

On the Unintended Consequence of Fiscal Rules: Evidence from Fiscal Expenditures

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Abstract

This paper documents the unintended consequence of fiscal rules in the form of tax expenditures using both theory and data. We first introduce a simple fiscal model where the government has time-inconsistent preferences with a present bias toward public spending in line with Halac and Yared (2014). We then empirically validate the main prediction of the model by providing evidence that the adoption of a binding fiscal rule on public spending leads to an increase in tax expenditures, whereas revenue rules, which do not constrain spending, leave them unaffected. Our findings suggest the existence of a robust «innovation channel” in the fiscal domain—paralleling regulatory capital requirements in banking.

Keywords: Fiscal Rule, Tax Expenditures, Deficit Bias, Innovation.

JEL Codes: D02, D82, E6, H1, P16.

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I. Introduction

Fiscal rules are widely held as the most important institutional instrument to ensure fiscal discipline. The adoption of fiscal rules has triggered the emergence of a vibrant strand of literature on fiscal rules. Overall, the evidence presented in the literature has found that fiscal rules are powerful tools to curb deficit bias but their effectiveness and economic consequences depend crucially on the mechanism design and implementation.¹ In the present paper, we take a slightly different perspective. We borrow from the insight from the law and finance literature on regulatory capital arbitrage whereby banks strategically innovate to minimize capital requirements.²

We develop a three-period model, in the spirit of Halac and Yared (2014), in which the key friction is not privately observed shocks as in Halac and Yared (2014, 2018, 2020, 2022, 2025) but a non-verifiable fiscal instrument—tax expenditures—that delivers contemporaneous political benefits while eroding the future tax base through a persistent “revenue-erosion” stock. Tax expenditures are provisions that depart from a benchmark tax system (exemptions, preferential rates, credits) and thereby erode revenues.³ They are widely understood as “spending through the tax system”, i.e., policy instruments that deliver financial support by reducing tax liabilities relative to a benchmark rather than by making explicit outlays (Surrey, 1973). In many ways, tax expenditures are “hidden” expenditures relative to traditional expenditures. As such, the hidden nature of tax expenditure makes them appropriate instrument to circumvent binding fiscal rules on standard expenditures.

The government is benevolent *ex ante* yet present-biased *ex post*, implying that under discretion it overuses hidden tax expenditures relative to the time-consistent benchmark. Because fiscal rules can restrict only contractible aggregates (debt, deficits, or on-budget

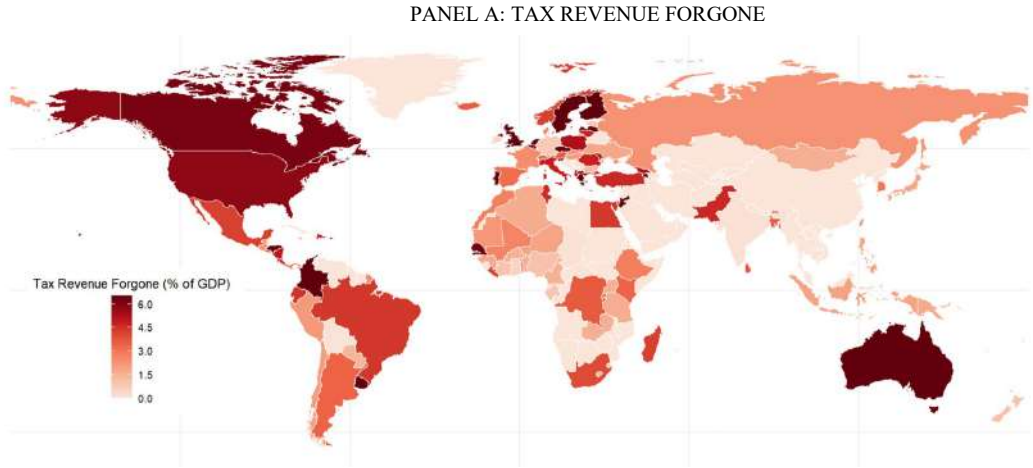
¹ The literature of fiscal rules is extensive. Most notably, in a series of influential papers Halac and Yared (2014; 2018; 2020; 2022; 2025) have explored the many facets of the economics of fiscal rules namely: design and enforcement mechanism; effectiveness and macroeconomic consequences; international coordination; trade-offs between commitment vs. flexibility; and regime transition. Interestingly, Yared (2019) argues that long-rise in government debt in advanced economies is primarily due to rising spending on entitlement programs, rather than tax cuts. The author argues that fiscal rule are essential to counter the deficit bias. In this paper, we explore an unintended consequence of the introduction of fiscal rule.

² The law and finance literature on regulatory arbitrage and its consequences is extensive (see seminal contribution by Partnoy, 1997). Jones (2000) provides an early account of how banks exploited flaws in banking regulation and became more complex. They “innovated away” from capital requirements, turning safety regulations into mere compliance exercises.

³ Tax cuts are broader than tax expenditures since they usually involve a reduction in tax rates, modifying the benchmark tax system itself. However, a targeted tax cut can be regarded as a tax expenditure if it is codified and reported as an identifiable benchmark departure.

spending), they may induce circumvention: when binding, tighter rules compress observable fiscal space and thereby increase equilibrium tax expenditures, whereas non-binding rules are locally neutral. Across rule types, debt and deficit rules generate equivalent diversion incentives once mapped into their implied tightening of borrowing capacity, while spending rules add a distinct revenue-dependence channel—a fall in revenues mechanically tightens the implied borrowing limit—potentially amplifying circumvention when revenue erosion is persistent. Overall, the framework offers a parsimonious mechanism linking binding fiscal rules to rising tax expenditures and highlights how rule design interacts with non-contractible policy margins (Halac and Yared, 2014; Milesi-Ferretti, 2004).

A cursory look at the data suggests that as the adoption of fiscal rules became widespread so-called tax expenditures began to spread broadly in line with our theoretical predictions.⁴ Figure 1 presents the global distribution of tax revenue forgone stemming from tax expenditures (Panel A) and the timing of fiscal rule adoption (Panel B). Figure AI in Appendix A presents a basic event analysis, illustrating the uptick in tax revenue forgone before and after the first year of fiscal rule introduction. To more systematically test the main prediction of theory, we use synthetic Diff-in-Diff methods over a worldwide panel of countries for the period going from 1990 to 2024. We combine the use of a novel dataset on revenue forgone which systematically compiled in the Global Tax Expenditures Database (GTED) with the International Monetary Fund (IMF) Fiscal Rules Dataset on fiscal rules.⁵



⁴ This co-movement should be read as suggestive rather than causal. The adoption of fiscal rules and the measured level of tax expenditures may be jointly determined, since both can respond to a common underlying demand for greater fiscal discipline. We address this simultaneity concern in the empirical strategy below, where the event-study and difference-in-differences designs exploit the timing of rule adoption to isolate its effect on subsequent tax expenditures.

⁵ The datasets used in our empirical analysis are described further below and in Appendix.

PANEL B: YEAR OF FIRST FISCAL RULE

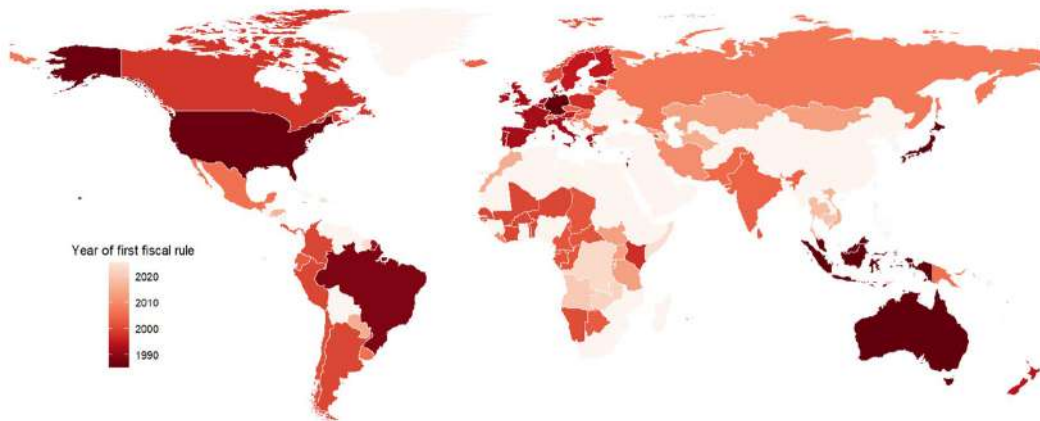


FIGURE 1. TAX REVENUE FORGONE AND YEAR OF FIRST FISCAL RULE

Notes: Panel A uses the latest available data of tax revenue forgone stemming from tax expenditures except for Russia for which the 2015 value is used due to abnormal reporting patterns after that year. Countries that do not report any tax revenue forgone provisions in the GTED dataset are assigned a value of zero. For transparency, Figure SAII presents the full set of maps depicting tax revenue forgone using the latest available observations—including Russia—as well as the first recorded year in which tax-assessment data become available. In Panel B, the lightest shaded areas represent countries that do not report the adoption of any fiscal rule.

Our empirical findings are threefold. First, we document a statistically significant rise in tax expenditures, on average, following the adoption of fiscal rules. Second, the estimated effects are markedly heterogeneous varying with both the design of the rule and the category of tax expenditure considered. Third, stronger control of corruption is associated with more, rather than fewer, tax expenditures after fiscal-rule adoption. Taken together, these results support a robust 'innovation channel': when fiscal rules become — much like regulatory capital requirements in banking — they induce a reallocation toward novel fiscal innovations, most notably tax expenditures, that enable spending Ministers to bypass traditional budgetary oversight.

The subject of tax expenditure is not just of importance as a potential strategic response to the adoption of fiscal rules; it also matters because tax expenditures can generate sizable economic costs. Indeed, tax expenditures often constitute a particularly costly instrument for transferring resources, insofar as they tend to be less well targeted and less transparent than direct spending, more distortionary, and therefore more conducive to rent-seeking and weak ex post discipline (Burman and Phaup, 2012; IMF, 2019). By narrowing the tax base, they may necessitate higher statutory rates to achieve a given revenue objective, thereby increasing marginal distortions and strengthening incentives for avoidance. Beyond these allocative effects, tax expenditures typically add complexity to the tax code and can raise both compliance costs for taxpayers and administrative costs for the revenue authority. A recurrent institutional concern is that tax expenditures are often easier to enact and harder to discipline than direct

expenditures, because they may receive less systematic scrutiny in annual budget negotiations and can be embedded in permanent provisions; in many settings, they are also less transparent and do not face approval and review procedures comparable to those applied to explicit spending (European Commission, 2014; OECD, 2025).

The paper is also related to the literature on “creative accounting” in the context of fiscal rules. Milesi-Ferretti (2003) provides a theoretical analysis suggesting that creative accounting is more likely to arise when fiscal institutions are less transparent or when fiscal rules are sufficiently stringent to induce systematic attempts at circumvention; his model features a myopic incumbent that discounts the future more heavily than society, thereby generating a deficit bias. Von Hagen and Wolff (2006) operationalize creative accounting in the European Union using stock–flow adjustments and document that the deficit ceilings of the Stability and Growth Pact are associated with greater recourse to such practices, consistent with governments’ incentives to compress reported deficits. Our contribution models an explicit “innovation channel” under the form of tax expenditures—an equilibrium logic akin to regulatory capital requirements in banking—so that circumvention operates through the endogenous creation and expansion of fiscal instruments, which can be viewed as an extensive-margin analogue of creative accounting.

The remainder of the paper is organized as follows. Section II presents a simple model. Section III presents the data and empirical strategy. Section IV presents the main results. Section V concludes.

II. A Simple Theoretical Model

We adapt the dynamic-mechanism perspective of Halac and Yared (2014) to an environment without exogenous shocks, where the key friction is a non-verifiable tax-expenditure instrument that reduces future fiscal capacity. Tax expenditures deliver contemporaneous political (or redistributive) benefits, yet they accumulate into a stock of “revenue erosion” that depresses future revenues. Because fiscal rules can constrain only observable objects—debt, deficits, or on-budget spending—they may induce substitution toward the hidden instrument. We characterize discretionary behavior and establish three results: (i) present bias implies overuse of hidden tax expenditures; (ii) a binding debt/deficit/spending rule induces circumvention through higher tax expenditures; (iii) when revenue erosion is persistent, the ex ante optimal rule differs from the sequentially optimal rule and becomes more strongly state- (history-) contingent, exploiting future discipline to incentivize hidden actions today.

