Growth-friendly Fiscal Rules? Safeguarding Public Investment from Budget Cuts through Fiscal Rule Design*

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Abstract

We study patterns of public investment behavior during fiscal consolidations in seventy five advanced and emerging economies during 1990-2018 and find that results differ significantly depending on fiscal rule design. Fiscal rules can be flexible, meaning that they include mechanisms to accommodate exogenous shocks (e.g., cyclically adjusted fiscal targets, well-defined escape clauses, and differential treatment of investment expenditures) or rigid, meaning they 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 percent of GDP is associated with an average 10 percent reduction in public investment. Instead, in countries with flexible fiscal rules, the negative effect of fiscal adjustments on public investment vanishes, which implies that flexible rules protect public investment during consolidation episodes. The corollary is that the design of fiscal rules can add a growth-friendliness dimension to the fiscal sustainability objective that has typically been the focus of fiscal rules in the past, provided public investment is productive.

JEL Codes: E32, E60, H12, H50, H54

Keywords: fiscal rules, public investment, fiscal consolidations, spending cyclicality.

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1 Introduction

Public investment levels have been declining across advanced and emerging economies over the last decades.[1] Structural features, including population aging and associated increased pension and health spending generating crowding-out effects on other budget items have been identified as one source of this secular trend in developed countries (Schuknecht & Zemanek, 2018). The bias against public investment is reinforced in times of fiscal adjustment or during economic downturns as the public investment-to-consumption ratio tends to be significantly reduced, a behavior that is specially prevalent across developing countries (Easterly & Servén, 2003; Serven, 2007; Bamba et al., 2020). In particular, when countries have to slash budget deficits, they tend to cut capital expenditure (public investment) relatively more than current expenditure (government consumption). To the extent such policy moves coincide with the low phase of the business cycle, fiscal adjustments contribute to the well-documented procyclical bias in public capital expenditures (Akitoby et al., 2006; Arezki & Ismail, 2013). This behavior in turn has been attributed to the fact that capital expenditure cuts are more politically palatable than cutting current expenditures (Ardanaz & Izquierdo, 2017).

The implications of the bias in spending composition are problematic from an economic welfare standpoint. This is so because of the growth-enhancing potential and distributional effects of public investment.[2] On the growth implications, Ilzetzki et al. (2013), for example, show that fiscal multipliers of public investment are larger than those of current expenditure under the conditions that are usually prevalent in developing countries. In fact, an extensive body of economic literature has shown that public investment can be particularly useful to propel economic growth especially during economic downturns (Abiad et al., 2016); when investment efficiency is high (Furceri & Li, 2017), and when the initial stock of public capital is low (Izquierdo et al., 2019).[3] In terms of distributional implications, Furceri & Li (2017) show that increases in public investment tend to lower income inequality over time in developing countries. Cavallo & Powell (2019) in turn, show that the estimated impacts of low public investment in infrastructure is regressive as

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[1]Since the 1980's, capital spending as a share of total outlays has lost about 4 percentage points in the developed world on average; and in emerging countries, despite their lower public capital stocks, the corresponding figure is around 8 percentage points (Izquierdo et al., 2018).

[2]Building up a country's public capital stock can increase private investment and productivity. However, distortions in the public investment management process may generate countervailing (crowding out) effects (Cavallo & Daude, 2011).

[3]The last condition in particular, is more prevalent in developing countries characterized by large infrastructure gaps (McKinsey Global Institute, 2016).

low investment results in higher prices that hurt relatively poor people more because they devote a larger share of their incomes to pay for infrastructure services compared to the rich.[4]

Considering the consequences of the systematic bias against public investment, designing policy tools to protect such spending category during periods of fiscal adjustment can be welfare improving. Can fiscal rules play such a role? The answer provided in this paper is a qualified *Yes*. Fiscal rules *can* counteract the bias against public investment during fiscal consolidations *if* they include certain design features that allow governments to preserve investment directly, or indirectly by enabling fiscal policy to accommodate unexpected shocks without penalizing capital expenditures.

Starting in the 1990's, fiscal rules have become widespread mechanisms to prevent governments from running persistent deficits and accumulating debt. While fiscal rules have been shown to improve fiscal sustainability, they have also been under scrutiny for unintendedly encouraging fiscal procyclicality (Alesina & Bayoumi, 1996; Fatas & Mihov, 2006; Clemens & Miran, 2012) and large cuts in public investment (Blanchard & Giavazzi, 2004). This is so because pressure to comply with aggregate numerical targets provides incentives for policymakers to cut spending items that may have long term payoffs such as public investment (Dur *et al.*, 1999; Beetsma & Debrun, 2007). 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, the over-compression of public investment during fiscal consolidations. However, this need not be the case in practice.

In fact, the empirical literature has shown there is great variation in fiscal rule design across countries and over time (IMF, 2009; Budina *et al.*, 2012; Eyraud *et al.*, 2018). In response to concerns about the lack of adaptability to shocks and investment compression, countries have been incorporating *flexible* features in their fiscal frameworks. Specifically, those features are: cyclically adjusted fiscal targets; well-defined escape clauses in the case of unanticipated shocks;[5] and investment-friendly provisions (i.e., rules that exclude capital expenditures from the numerical

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[4]The intuition is that the supply of infrastructure services would be unable to keep up with demand without higher investment. Consequently, prices of infrastructure services would rise. Those price increases, in turn, would be regressive because in their sample of Latin American and the Caribbean countries, poor households devote a higher share of income to paying for infrastructure services (16 percent of real income, on average) than richer households (13.5 percent of real income, on average).

[5]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 of the path back to the rule and treatment of accumulated deviations. See IMF (2009).

targets imposed on fiscal aggregates) (Budina *et al.*, 2012; Guerguil *et al.*, 2017). While in 1995 there were 11 countries that had adopted at least one such flexible feature (out of a total of 23 countries that had adopted a fiscal rule), by 2015 the figure increased to 52 countries (out of 92 countries that had adopted a fiscal rule). Therefore, by 2015, 57% of countries that had implemented a fiscal rule had adopted at least one flexible feature, and oftentimes more than one such feature at the same time, generating an overlap in the use of flexible rules that occurs about 70% of the time.[6]

How do these flexible features help in protecting public investment from budget cuts? Investment friendly provisions do so directly, because investment is exempted from the perimeter of the rule, thus promoting public investment growth during booms, and protecting capital spending from being cut excessively during busts or fiscal adjustment episodes.[7] Cyclically-adjusted balance rules and the inclusion of escape clauses contribute indirectly to the protection of public investment, through different channels. Fiscal rules in which targets are defined in cyclically adjusted terms allow policymakers to delink public spending (and thus, investment) from cyclical shocks, avoiding boom-bust cycles in fiscal policy in general, thus reducing the need to over-compress investment during bad times in particular.[8] The inclusion of well-defined escape clauses in fiscal rules contributes to enhance the reaction of fiscal policy to unforeseen events by allowing temporary deviations from the rules' targets. They provide maneuvering room to policymakers to implement discretionary fiscal stimulus in response to shocks. Public investment is the quintessential example of such countercyclical response. Thus, while achieving compliance with a rigid rule may require the compression of public investment during downturns, the activation of an escape clause could even propel it.

This paper contributes to the literature by documenting that flexibility mechanisms effec-

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[6]Specifically, 11 out of the 19 countries with fiscal rules that contained investment friendly provisions also had either cyclically adjusted balance and/or escape clauses. 22 out of the 26 countries with fiscal rules that contained cyclically adjusted balance targets also had either investment friendly provisions and/or escape clauses. Finally, 28 out of the 40 countries with fiscal rules that contained escape clauses also had either cyclically adjustment balances and/or investment friendly provisions.

