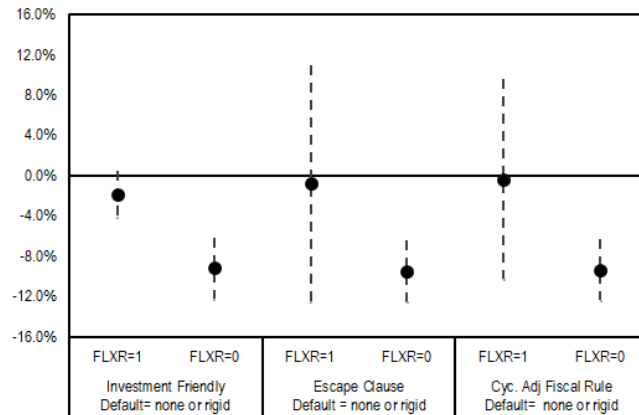
Panel A. Alternative definition and measure of fiscal consolidation.



Panel B. Alternative dependent variables.



Panel C. Considering flexibility features separately.



Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017). Note: Marginal effects computed from Table 1, Columns 2-8. Confidence intervals (IC) of 90% (dashed line).

## 6 Addressing Reverse Causality

Fiscal rules can be endogenous in many empirical applications of interest because governments may have incentives to change fiscal institutions or behavior in response to changes in fiscal outcomes (Poterba, 1994; Badinger and Reuter, 2015; Asatryan et al. 2018). Thus, in order to control for bias arising from possible reverse causality in this setting, we apply an instrumental variables approach.

Following Frankel, Vegh and Vuletin (2012), we use a measure of institutional quality (IQ) as an instrument of flexible fiscal rules. IQ is potentially a good instrument because it is plausible that countries with stronger political institutions are more likely to adopt fiscal rules in the first place<sup>13</sup>. IQ must satisfy the requirements of relevance and exogeneity to pass the filter of a good instrument. Relevance is tested in Table 3, Column 1. It is shown that IQ is a significant determinant of flexible fiscal rule presence in the first stage regression. The exogeneity condition can not be tested directly; instead, we use the IQ value from 1984 which pre-dates the start of the sample by 6 years. A limitation of this approach is that we must exclude the country fixed effects from the regressions because the 1984 IQ value is a constant.

Table 3 presents the IV results. Column 2 reports the second stage regression results. They show that public investment falls by close to 12 percent during fiscal consolidation episodes in countries without fiscal rules, or with rigid rules. Moreover, in line with the non-IV case, results show that having a flexible fiscal rule neutralizes the fall in public investment during fiscal consolidations. This is so because the interaction term is statistically significant at standard confidence levels, and the resulting estimated marginal effect of fiscal consolidations in countries with flexible fiscal rules is not statistically different from zero (Figure 6).

Column 3 presents the results from the exercises that use two additional instruments that have been used in other papers: proxies of government fragmentation and measures of check and balances (Badinger and Reuter, 2015). The relevance condition is tested in Table 3, Column 3. While first stage coefficient estimates for all the instruments have the expected signs, only the coefficient estimate of IQ is statistically significant. The exogeneity condition of the instruments in turn is targeted by using initial values that pre-date the beginning of the sample. Column 4 shows the second stage IV regression results.<sup>14</sup> Results show that public investment falls by

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<sup>13</sup>We construct an index of IQ by calculating the average of four variables from the International Country Risk Guide dataset: investment profile, corruption, law and order and bureaucratic quality.

<sup>14</sup>We cannot reject the Null that FLXR can be treated as exogenous (see p-value for Wu–Hausman) in any of the specifications. F statistic for testing weak instrument is significant at the typical 10% level, but is lower than 10



approximately 12.3 percent during fiscal consolidation episodes in countries without flexible fiscal rules, or with rigid rules. However, having a flexible fiscal rule neutralizes the negative effect of fiscal consolidations on public investment because the interaction term is statistically significant. The corresponding marginal effects are plotted in Figure 6.

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which is the threshold suggested by Stock, Wright, and Yogo (2002). If we are willing to accept at most a rejection rate of 15% of a nominal 5% Wald test, we can reject the null hypothesis that the instruments are weak, because the Min. Eigenvalue statistic exceeds its critical value in both specifications (Stock and Yogo, 2005). In the case of the specification with several instruments Sargan's (1958) test statistics is not significant at standard significance levels, which implies that the structural model is correctly specified.

**Table 3:** IV Regressions. Effect of fiscal rules on public investment growth rate, during fiscal consolidations.

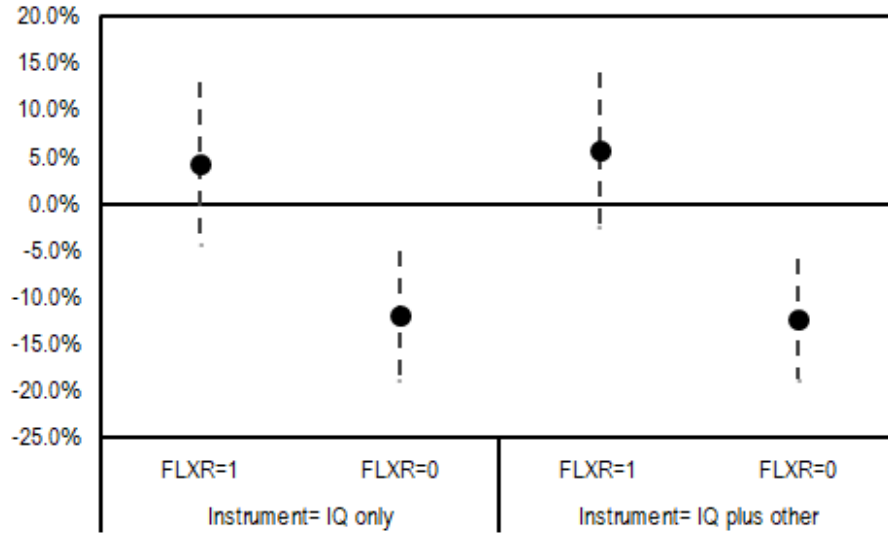
	Instrumented: Flexible Fiscal Rule			
	IV: IQ		IV: IQ, Check and Balances and Gov. Fragmentation	
	First Stage Flexible FR	Second Stage % Change PI	First Stage Flexible FR	Second Stage % Change PI
	[1]	[2]	[3]	[4]
FC		-0.119*** (0.0423)		-0.123*** (0.0395)
FLXR		-0.0165 (0.0294)		-0.0161 (0.0281)
FC * FLXR		0.162* (0.0913)		0.181** (0.0854)
Institutional Quality	0.130*** (0.0390)		0.121** (0.0563)	
Institutional Quality * FC	0.0126 (0.0127)		-0.0546 (0.0335)	
Government Fragmentation			0.00647 (0.202)	
Checks and Balances			0.0176 (0.0472)	
Government Fragmentation * FC			-0.257 (0.214)	
Checks and Balances * FC			0.102** (0.0500)	
Population	-2.377 (4.661)	0.152 (0.444)	-0.615 (5.566)	0.260 (0.498)
Growth Real GDP	-0.580 (1.006)	1.415*** (0.331)	-0.592 (0.997)	1.405*** (0.322)
Debt to GDP	-0.194 (0.149)	-0.0123 (0.00974)	-0.154 (0.166)	-0.0125 (0.00938)
Observations	1,092	947	1,048	903
R-squared	0.224	0.187	0.231	0.193
Country Fixed Effect	No	No	No	No
Year Dummies	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Wu-Hausman (p-value)		0.7694		0.6566
Robust F (first stage)		3.724		2.194
Prob > F		0.032		0.063
Min. Eigenvalue stat		33.41		13.78
Sargan Test (p-value)				0.8471

Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

Note: robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively.

Intercepts are included but not reported.

**Figure 6:** Addressing endogeneity. Marginal Effects using Instrumental Variables.



*Source:* Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017). *Note:* Marginal effects computed from Table 3, Columns 2 and 4. Confidence intervals (IC) of 90% (dashed line).

## 7 Fiscal Rules and Procyclicality in Capital Expenditures

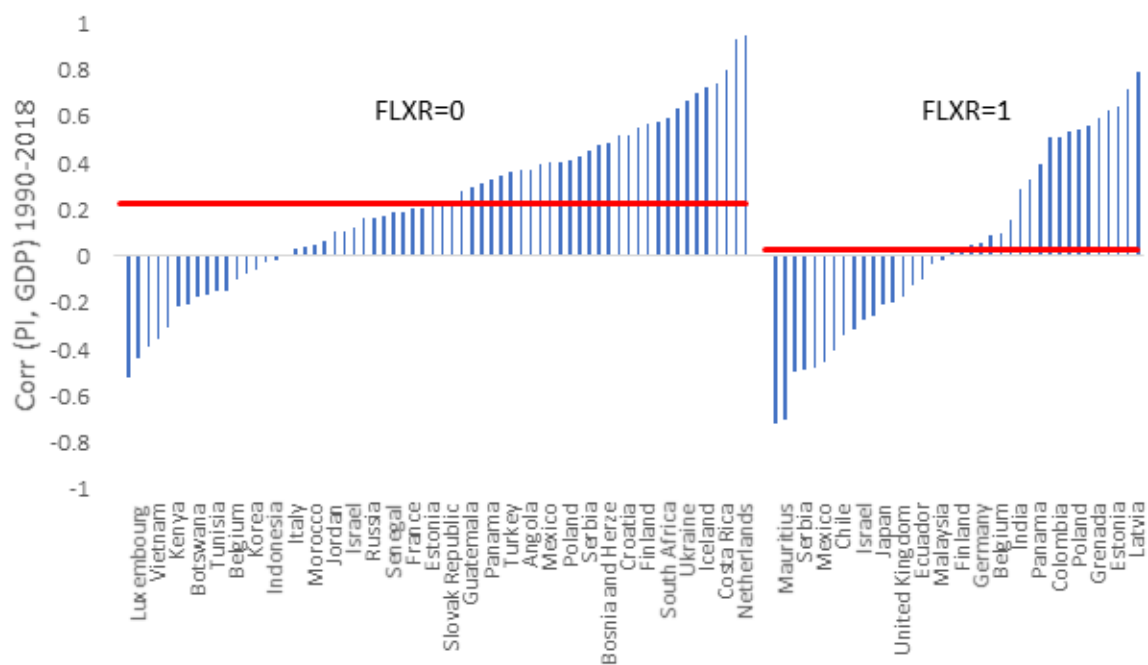
How can flexible fiscal rules help to protect public investment from budget cuts? One possibility is that such rules help to reduce the procyclicality of public investment. Consider each of the design features included in the definition of flexible rules and their implications in terms of the cyclical behavior of public spending. Rules with structural (as opposed to nominal) fiscal targets allow automatic stabilizers to operate over the business cycle. In the case of rules with escape clauses, they allow discretionary fiscal expansion during in response to negative exogenous shocks. In the case of investment friendly rules, they do not constrain public investment spending during periods of fiscal adjustment. In this section we examine the plausibility that flexible rules help to contain procyclical biases in public investment empirically. We do so while controlling for the traditional determinants of fiscal cyclicity discussed in the literature: limited creditworthiness (Gavin and Perotti 1997); and political economy factors (Frankel et al. 2012; Alesina et al. 2008).<sup>15</sup>

<sup>15</sup>The notion that flexible features affect the cyclical stance of fiscal policy was first discussed in Guerguil et al. (2017). The authors use propensity score matching techniques to estimate the effects of different fiscal rule features on public spending cyclicity. The exercise in this paper differs in two ways: we use panel regression techniques; and we measure public investment cyclicity using alternative estimation strategies.

## 7.1 Cross-sectional evidence

Following Kaminsky, Reinhart and Vegh (2004) we measure variation in cyclicality levels across countries using the correlation coefficient between the cyclical component of output and public investment over the period 1990-2018 for each country in our sample. Figure 7 presents cyclicality coefficients conditional splitting the sample between countries with flexible fiscal rule and countries with either no rule, or with a rigid rule. The results show that public investment cyclicality is significantly lower in countries with flexible fiscal rules: the median correlation is 0.23 for countries without such features, and only 0.03 in countries that include at least one flexible characteristic in their rule. Moreover, the frequency countries with negative correlation coefficients is two times larger among countries with flexible rules compared to the rest: while only 25 percent of countries without flexible rules have a negative correlation between output and capital expenditures, the share is 50 percent among countries with flexible fiscal rules.