Fiscal rules are commonly rationalized as commitment devices that mitigate deficit bias, yet their effectiveness hinges on enforceability and on the availability of “off-budget” margins enabling circumvention. Tax expenditures constitute a leading candidate: they often operate through fragmented legal provisions and are reported imperfectly—especially in developing and emerging economies—making them difficult to monitor and integrate into fiscal control systems. Our framework delivers a parsimonious mechanism for creative-accounting-type responses to rules (Milesi-Ferretti, 2004), specialized to the tax-expenditure margin.

We consider a three-period model following the illustrative structure in Halac and Yared (2014). Time is discrete, $t \in \{0,1,2\}$. The economy is small and open, with constant gross interest rate $1 + r$. The government inherits initial debt b_0 and faces a terminal condition $b_3 = 0$.

There is a benchmark (“potential”) tax revenue level $\bar{\tau} > 0$. On-budget spending is denoted $g_t \geq 0$ and is observable. The government budget constraint follows the same borrowing/spending technology as in Halac and Yared (2014):

$$(1) \quad g_t = \tau_t + \frac{b_{t+1}}{1+r} - b_t, \quad b_3 = 0$$

Equivalently, $b_{t+1} = (1 + r)(g_t - \tau_t + b_t)$, and in period 2 we have $g_2 = \tau_2 - b_2$.

In each period t , the government also chooses a tax expenditure $x_t \geq 0$, capturing exemptions, allowances, credits, reduced rate, and tax deferrals, all of which reduce revenue relative to a benchmark tax system. We assume x_t is observed only by the government and is non-verifiable for contracting purposes (e.g., due to fragmentation of legal instruments, weak reporting, or limited fiscal transparency).

Tax expenditures accumulate into a stock of “revenue erosion” (or fiscal legacy) s_t :

$$(2) \quad s_{t+1} = (1 - \lambda)s_t + x_t, \quad \lambda \in [0,1], \quad s_0 \text{ given.}$$

Current effective revenue is:

$$(3) \quad \tau_t = \bar{\tau} - \psi s_t, \quad \psi > 0.$$

Hence x_t depresses future revenues through s_{t+1} and s_{t+2} . This captures the empirically salient feature that some tax expenditures create persistent base erosion or delayed liabilities, while that their contemporaneous cost is often less salient.

Preferences and present bias

Instantaneous utility from observable spending is $u(g)$, strictly increasing and concave. Tax expenditures deliver (i) a contemporaneous political/redistributive payoff—because they can be targeted and less scrutinized than explicit outlays—and (ii) a cost reflecting inefficiency/opacity. We capture this with $v(x)$ increasing concave and $c(x)$ convex.

The social objective is:

$$(4) \quad W_0 = \sum_{t=0}^2 \delta^t [u(g_t) + \omega v(x_t) - c(x_t)],$$

where $\delta \in (0,1)$ and $\omega \geq 0$ reflects the weight society assigns to policy delivered through the tax code (Surrey, 1973).

Following Halac and Yared (2014), the government is benevolent ex ante but present-biased ex post. At date t , it maximizes:

$$(5) \quad V_t = u(g_t) + \omega v(x_t) - c(x_t) + \beta \sum_{k=1}^{2-t} \delta^k [u(g_{t+k}) + \omega v(x_{t+k}) - c(x_{t+k})],$$

with $\beta \in (0,1)$. The parameter β captures the self-control problem that generates a deficit/spending bias in Halac and Yared (2014).

A discretionary recursive equilibrium is a collection of policy functions $\{g_t(b_t, s_t), x_t(b_t, s_t), b_{t+1}(b_t, s_t)\}_{t=0}^2$ such that (i) feasibility holds (Equations 1, 2, and 3), and (ii) for each t , given the continuation induced by future selves’ equilibrium policies, the date- t government maximizes V_t . We obtain a first Proposition.

Proposition 1 (Present bias implies overuse of hidden tax expenditures under discretion)

Fix any public state (b_1, s_1) at $t = 1$. Let $x_1^D(\beta)$ denote the discretionary choice of x_1 under present-bias parameter β . Then, for interior solutions,

$$(5) \quad \beta < 1 \Rightarrow x_1^D(\beta) < x_1^D(1),$$

Proof. See Appendix.

This result is the analogue of Halac–Yared’s overspending bias, but it operates through a hidden fiscal instrument (tax expenditure) that pushes costs into the future via revenue erosion.

Fiscal rules: debt, deficit, spending, and revenue targets

Following Halac and Yared (2014), we model a fiscal rule as a dynamic mechanism that can restrict only contractible (observable and verifiable) objects—here, on-budget spending g_t , deficit $d_t \equiv g_t - \tau_t$ or public debt b_{t+1} —but cannot condition on the non-verifiable tax-expenditure instrument x_t . The policy-relevant issue is therefore not only the tightness of the rule, but also the choice of the targeted aggregate (debt, deficit, or spending) and how it shapes the scope for circumvention through x_t (Milesi-Ferretti, 2004).

We consider then four canonical fiscal rules (imposed for $t = 0, 1$). The debt rule directly caps the intertemporal transfer embedded in borrowing:

$$(8) \quad b_{t+1} \leq \bar{b}_{t+1}(b_t, s_t),$$

A deficit rule is given by:

$$(9) \quad d_t \equiv g_t - \bar{\tau}_t \leq \bar{d}_{t+1}(b_t, s_t),$$

Under the budget identity (1), $b_{t+1} = (1 + r)(d_t + b_t)$, so a deficit rule induces an implicit debt ceiling.

The expenditure rule (spending target) caps the observable outlay directly, letting the deficit adjust residually with revenue:

$$(10) \quad g_t \leq \bar{g}_t(b_t, s_t).$$

The revenue rule establishes a floor on verifiable realized revenue:

$$(11) \quad \tau_t \geq \underline{\tau}_t(b_t, s_t).$$

Because $\tau_t = \bar{\tau} - \psi s_t$, a revenue floor is equivalent to an upper bound on the erosion stock s_t . Since $s_{t+1} = (1 - \lambda)s_t + x_t$, a revenue floor at $t + 1$ imposes an implicit upper bound on the hidden action x_t . This is the crucial conceptual distinction: debt/deficit/spending rules constrain the observable intertemporal margin, whereas a revenue rule can—when binding—discipline the observable outcome that the hidden instrument erodes.

A general implication (used below) is that if a rule is slack at the equilibrium allocation, its Lagrange multiplier is zero and the allocation coincides locally with discretion; the novel incentives arise when the constraint binds.

Proposition 2. Fiscal rule type and tax-expenditure responses.

Assume interior solutions and standard curvature: $u' > 0$, $u'' < 0$, and $\phi'(x) < 0$. Consider period $t = 1$.

(i) Debt rule. If the rule $(b_2 \leq \bar{b}_2)$ binds $(b_2 = \bar{b}_2)$, then

$$\frac{\partial x_1}{\partial \bar{b}_2} < 0$$

Hence, tightening the debt ceiling (lower \bar{b}_2) increases hidden tax expenditures x_1 .

(ii) Deficit rule. If the rule $(d_1 \leq \bar{d}_1)$ binds $(d_1 = \bar{d}_1)$, then

$$\frac{\partial x_1}{\partial \bar{d}_1} < 0$$

(iii) Spending rule. If the rule $(g_1 \leq \bar{g}_1)$ binds $(g_1 = \bar{g}_1)$, then it induces an implicit debt ceiling:

$$(12) \quad b_2 = (1 + r)(\bar{g}_1 - \tau_1 + b_1) \equiv \bar{b}_2^g(\tau_1),$$

And therefore

$$\frac{\partial x_1}{\partial \bar{g}_1} < 0$$

(iv) Revenue rule. If the rule $(\tau_2 \geq \underline{\tau}_2)$ binds $(\tau_2 = \underline{\tau}_2)$, then increasing the stringency of the revenue rule (raising $\underline{\tau}_2$) reduces equilibrium tax expenditures:

$$\frac{\partial x_1}{\partial \underline{\tau}_2} < 0$$

Proof. See Appendix.

We establish also the following Corollaries.

Corollary 2. Comparative diversion and revenue dependence across rule targets (except revenue rule).

Suppose the previous fiscal rules are binding at $t = 1$, we have:

(i) **Equivalence up to scaling: Debt vs deficit vs spending.**⁶

$$\frac{\partial x_1}{\partial \bar{d}_1} = \frac{\partial x_1}{\partial \bar{g}_1} > \frac{\partial x_1}{\partial \bar{b}_2},$$

with $\frac{\partial x_1}{\partial \bar{b}_2} < 0$.

(ii) **Additional revenue-dependence under expenditure rules.**

$$\frac{\partial x_1}{\partial \tau_1} = -(1 + r) \frac{\partial x_1}{\partial \bar{b}_2} > 0$$

⁶ We note that $\frac{\partial x_1}{\partial \bar{d}_1} = \frac{\partial x_1}{\partial \bar{g}_1} = (1 + r) \frac{\partial x_1}{\partial \bar{b}_2}$

Proof. Immediate from Proposition 2.

The corollary formalizes a clean ranking logic. Holding fixed the implied tightening of borrowing capacity, debt and deficit rules deliver identical incentives to substitute from observable instruments toward the non-verifiable tax-expenditure margin.

Expenditure rules generate the same diversion effect per unit of tightening, but they also create an additional revenue-dependence channel: fluctuations in contemporaneous revenues (including those induced by past hidden tax expenditures through persistent erosion) mechanically alter the tightness of the implied borrowing space, thereby amplifying diversion incentives. Therefore, a fall in contemporaneous revenues (equivalently, an increase in the legacy erosion stock s_1) mechanically tightens the implied borrowing space under an expenditure ceiling and amplifies diversion toward x_1 . This revenue-dependence channel is absent under a pure debt rule and under a deficit rule.

A binding revenue rule operates differently than the others: it restricts the observable revenue outcome that x erodes, and therefore (weakly) reduces x as it becomes more stringent (Proposition 2(iv)).

Corollary 3. Persistence and amplification under binding spending rule.

With persistence ($\lambda < 1$), the erosion stock satisfies $s_1 = (1 - \lambda)s_0 + x_0$, so

$$\frac{\partial \tau_1}{\partial x_0} = -\psi < 0$$

Under binding spending rule at $t = 1$, equation (12) implies

$$\frac{\partial b_2}{\partial x_0} > 0$$

Proof.

Immediate from $\tau_1 = \bar{\tau} - \psi s_1$, $s_1 = s_1 = (1 - \lambda)s_0 + x_0$, and the derivative $\frac{\partial b_2}{\partial \tau_1} = \frac{\partial \bar{b}_2^g}{\partial \tau_1} \frac{\partial \tau_1}{\partial x_0} = (1 + r) \psi > 0$ from (12).

When $\lambda < 1$, revenue erosion is persistent and past tax expenditures depress future revenues. Under spending ceilings, this persistence generates a feedback loop: past x lowers current τ , which tightens the implied ceiling in (12), which strengthens incentives to shift further into x .

Hence spending rules can amplify history dependence and circumvention dynamics even when the nominal spending cap is unchanged.

This corollary isolates a design feature that is often central in “second-generation” fiscal frameworks: targets that are mechanically sensitive to contemporaneous revenues can unintentionally amplify incentives to shift activity toward less-controlled margins. In the present model, because tax expenditures erode future revenues and are non-verifiable, the spending-rule channel creates an additional, mechanically history-dependent tightening of fiscal space that can strengthen circumvention incentives relative to a deficit rule defined on $g_t - \tau_t$, or relative to a debt ceiling calibrated directly.

Halac and Yared (2014) emphasize that optimal fiscal rules must respect contractibility constraints and that persistence can make optimal rules history-dependent. In our setting, the persistence is not an exogenous shock but an endogenous fiscal legacy s_t produced by hidden tax expenditures. The nature of the target (debt/deficit/spending) matters because it determines how the rule translates into restrictions on the observable intertemporal margin, and thus how strongly it shifts incentives toward the non-verifiable instrument x_t . In particular, spending rules introduce an additional revenue-dependence channel that may strengthen the history dependence of the implementable constraint set and, consequently, the scope for circumvention.

III. Data and Empirical Framework

In this section, we present both the data and empirical framework used to test the main prediction of our theory.

A. Data

In the subsection, we present the main data used in the empirical analysis namely tax revenue forgone stemming from tax expenditures and fiscal rules. Table AI in the Appendix provides basic statistics related to the variables used in the empirical analysis.

