Evaluating Treatment Effect and Causal Effect of Fiscal Rules on Procyclicality New assessments on old debate: rules vs. discretion

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Abstract

This article is the first to renews the old debate of *"rules versus. discretion"* by introducing propensity score matching methods in macro analysis, such as Tapsoba (2012), and by using instrumental methods, to consider the national *stability culture*. By taking into account, at the same time, the self-selection problem and the omitted unobserved factor bias, in a sample of 126 countries of all level of development over the period 1985-2010, we provide strong evidence about the positive causal effect of fiscal rules adoption on the reduction of fiscal policy procyclicality. We find an asymmetrical impact, since fiscal rules adoption contributed to upgrade budget balance in periods of expansion, while it doesn't increase budget deficit in periods of recession. Furthermore, we show that the budget balance rules and the debt rules are more effective to dampen procyclicality than expenditure rules. We also provide evidence that the coverage of fiscal rules is not a critical issue to strength against procyclicality. Empirical results also displays the positive impact of the adoption of flexible rules, but also the adoption of fiscal rules combined to improve policy responsiveness. Finally, we find that FRs are effective when taking into account the national *stability culture*. This positive impact of fiscal rules adoption on fiscal policy cyclicality comes from an improvement of fiscal policy disciplinary, by ensuring a sustainable path of deficit and debt, or by smoothing business cycles.

Keywords: Fiscal Rules; Fiscal Rules Spread; Fiscal Policy Responsiveness; Procyclicality; Treatment Effect; Propensity Scores Matching.

JEL Codes: H11; E32; E6.

1. Introduction

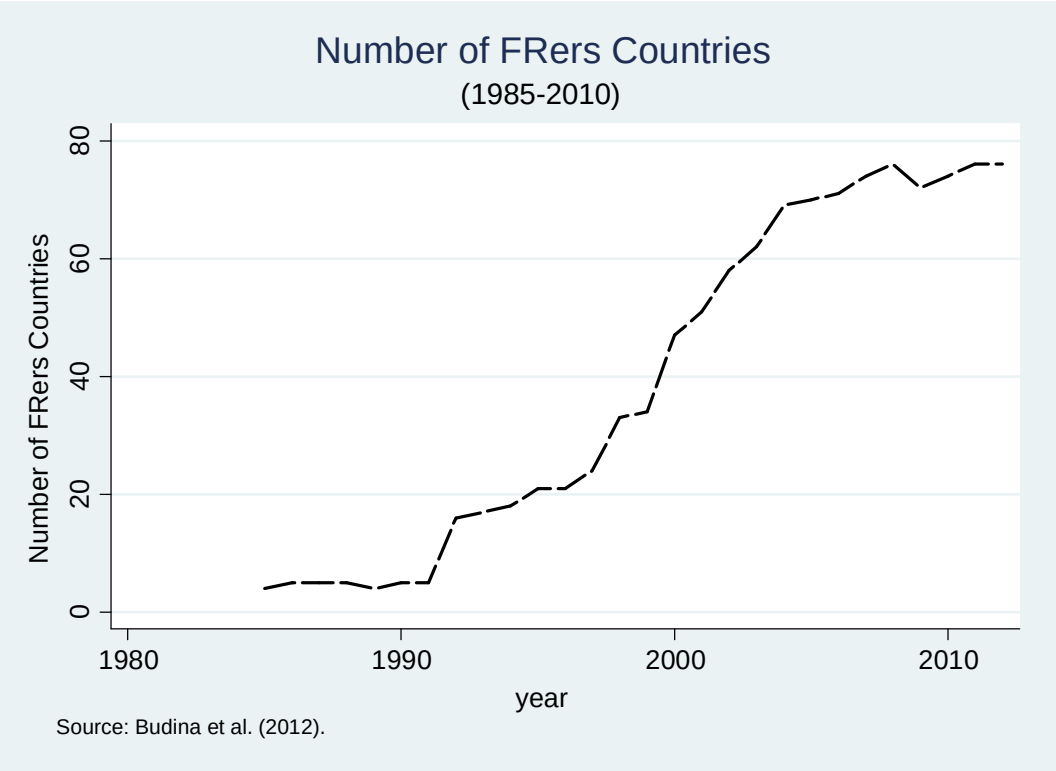
As economic theory depicted, countries must have to pursue countercyclical or acyclical fiscal policy.[1] Meanwhile, some economies, and notably developing countries, have followed procyclical fiscal policy in the last decades, since they raised spending or tax cuts during expansion, and cuts spending or raised taxes during recession (Frankel et al., 2013; Végh and Vuletin, 2012). This phenomenon can be explain by imperfect access to international credit markets for emerging economies (Caballero and Krishnamurthy, 2004; Gavin and Perotti, 1997; Gavin et al., 1996; Riascos and Végh, 2003), or due to the presence of political distortions in the considered country (Alesina et al., 2008; Talvi and Végh, 2005; Tornell and Lane, 1999; Velasco, 1997). Alternatively, the recent financial and economical crisis highlighted the fact that high debt context may enhance procyclical behavior since it severely reduce the fiscal space for political authorities when they conduct public policies (Blanchard et al., 2013; Combes et al., 2014; Égert, 2012).

Empirical literature point out that structural improvements in institutional framework seems to be the key to strength against procyclical fiscal policy (Frankel et al., 2012). Among this institutions, budget institutions may have a role, since they might reduce bias of unrestricted fiscal policy such as the inability of governments to reach fiscal balances (Alesina and Perotti, 1994). The two kinds of budget institutions in place are budget processes and numerical fiscal rules.[2] In this paper we focus on fiscal rules, due to data availability at the country level on the latter. Fiscal rules (FRs, hereafter) are long-lasting constraints on fiscal policy which are expressed as synthetic indicators of fiscal performance (Kopits and Symansky, 1988). In 1985, 4 countries are fiscal rulers (FRers, hereafter), while twenty five years later 76 countries have adopted FRs (see Graphic 1).[3]

The controversy in academic literature about the merits of FRs is known as the debate of *"rules versus. discretion"*. For the critics, FRs (and more generally explicit constraints) lowering the responsiveness of fiscal policy to output fluctuations, while for the proponents of FRs, explicit constraints will prevents governments from running unsustainable path of fiscal policy and smooth business cycles by reducing macroeconomic volatility.

[1] See Keynes (1937), Friedman (1957) and Barro (1989) for a thorough discussion on optimal fiscal policy.
[2] For a literature review on budget institutions, see Alesina and Perotti (1999).
[3] The majority of FRers countries adopted budget balance rules, debt rules, or a combination thereof.

Graphic 1.



On the one hand, Alt and Lowry (1994), Roubini and Sachs (1989) and Poterba (1994) found that explicit constraints on fiscal policy result in slower adjustments to unexpected shocks, while Lane (2003) and Levinson (1998) conclude that governments who are subject to stronger constraints leads to more procyclical fiscal policy.[4]

On the other hand, Alesina and Bayoumi (1996), Bohn and Inman (1996), Brzozowoski and Siwinska-Gorzelak (2010), Fatás and Mihov (2006), deHaan et al. (1999), Hallerberg and Von Hagen (1999), Perotti and Kontopoulos (2002), and Tapsoba (2012) provide some evidence about the disciplinary effect of constraints on fiscal policy, while Fatás and Mihov (2006) found that fiscal constraints in US context smooth business cycles.

The objective of this article is to demonstrate that FRs are an effective tool to struggle fiscal procyclicality by improving fiscal policy responsiveness, when taking into account the self-selection problem, as in Tapsoba (2012), but also the omitted unobserved factor bias of *stability culture* at national level. As describe in Graphic 1.a (see Appendix a) it appears that FRers countries improve their fiscal policy responsiveness (or improve their fiscal countercyclicality) by 0.237 percentage points, between the pre-FR period and the post-FR

[4] As reported by Levinson (1998), a petition signed by 1100 economists in the New-York Times (2/3/1997) states: "To keep the budget balanced (in US states) would aggravate recessions".

period, while non-FRers countries improve their fiscal policy responsiveness by 0.043 percentage points only, between the pre-FR period and the post-FR period.[5] This correlation displays a net improvement of fiscal responsiveness of 0.194 percentage points, due to FR implementation. Unfortunately, we can't conclude of a causal impact of FRs on fiscal policy responsiveness due to the self-selection problem and the omitted unobserved factor bias detailed hereafter. In the paper closest to ours, Combes et al. (2014) found that FRs dampen the impact of public debt burden on the implementation of countercyclical fiscal policy in OECD countries and emerging economies.

