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On the impact of fiscal policy on inflation: The case of fiscal rules

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Abstract

This paper examines the impact of fiscal rules on inflation across 79 countries from 1985 to 2021, employing entropy balancing as the methodology. By adopting this approach, the study addresses potential endogeneity concerns and takes into account variations among different country groups, including advanced economies, emerging markets, developing economies, and low-income countries. The primary outcome derived from the analysis indicates a negative relationship between fiscal rules and inflation in emerging and low-income countries. Moreover, this effect is observed for moderate and high inflation rates. These results are robust to different specifications.

Keywords : **Fiscal policy** ; **Inflation** ; **Propensity score methodology**

JEL Classification : C31, E31, E61, E62

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1 Introduction

Inflation represents a critical aspect of economic stability for every nation. Within this context, economic policies play a pivotal role in regulating and managing inflationary trends. While monetary policy is traditionally acknowledged as a crucial instrument for controlling inflation, the significance of fiscal policy in this regard has often been overlooked. Nevertheless, there exist various theories suggesting that fiscal policies can serve as effective stabilization tools. Consequently, many countries have adopted fiscal rules as a widely embraced form of fiscal policy. These fiscal rules, characterized by numerical limitations on fiscal aggregates, impose long-term constraints on fiscal policy (Lledó et al., 2017), thereby exerting downward pressure on inflationary tendencies.

Given the extensive empirical evidence establishing causal relationships between macroeconomic aggregates such as public debt, government spending, and the public deficit (Darvas et al., 2018), and the fiscal rule outcomes (e.g. Bouton et al., 2020; Vinturis, 2022), it appears reasonable to consider efforts aimed at reducing public debt or controlling public finances as potential instruments for managing inflation. The key to supporting this proposition lies in understanding the influence of fiscal policy on inflation levels. While numerous studies have examined the effects of fiscal policy on inflation (Feldstein, 1978; Eaton, 1981; Bianchi and Ilut, 2017; Coibion et al., 2021; Asandului et al., 2021), they often focus on longer-term perspectives, investigating the extent to which persistent deficit levels or fiscal shocks impact inflation (Rother, 2004). Notably, the sole study to our knowledge that simultaneously examines fiscal rules and inflation targeting as components of fiscal policy and explores their combined effect on inflation is Combes et al. (2014). By using dynamic panel-data techniques (System-GMM), the main conclusion of this study is that IT and FR jointly improve fiscal performance (higher fiscal balances all other things equal) and lower average inflation.

In this paper, I present the first comprehensive analysis of the impact of fiscal rules on inflation, differing from the conventional focus on fiscal deficits or fiscal shocks. To investigate this relationship, I employ a panel dataset spanning the period

from 1985 to 2021, encompassing 26 advanced countries, 29 emerging countries, and 24 low-income countries. To address potential endogeneity bias, I utilize matching techniques, specifically adopting entropy balancing (referred to as EB hereafter) as introduced by Hainmueller (2012). This method aims to minimize the entropy, which measures the uncertainty or imprecision within the data. By striving to achieve comparable distributions of characteristics across different groups, the algorithm facilitates an accurate comparison of propensity scores. This approach is crucial for several reasons.

First, the utilization of EB enables me to establish a causal relationship between fiscal rules and inflation outcomes while effectively isolating the effects of other factors. It is worth noting that there is currently no systematic evidence available regarding the direct impact of FRs on inflation. Nevertheless, existing literature suggests that when public debt surpasses a certain threshold, it tends to impede economic growth and elevate inflation (Barro, 1979; Kumar and Woo, 2010; Ostry et al., 2015; Blanchard, 2019). Consequently, economies should exercise prudence in managing their indebtedness to mitigate adverse economic consequences. Some economists and researchers argue that public debt can indeed lead to inflation. For instance, Fisher (1933) postulates that inflation arises from an excess supply of money, which can result from the creation of money to finance public debt. Friedman (1968) similarly develops the monetary debt theory, asserting that the creation of money to repay public debt can induce inflation. Additionally, Reinhart and Rogoff (2010) support the notion that public debt can lead to inflation, particularly if it is misused to finance non-productive expenditures (Sims, 2014; Romero et al., 2017; Afonso and Ibraimo, 2020). Under this perspective, to limit the evolution of public debt, public authorities often opt to implement fiscal rules, which can help to limit public expenditure and/or budget deficits. A growing body of evidence indicates that well-designed FRs are generally associated with the greater fiscal discipline (Alesina and Perotti, 1995; Alesina et al., 1999; Debrun, 2000; Hallerberg et al., 2009; Lledo et al., 2010; Gollwitzer, 2011; Tapsoba, 2012). Consequently, a connection between FRs and inflation begins to emerge.

Secondly, existing literature attributes global disinflation to factors such as monetary policy (e.g., more credible central banks (Morimoto et al., 2003)), globalization (Rogoff, 2003), or even luck. However, this paper suggests an alternative explanation: the implementation of fiscal rules. Considering the extensive literature emphasizing that inflation is influenced by both monetary and fiscal policy, it is plausible that global disinflation is influenced by institutional factors encompassing not only those governing monetary policy but also those associated with fiscal policy. Furthermore, within the examined sample, there is a prevailing trend toward the adoption of fiscal rules alongside the global disinflation movement. Although this correlation between FRs and inflation may be apparent, the application of EB allows me to control for confounding factors in inflation and accurately estimate the strict causal effect of adopting fiscal rules on inflation.

Thirdly, it is important to acknowledge that the decision to adopt fiscal rules may not be random. While there is no universal rule that applies to all countries, fiscal rules can assist governments in achieving their fiscal targets and enforcing fiscal discipline (Kopits, 2001; Badinger and Reuter, 2017). Indeed, countries may adopt fiscal rules with the aim of attaining fiscal discipline and ultimately reducing inflation. However, the adoption of fiscal rules could be an endogenous choice. Similar to certain monetary regimes, the endogeneity of fiscal rules implies that countries with relatively lower inflation rates are more likely to opt for such rules. Moreover, numerical fiscal rules can serve as a mechanism to prevent short-sighted governments from accumulating excessive debt. In other words, countries may introduce fiscal rules based on their specific macroeconomic conditions or policy preferences, thereby generating reverse causality (Grosse Steffen et al., 2021). Therefore, the objective of this paper is to examine the relationship between fiscal rules and inflation while giving particular attention to the issue of endogeneity.

I show that fiscal rules help reduce inflation, but the final impact depends on many factors, such as the structure of the economy or the monetary and fiscal policies implemented. More in detail, countries that have adopted fiscal rules have, on average, an inflation level that is about 1.92 percentage points (pp.) lower than

countries that have not implemented these types of rules. This result remains robust across different specifications of the entropy balancing method and alternative estimation techniques.

Secondly, I reveal that the influence of fiscal rules on inflation is more pronounced when the rules specifically constrain public debt and/or budget deficits. Furthermore, the impact is greater in developing countries compared to least-developed countries, and the effect is particularly evident in emerging and low-income countries.

Lastly, I provide empirical evidence that the decline in inflation rates induced by fiscal rules occurs in the short and medium term. Importantly, the effect of fiscal rules on inflation is more potent when the initial level of inflation is not above 15%, and it is found that the combination of central bank credibility and fiscal rules negatively affects inflation rates.

To the best of my knowledge, these findings represent the first evidence of the impact of fiscal rules on inflation. The economic significance of these effects suggests that the prioritization of monetary policy over fiscal policy in recent years is not completely justified, at least when related to inflation objectives.

The outline of this paper is organized as follows: Section 2 presents a survey of the related literature, providing a useful guide for my analysis. Section 3 briefly presents the methodology and the data. The results are shown in section 4. Section 5 presents the robustness checks. The final section provides the conclusions.

2 Literature Review

In this section, I first present the main literature on fiscal rules and public debt. I then turn to the link between public debt and inflation, specifically to the impact of public debt on inflation.

2.1 Fiscal rules and Public debt

The existing literature extensively investigates the effects of fiscal rules on public debt and a consensus has been reached that fiscal rules are effective in curbing the

accumulation of public debt in countries that adopt them (Alesina and Tabellini, 1990; Debrun et al., 2008; Halac and Yared, 2014, 2018). For instance, Alesina and Passalacqua (2016) discuss numerical rules and institutional designs that can lead to a moderation of government debt accumulation. Azzimonti et al. (2016) specifically analyzes the impact of a balanced budget rule, which requires legislators to refrain from running deficits, within a political economy model. Their main finding is that such a rule results in a gradual decrease in the level of government debt.

Furthermore, there is evidence highlighting the effectiveness of fiscal rules in mitigating the burden of public debt when implementing counter-cyclical fiscal policies. Combes et al. (2017) shed light on the positive effects of fiscal rules in alleviating constraints imposed by the debt stock when undertaking counter-cyclical fiscal policies. Similarly, Asatryan et al. (2018) examines the effects of balanced budget rules (BBR) at the constitutional level on fiscal outcomes and concludes that the introduction of this fiscal rule reduces the probability of experiencing a sovereign debt crisis. Heinemann et al. (2018) conduct a meta-regression analysis based on 30 studies published over the last decade, providing empirical evidence that points to the constraining effect of fiscal rules on fiscal aggregates.

In a recent contribution, Piguillem and Riboni (2021) demonstrate that even when fiscal rules are overridden or suspended by public authorities, they remain effective, as fiscal rules have a direct effect on reducing the temptation to accumulate debt. Additionally, a more recent paper by Vinturis (2022), utilizing estimations based on the entropy balancing method, reveals that fiscal rules significantly reduce total public spending and public consumption.

Taken together, this body of research consistently supports the notion that fiscal rules play a vital role in containing public debt and influencing fiscal outcomes, even in the face of potential challenges or temporary suspensions. The effectiveness of fiscal rules extends beyond their formal implementation, underscoring their significance in curbing debt accumulation and guiding fiscal behavior.

2.2 Public debt and Inflation

The theoretical relationship between fiscal policy and inflation has been a subject of inquiry among economists for a long time. While the monetarist view posits that inflation is solely caused by monetary aggregates, in a non-Ricardian environment with active monetary and fiscal policies, fiscal policy variables play a crucial role in determining the price level. The non-Ricardian policy framework suggests that changes in the value of government bonds impact household budgets, leading to wealth effects on private consumption demand, which, in turn, affect the price level (Woodford, 1998; Aimola and Odhiambo, 2020). Bhattarai et al. (2014) argue that in a passive monetary and active fiscal policy regime, public debt changes generate wealth effects on households, resulting in an increased response to inflation. On the other hand, in a passive monetary and passive fiscal policy regime, both monetary and fiscal policy parameters influence inflation. The relationship between public debt and inflation can be direct or indirect, depending on whether central banks or the private sector demand government bonds, as well as the inflation expectations of economic agents due to high levels of public debt (Nastansky and Strohe, 2015).

Empirical research on the relationship between public debt and inflation has been conducted for both developed and developing countries, leading to mixed conclusions. Various authors have studied this link using different estimation techniques, aiming to understand these macroeconomic variables and guide policy choices. For example, Taghavi (2001) examines the consequences of debt in the short and long term for major European economies (France, Germany, Italy, and the United Kingdom) and the EU as a whole. His study finds that debt appears to be inflationary in the long run but provides inconclusive evidence for the short run. Kwon et al. (2009) show a strong association between increased public debt and high inflation in indebted developing countries, although this pattern is less pronounced in other developing countries. Reinhart and Rogoff (2010) analyze the relationship between debt levels, growth, and inflation and find differing results for advanced economies and emerging markets, with the latter experiencing a sharper increase in inflation with higher debt levels. Nguyen (2015) studies the effects of government

debt on inflation in 15 developing Asian economies, finding statistically positive effects. Lopes da Veiga et al. (2016) analyze a panel of 52 African countries and find that high public debt levels increase inflation. More recent research by Dumitrescu et al. (2022) explores the non-linear effects of public debt on inflation in a sample of 22 emerging economies and identifies threshold effects, indicating that countries with larger shadow economies face higher inflation costs associated with increased public debt.

Despite the extensive research on public debt and inflation, there is limited literature specifically examining the direct impact of fiscal rules on inflation. Combes et al. (2014) and Combes et al. (2018) investigate how the joint implementation of inflation targeting (IT) and fiscal rules affects both inflation and fiscal performance using a large panel of countries. Their studies employ a two-step system GMM estimation technique to account for inflation dynamics and fiscal policy persistence. My study adds to the previous literature by focusing on the direct effect of fiscal rules on inflation, providing valuable insights into this relationship.