Revenue Forgone— The data on revenue forgone stemming from tax expenditures is systematically compiled in GTED.⁷ The dataset aggregates publicly available tax expenditure data from 218 jurisdictions from 1990 to now. This dataset includes provision-level estimates of forgone revenue, details on beneficiaries, and accompanying metadata such as the legal framework and duration of the provisions. Each entry is categorized by its tax base, policy

⁷ See URL link to the dataset: <https://gted.taxexpenditures.org/data-download-dashboard/#provisions-search>

objective, beneficiary type, and the form of tax expenditure, with further subcategories applied when relevant. GTED captures both granular (provision-level) and aggregated information but restricts inclusion to reports that present quantifiable indicators of tax expenditure usage, particularly forgone revenue figures.

The dataset also distinguishes between regular and irregular reporting practices and standardizes the data to improve comparability over time and across countries. This includes conversions into U.S. dollars and calculations of revenue forgone as a share of GDP. Table AII provides a country-by-country summary of the number of years with recorded revenue-forgone data.⁸

Fiscal Rule— We compile information on fiscal rules from the IMF Fiscal Rules Dataset (1985–2024),⁹ which covers 123 economies and systematically documents the existence, type, and characteristics of fiscal rules across countries. For each country–year observation, the dataset records whether any fiscal rule is in place (Yes/No). When present, four distinct rule types are identified: Budget Balance Rule (BBR), Debt Rule (DR), Expenditure Rule (ER), and Revenue Rule (RR)—each applicable to the central, general, or public sector, excluding subnational levels.

Control of Corruption— To capture the extent to which fiscal rules are binding we use the control of corruption indicator which is sourced from the World Governance Indicators (WGI) dataset. The measure originally captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as state capture. Arguably, in countries where public offices is widely perceived as a vehicle for private gains, the enforcement of fiscal rules tends to be weaker. The index is reported on a standardized scale ranging from –2.5 to +2.5, with higher values indicating better governance quality and a lower prevalence of corruption.

The original panel dataset includes 123 countries observed from 1990 to 2024. To maintain balanced coverage, missing entries in the fiscal rule indicators are coded as 0, indicating the absence of an established rule for the corresponding country–year observations.

⁸ We then classify these provisions into direct and indirect tax expenditures based on their Level-1 tax type categories. Direct tax forgone is defined using Level-1 categories Tax on Income and Tax on Property, whereas indirect tax forgone includes Tax on Goods and Services and items classified as Multiple/Not stated/Unclear/Other. The temporal evolution of these tax-expenditure categories is reported in Figure SAI (Supplementary Appendix).

⁹ See URL link to the IMF Fiscal Rule Dataset:

<https://www.imf.org/external/datamapper/fiscalrules/map/map.htm>

Other variable—In addition, to verify the effectiveness of fiscal rules on conventional expenditure dependent on the institutional environment, we use general government expenditure as a percentage of GDP from the Global Macro Database.

B. Empirical Framework

Benchmark Empirical Approach—Our primary empirical analysis employs the *synthetic difference-in-differences* (SDID) estimator developed by Arkhangelsky et al. (2021) to evaluate the dynamic effect of fiscal rule adoption on *tax revenue forgone* (TF). The SDID approach combines the strengths of the traditional difference-in-differences (DID) and synthetic-control (SC) estimators by reweighting both units and time periods to minimize pre-treatment discrepancies, thereby relaxing the strict parallel-trends assumption while retaining fixed-effects robustness.¹⁰

Formally, let Y_{it} denote tax forgone for country i in year t , and $FR_{it} \in \{0,1\}$ indicate whether a fiscal rule is in force. The SDID estimator solves

$$(15) \quad (\hat{\tau}_{sdid}, \hat{\mu}, \hat{\alpha}, \hat{\beta}) = \arg \min_{\tau, \mu, \alpha, \beta} \sum_{i=1}^N \sum_{t=1}^T (Y_{it} - \mu - \alpha_i - \beta_t - \tau FR_{it})^2 \hat{\omega}_i^{sdid} \hat{\lambda}_t^{sdid}$$

where $\hat{\omega}_i^{sdid}$ and $\hat{\lambda}_t^{sdid}$ are data-driven unit and time weights chosen to match pre-treatment outcome trajectories between treated and control groups and to balance pre- versus post-treatment periods. Intuitively, SDID reweights the control countries and pre-periods to approximate the counterfactual trajectory of the treated units had no fiscal rules been adopted. Bootstrap standard errors are clustered at the country level. The estimator can also be written as a weighted double-difference in adjusted outcomes,

$$(16) \quad \begin{aligned} \hat{\tau}_{sdid} &= \bar{\delta}_{tr} - \sum_{i=1}^{N_{co}} \hat{\omega}_i^{sdid} \bar{\delta}_i, \\ \bar{\delta}_i &= \frac{1}{T_{post}} \sum_{t>T_{pre}} Y_{it} - \sum_{t \leq T_{pre}} \hat{\lambda}_t^{sdid} Y_{it}, \end{aligned}$$

so that only countries and periods closely resembling the treated units receive non-zero weight. Consistency and asymptotic normality follow under an interactive fixed-effects structure of the outcome process.

¹⁰ Because the SDID estimator requires a control group consisting only of countries with no fiscal rules, we expanded the sample to 217 countries. SDID's implementation constraints—namely, prohibiting reversions from 1 to 0 and excluding units treated in the initial year—led to the removal of noncompliant cases. As a result, the final dataset used for the SDID estimation comprises 205 countries over the period 1990–2024, forming a balanced panel.

Exploring Heterogeneity—We further extend the analysis in two dimensions.

- (i) To test whether the different types of rules have heterogeneous effects, we differentiate between different rule types by estimating separate effects for the four categories namely: budget-balance rules (BBR), debt rules (DR), expenditure rules (ER), and revenue rules (RR).
- (ii) We further test for the heterogeneity depending as to whether fiscal rules are binding, we base our test based on the control of corruption measure. To do so, we split the sample of countries into low-corruption (bottom 25th percentile) and high-corruption (top 25th percentile) groups. Results using alternative cutoffs—such as the median or decile splits—are reported in the robustness check section

IV. Main Results

In this section, we present the main results of our empirical analysis.

A. Benchmark Results

Figures 2 show the impulse response of tax revenue forgone following the introduction of a fiscal rule using synthetic-DiD. The shaded areas are 90% and 68% (darker gray) confidence bands based on standard errors that are corrected for heteroskedasticity and autocorrelation using robust Heteroskedasticity and Autocorrelation Consistent estimators. Figure 2 shows that fiscal rule adoption has a positive effect on tax revenue forgone. The effect on tax revenue forgone is persistent increasing and reaching a peak 16 year after adoption of a fiscal rule. The main result is robust to using alternative estimator in the form of Local Projection Difference-in-Differences (LPDID) methods as reported in the Figure SAIII. The results confirm the theoretical predictions that the introduction of a fiscal rule by the Minister of Finance drives other spending Ministers to circumvent the rule by using tax expenditures.

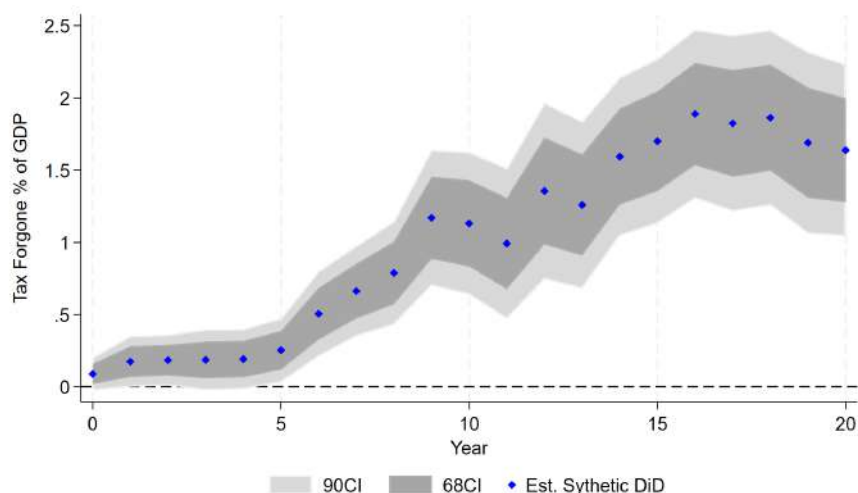


FIGURE 2. TAX FORGONE FOLLOWING A SHOCK TO THE ADOPTION OF FISCAL RULES

Notes: Impulse response functions are based on synthetic Differences-in-Differences estimators, with 68% (darker gray) and 90% confidence intervals shown. Refer to Arkhangelsky et al. (2021) for theoretical derivations.

B. Heterogeneity by Rule Type

Figures 3 show the impulse responses of tax revenue forgone following the adoption of various types of fiscal rules. Across the sample, 123 countries have implemented at least one fiscal rule. Specifically, 70 countries have ever adopted an expenditure rule, 24 have introduced a revenue rule, 110 have applied a budget balance rule, and 102 have implemented a debt rule). Figure 3 displays the responses of fiscal revenue forgone following respectively expenditure rule (Panel A), revenue rule (Panel B), balance budget rule (Panel C) and debt rule (Panel D).

The first, third and fourth panels (Panels A, C & D) in Figure 3 show that on average the adoption of respectively expenditure, balanced and debt rules have a positive effect on tax revenue forgone across the board. The effects are statistically significant for all types of rules. Instead, in the second panel (Panel B) show that the effect of the adoption of a revenue rule does not statistically significantly increase tax revenue forgone. The results using LPDID are reported in the Figure SAIV and confirms the results presented in Figure 3. Overall, the results suggest that irrespective of the choice of target of the fiscal rule the unintended effect in terms of tax revenue forgone is occurring—except for revenue rules where the effect while positive is not statistically significant.

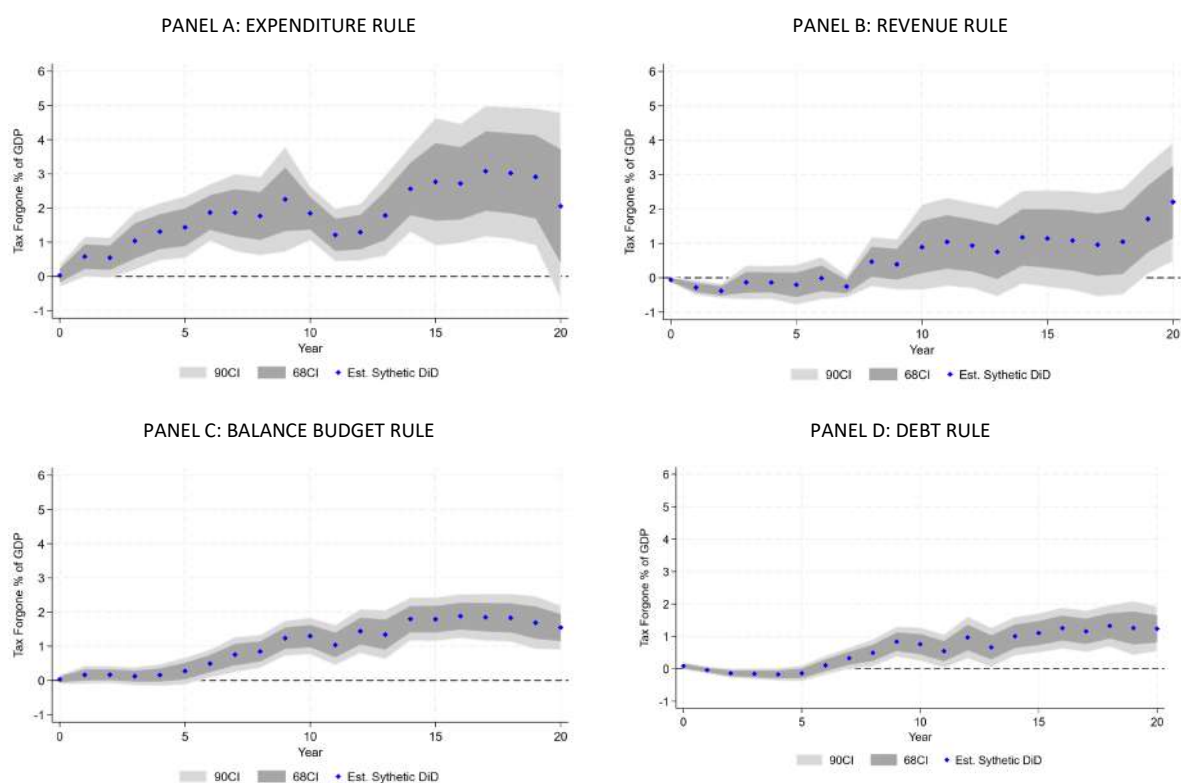


FIGURE 3. TAX FORGONE FOLLOWING A SHOCK TO FISCAL-RULE ADOPTION: HETEROGENEITY BY RULE TYPES

Notes: Estimations are based on synthetic Difference-in-Difference (Synthetic DID) with 68% (darker gray) and 90% confidence intervals shown. Refer to Arkhangelsky et al. (2021) for theoretical derivations. Across the sample, 123 countries have implemented at least one fiscal rule. Specifically, 70 countries have ever adopted an expenditure rule, 24 have introduced a revenue rule, 110 have applied a budget balance rule, and 102 have implemented a debt rule. Table SAI presents the full set of countries that have ever adopted each type of fiscal rule. Table SAII reports the overall effects for comparison.