**Figure 7:** Country Correlations between Cyclical Components of Public Investment and GDP conditional on fiscal rule design.



Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

## 7.2 Panel-level evidence

To exploit within country variation in cyclicity levels over time, we estimate the following Equation:

$$ccG_{i,t}^{PI} = \alpha_i + \phi_t + \beta_{ccY} ccY_{i,t} + \beta_{ccYflxr} ccY_{i,t} * FLXR_{i,t} + \theta X_{i,t} + \mu_{i,t} \quad (3)$$

Where  $ccG_{i,t}^{PI}$  and  $ccY_{i,t}$  are the estimated cyclical components of public investment and output, respectively.<sup>16</sup>  $X_{i,t}$  is a vector of control variables,  $\alpha_i$  are country fixed effects and  $\phi_t$  are time fixed effects. The coefficient estimate of interest,  $\beta_{ccYflxr}$ , is the interaction between the cycle and the flexible fiscal rule dummy. A positive sign of  $\beta_{ccY}$  would be consistent with a procyclical response of public investment in countries without a fiscal rule, or with a rigid rule. Similarly, a negative  $\beta_{ccYflxr}$  estimated coefficient would suggest that having a flexible fiscal rule reduces that procyclical behaviour.

We include two additional possible determinants of fiscal policy procyclicality that are related to borrowing constraints: the financial openness index from Chinn and Ito (2006); and the debt to GDP ratio. In addition, institutional quality indicators have been found to be related to procyclical fiscal biases in the literature (Alesina et al. 2008). Therefore, we also include the World Bank's Governance Indicators in the regression.

We estimate Equation 3 using two econometric methods: Columns 1-5 in Table 4 shows OLS results, and Columns 6-10 present Instrumental Variables (IV) estimations. In the IV case, the output gap of each country in the sample is instrumented using the export weighted output gap of the trading partners<sup>17 18</sup> Each column reports results from variants of the regression that include the interactions sequentially. For inference, we cluster the standard errors at the level of countries.<sup>19</sup>

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<sup>16</sup>We use the the Hodrick-Prescott (HP) filtering technique to estimate output gaps, setting the lambda parameter to 6.25.

<sup>17</sup>the export weighted output gaps are constructed using data from the Atlas of Economic complexity. See <http://atlas.cid.harvard.edu/data>

<sup>18</sup>The IV strategy follows Lane (2003); Gali and Perotti (2003), Jaimovich and Panizza (2007); Lledo et al. (2011), among others. The rationale for an IV strategy in this setting is that the output gap is affected by fiscal policy through the spending multiplier.

<sup>19</sup>See Table A4 (Appendix) for the first stage regressions of IV estimates.

Table 4 shows that coefficient estimate  $\beta_{ccYflxr}$  is negative, statistically significant, and economically large. In particular, the estimated degree of procyclicality is significantly lower in countries with flexible fiscal rules. For example, coefficient estimates from model 5 suggest that in the absence of flexible rules, a 1 percentage point deterioration in the output gap is associated with a 3 percent decrease in real public investment. However, procyclicality is reduced by almost 50% on average in countries with flexible fiscal rules. These results remain the same after accounting for possible reverse causality issues through the IV approach. For example, in Models 6,7, and 9, public investment falls by between 3 and 4.5 percentage points for every percentage point of worsening in the output gap.<sup>20</sup> However, this effect is neutralized for countries with flexible rules, turning public investment patterns from procyclical to acyclical. Regarding the control variables, lower levels of financial openness (a proxy for credit constraints) are positively related to public investment cyclicity (Columns 4 and 5), and lower values of the control of corruption index positively are related to procyclicality. Importantly for this paper, fiscal rule design remains as a significant determinant of cyclical behavior after accounting for the other plausible determinants. This provides reinforcing evidence in favor of the role of flexible fiscal rules in protecting public investment from large budget cuts.

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<sup>20</sup>In all IV estimations, we reject the null of no correlation in the underidentification test (Kleibergen-Paap rk LM statistic). The Kleibergen-Paap Wald rk F statistic is reported to test weak instruments and the critical values for Stock and Yogo test are: 10% = 7.03; 15% = 4.58; 20% = 3.95; 25% = 3.63. We can reject the null of weak instrument in estimations [6] and [7].

**Table 4:** Panel Fixed Effects Regressions between Cyclical Components of Public Investment and GDP conditional on fiscal rule design.

	Dep. Var.:Cyclical component of public investment									
	OLS Fixed Effect					IV Fixed Effect				
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Cyclical component of GDP	2.312*** (0.332)	2.616*** (0.341)	2.827*** (0.509)	2.330*** (0.390)	3.268*** (0.564)	3.789** (1.658)	4.586** (2.123)	2.563 (1.761)	3.904** (1.782)	3.443 (2.498)
FLXR	0.0157 (0.0181)	0.0143 (0.0167)	0.0179 (0.0182)	0.0241 (0.0194)	0.0183 (0.0167)	0.0188 (0.0169)	0.0189 (0.0154)	0.0204 (0.0174)	0.0300 (0.0216)	0.0236 (0.0185)
Cyclical component of GDP * FLXR	-1.809*** (0.587)	-1.456** (0.574)	-1.791*** (0.598)	-1.880** (0.758)	-1.600** (0.740)	-2.741** (1.228)	-2.196** (1.000)	-2.562* (1.458)	-2.537* (1.354)	-2.418* (1.253)
Financial openness		0.0203 (0.0230)			0.0325 (0.0280)		0.0209 (0.0238)			0.0357 (0.0297)
Cyclical component of GDP * Financial openness		-0.359** (0.157)			-0.450** (0.185)		-0.577 (0.474)			-0.816 (0.632)
Debt to GDP			-0.0222 (0.0160)		-0.0397* (0.0216)			0.0711 (0.0943)		0.0854 (0.132)
Cyclical component of GDP * Debt to GDP			-1.113 (0.672)		-1.448** (0.639)			3.907 (3.962)		4.661 (5.729)
Control of Corruption				0.00529 (0.0378)	0.00825 (0.0339)				-0.0258 (0.0364)	-0.0401 (0.0411)
Cyclical component of GDP * Control of Corruption				-0.0609 (0.277)	0.383* (0.202)				-0.0315 (0.386)	0.0275 (0.958)
Observations	1,451	1,415	1,429	1,178	1,145	1,306	1,277	1,316	1,105	1,076
R-squared	0.041	0.047	0.042	0.039	0.048					
Number of countries	71	69	71	71	69	71	69	73	71	69
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Underidentification Test						48.25	46.88	15.38	36.65	5.548
Chi-sq p-value						0.000	0.000	0.000	0.000	0.0185
Weak Instrument Test						15.92	11.97	3.526	7.392	0.876

Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

Note: robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively. Intercepts are included but not reported.

