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Original Sin: Fiscal Rules and Government Debt in Foreign Currency in Developing Countries

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Abstract

Most developing economies borrow abroad in foreign currency, which exposes them to the problem of “original sin.” Although the literature on the issue is relatively extensive, little is said about the role of fiscal frameworks such as fiscal rules in controlling original sin. Hence, using a panel of 59 developing countries over the period 1990-2020 and applying the entropy balancing method, we find that fiscal rules reduce government debt in foreign currency, and that the effects are statistically and economically significant and robust. In addition, the strengthening of the rule, better fiscal discipline prior to the adoption of the reform, financial development, financial openness, flexibility of the exchange rate regime, and sound institutions amplify the negative effect of fiscal rules on original sin.

Keywords: • Fiscal rules • Original sin • Developing countries • Entropy balancing

JEL Classification: F34; F41; G15; H63

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1 Introduction

Public debt is an important instrument for countries lacking domestic finance to support development projects, smooth short-term shocks, and promote poverty alleviation policies (Fatás et al., 2019; Panizza, 2022; Fujii, 2023). However, debt can be risky, especially if foreign currency dominates its composition. In particular, the international financial integration that paved the way for access to finance is a source of the original sin problem, defined as the inability of (developing) countries to contract debt in local currency (Eichengreen et al., 2002; Hausmann and Panizza, 2003; Ogrokhina and Rodriguez, 2018).

The concept of original sin was first introduced by Eichengreen et al. (2002) and Hausmann and Panizza (2003). A notion borrowed from the Bible and Christianity (Parramore, 2023) — involving the sin committed by Adam and Eve in the Eden Garden at the beginning of “humanity” — original sin is not without consequences. The existing literature has examined the issue to determine the consequences related to this problem. For instance, according to Eichengreen et al. (2023), countries’ inability to borrow in their local currency, i.e., original sin, is correlated with fear of floating, the need to hold additional international reserves, greater volatility in output and capital flows, lower credit ratings, and pro-cyclical rather than counter-cyclical fiscal and monetary policies. These conclusions are also shared by Hausmann et al. (2001) regarding the impact of original sin on the choice of the exchange rate regime. For Engel and Park (2022), local currency debt securities are a better hedge of consumption against income shocks than foreign currency debt securities, i.e., countries that hold a high share of debt in foreign currency would have little policy space to smooth shocks. Finally, countries with a large share of foreign currency debt are exposed to currency mismatches and are more vulnerable to financial crises and economic instability in the presence of a negative shock (Ogrokhina and Rodriguez, 2018).

A large literature documents the causes of the original sin problem. Early studies emphasize that original sin is inevitable, as it comes from external factors that the affected countries cannot control (Eichengreen et al., 2005). However, other authors highlight the importance of domestic policies and institutions as major factors affecting

the ability of governments to borrow in their own currency. For example, [Hausmann and Panizza \(2003\)](#) note that the issue of original sin is correlated with institutional quality, monetary credibility, or fiscal solvency. For [Engel and Park \(2022\)](#), original sin is related to inflation in developing countries. Indeed, the authors stress that although debt securities in local currency constitute a better hedge of consumption against income fluctuations than debt securities in foreign currency, they may represent a temptation for governments to use inflation as a fiscal solvency instrument, thus reducing their credibility vis-à-vis investors and pushing investors to choose foreign currency debt as an insurance mechanism. [Burger and Warnock \(2006\)](#) argue that the establishment of institutions guaranteeing creditor rights and an environment with stable inflation promote a debt composition in a less favorable direction to the original sin issue. [Hausmann and Panizza \(2003\)](#), [Claessens et al. \(2007\)](#), [Ogrokhina and Rodriguez \(2018\)](#), [Ogrokhina and Rodriguez \(2019\)](#), [Du et al. \(2020\)](#), and [Engel and Park \(2022\)](#) consider that the implementation of a credible monetary policy allows countries to reduce the share of debt denominated in foreign currency. Other authors emphasize the importance of structural factors such as the size of the country, the level of financial development, or financial openness (for instance, see [Caballero and Krishnamurthy, 2003](#); [Hausmann and Panizza, 2003](#); [Claessens et al., 2007](#)). Finally, among the determinants of original sin, other studies highlight the role of fiscal discipline ([Claessens et al., 2007](#); [Aizenman and Zheng, 2023](#)) or ideological and political factors ([Ballard-Rosa et al., 2022](#)).

Original sin is primarily a problem of developing countries ([Ogrokhina and Rodriguez, 2018](#); [Eichengreen et al., 2023](#); [Fujii, 2023](#)). Despite recent progress by some developing countries, such as Brazil, Mexico, and South Africa, in contracting debt in local currencies, the proportion of foreign currency debt still represents a large share of the debt composition of developing countries. Studies examining factors that may mitigate this problem focus mainly on monetary policy credibility ([Ogrokhina and Rodriguez, 2018](#); [Ogrokhina and Rodriguez, 2019](#); [Engel and Park, 2022](#); [Onen et al., 2023](#)), the existence of sound creditors' rights ([La Porta et al., 1997](#)), and international reserve management ([Alfaro and Kanczuk, 2009](#)). Although the literature on the issue is fairly extensive, little is said about the role of fiscal policy credibility in controlling the original sin. Indeed, the weak commitment to fiscal sustainability in developing countries compared

to developed countries could drive markets to anticipate defaults and inflation surprises and thus ultimately make foreign investors reluctant to buy developing country debt denominated in local currency.¹ Against this background, we may wonder to what extent fiscal institutions that offer credibility in the management of fiscal policy, such as fiscal rules, matter in controlling original sin.

Fiscal rules, which have been popular since the 1990s, are long-term constraints on fiscal policy through numerical limits on fiscal aggregates or the management of budgetary procedures. Fiscal rules are generally intended to correct biased incentives and contain pressures for excessive spending, particularly in good times, to ensure fiscal responsibility and debt sustainability. Defined to eliminate the persistent accumulation of deficits, fiscal rules may be numerical or procedural, and aim to achieve sound fiscal policy by eliminating three major problems in public finance management: the common pool problem that arises when different decision-makers involved in the budget process (e.g., legislators, minister of finance, line ministers) compete for public resources and fail to internalize the current and future costs of their choices (Weingast et al., 1981; Von Hagen and Harden, 1995; Velasco et al., 1999; Krogstrup and Wyplosz, 2010; Altunbaş and Thornton, 2017); the agency problem that arises from information asymmetry and conflicting incentives between government and voters and within the government hierarchy, which generally leads to manipulation of fiscal policy for electoral purposes (Nordhaus, 1975 ; Buchanan and Wagner, 1977; Cukierman and Meltzer, 1986; Dixit, 1998); and the problem of dynamic incoherence that leads governments to strategically use budget deficits to tie the hands of their successors in the presence of electoral uncertainty (Alesina and Tabellini, 1988; Alt and Lassen, 2006).

This paper examines the effect of fiscal rules (FR) on public debt denominated in foreign currency in developing countries. Based on a panel of 59 countries over the period 1990-2020, we apply the entropy balancing method developed by Hainmueller (2012) to address selection issues associated with policy adoption. The results suggest that fiscal rules significantly decrease the share of foreign currencies in government debt in countries with fiscal rules compared to non-fiscal rules countries, and that the effects

¹The fiscal credibility issue can be observed by analyzing debt ratings by financial markets, advanced countries having ratings twice as high as those of developing countries (Apeti et al., 2021).

are economically meaningful. In other words, fiscal rules limit the original sin issue in fiscal rules countries relative to non-fiscal rule countries. The results remain robust to various tests, including alternative specifications and estimation methods. Furthermore, we provide evidence that our results are not due to a spurious trend or confounding factors by conducting placebo tests. Finally, we explore heterogeneity features in the treatment and highlight some additional results. On the one hand, a distinction between the different types of rules suggests that the effect of debt rules and expenditure rules is slightly higher compared to that of budget balanced rules. On the other hand, the strengthening of the rule, better fiscal discipline prior to the adoption of the reform, financial development, financial openness, flexibility of the exchange rate regime, as well as the quality of institutions amplify the negative effect of fiscal rules on original sin.