[7]One example of an investment friendly rule is the United Kingdom's over the cycle "golden rule" implemented between 1997 and 2008 through which general government borrowing was only allowed for investment, and not to fund current spending. Over this period, the current budget, which excludes capital investment, averaged 0.1 percent of GDP, meeting the golden rule by a small margin, allowing capital spending to grow by more than 1 percentage point of GDP (IMF, 2010).

[8]As an example of such a rule, consider Chile's structural balance rule in force since 2001 that corrects not only for the cyclical influence of the domestic business cycle in the budget, but also takes into account swings in the price of one of its main commodities (copper).

tively safeguard public investment from budget cuts during fiscal consolidations, as they contribute to make public investment less procyclical. The empirical exercises are undertaken using a sample of 75 advanced and developing countries during 1990-2018. Results show that in countries *without* flexible fiscal rules (which include both countries without fiscal rules, and countries with rigid fiscal rules), a fiscal consolidation episode equivalent to at least 2 percent of GDP is associated with an average 10 percent reduction in capital expenditures. Instead, in countries where the fiscal rule includes flexibility features, the ensuing decline in investment is less than 2 percent, and not statistically significant. The results are robust to a battery of sensitivity analyses and hold after controlling for potential endogeneity in the estimations.

These results in turn are consistent with theoretical models in which, in the context of either political economy frictions, or specific capture technologies, introducing flexible features to fiscal rules can protect public investment from the natural bias against it. This is so either because flexible features explicitly lift the burden of adjustment from public investment, or they help to reduce the procyclicality of discretionary capital spending (Izquierdo & Kawamura, 2018).

From an economic welfare perspective, the discussion above does not imply that governments should necessarily choose to preserve public investment under all circumstances. In fact, there could be cases when cutting public investment may be preferred to reducing other types of expenditures. This for example could occur when investment is inefficient or the productivity of public capital is low;[9] when maintaining or increasing current expenditures (such as targeted transfers) may be needed in response to an exogenous shock in which consumers are credit constrained; in the aftermath of a period of over-investment in the economy; or as a result of a policy decision to shift the provision of certain infrastructure services toward the private sector. However, what flexible fiscal rules can do is to prevent policymakers from pursuing disproportional cuts in public investment during fiscal adjustments that tend reinforce the bias in spending composition, thus undermining long-term growth prospects. In other words, flexible mechanisms provide a safeguard to protect productive public investment in circumstances when it may not be necessary, or optimal to reduce it.[10]

The remainder of the paper is organized as follows. Section 2 reviews previous research on fiscal rules and identifies our contribution to the literature. Section 3 presents the data and

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[9]Such conditions tend to be more prevalent in developing countries (Pritchett, 2000; Dabla-Norris *et al.*, 2012; IMF, 2015). In these contexts, a key policy priority is to strengthen public investment management institutions, including better project appraisal and selection mechanisms and improved monitoring.

[10]To discuss the optimal design of fiscal rules in order to accommodate all possible types of shocks is outside the scope of this paper. For a recent analysis that goes in this direction, see Blanchard *et al.* (2020).

describes the empirical strategy. Section 4 reports the main results, several robustness tests that include addressing endogeneity concerns, and extensions incorporating context-conditional results. Section 5 explores a possible mechanism linking fiscal rule design to improved public investment management over the business cycle. Section 6 concludes by discussing policy implications and avenues for future research.

2   Related Literature

There is a vast theoretical and empirical literature studying the effects of budget institutions on fiscal performance.[11] The theoretical literature focuses on the optimal design of fiscal rules considering the trade-off between commitment versus flexibility (Amador *et al.*, 2006; Halac & Yared, 2014; Azzimonti *et al.*, 2016).[12] 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.[13]

Dur *et al.* (1999) is among the few theoretical papers that explore the effects of fiscal rules on the behavior of specific expenditure categories. The paper draws on Tabellini & Alesina (1990)'s seminal political economy model of budget deficits to assess the implications of balanced-budget rules on public investment outcomes.[14] It shows that a balanced-budget rule can coexist with suboptimal levels of public investment. In a similar context, Bassetto (2006) explore the conditions under which "golden rules," namely a type of balanced-budget rule that allows deficits to finance public investment but not current expenditure, can improve the efficiency of democratically chosen allocations.

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[11]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). See von Hagen & Harden (1995) and Alesina & Perotti (1999) for seminal references. In this paper, we concentrate on numerical fiscal rules.

[12]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 & Jonung (2019).

[13]Using subnational level data across the United States, Fatas & 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.

[14]In the Tabellini & Alesina (1990)'s model, electoral uncertainty over the identity of future majorities leads the current median voter to run excessive deficits.

The empirical literature is mostly focused on the effectiveness of fiscal rules in constraining aggregate level fiscal outcomes, such as the deficit, public debt, or the size of government (Asatryan *et al.*, 2018; Heinemann *et al.*, 2018). More recently, the literature has begun to exploit variation in fiscal rule design to assess other dimensions of fiscal performance, such as public spending procyclicality. For example, Bova *et al.* (2014) focus on so-called *second-generation* fiscal rules (e.g., rules with cyclically adjusted fiscal targets, or well-defined escape clauses), finding that those rules have contributed to reduce spending procyclicality in developing countries. Bergman & Hutchison (2015) find conditional relationships between fiscal rules, government efficiency, and the degree of procyclicality of total expenditures based on an index of fiscal rule strength, and Guerguil *et al.* (2017) show how different flexible features affect the cyclical behavior of public spending.

There are however few empirical papers studying the effects of fiscal rules on public investment outcomes. The exceptions are papers focusing on OECD countries. Such work examines the pros and cons of the so-called golden rule. For example, Blanchard & 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 deficit limits. However, Balassone & Franco (2000) suggest golden rules can provide leeway for opportunistic politicians to engage in creative accounting, namely simply reporting what is really current spending as investment on infrastructure.[15]

This paper contributes to the literature on fiscal rule effectiveness in three main 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 distinguishing between flexible and rigid features of fiscal rules. Third, it explores the mechanism through which flexibility characteristics help to protect investment by analyzing the the role of fiscal rule design in dampening procyclical biases in capital expenditures.

3   Empirical Strategy and Data

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

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

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[15]See also Milesi-Ferretti (2004).

where $G_{i,t}^{PI}$ is real public investment in country i at year t (alternatively, it is defined a real public investment over GDP, or real public investment over total government spending); $FLXR_{i,t}$ is a dummy equaling 1 if a flexible rule is in place at time t and 0 otherwise (i.e., otherwise means either no fiscal rule or a rigid fiscal rule); $FC_{i,t}$ is a dummy variable that equals 1 when country i has in place a fiscal consolidation in year t; $X_{i,t}$ is a vector of control variables, including population and the GDP growth rate (lagged one period to reduce endogeneity concerns), and the debt-to-GDP level; α_i are country fixed effects; and ϕ_t are time fixed effects.[16]

Following Guerguil *et al.* (2017), we define a flexible fiscal rule as one with at least one of three features present: (i) provisions that exclude public investment from the perimeter of the rule; (ii) the rule includes cyclically adjusted fiscal targets; or (iii) the rule contains well-defined escape clauses to accommodate exogenous shocks of various sorts, such as natural disasters.[17] In contrast, a fiscal rule that establishes numerical limits on fiscal targets but lacks flexible features is considered a rigid rule. In 2015 for example, there were 52 countries in the sample with a flexible fiscal rule (up from 11 in 1995), and 40 countries with a rigid rule (up from 12 in 1995). In alternative specifications, we break-up the flexibility definition evaluating the contribution of each of the three features separately and in combination.[18] In the case of fiscal consolidation episodes, we follow Alesina & Ardagna (2013) in defining a fiscal consolidation as a two-year period in which the cyclically adjusted primary balance-to-GDP ratio improves each year and the cumulative improvement is at least 2 percentage points of GDP (alternatively, we use the 1.5 percent of GDP threshold for robustness).