Underidentification Test: Kleibergen-Paap rk LM statistic. Weak Instrument Test: Kleibergen-Paap rk Wald F statistic.

## 8 Policy Trade-Offs: Growth Friendliness vs. Fiscal Sustainability?

The literature on optimal fiscal rules highlights the trade-off between commitment and flexibility brought by adopting a rules based framework. But there are potentially other trade-offs as well. Up to this point, the analysis in this paper has focused on the implications of certain design features of fiscal rules on the ability of the rules to protect public investment during fiscal adjustments. To the extent that the design of fiscal rules can help to reduce the procyclical bias of public investment behavior, it would also help improving the quality of fiscal policy management, making it more growth friendly. However, does this positive feature come at the expense of reducing the effectiveness of fiscal rules in ensuring fiscal sustainability? The answer is No.

In order to show why, this section explores the relationship between fiscal rules and the

frequency of sovereign debt crisis using data from Reinhart and Rogoff (2011). Following Asatryan et al. (2018), the probability of a debt crisis is modeled as a function of the presence of a fiscal rule. The innovation in this paper is to separate between different types of rules. The dependent variable are crisis events defined as periods when governments fail to meet an interest or principal payment on domestic and/or external debt. The control variables include population size, per capita income, the level of democracy<sup>21</sup>, and public debt-to-GDP ratios. Columns 1-4 in Table 5 present the results from pooled probit regressions, and Columns 5-8 introduce an IV setup in which flexible rules are instrumented using initial institutional quality.<sup>22 23</sup>

The results show that fiscal rules in general, and flexible rules in particular, are associated with a *lower* probability of debt crises. According to Models 1-4, the magnitude of the average risk-reducing estimated effect oscillates between 10-13%. As shown by Figure 8, the marginal effects computed from the estimated coefficients for any type of fiscal rules, and for flexible fiscal rules respectively, are of similar magnitude. This suggest that when seen through the lens of the estimated probability of a debt crisis, "flexibility" does not imply that the rule yields less fiscal sustainability than rigid rules. This is so because the estimated impacts on the probability of a debt crisis of a flexible fiscal rule are economically and statistically the same as with any other type of fiscal rule.<sup>24</sup>

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<sup>21</sup>As measured by Polity2 scores which subtracts the country's score in an "autocracy" index from its score in a "democracy" index (resulting in a range from -10 to 10).

<sup>22</sup>We have tried using a generalized diff-in-diff design following Equations 1 and 2 as in previous sections, but the fact that in several countries sovereign debt crisis are never observed results in a significant loss of observations.

<sup>23</sup>See Table A5 (Appendix) for the first stage regressions of IV estimates.

<sup>24</sup>This analysis can be expanded in several dimensions, for example, introducing other measures of fiscal performance traditionally found in the fiscal rule literature (debt levels, government size, etc).



**Table 5:** Determinants of the probability of debt crises.

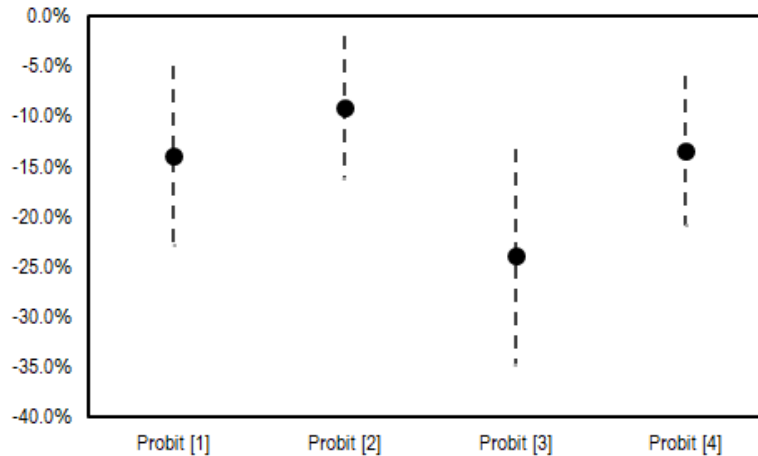
	Dep. Var.:Probability of debt crisis							
	Probit				IV Probit			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
FR	-0.745** (0.294)	-0.764** (0.358)			-2.420*** (0.213)	-2.320*** (0.180)		
FLXR			-1.484*** (0.423)	-1.399*** (0.491)			-2.500*** (0.226)	-2.268*** (0.268)
Real GDP	-0.0263 (0.0244)	0.00460 (0.0327)	-0.0372 (0.0230)	-0.00424 (0.0326)	-0.00713 (0.0316)	0.00406 (0.0319)	-0.00398 (0.0296)	0.0172 (0.0355)
Population	-0.237** (0.115)	-0.335** (0.133)	-0.267** (0.120)	-0.386*** (0.142)	-0.141 (0.0939)	-0.187** (0.0924)	-0.101 (0.116)	-0.143 (0.131)
Polity	-0.0560** (0.0251)	-0.0626** (0.0303)	-0.0627** (0.0247)	-0.0770*** (0.0285)	0.0349 (0.0259)	0.0428 (0.0295)	-0.0169 (0.0270)	-0.0333 (0.0310)
Debt to GDP		0.419 (0.349)		0.184 (0.326)		0.343 (0.332)		-0.599 (0.397)
Observations	1,309	1,054	1,309	1,054	979	800	979	800
Country Fixed Effect	No	No	No	No	No	No	No	No
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald (p value)					0.000	0.000	0.000	0.000

*Source:* Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

*Note:* robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively.

Intercepts are included but not reported.

**Figure 8:** Marginal effects . Probability of having a debt crisis.



*Source:* Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017). *Note:* Marginal effects computed from Table 5, Columns 1 and 4. Confidence intervals (IC) of 90% (dashed line).

## 9 Conclusions

In 2019, public investment fell below 1 per cent of GDP on average in emerging markets for the first time in 20 years.<sup>25</sup> There is a growing concern among policymakers about the declining trend in public investment which is one undesirable feature of fiscal policy procyclicality.