Employing propensity score matching methods and instrumental methods within a sample of 126 countries over the period 1985-2010, we find evidence that FR adoption (considered as a *treatment* during the rest of the article) strongly reduce procyclical behavior of fiscal policy. In other words, in time of economic booms, FR adoption ensure improvements in governments budget balances. Moreover, our results indicate that FR adoption does not foster countercyclical fiscal policy in time of economic bust (i.e. FR adoption does not exacerbate budget deficits during recessions). As illustrated by Graphic 2.a and Graphic 3.a (see Appendix a), upswings in budget balances and primary budget balances are observed for three chosen countries, of all levels of development, which adopted national FRs (Canada, Costa-Rica and Namibia), and two monetary unions, which adopted supranational FRs (Economic Community of African Central States and European Union), between the pre-FR period and the post-FR period.[6] This paper also find that FRs have different impact on fiscal policy responsiveness, depending on their targets, since sustainability rules and flexible rules exert a strong and significant impact on fiscal policy responsiveness upgrading, while FRs targeting government expenditures doesn't exert a significant impact. Furthermore, the coverage of FRs (i.e. national rules or supranational rules) is not a critical issue to strength against procyclicality of fiscal policy. Finally, we find that FRs are effective even in a context of historical weakness of *stability culture*, which is actually the case in a significant number of emerging countries and low income economies.

[5] Regarding non-FRers, we define the cut-off as the mid-year of the period running from the first adoption of FR (Japan adopted FR in 1947, but our sample begin in 1985, this latter becomes therefore the starting date of FR for Japan) and the ending date in our sample (2010), that is 1998.

[6] We choose three countries of all levels of development which adopting national FRs around 1998, the mid-year of the period 1985-2010 (Canada: 1998 ; Costa-Rica: 2001 ; Namibia: 2001). We can't analyze the evolution of fiscal discipline for the Western African Economic and Monetary Union (WAEMU), since we don't have any observation for primary budget balance over GDP before FRs adoption. Concerning figures for European Union, we deal with the twelve signatory countries of the Maastricht treaty in 1992.

To our own known, this paper is the very first to assess the impact of FRs on fiscal policy responsiveness on a wide sample of countries, when taking into account, at the same time, the self-selection problem and the omitted factor bias of *stability culture*. We provide significant evidence of the effectiveness of FR adoption to struggle fiscal policy procyclicality. Our findings are robust (i) when using alternative measures of fiscal policy responsiveness, (ii) when considering alternative adoption date, and (iii) when estimating alternative propensity score.

The paper is organized as follows. Section 2 consider the dataset and describes the econometric methodology. Section 3 displays empirical results, while section 4 briefly concludes and draws some policy recommendations.

2. Data and methodology

2.1. Data

Our data consists of 126 countries, over the period 1985-2010, due to information availability on FRs. On this sample 67 countries are FRers. Among this countries, 25 are advanced economies, 24 are emerging economies, and 18 are low-income countries.[7] The 59 non-FRers countries are used as control group. All treated countries and control countries are listed in Table 1.b (see Appendix b). The panel is unbalanced because of missing observations. FRs starting dates are taken from the revised version of the Fiscal Rule Dataset (Budina et al., 2012) published by the IMF's Fiscal Affairs Department, which include information about national and supranational fiscal rules across the Fund membership. In the econometric analysis, FR is a binary variable equaling one, if in a given country, in a given year a FR is implemented for at least five years, over the period 1985-2010.[8] We also consider the nature of FR in place, in terms of targeting, flexibility, coverage, and combination. All details concerning the nature of FRs and their adopting dates are given in Table 2.b (see Appendix b).

Following Aghion and Marinescu (2008), we estimate the cyclicality of fiscal policy as:

$$FP_{it} = \alpha_{it} + \beta_{it} OG_{it} + \varepsilon_{it,} \quad (1)$$

where $\varepsilon_{it\rightarrow} N\left(0, \frac{\sigma^2}{w_t(\tau)}\right)$ and $w_t(\tau) = \frac{1}{\sigma\sqrt{2\pi}} \exp(-\frac{(\tau-t)}{2\sigma^2})$.

[7] Income categories refers to Budina et al. (2012) classification.
[8] Our results are robust when we take into account countries which adopt FR for less than five years.

FP_{it} is the measure of fiscal policy, captured by the budget balance over GDP, OG_{it} is the output gap and ε_{it} is the error term. The budget balance ratio is used for benchmark results instead of the primary budget balance ratio, since we loss about 33% of total observations with the latter indicator.[9] The output gap is calculated as the difference between the logarithm of real GDP and the logarithm of a Hodrick-Prescott filtered trend of real GDP (with 100 as smoothing parameter). [10] The coefficient of interest, β_{it} show that fiscal policy is coutercyclical (procyclical) if $\beta_{it} > 0\ (< 0)$, while acyclical otherwise. Using the Local Gaussian Weighted Ordinary Least Squares (LGWOLS), we compute the β_{it} coefficients using all available observations for each country i at each date t, with observations weighted by a Gaussian centered at the considered date t (with 5 as value for σ, as used by Aghion and Marinescu, 2008).

2.2. Methodology

We consider FRs adoption as a *treatment* just as in Tapsoba (2012), inspired by microeconometrics impact evaluation. For us, FRers countries are the treated group, while non-FRers countries are the control group. So, we calculate the Average Treatment effect of the Treated (ATT, hereafter), which is the average effect of being FRer on fiscal policy responsiveness:

$$ATT = E[(\beta_{i1} - \beta_{i0})|FR_i = 1] = E[\beta_{i1}|FR_i = 1] - E[\beta_{i0}|FR_i = 1], \quad (2)$$

where FR_i is the Fiscal Rule dummy in country i. β_{i1} is the fiscal policy cyclicality (and more generally the value of outcome variable) when country i has adopted the FR and β_{i0} if not. In other words, $\beta_{i0}|FR_i = 1$ is the fiscal policy cyclicality that would have been observed if a FRer country had not adopted fiscal rule policy, while $\beta_{i1}|FR_i = 1$ is the actual fiscal policy cyclicality which is observed on the same country. This equation would imply that the average fiscal policy cyclicality that a FRer country would have if it had not adopted FR is the best counterfactual. However, such a counterfactual is not observable, due to the identification problem.

We just can't compare the sample mean fiscal policy responsiveness between the treated group and the control group because FR adoption is probably non-random, as FR is certainly correlated with observable variables that affects fiscal policy cyclicality, leading to the self-

[9] Note that our main findings remains qualitatively unchanged when we use the primary budget balance ratio.
[10] Note that our main findings remains qualitatively unchanged when we use 6.25 as smoothing parameter, as recommended by Ravn and Uhlig (2002).

selection problem, which can biased estimates of the ATT. So, we use alternative propensity score matching (PSM, hereafter) methods to deal with self-selection bias. With PSM we retain as a control group all countries similar to FRers in terms of observed characteristics which affects simultaneously FR adoption and fiscal policy cyclicality. Consequently, the difference between cyclicality in FRers countries ($Cycl._0$) and cyclicality between matched counterfactual ($Cycl._1$) is attributable to the treatment. To use PSM we need to assume conditional independence, i.e. $Cycl._0, Cycl._1 \perp FR|X$, which requires for, conditional on observables X, the outcomes $Cycl._0$ and $Cycl._1$ to be independent of the treatment. Under this assumption, Equation above can be rewritten as:

$$ATT = E[\beta_{i1}|FR_i = 1, X_i] - E[\beta_{i0}|FR_i = 0, X_i], \quad (3)$$

where $E[\beta_{i0}|FR_i = 0, X_i]$ is now observable. Yet, as the number of covariates (X) increases, such a matching would be difficult to implement in practice. To skirt the high dimension problem, we use propensity score instead of X, following Rosenbaum and Rubin (1983). Propensity score is the probability of adopting FR, conditionally to X:

$$p(X_i) = E[FR_i|X_i] = Pr(FR_i = 1|X_i). \quad (4)$$

Under the common support assumption (i.e. $p(X_i) < 1$), requiring the existence of some comparable control units for each treated unit, we estimate ATT as:[11]

$$ATT = E[Y_{i1}|FR_i = 1, p(X_i)] - E[Y_{i0}|FR_i = 0, p(X_i)]. \quad (5)$$

Following Tapsoba (2012), we use four traditional PSM methods. First, the *nearest-neighbor* matching with replacement matches each treated unit to the n control units having the closest propensity score (we consider n=1, n=2 and n=3). The second method is *radius* matching, which matches a treated unit to the control units with estimated propensity scores falling within a radius (or "caliper") r (we consider a wide radius r=0.10, a medium radius r=0.05 and a small radius r=0.03). The third method is the *regression-adjusted local linear* matching of Heckman et al. (1998), which consists of matching covariates-adjusted outcome for the treated group with the corresponding covariates-adjusted outcomes for the control group, using local linear regression weights. Finally, *kernel* matching method matches a treated unit to all control units weighted proportionally by their closeness in terms to propensity scores, to the treated unit. As the matching method estimator has no analytical variance, we compute

[11] We systematically employ the common support option, which exclude all treated countries whose propensity score is higher than the maximum, or lesser than the minimum propensity score of the untreated countries.

standard errors by bootstrapping (i.e. by re-sampling observations of the control group), following Dehejia and Wahba (2002).