The paper is organized as follows. The next section presents the theoretical discussions. Section 3 describes the data and the methodology. Section 4 reports the main findings. Sections 5 and 6 discuss the robustness and heterogeneity of our results, respectively. The last section concludes.

2 Fiscal rules and the currency composition of government debt: the arguments

Original sin is a constraint on access to international financial markets in local currency for developing countries. This constraint, which prevents optimal debt management, is due to two factors: a lack of fiscal credibility and a lack of monetary credibility. In this context, based on the existing literature, our reading is that fiscal rules may influence government debt's currency composition via two channels, i.e., fiscal credibility and monetary credibility. Fiscal credibility arises from the commonly shared view in the literature that fiscal rules promote prudent management of fiscal policy. For example, [Asatryan et al. \(2018\)](#) note that the adoption of fiscal rules promotes fiscal discipline by reducing the debt-to-GDP ratio and lowering the probability of a debt crisis. In a recent study, [Gomez-Gonzalez et al. \(2022\)](#) stress that fiscal rules promote macroeconomic stability due to their significant reduction of sovereign risk and the probability of a sudden

stop. In a survey, [Von Hagen \(2002\)](#) underlines that fiscal institutions are associated with better fiscal discipline. The favorable effect of fiscal rules on fiscal discipline is supported by various authors in the literature, among them, [Grembi et al. \(2016\)](#); [Badinger and Reuter \(2017\)](#); [Fatás et al. \(2019\)](#); [Salvi et al., 2020](#); [Barbier-Gauchard et al. \(2021\)](#); and [Caselli and Wingender \(2021\)](#); [Apeti et al. \(2023b\)](#).² Another problem related to fiscal policy in developing countries is procyclicality and deficit bias during electoral periods, which lead to economic instability such as lower economic growth, higher growth volatility, higher inflation and its volatility, and undermine developing countries' credibility ([Fatás and Mihov, 2003](#); [Afonso and Jalles, 2020](#); [Fatás and Mihov, 2013](#); [Sacchi and Salotti, 2015](#); [Rother, 2004](#); [Heimberger, 2023](#)). However, evidence is found in the literature that fiscal rules help to limit the procyclicality of fiscal policy and budgetary drift during electoral periods. For example, using a sample of 56 countries over 1990-2011, [Combes et al. \(2017\)](#) show that fiscal rules limit the procyclicality of fiscal policy. The same result is shared by [Debrun et al. \(2008\)](#), [Guerguil et al. \(2017\)](#), [Gootjes and de Haan \(2022b\)](#) and [Apeti et al. \(2023b\)](#). Regarding the reduction of political budget cycles, [Rose \(2006\)](#), [Bonfatti and Forni \(2019\)](#), and [Gootjes et al. \(2021\)](#) advocate the benefit of fiscal rules. Finally, other studies have looked at the impact of fiscal rules on debt ratings and bond spreads — which reflect the credibility of fiscal policy — showing that fiscal rules increase debt ratings and reduce bond spreads ([Badinger and Reuter, 2017](#); [Thornton and Vasilakis, 2017](#); [Afonso and Jalles, 2019](#); [Thornton and Vasilakis, 2020](#)).

As mentioned earlier, the second channel through which fiscal rules may affect government debt in foreign currencies is monetary credibility, especially inflation. As pointed out above, monetary credibility, especially inflation, is one of the factors that reduce the ability of developing countries to contract debt in local currency ([Engel and Park, 2022](#)). Beyond the benefit of fiscal discipline and credibility, the literature provides evidence of the role of fiscal rules in controlling inflation. For instance, over the period 1990-2009, [Combes et al. \(2018\)](#) find that adopting fiscal rules reduces inflation, thus

²See also [Drazen \(2004\)](#); [Primo \(2006\)](#); [Hallerberg et al. \(2007\)](#); [Krogstrup and Wälti \(2008\)](#); [Schaltegger and Feld \(2009\)](#); [Gollwitzer \(2011\)](#); [Argimón and Cos \(2012\)](#); [Tapsoba \(2012\)](#); [Benito et al. \(2013\)](#); [Dahan and Strawczynski \(2013\)](#); [Luechinger and Schaltegger \(2013\)](#); [Neyapti \(2013\)](#); [Tapp \(2013\)](#); [Foremny \(2014\)](#); [Burret and Feld \(2018\)](#); [Caselli and Reynaud \(2020\)](#).

improving monetary policy credibility. Putting these discussions together, we expect fiscal rules to help developing countries reduce original sin, i.e., the share of government debt denominated in foreign currency.

3 Data and Methodology

3.1 Data

We examine the effect of fiscal rules on the share of government debt in foreign currency, using a panel of 59 developing countries over the period 1990-2020. Out of this sample, 28 countries have implemented fiscal rules for at least one year between 1990 and 2020. As data are not available for all countries and years, the number of observations depends on the explanatory variables used in the study. Our treatment variable, fiscal rules (FR), is measured by a dummy variable that takes 1 when a country i has adopted a fiscal rule in year t , and zero otherwise. This variable is from the IMF’s Fiscal Rules Dataset. The share of government debt in foreign currency is extracted from the International Debt Securities (IDS) statistics provided by the Bank for International Settlements (BIS), and is measured as follows: ³

$$\text{Foreign currency share} = 1 - \frac{\text{local currency debt}}{\text{total international debt}} \quad (1)$$

From the existing literature, we include a set of economic and institutional covariates considered as determinants of fiscal rule adoption (or original sin), such as GDP per capita, annual GDP growth, fiscal balance, financial openness, exchange rate regime, inflation targeting, export shares, and the quality of institutions (captured by the level of democracy). Since better economic performance is likely to promote the adoption of credible fiscal rules, GDP per capita and annual GDP growth may be positively correlated with the probability of adopting FR. Second, the effect of fiscal balance on the likelihood of adopting FR may be ambiguous. On the one hand, a sound fiscal position can reflect the prerequisites for the adoption of a credible fiscal framework such as fiscal

³See, for instance, [Hausmann and Panizza \(2003\)](#), [Ogrokhina and Rodriguez \(2018\)](#), [Ogrokhina and Rodriguez \(2019\)](#), and [Eichengreen et al. \(2023\)](#) for a similar approach.

rules. On the other hand, it can be argued that countries with loose fiscal policies, i.e., high fiscal deficits may also choose to adopt FR to achieve greater fiscal discipline. Moreover, improved fiscal positions may reflect sounder fiscal policies that can reduce the need for fiscal institutions to promote fiscal discipline (Kopits, 2001; Bohn, 2008; Calderón and Schmidt-Hebbel, 2008). Third, we expect a positive influence of financial openness on fiscal rules, as in some countries fiscal rules have been adopted as part of more comprehensive economic reforms, including financial liberalization (Tapsoba, 2012). Fourth, we consider the export shares, as a deterioration in trade is likely to increase the probability of adopting fiscal rules (Kumar et al., 2009). Fifth, we control for the exchange rate regime, as the literature highlighted a strong relationship between the exchange rate regime and the fiscal discipline embodied in fiscal rules (see Masson et al., 1991; Elbadawi et al., 2015). In the same vein, we include a dummy variable capturing whether a country has adopted the inflation targeting regime or not, as several studies have shown that the inflation targeting framework is conducive to the adoption of fiscal rules (Beetsma and Bovenberg, 1997, Castellani and Debrun, 2005, Badinger and Reuter, 2017, Combes et al., 2018). Finally, the correlation between fiscal rules and the level of democracy may be ambiguous. On the one hand, good institutions can foster sound fiscal behavior, which may reduce the incentive for countries to tie their hands through constraining reforms such as fiscal rules. On the other hand, better institutions can create a strong environment for FR adoption through high compliance with the rule's targets.