This paper shows that certain design features of fiscal rules help to safeguard public investment from budget cuts during fiscal consolidation episodes. This is positive news because many countries have adopted fiscal rules, or are considering strengthening the policy management toolkit by adopting rules-based frameworks. The results in this paper suggest that including elements related to the protection of public investment in the design of the rules can add a growth enhancing dimension to the fiscal sustainability concerns that have typically been the focus of fiscal rules in the past. Further results show that introducing those flexibility features in the design of the rule does not come at the expense of making the rule be less effective on the fiscal sustainability dimension.

Reforms in rules-based fiscal frameworks aimed at protecting public investment should be accompanied by safeguards. First, improvements to public investment management processes are required in all phases of the project cycle, from appraisal through selection, and implementation, to ensure that additional capital expenditures effectively contribute to propelling productivity growth in the economy, (Gupta et al. 2014). Second, the provisions in investment-friendly

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<sup>25</sup>Financial Times: Investment in emerging markets falls to historic low (May 10, 2019).

fiscal rules should seek to mitigate opportunistic classifications of capital expenditures (e.g. reporting current expenditures as infrastructure investment). This in turn requires strengthening transparency standards in government finance statistics by adopting international best practices. Third, adopting medium-term fiscal frameworks can support an effective implementation of fiscal rules by extending the horizon of fiscal policymaking beyond the one year time line. Finally, enforcement and monitoring mechanisms should be in place to foster rule compliance. For example, independent fiscal councils that can verify whether rules are being complied with; and/or provide ex-ante regular quality control to macroeconomic and fiscal assumptions underpinning the budget process. Further research on how these features interact at the country level would advance the understanding of the general equilibrium and welfare effects of fiscal rules.

## References

- [1] Abiad, A., D. Furceri and P. Topalova. 2016. The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies. *Journal of Macroeconomics*, 50, pages 224-240, 2016.
- [2] Alesina, A., C. Favero, and F. Giavazzi. 2017. What do we know about the effects of austerity? NBER
- [3] Alesina, Alberto, and Silvia Ardagna. 2013. “The Design of Fiscal Adjustments.” *Tax Policy and the Economy*. 27: 19-67.
- [4] Alesina, A., and S. Ardagna. 2010. “Large Changes in Fiscal Policy: Taxes versus Spending.” *Tax Policy and the Economy*. 24: 35-68.
- [5] Alesina, A., F. Campante, and G. Tabellini. 2008. “Why is Fiscal Policy Often Procyclical?” *Journal of the European Economic Association*, Vol. 6(5), pp. 1006-1036.
- [6] Alesina, A.F. , Bayoumi, T. , 1996. The Costs and Benefits of Fiscal Rules: Evidence from U.S. States. Cambridge, Massachusetts: National Bureau of Economic Research NBER Working Paper No. 5614 .
- [7] Alesina, A., and G. Tabellini. 1990. “Voting on the Budget Deficit.” *American Economic Review* 80 (1): 37–49.
- [8] Alesina, Alberto F. and Roberto Perotti, 1999. ”Budget Deficits and Budget Institutions,” NBER Chapters,in: *Fiscal Institutions and Fiscal Performance*, pages 13-36 National Bureau of Economic Research, Inc.

- [9] Amador, M., I. Werning, and G.-M. Angeletos (2006) “Commitment Vs. Flexibility,” *Econometrica*, 74, 365-396.
- [10] Ardanaz, M. and A. Izquierdo. 2017. Current Expenditure Upswings in Good Times and Capital Expenditure Downswings in Bad Times? Evidence from developing countries. IDB-Working Paper 838. InterAmerican Development Bank.
- [11] Arezki, R., and K. Ismail. 2013. “Boom-Bust Cycle, Asymmetrical Fiscal Response and the Dutch Disease.” *Journal of Development Economics* 101: 256-267.
- [12] Asatryan, Z, C. Castellón, and T. Stratmann. 2018. Balanced budget rules and fiscal outcomes: Evidence from historical constitutions. *Journal of Public Economics*
- [13] Azzimonti, M., M. Battaglini, and S. Coate (2016): The Costs and Benefits of Balanced Budget Rules: Lessons from a Political Economy Model of Fiscal Policy,” *Journal of Public Economics*, 136, 4561.
- [14] Balassone, Fabrizio and Franco, Daniele, (2000), Public investment, the Stability Pact and the ‘golden rule’, *Fiscal Studies*, 21, issue 2, p. 207-229.
- [15] Barro, Robert J, 1979. ”On the Determination of the Public Debt,” *Journal of Political Economy*, University of Chicago Press, vol. 87(5), pages 940-971, October.
- [16] Bassetto, M. and T. Sargent (2006): Politics and Efficiency of Separating Capital and Ordinary Government Budgets,” *The Quarterly Journal of Economics*, 121, 1167-1210.
- [17] Blanchard, O., and F. Giavazzi, 2004. Improving the SGP through a proper accounting of public investment, Center for Economic and Policy Research Discussion Paper No. 4220.
- [18] Beetsma, R., Debrun, X., 2007. The new stability and growth Pact: a first assessment. *Eur. Econ. Rev.* 51, 453–477.
- [19] Bova, E. , Carcenac, N. , Guerguil, M. 2014. Fiscal Rules and the Procyclicality of Fiscal Policy in the Developing World. International Monetary Fund, Washington IMF Working Papers No. 14/122 .
- [20] Caselli, F. and J. Reynaud (2019) Do fiscal rules improve the fiscal balance? A new instrumental variable strategy. IMF Working Paper.
- [21] Cavallo, E., and C. Daude. 2011. Public investment in developing countries: a blessing or a curse? *Journal of Comparative Economics*