3. Results

3.1. Estimating the propensity scores

We estimate the propensity scores using a probit model with FRs binary variable as the dependant variable.[12] Our baseline selection equation includes past discretionary fiscal policy, the logarithm of real GDP per capita, the logarithm of government expenditure ratio, the logarithm of natural rents ratio, and some political variables, such as democracy degree, federal states forms, majoritarian electoral rules, presidential forms of governments and member of currency union status.

FRs are expected to be more likely approved in a rugged fiscal context because they're based on the principle of public credibility concerning government announcement on fiscal policy objectives (Budina et al., 2012; Calderón and Schmidt-Hebel, 2008; IMF, 2009). So we anticipate a negative correlation between the likelihood of FRs adoption and lagged discretionary fiscal policy.[13] FRs are also more likely to be adopt in countries with favorable macroeconomic situation, (Budina et al., 2012; IMF, 2009) due to the economical and political implementation costs of such a reform. Accordingly, we expect a positive correlation between the probability of adopting FRs and the logarithm of real GDP per capita. Countries with higher state size are more prone to adopt FRs to dampen the "common-pool" problem, since a lot of public spending is targeted to specific groups of voters, while it is financed by all voters (Alesina and Perotti, 1998 ; Von Hagen, 2005). As a result, we expect a positive correlation between the probability of FRs adoption and government expenditure ratio. Rich-endowed countries in natural resources are more likely to choose FRs, due to the so-called "natural-resource curse", which may directly rise growth at the price of deeper volatility (Poelhekeand and Van der Ploeg, 2007). Again, the expected sign on the coefficient of natural rents ratio is positive.

Concerning political factors, we assume a positive connection between the probability of adopting FRs and the democracy degree. Recall that higher democracy degree imply more clearly defined constraints on executive, but also broader inclusion of citizens in the political

[12] All results remains unchanged when we use a logit model, confirming the adequacy of the assumption about normality of the probit model.

[13] In line with Fatás and Mihov (2003; 2006), discretionary fiscal policy refers to any modification in fiscal policy which is not justify by economic conditions. The measurement is detailed in Appendix d.

decision making process (Acemoglu et al., 2003 ; Gerring et al., 2005; Lijphart, 2012).[14] Naturally it imply a reinforcement in the commitment of political leaders to "tying their hands" with FRs, to dampen the consequences of polarized social preferences (Talvi and Végh, 2005; Woo, 2009), but also conflicts of interest between political parties (Alesina and Tabellini, 1990), the agency problem between voters and politicians (Alesina et al., 2008; Von Hagen, 2005) ; and the previously analyzed "common-pool" problem (Alesina and Perotti, 1995; Von Hagen, 2005).

The expected sign on federal states forms is ambiguous *a priori*. On the one hand, federalism imply strong vertical separation of power (Gerring et al., 2005) and so a strong willingness for local jurisdiction to minimize the economical (and political) trespassing of the federal state (Huber et al., 1993; Swank, 2002). Under this perspective, FRs can be view as an effective tool to steers the economical weight of the federal state. On the other hand, federal states forms may suffers from a coordination problem to take decisions at national level (Gerring et al., 2007).

The expected sign on majoritarian electoral system is also ambiguous *a priori*. Indeed, majoritarian electoral rules implied lower probability of coalition government formation (Austen-Smith and Banks, 2000).[15] So, majoritarian rules not acting in favor of a commitment between political parties to "tying their hands" with FRs, except for FRs targeting debt (or debt rules) since political leaders have some interest to avoid the consequences of strategic utilization of debt by the opposition (Alesina and Tabellini, 1990).

Presidential forms of governments are expected to have a positive impact on FRs adoption. In fact presidential regimes imply a strong horizontal separation of power (Lijphart, 2012; Gerring et al., 2005) and so a strong willingness for each political parties to "tying their hands" with FRs, since it meets the need to predict behavior of executive leader (Henisz, 2000; 2002), whose position is secure from the confidence vote by the opposition.

Finally, we anticipate a positive correlation between the member of currency union status and FRs adoption. Indeed, in monetary unions FRs are approved at a supranational level, in order to prevent state to over-borrowing and demanding a bailout to central bank (Eichengreen and Von Hagen, 1996), but also to overturning Mundell's trade-off between transaction costs and

[14] We take into account the instability of political regimes through democracy degree since it include revolutions and *coups d'État.*

[15] We take into account government fragmentation through electoral system, since majoritarian electoral rules tend to favor concentration of power in a two-party system (see Duverger's law).

stabilization policy (Cooper and Kempf, 2004). Otherwise the presence of supranational rules may encourage the adoption of national rules (Debrun et al., 2008 ; IMF, 2009).[16]

Table 1.c (see Appendix c) exhibit the probit estimates of propensity scores. Almost all coefficient are significant with the expected signs. Lagged discretionary fiscal policy is negatively correlated with FRs adoption, while the real GDP per capita, natural resource endowment, democracy degree and member of currency union status are always positively and significantly associated with the probability of adopting FRs.[17]

Otherwise, presidential forms of governments are positively link to FRs adoption and especially expenditure rules, while majoritarian electoral system and state size are positively correlated with debt rules adoption (and expenditure rules adoption regarding state size), but negatively (or unsignificantly) associated with other forms of FRs adoption. Finally federal state forms are negatively (or unsignificantly) associated with any forms of FRs adoption, except for FRs associated with well-defined escape clause.

3.2. Results from matching on propensity scores

In accordance with first assessments, results from PSM methods displays the positive and causal impact of FRs adoption on fiscal policy responsiveness. So, when we take into account self-selection problem, FRs remains effective to struggle fiscal procyclicality through improvements in fiscal policy responsiveness by 0.134 percentage points and 0.156 percentage points. Our findings are in accordance with Combes et al. (2014). To verify the adequacy of the control group, we check the standardized bias on observables after matching (see Table 1, hereafter). It systematically under 5%, as recommended by Rosenbaum and Rubin (1985).

Our results are extremely robust to several sensitivity checks. Firstly, we replace the budget balance ratio over GDP by the primary budget balance ratio over GDP as a measure of fiscal policy, when calculating the fiscal policy cyclicality. Secondly, we use a smoothing parameter equaling 6.25 for Hodrick-Prescott filtered trend of real GDP, when calculating the fiscal policy cyclicality. Thirdly, we consider the last year of major addition or subsequent change for the FRs as alternative starting date for FRs adoption, with information obtained from the Fiscal Rule Dataset (Budina et al., 2012). Finally, we estimated propensity scores, by

[16] Budina et al. (2012) displays that supranational rules are not yet completed by national rules for the majority of currency union members.

[17] Note that member of currency union status is positively associated with supranational FRs adoption, but negatively associated with national FRs adoption.

replacing the lagged value of discretionary fiscal policy by the lagged value of macroeconomic volatility, calculated as the standard deviation of the growth rate of real GDP.

Furthermore, we find that FR adoption exert an impact on fiscal policy responsiveness, which is conditional to economic health. On the one hand, during periods of expansion, we find that FR adoption have a positive and significant impact on fiscal policy responsiveness. It means that FR adoption ensure improvements in governments budget balances during time of economic boom. On the other hand, during periods of recession, we show that FR adoption have a negative, but insignificant, impact on fiscal policy responsiveness. It means that the presence of FR in the country does not exacerbate budget deficits during time of economic bust.

Finally, when calculating the ATT impact of FRs adoption, we distinguish FRs according to their different classification. Regarding basic rules, we take into account FRs by their targeting, namely the budget balance rules, the debt rules and the expenditure rules.[18] Regarding flexible rules, we take into account the cyclically-adjusted balance rules, the golden rules (i.e. a rule which exclude public investments or other priority items from ceiling) and rules allowing escape clause in their implementation. Regarding the coverage of FRs, we distinguish FRs adopted at a national level, from FRs adopted at a supranational level, in currency unions. Regarding the combination of rules, we take into account the combination of the budget balance rules with debt rules, since it's the most common combination of FRs over the period 1985-2010. We find that almost all kind of FRs improve significantly fiscal policy responsiveness, except expenditure rules, which have a negative or unsignificant impact on fiscal policy responsiveness. Which imply the importance of the targeting when countries adopting FRs to strength against procyclicality.