3.2 Methodology

We ask whether fiscal rules reduce government debt in foreign currency in developing countries. Fiscal rule adoption is not random and may be affected by economic and institutional performance. Such factors — which may also affect international debt denomination — make fiscal rule adoption endogenous, leading to a potential selection bias. To mitigate the potential endogeneity of fiscal rules, we employ a matching approach, entropy balancing, developed by Hainmueller (2012). The approach has been used by Neuenkirch and Neumeier (2016) to assess the impact of U.S. sanctions on poverty, or Caselli and Wingender (2021) to assess the effect of fiscal rules on public deficits using

the Maastricht treaty’s fiscal criterion as an example.⁴ Fiscal rules adoption is the treatment, and government debt in foreign currency is the outcome variable. As is common in the literature, we consider country-year observations, those with fiscal rules being the treated units, and those without fiscal rules being the control units. The treatment effect on the treated (ATT) is defined as follows:

$$ATT = E[Y_{(1)}|T = 1] - E[Y_{(0)}|T = 1] \quad (2)$$

where $Y_{(.)}$ is the outcome variable, i.e., the share of government debt in foreign currency. T is a dummy variable indicating whether the unit is subject to fiscal rules adoption ($T = 1$) or not ($T = 0$). $E[Y_{(1)}|T = 1]$ is the outcome variable during the fiscal rules period and $E[Y_{(0)}|T = 1]$ is the counterfactual outcome for countries with fiscal rules, i.e., the share of government debt in foreign currencies that would have been observed if they had not introduced fiscal rules. Indeed, $E[Y_{(0)}|T = 1]$ is not observable due to a counterfactual issue. Identifying the treatment effect requires a good proxy for $E[Y_{(0)}|T = 1]$. To do so, we match fiscal rules units with non-fiscal rules units that are as close as possible, based on observable characteristics, correlated with fiscal rules adoption, and potentially with the outcome variable. Based on this, we can rewrite Equation 2 as follows:

$$ATT(\chi) = E[Y_{(1)}|T = 1, X = \chi] - E[Y_{(0)}|T = 0, X = \chi] \quad (3)$$

where χ is a vector of covariates that may affect both a country’s decision to adopt fiscal rules and its international debt denomination. $E[Y_{(1)}|T = 1, X = \chi]$ represents the share of government debt in foreign currency for fiscal rules countries, and $E[Y_{(0)}|T = 0, X = \chi]$ is the expected share of government debt in foreign currency for non-fiscal rules countries (the synthetic control group). Entropy balancing requires two steps. The first step is to compute the weights of the control group (untreated group) so that they satisfy pre-specified balanced constraints involving the sample moments of observable characteristics (X). Following [Neuenkirch and Neumeier \(2016\)](#), we choose equilibrium constraints that

⁴See other studies using the same approach: [Bambe et al. \(2022\)](#); [Apeti \(2023b\)](#); [Apeti \(2023a\)](#); [Apeti and Edoh \(2023\)](#); [Apeti et al. \(2023a\)](#).

impose equal covariate means between the treatment and control groups. In doing so, we ensure that the control group is composed, on average, of untreated units that are as similar as possible to the treated units. The second stage uses the weights from the first stage in a regression analysis where the share of government debt in foreign currency is the dependent variable, and the fiscal rule dummy is the main explanatory variable. We control for entropy balancing covariates as well as time and country-specific effects, as in a randomization experiment, to increase the efficiency of the estimations.

Entropy balancing allows identifying the effect of fiscal rules by comparing fiscal rule and non-fiscal rule countries that are similar as possible in their observable characteristics, while accounting for country and time-specific effects. By combining a matching approach with a regression approach, entropy balancing offers some advantages over several alternative methods, as argued by [Neuenkirch and Neumeier \(2016\)](#). A particularly important advantage is that entropy balancing is a non-parametric approach, thus circumventing model misspecification issues. In addition, in contrast to regression-based analyses, the treatment effects estimated from entropy balancing do not suffer from multicollinearity, as the reweighting scheme orthogonalizes the covariates with respect to the treatment indicator. Moreover, in contrast to other matching methods, entropy balancing ensures a high covariate balance between the treatment and control groups, even in small samples, and a more flexible reweighting scheme. In other words, entropy balancing reweights observations to achieve a balance between treated and untreated units, while keeping the weights as close as possible to the base weights to avoid a loss of information. Finally, by combining a matching approach with a regression analysis, entropy balancing allows addressing properly the panel structure of our data, by including country and time effects in the regression analysis, thus accounting for unobserved heterogeneity.

Despite the various advantages of the entropy balancing method discussed above, this approach may have some limits. Indeed, entropy balancing may fail to control potential endogeneity issues resulting from unobserved time-varying factors that may affect both fiscal rules and the share of government debt in foreign currencies, and, on the other hand, to successfully deal with the inertia of the outcome variable. Hence, for robustness purposes, we rely on alternative estimation methods such as Ordinary Least

Squares (OLS), two-stage least-squares (OLS-IV/2SLS), and a two-step system-GMM dynamic panel estimator (see subsection 5.3).

3.3 Descriptive statistics

This section displays some correlational evidence linking fiscal rules and the share of foreign currency in government debt in the countries in our sample, over the period 1990-2020. Figure 1 presents the average evolution of sovereign debt in foreign currency, considering an average trend over 10-year sub-periods. During the first decade (1990-1999), the share of public debt in foreign currency in countries with fiscal rules is identical to that of the control countries, i.e., 100%. In the second decade (2000-2009), there was a slight decrease in the treated countries (98%), although the magnitude remained comparable to that of the control countries (99%). The last decade (2010-2020) has seen a significant decline in foreign currency public debt, both in the group of treated and control countries. However, the decline was more pronounced in the treated compared to the control countries (74% versus 86%). Finally, over the overall period (1990-2020), we observe, on average, a higher share of foreign currency in sovereign debt for untreated compared to treated countries, 0.95 vs. 0.92 points. Moreover, our data suggest that the difference in the outcome variable between the two groups, i.e., 0.03 is statistically significant ($t = 2.45$; p-value: 0.01). These relationships, although not causal, provide an indication of the treatment effect of fiscal rule adoption and how to identify it. Indeed, the downward trend observed in both groups of countries shows that it would be misleading to estimate the effect of fiscal rules on the share of government debt denominated in foreign currency by comparing this share before and after the adoption of fiscal rules. To avoid overestimating the effect of the policy, we use, as discussed above, the non-fiscal countries as a control group to estimate the counterfactual outcome. By doing so, we can control potential secular trends and isolate the treatment effect (see Lagarde, 2012; Ogrokhina and Rodriguez, 2018; Apeti, 2023a).