- [22] Clemens, J. and S. Miran. 2012. “Fiscal Policy Multipliers on Subnational Government Spending,” *American Economic Journal: Economic Policy*, American Economic Association, vol. 4(2), pp. 46-68, Mayo.
- [23] Debrun, X. and L. Jonung. 2018. Under threat: Rules-based fiscal policy and how to preserve it. *European Journal of Political Economy*
- [24] Easterly, W., and L. Servén. 2003. *The Limits of Stabilization: Infrastructure, Public Deficits, and Growth in Latin America*. Stanford, United States: Stanford University Press.
- [25] Eyraud, L., X. Debrun, A. Hodge, V. Lledó, and C. Pattillo. 2018. *Second-Generation Fiscal Rules: Balancing Simplicity, Flexibility, and Enforceability*. IMF Staff Discussion Note No. SDN/18/04.
- [26] Fatas, A. and I. Mihov. 2006. The macroeconomic effects of fiscal rules in the US states. *Journal of Public Economics* 90, 101–117.
- [27] Frankel, J., C. Végh, and G. Vuletin. 2012. “On Graduation from Fiscal Procyclicality.” *Journal of Development Economics* 100: 32–47.
- [28] Furceri, D. and B. Li. 2017. *The Macroeconomic (and Distributional) Effects of Public Investment in Developing Economies*. IMF working papers 17/217.
- [29] Gali, J. and R. Perotti. 2003. “Fiscal Policy and Monetary Integration in Europe,” *Economic Policy*, Vol. 37, pp. 533-572.
- [30] Grigoli, F. and M. Zachary. 2011. “Do high and volatile levels of public investment suggest misconduct? the role of institutional quality,” *Policy Research Working Paper Series 5735*, The World Bank.
- [31] Guajardo, Jaime, Daniel Leigh, and Andrea Pescatori. 2014. “Expansionary Austerity? International Evidence.” *Journal of the European Economic Association*. 12(4): 949-68.
- [32] Guerguil, M., P. Mandon, and R. Tapsoba. 2017. Flexible fiscal rules and countercyclical fiscal policy. *Journal of Macroeconomics* 52: 189-220.
- [33] Gupta, Sanjeev and Kangur, Alvar and Papageorgiou, Chris and Wane, Abdoul. (2014). *Efficiency-Adjusted Public Capital and Growth*. *World Development*. 57. 164-178.
- [34] Halac, M. and P. Yared (2014): *Fiscal Rules and Discretion under Persistent Shocks*,” *Econometrica*, 82.
- [35] Hausman, J. A. 1978. Specification tests in econometrics. *Econometrica* 46: 1251–1271.

- [36] Heinemann, F., Moessinger, M.-D., Yeter, M., 2018. Do fiscal rules constrain fiscal policy? A meta-regression-analysis. *Eur. J. Polit. Econ.* 51, 69–92.
- [37] International Monetary Fund 2017. Fiscal rules dataset: 1985-2015.  
<https://www.imf.org/external/datamapper/FiscalRules/map/map.htm>
- [38] International Monetary Fund. 2009. “Fiscal Rules—Anchoring Expectations for Sustainable Public Finances.” IMF Policy Paper, International Monetary Fund, Washington, DC.
- [39] Izquierdo, A, R. Lama, J.P. Medina, J. Puig, D. Riera-Critchon, C. Vegh, and G. Vuletin. 2018. Does the size of the public investment multiplier depend on the initial stock of public capital? Inter-American Development Bank, Washington, DC.
- [40] Jaimovich, D., and U. Panizza. 2007. “Procyclicality or Reverse Causality?” RES Working Papers 1029, Inter-American Development Bank.
- [41] Jorda, O. 2005. ”Estimation and inference of impulse responses by local projections”, *American Economic Review* 95 (1), 161-182.
- [42] Kaminsky, G., C. Reinhart, and C. Vegh. 2004. “When It Rains It Pours: Procyclical Capital Flows and Macroeconomic Policies,” *NBER Macroeconomics Annual*, Vol. 19.
- [43] Keefer, P., and S. Knack. 2007. “Boondoggles, Rent-Seeking and Political Checks and Balances: Public Investment under Unaccountable Governments.” *Review of Economics and Statistics* 89: 566–572.
- [44] Lledo, V., I. Yackovlev, and L. Gadenne. 2011. “A Tale of Cyclicity, Aid Flows and Debt: Government Spending in Sub-Saharan Africa, *Journal of African Economies*, Vol. 20(5), pp. 823-849.
- [45] McKinsey Global Institute. 2016. Bridging global infrastructure gaps. McKinsey and Company. June.
- [46] Milesi-Ferretti, G. 2003. “Good, Bad, or Ugly? On the Effects of Fiscal Rules with Creative Accounting.” *Journal of Public Economics* 88 (1): 377–94.
- [47] Peletier, B., R. Dur, and O. Swank. 1999. “Voting on the Budget Deficit: Comment.” *American Economic Review* 89 (5): 1377–1381.
- [48] Poterba, J. (1994), ”State responses to fiscal crises: The effects of budgetary institutions and politics”, *Journal of Political Economy* 102.

- [49] Reinhart, C., and K. Rogoff. 2011. From financial crash to debt crisis. *American Economic Review* 101 (5): 1676-1706.
- [50] Riera-Crichton, D., Vegh, C. A., and Vuletin, G. 2014. "Fiscal Multipliers in Recessions and Expansions: Does it Matter Whether Government Spending is Increasing or Decreasing? ". World Bank Policy Research Working Paper No. 6993.
- [51] Romer C., and D. Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks." *American Economic Review* 100: 763–801.
- [52] Sargan, J. D. 1958. The estimation of economic relationships using instrumental variables. *Econometrica* 26: 393–415.
- [53] Serven, Luis, 2007. "Fiscal rules, public investment, and growth," Policy Research Working Paper Series 4382, The World Bank.
- [54] Schaechter, A., Kinda, T., Budina, N., and A. Weber. 2012. "Fiscal Rules in Response to the Crisis - Toward the "Next-Generation" Rules. A New Dataset." IMF Working Paper 12/187, International Monetary Fund, Washington, DC
- [55] Stock, J. H., J. H. Wright, and M. Yogo. 2002. A survey of weak instruments and weak identification in generalized method of moments. *Journal of Business and Economic Statistics* 20: 518–529.
- [56] Stock, J. H., and M. Yogo. 2005. Testing for weak instruments in linear IV regression. In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, ed. D. W. K. Andrews and J. H. Stock, 80–108. New York: Cambridge University Press.
- [57] Stock, J., and M. Watson, 2007. "Why has U.S. inflation become harder to forecast?" *Journal of Money, Banking and Credit* 39, 1-33.