C. Direct and Indirect Tax Forgone

Figures 4 show the impulse responses for different categories of tax revenue forgone namely direct and indirect following the adoption of fiscal rules. Direct tax forgone covers tax on income and tax on property, while indirect tax forgone includes goods and services taxes. Figure 4 displays the responses following the adoption of a fiscal rule for respectively direct (Panel A), and indirect (Panel B) revenue forgone.

The first and second panels (Panels A & B) in Figure 4 show that the adoption of fiscal rules have a positive effect on both direct and indirect tax revenue forgone across the board. The effects are statistically significant for all types of revenue forgone. Results using LPDID estimators are reported in Figure SAV and confirm the results presented in Figure 4. Overall, the results suggest the unintended consequences of fiscal rule is not just happening in the form of direct taxes such as corporate income tax but also in terms of indirect taxes including value added tax exemption.

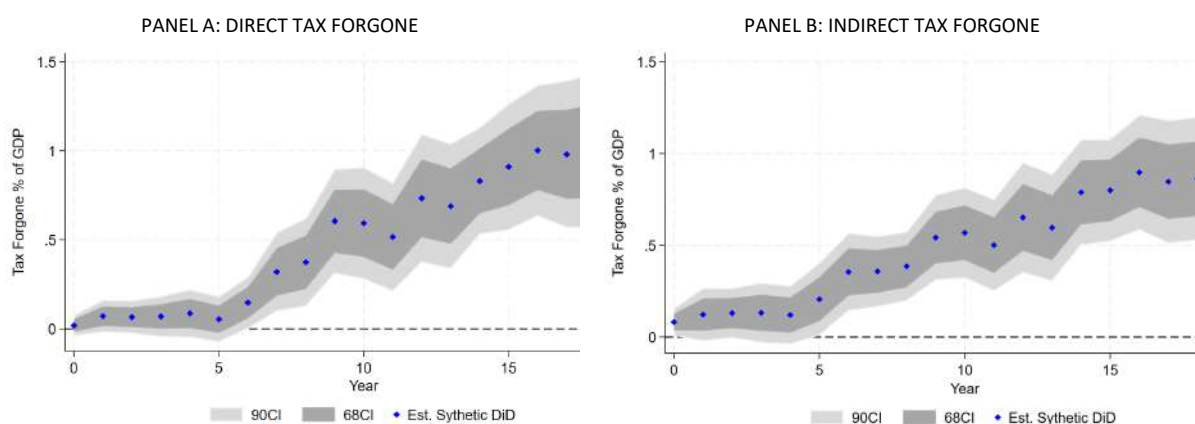


FIGURE 4. TAX FORGONE FOLLOWING THE ADOPTION OF FISCAL RULES: DIRECT AND INDIRECT TAX FORGONE

Notes: 95% CIs and p-values are based on large-sample approximations. Direct tax forgone covers Tax on Income and Tax on Property, while indirect tax forgone includes Goods and Services taxes and items marked Multiple. The LPDID results are reported in the Figure SAV. The corresponding aggregated SDID results are presented in Table SAIII.

D. Heterogeneity by Control of Corruption

Figure 5 presents the impulse responses of respectively tax revenue forgone and conventional expenditure following the adoption of fiscal rules for low and high control of corruption.¹¹ Each top panel (Panel A1 and A2) presents results using tax revenue forgone as outcomes while bottom panels (Panel B1 and B2) present results using conventional expenditures as outcomes. The top panels, Panel A.1 and Panel A.2 of Figure 5, show that the adoption of fiscal rules has a positive effect on tax revenue forgone only in countries where the control of corruption is strong (Panel A1)—not in countries with low control of corruption (Panel A2). That seems paradoxical but as our theory predicts the innovation channel triggered by the introduction of fiscal rule is only operative when the fiscal rule is binding. That is precisely what the control of corruption measure captures. These results thus confirm our main theoretical prediction.

We now turn to verifying that binding fiscal rules do actually reign in conventional expenditure. The bottom panels show that when the control of corruption is strong (Panel B1) conventional expenditure response to the adoption of a fiscal rule is not statistically different from zero. Instead, when the control of corruption is weak (Panel B2) conventional expenditure response to the adoption of a fiscal rule is increasing persistently and statistically significant. These results confirm that our choice of the control of corruption to proxy the binding nature of fiscal rule is appropriate. All in all, the results confirm the robust nature of the innovation channel following the adoption of rule but only in countries where the rule is binding.

¹¹ We rely on general government expenditure measured as a percentage of GDP from the Global Macro Database.

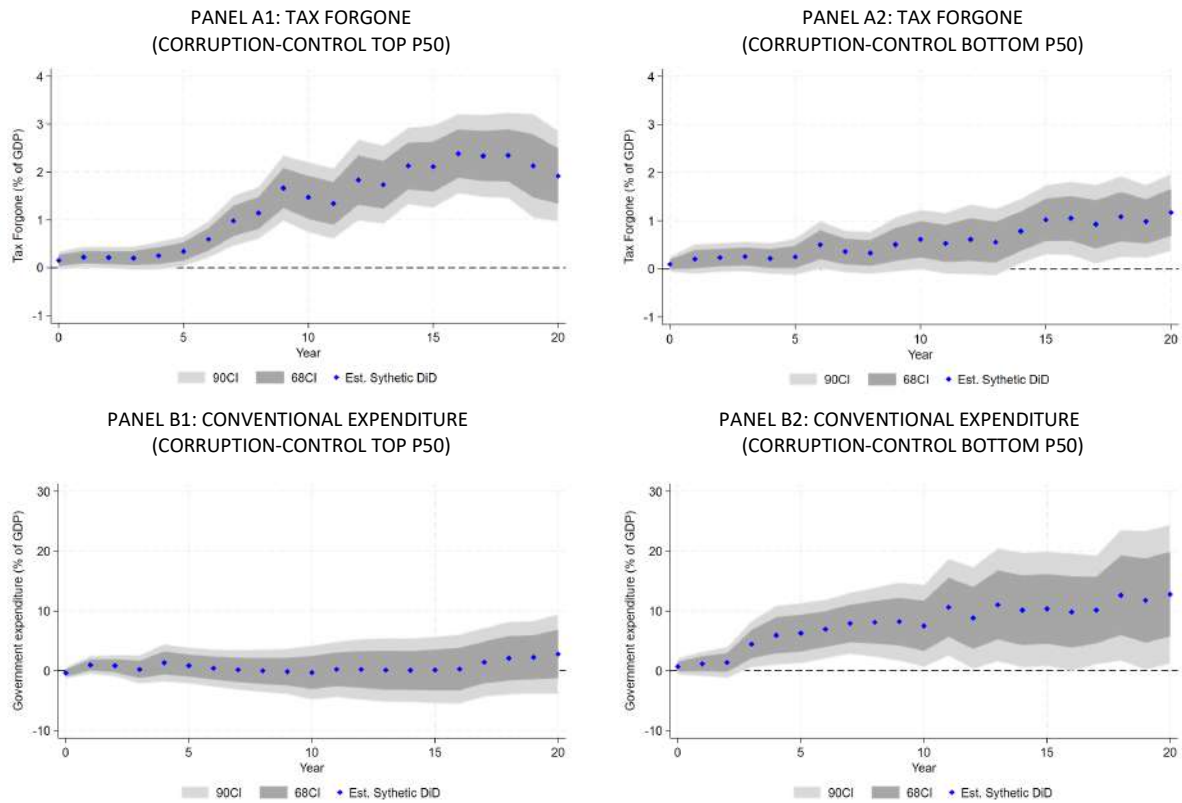


FIGURE 1. HETEROGENEOUS EFFECTS OF FISCAL RULES DEPENDING ON CONTROL OF CORRUPTION

Notes: Top 50 (Bottom 50) percentile corresponds to observations above (below) the sample median of control of corruption. Higher values of the control-of-corruption index proxy for binding fiscal rule. Panel A uses tax forgone as the outcome variable, consistent with the baseline results, whereas Panel B replaces the outcome with a measure of conventional expenditure, proxied by general government expenditure as a percentage of GDP. We compare countries that adopt fiscal rules under high (resp. low) control of corruption with a pooled control group of all never-treated countries, and exclude countries that adopt fiscal rules under the opposite institutional regime to avoid heterogeneous treatment exposure. It should be noted that to obtain a balanced dataset, we implemented a two-step imputation strategy. First, within each country, missing values were linearly interpolated over time between observed data points; any interpolated values that produced economically implausible outcomes (e.g., negative expenditure) were set back to missing. Second, remaining gaps—typically those occurring entirely outside the observed range—were filled using the country-specific mean of the interpolated series. This approach preserves within-country temporal patterns where information exists while providing a conservative and stable fill-in for extended missing segments.

Figure SAVI replicates the analysis in Figure 5 using alternative cutoff thresholds (i.e., the 25th and 10th percentiles), while Figure SAVII replicates the analysis using a detrended outcome variable.

E. Robustness Checks

As part of our robustness check exercise, we address two potential concerns regarding the data on tax expenditures and empirical identification.

First, the evolution of tax expenditures may reflect a common trend independently of the adoption of fiscal rules. Indeed, country-specific linear trends may confound the dynamic response estimated by SDID. To address this concern, we remove a common linear trend by estimating a pooled specification of the form $y_{it} = \delta t + u_{it}$. We also allow for country-specific

linear trends by estimating, for each country i , the regression $y_{it} = \alpha_i + \delta_i t + u_{it}$. The resulting residuals \hat{u}_{it} are then used as the detrended measure of tax revenue forgone. The resulting SDID impulse responses—reported in Figure AII—show that our main conclusions remain unchanged.

Second, the introduction of fiscal rules may coincide with a change in pattern of disclosure including in tax expenditures. Indeed, missing-data patterns may raise concerns that the increasing availability of provision-level tax-forgone information and the rising prevalence of fiscal rules over time could generate spurious correlations. To mitigate this, we implement a trimming procedure in which the first and last 10% of country–year observations are excluded from the estimation sample. We also restrict the sample to the first twelve years of available data for each country. We then re-estimate all specifications, including both SDID and local-projection DID. We re-estimate all specifications—covering both the SDID and local-projection DID frameworks—after trimming the first and last 10 percent of country–year observations. The results, reported in Figure AIII, confirm that our main findings are robust to this sample restriction procedure. Finally, Figure AIV shows that fiscal rules do not predict statistically significantly effect on this assessment margin.

V. Conclusion

This paper documented the unintended consequences of fiscal rules in the form of tax expenditures using both theory and data. We first developed a theoretical model inspired by Halac and Yared (2014) in which we introduce tax expenditure as a instrument to circumvent fiscal rules. We then take the model’s central prediction to the data and document that, in countries where fiscal rules are effectively binding, their adoption is associated not with a contraction but with a statistically significant expansion of tax expenditures. This pattern is consistent with a robust fiscal “innovation channel”—analogous to the effects of regulatory capital requirements in banking—through which binding constraints reallocate policy effort toward novel, less salient instruments of budgetary intervention.

The paper has important implications for both policy and future research. Tax expenditures have long been overlooked despite their growing economic significance. Promoting full transparency of tax expenditure is a necessary step to fiscal discipline. Further research could aim at exploring the heterogeneity of the unintended consequences from the adoption of a fiscal rule at the Minister level. To do so, the assumption of a common-multiplier restriction in our

model should be lifted. If enforcement is fragmented, discretionary, or shaped by bargaining, then equilibria with heterogeneous shadow values may be empirically relevant and the variational refinement may be overly restrictive.