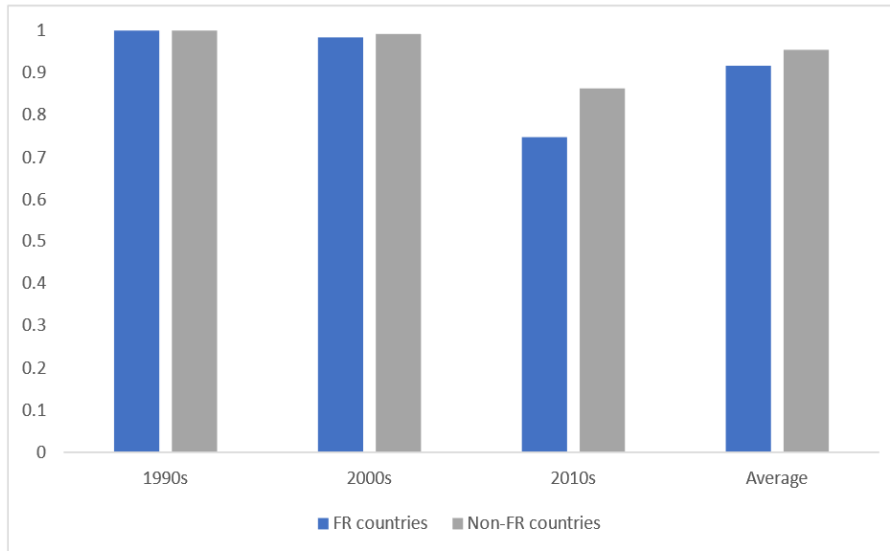


Figure 1: Share of foreign currency in sovereign debt (1990-2020) with (FR) and without fiscal rules (Non-FR)

4 Results

4.1 Covariates balance

Table 1 reports descriptive statistics related to the first stage equation. Panel A shows a comparison of pre-weighting sample means for the matching covariates described in subsection 3.1, between units with fiscal rules (Column [2]) and control units or the potential synthetic group (Column [1]). Column [5] suggests statistically significant differences between units with fiscal rules and controls, as some p-values are below the 10% threshold. More specifically, countries with fiscal rules seem to be more likely to adopt a monetary framework geared towards price stability, such as inflation targeting, compared to control units. In addition, countries with fiscal rules are characterized by stronger institutions, in particular a better democratic framework, and have better fiscal discipline compared to control units. Such differences could lead to selection bias in policy adoption, hence, to spurious estimates, if endogeneity is not properly addressed. Therefore, from the pre-treatment covariates of the main model, we re-weight the control units in order to make the pre-treatment covariates of the control group, on average, as comparable as possible to those of the treated units. The means of the covariates

Table 1: Descriptive statistics and covariate balancing

	[1]	[2]	[3] = [1] - [2]	[4]	[5]
Panel A : Descriptive statistics	Non-FR	FR	Difference	t-Test	p-Val.
Log.GDP per capita	8.4666	8.4423	0.0243	0.3555	0.7224
Inflation targeting	0.1579	0.4115	-0.2536	-6.5602	0.0000
Democracy	3.5357	4.1693	-0.6336	-5.9783	0.0000
Exports share	0.0046	0.0039	0.0007	1.2999	0.1941
Lag.Fiscal balance	-1.9906	-0.6764	-2.9986	-2.9986	0.0029
Fixed exchange rate regime	0.2071	0.2188	-0.0117	-0.3391	0.7348
Government durability	22.9219	24.026	-1.1041	-0.6008	0.5485
Annual GDP growth	4.6556	4.1382	0.5174	1.6504	0.0998
Capital openness	0.263	0.2256	0.0374	0.3314	0.7405
Observations	589	192			
	[1]	[2]	[3] = [1] - [2]	[4]	[5]
Panel B : Covariate balancing	Non-treated	Treated	Difference	t-Test	p-Val.
Log.GDP per capita	8.4418	8.4423	-0.0005	0.01	0.995
Inflation targeting	0.4094	0.4115	-0.0021	0.04	0.966
Democracy	4.1599	4.1693	-0.0094	0.08	0.939
Exports share	0.0039	0.0039	0.0000	-0.08	0.936
Lag.Fiscal balance	-0.6824	-0.6764	-0.006	0.01	0.993
Fixed exchange rate regime	0.2184	0.2188	-0.0004	0.01	0.992
Government durability	24.023	24.026	-0.003	0.00	0.999
Annual GDP growth	4.1434	4.1382	0.0052	-0.01	0.988
Capital openness	0.224	0.2256	-0.0016	0.01	0.989
Observations	589	192			
Total of weights	192	192			

of the synthetic group are reported in Column [1] of Panel B. Column [5] suggests that the weighing eliminated any statistically significant pre-treatment differences between the means of the treated and synthetic covariates. The synthetic group can therefore be seen as a “near perfect” counterfactual of the treated group, thus addressing potential selection problems due to policy adoption.

4.2 Main results

The second step of the entropy balancing is to estimate the effect of the treatment, based on the weights calculated in Panel B of Table 1. We estimate the following model:

$$Y_{i,t} = \alpha + \beta FR_{i,t} + \eta X_{i,t} + \mu_i + \psi_t + \varepsilon_{i,t} \quad (4)$$

where $Y_{i,t}$ is the share of foreign currency in government debt of country i in year t . $FR_{i,t}$ is a dummy variable equal to 1 for a country i having adopted a fiscal rule in

year t , and zero otherwise. X_{it} is the set of the covariates described in subsection 3.1. μ_i and ψ_t represent country and time-fixed effects, respectively, capturing unobserved heterogeneity. Finally, $\varepsilon_{i,t}$ is the idiosyncratic error term.

Main results. Panel A of Table 2 displays the main results. In Column [1], we run a simple univariate (naive) regression from entropy balancing to capture the only responsiveness of government debt in foreign currencies following the introduction of fiscal rules. Column [2] includes all the controls of the baseline model. In Columns [3]-[4], we include country and year fixed effects, respectively. Column [5] reports the main results, i.e., considering both covariates and country/year fixed effects. The estimates suggest that the introduction of fiscal rules reduces the share of foreign currency in government debt in developing countries by 2.9 percentage points compared to other developing countries that did not introduce fiscal rules. This result is statistically significant at the 1% threshold. In Column [6], we analyze the influence of some particular confounding factors that may pollute our effects, by including a time trend in the previous model. We refer in particular to [Saka et al. \(2022\)](#) and [Apeti and Edoh \(2023\)](#) who state that controlling for time trends removes distinctive trends in our outcome variable in individual countries that might otherwise bias our estimates if they accidentally coincide with other changes in fiscal rules. The results remain consistent with those of the baseline model. Finally, regarding the control variables in the baseline model (Column [5]),⁵ we find that per capita income, GDP growth, institutional quality (captured by the level of democracy), fiscal balance, fixed exchange rate regime, and export shares significantly reduce the share of government debt in foreign currency.⁶ The negative influence of the fixed exchange rate regime on original sin may be explained by the beneficial effect of this regime on fiscal discipline, as suggested in the literature (e.g., see [Masson et al., 1991](#); [Giavazzi and Pagano, 1988](#); [Elbadawi et al., 2015](#)).

Magnitude of the effect. Our main results suggest a negative and significant effect of fiscal rules on the share of foreign currency in government debt in developing countries, with a magnitude of 2.9 percentage points. In addition, we find that this effect represents about 15% of the standard deviation of the outcome variable, which suggests

⁵The coefficients are not reported in the table for space purposes but are available on request.

⁶For instance, see [Hausmann and Panizza \(2003\)](#); [Claessens et al. \(2007\)](#); or [Ogrokhina and Rodriguez \(2018\)](#) for similar results.

an economically meaningful impact of fiscal rules.

5 Robustness

5.1 Alternative samples

We conduct some additional tests by re-estimating our main model from alternative samples. The results are reported in Panel B of Table 2. First, we exclude hyperinflation episodes from the sample, as they can be very costly for the economy. Second, since the 2008-2009 financial crisis led to significant macroeconomic imbalances in many countries, we exclude these years from the study period. Similarly, in Column [3] we exclude the post-Cold War years (1990-1995), during which many countries experienced particular economic dynamics. Fourth, our main sample includes seven fragile states. Since the latter exhibit very different characteristics from other countries, we exclude them from the main sample.⁷ Fifth, public finances deteriorated considerably in the context of the Covid-19 crisis, where a number of measures were introduced to support social policies. Therefore, in Column [5], we exclude the year of the beginning of the global pandemic, i.e., 2020, from our study period. Finally, since our data suggest a decline in the share of foreign currency debt from the 2000s onwards (Figure 1), in the last column we restrict our study window to this period, i.e., 2000-2020. The results reported in Columns [1]-[6] of Panel B (Table 2), respectively, remain stable.