3.2.1. Benchmark results

In Table 1 (hereafter) , the 1st line reports the estimated ATT of FRs adoption on fiscal policy responsiveness. The estimated ATT is systematically positive and significant. The amplitude of the estimated ATT ranges from 0.134 (0.03-radius matching) to 0.156 (1-nearest-neighbor matching), suggesting that on average, FRs adoption upgrade fiscal policy responsiveness by 0.134 percentage points and 0.156 percentage points, respectively. So, contrary to Lane (2003) and Levinson (1998) we provide some evidence that stronger constraints on fiscal

[18] We don't take into account the revenue rule since only seven countries have adopted such a rule over 1985-2010, namely Australia, Belgium, Brazil, Denmark, France, Kenya and Netherlands.

policy leads to less procyclical fiscal policy. This impact could be due to the disciplinary impact of FRs on fiscal policy, or due to the fact that FRs smooth business cycles.

Note that the estimated impact of FRs adoption obtained from PSM is not so far to the correlation of 0.194 percentage points improvements for fiscal policy responsiveness, obtained from the Graphic 1.a (see Appendix a). Our findings are extremely robust to the different matching methods, in terms of statistical significance and magnitude of coefficients. The average and median bias on observables after matching are always under the threshold of 5% defined by Rosenbaum and Rubin (1985).

The 2nd section of Table 1 displays the estimated ATT for the sensitivity checks. Our main findings are robust in terms of magnitude, to several modifications in the calculation of fiscal policy cyclicality (see line [a] and line [b]). Our results are also robust in terms of magnitude and statistical significance when we consider alternative (or *conservative*) adopting date for FRs (see line [c]). Finally, the results are also robust in terms of magnitude and statistical significance, when we estimated propensity scores by replacing our measure of discretionary fiscal policy with macroeconomic volatility.

3.2.2. Economic cycle

The 3rd section of Table 1 displays the estimated ATT of FRs adoption on fiscal policy responsiveness, depending on the position in the business cycle. During time of economic boom (see line [a]), FRs adoption enhances fiscal policy responsiveness among 0.271 percentage points (0.10-radius matching) and 0.358 percentage points (2 and 3-nearest-neighbor matching). In other words, FRs adoption is effective to reinforce fiscal consolidation in periods of expansion. The line [b] displays the estimated ATT during time of economic bust. Irrespective of the matching method, the estimated ATT is negative and statistically unsignificant. In other words, FRs adoption exert an asymmetrical impact on fiscal policy procyclicality, since it increase budget balance during periods of expansion, while it doesn't exacerbate budget deficits during periods of recession. To our own know, these findings are totally new and demonstrate that the FRs impact on fiscal performance is conditional to economic performance, and show that FRs adoption is not necessarily detrimental for global well-being during recessions, since it doesn't have any significant impact on fiscal policy responsiveness during these times.

3.2.3. The Nature of fiscal rule in place

The 4th section of Table 1 displays the estimated ATT for basic rules adoption (panel A), for flexible rules adoption (panel B), for FRs adoption, regarding their coverage (panel C) and for the adoption of combination of FRs (panel D). According to panel A, budget balance rule adoption and debt rule adoption have a positive and significant impact on fiscal policy responsiveness (see line [a] and line [b]) while expenditure rule adoption have a negative or unsignificant impact on fiscal policy responsiveness (see line [c]). In other words, the targeting is a critical issue for governments when they adopt FRs to struggle procyclicality; while budget balance rules and deficit rules are closely link to fiscal policy sustainability, expenditure rules are indirectly link to fiscal policy sustainability since they're more effective to steers the size of governments (Budina et al., 2012).

Furthermore, in panel B, the estimated ATT associated to the three forms of flexible rules are positive and statistically significant, irrespective to the matching method employed (see lines [a], [b] and [c]). In terms of impact magnitude, cyclically-adjusted balance rules appears to be more effective than golden rules or rules implemented with escape clauses to strength against procyclicality. Indeed, cyclically-adjusted balances rule adoption improve fiscal policy responsiveness by 0.336 percentage points (local linear matching) and 0.422 percentage points (1-nearest neighbor matching), whereas golden rule adoption enhance fiscal policy responsiveness by 0.223 percentage points (3-nearest neighbor matching) and 0.253 percentage points (2-nearest neigbhor matching) and rule with escape clause adoption upgrade fiscal policy responsiveness by 0.194 percentage points (3-nearest neighbor matching) and 0.218 percentage points (0.10-radius matching). The fact is that cyclically-adjusted balance rules are closely link to fiscal policy sustainability and accounts for economic shocks (Budina et al., 2012). However, cyclically-adjusted balance rules are relatively difficult to monitor since the correction for cycles is non operational without adequate statistical institution in place.

Moreover, panel C displays the estimated ATT for FRs adopted at a national level and at supranational level and show very interesting results (see line [a] and line [b]). Both national and supranational rules adoption enhances fiscal policy responsiveness. In other words, the coverage of FRs is not a critical issue to strength against procyclicality. In terms of impact magnitude, supranational rules upgrade fiscal responsiveness by 0.197 percentage points (0.05-radius matching) and 0.241 percentage points (2-nearest neighbor matching), while

national rules enhances fiscal policy responsiveness by 11.8 percentage points (0.10-radius matching) and 16.8 percentage points (0.05-radius matching).

Table 1.: FRs and Fiscal Policy Responsiveness

Dependant Variable : Fiscal Policy Responsiveness	nearest-neighbor matching			radius matching			local linear regression matching	kernel matching
	n= 1	n= 2	n= 3	r= 0.03	r= 0.05	r= 0.10		
[1]	**0.156*** [0.051]**	**0.151*** [0.047]**	**0.146*** [0.046]**	**0.134*** [0.040]**	**0.141*** [0.036]**	**0.155*** [0.037]**	**0.152*** [0.040]**	**0.140*** [0.035]**
Number of treated obs.	730	730	730	730	730	730	730	730
Number of control obs.	1,474	1,474	1,474	1,474	1,474	1,474	1,474	1,474
Total observations	2,204	2,204	2,204	2,204	2,204	2,204	2,204	2,204
Average Bias After Matching (%)	4.8	4.8	4.1	3.7	3.5	4.4	4.8	3.6
Median Bias After Matching (%)	2.7	3.3	2.0	1.8	1.7	2.3	2.7	1.8
[2] Sensitivity Checks								
[a] Alternative fiscal policy measurement	0.140** [0.062]	0.144** [0.059]	0.136** [0.061]	0.123** [0.054]	0.112** [0.053]	0.093* [0.049]	0.131** [0.058]	0.113** [0.055]
[b] Alternative output gap measurement	0.139* [0.082]	0.111 [0.078]	0.119* [0.071]	0.101* [0.061]	0.109* [0.064]	0.125** [0.061]	0.127** [0.063]	0.109* [0.060]
[c] Alternative FRs adopting date	0.122*** [0.046]	0.075* [0.043]	0.083** [0.042]	0.097*** [0.035]	0.101*** [0.035]	0.123*** [0.034]	0.106*** [0.036]	0.101*** [0.035]
[d] Alternative propensity score estimated	0.075* [0.043]	0.085** [0.038]	0.097*** [0.038]	0.107*** [0.033]	0.125*** [0.033]	0.161*** [0.031]	0.088** [0.036]	0.121*** [0.037]
[3] Economic Cycle								
[a] Expansion	0.327*** [0.087]	0.358*** [0.081]	0.358*** [0.084]	0.334*** [0.073]	0.311*** [0.071]	0.271*** [0.072]	0.339*** [0.071]	0.319*** [0.072]
[b] Recession	-0.022 [0.066]	-0.023 [0.063]	-0.036 [0.066]	-0.030 [0.055]	-0.035 [0.057]	-0.027 [0.058]	-0.046 [0.059]	-0.034 [0.060]
[4] Nature of Fiscal Rules in place								
Panel A: Basic Rules								
[a] Budget balance rule	0.178*** [0.055]	0.191*** [0.052]	0.217*** [0.050]	0.189*** [0.044]	0.181*** [0.042]	0.183*** [0.041]	0.213*** [0.047]	0.182*** [0.041]
[b] Debt rule	0.209*** [0.051]	0.189*** [0.049]	0.197*** [0.049]	0.179*** [0.042]	0.174*** [0.042]	0.181*** [0.042]	0.189*** [0.046]	0.175*** [0.045]
[c] Expenditure rule	-0.076 [0.076]	-0.042 [0.070]	-0.058 [0.063]	-0.087 [0.054]	-0.090* [0.054]	-0.072 [0.054]	-0.110* [0.049]	-0.088* [0.052]
Panel B: Flexible Rules								
[a] Cyclically-adjusted balance rule	0.422*** [0.105]	0.386*** [0.108]	0.377*** [0.108]	0.369*** [0.087]	0.401*** [0.090]	0.408*** [0.082]	0.336*** [0.082]	0.393*** [0.080]
[b] Golden rule	0.235*** [0.063]	0.253*** [0.064]	0.223*** [0.061]	0.237*** [0.048]	0.240*** [0.052]	0.250*** [0.048]	0.250*** [0.048]	0.246*** [0.048]
[c] Rule with escape clause	0.205*** [0.074]	0.215*** [0.068]	0.194*** [0.066]	0.198*** [0.060]	0.202*** [0.057]	0.218*** [0.058]	0.205*** [0.056]	0.202*** [0.058]
Panel C: Coverage of Rules								
[a] National rule	0.151*** [0.057]	0.127*** [0.056]	0.119** [0.051]	0.124*** [0.037]	0.132*** [0.036]	0.168*** [0.037]	0.118*** [0.040]	0.130*** [0.039]
[b] Supranational rule	0.221*** [0.067]	0.234*** [0.060]	0.241*** [0.061]	0.207*** [0.053]	0.197*** [0.053]	0.219*** [0.042]	0.229*** [0.058]	0.202*** [0.053]
Panel D: Combination of Rules								
[a] Sustainability rules	0.246*** [0.065]	0.210*** [0.060]	0.203*** [0.058]	0.199*** [0.050]	0.181*** [0.044]	0.190*** [0.046]	0.210*** [0.046]	0.185*** [0.048]