3 Methodology and Data

This section presents the methodology of the propensity score method used. I then show the main features of the dataset.

3.1 Methodology

Propensity score methodology is an econometric tool that seeks to overcome the endogeneity before assessing the impact of fiscal rules on the inflation rate. This methodology permits isolating the effect of fiscal rule adoptions from other differences that may exist between the implementation of FRs and comparison groups. By doing so, I can be certain that differences in the inflation rate between the two groups come as a result of adopting, at least, one fiscal rule and not other economic conditions.

Entropy balancing is a statistical method used in economics to balance or equalize the distribution of certain variables across different groups or treatment conditions.

It aims to create comparable groups by adjusting the weights assigned to each observation based on their characteristics. In simple terms, entropy balancing is a technique that helps make different groups or treatment conditions more similar by adjusting the weights of individual observations based on their characteristics.

More in detail, let Z be a binary variable indicating the treatment of fiscal rule adoption's status ($Z = 1$ for the country with at least one, at least, fiscal rule and $Z = 0$ for the control group), X the covariates matrix and e the propensity score. For each unit, the FRs effect is defined as $Y_i(1) - Y_i(0)$: the difference between the two potential outcomes. The average treatment effect on the treated (ATT) is defined as $E[Y_i(1) - Y_i(0)|Z = 1] = E[Y(1)|Z = 1] - E[Y(0)|Z = 1]$, the expectation for the population of interest (Imbens, 2004). That is, the ATT is the difference in the pair of potential outcomes averaged over the population that constitutes the treatment group i.e. the countries that adopted fiscal rules.

Consequently, $E[Y(1)|Z = 1]$ is the inflation rate after the fiscal rule implementation. $E[Y(0)|Z = 1]$ represents the counterfactual outcome for a country having introduced fiscal rules, i.e. the rate of inflation in FRs countries if they had not introduced fiscal rules. It is therefore a counterfactual that cannot be identified from the available data as $E[Y(1)|Z = 1]$. To get to the bottom of this problem, Rosenbaum and Rubin (1983) propose a selection of observables and an overlap: this is the strong ignorability assumption. This implies that $Y(0) \perp Z|X$ and $Pr(Z = 1|X = x) < 1$ for all x in the support of $f_{X|D=1}(x)$ and so the ATT estimator is defined as follows:

$$\tau = E[Y|Z = 1] - \int E[Y|X = x, Z = 0] f_{X|Z=1}(x) dx$$

where τ is ATT. The estimation of the term in the integral is done under the condition that the distribution of covariates in the control group is similar to the distribution of covariates in the treatment group. Once this balance is achieved, the FRs effects can then be estimated by a standard analysis method (Imbens, 2004).

Several techniques can be used to adjust the distribution of covariates so that there is as close as possible to a balance between the treatment and control groups. One such method is propensity score matching with many variations such as propen-

sity score weighting, and covariates adjustments. However, it is particularly challenging and complex to reach a balance with these methods because the procedure has to be repeated manually until a certain balance in the distribution of covariates is attained. Hainmueller (2012) therefore develops a method, which I use in this paper, that ensures covariate balance.

The entropy balancing method proposed by Hainmueller (2012) is a generalization of the propensity score weighting method. Unlike the propensity score weighting method, where weights must first be calculated after a logistic regression, entropy balancing allows for the creation of control groups similar to the treatment groups as early as the preprocessing phase. The weights are estimated from a large set of balancing constraints. The weights w_i of each observation i of the control group are taken so that there is an entropy minimization with q_i as the base weights :

$$\min_{w_i} H(w) = \min_{w_i} \sum_{i|Z=0} w_i \log(w_i/q_i)$$

This minimization is done under the following three constraints:

$$\sum_{i|Z=0} w_i c_{ri}(X_i) = m_r, \text{ for } r = 1, ..., R$$

$$\sum_{i|Z=0} w_i = 1$$

$$w_i \geq 0, \forall i \text{ such that } Z = 0$$

The first constraint is the balance constraint, defined to equalize the moments of the covariate distributions between the treatment and reweighted control groups. This constraint must be satisfied for all covariates. The balance constraint is formulated with m_r containing the moment of order r of any treatment group variable X_j and moment functions for the control group. The specification of these moment functions is such that $c_{ri}(X_j) = X_j^r$ or $c_{ri}(X_j) = (X_j - \mu_j)^r$ with μ_j the mean. This constraint is verified for all our estimates. Standardized mean differences are used

to compare the means of different groups; in this case, to compare the means of the treatment group to the control group in a randomized controlled trial. This is done before and after weighting.

The second constraint is the normalization constraint which implies that the sum of the weights is equal to the normalization constant of one. The latter condition implies a non-negativity constraint because the distance metric is not defined for negative weight values. However, this constraint is not binding and may therefore not be fulfilled.

Ultimately, the estimation of the entropy balancing weights comes down to the minimization problem of the loss function $H(w)$ which is solved by using the Lagrange multiplier and a Levenberg-Marquardt process leading to the solution (see Hainmueller (2012)) :

$$W^* = \frac{Q \cdot exp(-C'Z)}{Q'exp(-C'Z)}$$

The balance constraints are rewritten in matrix form and are given by $CW = M$ with $C = (c_1(X_i), ..., c_R(X_i))´$ of rank $(R \times n_0)$ and the moment vector $M = (m_1, ..., m_R)´$ and $Z = (\lambda_1, ..., \lambda_R)´$ is a vector of Lagrange multipliers for the balance constraints.

This method has several advantages according to two specific points. The first one is that it is a method of the maximum entropy family and it has been shown that minimizing the entropy from uniform base weights provides an estimator that is consistent as well as asymptotically normal and efficient (Ireland and Kullback, 1968). The second is that entropy balancing ensures covariate balance, which is one of the main keys in observational studies. The quality of a causal effects study is measured essentially by the diagnostic of the balance in the distribution of covariates between the treatment and control groups.

The entropy balancing, like any propensity score method, permits to address of potential endogeneity between the outcome of interest and treatment variable. It should be added that there are matching methods that remove and retain participants (here each observation, that is, each country, each year) in the matching process in order to present a balance in the covariates (Thoemmes and Ong, 2016).

This is not the case with the entropy balancing, which does not exclude any observations. Amusa et al. (2019) assert that the entropy balancing technique is useful and excellent in terms of performance after evaluating its performance using an extended series of Monte Carlo simulations.

Theoretical results and simulations in the literature suggest that entropy balancing is a very attractive alternative to conventional weighting estimators that estimate the propensity score by maximum likelihood. Specifically, we find that the entropy balancing is doubly robust with respect to the linear regression of the outcomes and the logistic regression of the propensity scores and that it reaches the asymptotic limit of semi-parametric variance when the two regressions are correctly specified (Zhao and Percival, 2017).

3.2 Data and Descriptive statistics

This section describes the data used in empirical analysis. I employ annual data for a large sample of advanced, emerging, and developing economies[1]. The availability of data on fiscal rules, also only available on an annual basis, restricts our country sample to 79 countries for the period 1985-2021. The sample includes 26 advanced countries, 29 emerging countries, and 24 low-income countries following IMF's classification. More specifically, I consider the following countries :

- High-income countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, United States.

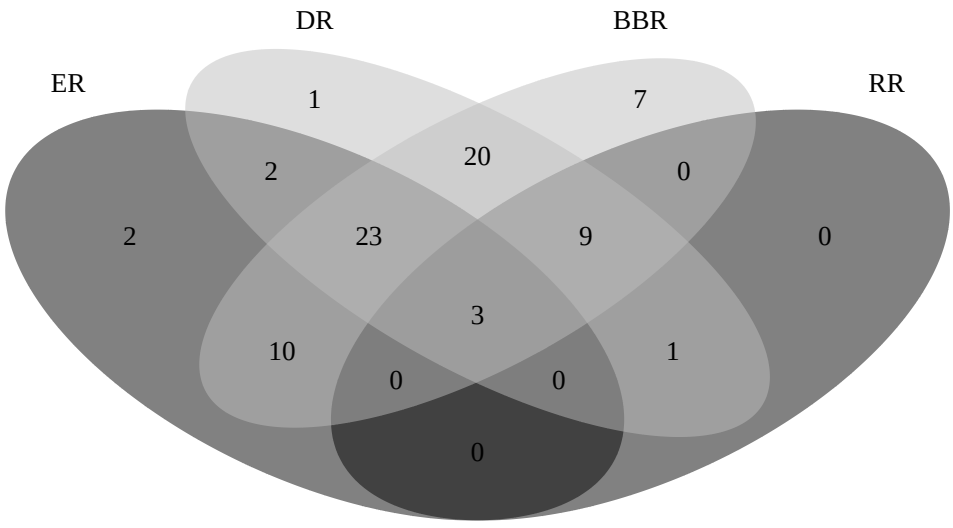
- Emerging countries: Argentina, Armenia, Azerbaijan, Botswana, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Ecuador, Equatorial Guinea, Hungary, India, Indonesia, Iran, Jamaica, Malaysia, Malta, Mauritius, Mexico, Namibia, Pakistan, Paraguay, Poland, Russia, Sri Lanka, Thailand, Uruguay.

[1] Quarterly data is generally not available for fiscal policy indicators for emerging and developing economies.

- Low-income countries: Benin, Burkina-Faso, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Republic of Congo, Côte d'Ivoire, Dominica, Gabon, Grenada, Guinea Bissau, Kenya, Maldives, Mali, Mongolia, Niger, Nigeria, Rwanda, Senegal, Togo, Uganda, Vietnam.

Data on Fiscal rules comes from the International Monetary Fund Fiscal Affairs Department Fiscal rules dataset (IMF FAD and Davoodi et al., 2022). This dataset compiles cross-national information on fiscal rules from 1985 to 2021 and is the best data available for comparisons across countries and over time (Ulloa-Suarez and Valencia, 2022). The index is constructed as binary coding with a score of one '1' if a country's fiscal rule had that specific feature and a score of zero '0' otherwise. Fiscal rules are decomposed into expenditure rules (ER), revenue rules (RR), budget balance rules (BBR), and debt rules (DR).

Figure 1: Number of countries with fiscal rules in 2021



Note: ER, RR, DR, and BBR mean respectively Expenditure rules, Revenue rules, Debt rules, and Budget balance rules. Data comes from the IMF Fiscal Rules dataset.

Expenditure rules set limits on total, primary, or current government expenditures. Debt rules set an explicit anchor or ceiling for public debt, often expressed in percent of GDP. Revenue rules set ceilings or floors on revenues and are aimed at boosting revenue collection and/or preventing an excessive tax burden. Budget

balance rules constrain the budget aggregate that primarily influences the debt ratio and are largely under government control[2]. We have a binary entry of '1' if the country has that specific type of fiscal rule or '0' otherwise. Some countries have multiple rules with '1' indicated in each category.

The adoption of fiscal rules has remarkably evolved over the period of our study. For our panel, in 1985, there were only six economies that had adopted fiscal rules, whereas in 2021 there were seventy-seven countries. Figure 1 shows that by 2021, 40 nations had adopted fiscal rules related to expenditures, 72 for rules related to the budget balance, 59 for rules that constrain the public debt, and only 13 nations for rules related to income.

As seen in table A.2 in the appendix, advanced countries in the panel are much more likely to follow fiscal rules than the other two groups of countries. Indeed, 75.5% of advanced countries have opted for fiscal rules against 50.2% and 50.4% respectively for emerging and low-income countries. When I consider the rules by type, budget balance rules followed by debt rules are the most adopted by both advanced and non-advanced countries. In fact, 72.1% of advanced countries have adopted budget balance rules, and 50.1% adopted debt rules. Also, 41.3% of emerging countries have adopted budget balance rules and 29.5% acquire debt rules. As for low-income countries, more than 40% of them follow budget balance rules (49.3%) and debt rules (48.5%). Disparities are observed in the dispersion of certain fiscal rules in our panel. Revenue rules are highly favored by low-income countries (25.2%) compared to 6.6% for advanced countries and 1.1% for emerging countries. When it comes to expenditure rules, low-income countries adopt them in very low proportions (2.7%) compared to 39.6% for advanced countries and 19.8% for emerging countries. Regarding inflation, Table A.1 in the appendix shows that inflation is lower on average in countries that have adopted fiscal rules than in those that have not, whether they are advanced, emerging, or low-income countries (see Table 1). Note, however, the average inflation for emerging countries is very high because certain countries such as Argentina, Armenia, and Brazil have had episodes of very high inflation.