5.2 Additional controls

Our main estimates may suffer from a bias due to some omitted potential determinants of fiscal rules that may be correlated with the outcome variable. To control for these factors, in Columns [2]-[9] of Table B1, we augment our main equation with the following covariates: financial development, sovereign debt rating, government consumption,

⁷Fragile states are classified by the IMF as those having characteristics that significantly undermine their economic and social performance, with weak governance, limited administrative capacity, chronic humanitarian crises, persistent social tensions, and, often, violence or the legacy of armed conflict and civil war.

Table 2: FR and the share of foreign currency in government debt

Panel A: Entropy balancing						
	[1]	[2]	[3]	[4]	[5]	[6]
	Naive	Adding Controls	Controls & Country FE	Controls & Time FE	Controls Time/Country FE	Controls Time/Country FE/Trend
FR dummy	-0.029*** (0.008)	-0.025*** (0.008)	-0.018** (0.009)	-0.022*** (0.008)	-0.029*** (0.011)	-0.029*** (0.011)
Observations	570	570	570	570	570	570
R-squared	0.0365	0.217	0.5831	0.2911	0.6118	0.6118
Panel B: Alternative samples						
	[1]	[2]	[3]	[4]	[5]	[6]
FR dummy	-0.027** (0.0108)	-0.028** (0.0118)	-0.026** (0.0117)	-0.025** (0.0110)	-0.029*** (0.0111)	-0.024* (0.0139)
Observations	524	505	522	525	570	446
R-squared	0.6597	0.6376	0.621	0.6624	0.6118	0.6414
Country, Time FE & Controls	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Placebo & falsification tests						
	[1]	[2]				
FR dummy					-0.007 (0.0053)	-0.028*** (0.0106)
Observations					569	402
R-squared					0.5293	0.6031
Country, Time FE & Controls					Yes	Yes

Notes: This table reports estimates of the impact of fiscal rules on the share of foreign currency in government debt. Panel A uses weighted least squares regressions. Panel B estimates the main equation using alternative samples. That is, the first column of Panel B excludes from the sample any episode of hyperinflation. Columns [2] and [3] ignore the 2008-2009 financial crisis and the post-Cold War years (1990-1995), respectively. In Column [4], we exclude fragile states. In the last column, we exclude the year of the beginning of the global pandemic, i.e., 2020, from our study period. Finally, Panel C runs placebo tests from the main model. In Column [1], we randomly assign the treatment to the sample. In Column [2], we re-estimate our main results over a shorter period, considering a five-year window. All specifications include the variables of the baseline model: GDP per capita (log), annual GDP growth, fiscal balance (lag), financial openness, the exchange rate regime, inflation targeting, export shares, and the level of democracy. Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

political checks and balances, inflation, exchange rate volatility,⁸ and a dummy equal to 1 if a country, at a given time, has experienced a currency, debt, inflation, or banking crisis, and zero otherwise, and government stability.⁹ Finally, the last column combines all additional controls in the same regression. The new estimates remain negative and statistically significant, with a magnitude ranging from 2.6 to 3.4 percentage points, i.e., comparable to that of the baseline model (2.9 percentage points, Column [5] of Table B1). Regarding additional controls, we find a negative and statistically significant influence of financial development and political checks and balances on original sin, while government consumption is positively associated. The result of financial development can be put into perspective with the argument advanced by [Claessens et al. \(2003\)](#), that a more developed banking system is associated with a larger investor base, thereby fostering wider domestic currency bond markets. The favorable effect of political checks and balances on the control of original sin is probably because stronger checks and balances in the budgetary process can limit budgetary pressures, and thus the scope for governments to incur more debt ([Alesina and Perotti, 1996](#); [Fabrizio and Mody, 2006](#)). Finally, the adverse effect of government size is probably due to the fact that a large government can penalize economic activity, as pointed out by [Afonso and Furceri](#)

⁸Volatility is calculated as the standard deviation of the exchange rate variable over three moving years.

⁹We briefly discuss the relevance of the selected additional controls. We include financial development since the literature stresses its positive effect on the adoption of credible fiscal rules ([Hansen, 2020](#); [Gootjes and de Haan, 2022a](#)). Since sovereign debt ratings reflect sound fiscal discipline, it can be argued that countries with higher ratings, thus meeting the necessary preconditions, are more likely to implement credible fiscal rules. On the other hand, the literature shows that financial markets act as a watchdog or enforcement mechanism for fiscal rules ([Halac and Yared, 2022](#)) as the financial markets directly punish (fiscal rules) governments when loose fiscal behavior is detected ([Kelemen and Teo, 2014](#); [Kalan et al., 2018](#); [Gootjes and de Haan, 2022a](#)), thus reinforcing compliance with requirements set by the rule. The effect of government size, captured by government consumption, on the adoption of fiscal rules, is ambiguous. On the one hand, an increase in the size of the government may favor output stability ([Fatás and Mihov, 2001](#); [Andrés et al., 2008](#); [Asimakopoulos and Karavias, 2016](#)), creating a favorable framework for the adoption of fiscal rules. On the other hand, [Afonso and Furceri \(2010\)](#), [Bergh and Karlsson \(2010\)](#), [Bergh and Henrekson \(2011\)](#), [Asimakopoulos and Karavias \(2016\)](#) pointed out that a large government size penalizes economic activity, which may reduce the likelihood of the adoption of credible rules. Next, since sharing policies among a larger number of decision-makers can lead to problems of negotiation, agency, coordination, and collective action ([Franzese Jr, 2002](#)), it can be assumed that political checks and balances may hinder the adoption of reforms such as fiscal rules. As better economic performance would influence the likelihood of FR adoption ([Kumar et al., 2009](#); [Budina et al., 2012](#)), factors such as inflation, crises, and exchange rate volatility would be negatively correlated with FR. Last, good government stability may facilitate budget planning and reforms aimed at promoting the public administration's ability to mobilize domestic revenue, and ultimately better budget discipline, which can be conducive to the adoption of FR.

(2010), Bergh and Karlsson (2010), Bergh and Henrekson (2011), and Asimakopoulou and Karavias (2016).

5.3 Alternative estimation methods

Next, we check whether our baseline results are sensitive to other econometric methods such as OLS, instrumental Variables (IV/2SLS), and GMM estimators.

OLS estimates. We re-estimate our main model using a simple fixed-effects panel regression, from the OLS estimator. The results reported in Column [1] of Table B2 suggest a negative and statistically significant effect of fiscal rules on the share of foreign currency in government debt. Moreover, the effect obtained from OLS (3.8 percentage points) remains qualitatively comparable to that of the baseline model obtained from entropy balancing (2.9 percentage points).