# Appendix

**Table A1:** List of Countries.

Advanced Economies	Developing Asia	Developing Europe and Ex-USSR	Latin America and Caribe	Middle East, North Africa and Sub-Saharan Africa
Australia	China	Bosnia and Herze	Argentina	Algeria
Austria	India	Bulgaria	Barbados	Egypt
Belgium	Indonesia	Croatia	Brazil	Jordan
Canada	Malaysia	Lithuania	Chile	Lebanon
Czech Republic	Philippines	Poland	Colombia	Morocco
Estonia	Thailand	Romania	Costa Rica	Tunisia
Finland	Vietnam	Serbia	Dominican Republ	Angola
France		Turkey	Ecuador	Botswana
Germany		Georgia	El Salvador	Kenya
Greece		Kazakhstan	Grenada	Mauritius
Hong Kong SAR		Russia	Guatemala	Senegal
Iceland		Ukraine	Guyana	South Africa
Ireland			Mexico	
Israel			Panama	
Italy			Paraguay	
Japan			Peru	
Korea			Suriname	
Latvia			Uruguay	
Luxembourg				
Netherlands				
New Zealand				
Portugal				
Slovak Republic				
Switzerland				
United Kingdom				
United States				

*Source:* Own elaboration based on WEO-IMF country classification.



**Table A2: Descriptive Statistics.**

	Mean	Sd	Min	10th pct	90th pct	Max	Observations	Source
Public Investment Growth Rate	0.03	0.18	-1.09	-0.15	0.21	1.75	1530	WEO-IMF, October 2018
Fiscal Consolidation (2 Year definition)	0.20	0.40	0.00	0.00	1.00	1.00	1530	WEO-IMF, October 2018
Fiscal Rule (FR)	0.55	0.50	0.00	0.00	1.00	1.00	1530	IMF Fiscal Rules Dataset
Flexible FR	0.32	0.46	0.00	0.00	1.00	1.00	1530	IMF Fiscal Rules Dataset
Other design FR	0.13	0.33	0.00	0.00	1.00	1.00	700	IMF Fiscal Rules Dataset
Population Growth Rate	0.01	0.01	-0.06	0.00	0.02	0.05	1530	WEO-IMF, October 2018
Real GDP Growth Rate	0.03	0.03	-0.16	0.00	0.07	0.22	1530	WEO-IMF, October 2018
Debt to GDP ratio	0.54	0.36	0.00	0.17	1.00	2.38	1508	WEO-IMF, October 2018
Current spending growth rate	0.04	0.07	-0.33	-0.02	0.11	0.46	1480	WEO-IMF, October 2018
Institutional Quality	4.14	1.17	1.85	2.78	5.87	6.45	1281	International Country Risk Guide
Stock of Public Capital per capita	13.76	10.64	0.62	2.87	28.63	57.01	1290	IMF (2015)
Old Age Dependency	17.24	8.06	4.53	7.51	27.64	45.03	1085	World Bank
Control of Corruption	0.42	0.99	-1.39	-0.73	1.94	2.46	1245	World Bank
Real GDP per capita (log)	18.12	2.26	13.91	15.89	22.07	24.39	1530	WEO-IMF, October 2018
Fiscal Consolidation (1 Year definition)	0.15	0.36	0.00	0.00	1.00	1.00	1530	WEO-IMF, October 2018
Narrative Fiscal Consolidation	0.29	0.46	0.00	0.00	1.00	1.00	503	Guajardo et al. (2014)
Change in share of Public investment over GDP from t-1 to t	0.00	0.01	-0.06	-0.01	0.01	0.06	1530	WEO-IMF, October 2018
Change in share of public investment over total expenditure from t-1 to t	0.00	0.02	-0.17	-0.03	0.02	0.19	1480	WEO-IMF, October 2018
Government Fragmentation	0.28	0.28	0.00	0.00	0.69	0.91	1413	Database of Political Institutions IADB
Checks and Balances	3.48	1.74	1.00	1.00	5.00	18.00	1414	Database of Political Institutions IADB
Financial openness	1.01	1.48	-1.91	-1.20	2.36	2.36	1494	Chinn-Ito Financial Openness Index
Polity2	7.04	4.62	-7.00	-2.00	10.00	10.00	1328	Center for Systemic Peace

Source: Own elaboration.

**Table A3:** Robustness of baseline results. Effects of fiscal rules on public investment during fiscal consolidations.

	Dep. Var							
	% Change PI			Change PI/GDP	Change PI/TE	% Change PI		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
FC	-0.0790*** (0.0256)			-0.00507*** (0.00138)	-0.00783*** (0.00261)	-0.0921*** (0.0187)	-0.0949*** (0.0189)	-0.0937*** (0.0185)
FLXR	0.0388* (0.0216)	-0.00544 (0.0114)	-0.0118 (0.0232)	-0.000295 (0.000698)	-0.00116 (0.00222)			
FC * FLXR	0.0691** (0.0309)			0.00422** (0.00169)	0.00871** (0.00379)			
Control of Corruption	0.0179 (0.0297)							
Stock of Capital per capita	-0.0155*** (0.00389)							
Old Age Dependency	0.00511 (0.00436)							
Real GDP per capita (log)	-0.0439 (0.0746)							
1Y Fiscal Consolidation		-0.104*** (0.0213)						
1Y Fiscal Consolidation * FLXR		0.0827*** (0.0313)						
Narrative Fiscal Consolidation			-0.0419** (0.0174)					
Narrative Fiscal Consolidation * FLXR			0.0137 (0.0318)					
Investment Friendly Fiscal Rule (IFR)						0.00192 (0.0167)		
FC * IFR						0.0738*** (0.0234)		
Escape Clause (EC)							0.0262 (0.0275)	
FC * EC							0.0868 (0.0742)	
Cyc. Adj. Balance (CAB)								0.00539 (0.0242)
FC * CAB								0.0903 (0.0630)
Population Growth Rate	-0.635 (1.714)	1.190 (1.199)	6.364*** (1.563)	-0.0336 (0.0439)	-0.104 (0.117)	1.008 (1.256)	0.725 (1.397)	0.789 (1.423)
Real GDP Growth Rate	2.283*** (0.398)	2.108*** (0.261)	1.707** (0.606)	0.0378*** (0.0138)	0.142*** (0.0405)	2.194*** (0.278)	2.106*** (0.278)	2.037*** (0.264)
Debt to GDP	-0.0325 (0.0601)	0.0130 (0.0346)	-0.00213 (0.0169)	0.000844 (0.00163)	0.00319 (0.00596)	0.0256 (0.0366)	0.00752 (0.0475)	0.0175 (0.0477)
Observations	859	1,508	318	1,525	1,475	1,294	1,151	1,150
R-squared	0.217	0.169	0.273	0.080	0.043	0.177	0.176	0.181
Number of Countries	72	75	14	75	73	75	71	71
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

Note: robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively. Intercepts are included but not reported.