[2]For more details on the characteristics of each rule see Davoodi et al. (2022).

Table 1: Average of inflation and public debt following income groups

	Average of inflation (1985-2021)		
	Advanced countries	**Emerging countries**	**Low-income countries**
Without fiscal rules	5.68	87.6	15.4
With fiscal rules	2.03	5.57	3.07
	Average of public debt (1985-2021)		
	Advanced countries	**Emerging countries**	**Low-income countries**
Without fiscal rules	53.3	47.3	67.4
With fiscal rules	60.4	44.0	51.9
	Average of inflation (1985-2021)		
	Pegged exchange rate regime		**Floating exchange rate regime**
Without fiscal rules	15.4		9.93
With fiscal rules	3.23		3.62

On the other hand, on average, inflation is higher in countries that have not adopted fiscal rules whether I distinguish countries by their exchange rate arrangements. It is important to note that the discrepancy is less significant for advanced countries than for the other groups of countries in the panel study. So, according to the classification of countries by income level and by exchange rate regime, the level of inflation is much higher for countries that have not adopted fiscal rules (see Table 1).

As seen in Table A.3 in the appendix, there is not much difference in the occurrence of fiscal rules between countries with fixed and floating exchange rate regimes. In fact, 61.8 percent of countries with fixed exchange rate regimes and 55.6 percent of countries with floating exchange rate regimes have opted for fiscal rules. There are, however, disparities in the level of fiscal rules related to revenue and those related to public debt. Less than one percent of flexible exchange rate countries have adopted revenue rules and only 17.6 percent have adopted fiscal rules related to public debt.

Regarding public debt, there was a downward trend in the 2000s. However, the 2007-08 subprime crisis put debt back on an upward trend (see Figure 2, Appendix A). Table 1 also presents the average debt in countries grouped by income level. As can be seen, the average debt over the period is lower in countries with fiscal rules in place than in countries without. This is apparent in emerging and least-developed countries. Note, however, an inverse tendency for advanced countries (60.4% average debt for those with FRs against 53.3 % for those without FRs).

With respect to the outcome variable, I use the annual growth rate of the Con-

sumer Price Index (CPI). Finally, the rest of the variables that enter the estimation are real GDP per capita growth, public debt, the dependency ratio, a dummy for inflation targeting (IT), political stability, public deficit, trade openness, the political orientation of government, unemployment rate, education, and exchange rate regime. The data are annual and come from the World Bank (WDI/WGI) database, ILO for the unemployment rate, and the IMF database for all the considered series.

The selection of the control variables in this study is guided by previous literature on the determinants of fiscal rules. Indeed, it is important to note that fiscal rules are predominantly adopted by developed countries, which are characterized by strong macroeconomic performance (IMF, 2009; Tapsoba, 2012). Therefore, we anticipate a positive relationship between real GDP per capita growth and the adoption of fiscal rules. Considering that inflation can complicate the design and implementation of fiscal rules (IMF, 2009), we expect higher inflation to have a negative effect on the probability of adopting fiscal rules.

The relationship between debt and the adoption of fiscal rules is uncertain since fiscal rules are often adopted to contain the growth of debt levels (Combes et al., 2019). The impact of the choice of exchange rate regime on the adoption of fiscal rules remains also uncertain, despite theories from Mundell-Fleming and Keynesian perspectives suggesting that a fixed exchange rate regime promotes better fiscal discipline. However, empirical evidence does not consistently support this conclusion (Gavin and Perotti, 1997; Tornell and Velasco, 2000).

Countries with a high dependency ratio face challenges in maintaining fiscal discipline due to high social spending (Calderon and Schmidt-Hebbel, 2008) and are therefore less likely to adopt fiscal rules. Similarly, a high unemployment rate can negatively impact spending, leading us to expect a negative effect of the unemployment rate on the likelihood of adopting fiscal rules. Given that the adoption of inflation targeting is often accompanied by the implementation of fiscal policies to ensure fiscal discipline (Minea and Tapsoba, 2014; Combes et al., 2018), we anticipate a positive link between the adoption of inflation targeting and fiscal rule adoption.

High levels of trade openness expose a country to external shocks and risks. When faced with such shocks, governments may increase spending, resulting in larger budget deficits. This view, supported by Rodrik (1998), Cameron (1978), and Combes and Saadi-Sedik (2006), suggests a negative impact of terms of trade on the budget balance. As such, we expect that countries heavily involved in foreign trade will be more inclined to adopt fiscal rules, particularly those related to fiscal balance.

Finally, to address potential endogeneity and reverse causality issues, our model specifications include lagged variables that capture time dependence and account for the influence of past values of variables such as public debt or dependency ratio on the contemporary adoption of fiscal rules. Lagged variables serve as "instrumental" variables, helping to mitigate endogeneity concerns.

4 Estimating Results

4.1 Baseline results

I first define the treatment as a dummy variable that takes on the value 1 if a country has adopted at least one fiscal rule for the given year. Table 2 presents the average treatment effects on inflation of a country's adoption of fiscal rules. The ATT is the difference in inflation-level potential outcomes between countries that adopted fiscal rules, and countries that did not adopt these rules conditionally on the fact that they both adopted fiscal rules. I use a counterfactual in a 'parallel universe' where the same observables who were assigned the treatment in this universe would not get the treatment. In other words, with ATT we are comparing countries that got FRs, with a comparable group that did not adopt the rule but otherwise share very similar characteristics.

The results in the (1) to (4) columns are those obtained by the entropy balancing, for inflation obtained with the CPI with differences in the consideration of fixed effects. For robustness, the results in the last column are obtained with the GDP deflator as the dependent variable. As seen, the results show that countries that

Table 2: ATT for all fiscal rules

Benchmark Model	[1]	[2]	[3]	[4][a]	[5][b]
ATT	- 1.92***	- 1.65***	-1.23***	- 1.92**	- 1.46***
	(0.44)	(0.47)	(0.42)	(0.46)	(0.43)
Treated/Total	1638/2787	1638/2787	1638/2787	1638/2787	1638/2787
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

adopted fiscal rules have on average, lower inflation that controls observations, the difference being negative and significant at any confidence level.

4.2 According to various types of fiscal rules

In the previous subsection, I considered as a dependent variable the fact that the country has adopted at least one fiscal rule. To take into account the influence that a particular rule could have, we repeat the two steps of the methodology, considering each time the specific adoption of one of the four types of fiscal rules. I distinguish four types of fiscal rules: expenditure rules (ER), revenue rules (RR), debt rules (DR), and budget balance rules (BBR). It is useful to consider the specific effects of each type of fiscal rule in an analysis because the existing literature reveals that, depending on the target of a fiscal rule, heterogeneous effects can be observed (Brzozowski and Siwińska-Gorzelak, 2010; Barbier-Gauchard et al., 2021).

Table 3 shows that the fiscal rules, taken separately, reduce inflation. The public expenditures and the balance of budget rules are negatively related to inflation. The robustness of these results can be observed through the significance of the results in all the columns and could be explained by the fact that countries generally adopt more numerical rules limiting the budget balance deficit. These results are consistent and strengthen those obtained by considering all fiscal rules.

The other two rules, namely, RR and DR, also show that the adoption of fiscal rules reduces inflation. However, these results are no longer significant when considering the individual and/or time-fixed effects of the countries in the panel used. Most countries adopt, to a significant extent, rules limiting the evolution of public

Table 3: ATT using various rules

ATT	[1]	[2]	[3]	[4][a]	[5][b]
ER	- 1.12**	- 0.83**	- 2.91***	- 1.92**	- 2.86***
	(0.45)	(0.40)	(0.98)	(0.87)	(0.87)
Treated/Total	597/2787	597/2787	597/2787	597/2787	597/2787
RR	- 1.19***	- 0.10	- 0.54	- 0.03	0.35
	(0.35)	(0.38)	(0.71)	(0.34)	(0.80)
Treated/Total	280/2787	280/2787	280/2787	280/2787	280/2787
DR	- 2.81***	- 2.19***	1.50	- 0.57**	1.03
	(0.43)	(0.39)	(0.75)	(0.24)	(0.69)
Treated/Total	1171/2787	1171/2787	1171/2787	1171/2787	1171/2787
BBR	- 1.14***	-0.87**	- 0.90***	- 0.07***	- 1.19**
	(0.29)	(0.28)	(0.26)	(0.17)	(0.36)
Treated/Total	1506/2787	1506/2787	1506/2787	1506/2787	1506/2787
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

debt, whether they are advanced or low-income countries. It is therefore possible that this insignificance is specific to each group of countries, depending on their income. Indeed, the empirical literature shows that the relationship between debt and inflation is often not the same for advanced countries and other countries. Note, also that fiscal rules related to public revenues do not appear to have significant effects on inflation.

To go further, I repeat the estimations only for FRs countries (see Appendix B.1 that present the FRs' effect on the sample of countries that have adopted at least one fiscal rule)[3]. On average, debt rules and budget balance rules have a negative impact on inflation. These results are statistically significant (Table B.1.1). Interestingly, it seems possible that these results are due to a significant interaction between debt rules and budget balance rules observed in Figure 1. In fact, countries that adopt debt rules have often adopted joint budget balance rules.

4.3 Heterogeneity among countries

To further investigate on possible heterogeneity, table 4 distinguishes between advanced and non-advanced countries.

First, I compare the inflationary effect of fiscal rules on advanced countries and

[3]This stage helps me to analyze more precisely the effects of each type on inflation.

all other countries (emerging and low-income countries) in the panel. As seen in Table 4, overall, the effect of fiscal rules on inflation remains negative for the non-advanced countries. The results show that for non-advanced countries, the effect of fiscal rules is negative and very high. The estimated results show that fiscal rules do not influence inflation in advanced countries.

Table 4: ATT according to advanced and emerging and low-income countries

ATT	[1]	[2]	[3]	[4][a]	[5][b]
Advanced countries	- 0.29**	- 0.07	- 0.16	- 0.33*	- 0.33
	(0.13)	(0.12)	(0.15)	(0.17)	(0.25)
Treated/Total	707/936	707/936	707/936	707/936	707/936
Emerging and low-income countries	- 4.60***	- 3.30***	- 4.41***	- 4.90***	- 4.30***
	(1.03)	(1.17)	(1.60)	(0.78)	(1.43)
Treated/Total	931/1851	931/1851	931/1851	931/1851	931/1851
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Secondly, I compare the potential effect of fiscal rules on inflation in emerging and low-income countries. The first group of countries has a very large effect of fiscal rules on inflation. The results for emerging countries are robust and statistically significant. I find that fiscal rules reduce inflation by at least 5 percentage points. For low-income countries also, the ATT is negative and significant for emerging countries. However, the effect seems lower than that for emerging economies.

Table 5: ATT according to emerging and low-income economies

ATT	[1]	[2]	[3]	[4][a]	[5][b]
Emerging Countries	- 7.50***	- 7.73***	- 5.80	- 5.14***	- 6.21*
	(2.78)	(2.93)	(3.99)	(0.89)	(3.17)
Treated/Total	516/1028	516/1028	516/1028	516/1028	516/1028
Low-Income Countries	- 2.49***	- 1.14**	- 3.88*	- 2.28***	- 3.16*
	(0.79)	(1.23)	(1.95)	(0.74)	(2.64)
Treated/Total	415/823	415/823	415/823	415/823	415/823
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

The findings of this study reveal a diminishing effect of fiscal rules on inflation

in emerging and low-income countries, while no significant results are observed for advanced countries. Several factors may help explain this result. Firstly, many advanced countries benefit from monetary policy managed by an independent central bank whose primary mandate is to maintain price stability (Cukierman et al., 1992; Alpanda and Honig, 2009). As fiscal rules primarily focus on public financial management and are not directly related to monetary policy, their impact on inflation may be limited in these countries.

Secondly, advanced countries often have greater fiscal flexibility, allowing them to adjust their fiscal policy in response to economic conditions (Davoodi et al., 2022). Even with fiscal rules in place, these countries may choose to deviate temporarily from the targets set to address immediate economic needs. This flexibility can help mitigate the impact of fiscal rules on macroeconomics.