IV estimates. Next, we test the robustness of our results by using instrumental variables proposed in the literature. For instance, Debrun et al. (2008) and Gootjes et al. (2021) use the lag in fiscal rules as instruments, while Caselli and Reynaud (2020) and Ardanaz et al. (2021) exploit the geographical diffusion of fiscal rules across countries, arguing that reforms in neighboring countries can influence the adoption of domestic reforms, for example through peer pressure (Caselli and Reynaud, 2020; Ardanaz et al., 2021) or an imitation effect to send a credibility signal to international markets (Balvir, 2023). Instrumental variables allow controlling potential endogeneity issues resulting from unobserved time-varying factors that may affect both fiscal rules and the share of government debt in foreign currencies. Following the studies mentioned above, we strengthen our robustness, relying on two instruments: the fiscal rule variable lagged by one year and the number of fiscal rules in place in countries with common borders with respect to the national economy.¹⁰ Column [2] (Table B2) suggests that fiscal rules

¹⁰The number of fiscal rules in place in countries with common borders with respect to the national economy is defined as follows:

$$contiguity_{i;t} = \sum_{j \neq i}^{n-i} FR_{j,t} * X_{j,i,t} \quad (5)$$

where j is the neighboring country of the domestic country i . $FR_{j,t}$ is a dummy equal to 1 when the country j has a fiscal rule at the time t , and zero otherwise. $X_{j,i,t}$ is equal to zero when countries have no common borders and sums the number of countries with common borders. Finally, $contiguity_{i;t}$ is

significantly reduce the share of government debt in foreign currencies, even when we re-estimate our main model from instrumental variables. Although the new coefficients obtained from IV (about 5 percentage points) are slightly higher than that obtained from entropy balancing (about 3 percentage points), the magnitude of the coefficients does not differ substantially. Moreover, the Kleinbergen-Paap and Stock-Yogo statistics suggest that the instruments used are relevant. Similarly, the Hansen test, with a p-value above the 10% threshold, supports the hypothesis of exogeneity of the instruments used.

GMM estimates. The outcome variable may have a strong dynamic effect, which is not taken into account in the static models conducted so far. Consequently, we rely on the [Blundell and Bond \(1998\)](#) two-step system-GMM dynamic panel estimator, which allows controlling for the persistence of the dependent variable, while addressing the Nickell bias ([Nickell, 1981](#)). Moreover, the method combines equations in levels and first differences and uses lagged differences and levels of explanatory variables as instruments to mitigate endogeneity concerns.¹¹ The results reported in Column [3] of Table [B2](#) show a positive and statistically significant effect of the lagged dependent variable, corroborating the hypothesis of the dynamic effect of government debt in foreign currency. Furthermore, the coefficient on the interest variable shows a negative and statistically significant effect of fiscal rules on government debt in foreign currency, with a magnitude comparable to that obtained with entropy balancing (3.7 percentage points), supporting our baseline findings.

5.4 Placebo and falsification tests

This section performs placebo tests, based on random assignments to the treatment. The underlying intuition is that if our results so far are driven by unobservables or a spurious pattern, randomly assigned adoption dates could also lead to statistically significant

our instrument and captures the number of fiscal rules in place in countries with common borders with respect to the national economy.

¹¹For the GMM model, we follow [Combes and Ebeke \(2011\)](#), [Docquier et al. \(2016\)](#), [Fosu and Abass \(2019\)](#), [Pleninger and Sturm \(2020\)](#), [Apeti and Edoh \(2023\)](#) and compute our data over a non-overlapping 5-year average sub-period to limit short-term noise unrelated to the effects we are trying to capture.

effects (Apeti et al., 2023c). Results are reported in Panel D of Table 2. In Column [1], we randomly assign the treatment to the sample. Regression results suggest that fictitious adoption dates have no statistically significant effect on the outcome variable, ruling out the hypothesis of unobservables or a spurious trend that could drive our results. In the same vein, the introduction of fiscal rules may lead to a change in the economic, political, institutional, and social environment of the treated country, which could lead to effects that may overlap with those induced by fiscal rules (Neuenkirch and Neumeier, 2015; Apeti, 2023a; Apeti and Edoh, 2023). Therefore, in Column [2] of Table 2, we re-estimate our main results by considering a five-year window before and after the adoption of the reform.¹² The estimates from a smaller window remain negative, statistically significant, and close to that obtained from the full sample (2.9 percentage points), suggesting that our coefficients are unlikely to be driven by the change in the economic, political, institutional, and social environment following the introduction of the rule. In other words, the effect identified in this paper is due to fiscal rules and not to economic, political, institutional, and social changes following those rules.

6 Heterogeneity

6.1 The types of fiscal rules

This section explores some heterogeneity features, distinguishing between the different types of rules. In our sample and over our study period, budget balanced rules (BBR) are the most common — adopted by 25 countries — followed by debt rules (DR) — adopted by 17 countries — and expenditure rules (ER), adopted by 15 countries.¹³ BBR set a numerical ceiling or target for the government’s budget balance, while DR set an explicit limit on the stock of government debt to ensure convergence to a debt target. Finally, ER, by limiting total, primary, or current expenditure, directly targets the size of the

¹²This narrow time window characterizing our fiscal rules variable would provide a more robust estimate of its effect on the share of foreign currency debt since the slow-changing institutional, political, social, and economic environment is more likely to be stable over narrow time periods (Neuenkirch and Neumeier, 2015; Apeti, 2023a; Apeti and Edoh, 2023).

¹³We do not assess the effect of revenue rules (RR) as only two countries (Côte d’Ivoire and Senegal) have implemented RR in our sample.

government. Previous studies have shown that BBR (e.g., see [Tapsoba, 2012](#); [Barbier-Gauchard et al., 2021](#)) and ER ([Tapsoba, 2012](#)) significantly improve the Cyclically-Adjusted Primary Fiscal Balance (CAPB), with a stronger effect for ER ([Tapsoba, 2012](#)). Regression results reported in [Table C1](#) suggest a negative and significant effect of all the different types of rules on the share of foreign currency in public debt, the effect of DR and ER being slightly higher (about 5 and 7 percentage points, respectively) compared to that of BBR (about 2 percentage points).

6.2 Credibility of the rules

The success of fiscal rules may depend to a large extent on the credibility of the fiscal framework. In what follows, we examine whether the strengthening of the rules, measured by the fiscal rule index and used as a proxy for credibility, influences the reform’s effectiveness. Following [Gootjes et al. \(2021\)](#), we construct a fiscal rule index, by considering the four aspects of the rule: balanced budget rules, debt rules, expenditure rules, and revenue rules. The index ranges from 0 to 5, with higher values indicating a strengthening of the rule.¹⁴ [Figure 2](#) suggests that the beneficial effect of fiscal rules on the control of original sin is amplified when the rule is tightened.

6.3 Macroeconomic and institutional factors

Next, we explore other sources of heterogeneity, considering economic, and institutional factors such as lagged fiscal balance, the quality of institutions (proxied by the level

¹⁴

The indicator is constructed as follows:

$$FRI = Coverage + Legal\ basis + Supporting\ procedures + Enforcement + Flexibility \quad (6)$$

where *FRI* (Fiscal Rules Index) represents the strength of the rule and ranges from 0 to 5. Coverage captures the type of government (central or general) covered by the rule. The legal basis considers the legal aspects of the reform, such as political agreements, legislative statutes, or constitutional rules. Supporting procedures take into account the presence of multiannual expenditure ceilings, a law on fiscal responsibility, and an independent fiscal body that sets budgetary assumptions and monitors their implementation. Enforcement captures the number of formal enforcement procedures in place. Flexibility captures the presence of a well-defined exemption clause, determines whether the balanced budget target is adjusted for the cycle, and whether public infrastructure spending is excluded from the spending cap. The computed index is normalized to the unit, allowing its values to vary between 0 and 1.