The data covers 75 countries, spanning different regions and levels of economic development over the period 1990-2018. Public investment, cyclically adjusted primary balance, and control variables were obtained from the World Economic Outlook (WEO) dataset (October 2018).

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[16]The pairwise correlation between $FC_{i,t}$ and $FLXR_{i,t}$ is 0.02 and not statistically significant at conventional levels.

[17]Our definition draws on previous literature that exploits variation in fiscal rule features, and specifically, work at the International Monetary Fund (Guerguil *et al.*, 2017; Budina *et al.*, 2012; IMF, 2009). For example, in the construction of the original fiscal rule strength index that has now become a standard measure of the quality of fiscal rule design in several studies, IMF (2009) considers flexibility, or "the degree of freedom rules allow to policymakers in responding to different types of shocks (e.g., through cyclically adjusted fiscal targets, or exclusion of some spending aggregates from the target, or escape clauses)". Similarly, Guerguil *et al.* (2017) 'flexibility' definition captures whether a well-defined escape clause exists, whether a balanced budget target is adjusted cyclically, and whether public infrastructure spending is excluded from the expenditure ceiling.

[18]The reason that the disaggregated version of $FLXR$ is not the preferred specification, is that as discussed in the introduction, in the majority of the cases when there is one flexibility feature present, it is usually combined with another, making it difficult to disentangle the individual contribution of each feature separately.

Data on fiscal rules was drawn from the IMF fiscal rules dataset (IMF, 2017).

There are 296 episodes of fiscal consolidations between 1990 and 2018 in the sample (see Table 1, column 6), of which approximately 60 percent accrue in developing economies.[19] The unconditional likelihood of a fiscal consolidation episode is larger in countries with fiscal rules (181 cases) than in countries without them (115 cases), which is not surprising considering that fiscal rules impose restrictions on fiscal outcomes. The median growth rate of real public investment during fiscal consolidations is -2.5 percent across all fiscal consolidation episodes, and it is similar for episodes in countries with fiscal rules (-2.5 percent) and without them (-2.9 percent). However, not all types of fiscal rules yield the same outcomes for investment: the median drop in real public investment is smaller in countries with flexible fiscal rules (-0.4 percent) than in countries with rigid fiscal rules (-4.6 percent).

Table 1 also shows the relative size and composition of fiscal adjustments under different scenarios, and decomposes the contribution of each budget item to the improvement in the primary balance. Overall, public investment contributes a larger share of the fiscal adjustment than either increased revenues or current spending cuts when measured relative to the median levels of each budget component. The median improvement in primary balance across all fiscal consolidations episodes is 3.3 percent of GDP (Column 2). 1.3 percentage points of that comes through increased revenues (Column 3); 1.4 percentage points is contributed by cuts in current spending (Column 4); and 0.6 percentage points is the contribution of public investment cuts (Column 5). However, note that median fiscal revenues (current expenditures) are 32.2 (28) percent of GDP, while median public investment is only 3.4 percent of GDP (values not reported in the table). Therefore, the contribution of revenues to the adjustment is about 4 percent relative to the median revenues (=1.3/32.2), the contribution of current spending cuts is 5 percent relative to the median current spending (=1.4/28), while the contribution of public investment cuts is about 18 percent relative to median public investment (=0.6/3.4). Interestingly, among countries with flexible fiscal rules, the contribution of public investment cuts relative to its median is reduced in half to 9 percent (=0.3/3.4), while the contribution of revenues increases to 6 percent (=1.8/32.2) and the contribution of current spending cuts falls slightly to 4 percent (=1.1/28).

Table 1 shows that real public investment falls by more during fiscal consolidations in countries without flexible fiscal rules. Some specific country examples can shed more light on the composition of adjustment under flexible rules. Consider the case of the United Kingdom. Prior to the introduction of its investment-friendly rule in 1997, the government pursued a fiscal consolidation of about 2.5 percent of GDP. Public investment contributed more than a quarter of

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[19]See Figure A1 in the Appendix.

the total adjustment. In contrast, after the introduction of the rule, the fiscal adjustment equivalent to 2.8 percent of GDP that ended in 1999 implied a smaller reduction in public investment (less than 10 percent of total adjustment). Chile and Portugal undertook fiscal adjustments in 2006 and 2007 of similar size (between 3 and 3.4 percent of GDP) when output was above potential, but under different institutional contexts. Under Chile's structural balance rule in force since 2001, the adjustment in the primary balance did not affect investment. Instead in Portugal, whose fiscal framework lacked flexible rule mechanisms at the time, the share of public investment in the total adjustment exceeded 25 percent. Finally, the cases of Croatia and Uruguay show how public investment can react differently in periods of stress in developing countries. The fiscal adjustment under Croatia's fully fledged flexible setup between 2012 and 2013 amounted to 3 percent of GDP, distributed between a 1.8 percentage point increase in fiscal revenues and a 1.2 percentage point contraction in current expenditures. Public investment was not only excluded from the adjustment process but actually increased in real terms by 4 percent during the consolidation. In contrast, the adjustment in Uruguay (which did not have a fiscal rule) between 2001 and 2002 was 1.5 percent of GDP, with over one-half of the total adjustment undertaken through a reduction in public investment, resulting in a contraction in capital expenditures of 25 percent in real terms.

In short, Table 1 and the selected country cases show that the behavior of public investment differs depending on whether countries have fiscal rules with flexible features or not. This is precisely the dimension that we exploit in the next section to probe deeper into the question as to whether fiscal rules can effectively protect productive public investment during periods of fiscal adjustment.

Table 1: Public Investment Growth Rates and the Anatomy of Fiscal Consolidations

	[1]	[2]	[3]	[4]	[5]	[6]
	Growth rate public investment	Primary Balance	Revenues	Current Spending	Public Investment	N
	(percent change)	(change, percentage points of GDP)				
All Episodes	-2.5	3.3	1.3	-1.4	-0.6	296
Episodes without fiscal rule	-2.9	3.4	0.7	-1.9	-0.8	115
Episodes with fiscal rule	-2.5	3.0	1.5	-1.0	-0.5	181
With flexible features	-0.4	3.2	1.8	-1.1	-0.3	102
Without flexible features	-4.6	2.5	0.9	-1.0	-0.6	79

Note: values in table are median changes of the corresponding variables over fiscal consolidation episodes.
Source: Authors' elaboration based on WEO-IMF.

4 Results

4.1 Baseline results

Table 2 shows 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 10 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. According to the marginal effects from Column 2, public investment falls by less than 2 percent during fiscal consolidations in countries with flexible fiscal rules, however such estimated effect is not statistically different from zero.

Is it the *design* of the fiscal rule, or the presence of a fiscal rule *per se* that is driving our results? To answer this question, Column 3 introduces an interaction term under fiscal consolidation episodes, FLXR and a dummy capturing the presence of a national fiscal rule of any type (FR). In countries where fiscal rules lack flexibility features, public investment falls by 11 percent during fiscal consolidations, whereas the fall is only about 2 percent and statistically insignificant for countries with flexible characteristics.