Furthermore, policymakers in advanced countries may prioritize other policy objectives such as social stability, economic growth, or reducing unemployment over strict adherence to budget rules. In some cases, policymakers may be willing to tolerate a certain level of deficit or public debt to pursue these objectives.

These factors collectively contribute to the limited or insignificant impact of fiscal rules on inflation in advanced countries, as observed in my results.

4.4 Heterogeneity according to characteristics of the regime

In this subsection, I analyze the effects of fiscal rules on inflation considering different economic characteristics when the rule is adopted, namely, the duration of the implementation of the rules, the inflation level, and the credibility of the monetary authority.

4.4.1 Duration of FR's adoption

In this subsection, I examine the effects of the duration of adopting fiscal rules on inflation. The duration of adoption is a crucial factor in assessing the impact of fiscal rules on inflation because it allows for capturing both short-term and long-term effects. To investigate this, I construct a set of dummy variables representing

different durations of fiscal rule adoption:

1. The first dummy variable represents countries that have recently adopted fiscal rules. This category includes countries that have just implemented fiscal rules and have not yet had them in place for a significant period.

2. The second dummy variable represents countries that have had fiscal rules for less than 3 years. This category captures the short-term effects of fiscal rule adoption on inflation.

3. The third dummy variable represents countries that have maintained fiscal rules for at least 3 years. This duration allows the capture of medium-term effects on inflation.

4. The fourth dummy variable represents countries that have adhered to fiscal rules for at least 5 years. This duration enables assessing the longer-term effects of fiscal rule adoption on inflation.

5. The fifth dummy variable represents countries that have had fiscal rules in place for more than 10 years. This category captures the effects of long-term adherence to fiscal rules on inflation.

The dummies are then:

$$D_i = \begin{cases} 1 & \text{if the condition is satisfied} \\ 0 & \text{otherwise.} \end{cases}$$

By considering these different durations of fiscal rule adoption, I can examine how the length of time that countries have maintained fiscal rules influences the impact on inflation. This analysis helps provide insights into the cumulative effects and potential time dynamics associated with the adoption of fiscal rules.

As seen in Table 6, the analysis reveals that fiscal rules have a more pronounced negative effect on inflation when they are newly adopted and after up to ten years of adoption. Indeed, in the initial years of implementing fiscal rules, inflation decreases on average by 9.41 percentage points. This decline in inflation persists, with

Table 6: Duration of the rules' adoption

ATT	[1]	[2]	[3]	[4][a]	[5][b]
	Have just adopted the FRs				
FR	- 9.41**	- 7.86	- 5.67	- 7.13	- 3.72
	(4.31)	(4.81)	(5.32)	(4.39)	(4.09)
Treated/Total	78/2787	78/2787	78/2787	78/2787	78/2787
	Have adopted the FRs for less than 3 years				
FR	- 11.10***	- 11.10***	- 8.43**	- 8.90**	- 6.79**
	(2.86)	(3.53)	(3.60)	(4.25)	(3.07)
Treated/Total	234/2787	234/2787	234/2787	234/2787	234/2787
	Have adopted the FRs at least 3 years				
FR	- 10.68***	- 9.39***	- 6.24**	- 6.05**	- 5.12**
	(2.60)	(2.84)	(2.88)	(2.78)	(2.51)
Treated/Total	311/2787	311/2787	311/2787	311/2787	311/2787
	Have adopted the FRs at least 5 years				
FR	- 11.20***	- 8.24***	- 4.14*	- 4.83**	- 3.00
	(2.45)	(2.26)	(2.36)	(1.92)	(1.97)
Treated/Total	463/2787	463/2787	4630/2787	463/2787	463/2787
	Have adopted the FRs at least 10 years				
FR	- 0.64***	- 0.29	0.55	0.17	0.72*
	(0.21)	(0.27)	(0.34)	(0.15)	(0.40)
Treated/Total	932/2787	932/2787	932/2787	932/2787	932/2787
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

reductions of 11.10 percent, 10.68 percent, and 11.20 percent in inflation observed when countries have had fiscal rules in place for less than three years, at least three years, and at least five years, respectively[4]. Note, however, that the effect is no longer significant for countries with more than 10 years of the regime.

Therefore, it can be concluded that fiscal rules have an effect on inflation that is short or medium-term in nature. In the short term, the implementation of fiscal consolidation measures, such as reducing government spending or increasing taxes, can lead to a contraction in aggregate demand, which subsequently lowers inflation. However, the long-term impact of fiscal rules on inflation is not significant, indicating that other factors and country-specific characteristics play a more prominent role in

[4]Note that this negative impact of fiscal rules on inflation remains evident even after accounting for time-fixed effects. However, when individual fixed effects are introduced, the negative effect of fiscal rules on inflation is no longer observed. This suggests that the influence of fiscal rules on inflation is not solely dependent on the duration of their adoption but rather on the specific characteristics of each country in each year.

determining inflation outcomes over extended periods.

4.4.2 Level of inflation

Analyzing the level of inflation is crucial for evaluating the impact of fiscal rules on inflation as it provides a baseline, helps understand inflation dynamics, assesses policy effectiveness, examines interactions with monetary policy, and identifies unintended consequences. This analysis enables policymakers to make informed decisions and adjustments to fiscal rules to achieve their desired inflation objectives.

Table 7: ATT according to levels of inflation

ATT	[1]	[2]	[3]	[4][a]	[5][b]
			Inflation less than 3 percent		
FR	- 1.40***	- 1.27***	- 0.43***	- 0.80***	- 0.31
	(0.17)	(0.12)	(0.10)	(0.07)	(0.28)
Treated/Total	973/2787	973/2787	973/2787	973/2787	973/2787
			Inflation less than 5 percent		
FR	- 1.62***	- 1.56***	- 0.83***	- 1.08***	- 0.79***
	(0.24)	(0.19)	(0.13)	(0.09)	(0.28)
Treated/Total	1295/2787	1295/2787	1295/2787	1295/2787	1295/2787
			Inflation less than 10 percent		
FR	- 1.88***	- 1.74***	- 1.30***	- 1.86***	- 1.47***
	(0.34)	(0.35)	(0.28)	(0.26)	(0.34)
Treated/Total	1556/2787	1556/2787	1556/2787	1556/2787	1556/2787
			Inflation more than 15 percent		
FR	- 205.60***	- 261.90***	- 110.339	63.70	- 61.65
	(58.82)	(64.94)	(68.40)	(26.88)	(60.00)
Treated/Total	23/2787	23/2787	23/2787	23/2787	23/2787
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Therefore, as a further step, I consider countries according to their inflation level and distinguish between less than 3%, less than 5%, less than 10%, and more than 15%.

Table 7 shows that inflation decreases by a few percentage points regardless of the level of inflation considered. The results are statistically significant and robust to the addition of fixed effects or changes in the variables of interest. The results seem to show that the effect of the rules is effective for moderate and high inflation. The results, when inflation is more than 15%, are not significant with adding time

or/and country fixed effects. In conclusion, the effectiveness of the effect of fiscal rules on inflation, therefore, is less robust when the inflation rate rises.

4.4.3 Credibility of the monetary authority

The source of inflation remains a topic of ongoing debate among economists, with differing viewpoints on whether inflation is primarily driven by monetary factors or budgetary phenomena. Some economists argue that inflation is purely monetary in origin, as emphasized by Friedman (1968) and many others. On the other hand, Woodford (1998) and others suggest that fiscal policy can also contribute to inflation.

In reality, inflation can have both monetary and fiscal origins, highlighting the importance of considering the interplay between monetary and fiscal policies. The combination of these policies has been a subject of debate in economics. Therefore, the objective of this part of the study is to examine whether the joint implementation of monetary policy, measured by the adoption of inflation targeting and fiscal policy in the form of budgetary rules, can effectively reduce inflation. By examining the effect of fiscal rules on inflation for both countries with credible central banks and those without, I can evaluate the combined influence of monetary and fiscal policies on inflation dynamics. This analysis provides insights into the effectiveness of fiscal rules in reducing inflation under different central bank credibility scenarios.

Table 8: Central bank credibility

ATT	[1]	[2]	[3]	[4][a]	[5][b]
	Central Bank credibility				
FR	-1.18***	-1.19***	- 0.69***	- 0.65***	- 0.70***
	(0.16)	(0.21)	(0.08)	(0.07)	(0.17)
Treated/Total	446/892	446/892	446/892	446/892	446/892
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

To explore this, I assess the impact of fiscal rules on inflation for countries with both credible and non-credible central banks. To measure central bank credibility, an index is constructed that reflects the perceived credibility of each country's central bank on an annual basis. More in detail, in line with the existing literature

(Levieuge et al., 2018; López-Villavicencio and Pourroy, 2022), the credibility of the central bank is measured by the deviation between observed inflation and the central bank's inflation target, squared. This measure serves as the credibility index, where central banks with an index below the median are considered the most credible. Consequently, a dummy variable takes the value of one if the central bank is deemed the most credible, and zero otherwise.

The results of this exercise are presented in Table 8. As seen, the results reveal that the adoption of fiscal rules reduces inflation by 1.18% when central banks are deemed credible. However, when controlling for time and/or individual fixed effects, the downward impact of fiscal rules decreases to an average of 0.65%. This finding aligns with previous literature, such as Combes et al. (2018), which suggests that combining inflation targeting with fiscal rules not only leads to a reduction in inflation but also produces a more substantial effect than each policy taken individually.

5 Robustness Checks

As robustness checks, below I provide alternative analyses to test the resilience of my estimates to different model specifications and techniques.

I test the robustness of my estimates through various tests and graphs. In particular, the absence of selection bias, i.e. the conditional independence assumption, is tested by using the difference between the average variable for the treatment group and the control group. For this purpose, I use the standardized mean differences (SMD). The results presented in the appendix B ensure covariate balance and with SMD, I note that after weighting, the balancing of covariates between treatment and control groups is performed

5.1 Entropy balancing

5.1.1 Other model specifications

I tested the robustness of the results from the entropy balancing by adding fixed and/or individual effects at each stage of the methodology. I also re-estimated all es-

timates from several econometric model specifications (benchmark model — adding compliance with rules — adding trade openness — adding political orientation of government — adding macroeconomic variables — adding exchange rate regime). As seen in the table, when I consider the models which take into account compliance with fiscal rules, trade openness, policy stance of the government, exchange rate regime, etc. provide statistically significant results across all columns. These results suggest a negative effect of fiscal rule adoption on inflation. The estimated coefficients associated with each model are roughly equal showing the robustness of my results.

Table 9: ATT for all fiscal rules: other model specifications

Model 2: Adding compliance with rules	[1]	[2]	[3]	[4]^a	[5]^b
ATT	-1.54***	-1.45***	-1.29***	- 1.83***	- 1.34***
	(0.35)	(0.38)	(0.33)	(0.50)	(0.41)
Treated/Total	1638/2787	1638/2787	1638/2787	1638/2787	1638/2787
Model 3 : Adding openness	[1]	[2]	[3]	[4]^a	[5]^b
ATT	-1.83***	- 1.60***	- 1.15***	- 1.73***	- 1.39***
	(0.45)	(0.49)	(0.44)	(0.44)	(0.42)
Treated/Total	1638/2787	1638/2787	1638/2787	1638/2787	1638/2787
Model 4: Adding political orientation of gov.	[1]	[2]	[3]	[4]^a	[5]^b
ATT	-2.10***	- 1.70***	- 1.30***	- 1.93***	- 1.47***
	(0.51)	(0.50)	(0.44)	(0.47)	(0.46)
Treated/Total	1638/2787	1638/2787	1638/2787	1638/2787	1638/2787
Model 5 : Adding macroeconomic variables	[1]	[2]	[3]	[4]^a	[5]^b
ATT	- 2.04***	- 1.65***	- 0.76	-1.85***	- 1.30***
	(0.47)	(0.49)	(0.47)	(0.46)	(0.44)
Treated/Total	1638/2787	1638/2787	1638/2787	1638/2787	1638/2787
Model 6 : Adding exhange rate regime	[1]	[2]	[3]	[4]^a	[5]^b
ATT	- 1.12***	- 1.12***	- 0.51	- 0.86***	- 0.99**
	(0.35)	(0.37)	(0.54)	(0.17)	(0.39)
Treated/Total	1621/2768	1621/2768	1621/2768	1621/2768	1621/2768
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

The robustness of the model's results with the addition of the government's political orientation can be justified by the fact that high inflation is found in nations governed by the left and low inflation is found in political systems dominated by the center and right parties (Hibbs, 1977).