Note: bootstrapped standard errors (via 500 replications) in brackets.
***: significant at 1%; **: significant at 5%; *: significant at 10%.

These empirical findings are surprising because supranational rules suffers from a problem of insufficient enforcement and compliance, with, as consequences, frequently non-sanctioned violations by currency union member countries (Prakash and Cabezon, 2008). Having said that, supranational rules are systematically targeting budget balance ratio or debt ratio, while some national rules are targeting expenditure (or revenue) ratio.

Finally, in panel D, the estimated ATT of the simultaneous adoption of budget balance rules and debt rules appears to be positive and statistically significant (see line [a]). Indeed the adoption of the two sustainability rules improve fiscal responsiveness by 0.181 percentage points (0.05-radius matching) and 0.246 percentage points (1-nearest neighbor matching). In terms of impact magnitude, we notice that the adoption of a combination of rules slightly reinforce the impact of FRs adoption on fiscal policy responsiveness (see line [a] and line [b], in panel A).

We provide strong evidence that FRs adoption reduce procyclical behavior of fiscal policy, by taking into account self-selection problem with PSM methods. Moreover, we found that FRs adoption would consolidate budget balance in time of economic boom, while it doesn't exacerbate budget deficits during time of economic bust. Furthermore, we find that FRs targeting is a critical issue when governments aimed to struggle fiscal procyclicality, while FRs coverage is not a critical issue. Finally, we provide empirical evidences about the positive impact of flexible rules adoption, and of the adoption of the most widespread combination of FRs worldwide (i.e. the budget balance rule and the debt rule).

3.3. Results from instrumentation

A growing literature relative to the macroeconomic impact of FRs focus on the national *stability culture*, which may overestimate the positive effects of explicit constraints on fiscal targets (see Heinemann et al., 2014, for a literature review). Indeed, the *stability culture* is fundamentally an unobserved factor which is not well captured by PSM methods and might induce an upper omitted unobserved factor bias of FRs impact, since these latter may just mirror fiscal preferences of politicians and voters. Having said that, *stability culture* may be approximate by past inflation rates (Heinemann et al., 2014), fiscal preferences of political parties (Benoit and Laver, 2006), strength of governments (Heinemann et al., 2014; Woldendorp et al., 2000), population trust (Alesina and Drazen, 1991; Heinemann et al., 2014; Roubini and Sachs, 1989), but also by opinion surveys (Bohn and Inman, 1996; Heinemann and Hennighausen, 2012; Stix, 2013), referendum results (Dafflon and Pujol,

2001; Pujol and Weber, 2003), or lexicometry on politicians speeches (Pujol, 2009). Except to past inflation rates, proxies of *stability culture* are available for a limited number of countries, namely the United States and Western Europe. Moreover, some proxies of stability culture, such as fiscal preferences of parties, population trust, opinion surveys, or referendum results are irrelevant to capture *stability culture* in authoritarian countries. So, in order to take into account the potential impact of *stability culture* on procyclicality in our wide sample of countries we are instrumenting FRs adoption by its lag value and an indicator of FRs spread, which vary across time:

$$spread_{it} = \sum_{j=1}^{N-1}(FR_{jt} * \frac{GDP_{jt}}{\sum_{i=1}^{N} GDP_t}), \quad (6)$$

where FR_{jt} indicate if the country j have adopted or not an FR at year t and $\frac{Gdp_{jt}}{\sum_{i=1}^{N} GDP_t}$ is the economic weight of country j at year t. The underlying idea is that FRs are more likely to be adopted in country i when more countries decide to adopt FRs, especially if they have a strong economic influence worldwide. Theoretically, the exclusion restriction is likely to be satisfied, since the adoption of FRs in other countries don't have any impact on national fiscal performance. We check our instrumentation strategy by using the 2SLS estimator in a linear model, while controlling for indicators previously used for the PSM methods:

$$FP_{it} = \gamma + \delta FR_{it} + X_{it} + \vartheta_l + \mu_t + \epsilon_{it}, \quad (7)$$

where X_{it} is the vector of controlling variables used for the estimation of propensity scores, ϑ_l is a continent specific effect and μ_ta time specific effect.[19] ϵ_{it} is the stochastic disturbance term. We don't use the Difference GMM estimator or the System GMM estimator, since they encounter overfit problem with long *T* panels (Bowsher, 2002; Roodman, 2009).

Results from linear estimations are displayed in Table 2 (hereafter). Overidentification tests doesn't reject the validity of the exclusion condition.[20] Furthermore, the damping impact of FRs adoption on fiscal procyclicality is systematically higher when we control for the omitted unobserved factor bias. Precisely, FRs adoption upgrade fiscal policy responsiveness by 0.151 percentage points and 0.276 percentage points with OLS estimations, and improve fiscal policy responsiveness by 0.164 percentage points and 0.306 percentage points with 2SLS

[19] We don't introduce countries specific effects because the estimated covariance matrix of moment conditions is not of full rank, when we instrumenting.

[20] Note that the instrument of FR spread has a negative and significant impact on FRs adoption when we control for time dummies (i.e. common periodic shocks), and has a positive and significant impact on FRs adoption otherwise. These results are not surprising since time dummies are necessarily capturing the effect of FR spread on FRs adoption.

estimations. Our findings are in line with Heinemann et al. (2014); indeed, FRs must reinforce fiscal performance in countries with a historical lack of *stability culture*.

So, we find that FRs adoption reduce procyclical behavior of fiscal policy, by taking into account the omitted unobserved factor bias of *stability culture* with instrumental methods. Indeed, the impact of FRs on procyclicality reduction is reinforce when we instrument by lag value of FRs adoption and our constructed indicator of FRs spread. This may imply that FRs are effective even in a context of historical weakness of *stability culture*, which is actually the case in a significant number of emerging countries and low income economies.

Table 2: Linear Estimation of FRs Impact

VARIABLES	(1) ols	(2) 2sls	(3) ols	(4) 2sls	(5) ols	(6) 2sls	(7) ols	(8) 2sls	(9) ols	(10) 2sls
	Fiscal Policy Responsiveness									
Fiscal Rules Adoption	0.276***	0.306***	0.177**	0.211***	0.151*	0.181**	0.152**	0.183**	0.136	0.164*
	[0.0776]	[0.0801]	[0.0705]	[0.0769]	[0.0839]	[0.0904]	[0.0714]	[0.0780]	[0.0848]	[0.0916]
Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Continent Dummies	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Observations	2,265	2,239	2,239	2,239	2,239	2,239	2,239	2,239	2,239	2,239
Adjusted R2	0.038	-	0.187	-	0.183	-	0.208	-	0.204	-
lag Fiscal Rules Adoption (1st step Estimation)		0.958***		0.919***		0.915***		0.918***		0.914***
		[0.006]		[0.008]		[0.009]		[0.008]		[0.009]
Fiscal Rules Spread (1st step Estimation)		0.164**		0.116*		-6.549**		0.116*		-6.546**
		[0.073]		[0.069]		[2.774]		[0.068]		[2.758]
F-test (p-value)		0.000		0.000		0.000		0.000		0.000
Sargan/Hansen J stat. (p-value)		0.743		0.289		0.235		0.362		0.275

Note: clustered standard errors in brackets.
***: significant at 1%; **: significant at 5%; *: significant at 10%.