Are some flexible features more effective than others in protecting public investment? To evaluate the contribution of each flexibility feature independently and in combination, Column 4 presents results from a specification that interacts fiscal consolidation episodes with dummies capturing the presence of investment-friendly rules (IFR), rules with escape clauses (EC), and cyclically-adjusted balance rules (CAB). Results suggest that IFR and CAB do a better job than EC at safeguarding public investment from budget cuts. In the presence of IFR, public investment decreases by 2 percent (se=0.02), and when CAB rules are in place, public investment increases by 4 percent (se=0.06), however neither effect is statistically significant. In contrast, EC by themselves are not enough to prevent public investment from falling sharply during fiscal adjustments, suggesting the need to complement EC with other flexibility mechanisms to enhance effectiveness.[20]

Finally, Column 5 explores whether flexible fiscal rules are useful at protecting current expenditures. This type of expenditure is typically less prone to cuts during consolidation, as there are political economy pressures that naturally protect it, such as unions pressing for no cuts

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[20]As noted in the introduction, this is indeed how such rules work in practice. Among fiscal rule adopters containing escape clauses, seventy percent combine EC with either IFR or CAB, or both.

in either wages or employment, and pensioners pushing to keep their purchasing power.[21] This natural protection argument is validated by the fact that current spending cuts are lower during consolidation periods (3.6 percent, on average), and that they do not vary as much as cuts in capital expenditures in the presence of a flexible fiscal rule. In fact, we cannot reject the hypothesis that the estimated marginal effects are the same, suggesting flexible rules are indeed operating over our variable of interest (investment), and not just on all types of public expenditure.

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[21]See Ardanaz & Izquierdo (2017) for asymmetries in the treatment of current vis-à-vis capital expenditures across different stages of the business cycle.

Table 2: Baseline Panel Regressions: Effect of Fiscal Rules on Public Investment and Current Spending Growth Rate, During Fiscal Consolidations

	Dependent Variable				
	Public investment				Current spending
	[1]	[2]	[3]	[4]	[5]
Fiscal Consolidation (FC)	-0.108***	-0.100***	-0.0961***	-0.0959***	-0.0356***
	(0.0156)	(0.0164)	(0.0196)	(0.0177)	(0.00556)
Flexible fiscal rule (FLXR)	-0.00936	-0.00817	-0.00729		0.00359
	(0.0122)	(0.0118)	(0.0142)		(0.00500)
FC * FLXR	0.0845***	0.0825***	0.0888***		0.0169**
	(0.0218)	(0.0217)	(0.0306)		(0.00759)
Any type of fiscal rule (FR)			-0.00218		
			(0.0151)		
FC * FR			-0.0102		
			(0.0311)		
Investment Friendly Fiscal Rule (IFR)				0.00185	
				(0.0189)	
FC * IFR				0.0793***	
				(0.0265)	
Escape Clause (EC)				-0.0123	
				(0.0182)	
FC * EC				-0.00917	
				(0.0308)	
Cyc. Adj. Balance (CAB)				-0.0217	
				(0.0215)	
FC * CAB				0.140**	
				(0.0654)	
Population growth rate		1.377	1.370	1.531	0.191
		(1.444)	(1.448)	(1.474)	(0.384)
Real GDP growth rate (t-1)		0.522**	0.520**	0.464*	0.303***
		(0.251)	(0.254)	(0.259)	(0.101)
Debt to GDP		-0.00847	-0.00840	-0.0144	-0.0476***
		(0.0338)	(0.0342)	(0.0338)	(0.0126)
Marginal Effects					
FLXR = Yes	-0.023	-0.017	-0.017		-0.018***
	(0.016)	(0.015)	(0.016)		(0.005)
FLXR = No	-0.107***	-0.100***	-0.106***		-0.035***
	(0.015)	(0.016)	(0.026)		(0.005)
Observations	1,507	1,507	1,507	1,507	1,457
R-squared	0.080	0.087	0.088	0.090	0.156
Number of countries	75	75	75	75	73
Country fixed effect	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes

Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: Robust cluster standard errors in brackets. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, respectively. Intercepts and all corresponding interactions are included but not reported for briefness. Only the interaction term between EC * IFR is statistically significant.

4.2 Dynamics

To study the persistence of the estimated effects over time, we introduce a dynamic version of the baseline specification. In particular, using the single-equation approach of Jordà (2005) and Stock & 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 public investment growth using lags and contemporaneous changes in the right hand side variables of the estimated equation.[22] More specifically, the accumulated response of public investment growth at the horizon h is estimated by modifying Equation 1 as follows:

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

In this approach, each step in the accumulated IRF is obtained from a different individual regression (Riera-Crichton et al., 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 1 shows projections six years ahead under different scenarios. Panels A and B show the estimated behavior of public investment over time in countries with flexible rules vs. countries without fiscal rules, or those with rigid rules. In both panels, $t = 1$ is the year of the fiscal consolidation shock. Results show that in countries with flexible fiscal rules, public investment does not fall during fiscal consolidation periods, neither in the year of consolidation nor in subsequent years. However, in countries lacking flexibility mechanisms, the drop in public investment is persistent: public investment falls at least during three consecutive years.

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[22]As discussed in Jordà (2005), there are multiple advantages to using LP. In particular, LP (i) can be estimated by single-regression techniques (least-squares dummy variables), (ii) are more robust to potential mis-specifications, and (iii) can easily accommodate highly non-linear and flexible specifications.

Figure 1: Dynamic Effect of Having a Flexible Fiscal Rule

Panel A. Flexible FR　　　　　　　　　Panel B. No Flexible FR (rigid or none)
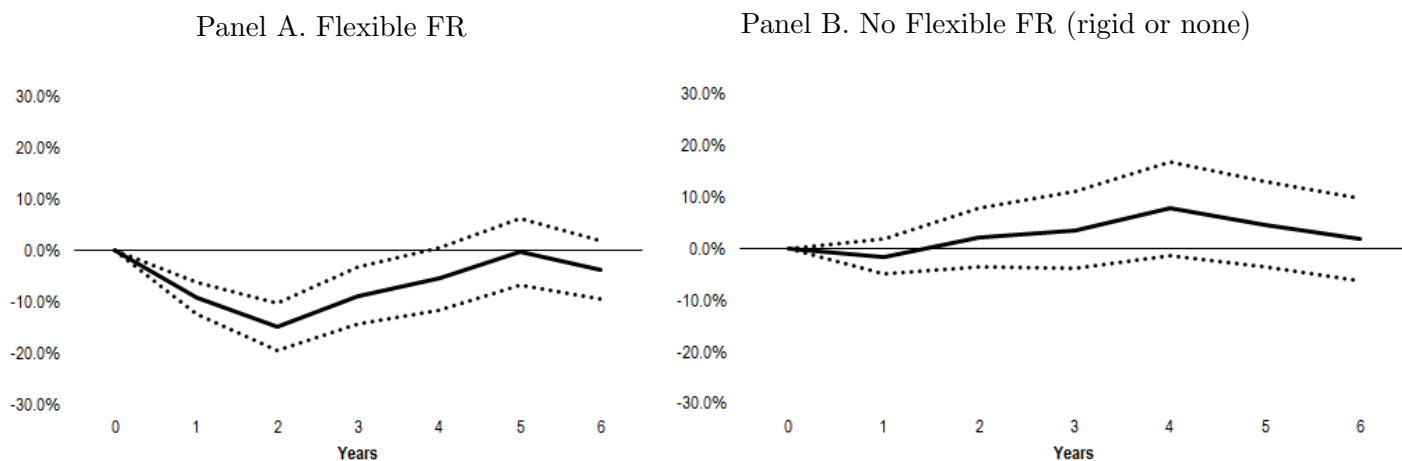
Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: Marginal effects with 90 percent confidence interval (dashed line).

4.3　Robustness tests

We test the robustness of our baseline results along several dimensions: (i) introducing additional control variables, (ii) using alternative definitions and measures of fiscal consolidations, (iii) using alternative definitions of the dependent variable, and (iv) testing for the potential endogeneity of fiscal rules. Table 3 shows results from this robustness exercise.[23]

In Column 1, we introduce four additional control variables that could affect both the level and growth rate of public investment: the per capita stock of public capital, the old age dependency ratio, a measure of institutional quality[24], and income per capita. In Column 2, we re-define a fiscal consolidation episode as a single year (1Y) in which the cyclically adjusted primary balance improves by at least 1.5 percent of GDP (Alesina & Ardagna, 2010).[25] Column 3 goes back to the baseline definition of adjustments, but uses an alternative measure to identify fiscal consolidation episodes, based on changes in the *observed*, rather than the cyclically adjusted, primary balance. Columns 4 and 5 re-define the dependent variable as the change in the public investment-to-GDP

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[23]We 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 on request).