This influence of fiscal rules could in part explain the fact that fixed exchange rate regimes are associated with low inflation. Indeed, fixed exchange rates are associated with significantly better inflation outcomes (lower and less variable inflation), and there is some evidence of at least a causal relationship (Alogoskoufis and Smith,

1991; Alogoskoufis, 1992; Obstfeld and Rogoff, 1995).

The results of all model specifications (benchmark model — adding compliance with rules — adding trade openness — adding political orientation of government — adding macroeconomic variables — adding exchange rate regime) are statistically significant when we change the dependent variable to the GDP deflator.

5.1.2 Different time samples

In 2000, 40 countries of our sample adopted fiscal rules. So, for the test robustness question, I repeat all estimations by distinguishing two periods (see Appendix B.1). The first set of analyses examined the impact of fiscal rules on inflation from 1985 to 2000. It can be seen from the data in Table B.1.2 that there was no evidence that fiscal rules have an influence on inflation. This inconsistency may be due to between 40 countries, they have more advanced countries in this period. These results corroborate the previous findings. The results, as shown in Table B.1.3, indicate that, from 2000 to recent times, fiscal rules have had an impact on inflation.

5.2 Propensity score matching

The propensity score is obtained by estimating the probability of adopting fiscal rules for all the countries of our sample, using a logit model where FR is a dummy that takes 1 if the country has an FR, 0 otherwise. The variables used to estimate the propensity scores are those usually employed in the literature to explain the probability of adopting an FR (see previous section) (Tapsoba, 2012; Combes et al., 2019; Bamba et al., 2020).

Table 10: Propensity scores estimates

	[1]	[2]	[3]	[4]	[5]	[6]
Dependent var. = Fiscal rules						
Log of real GDP per capita	0.55***	0.58***	0.53***	0.56***	0.56***	0.56***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Public debt lagged one year	0.00	0.00	0.00	0.00	0.00	- 0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Dependency ratio lagged one year	- 0.01**	- 0.01**	- 0.01***	- 0.01**	- 0.01**	- 0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation lagged one year	- 1.96***	- 1.92***	- 1.90***	- 1.96***	- 1.99***	- 1.64***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Inflation targeting (dummy)	0.62***	0.58***	0.71***	0.63***	0.60***	1.05***
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.16)
Political stability	0.06***	0.05***	0.07***	0.07***	0.06***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Deficit under 3% dummy		0.52***				
		(0.13)				
Public debt under 60% dummy		0.21				
		(0.15)				
Trade openness			0.00***			
			(0.00)			
Political orientation of gov.				- 0.20***		
				(0.05)		
Unemployment rate					- 0.01	
					(0.01)	
Level of education					- 0.15***	
					(0.05)	
Flexibility of exchange rate						- 0.42***
					(0.05)	
Intercept	- 0.28	- 1.08**	- 0.87	- 0.10	0.85	0.40
	(0.42)	(0.48)	(0.45)	(0.43)	(0.58)	(0.44)
Pseudo R2	0.35/0.22	0.36/0.23	0.33/0.21	0.33/0.21	0.33/0.21	0.36/0.23
Number of obs.	2787	2787	2787	2787	2787	2768

Notes: [1], [2], [3], [4], [5] and [6] respectively denote benchmark model, model adding compliance with rules, model adding trade openness, model adding political orientation of government, model adding macroeconomic variables, model adding exchange rate regime. Standard errors are in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

As seen in Table 1, the coefficients on most variables are significant and consistent with those in the literature. We note that GDP per capita growth, the presence of an inflation targeting regime, and government stability increase the probability of FR adoption, with opposite effects for the dependency ratio and inflation lagging one year. From the previous literature, I find that a fixed exchange rate regime lowers the probability to adopt fiscal rules.

All my main findings are also confirmed when I chose another propensity score technique, namely, the nearest neighbor algorithm, kernel algorithm, local-linear algorithm, and radius algorithm. Results with propensity score matching remain very close to the baseline results and the results following heterogeneity's characteristics of countries (see Appendix C). The balancing hypothesis is accepted for almost all

estimates for my four matching algorithms.

Table 11: All fiscal rules

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.280*	-0.288	-0.167	-0.320***	-0.538***	-0.336***	-0.188***	-0.180
	(-1.75)	(-1.10)	(-0.50)	(-2.73)	(-4.53)	(-2.80)	(-3.38)	(-0.92)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	23.20	31.55	35.94	22.72	23.77	21.64	22.81	30.82
Rubin's R	0.84	0.81	0.84	0.92	0.83	0.93	0.89	0.82

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

6 Conclusion

The focus of the debate on fiscal rules has primarily been on their effectiveness in achieving fiscal discipline, with less attention given to their impact on inflation. This study fills this gap by rigorously examining the causal effect of fiscal rules on inflation, contributing to a better understanding of the fiscal framework. The empirical findings shed light on an alternative explanation for global disinflation, highlighting the role of fiscal rules as institutional factors that affect both monetary and fiscal policies.

Addressing the challenges of counterfactual and endogeneity, this study employs the entropy balancing methodology to analyze panel data from 79 countries spanning from 1985 to 2021. The results consistently reveal a negative relationship between the adoption of fiscal rules and inflation. When considering all observations, fiscal rules are found to reduce inflation. Robustness checks conducted by examining different types of fiscal rules further support this result, with expenditure rules, debt rules, and budget balance rules demonstrating a significant impact on lowering inflation even when accounting for fixed effects. The non-significance observed for revenue rules does not bias the overall findings, as these rules are not widely adopted.

Furthermore, when distinguishing between advanced and emerging/low-income countries, the study finds that the effect of fiscal rules on inflation is negative for the latter group but not for the former. These findings are robust across various model specifications, the inclusion of fixed effects, alternative dependent variables, and propensity score matching. The implications of this study highlight the im-

portance of tailored policy measures that consider the specific characteristics of individual economies. Policymakers should strive for greater alignment and coordination between fiscal and monetary authorities to ensure macroeconomic stability. In emerging and low-income countries, the implementation and enforcement of fiscal rules can serve as an effective strategy for managing inflation and promoting fiscal discipline. Setting clear targets for fiscal deficits, debt levels, and expenditure controls can contribute to these objectives.

While this study is limited to the *de jure* adoption of fiscal rules, further research could explore the strength and compliance of fiscal rule implementations, particularly in advanced countries where no significant effect on inflation was observed. By delving deeper into these aspects, future studies can provide valuable insights into the dynamics of fiscal rules in advanced economies.

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A Descriptive statistics

Figure 2: Evolution of public debt over period

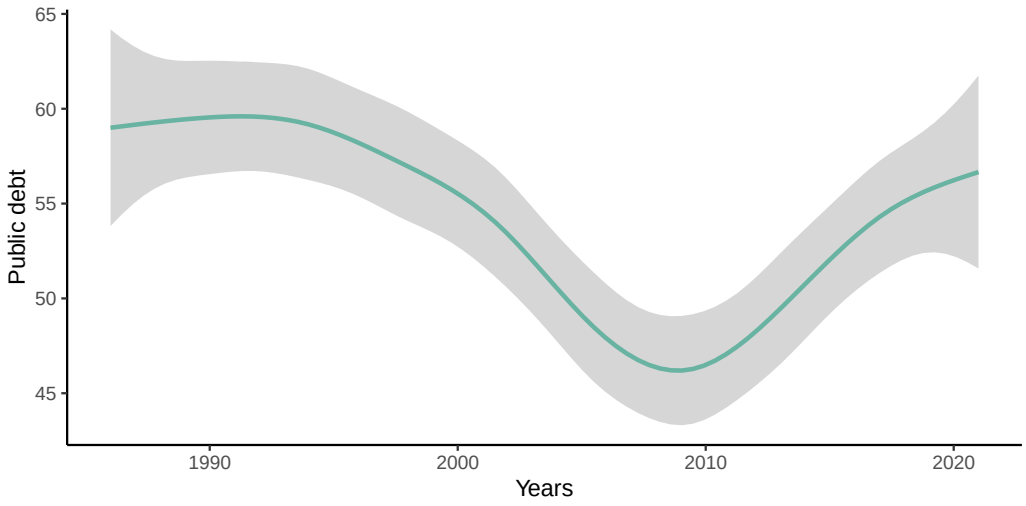


Table 1: Average of inflation following FR adoptions'

	Average of inflation
Without fiscal rules	38,70
With fiscal rules	3.65

Note: The average inflation is very high because certain Emerging countries have had episodes of very high inflation.

Table 2: Proportion of fiscal rules adoption following income of countries

	Advanced countries	Emerging countries	Low-income countries
Fiscal rules all together			
0	24.5	49.8	49.6
1	75.5	50.2	50.4
Expenditure rules			
0	60.4	80.2	97.3
1	39.6	19.8	2.7
Revenue rules			
0	93.4	98.9	74.8
1	6.6	1.1	25.2
Debt rules			
0	49.9	70.5	51.5
1	50.1	29.5	48.5
Budget Balance rules			
0	27.9	58.7	50.7
1	72.1	41.3	49.3

Table 3: Proportion of fiscal rules adoption following exchange rate arrangement

	Pegged exchange rate regime	Floating exchange rate regime
Fiscal rules all together		
0	38.2	44.4
1	61.8	55.6
Expenditure rules		
0	80.4	79.1
1	19.6	20.9
Revenue rules		
0	86.2	99.5
1	13.8	0.5
Debt rules		
0	45.1	82.4
1	54.9	17.6
Budget Balance rules		
0	41.9	49.9
1	58.1	50.1

Table 4: Statistics for IT countries

	Countries with IT	
	Average of inflation	**Average of public debt**
Without fiscal rules	3.72	33.4
With fiscal rules	3.20	45.2

Table 5: Average of inflation and public debt following each FR type

Average of inflation	Average of public debt
Countries with ER	
3.14	57.3
Countries with RR	
3.49	47.0
Countries with DR	
2.90	55.0
Countries with BBR	
3.13	53.9

B Entropy balancing: Estimates and Standardized Mean Differences

B.1 Estimates

Table 1: ATT according to various rules for FRs countries

	[1]	[2]	[3]	[4]	[5]
ER	- 0.55***	- 0.27	- 0.20	- 1.56	- 0.84**
	(0.21)	(0.20)	(0.28)	(6.42)	(0.34)
Treated/Total	594/1740	594/1740	594/1740	594/1740	594/1740
RR	- 3.02***	- 2.45***	- 0.63	- 1.01	- 1.27
	(0.81)	(0.50)	(1.11)	(0.96)	(1.33)
Treated/Total	280/1426	280/1426	280/1426	280/1426	280/1426
DR	- 1.73***	- 1.39***	- 0.90**	- 2.27***	- 1.21***
	(0.29)	(0.25)	(0.37)	(0.44)	(0.44)
Treated/Total	1171/2317	1171/2317	1171/2317	1171/2317	1171/2317
BBR	- 1.31***	-0.96***	- 0.62**	- 2.49***	- 0.78**
	(0.24)	(0.21)	(0.27)	(0.52)	(0.35)
Treated/Total	1506/2652	1506/2652	1506/2652	1506/2652	1506/2652
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Table 2: ATT from 1985 to 2000

Data from 1985 to 2000 (40 FR's countries)	[1]	[2]	[3]	[4]	[5]
FR	- 1.29***	- 0.85**	0.25	- 0.11	- 0.52
	(0.43)	(0.33)	(0.57)	(0.43)	(0.61)
Treated/Total	256/1147	256/1147	256/1147	256/1147	256/1147
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Table 3: ATT from 2000 to 2021

Data from 2000 to 2021	[1]	[2]	[3]	[4]	[5]
FR	- 1.22***	- 1.08***	- 1.06***	- 2.64***	- 2.16***
	(0.29)	(0.29)	(0.28)	(0.67)	(0.49)
Treated/Total	294/1715	294/1715	294/1715	294/1715	294/1715
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	No	Yes	Yes	Yes

Notes: ATT represents average treatment effects on the treated. *a* and *b* respectively denotes the inclusion of time-fixed effects in the first step, and the use of GDP deflator as the dependent variable. Bootstrapped standard errors in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

B.2 Standardized Mean Differences

The tables below present the standardized mean differences obtained before and after the weighting stage. The standardized difference in the mean propensity score in the two groups should be near 0 according to Rubin's (2001) criteria. Ensuring a covariate balance between comparison groups is central to causal studies.