4. Conclusion

This article renews the old debate of *"rules versus. discretion"*, by introducing PSM methods in macro analysis, such as Tapsoba (2012), and by using instrumental methods. By taking into account the self-selection problem and the omitted unobserved factor bias of *stability culture* in a sample of 126 countries of all level of development over the period 1985-2010, we provide strong evidence about the positive causal effect of FRs adoption on the reduction of fiscal policy procyclicality.

We find that FRs adoption contributed to upgrade budget balance in periods of expansion, while it doesn't increase budget deficit in periods of recession. Furthermore, we show that the budget balance rules and the debt rules are more effective to dampen procyclicality than expenditure rules. We also provide evidence that the coverage of FRs is not a critical issue to strength against procyclicality. Empirical results also displays the positive impact of the adoption of flexible rules, but also the adoption of FRs combined to improve policy responsiveness. Finally, we find that FRs are effective even in a context of historical weakness of *stability culture*, which is actually the case in a significant number of emerging countries and low income economies. This positive impact of FRs adoption on fiscal policy cyclicality comes from an improvement of fiscal policy disciplinary, by ensuring a sustainable path of deficit and debt (Tapsoba, 2012; Combes et al., 2014), or by smoothing business cycles (Fatás and Mihov, 2006).

In terms of policy recommendations, FRs adoption is an effective reform to improving the control on fiscal policy. The targeting of FRs is a critical issue for governments when they strength against procyclicality, while the coverage of FRs isn't. However, the simple adoption of FRs is clearly not sufficient to guarantee fiscal policy countercyclicality, since they must be accompanied by enforcement mechanisms, transparency improvements in fiscal procedures, and by independent fiscal institutions, such as fiscal councils.

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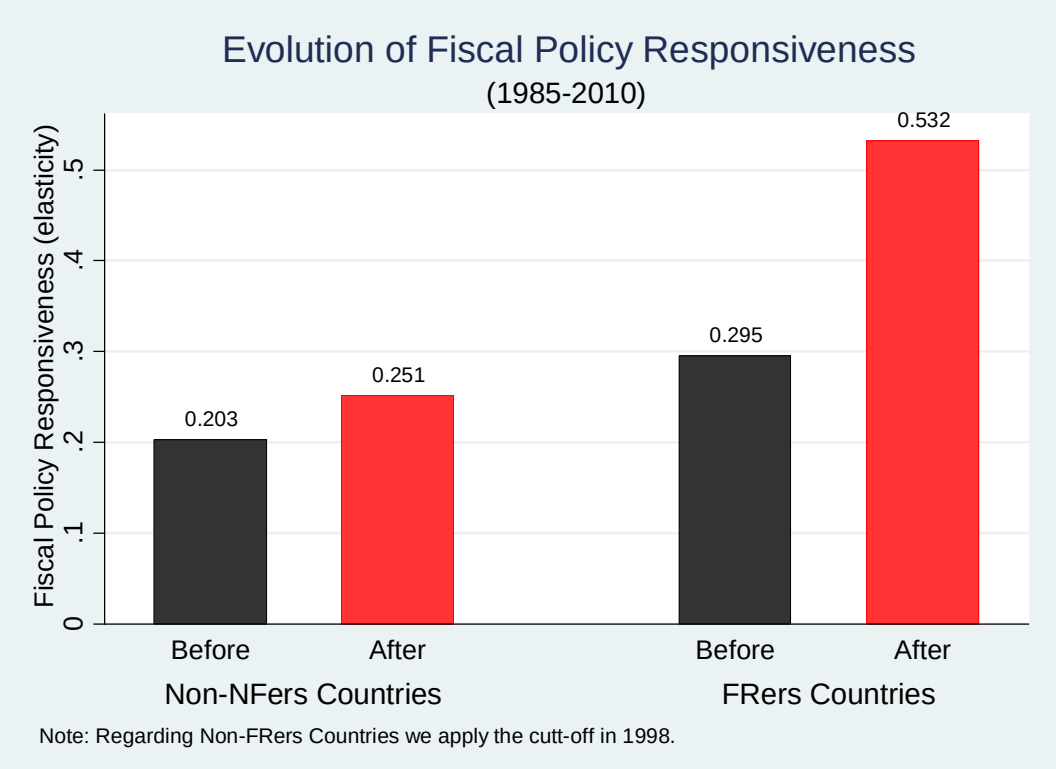
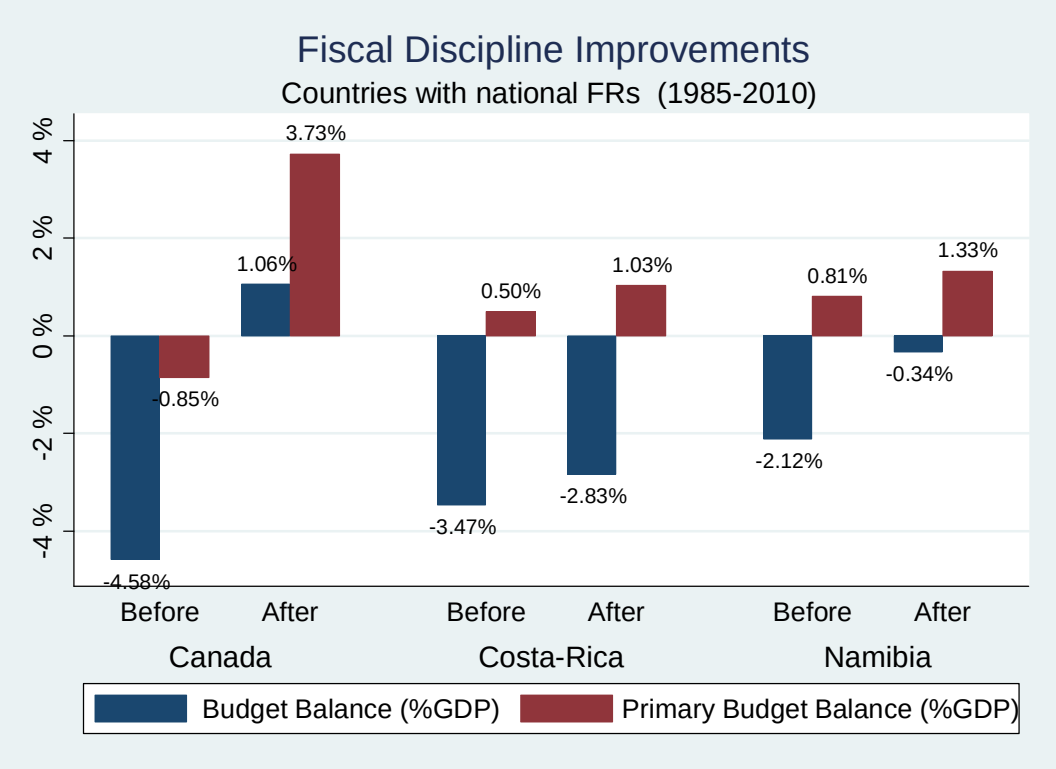
Appendix a.

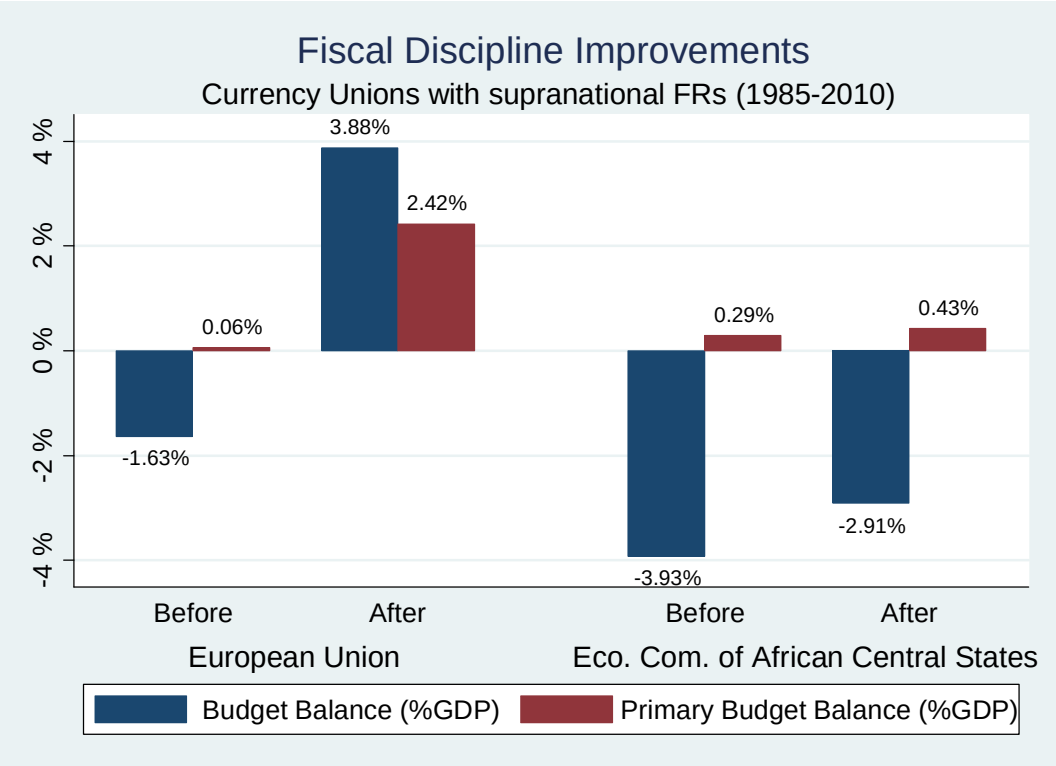
Graphic 1.a.