[24]Following Frankel *et al.* (2013), we construct an index of institutional quality by calculating the average of four variables from the International Country Risk Guide dataset: investment profile, corruption, law and order, and bureaucratic quality.

[25]See Yang *et al.* (2015) for a review of of different approaches to identify fiscal consolidation episodes.

ratio from one year to the next, and the change in the share of public investment in total primary expenditure, respectively (as opposed to the growth rate in the level of real public investment that is used in the baseline).[26] Across all specifications, the sign and statistical significance of the baseline results remain robust: flexible mechanisms in fiscal rules help to neutralize the negative effects of fiscal adjustments on public investment. Finally, to address the potential endogeneity problem of fiscal rules, Column 6 introduces an instrumental variable (IV) approach in which the number of flexible rules in place across neighboring countries is used as an instrument, following Caselli & Reynaud (2020).[27] Using the geographic contiguity instrument, we find that public investment falls by more than 14 percent during fiscal consolidation episodes in countries without fiscal rules or with rigid rules. In line with the baseline estimates, having a flexible fiscal rule neutralizes the fall in public investment during fiscal consolidations. The resulting estimated marginal effect of fiscal consolidations in countries with flexible fiscal rules is not statistically different from zero. In sum, while it is challenging to establish causality unequivocally in this setup[28] results from the IV approach are consistent with baseline findings, suggesting fiscal rules are effective even after potential endogeneity concerns are explicitly taken into account.[29]

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[26]In unreported robustness checks, we measure capital expenditures as a percentage of *potential* output, using the Hodrick-Prescott filtering technique. Using the smoother GDP series in the denominator does not change the baseline results.

[27]Specifically, the instrumental variable captures for a given country/year, the number of flexible fiscal rules in place in countries with common borders with respect to the country of interest. The first-stage results show a strong correlation between the instrument and the probability of fiscal rule adoption: the fact that neighboring countries adopt a flexible rule increase the probability of adoption in the domestic economy by around 12 percent, suggesting that the instrumental variable strategy is relevant. See Table A3 (Appendix). At the same time, the Kleinbergen-Paap F-stat. indicates the results are not affected by a weak instrument problem.

[28]The validity of the identification assumption could be questioned if as discussed in Caselli & Reynaud (2020), a neighbors' fiscal rule impacts domestic fiscal outcomes directly, because the adoption of the rule generates fiscal spillovers.

[29]We have also examined other instruments that have been typically identified in the literature such as for example, government fragmentation, checks and balances, and inflation targeting regimes (Badinger & Reuter, 2017). These instruments do not perform well in terms of relevance (e.g. they present a low correlation with flexibility), thus suffering from a weak instrument problem. In addition, it is plausible to argue that each of these instrumental variables have direct effects on fiscal outcomes, thus violating the exclusion restriction.

Table 3: Robustness of Baseline Results: Effects of Fiscal Rules on Public Investment, during Fiscal Consolidations

	Dependent Variable					
	% Change PI			Change PI/GDP	Change PI/TE	% Change PI
	[1]	[2]	[3]	[4]	[5]	[6]
Fiscal Consolidation (FC)	-0.0903***			-0.00517***	-0.00848***	-0.145***
	(0.0226)			(0.00133)	(0.00253)	(0.0327)
Flexible FR (FLXR)	-0.00404	-0.00386	-0.000688	-0.0006882	-0.000289	0.00118
	(0.0180)	(0.0126)	(0.0113)	(0.000592)	(0.00164)	(0.0587)
FC * FLXR	0.0840***			0.00402**	0.00773**	0.216***
	(0.0282)			(0.00162)	(0.00345)	(0.0770)
Institutional Quality	-0.0134					
	(0.0177)					
Stock of Capital	-0.0194***					
	(0.00586)					
Old Age Dependency	0.00541					
	(0.00485)					
Real GDP per capita (log)	0.111					
	(0.0695)					
One-Year Fiscal Consolidation (1Y FC)		-0.115***				
		(0.0229)				
1Y FC * FLXR		0.0902***				
		(0.0316)				
Observed Balance FC (OB FC)			-0.0551***			
			(0.0162)			
OB FC * FLXR			0.0414*			
			(0.0211)			
Population growth rate	-0.118	1.356	1.741	-0.0213	-0.0276	-0.378
	(1.776)	(1.426)	(1.496)	(0.0482)	(0.125)	(1.063)
Real GDP growth rate (t-1)	0.254	0.556**	0.591**	0.00838	0.0415	0.575**
	(0.297)	(0.245)	(0.255)	(0.0122)	(0.0261)	(0.236)
Debt to GDP	-0.0303	-0.0121	-0.0102	0.000932	0.00600	-0.0506
	(0.0504)	(0.0337)	(0.0337)	(0.00137)	(0.00364)	(0.0355)
Marginal Effects						
FLXR = Yes	-0.006	-0.025	-0.013	-0.001	-0.000	0.071
	(0.019)	(0.023)	(0.014)	(0.000)	(0.002)	(0.048)
FLXR = No	-0.090***	-0.115***	-0.055***	-0.005***	-0.008***	-0.144***
	(0.022)	(0.022)	(0.016)	(0.001)	(0.002)	(0.032)
Observations	977	1,507	1,506	1,507	1,457	1,239
R-squared	0.110	0.094	0.068	0.087	0.044	0.086
Number of countries	68	75	75	75	73	62
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Underidentification Test						13.97
Chi-sq p-value						0.000
Weak Instrument Test						7.775

Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: 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. Stock-Yogo weak ID test critical values (maximal IV size): 10% = 7.03; 15% = 4.58; 20% = 3.95; 25% = 3.63.

4.4 Conditional effects of fiscal rules

We extend the baseline results by asking whether broader features of the political and economic environment affect the effectiveness of flexible rules in protecting public investment from budget cuts. For example, it could be the case that fiscal rules are only effective when the quality of governance is high (Bergman & Hutchison, 2015). In addition, to the extent that the fiscal multiplier of public investment varies with the level or stock of public capital (Izquierdo *et al.*, 2019) the policy relevance of introducing flexible rules to protect investment should increase in some contexts more than others. To test for these conditional effects of fiscal rules, we add interaction terms between the FC, FLXR dummy and institutional quality (IQ), and the public capital stock, respectively, to the baseline specification. Figure 2 plots the marginal effects with 95 percent confidence bands.

Panel A shows the effect of fiscal consolidation on public investment for countries with and without flexible fiscal rules, as a function of different levels of institutional quality. Flexible rules are effective at protecting investment for all values of IQ, but the effect declines as IQ improves. Once IQ reaches values above the 90th percentile, the difference between countries with and without flexible rules is not statistically significant. This suggests that flexible features in fiscal rules are most needed when institutions are weaker.

Finally, Panel B shows the behavior of public investment during fiscal adjustments depending on whether flexible fiscal rules are in place, across the different values of the public capital stock variable. While public investment is protected during fiscal adjustments across the whole range of public capital stock values when flexible mechanisms are present, the difference between rules adopters and others is larger at lower levels of public capital stock. For example, for a country with per capita public capital of about USD 5,000 (the median value for a developing country in our sample), the difference implies that in the absence of flexible rules, investment contracts by 12 percent (se=0.02) while in the presence of flexibility mechanisms, investment is protected. This result suggests that for countries that are building up their public capital stock, rules-based fiscal frameworks with flexible features are needed.