Table 1: Benchmark model

BENCHMARK MODEL	**Before weighting**			**After weighting**		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001

Table 2: Adding compliance with rules

MODEL 2	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001
Compliance1	0.9	0.81	0.262	0.9	0.9	<0.001
Compliance2	0.7	0.66	0.069	0.7	0.7	<0.001

Table 3: Adding trade openness

MODEL 3	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001
Trade	88.69	66.53	0.374	88.69	88.69	<0.001

Table 4: Adding political orientation of Government

MODEL 4	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001
Political orientation of Gov.	1.21	1.11	0.085	1.21	1.21	<0.001

Table 5: Adding macroeconomic variables

MODEL 5	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001
Unemployment	7.34	7.05	0.061	7.34	7.34	<0.001
Education's level	6.48	6.51	0.036	6.48	6.48	<0.001

Table 6: Adding exchange rate regime

MODEL 6	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.95	3.54	0.589	3.95	3.95	<0.001
Lag of debt	52.35	53.83	0.041	52.35	52.35	<0.001
Lag of dependency ratio	59.37	71.17	0.597	59.37	59.37	<0.001
Inflation	0.53	0.92	0.81	0.53	0.53	<0.001
Inflation targeting	0.24	0.07	0.459	0.24	0.24	<0.001
Political stability	6.48	3.62	0.492	6.48	6.48	<0.001
Flexibility of exchange rate	1.95	2.38	0.352	1.95	1.95	<0.001

Table 7: Expenditure rules

ONE TYPE OF RULES: ER	Before weighting			After weighting		
Variable	**ER**	**Non-ER**	**SMD**	**ER**	**Non-ER**	**SMD**
Real GDP	4.23	3.67	0.924	4.23	4.23	<0.001
Lag of debt	58.03	51.58	0.176	58.03	58.03	<0.001
Lag of dependency ratio	51.45	67.47	1.007	51.45	51.45	<0.001
Inflation	0.48	0.74	0.602	0.48	0.48	<0.001
Inflation targeting	0.33	0.13	0.48	0.33	0.33	<0.001
Political stability	8.22	4.56	0.746	8.22	8.22	<0.001

Table 8: Revenue rules

ONE TYPE OF RULES: RR	Before weighting			After weighting		
Variable	**RR**	**Non-RR**	**SMD**	**RR**	**Non-RR**	**SMD**
Real GDP	3.39	3.83	0.609	3.39	3.39	<0.001
Lag of debt	46.62	53.65	0.19	46.62	46.62	<0.001
Lag of dependency ratio	79.82	62.33	0.879	79.82	79.82	<0.001
Inflation	0.47	0.71	0.513	0.47	0.47	<0.001
Inflation targeting	0.09	0.18	0.256	0.09	0.09	<0.001
Political stability	5.33	5..33	0.001	5.33	5.33	<0.001

Table 9: Debt rules

ONE TYPE OF RULES: DR	Before weighting			After weighting		
Variable	**DR**	**Non-DR**	**SMD**	**DR**	**Non-DR**	**SMD**
Real GDP	3.89	3.71	0.249	3.89	3.89	<0.001
Lag of debt	54.25	51.99	0.063	54.25	54.25	<0.001
Lag of dependency ratio	62.75	65.06	0.115	62.75	62.75	<0.001
Inflation	0.5	0.81	0.692	0.5	0.5	<0.001
Inflation targeting	0.18	0.17	0.024	0.18	0.18	<0.001
Political stability	6.69	4.35	0.42	6.69	6.69	<0.001

Table 10: Budget balance rules

ONE TYPE OF RULES: BBR	Before weighting			After weighting		
Variable	**BBR**	**Non-BBR**	**SMD**	**BBR**	**Non-BBR**	**SMD**
Real GDP	3.95	3.58	0.555	3.95	3.95	<0.001
Lag of debt	53.46	52.31	0.032	53.46	53.46	<0.001
Lag of dependency ratio	59.89	69.27	0.473	59.89	59.89	<0.001
Inflation	0.51	0.9	0.829	0.51	0.51	<0.001
Inflation targeting	0.23	0.1	0.372	0.23	0.23	<0.001
Political stability	6.49	3.9	0.45	6.49	6.49	<0.001

Table 11: Advanced countries

ADVANCED COUNTRIES	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	4.38	4.17	0.414	4.38	4.38	<0.001
Lag of debt	60.41	50.42	0.286	60.41	60.41	<0.001
Lag of dependency ratio	49.64	50.26	0.108	49.64	49.64	<0.001
Inflation	0.41	0.67	0.958	0.41	0.41	<0.001
Inflation targeting	0.29	0.18	0.265	0.29	0.29	<0.001
Political stability	8.43	8.85	0.101	8.43	8.43	<0.001

Table 12: No-advanced countries

NO DEVELOPED COUNTRIES	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.58	3.4	0.306	3.58	3.58	<0.001
Lag of debt	45.65	54.64	0.255	45.65	45.65	<0.001
Lag of dependency ratio	67.46	76.12	0.422	67.46	67.46	<0.001
Inflation	0.62	0.97	0.687	0.62	0.62	<0.001
Inflation targeting	0.19	0.05	0.45	0.19	0.19	<0.001
Political stability	4.85	2.38	0.432	4.85	4.85	<0.001

Table 13: Emerging countries

DEVELOPING COUNTRIES	**Before weighting**			**After weighting**		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.84	3.6	0.472	3.84	3.84	<0.001
Lag of debt	43.14	43.94	0.027	43.14	43.14	<0.001
Lag of dependency ratio	53.93	62.49	0.697	53.93	53.93	<0.001
Inflation	0.72	1.13	0.855	0.72	0.72	<0.001
Inflation targeting	0.33	0.09	0.627	0.33	0.33	<0.001
Political stability	6.34	5.62	0.147	6.34	6.34	<0.001

Table 14: Low-income countries

LOW INCOME COUNTRIES	**Before weighting**			**After weighting**		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.22	3.12	0.17	3.22	3.22	<0.001
Lag of debt	49.21	69.27	0.51	49.21	49.21	<0.001
Lag of dependency ratio	86.69	94.76	0.598	86.69	86.69	<0.001
Inflation	0.48	0.77	0.555	0.48	0.48	<0.001
Inflation targeting	0	0	<0.001	0	0	<0.001
Political stability	2.75	-2.06	0.965	2.75	2.75	<0.001

Table 15: Countries that have just adopted fiscal rules

DURATION HAVE JUST ADOPTED	**Before weighting**			**After weighting**		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.78	3.79	0.012	3.78	3.78	<0.001
Lag of debt	52.41	52.96	0.015	52.41	52.41	<0.001
Lag of dependency ratio	62.78	64.13	0.068	62.78	62.78	<0.001
Inflation	0.63	0.68	0.131	0.63	0.63	<0.001
Inflation targeting	0.16	0.17	0.039	0.16	0.16	<0.001
Political stability	5.59	5.32	0.047	5.59	5.59	<0.001

Table 16: Countries that have adopted FRs less than three years

DURATION LESS THAN 3 YEARS	**Before weighting**			**After weighting**		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.72	3.70	0.031	3.72	3.72	<0.001
Lag of debt	54.31	54.61	0.008	54.31	54.31	<0.001
Lag of dependency ratio	62.64	64.24	0.081	62.64	62.64	<0.001
Inflation	0.64	0.70	0.144	0.64	0.64	<0.001
Inflation targeting	0.18	0.16	0.059	0.18	0.18	<0.001
Political stability	5.40	5.08	0.056	5.40	5.40	<0.001

Table 17: Countries that have adopted at least three years

DURATION AT LEAST 3 YEARS	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.74	3.69	0.031	3.74	3.74	<0.001
Lag of debt	54.20	54.63	0.008	54.20	54.20	<0.001
Lag of dependency ratio	62.46	64.31	0.081	62.46	62.46	<0.001
Inflation	0.63	0.71	0.144	0.63	0.63	<0.001
Inflation targeting	0.19	0.16	0.059	0.19	0.19	<0.001
Political stability	5.46	5.06	0.056	5.46	5.46	<0.001

Table 18: Countries that have adopted at least five years

DURATION AT LEAST 5 YEARS	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.77	3.69	0.031	3.77	3.77	<0.001
Lag of debt	53.24	54.85	0.008	53.24	53.24	<0.001
Lag of dependency ratio	62.13	64.50	0.081	62.13	62.13	<0.001
Inflation	0.63	0.71	0.144	0.63	0.63	<0.001
Inflation targeting	0.19	0.16	0.059	0.19	0.19	<0.001
Political stability	5.55	5.02	0.056	5.55	5.55	<0.001

Table 19: Countries that have adopted for more ten years

Duration after ten years	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	4.04	3.52	0.031	4.04	4.04	<0.001
Lag of debt	55.16	54.29	0.008	55.16	55.16	<0.001
Lag of dependency ratio	57.71	67.32	0.081	57.71	57.71	<0.001
Inflation	0.45	0.82	0.144	0.45	0.45	<0.001
Inflation targeting	0.26	0.11	0.059	0.26	0.26	<0.001
Political stability	7.06	4.13	0.056	7.06	7.06	<0.001

Table 20: Countries that have inflation under three percent

INFLATION UNDER 3%	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	4.05	3.51	0.81	4.05	4.05	<0.001
Lag of debt	56.89	53.34	0.2	56.89	56.89	<0.001
Lag of dependency ratio	58.79	66.96	0.961	58.79	58.79	<0.001
Inflation	0.32	0.90	0.919	0.32	0.32	<0.001
Inflation targeting	0.23	0.13	1.035	0.23	0.23	<0.001
Political stability	6.78	4.21	0.451	6.78	6.78	<0.001

Table 21: Countries that have inflation under five percent

INFLATION UNDER 5%	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	4.03	3.41	0.743	4.03	4.03	<0.001
Lag of debt	55.24	54.01	0.033	55.24	55.24	<0.001
Lag of dependency ratio	58.76	68.74	0.519	58.76	58.76	<0.001
Inflation	0.41	0.95	1.244	0.41	0.41	<0.001
Inflation targeting	0.24	0.10	0.383	0.24	0.24	<0.001
Political stability	6.70	3.72	0.531	6.70	6.70	<0.001

Table 22: Countries that have at least inflation dix percent

INFLATION LESS THAN 10%	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	3.97	3.36	0.709	3.97	3.97	<0.001
Lag of debt	53.82	55.55	0.047	53.82	53.82	<0.001
Lag of dependency ratio	59.47	69.97	0.539	59.47	59.47	<0.001
Inflation	0.49	0.96	0.982	0.49	0.49	<0.001
Inflation targeting	0.24	0.07	0.463	0.24	0.24	<0.001
Political stability	6.47	3.39	0.537	6.47	6.47	<0.001

Table 23: Central bank credibility

CENTRAL BANK CREDIBILITY	Before weighting			After weighting		
Variable	**FR**	**Non-FR**	**SMD**	**FR**	**Non-FR**	**SMD**
Real GDP	4.10	3.94	0.229	4.10	4.10	<0.001
Lag of debt	49.06	51.98	0.083	49.06	49.06	<0.001
Lag of dependency ratio	54.43	60.13	0.37	54.43	54.43	<0.001
Inflation	0.52	0.40	0.39	0.52	0.52	<0.001
Inflation targeting	0.52	0.50	0.04	0.52	0.52	<0.001
Political stability	8.45	7.10	0.385	8.45	8.45	<0.001

C Robustness

Propensity score matching is another technique that is used to estimate the effect of a treatment or intervention on a particular outcome by comparing the outcomes of treated and untreated individuals who are similar in all other respects.

C.1 Examination of common support regions'

The overlap propensity score is a measure of the degree to which the distribution of a variable overlap between two groups. To calculate the overlap propensity score,

we estimate the propensity scores for each individual in the treated and untreated groups. The propensity score is the probability that an individual in the treated group received the treatment, given their observed characteristics. The overlap propensity score is then calculated as the overlap between the two groups' propensity score distributions. For example, if the overlap propensity score is high, it means that the propensity scores of the treated and untreated individuals are similar, indicating that the two groups are similar in terms of their observed characteristics. This suggests that any differences in outcomes between the treated and untreated groups are likely due to the treatment itself, rather than any other underlying differences between the groups. I therefore test this hypothesis through the following figures which represent the common support regions. I can observe for most of the figures that the common support is large enough.