Graphic 2.a.


Fiscal Discipline Improvements
Countries with national FRs (1985-2010)
4 %
2 %
0 %
-2 %
-4 %
3.73%
1.06%
-0.85%
-4.58%
0.50%
1.03%
-3.47%
-2.83%
0.81%
1.33%
-2.12%
-0.34%
Before
After
Before
After
Before
After
Canada
Costa-Rica
Namibia
Budget Balance (%GDP)
Primary Budget Balance (%GDP)

Graphic 3.a.


Fiscal Discipline Improvements
Currency Unions with supranational FRs (1985-2010)
4 %
2 %
0 %
-2 %
-4 %
3.88%
2.42%
0.06%
-1.63%
0.29%
0.43%
-2.91%
-3.93%
Before
After
Before
After
European Union
Eco. Com. of African Central States
Budget Balance (%GDP)
Primary Budget Balance (%GDP)

Appendix b.

Table 1.b.: Sample

Whole Sample				
FRers			Non-FRers	
Antigua and Barbuda [2]	Guinea-Bissau [1]	St. Lucia [2]	Albania	Malaysia
Argentina [2]	Hong Kong SAR. China [3]	St. Vincent and the Grenadines [2]	Algeria	Mauritania
Australia [3]	Hungary [2]	Sweden [3]	Bahamas. The	Mongolia
Austria [3]	Iceland [3]	Switzerland [3]	Bahrain	Morocco
Belgium [3]	India [2]	Togo [1]	Bangladesh	Mozambique
Benin [1]	Indonesia [2]	United Kingdom [3]	Barbados	Nepal
Botswana [2]	Israel [3]	United States [3]	Belize	Nicaragua
Brazil [2]	Italy [3]		Bhutan	Oman
Bulgaria [2]	Japan [3]		Bolivia	Paraguay
Burkina Faso [1]	Kenya [1]		Brunei Darussalam	Philippines
Cameroon [1]	Latvia [2]		Burundi	Rwanda
Canada [3]	Luxembourg [3]		China	Saudi Arabia
Cape Verde [1]	Mali [1]		Comoros	Sierra Leone
Central African Republic [1]	Malta [2]		Dominican Republic	Singapore
Chad [1]	Mauritius [2]		Egypt. Arab Rep.	South Africa
Chile [2]	Mexico [2]		El Salvador	Sudan
Colombia [2]	Namibia [2]		Ethiopia	Suriname
Congo. Rep. [1]	Netherlands [3]		Fiji	Swaziland
Costa Rica [2]	New Zealand [3]		Gambia. The	Thailand
Cote d'Ivoire [1]	Niger [1]		Georgia	Tonga
Cyprus [3]	Nigeria [1]		Ghana	Trinidad and Tobago
Denmark [3]	Norway [3]		Guatemala	Tunisia
Dominica [1]	Pakistan [2]		Guyana	Turkey
Ecuador [2]	Panama [2]		Honduras	Uganda
Finland [3]	Peru [2]		Jordan	Uruguay
France [3]	Portugal [3]		Korea. Rep.	Vanuatu
Gabon [1]	Senegal [1]		Lesotho	Venezuela. RB
Germany [3]	Spain [3]		Liberia	Zambia
Greece [3]	Sri Lanka [2]		Madagascar	Zimbabwe
Grenada [1]	St. Kitts and Nevis [2]		Malawi	

Note: Income categories of FRers countries, in parenthesis, refers to Budina et al. (2012). [1]: Low Income Countries ; [2]: Emerging Countries ; [3]: Advanced Countries.

Adopting Date									
	Sustainability rules		Medium-lasting rules			Sustainability rules		Medium-lasting rules	
Countries	BBR	DR	ER	RR	Countries	BBR	DR	ER	RR
Antigua and Barbuda (Sup.)	1998 *(R)*	1998			India (G)	2004 *(R)*			
Argentina (EC)	2000 *(R)*		2000 *(R)*		Indonesia	1985 *(2004)*	2004		
Australia	1985 *(1998)*	1998	1985	1985	Israel (G)	1992 *(2010*)*		2005 *(2010*)*	
Austria (Sup. ; CA ; EC)	1995 *(1998)*	1995			Italy (Sup. ; EC)	1992	1992		
Belgium (Sup. ; EC)	1992	1992	1993 *(1998)*	1995 *(1999)*	Japan (G)	1947 *(1998)*	2006* *(2010*)*		
Benin (Sup. ; G ; EC)	2000	2000			Kenya		1997		1997
Botswana			2003		Latvia (Sup. ; EC)	2004	2004		
Brazil (G ; EC)		2000		2000	Luxembourg (Sup. ; G ; EC)		1990 *(2004*)*	1990	
Bulgaria (Sup. ; G)	2006	2003	2006 *(2010*)*		Mali (Sup. ; G ; EC)	2000	2000		
Burkina Faso (Sup. ; G ; EC)	2000	2000			Malta (Sup. ; EC)	2004	2004		
Cameroon (Sup. ; G)	2002 *(2008*)*	2002			Mauritius		2008*		
Canada	1998 *(2006)*	1998 *(2006)*	1998 *(2006)*		Mexico (EC)	2006 *(2009*)*			
Cape Verde	2002	2002			Namibia		2001		
Central African Republic (Sup. ; G)	2002 *(2008*)*	2002			Netherlands (Sup. ; G ; EC)	1992	1992	1994	1994
Chad (Sup. ; G)	2002 *(2008*)*	2002			New Zealand (G)	1994	1994		
Chile (CA)	2001 *(2010*)*				Niger (Sup ; G ; EC)	2000	2000		
Colombia	*2011**		2000		Nigeria	2007*			
Congo. Rep. (Sup. ; G)	2002 *(2008*)*	2002			Norway (CA)	2001			
Costa Rica (G)	2001				Pakistan (G ; EC)	2005	2005		
Cote d'Ivoire (Sup. ; G ; EC)	2000	2000			Panama (CA ; EC)	2002* (*2008**)	2002* (*2008**)		
Cyprus (Sup. ; EC)	2004	2004			Peru (EC)	2000 *(2003)*		2000 *(2003)*	
Denmark (Sup. ; CA ; G ; EC)	1992 *(2011*)*	1992	1994 *(2009*)*	2001 *(2012*)*	Portugal (Sup. ; EC)	1992	1992		
Dominica (Sup.)	1998 *(2006)*	1998			Senegal (Sup. ; G ; EC)	2000	2000		
Ecuador (G)	2003 *(2010*)*	2003 *(2010*)*			Spain (Sup. ; CA ; G ; EC)	1992 *(2006)*	1992	2011*	
Finland (Sup. ; CA ; G ; EC)	1995 *(2011*)*	1995 *(2011*)*	2003 *(2011*)*		Sri Lanka	2003	2003		
France (Sup. ; EC)	1992	1992	1998 *(2011*)*	2006 *(2011*)*	St. Kitts and Nevis (Sup.)	1998 *(R)*	1998		
Gabon (Sup. ; G)	2002 *(2008*)*	2002			St. Lucia (Sup.)	1998 *(R)*	1998		
Germany (Sup. ; CA ; G ; EC)	1985 *(2009*)*	1992	1985 *(2008*)*		St. Vincent and the Grenadines (Sup.)	1998 *(R)*	1998		
Greece (Sup. ; EC)	1992	1992			Sweden (Sup ; CA ; EC)	1995 *(2000)*	1995	1997	
Grenada (Sup.)	2000 *(2006)*	2000			Switzerland (CA ; EC)				
Guinea-Bissau (Supr. ; G ; EC)	2000	2000			Togo (Sup. ; G ; EC)	2000	2000		
Hong Kong SAR. China (G)	1997				United Kingdom	1992 *(2010*)*	1992 *(2010*)*		
Hungary (Sup. ; EC)	2004 *(2012*)*	2004 *(2012*)*	*2010**		United States (G)	1986*		1990 *(2011*)*	
Iceland			2004 *(R)*						

Note: Information on FRs adoption come from the Fiscal Rules Dataset (1985-2012). **BBR**: budget balance rule. **DR**: debt rule. **ER**: expenditure rule. **RR**: revenue rule. * means that we don't take into account the adoption date because the considered FR is implemented for less than 5 years in our sample (1985-2010). **Sup.** signals that country adopted a supranational FR. **CA** signals the presence of FRs targeting cyclically-adjusted balance or structural balance. **G** signals the presence of a "golden rules". **EC** signals that FRs has a well-defined escape clause. Year of last major change in FR implementation appears in parenthesis, while **R** stand for countries that repealed the rule during the time horizon.