5 Mechanisms: Fiscal Rules and Public Investment Procyclicality

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

Figure 2: Conditional effects of fiscal rules on institutional quality and the stock of public capital. Average marginal effects

Panel A. Institutional Quality
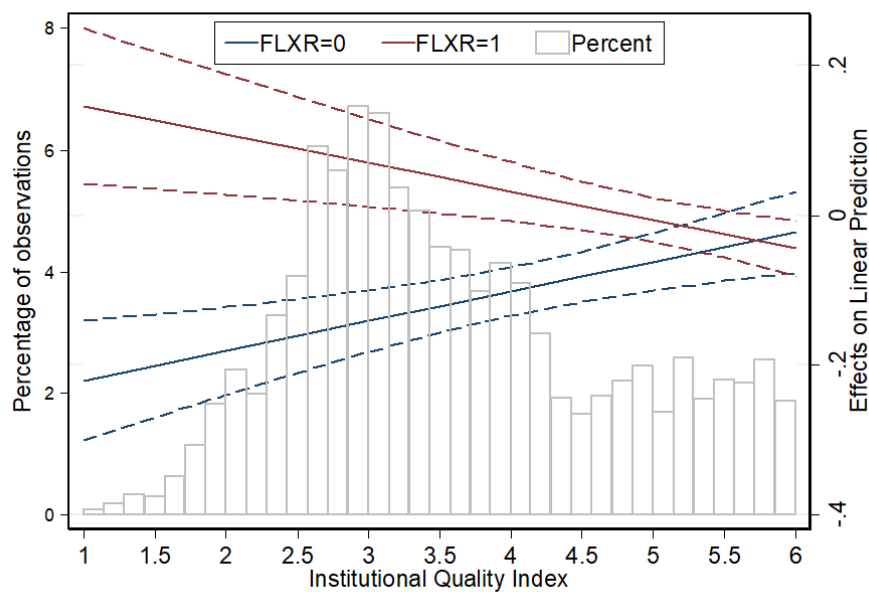
Panel B. Public Capital Stock
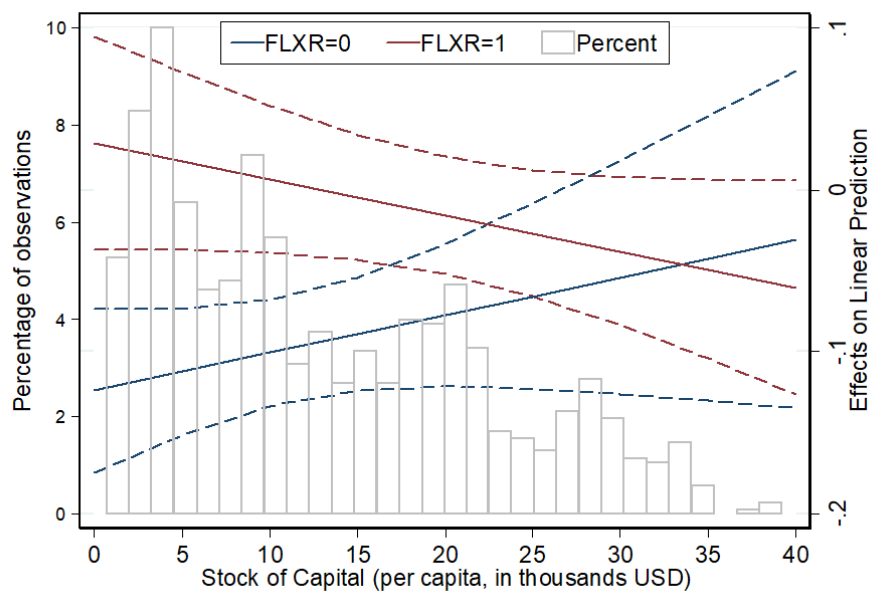
Source: Authors' elaboration. *Notes*: Figures (a) and (b) plot the marginal effects of fiscal consolidations on public investment. The histograms in the background present the distribution of the sample according to the IQ index and public capital stock, respectively. Dashed lines indicate 95 percent confidence interval.

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, separating spending (and thus, investment) decisions from temporary budget shocks.[30] In the case of rules with escape clauses, they allow discretionary fiscal expansion in response to negative exogenous shocks. In the case of investment-friendly rules, they do not constrain public investment spending by definition. 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 cyclicality usually discussed in the literature: limited creditworthiness (Gavin & Perotti, 1997); and political economy factors (Alesina *et al.*, 2008; Frankel *et al.*, 2013).[31]

5.1 Cross-sectional Evidence

Following Kaminsky *et al.* (2005), 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 the sample. Figure 3 presents cyclicality coefficients by splitting the sample between countries with flexible fiscal rules (FLXR=1) and countries with either no rule or with a rigid rule (FLXR=0). 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 for countries that include at least one flexible characteristic in their rule. Moreover, the frequency of countercyclical policy patterns 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.

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[30]Rules targeting nominal budget balances risk inducing procyclicality in the conduct of fiscal policies, by allowing revenue windfalls during booms to be spent, and by requiring budget cuts during recessions. In contrast, rules targeting cyclically adjusted (or structural) budget balances require above-trend revenues to be saved, and allow spending to be sustained during recessions, thus minimizing procyclicality.

[31]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 cyclicality. The exercise in this paper differs from Guerguil *et al.* (2017) in two main ways: we use panel regression techniques; and we measure public investment cyclicality using an alternative estimation strategy.

Figure 3: Country Correlations between Cyclical Components of Public Investment and GDP Conditional on Fiscal Rule Design
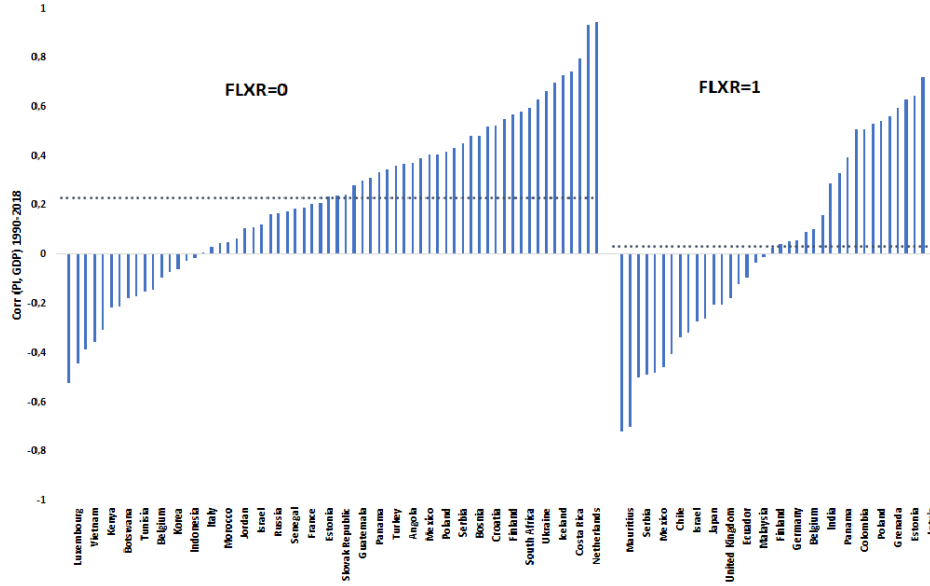
Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Note*: Solid horizontal lines represent median levels of cyclicality in each sample.

5.2 Panel-Level Evidence

To exploit within-country variation in cyclicality levels over time, we estimate the following equation:

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

where $ccG_{i,t}^{PI}$ and $ccY_{i,t}$ are the estimated cyclical components of public investment and output, respectively. [32]; $X_{i,t}$ is a vector of control variables; α_i are country fixed effects; and ϕ_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 β_{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 procyclical behavior.

We include two additional determinants of fiscal policy procyclicality that are related to

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[32]We use the the Hodrick-Prescott filtering technique to estimate output gaps, setting the lambda parameter to 6.25.

borrowing constraints: the financial openness index from Chinn & Ito (2006) and the debt-to-GDP ratio. To allow for differences in institutional quality of countries over time, the IQ variable is included as a control (Frankel *et al.*, 2013).