Figure 1: All fiscal rules

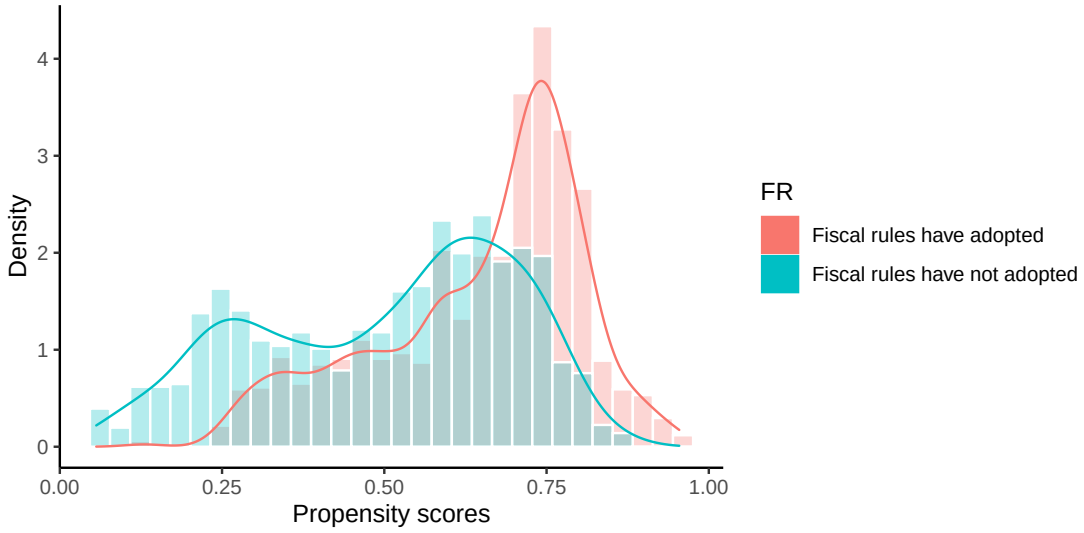


Figure 2: Expenditure rules

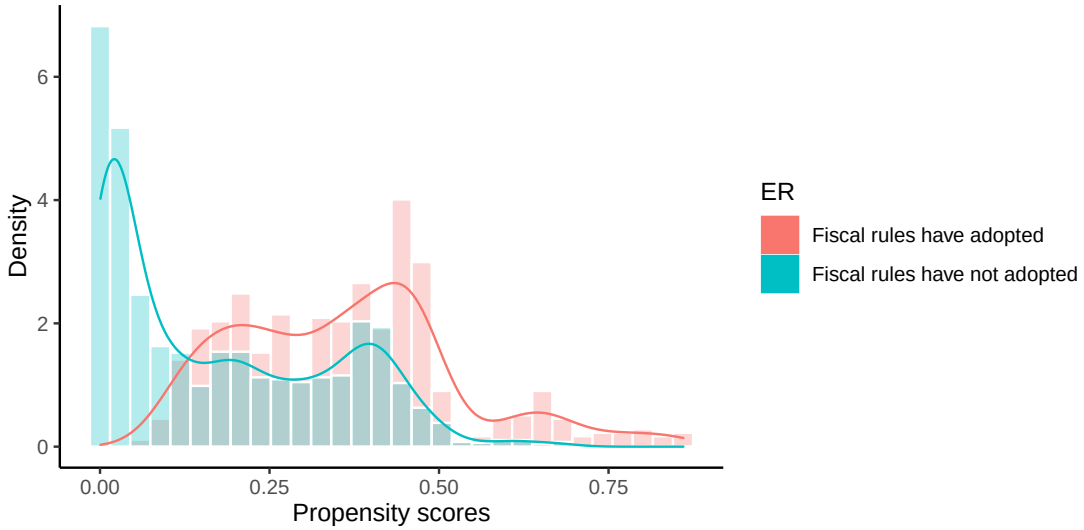


Figure 3: Revenue rules

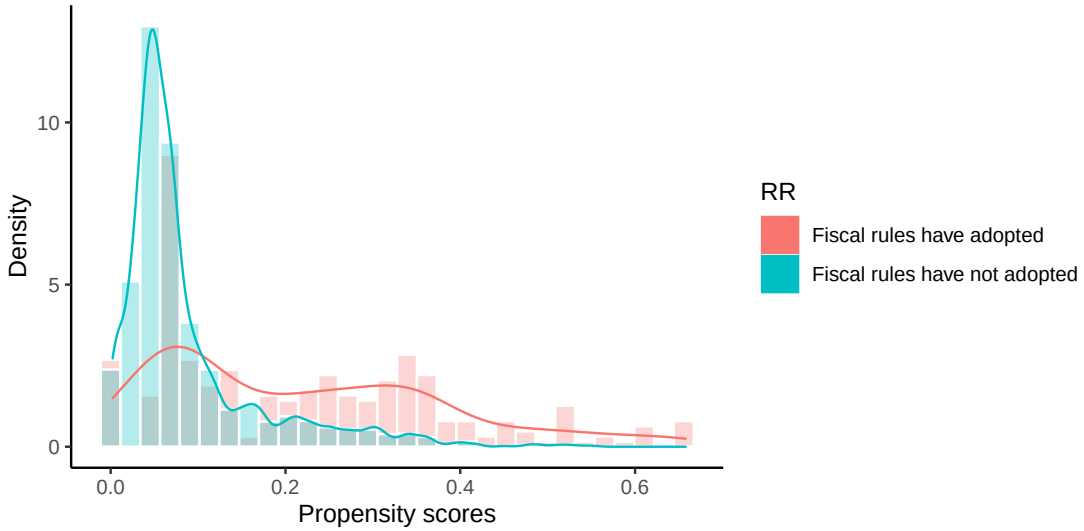


Figure 4: Debt rules

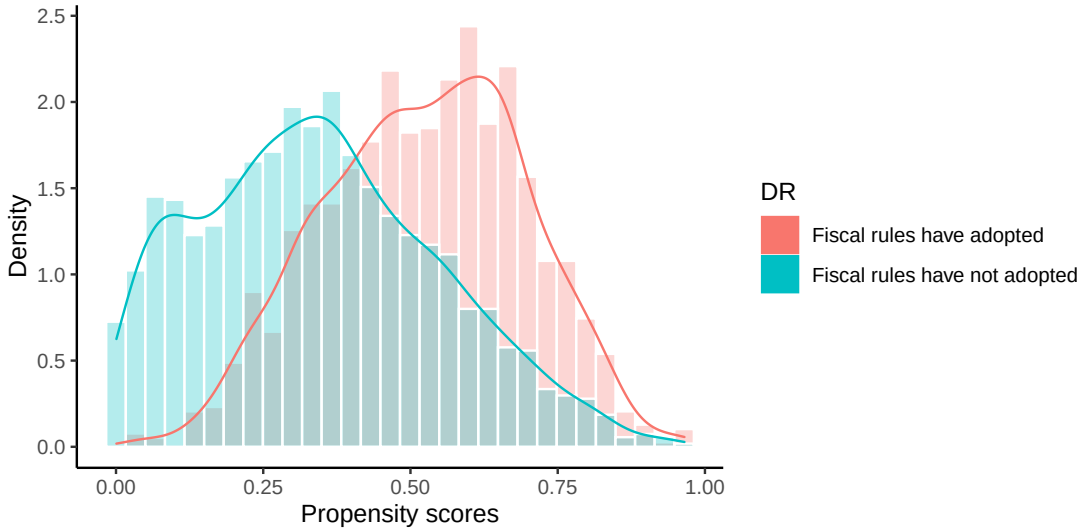


Figure 5: Budget balance rules

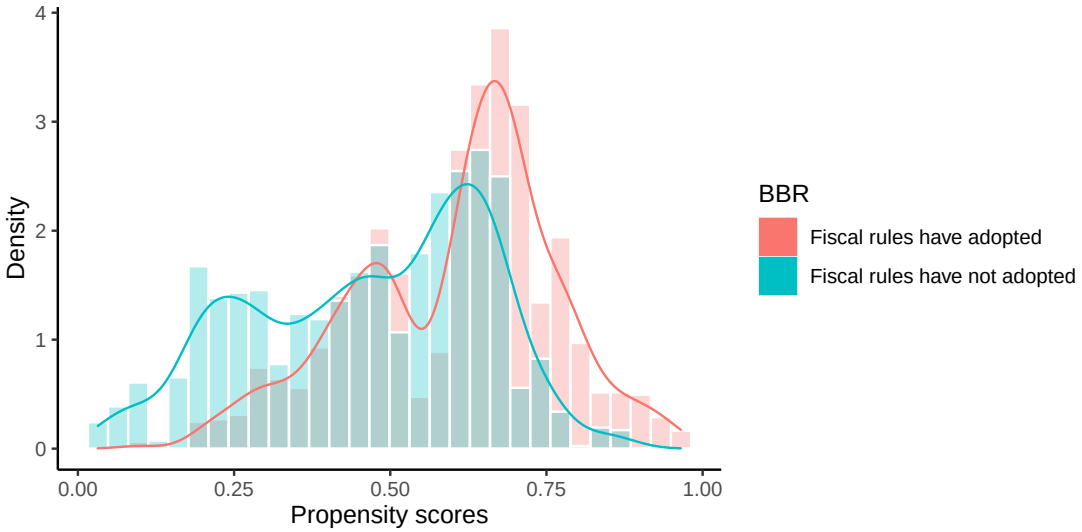


Figure 6: Advanced economies

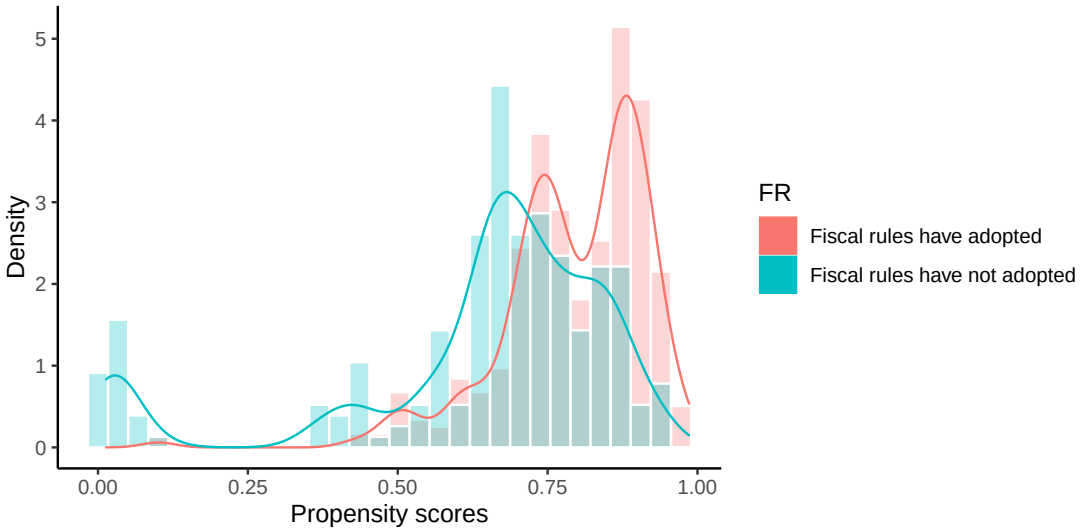


Figure 7: No advanced economies

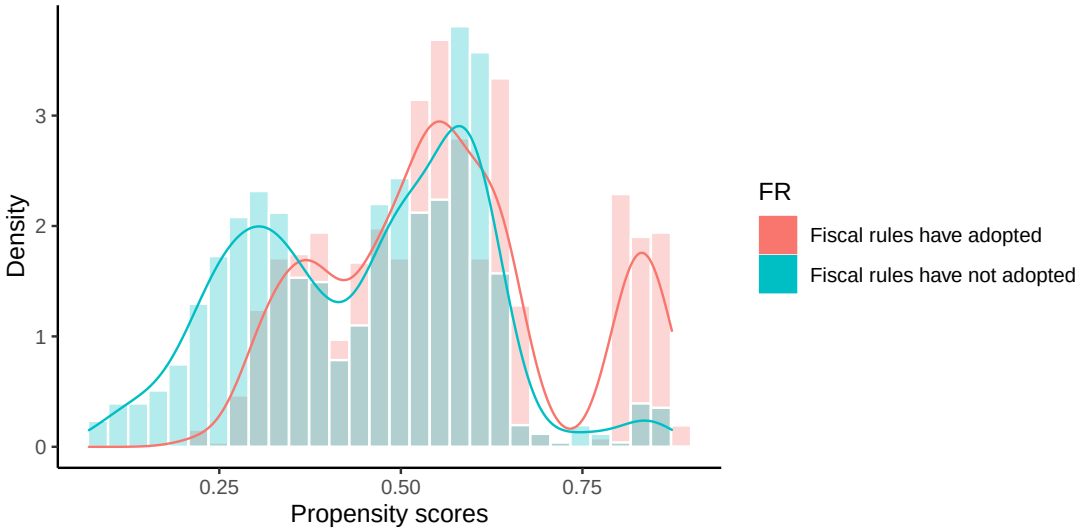


Figure 8: Emerging economies

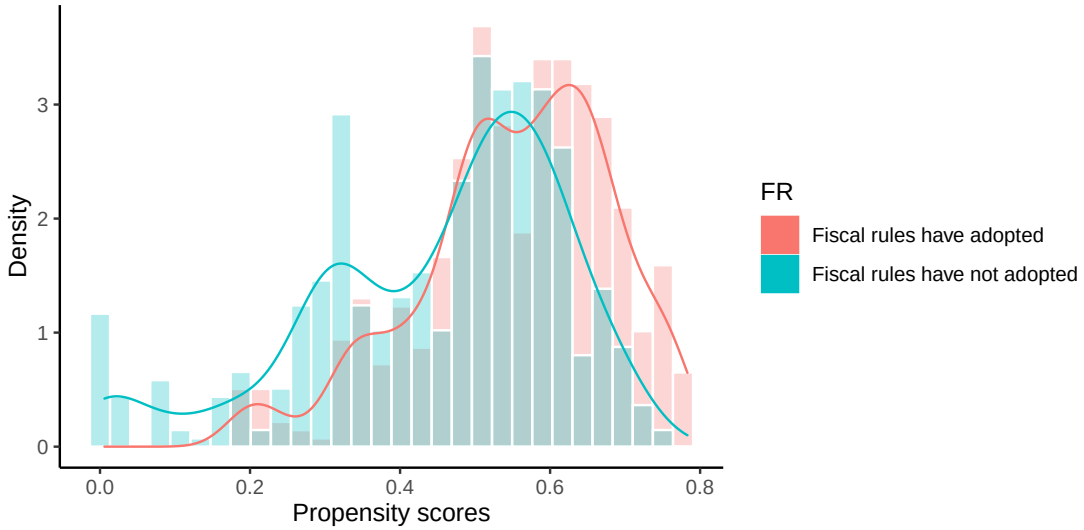
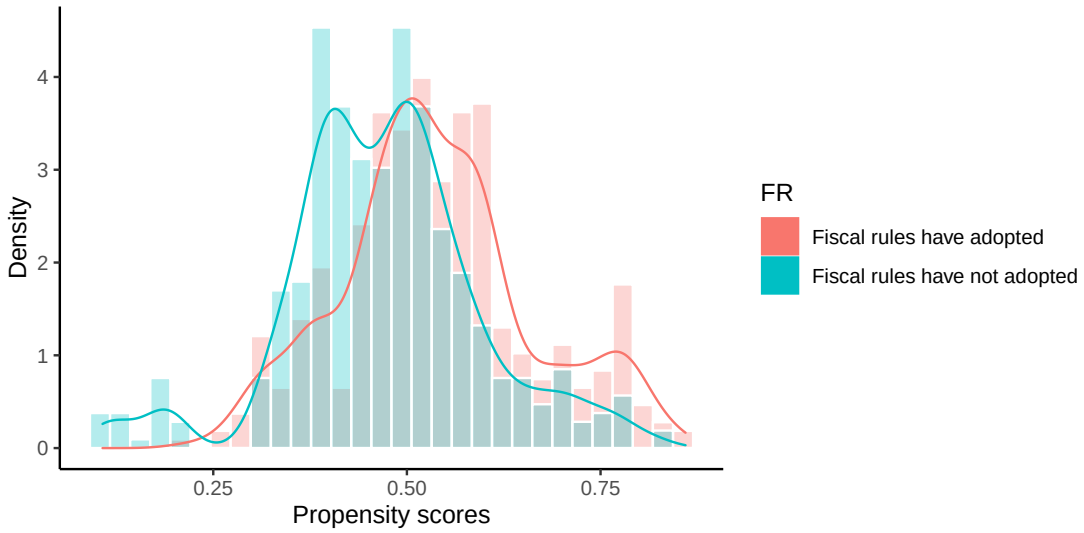


Figure 9: Low-income economies



C.2 Estimates from propensity score matching

To perform propensity score matching, I first need to estimate the propensity scores for each individual in the treated and untreated groups. I can then use these propensity scores to match individuals in the treated group with individuals in the untreated group who have similar propensity scores. This helps to control for differences between the two groups that are unrelated to the treatment and allows me to estimate the effect of the treatment on the outcome of interest.

Table 1: Propensity scores estimates

	[1]	[2]	[3]	[4]	[5]	[6]
Dependent var. = Fiscal rules						
Log of real GDP per capita	0.55***	0.58***	0.53***	0.56***	0.56***	0.56***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Public debt lagged one year	0.00	0.00	0.00	0.00	0.00	- 0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Dependency ratio lagged one year	- 0.01**	- 0.01**	- 0.01***	- 0.01**	- 0.01**	- 0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation lagged one year	- 1.96***	- 1.92***	- 1.90***	- 1.96***	- 1.99***	- 1.64***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Inflation targeting (dummy)	0.62***	0.58***	0.71***	0.63***	0.60***	1.05***
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.16)
Political stability	0.06***	0.05***	0.07***	0.07***	0.06***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Deficit under 3% dummy		0.52***				
		(0.13)				
Public debt under 60% dummy		0.21				
		(0.15)				
Trade openness			0.00***			
			(0.00)			
Political orientation of gov.				- 0.20***		
				(0.05)		
Unemployment rate					- 0.01	
					(0.01)	
Level of education					- 0.15***	
					(0.05)	
Flexibility of exchange rate						- 0.42***
					(0.05)	
Intercept	- 0.28	- 1.08**	- 0.87	- 0.10	0.85	0.40
	(0.42)	(0.48)	(0.45)	(0.43)	(0.58)	(0.44)
Pseudo R2	0.35/0.22	0.36/0.23	0.33/0.21	0.33/0.21	0.33/0.21	0.36/0.23
Number of obs.	2787	2787	2787	2787	2787	2768

Notes: [1], [2], [3], [4], [5] and [6] respectively denote benchmark model, model adding compliance with rules, model adding trade openness, model adding political orientation of government, model adding macroeconomic variables, model adding exchange rate regime. Standard errors are in parentheses. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

There are several different methods for performing propensity score matching, including nearest neighbor matching, kernel matching, local linear method, and radius method.

1. Nearest neighbor matching: This method involves identifying the treated individual with the closest propensity score to each untreated individual, and pairing them together. The number of treated and untreated individuals that are matched in this way is equal.

2. Kernel matching: This method involves estimating the propensity score distribution for both the treated and untreated groups using a kernel density estimate. The treated and untreated individuals are then matched based on their distance from the mean of the respective propensity score distribution.

3. Local linear method: This involves fitting a local linear regression model to the data, using the treatment status as the independent variable and the potential confounding variables as the predictors. The fitted model is then used to predict the propensity score.

4. Radius method: For each treatment individual, we find the nearest control individual with a propensity score within a certain radius. This radius can be adjusted to achieve a desired balance between treatment and control individuals.