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Appendix

TABLE AI. DESCRIPTIVE STATISTICS, VARIABLES, AND UNITS

Variable	Source(s)	Units	Mean	SD	Min	Max
Tax Revenue Forgone		% of GDP	0.78	2.14	0.00	34.16
Direct Tax Forgone	The author's calculations are based on the Global Tax Expenditures Database (GTED)	% of GDP	0.40	1.39	0.00	19.02
Indirect Tax Forgone		% of GDP	0.37	1.15	-0.61	32.10
Other Tax Forgone		% of GDP	0.00	0.06	0.00	3.96
General Government Expenditure	Global Marco Dataset	% of GDP	31.48	19.03	2.15	594.77
Rules in Place	IMF Fiscal Rules Dataset	Dummy	0.33	0.47	0.00	1.00
Expenditure rule (ER)	IMF Fiscal Rules Dataset	Dummy	0.22	0.41	0.00	1.00
Revenue rule (RR)	IMF Fiscal Rules Dataset	Dummy	0.10	0.29	0.00	1.00
Budget balance rule (BBR)	IMF Fiscal Rules Dataset	Dummy	0.50	0.50	0.00	1.00
Debt rule (DR)	IMF Fiscal Rules Dataset	Dummy	0.45	0.50	0.00	1.00
Control of corruption	World Governance Indicators (WGI)	z-score	-0.03	1.00	-1.97	2.46

Source: Author calculations.

TABLE AII. YEARS OF REPORTED TAX-ASSESSMENT AVAILABILITY

Country Name	Number of Years Reported	Country Name	Number of Years Reported	Country Name	Number of Years Reported
Albania	8	Georgia	6	Netherlands	28
Argentina	25	Ghana	9	Norway	15
Armenia	11	Guinea	4	New Zealand	15
Australia	38	Greece	12	Pakistan	21
Austria	22	Guatemala	19	Panama	11
Burundi	15	Honduras	7	Peru	22
Belgium	22	Hungary	13	Philippines	12
Benin	15	Indonesia	10	Papua New Guinea	20
Burkina Faso	9	India	20	Poland	10
Bangladesh	2	Ireland	20	Puerto Rico	9
Bulgaria	17	Iceland	26	Portugal	14
Bolivia	12	Israel	26	Paraguay	12
Brazil	19	Italy	15	Romania	11
Bhutan	17	Jamaica	16	Russia (Russian Federation)	12
Canada	36	Jordan	9	Rwanda	6
Switzerland	5	Japan	1	Senegal	14
Chile	24	Kazakhstan	7	Sierra Leone	7
Côte d'Ivoire (Ivory Coast)	17	Kenya	7	El Salvador	5
Cameroon	9	South Korea (Republic of Korea)	11	Slovakia	16
Democratic Republic of the Congo	14	Liberia	4	Slovenia	7
Colombia	19	Sri Lanka	5	Sweden	32
Cabo Verde (Cape Verde)	20	Lesotho	8	Eswatini (Swaziland)	10
Costa Rica	13	Lithuania	11	Chad	3
Cyprus	6	Luxembourg	11	Togo	5
Czechia (Czech Republic)	12	Latvia	11	Tonga	13
Germany	35	Morocco	22	Tunisia	4
Denmark	8	Moldova	5	Türkiye (Turkey)	17
Dominican Republic	18	Madagascar	9	Taiwan	24
Algeria	10	Maldives	5	Tanzania	24
Ecuador	17	Mexico	24	Uganda	7
Egypt	1	North Macedonia	6	Ukraine	19
Spain	28	Mali	10	Uruguay	19
Estonia	17	Mongolia	13	United States	32
Ethiopia	5	Mauritania	9	South Africa	17
Finland	32	Mauritius	19	Zambia	2
France	27	Niger	7	Somalia	5
Gabon	7	Nigeria	7	Tajikistan	1
United Kingdom	28	Nicaragua	14		

Notes: Authors' compilation based on the Global Tax Expenditures Database (GTED), available at: <https://gted.taxexpenditures.org/>

Source: Author calculations.

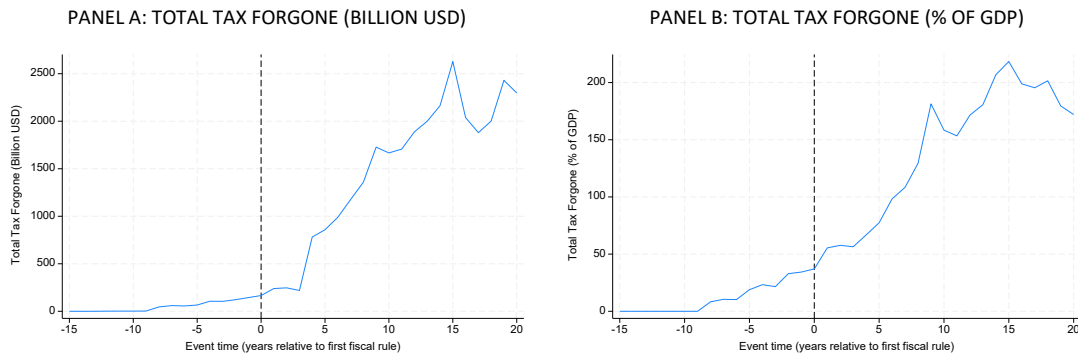


FIGURE AI. EVENT-STUDY PATTERNS OF TAX FORGONE AROUND THE INTRODUCTION OF FISCAL RULES

Notes: Both panels present an event-study depiction of the evolution of tax forgone in the 15 years before and 20 years after the first adoption of a fiscal rule. Panel B excludes Zambia, Burundi, Jamaica, Mexico, Morocco, Serbia and Montenegro, Tonga, Tanzania, and Uruguay due to missing or inconsistent GDP data, which prevents constructing a reliable tax-forgone-to-GDP series.

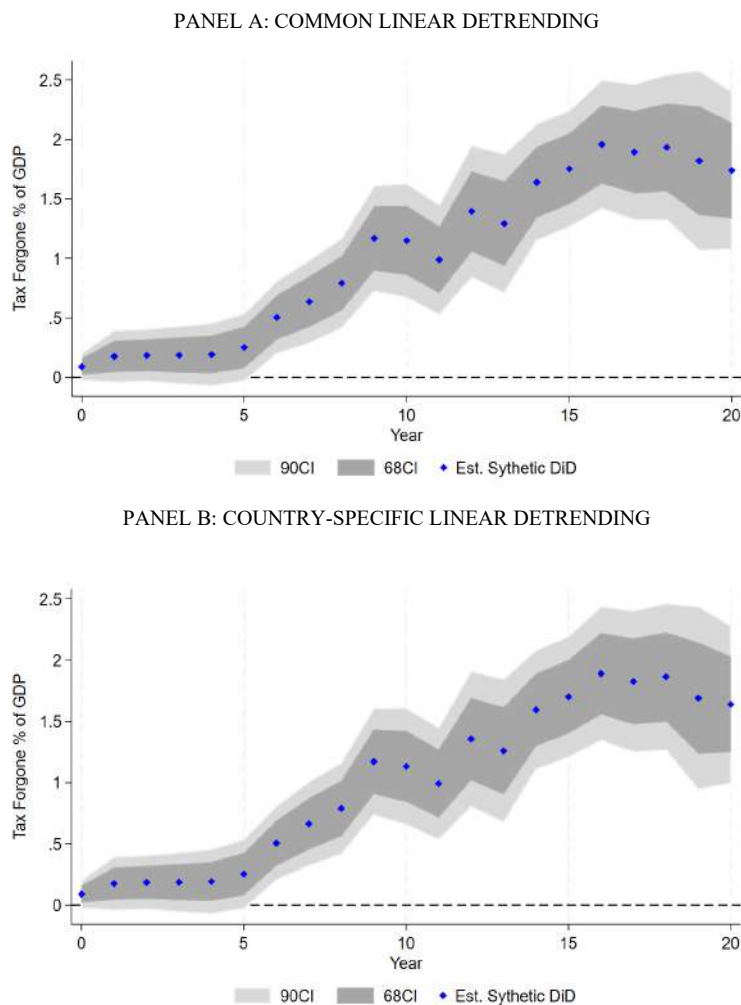


FIGURE AII. IRFS OF DETRENDED TAX FORGONE FOLLOWING A SHOCK TO THE ADOPTION OF FISCAL RULES: SDID

Notes: Estimations are based on synthetic DID, with 68% and 90% confidence intervals shown. Refer to Arkhangelsky et al. (2021) for theoretical derivations. To remove country-specific linear trends prior to implementing SDID, we detrend the outcome variable as follows. In Panel A, we estimate a common linear trend of the form $y_{it} = \delta_i t + u_{it}$. In Panel B, we allow for country-specific trends by estimating, for each country i , the regression $y_{it} = \alpha_i + \delta_i t + u_{it}$. The resulting residuals \hat{u}_{it} are then used as the detrended measure of tax forgone.

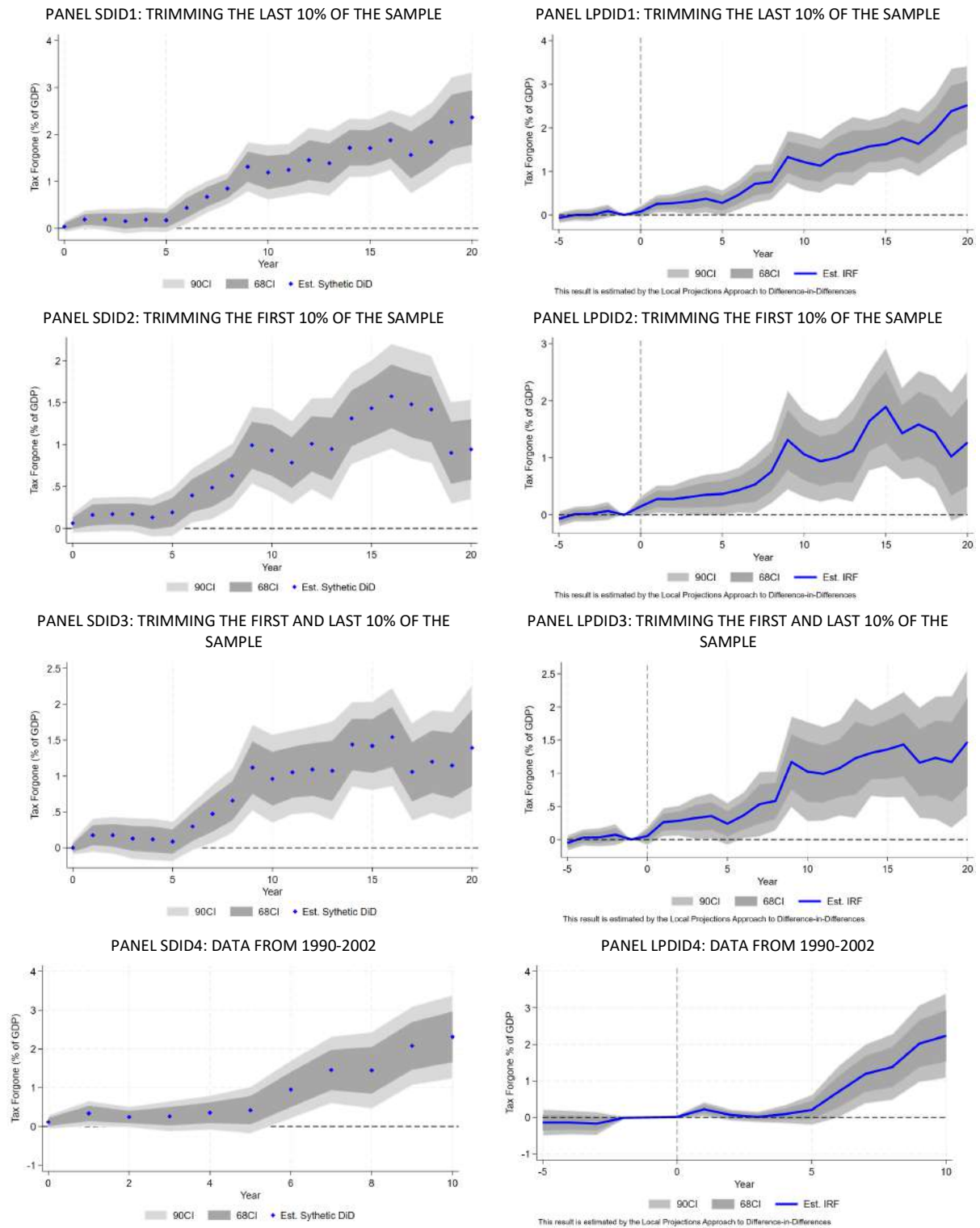
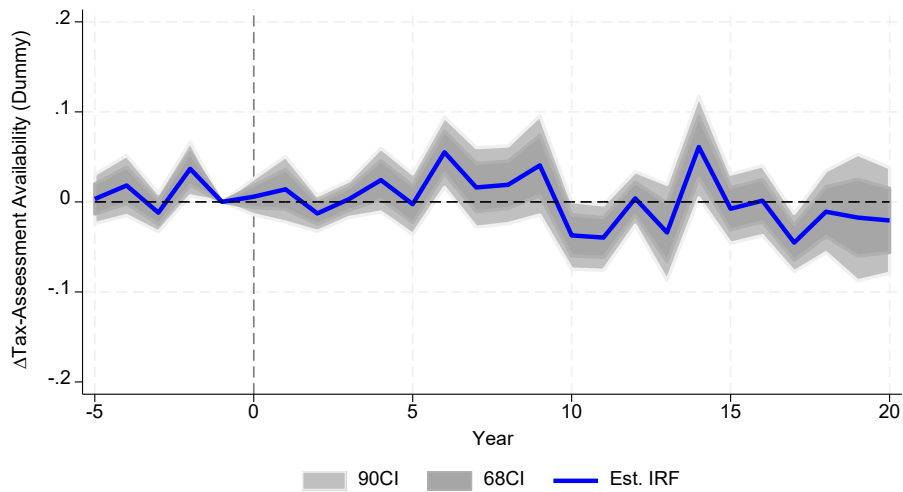


FIGURE AIII. ROBUSTNESS CHECK: TRIMMING THE FIRST AND LAST 10% OF THE SAMPLE

Notes: Left panel: estimates using the SDID estimator; right panel: estimates using the LP-DID estimator. Panel SDID2 — Trimming the First 10% of the Sample; to ensure proper implementation of the SDID estimator, 13 countries lacking a valid never-treated comparison group were excluded from the sample: BEL, DNK, ESP, EST, FRA, GBR, GRC, IRL, ISR, ITA, NLD, NZL, and PRT. In the SDID4 and LPDID4 panels, we aim to test the effect of fiscal rules on tax forgone using the earliest 10% of available years. However, because the data do not provide sufficient temporal coverage to meet the minimum requirement of 12 years, this specification cannot be estimated directly. Instead, we restrict the sample to the period 1990–2002 (which accounts for roughly 35% of all observations), and the results remain robust.