We estimate Equation 3 using two econometric methods: Columns 1-5 in Table 4 shows OLS results, and Columns 6-10 present IV estimations. The rationale for an IV strategy in this setting is that the output gap is affected by fiscal policy through the spending multiplier.[33] To address this, the output gap of each country in the sample is instrumented using the export-weighted output gap of trading partners.[34] 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.[35]

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 Column 5 suggest that, in the absence of flexible rules, a 1 percentage point deterioration in the output gap is associated with a decline in the cyclical component of public investment equivalent to 2.4 percentage points. However, this effect is neutralized for countries with flexible rules: the same output shock is associated with a 0.6 percentage point reduction in the cyclical component of public investment and is not statistically significant. Thus, flexible fiscal rules allow public investment patterns to switch from procyclical to acyclical. Similar effects are obtained after accounting for possible reverse causality through the IV approach (Columns 6-10). Regarding control variables, lower levels of financial openness (a proxy for credit constraints) are positively related to public investment cyclicality (Columns 2 and 5), while the effects of institutional quality are less clear cut. Even after accounting for such standard determinants, fiscal rule design remains a significant predictor of cyclical behavior. 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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[33]The IV strategy follows Gali & Perotti (2003), Lane (2003), Panizza & Jaimovich (2007), Lledó *et al.* (2011), among others.

[34]The export weighted output gaps are constructed using data from the Atlas of Economic complexity. See http://atlas.cid.harvard.edu/data.

[35]See Table A4 (Appendix) for the first-stage regressions of IV estimates.

Table 4: Panel Fixed Effects Regressions between Cyclical Components of Public Investment and GDP Conditional on Fiscal Rule Design

	Dependent Variable: cyclical component of public investment									
	OLS fixed effects					IV fixed effects				
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Cyclical component of GDP	2.338***	2.642***	2.838***	3.050***	2.339***	3.755**	4.598**	2.557*	5.171**	3.981*
	(0.344)	(0.354)	(0.510)	(0.956)	(0.735)	(1.666)	(2.182)	(1.498)	(2.024)	(2.167)
Flexible FR (FLXR)	0.0169	0.0151	0.0180	0.0227	0.0199*	0.0199	0.0197	0.0205	0.0257	0.0191
	(0.0182)	(0.0167)	(0.0182)	(0.0154)	(0.0117)	(0.0204)	(0.0190)	(0.0205)	(0.0218)	(0.0178)
Cyclical component of GDP*FLXR	-1.817***	-1.468**	-1.795***	-1.814**	-1.740**	-2.715**	-2.166**	-2.561*	-2.535*	-2.512*
	(0.589)	(0.574)	(0.598)	(0.723)	(0.777)	(1.241)	(0.965)	(1.373)	(1.420)	(1.356)
Financial openness (Fin. Op.)		0.0210			0.0289		0.0216			0.0326
		(0.0234)			(0.0315)		(0.0245)			(0.0337)
Cyclical component of GDP*Fin. Op.		-0.353**			-0.457**		-0.588			-0.825
		(0.159)			(0.190)		(0.494)			(0.667)
Debt to GDP			-0.0223		-0.0340			0.0707		0.100
			(0.0160)		(0.0233)			(0.0795)		(0.101)
Cyclical component of GDP*Debt to GDP			-1.123*		-1.670**			3.906		4.808
			(0.672)		(0.656)			(2.639)		(3.666)
Institutional Quality (IQ)				0.0272	0.0288				0.0153	0.0108
				(0.0313)	(0.0347)				(0.0262)	(0.0301)
Cyclical component of GDP*IQ				-0.188	0.307				-0.231	-0.0387
				(0.228)	(0.200)				(0.302)	(0.614)
Marginal Effects										
FLXR = Yes	0.52	1.173**	1.043*	1.235	0.599	1.04	2.431	-0.004	2.636	1.469
	(0.508)	(0.475)	(0.563)	(1.273)	(1.136)	(0.958)	(1.606)	(1.098)	(1.885)	(2.219)
FLXR = No	2.337***	2.641***	2.838***	3.049***	2.338***	3.755**	4.597**	2.556*	5.171**	3.981*
	(0.343)	(0.353)	(0.509)	(0.955)	(0.734)	(1.665)	(2.182)	(1.497)	(2.024)	(2.166)
Observations	1,428	1,392	1,428	1,197	1,165	1,283	1,254	1,315	1,194	1,165
R-squared	0.041	0.046	0.042	0.044	0.052	0.035	0.035	0.008	0.030	-0.011
Number of countries	71	69	71	66	64	71	69	73	66	64
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						46.29	46.29	15.34	37.58	8.116
Chi-sq p-value						0.000	0.000	0.000	0.000	0.00439
Weak Instrument Test						15.38	11.62	3.520	8.655	1.301

Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: 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.

6   Conclusions

This paper has shown that certain features of fiscal rules can help safeguard public investment during fiscal consolidation periods. Our results have important policy implications. As countries deal with the consequences of the coronavirus pandemic, there was already a growing concern about the decline in public investment, which, on average, had fallen below 1 per cent of GDP across emerging economies in 2019.[36] After the pandemic recedes, many countries will likely be forced to engineer large fiscal consolidations as debt sustainability concerns increase. While fiscal adjustments may be inevitable, countries can set into motion mechanisms to dampen the negative welfare impacts of those consolidations. Several countries have either already introduced fiscal rules, or are considering them to strengthen the policy management toolkit. The results in this

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[36]*Financial Times*: Investment in emerging markets falls to historic low (May 10, 2019).

paper suggest that including elements related to the protection of public investment in the design of these rules can add a growth-enhancing dimension to the fiscal sustainability concerns that have typically been the focus of fiscal rules in the past, provided capital spending is productive.

Beyond these policy implications, there are caveats and issues outside the scope of this paper that warrant further research. First, evidence suggests that differential treatment of investment expenditure and cyclically adjusted fiscal targets seem to be more effective than well-defined escape clauses in protecting public investment. However, the elements of flexibility are not mutually exclusive and they are oftentimes bundled together. A finer analysis of each of these elements and their interrelationships in the context of idiosyncratic factors would be warranted on a country-by-country basis. Second, the theoretical literature on optimal fiscal rules highlights a potential trade-off between commitment to fiscal discipline and flexibility. Preliminary evidence (reported in the working paper version of this paper) suggests that flexible features do not reduce the effectiveness of the rule in terms of improving debt sustainability. However, more empirical research is warranted to prove it. Third, international experience suggests there are implementation challenges associated with flexible features in fiscal rules, which call for remedial policy measures. With respect to IFR, the possibility of opportunistic classifications of capital expenditures can be counteracted by strengthening international transparency standards in government finance statistics. CAB rules are not simple to implement, especially for countries highly dependent on commodity exports, where long-term trend in international prices are difficult to estimate accurately, in addition to complications arising from estimating output gaps in real time. This complexity calls for strengthening the independence and technical capabilities of the fiscal rules consultative committees in charge of these estimations. Finally, in some cases the lack of clearly defined escape clauses has brought about discretionary measures that can potentially undermine the credibility of the rule itself. Further research on how these tradeoffs interact at the country level could help advance our understanding of the general equilibrium effects of fiscal rules.