Table 2.b.: FRs adopting date

Appendix c.

Table 1.c.: Estimating Propensity Scores (Full Sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Basic Rules			Flexible Rules			Coverage of Rules		
VARIABLES	FR	Budget Balance Rule	Debt Rule	Expenditure Rule	Cyclically-Adjusted Balance Rule	Golden Rule	Escape Clause	National Rule	Supranational Rule	Sustainability rules
Lag discretionary fiscal policy	-0.242***	-0.256***	-0.272***	-0.297***	-0.439***	-0.351***	-0.280***	-0.226***	-0.269***	-0.295***
	[0.0311]	[0.0331]	[0.0346]	[0.0611]	[0.0815]	[0.0409]	[0.0471]	[0.0410]	[0.0434]	[0.0366]
Log GDP per cap.	0.212***	0.234***	0.0902***	0.436***	0.918***	0.171***	0.00806	0.232***	0.173***	0.124***
	[0.0251]	[0.0265]	[0.0244]	[0.0445]	[0.124]	[0.0293]	[0.0318]	[0.0320]	[0.0297]	[0.0252]
Log consumption expenditure ratio (%GDP)	0.0505	-0.297***	0.466***	1.013***	-0.262	-0.121	-0.0615	0.0817	0.0661	0.192*
	[0.0931]	[0.102]	[0.0997]	[0.162]	[0.257]	[0.105]	[0.122]	[0.115]	[0.122]	[0.102]
Log natural rents ratio (%GDP)	0.123***	0.149***	0.179***	0.410***	0.444***	0.184***	0.189***	0.0789*	0.116***	0.220***
	[0.0343]	[0.0365]	[0.0380]	[0.0613]	[0.0938]	[0.0416]	[0.0478]	[0.0403]	[0.0425]	[0.0413]
Democracy degree	0.638***	0.820***	0.898***	1.737***	3.563***	0.247	0.968***	0.482***	0.912***	1.060***
	[0.147]	[0.150]	[0.151]	[0.235]	[0.487]	[0.175]	[0.191]	[0.181]	[0.163]	[0.154]
Federal	-0.254***	-0.314***	-0.228**	0.00775	-0.347**	-0.0983	0.260**	-0.0589	-0.809***	-0.361***
	[0.0915]	[0.101]	[0.104]	[0.136]	[0.158]	[0.117]	[0.129]	[0.111]	[0.134]	[0.113]
Presidential	0.348***	-0.0108	0.185	0.997***	0.0414	0.0440	-0.0249	0.648***	-0.980***	-0.159
	[0.0957]	[0.103]	[0.116]	[0.159]	[0.208]	[0.114]	[0.125]	[0.111]	[0.161]	[0.124]
Majoritary	0.0571	-0.205***	0.210**	-0.183	-0.731***	-0.0384	-0.654***	0.0465	-0.128	0.0199
	[0.0754]	[0.0789]	[0.0855]	[0.142]	[0.177]	[0.0917]	[0.121]	[0.103]	[0.100]	[0.0860]
Member of Currency Union	1.446***	1.491***	1.749***	0.873***	1.019***	1.444***	1.682***	-0.511***	2.197***	1.770***
	[0.0773]	[0.0791]	[0.0822]	[0.136]	[0.165]	[0.0874]	[0.107]	[0.179]	[0.0928]	[0.0842]
Pseudo-R^2	0.277	0.302	0.361	0.423	0.591	0.241	0.332	0.183	0.506	0.385
Observations	2,239	2,131	2,069	1,655	1,619	1,825	1,705	1,750	1,954	2,000

Note : robust standard errors in brackets. Unreported constant included.

***: significant at 1%; **: significant at 5%; *: significant at 10%.

Appendix d.

Table 1.d.: Descsriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
FR	2365	0.329	0.470	0	1
BBR	2365	0.284	0.451	0	1
DR	2365	0.257	0.437	0	1
ER	2365	0.082	0.275	0	1
CA	2365	0.065	0.246	0	1
G	2365	0.154	0.361	0	1
Sup.	2365	0.209	0.407	0	1
Sustainability Rules (BBR+DR)	2365	0.228	0.420	0	1
FR Spread	2365	0.025	0.063	0	0.292
Budget Balance Responsiveness	2365	0.347	0.662	-2.067	4.161
Budget Balance Ratio (% GDP)	2365	-2.166	5.196	-33.112	40.339
Primary Budget Balance Ratio (% GDP)	1485	0.303	4.536	-19.289	31.794
Output Gap	2365	0.001	0.0447	-0.538	0.692
Discretionary Fiscal Policy	2365	2.579	1.205	-1.902	9.506
Macroeconomic Volatility	2365	0.525	0.936	-2.981	4.421
Real GDP pc	2365	11156.35	14828.69	111.886	87716.73
Consumption Expenditure Ratio (% GDP)	2365	16.191	6.697	1.281	97.154
Natural Rents Ratio (% GDP)	2365	6.779	11.962	0	78.593
Democracy Degree	2365	0.660	0.325	0	1
Federalism	2365	0.192	0.394	0	1
Presidentialism	2365	0.233	0.423	0	1
Majoritarian	2365	0.341	0.474	0	1
Member C.U	2365	0.273	0.445	0	1

Table 2.d.: Variables and Definitions

Variable	Definition	Source
Discretionary Fiscal Policy	Fatas and Mihov's measure of discretionary fiscal policy: we use annual data over 1984-2011 to estimate the following equation for each country: $\Delta G_{i,t}= \alpha_i+\beta_i \Delta Y_{i,t}+ \delta_i \Delta G_{i,t-1}+\rho_i W_{i,t}+\varepsilon_{i,t}$, where $G_{i,t}$ is the logarithm of real government spending, $Y_{i,t}$ is the logarithm of real GDP and $W_{i,t}$ is a vector of control variables, including inflation rate, inflation squared and a time trend. The standard deviation of $\varepsilon_{i,t}$ is interpreted as the size of a discretionary change in fiscal policy for country i. Because output may be endogenous, we use two stage least-square method, and we instrument output by two lags of GDP growth, the index of oil prices and lagged inflation.	Author's construction
Fiscal Policy Responsiveness	Aghion and Marinescu's measure of fiscal policy responsiveness.	
FRs dummies	Binary variable equaling 1 if country have the specified FR in place for more than 4 years, 0 otherwise.	Fiscal Rule Dataset by the IMF's Fiscal Affairs Department (2012)
FR spread	Indicator of the number of FRs adopted in foreign countries at time *t*, weighted by their economical weight worldwide, at time *t*.	Author's Construction
Log budget balance ratio	Net lending (+)/ borrowing (–) is calculated as revenue minus total expenditure %GDP.	World Economic Outlook (WEO, 2013)
Log primary budget balance ratio	Net lending (+)/ borrowing (–) is calculated as revenue minus total expenditure (excluding interest payments) %GDP.	
Log real GDP per capita	GDP per capita (constant 2005 US$).	World Development Indicators (WDI, 2014); Penn World Table (PWT 8.0)
Output Gap	Output gap is calculated as the difference between log of GDP and log of GDP trend (HP filter).	Author's construction
Macroeconomic Volatility	Standard deviation of GDP growth rate.	
Log consumption expenditure ratio	Consumption expenditure % GDP.	World Development Indicators (WDI, 2014); Penn World Table (PWT 8.0)
Log natural rents	Natural resource exportation %GDP.	World Development Indicators (WDI, 2014)
Democracy degree	Linear interpolation of freedom house political right index and polity2 index	Freedom House (2014); PolityIV (2011)
Federalism	Binary variable equaling 1 if country have a federal state form, 0 otherwise.	Perspective Monde (2014); CIA WorldFactbook (2014)
Presidentialism	Binary variable equaling 1 if country have a presidential form of government, 0 otherwise.	Cheibub et al. (2009); Perspective Monde (2014)
Majoritarian	Binary variable equaling 1 if country have a majoritarian electoral system in place, 0 otherwise.	Bormann and Golder (2013); Perspective Monde (2014)
Member of currency union	Binary variable equaling 1 if country is member of a currency union, 0 otherwise.	Fiscal Rule Database by the IMF's Fiscal Affairs Department (2012)