This result is estimated by the Local Projections Approach to Difference-in-Differences

FIGURE AIV. FISCAL RULE IN PLACE ON TAX-ASSESSMENT AVAILABILITY

Notes: Tax-assessment availability is a binary indicator equal to 1 if the tax-assessment data are available (non-missing) and 0 if the information is missing. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Supplementary Appendix (Online): An Unintended Consequence of Fiscal Rules

SUPPLEMENTARY APPENDIX I EQUILIBRIUM CHARACTERIZATION AND PROOFS

The following Lemmas are necessary to establish the main results presented in Section II of this paper.

Proof of Proposition 1

Define $\phi(x)$ such that:

$$(6) \quad \phi(x) \equiv \omega v'(x) - c'(x).$$

Under the curvature assumptions, ϕ is strictly decreasing. At $t = 1$, $s_2 = (1 - \lambda)s_1 + x_1$ and $g_2 = \bar{\tau} - \psi s_2 - b_2 g_2$. Holding (b_2, s_1) fixed, the date-1 government's FOC for an interior x_1 is:

$$(7) \quad \phi(x_1) = \beta \delta \psi u'(g_2).$$

When $\beta = 1$, the corresponding condition is $\phi(x_1) = \delta \psi u'(g_2)$. Because $u'(g_2) > 0$, the right-hand side of (6) is strictly smaller than that of (7) when $\beta < 1$. Since $\phi(\cdot)$ is strictly decreasing, a lower value on the right-hand side requires a strictly larger x_1 to satisfy the equality. Hence $x_1^D(\beta) > x_1^D(1)$. ■

Proof of Proposition 2

(i) Define

$$F(x_1, \bar{b}_2) \equiv \phi(x_1) - \beta \delta \psi u'(g_2) = \frac{\partial V_1}{\partial x_1},$$

Where $g_2 = \bar{\tau} - \psi((1 - \lambda)s_1 + x_1) - \bar{b}_2$. Since $\partial g_2 / \partial \bar{b}_2 = -1$ and $\partial g_2 / \partial x_1 = -\psi$, the Second Order Condition is respected:

$$\frac{\partial F(x_1, \bar{b}_2)}{\partial x_1} = \phi'(x_1) - \beta \delta \psi u''(g_2) \frac{\partial g_2}{\partial x_1} = \phi'(x_1) - \beta \delta \psi^2 u''(g_2) < 0.$$

Given that $\phi'(\cdot) < 0$ and $u''(\cdot) < 0$, we obtain:

$$\frac{\partial F(x_1, \bar{b}_2)}{\partial \bar{b}_2} = -\beta \delta \psi u''(g_2) \frac{\partial g_2}{\partial \bar{b}_2} = \beta \delta \psi u''(g_2) < 0$$

By the implicit function theorem, we deduce:

$$\frac{\partial x_1}{\partial \bar{b}_2} = -\frac{\partial^2 F(x_1, \bar{b}_2)}{\partial x_1 \partial \bar{b}_2} / \frac{\partial^2 F(x_1, \bar{b}_2)}{\partial x_1^2} < 0$$

(ii) With $b_2 = (1 + r)(\bar{d}_1 + b_1)$, apply (i) by substitution.

(iii) Under a binding spending rule $g_1 = \bar{g}_1$, the budget constraint implies $b_2 = \bar{b}_2^g(\tau_1)$, which is increasing in \bar{g}_1 . Combine (i) with the chain rule.

(iv) The revenue rule (11) is equivalent to $s_2 \leq \bar{s}_2$, hence to an upper bound on x_1 : $x_1 \leq \bar{s}_2 - (1 - \lambda)s_1$. The rule $\tau_2 \geq \underline{\tau}_2$ is equivalent to $\bar{\tau} - \psi s_2 \geq \underline{\tau}_2$ i.e. $s_2 \leq \frac{\bar{\tau} - \underline{\tau}_2}{\psi} = \bar{s}_2$. Since $s_2 = (1 - \lambda)s_1 + x_1$, this yields $x_1 \leq \bar{s}_2 - (1 - \lambda)s_1$. Increasing lowers and tightens the feasible set for; hence equilibrium weakly decrease, and decreases strictly if the constraint binds.

SUPPLEMENTARY APPENDIX TABLES

TABLE SAI. DETAILS ON THE COUNTRIES THAT HAVE ADOPTED EACH TYPE OF FISCAL RULE

Country name	Expenditure rule: ever = 1	Revenue rule: ever = 1	Budget balance rule: Ever = 1	Debt rule: Ever = 1	Any Fiscal Rules: Ever = 1
Andorra	1	1	1	1	1
Angola	0	0	1	1	1
Antigua and Barbuda	1	1	1	1	1
Argentina	1	0	1	0	1
Armenia	1	0	1	1	1
Aruba	0	0	1	1	1
Australia	1	1	1	1	1
Austria	1	0	1	1	1
Azerbaijan	1	0	1	1	1
Bahamas, The	1	1	1	1	1
Barbados	0	0	0	1	1
Belgium	1	1	1	1	1
Benin	0	1	1	1	1
Botswana	1	0	1	1	1
Brazil	1	0	1	0	1
Bulgaria	1	0	1	1	1
Burkina Faso	0	1	1	1	1
Burundi	0	0	1	1	1
Cabo Verde	0	0	1	1	1
Cambodia	0	0	1	1	1
Cameroon	0	0	1	1	1
Canada	1	0	1	1	1
Central African Republic	0	0	1	1	1
Chad	0	0	1	1	1
Chile	0	0	1	1	1
Colombia	1	0	1	1	1
Congo, Democratic Republic of	0	0	1	1	1
Congo, Republic of	0	0	1	1	1
Costa Rica	1	0	1	0	1
Croatia	1	0	1	1	1
Cyprus	1	0	1	1	1
Czech Republic	1	0	1	1	1
Côte d'Ivoire	0	1	1	1	1
Denmark	1	1	1	1	1
Dominica	0	0	1	1	1
Dominican Republic	1	0	0	1	1
Ecuador	1	0	1	1	1
El Salvador	1	1	1	1	1
Equatorial Guinea	0	0	1	1	1
Estonia	1	0	1	1	1
Finland	1	0	1	1	1
France	1	1	1	1	1
Gabon	0	0	1	1	1
Georgia	1	0	1	1	1
Germany	1	0	1	1	1

Greece	1	0	1	1	1
Grenada	1	0	1	1	1
Guinea Bissau	0	1	1	1	1
Honduras	1	0	1	0	1
Hong Kong SAR	0	0	1	0	1
Hungary	1	0	1	1	1
Iceland	1	0	1	1	1
India	0	0	1	1	1
Indonesia	0	0	1	1	1
Iran	0	1	0	1	1
Ireland	1	0	1	1	1
Israel	1	0	1	0	1
Italy	1	0	1	1	1
Jamaica	0	0	1	1	1
Japan	1	0	1	0	1
Kazakhstan	1	0	1	1	1
Kenya	0	1	1	1	1
Kiribati	1	0	0	0	1
Kosovo	1	0	1	1	1
Latvia	1	0	1	1	1
Liberia	0	0	0	1	1
Lithuania	1	0	1	1	1
Luxembourg	1	0	1	1	1
Malaysia	1	0	1	1	1
Maldives	0	0	1	1	1
Mali	0	1	1	1	1
Malta	1	0	1	1	1
Marshall Islands	0	0	1	0	1
Mauritius	0	0	0	1	1
Mexico	1	0	1	0	1
Mongolia	1	0	1	1	1
Montenegro, Rep. of	0	0	1	1	1
Morocco	0	0	1	0	1
Namibia	1	0	0	1	1
Nauru	1	1	1	0	1
Netherlands	1	1	1	1	1
New Zealand	0	0	1	0	1
Niger	0	1	1	1	1
Norway	0	0	1	0	1
Pakistan	0	0	1	1	1
Panama	0	0	1	1	1
Papua New Guinea	0	0	0	1	1
Paraguay	1	0	1	0	1
Peru	1	0	1	1	1
Poland	1	0	1	1	1
Portugal	1	0	1	1	1
Romania	1	0	1	1	1
Russia	1	0	1	0	1
Rwanda	0	0	1	1	1
Senegal	0	1	1	1	1
Serbia	1	0	1	1	1
Singapore	1	0	1	0	1
Slovak Republic	1	0	1	1	1
Slovenia	1	0	1	1	1
Solomon Islands	0	0	1	1	1
Somalia	0	0	1	1	1
South Sudan	0	0	1	1	1
Spain	1	0	1	1	1
Sri Lanka	1	0	1	1	1
St. Kitts and Nevis	0	0	1	1	1
St. Lucia	0	0	1	1	1
St. Vincent and the Grenadines	1	0	1	1	1
Suriname	0	0	0	1	1
Sweden	1	0	1	1	1
Switzerland	0	0	1	0	1
Tanzania	1	0	1	1	1
Thailand	1	0	0	1	1
Timor-Leste	0	1	0	1	1
Togo	0	1	1	1	1
Tonga	1	1	0	1	1
Turkmenistan	0	0	1	0	1
Uganda	1	1	1	1	1
United Kingdom	1	0	1	1	1
United States	1	0	1	0	1
Uruguay	1	0	1	0	1

Vanuatu	0	0	1	1	1
Vietnam	0	1	1	1	1
Zambia	0	0	0	1	1
Total number of countries that have introduced fiscal rules	70	24	110	102	123

Source: Author calculations.

TABLE SAII. HETEROGENEOUS EFFECTS OF FISCAL RULES ON TAX FORGONE (% OF GDP): SYNTHETIC DID

Dependent Variable Columns	Tax forgone (% of GDP)				
	(1)	(2)	(3)	(4)	(5)
Fiscal rule in place	1.079*** (0.217)				
Type of fiscal rule in place: Expenditure rule		1.588*** (0.425)			
Type of fiscal rule in place: Revenue rule			0.824 (0.643)		
Type of fiscal rule in place: Budget balance rule				1.129*** (0.239)	
Type of fiscal rule in place: Debt rule					0.689*** (0.250)
Observations	7175	7140	7490	7000	7385

Notes: 95% CIs and p-values are based on large-sample approximations. Refer to Arkhangelsky et al. (2021) for theoretical derivations. The synthetic DID command in Stata requires that the control group consist of countries with no recorded fiscal rules. Therefore, we supplemented the dataset with additional countries to serve as the control group (217 countries worldwide). Accordingly, countries without any record of fiscal rules were assigned a value of 0. Because SDID also imposes strict requirements for implementation (i.e., no reversion from 1 back to 0 and no units already treated in the initial year 1990), we excluded noncompliant countries from the sample, representing less than 5% of total observations. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Author calculations.