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Appendix

Table A1: List of Countries

Advanced Economies	Developing Asia	Developing Europe and Ex-USSR	Latin America and Caribbean	Middle East, North Africa and Sub-SaharanAfrica
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		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: Authors' 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	1507	WEO-IMF, October 2018
Fiscal Consolidation (2 Year definition)	0.20	0.40	0.00	0.00	1.00	1.00	1507	WEO-IMF, October 2018
Fiscal Rule (FR)	0.56	0.50	0.00	0.00	1.00	1.00	1507	IMF Fiscal Rules Dataset
Flexible FR (FLXR)	0.32	0.47	0.00	0.00	1.00	1.00	1507	IMF Fiscal Rules Dataset
Investment Friendly FLXR	0.19	0.39	0.00	0.00	1.00	1.00	1507	IMF Fiscal Rules Dataset
Escape Clause FLXR	0.28	0.45	0.00	0.00	1.00	1.00	1507	IMF Fiscal Rules Dataset
Cyc. Adj. Bal. FLXR	0.13	0.34	0.00	0.00	1.00	1.00	1507	IMF Fiscal Rules Dataset
Primary Balance (% of GDP)	-0.52	3.61	-29.70	-4.67	3.53	15.30	1188	WEO-IMF, October 2018
Revenues (% of GDP)	32.20	10.20	10.70	19.00	46.40	55.70	1225	WEO-IMF, October 2018
Current Spending (% of GDP)	28.00	11.10	7.32	13.90	42.60	58.80	1461	WEO-IMF, October 2018
Public Investment (% of GDP)	3.41	2.97	0.00	0.16	7.16	19.50	1455	WEO-IMF, October 2018
Population Growth Rate	0.01	0.01	-0.06	0.00	0.02	0.05	1507	WEO-IMF, October 2018
Real GDP Growth Rate	0.03	0.03	-0.16	0.00	0.07	0.22	1507	WEO-IMF, October 2018
Debt to GDP ratio	0.54	0.36	0.00	0.17	1.00	2.38	1507	WEO-IMF, October 2018
Current spending growth rate	0.04	0.07	-0.33	-0.02	0.11	0.46	1457	WEO-IMF, October 2018
Institutional Quality	4.15	1.17	2.03	2.78	5.87	6.45	1268	International Country Risk Guide
Stock of Public Capital per capita	13.86	10.68	0.71	2.87	28.74	57.01	1267	IMF (2015)
Old Age Dependency	17.42	8.04	4.53	7.52	27.65	45.03	1062	World Bank
Real GDP per capita (log)	18.12	2.27	13.91	15.89	22.07	24.39	1507	WEO-IMF, October 2018
Fiscal Consolidation (1 Year definition)	0.15	0.36	0.00	0.00	1.00	1.00	1507	WEO-IMF, October 2018
Fiscal Consolidation OB	0.22	0.42	0.00	0.00	1.00	1.00	1506	WEO-IMF, October 2018
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	1507	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	1457	WEO-IMF, October 2018
Geographic contiguity instrument	1.11	1.25	0.00	0.00	3.00	8.00	1319	Geodatasource and IMF FR Dataset
Financial openness	1.02	1.49	-1.91	-1.20	2.36	2.36	1471	Chinn-Ito Financial Openness Index
Output gap of the trading partners.	0.00	0.01	-0.06	-0.01	0.01	0.04	1354	Atlas of Economic complexity.

Source: Authors' elaboration.

Table A3: First-stage Regression of instrumental variables regressions between Flexible Fiscal Rule and Contiguity Instrument. Refer to Table 3, Column 6, in the main text

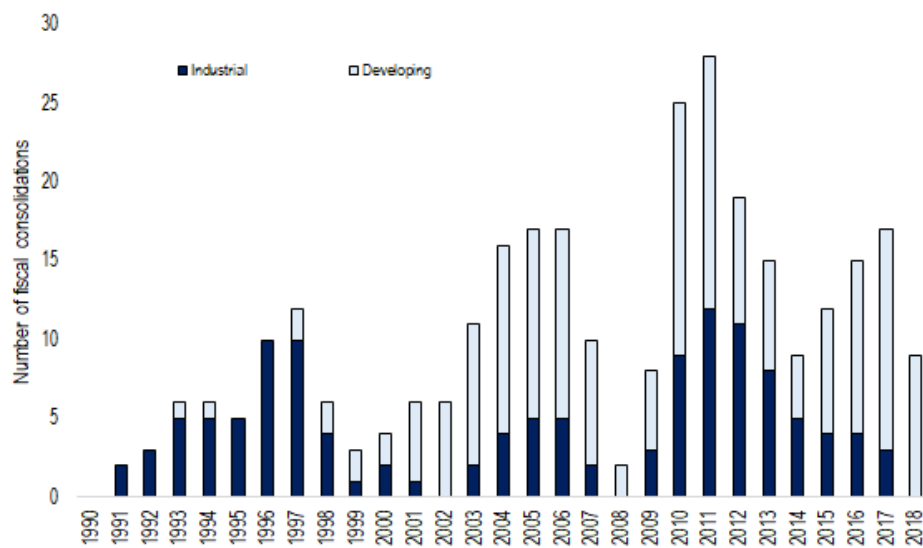|	Dependent Variable
	FLXR
Contiguity IV	0.123***
	(0.0331)
Fiscal Consolidation (FC)	0.0191
	(0.0367)
FC * Contiguity IV	0.00669
	(0.0288)
Population growth rate	2.445
	(4.355)
Real GDP growth rate (t-1)	0.436
	(0.428)
Debt to GDP	0.240*
	(0.142)
Observations	1,239
R-squared	0.229
Number of countries	62
Country Fixed Effect	Yes
Year Dummies	Yes
Controls	Yes

Source: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: Standard errors in brackets. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, respectively.

Table A4: First-stage Regression of instrumental variables regressions between cyclical components (cyc. comp.) of public investment and GDP conditional on fiscal rule design. Refer to 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*Institutional Quality
TP cyc. comp.	0.978***	0.0345	1.015**	0.0384	0.139	-0.227	-0.0540
	(0.281)	(0.0423)	(0.399)	(0.0912)	(0.831)	(0.182)	(1.581)
TP cyc. comp.*FLXR	0.134	1.137***	-0.00132	1.151***	-0.0235	0.0761	0.0155
	(0.150)	(0.103)	(0.179)	(0.0989)	(0.309)	(0.101)	(0.775)
TP cyc. comp.*Financial openness			0.0680	0.00684	1.108***	0.00605	0.271
			(0.0837)	(0.0137)	(0.179)	(0.0296)	(0.321)
TP cyc. comp.*Institutional Quality			0.0905	-0.00622	0.133	0.0998**	1.398***
			(0.0724)	(0.0296)	(0.125)	(0.0437)	(0.365)
TP cyc. comp.*Debt to GDP			-0.946***	-0.00732	-1.462**	0.259	-3.515***
			(0.319)	(0.0638)	(0.628)	(0.348)	(1.263)
Financial openness			-0.00101	-0.000007	0.000986	-0.000592	-0.00362
			(0.000984)	(0.000417)	(0.00133)	(0.000823)	(0.00335)
Institutional Quality			0.00384*	0.00134*	0.00617*	0.00275*	0.0172**
			(0.00193)	(0.000696)	(0.00325)	(0.00140)	(0.00768)
Debt to GDP			-0.0232***	-0.00174*	-0.0258**	-0.0204***	-0.0878***
			(0.00494)	(0.000899)	(0.0100)	(0.00472)	(0.0199)
Flexible FR	-0.000775	-0.000456	-0.000781	-0.00109	-0.000931	0.000131	-0.00191
	(0.00135)	(0.000823)	(0.00147)	(0.000804)	(0.00305)	(0.00114)	(0.00559)
Observations	1,283	1,283	1,165	1,165	1,165	1,165	1,165
R-squared	0.390	0.554	0.461	0.571	0.471	0.314	0.509
Number of Countries	71	71	64	64	64	64	64
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: Authors' elaboration based on WEO-IMF and IMF fiscal rules dataset (IMF, 2017). *Notes*: 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 = Trading partners. First stages associated with Columns 7 -9 are not reported for briefness.

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

Source: Authors' elaboration based on WEO-IMF.