of democracy, central bank independence, and government fragmentation), the level of economic development (proxied by per capita income), exchange rate flexibility, financial openness, and financial development. We lag fiscal balance (by one year) to capture the preconditions for the implementation of credible fiscal rules. A sound fiscal discipline prior to the adoption of the reform should enhance the credibility of the fiscal framework, thus amplifying the effectiveness of the rules. A good institutional framework, such as democracy, encourages governments to be more transparent in budget management and helps to promote greater capacity to implement healthy and sustainable reforms that can foster the sustainability of public finances. This may reinforce the beneficial effect of fiscal rules on original sin. Similarly, in the spirit of the unpleasant monetarist arithmetic (Sargent and Wallace, 1981) or the fiscal theory of the price level (Leeper, 1991; Sims, 1994; Woodford, 1995), weak central bank independence is likely to lead to fiscal dominance, resulting in higher deficits. Therefore, in line with this literature, we expect central bank independence to enhance the beneficial effect of fiscal rules on original sin. Next, a large literature has examined the effect of government fragmentation on fiscal outcomes, suggesting that fragmentation tends to be associated with a lax fiscal policy (e.g., see Kontopoulos and Perotti, 1999; Edin and Ohlsson, 1991; Borrelli and Royed, 1995; Franzese, 2000; Volkerink and De Haan, 2001; Balassone and Giordano, 2001; Artés and Jurado, 2018). The effect of fiscal rules on original sin could therefore be mitigated in the presence of high government fragmentation. On the other hand, fiscal rules may be implemented with the aim of correcting fiscal distortions due to fragmentation. As economic development is positively correlated with the quality of institutions, we expect fiscal rules to be more effective in reducing original sin in countries with a high per capita income. Regarding the exchange rate regime, a large literature highlights a strong correlation between the fixed exchange rate regime and fiscal discipline, embodied in fiscal rules (e.g., see Masson et al., 1991; Giavazzi and Pagano, 1988; Elbadawi et al., 2015). Other studies suggest that the difference between fixed and flexible regimes lies in the intertemporal distribution of the costs of fiscal laxity, considering that these costs under a fixed exchange rate appear in the future, while they occur immediately in flexible rates through exchange rate movements (Tornell and Velasco, 1995). Financial openness and development are expected to amplify the effect of fiscal rules on original sin due to the principle of sanctions, which acts as a monitoring body for rules compliance

(Garrett, 1995; Kim, 2003; Altunbaş and Thornton, 2017; Halac and Yared, 2022). The results presented in Figure 2 suggest that better fiscal discipline prior to the adoption of the reform, financial development, financial openness, flexibility of the exchange rate regime, as well as sound institutions foster the beneficial effect of fiscal rules on the original sin.

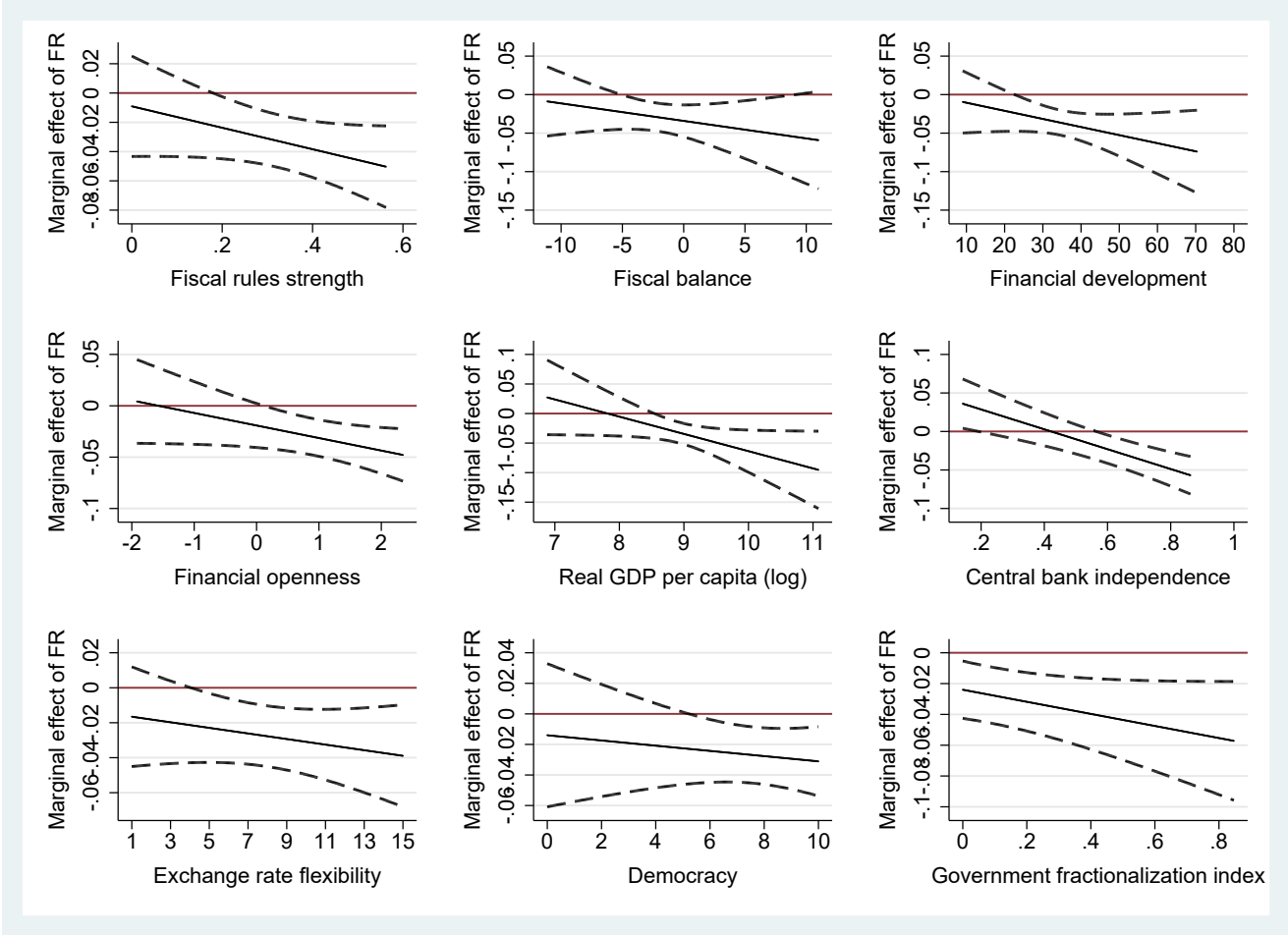


Figure 2: Heterogeneity: Exploring conditional effects

7 Conclusion

Most developing countries usually borrow from the international capital markets in foreign currency, a phenomenon known in the literature as “original sin.” When a currency crisis occurs, the depreciation of the domestic currency leads to government insolvency and the inability to honor its foreign currency debt, with significant consequences for the economy. Against this background, this paper examines to what extent binding fiscal frameworks aimed at promoting fiscal discipline, such as fiscal rules, affect the control of original sin. To do so, we rely on a panel of 59 developing countries over the period 1990-2020 and apply the entropy balancing method to mitigate potential selection bias associated with policy adoption. We find that the fiscal rules significantly reduce the share of public debt in foreign currency, and that the effects are economically meaningful. These results are robust to the inclusion of additional controls, sample size changes, and the use of alternative estimation methods. Our estimates could be driven by unobservable factors or a spurious trend, but placebo tests suggest that the observed effect is due to fiscal rules and that our estimates are not affected by confounding factors. We also find that, on the one hand, the effect of debt rules and expenditure rules is slightly higher compared to that of budget balanced rules. On the other hand, the strengthening of the rule, better fiscal discipline prior to the adoption of the reform, financial development, financial openness, flexibility of the exchange rate regime, as well as the quality of institutions amplify the beneficial effect of fiscal rules on the control of original sin.

Overall, this study contributes to the literature on original sin and fiscal institutions, highlighting a key finding: fiscal frameworks aimed at promoting fiscal discipline, such as fiscal rules, matter in controlling original sin. As a result, developing countries could exploit the opportunity of fiscal rules to increase investor or financial market confidence in order to improve the currency composition of their debt.