TABLE SAIII. IRFS OF TAX FORGONE FOLLOWING A SHOCK TO THE ADOPTION OF FISCAL RULES: DIRECT VERSUS INDIRECT TAX FORGONE

Dependent variable(s) Columns	Direct Tax forgone	Indirect Tax forgone
	(1)	(2)
Fiscal rule in place	0.577*** (0.170)	0.510*** (0.097)
Observations	7175	7175

Notes: Direct tax forgone covers Tax on Income and Tax on Property, while indirect tax forgone includes Goods and Services taxes and items marked Multiple. Standard significance levels are denoted as follows: * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Author calculations.

SUPPLEMENTARY APPENDIX FIGURES

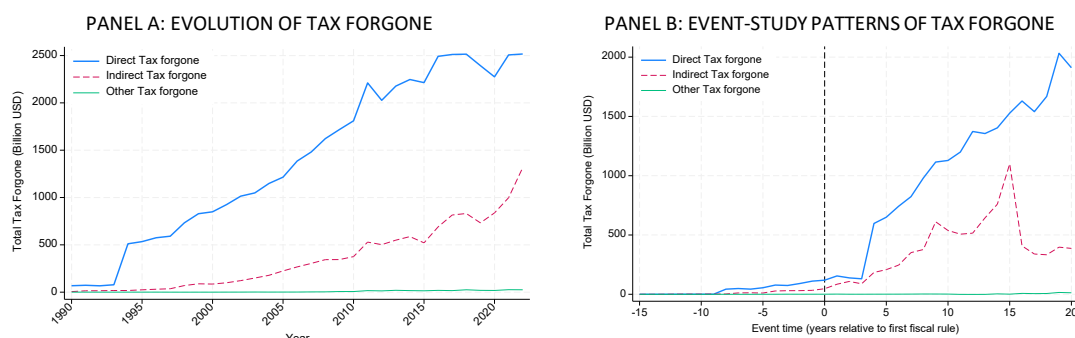
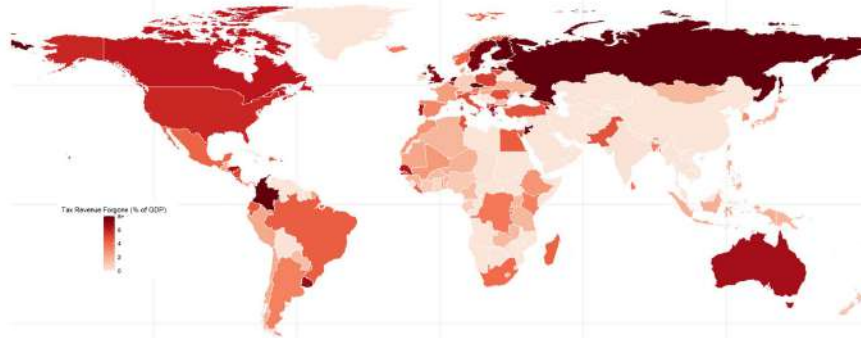


FIGURE SA1. EVOLUTION OF DIRECT, INDIRECT, AND OTHER TAX REVENUE FORGONE

PANEL A: TAX REVENUE FORGONE (% OF GDP)



PANEL B: FIRST YEAR WITH TAX REVENUE FORGONE

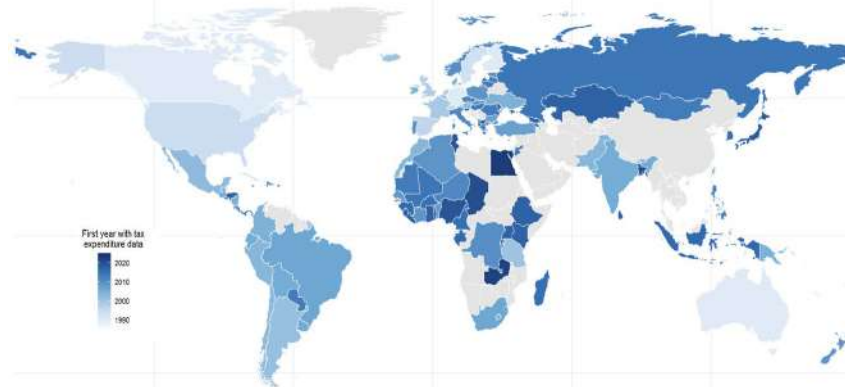


FIGURE SAII. TAX REVENUE FORGONE

Notes: Panel A uses the latest available data. Countries that do not report any tax-forgone provisions in the GTED dataset are assigned a value of zero. Panel B shows the first year in which tax forgone is recorded.

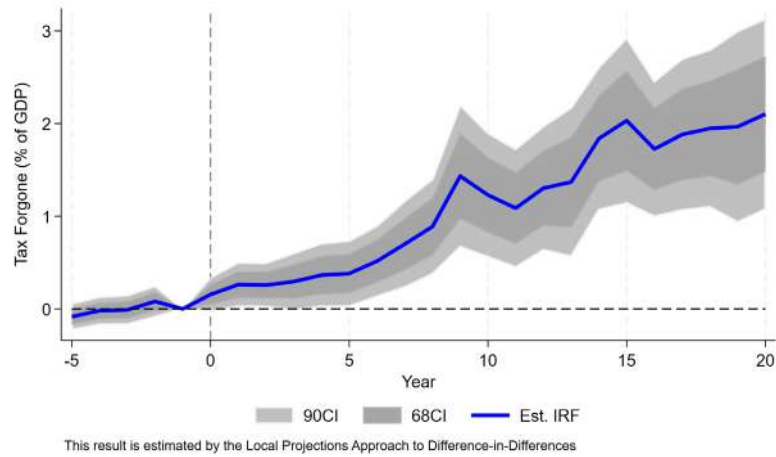


FIGURE SAIII. IRFS OF TAX FORGONE FOLLOWING A SHOCK TO THE ADOPTION OF FISCAL RULES
Notes: Estimations are based on LPDID, with 68% and 90% confidence intervals shown.

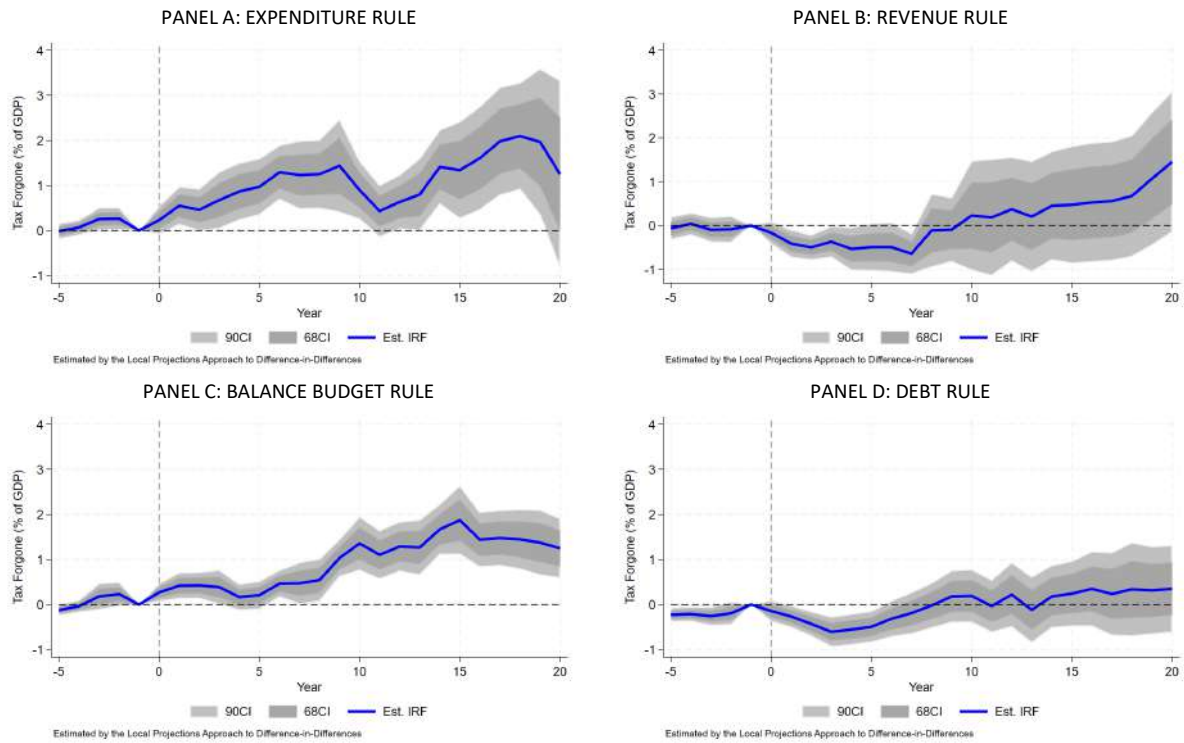


FIGURE SAIV. HETEROGENEITY BY RULE TYPE: LPDID
 Notes: Estimations are based on LPDID, with 68% and 90% confidence intervals shown.

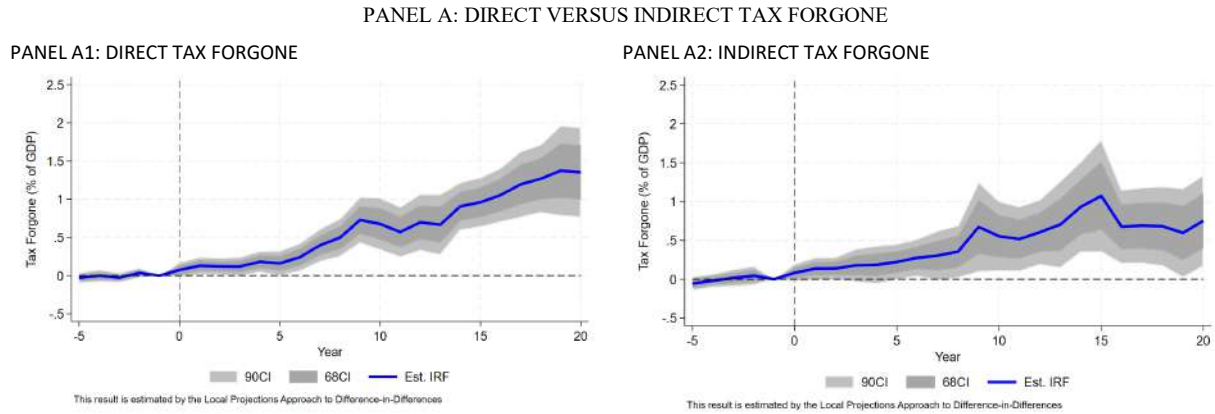


FIGURE SAV. DIRECT AND INDIRECT TAX FORGONE: LPDID
 Notes: Estimations are based on LPDID, with 68% and 90% confidence intervals shown.