**Table A4:** First Stage Regression of Instrumental variables regressions between cyclical components (cyc. comp.) of public investment and GDP conditional on fiscal rule design. Table 4 in the main text.

	First Stage Regression						
	Column 6 at Table 4		Column 10 at Table 4				
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	cyc. comp. of GDP	cyc. comp. of GDP*FLXR	cyc. comp. of GDP	cyc. comp. of GDP*FLXR	cyc. comp. of GDP*Financial openness	cyc. comp. of GDP*Debt to GDP	cyc. comp. of GDP*Control of Corruption
TP cyc. comp.	0.988*** (0.277)	0.0361 (0.0428)	1.401*** (0.316)	0.00481 (0.0513)	0.728 (0.622)	0.181 (0.210)	0.0978 (0.240)
TP cyc. comp.*FLXR	0.135 (0.150)	1.137*** (0.103)	-0.0940 (0.170)	1.094*** (0.0881)	-0.0194 (0.299)	0.0180 (0.105)	-0.0867 (0.169)
TP cyc. comp.*Financial openness			0.0615 (0.0788)	0.0115 (0.00908)	1.143*** (0.169)	-0.00482 (0.0270)	-0.0407 (0.0744)
TP cyc. comp.*Control of Corruption			0.151* (0.0874)	-0.00177 (0.0332)	0.0886 (0.147)	0.155*** (0.0540)	1.149*** (0.145)
TP cyc. comp.*Debt to GDP			-0.971*** (0.311)	-0.0151 (0.0608)	-1.507** (0.610)	0.221 (0.339)	0.125 (0.266)
Financial openness			-0.00116 (0.000747)	-8.44e-05 (0.000377)	0.000223 (0.00117)	-0.000704 (0.000698)	8.38e-05 (0.000911)
Control of Corruption			0.00535* (0.00298)	0.000618 (0.000772)	0.00466 (0.00543)	0.00450** (0.00198)	0.00406 (0.00294)
Debt to GDP			-0.0256*** (0.00474)	-0.00247** (0.000976)	-0.0316*** (0.0112)	-0.0226*** (0.00469)	-0.00725 (0.00735)
FLXR	-0.000788 (0.00136)	-0.000414 (0.000820)	-0.00173 (0.00150)	-0.00133 (0.000903)	-0.00273 (0.00339)	-0.000313 (0.00118)	-0.000126 (0.00111)
Observations	1,306	1,306	1,076	1,076	1,076	1,076	1,076
R-squared	0.382	0.554	0.471	0.588	0.489	0.320	0.510
Number of Countries	71	71	69	69	69	69	69
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

Note: robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively. Intercepts are included but not reported. TP is the abbreviation for Trading partners. First stages associated with Columns 7 -9 are not reported for brevity.

**Table A5:** First Stage Regression of Instrumental variables regressions between probability of having a debt crisis and fiscal rule design. Table 5 in the main text.

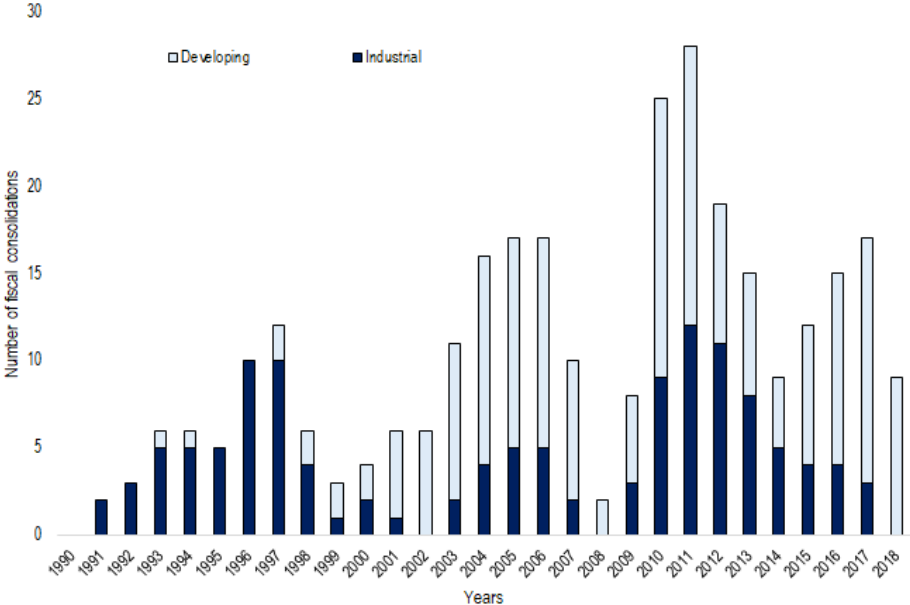
	First stage regressions. Columns 5-8 at Table 5			
	Dep. Var. FR		Dep. Var. FLXR	
	[1]	[2]	[3]	[4]
Institutional Quality	0.117*** (0.0336)	0.0883** (0.0383)	0.126*** (0.0388)	0.131*** (0.0423)
Real GDP per capita (log)	0.00885 (0.0105)	0.00929 (0.0132)	0.0115 (0.0105)	0.0190 (0.0150)
Population (log)	-0.0238 (0.0238)	-0.0438 (0.0296)	-0.00337 (0.0294)	-0.0111 (0.0382)
Polity 2	0.0183** (0.00797)	0.0255*** (0.00929)	-0.00335 (0.00859)	-0.00480 (0.0109)
Debt to GDP		0.217** (0.102)		-0.164 (0.154)
Observations	979	800	979	800
Country Fixed Effect	No	No	No	No
Year Dummies	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

*Source:* Own elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF 2017).

*Note:* robust cluster standard errors in brackets. Significance level \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , respectively.

Intercepts are included but not reported.

**Figure A1:** Distribution of fiscal consolidations over time. Developing and industrial countries. 1990 - 2018.



Source: Own elaboration based on WEO-IMF.