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Appendix A Data and sample

Table A1: List of Fiscal Rules (FR) and Non-FR countries

Treatment group(FR)	Date	Control group(Non-FR)	
Argentina	2000	Aruba	Ukraine
Bahamas, The	2018	Albania	Venezuela, RB
Brazil	1998	United Arab Emirates	South Africa
Chile	2001	Bahrain	
Cote d'Ivoire	2000	Belarus	
Congo, Rep.	2002	Belize	
Colombia	2000	Bolivia	
Costa Rica	2001	Barbados	
Gabon	2002	China	
Georgia	2013	Dominican Republic	
Grenada	1998	Egypt, Arab Rep.	
Indonesia	1990	Fiji	
India	2004	Ghana	
Jamaica	2010	Guatemala	
Kazakhstan	2013	Iraq	
Sri Lanka	2003	Jordan	
Mexico	2006	Lebanon	
Mongolia	2013	Morocco	
Mauritius	2008	North Macedonia	
Namibia	2001	Oman	
Nigeria	2007	Philippines	
Peru	2000	Papua New Guinea	
Paraguay	2015	Qatar	
Russian Federation	2007	Saudi Arabia	
Senegal	2000	Seychelles	
Serbia	2011	Trinidad and Tobago	
Thailand	2019	Tunisia	
Uruguay	2006	Turkey	

Table A2: Descriptive statistics of the main variables

Variable	Obs.	Mean	Sd	Min	Max
Share of government debt in foreign currency	881	0.9367	0.2026	0	1
Log.GDP per capita	1,718	8.5337	0.9193	6.2681	11.0985
Inflation targeting	1,769	0.1633	0.3698	0	1
Democracy	1,508	3.5991	1.3802	0	6
Exports share	1,138	0.0035	0.0082	1.85E-6	0.0943
Lag.Fiscal balance	1,524	-2.3350	5.4048	-35.398	29.802
Fixed exchange rate regime	1,109	0.2587	0.4381	0	1
Government durability	1,514	21.169	20.2342	0	99
Annual GDP growth	1,739	3.4384	5.8842	-64.0471	57.8178
Capital openness	1,517	0.0503	1.4392	-1.9165	2.3467

Table A3: Sources of variables

Variables		Nature	Sources
1. Main model variables			
Fiscal rules		Dummy	IMF Fiscal Rules Dataset
Share of government debt in foreign currency		Ranging from 0 to 1	The International Debt Securities (IDS)
Fiscal balance (%GDP)		Continuous	Kose et al. (2022)
Annual GDP growth		Continuous	WDI
GDP per capita		Continuous	WDI
Financial openness		Index ranging approximately from -2 to 2	Chinn and Ito (2006)
Fixed exchange rate regime		Dummy	Authors, from Ilzetzki et al. (2019)
Inflation targeting		Dummy	Rose (2007) ; Roger (2009) ; Cizkowicz-Pekala et al. (2019)
Share of World Exports		Continuous	Direction of Trade, IMF
Democracy		Index ranging from 0 to 6	The International Country Risk Guide (ICRG)
Government durability		Continuous	Polity IV
2. Additional controls			
Financial development		Index ranging from 0 to 1	IMF Financial Development Index Database
Sovereign debt rating		Index ranging from 1 to 21	Kose et al. (2022)
Government consumption		Continuous	WDI
Inflation		Continuous	WDI
Political checks and balances		Continuous	The Database of Political Institutions
Exchange rate volatility		Continuous	Authors, from Penn World Table
Crisis		Dummy	Nguyen et al. (2022)
Government stability		Index ranging from 0 to 12	The International Country Risk Guide (ICRG)

Appendix B Robustness

Table B1: FR and the share of foreign currency in government debt: Additional controls

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Baseline									
FR dummy	-0.029*** (0.0111)	-0.029*** (0.0111)	-0.026*** (0.0111)	-0.034*** (0.0110)	-0.029*** (0.0117)	-0.030*** (0.0122)	-0.028*** (0.0109)	-0.028*** (0.0109)	-0.028*** (0.0113)	-0.030*** (0.0116)
Financial development		-0.286*** (0.0702)								-0.324*** (0.0851)
Inflation			-0.005 (0.0039)							-0.001 (0.0030)
Government consumption				0.008*** (0.0016)						0.009*** (0.0018)
Political checks and balances					-0.007* (0.0040)					-0.018*** (0.0049)
Sovereign debt rating						-0.001 (0.0024)				0.002 (0.0030)
Log. Exchange rate volatility							0.010* (0.0057)			0.016 (0.0103)
Crisis								0.006 (0.0092)		0.010 (0.0112)
Government stability									-0.003 (0.0020)	-0.003 (0.0023)
Observations	570	570	535	549	543	505	561	570	570	425
R-squared	0.6118	0.6221	0.6535	0.6284	0.6207	0.6216	0.6051	0.6122	0.6141	0.7252
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country & Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimates of the impact of fiscal rules on the share of foreign currency in government debt, including additional controls. Column [1] reports the results of the main model. All specifications include the variables of the baseline model: GDP per capita (log), annual GDP growth, fiscal balance (lag), financial openness, the exchange rate regime, inflation targeting, export shares, and the level of democracy. Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table B2: FR and the share of foreign currency in government debt: OLS, IV and GMM estimates

	Panel A: OLS	Panel B: IV	Panel C: GMM
	[1]	[2]	[3]
FR dummy	-0.038*** (0.0105)	-0.054*** (0.0129)	-0.037* (0.0224)
Log.GDP per capita	-0.053** (0.0264)	-0.052*** (0.0195)	-0.027 (0.0415)
Inflation targeting	-0.012 (0.0081)	-0.011 (0.0076)	0.014 (0.0228)
Democracy	-0.007** (0.0029)	-0.007*** (0.0029)	-0.011 (0.0116)
Exports share	-6.207*** (2.2614)	-6.323*** (2.1613)	-4.792*** (1.2914)
Lag.Fiscal balance	-0.002* (0.0011)	-0.002** (0.0008)	0.003 (0.0033)
Fixed exchange rate regime	-0.010 (0.0169)	-0.019 (0.0166)	0.041 (0.0711)
Government durability	3.761E-4 (0.0004)	3.586E-4 (0.0003)	0.001 (0.0016)
Annual GDP growth	-0.001** (0.0006)	-0.002*** (0.0006)	-0.003 (0.0028)
Capital openness	-0.008** (0.0035)	-0.007** (0.0035)	-0.012 (0.0212)
Lag.Dependent variable			0.995*** (0.3067)
Observations	570	555	111
R-squared	0.5417	0.4046	
Country & Time FE	Yes	Yes	Yes
Instruments		Lag. Fiscal rules/Contiguity	
Kleinberg-Paap rk test		83.30	
Stock-Yogo Stats test		19.93	
Hansen p-value		0.2115	0.331
AR(2) p-value			0.293
Number of instruments			34

Notes: This table reports estimates of the impact of fiscal rules on the share of foreign currency in government debt. Panel A re-estimates the baseline model using OLS. Panel B relies on instrumental variables, considering the fiscal rule variable lagged by one year and the number of fiscal rules in place in countries with common borders with respect to the national economy as instruments. Panel C re-estimates the baseline model using the two-step system-GMM dynamic panel estimator (we compute our data over a non-overlapping 5-year average sub-period to limit short-term noise unrelated to the effects we are trying to capture). Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

Appendix C Heterogeneity

Table C1: FR and the share of foreign currency in government debt: types of rules

	[1]	[2]	[3]
	BBR	DR	ER
ATT	-0.024** (0.0109)	-0.045** (0.0176)	-0.071*** (0.0175)
Observations	570	570	570
R-squared	0.6144	0.6658	0.7738
Baseline Controls	Yes	Yes	Yes
Country & Time FE	Yes	Yes	Yes

Notes: This table reports estimates of the impact of fiscal rules on the share of foreign currency in government debt, distinguishing between budget balanced rules (BBR), debt rules (DR), and expenditure rules (ER). All specifications include the variables of the baseline model: GDP per capita (log), annual GDP growth, fiscal balance (lag), financial openness, the exchange rate regime, inflation targeting, export shares, and the level of democracy. Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$