PANEL A: TAX FORGONE
 PANEL A1: TOP 25 PERCENTILE PANEL A2: BOTTOM 25 PERCENTILE

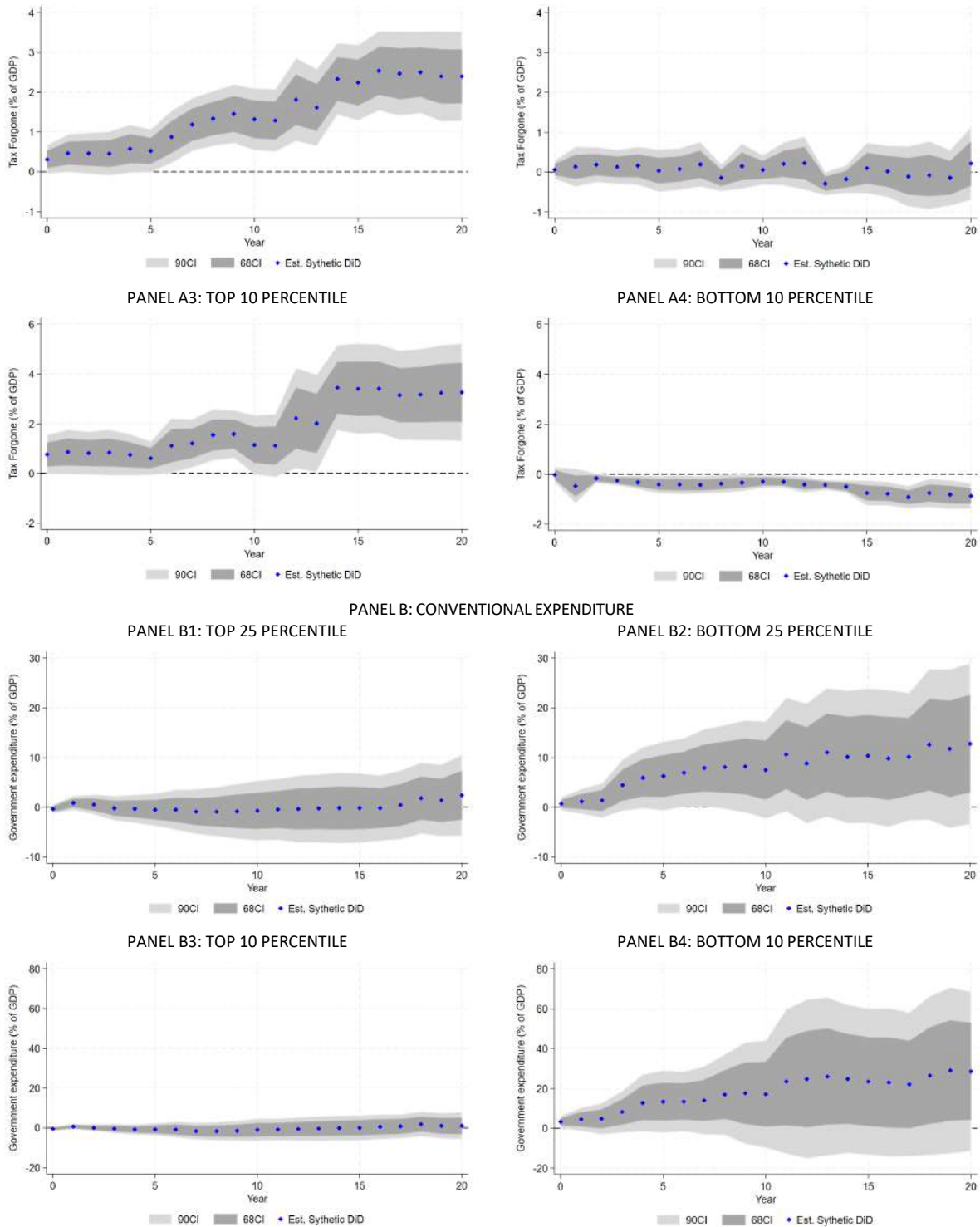
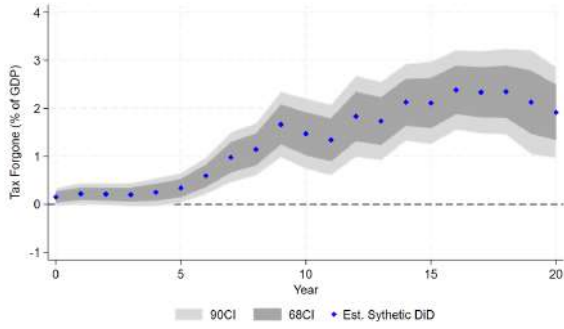


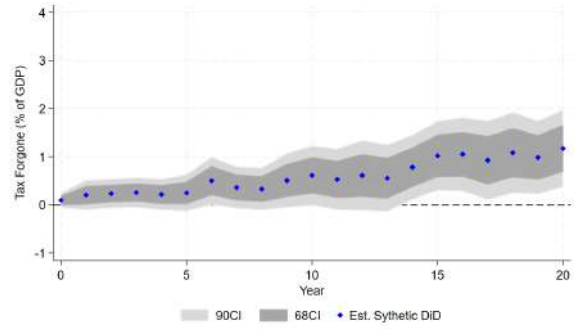
FIGURE SAVI. HETEROGENEITY OF FISCAL-RULE ADOPTION ON GOVERNMENT EXPENDITURE: CONTROL OF CORRUPTION
Notes: Top 25 (Bottom 25) percentile corresponds to observations above (below) the third and first quartile thresholds. Top 10 (Bottom 10) percentile corresponds to observations above (below) the corresponding decile cut-offs. Higher values of the control-of-corruption index indicate a less corrupt institutional environment. Panel A uses tax forgone as the outcome variable, consistent with the baseline results, whereas Panel B replaces the outcome with a measure of conventional expenditure, proxied by general government expenditure as a percentage of GDP. We compare countries that adopt fiscal rules under high (resp. low) control of corruption with a pooled control group of all never-treated countries, and exclude countries that adopt fiscal rules under the opposite institutional regime to avoid heterogeneous treatment exposure.

PANEL A: COUNTRY-SPECIFIED DETRENDED TAX FORGONE

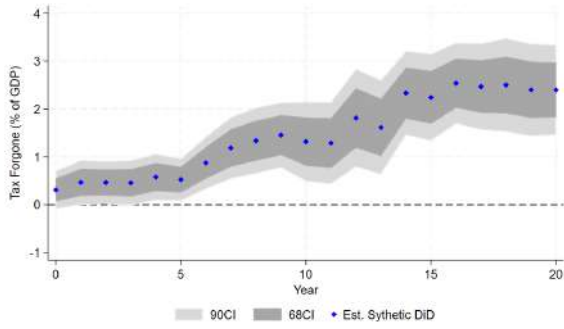
PANEL A1: TOP 50 PERCENTILE



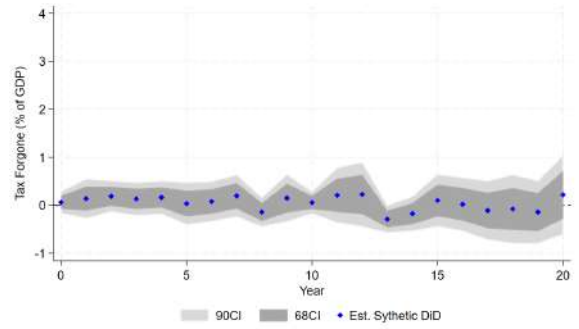
PANEL A2: BOTTOM 50 PERCENTILE



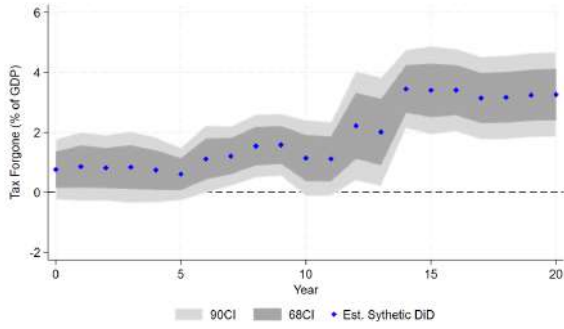
PANEL A3: TOP 25 PERCENTILE



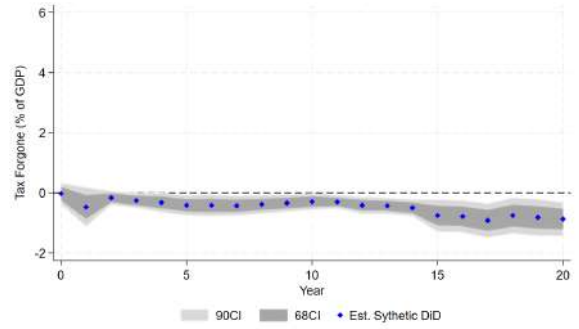
PANEL A4: BOTTOM 25 PERCENTILE



PANEL A5: TOP 10 PERCENTILE

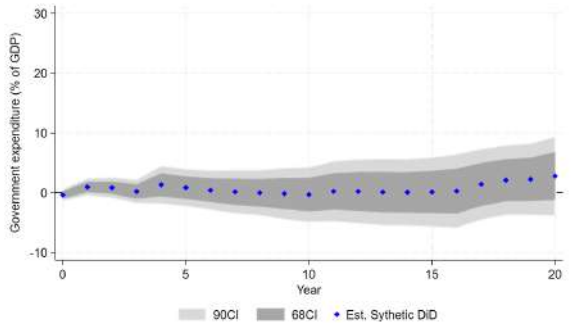


PANEL A6: BOTTOM 10 PERCENTILE

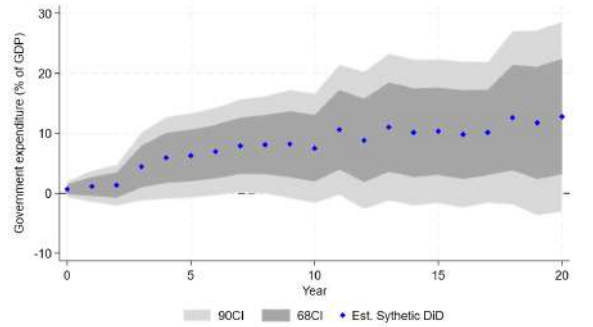


PANEL B: COUNTRY-SPECIFIED DETRENDED CONVENTIONAL EXPENDITURE

PANEL B1: TOP 50 PERCENTILE



PANEL B2: BOTTOM 50 PERCENTILE



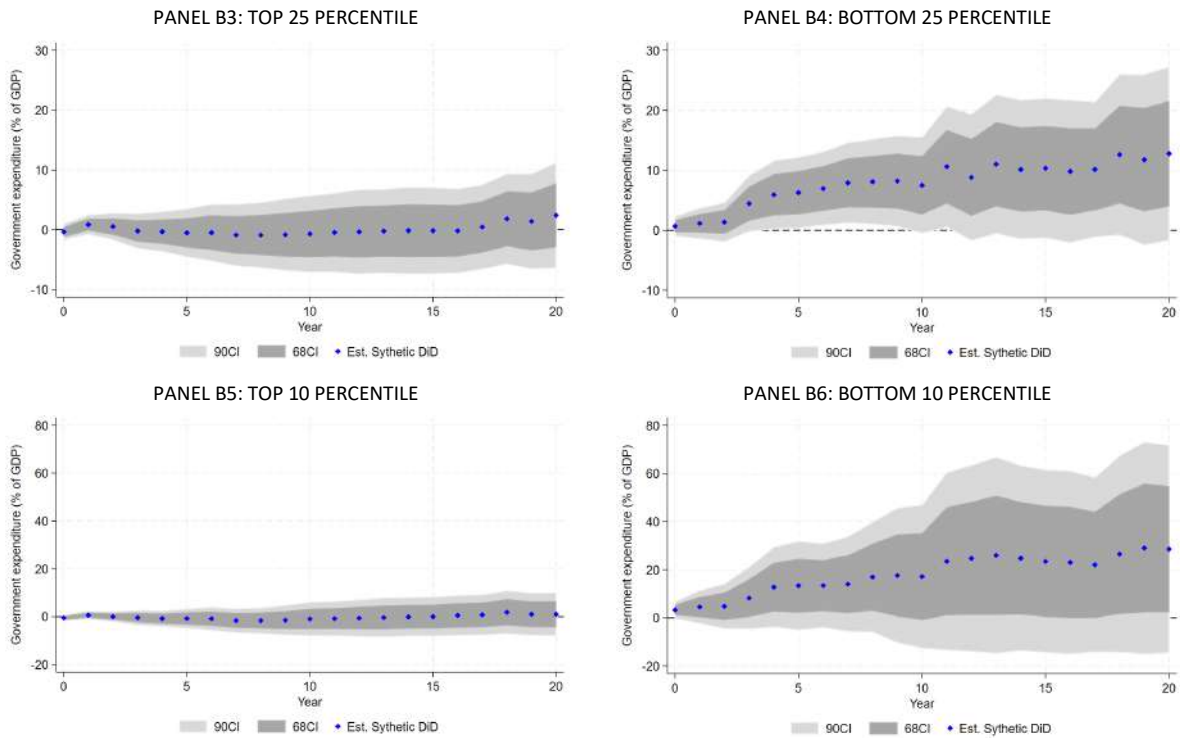


FIGURE SAVII. HETEROGENEITY OF FISCAL-RULE ADOPTION ON *DETRENDED* GOVERNMENT EXPENDITURE: CONTROL OF CORRUPTION

Notes: Top 50 (Bottom 50) percentile corresponds to observations above (below) the sample median of control of corruption. Top 25 (Bottom 25) percentile corresponds to observations above (below) the third and first quartile thresholds, respectively. Top 10 (Bottom 10) percentile corresponds to observations above (below) the corresponding decile cut-offs. Higher values of the control-of-corruption index indicate a less corrupt institutional environment. We compare countries that adopt fiscal rules under high (resp. low) control of corruption with a pooled control group of all never-treated countries, and exclude countries that adopt fiscal rules under the opposite institutional regime to avoid heterogeneous treatment exposure. Panel A uses tax forgone as the outcome variable, consistent with the baseline results, whereas Panel B replaces the outcome with a measure of conventional public expenditure, proxied by general government expenditure as a percentage of GDP. We allow for country-specific trends by estimating, for each country i , the regression $y_{it} = \alpha_i + \delta_i t + u_{it}$. The resulting residuals \hat{u}_{it} are then used as the detrended measure of tax expenditure.

“Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner ? Sera-ce sur le caprice de chaque particulier ? Quelle confusion ! Sera-ce sur la justice ? Il l'ignore.”

Pascal

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