A caliper for propensity score matching is a maximum allowable difference between the propensity scores of the treated and untreated individuals that are matched. Only pairs of individuals with propensity scores that fall within this range are included in the analysis. Here, we specify different calipers just for the nearest neighbor and radius algorithms.

Rubin's B is the absolute standardized difference of the means of the linear index of the propensity score in the treated and (matched) non-treated group. Rubin's R is the ratio of treated to (matched) non-treated variances of the propensity score index. Rubin (2001) recommends that B be less than 25 and that R be between 0.5 and 2 for the samples to be considered sufficiently balanced.

Table 2: Expenditure rules

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.261	-0.406***	-0.333***	-0.749*	-1.374***	-0.752	-0.306**	-0.278
	(-1.37)	(-9.86)	(-3.43)	(-1.67)	(-2.88)	(-1.48)	(-2.44)	(-1.34)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	23.97	19.96	17.33	14.56	23.85	14.53	17.40	18.31
Rubin's R	0.54	0.49	0.48	0.75	0.54	0.80	0.51	0.53

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Table 3: Revenue rules

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-5.730	-10.46	-14.92**	-4.287**	-7.931***	-4.018***	-11.07***	-14.80***
	(-0.95)	(-0.73)	(-2.57)	(-2.34)	(-5.81)	(-3.29)	(-72.02)	(-4.45)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	40.90	30.63	28.56	22.72	40.33	22.62	29.42	26.59
Rubin's R	0.58	0.56	0.57	0.68	0.60	0.71	0.51	0.48

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

Table 4: Debt rules

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.655***	-0.646***	-0.600***	-1.121***	-1.824	-1.187**	-0.693***	-0.671***
	(-2.59)	(-63.60)	(-4.26)	(-5.07)	(-1.63)	(-2.32)	(-353.63)	(-3.11)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	14.73	14.67	12.91	11.24	14.69	11.12	12.12	13.99
Rubin's R	0.47	0.59	0.69	0.79	0.47	0.80	0.71	0.73

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

Table 5: Budget balance rules

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.157	-0.0849	-0.102	-0.362***	-0.736***	-0.419*	-0.161*	-0.202***
	(-0.48)	(-0.35)	(-1.19)	(-12.16)	(-7.06)	(-1.92)	(-1.67)	(-4.39)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	30.90	31.41	31.86	24.04	23.88	20.89	22.64	27.17
Rubin's R	0.61	0.65	0.64	0.70	0.63	0.71	0.67	0.66

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

Table 6: Advanced countries

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	0.0338	0.0536	-0.0466***	-3.640**	-5.380***	-4.086	-0.564	-0.193
	(0.18)	(0.98)	(-8.34)	(-2.35)	(-2.91)	(-1.54)	(-0.84)	(-0.39)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	74.30	67.32	62.47	61.00	74.72	61.19	61.84	64.39
Rubin's R	0.52	0.51	0.51	0.52	0.53	0.53	0.51	0.50

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

Table 7: No-developed countries

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.751	-0.618***	-0.735***	-0.814***	-1.055***	-0.813***	-0.726***	-0.721***
	(-1.26)	(-5.80)	(-2.59)	(-10.46)	(-40.34)	(-24.02)	(-8.06)	(-3.78)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	32.68	12.59	13.23	17.27	13.00	17.19	18.13	19.78
Rubin's R	1.06	1.03	1.06	1.04	1.06	1.03	1.08	1.09

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for p < 0.10, p < 0.05, and p < 0.01.

Table 8: Emerging countries

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-0.873***	-0.898***	-0.956***	-1.311***	-2.267***	-1.331***	-1.196***	-1.047***
	(-9.00)	(-11.21)	(-2.87)	(-10.72)	(-6.67)	(-8.88)	(-6.17)	(-2.75)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	25.08	31.98	22.46	23.13	25.90	23.22	22.32	22.34
Rubin's R	0.77	0.73	0.75	0.76	0.77	0.76	0.78	0.77

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Table 9: Low-income countries

	Nearest neighbor(1)	Nearest neighbor(2)	Nearest neighbor(5)	Kernel	Local-linear	Radius (.05)	Radius (.01)	Radius (.005)
ATT	-4.081***	-4.339***	-4.428***	-4.855***	-4.910***	-4.873***	-4.475***	-4.607***
	(-31.57)	(-9.84)	(-21.86)	(-32.33)	(-5.22)	(-40.49)	(-9.88)	(-6302.68)
N	2787	2787	2787	2787	2787	2787	2787	2787
Rubin's B	27.35	26.87	25.49	27.95	27.62	28.39	24.35	25.29
Rubin's R	0.88	0.88	0.87	0.80	0.89	0.80	0.83	0.84

Notes: Bootstrapped standard errors based on 500 replications are reported in brackets. The stars, *, **, and *** respectively stand for $p < 0.10$, $p < 0.05$, and $p < 0.01$.