

WP/19/49

IMF Working Paper

Do Fiscal Rules Cause Better Fiscal Balances? A New Instrumental Variable Strategy

by Francesca Caselli and Julien Reynaud

***IMF Working Papers* describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

I N T E R N A T I O N A L M O N E T A R Y F U N D

IMF Working Paper

Fiscal Affairs and Research Departments

Do Fiscal Rules Cause Better Fiscal Balances? A New Instrumental Variable Strategy**Prepared by Francesca Caselli and Julien Reynaud¹**

Authorized for distribution by Catherine Pattillo

March 2019

***IMF Working Papers* describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Abstract

This paper estimates the causal effect of fiscal rules on fiscal balances in a panel of 142 countries over the period 1985-2015. Our instrumental variable strategy exploits the geographical diffusion of fiscal rules across countries. The intuition is that reforms in neighboring countries may affect the adoption of domestic reforms through peer pressure and imitational effects. We find that fiscal rules correlate with lower deficits, but the positive link disappears when endogeneity is correctly addressed. However, when considering an index of fiscal rules' design, we show that well-designed rules have a statistically significant impact on fiscal balances. We conduct several robustness tests and show that our results are not affected by weak instrument problems.

JEL Classification Numbers: C26; E62; H30; H60.

Keywords: Instrument variable (IV) estimation, Fiscal rules; Fiscal balances.

Author's E-Mail Address: fcaselli@imf.org, jreynaud@imf.org.

¹ We thank Xavier Debrun, Luc Eyraud, Marialuz Moreno Badia, Catherine Pattillo, and Philippe Wingender, as well as participants at the IMF FAD seminar, the OECD ECO seminar, the ECFIN seminar, and the ECB FIP seminar for insightful comments. We also thank Federico Ganz and Valentina Antonaccio for help with the anecdotal evidence on the Uruguayan fiscal rules. This paper was featured as a Background Paper to the IMF Staff Discussion Note No.18/04 on "Second-Generation Fiscal Rules: Balancing Simplicity, Flexibility, and Enforceability".

I. INTRODUCTION

It is well documented that the introduction of fiscal rules is correlated with better fiscal performance (IMF, 2009). Several empirical studies have shown that countries with fiscal rules tend to have better fiscal outcomes, including by running smaller fiscal deficits (Debrun and others 2008; Tapsoba 2012; Bergman and others 2017). However, it is harder to establish causality between institutional variables and fiscal outcomes, as both could be shaped by similar factors: countries with fiscal rules may have certain observed or unobserved characteristics that foster good fiscal policy, such as a preference for fiscal prudence, whether or not a rule is in place (Poterba, 1996). In other words, countries self-select into rule's adoption. Moreover, countries might adopt fiscal rules in periods of economic stress or crisis, or after consolidation episodes to lock-in the gains, generating reverse causality. As pointed out in a recent meta-regression analysis by Heinemann and others (2018), the positive correlation between rule's adoption and fiscal outcomes tends to disappear once the analysis correctly address the issue of endogeneity.²

Most of the studies on fiscal rules addresses endogeneity by using generalized methods of moments (GMM) estimators or instrumental techniques involving political economy variables. Debrun and Kumar (2008), for instance, use lagged fiscal rules and an indicator for countries with commitment to centralize budget process as instruments to study the impact of several types of fiscal rules in 25 European countries. Badinger and Reuter (2017) find a significant impact of fiscal rules that reduce deficits using checks and balance, government fragmentation, and inflation targeting as instruments in a sample of 74 countries over 1985-2012. Some recent studies adopt treatment effect techniques to address the endogeneity issues. Caselli and Wingender (2018), for example, use inverse probability weighting to study the impact of the 3 percent deficit ceiling on the entire distribution of fiscal balances in European countries. Guerguil and others (2017) use propensity score matching to mitigate the traditional self-selection problem. Grembi and others (2016) exploit a quasi-experimental design in Italy and study the effect central fiscal rules on municipal governments.³

This paper contributes to the empirical literature on the effectiveness of fiscal rules by developing a new instrumental variables strategy.⁴ We argue that the introduction of a fiscal rule in neighboring countries can trigger domestic reforms and in turn the adoption of a domestic fiscal rule. Building on this idea developed in the political science literature, our instrument is therefore constructed as a dummy variable accounting for the number of neighboring countries that adopted a fiscal rule in previous years.⁵ Different channels discussed in the political science literature can be at play: economic competition, learning,

² In a meta-analysis covering 30 recent empirical studies, Heinemann and others (2018) conclude that even though rules have a positive average effect on the fiscal balance, estimations exploiting instrumental variables or quasi-experimental designs often fail to identify systematic differences in the fiscal behavior of countries with and without fiscal rules.

³ While a fiscal rule might reduce the deficit bias, it might also sacrifice the benefits of fiscal policy stabilization. We deliberately focus on the disciplining effect of fiscal policy, and we do not attempt to quantifying the effect of rule on the level of procyclicality of fiscal policies.

⁴ For a comprehensive review of fiscal rules and their design please see Eyraud and others 2018.

⁵ By neighboring country, we mean countries with a common border.

socialization, mimicking, and coercion (Dobbin, Simmons, and Garrett, 2007; and Shipan and Volden, 2008; Markoff, 1996; Weyland, 2008; Buera and others, 2011; and Giuliano and others, 2013). From an econometric point of view, the presence of rules in neighboring countries captures an exogenous source of variation in domestic rules that does not directly impact the fiscal balance. A set of weak instrument tests is performed and confirm that our instrumentation strategy is relevant. While we cannot test *per se* for the exogeneity of our instrument, we discuss the channels that can invalidate our exclusion restrictions and we address potential caveats.

Our analysis yields two main results. First the effect of (any) rule on the fiscal deficit cannot be precisely estimated (that is, it is statistically insignificant) once the potential endogeneity is adequately controlled for. We address the endogeneity problem arguing that the adoption of fiscal rules in nearby countries can influence the home country's adoption, and that changes in existing fiscal rules, i.e. in the quality of the rules, can also influence changes in the home country. Considering an index that captures a continuous measure of fiscal rule strength (Schaechter and others 2012), our second main result is that well-designed fiscal rules do have a significant impact on the fiscal balance. Moving from a relatively weakly designed fiscal rule to a better designed fiscal rule can increase the fiscal balance by some 0.6 percent of GDP.

The paper is organized as follows: Section II discusses related literature and present our instrumental variables strategy. Section III presents the empirical set and the data used in the estimation. In Section IV we discuss the results with the new instrumental variable and possible weaknesses of our empirical strategy and address those with a set of robustness exercises in Section V. Section VI extends the analysis to the design of fiscal rules. Finally, we conclude in Section VII.

II. A NEW INSTRUMENTAL VARIABLES STRATEGY

Our instrumental strategy relies on the assumption that fiscal rules' adoption in neighboring countries may induce the domestic country to introduce a rule as well. The intuition is that reforms in neighboring countries may affect the adoption of domestic reforms through peer pressure and imitational effects (Buera and others, 2011; Giuliano and others, 2013). Persson and Tabellini (2009) use democracy in neighboring countries as a proxy for the democratic capital of domestic countries. Acemoglu and others (2016) argue that transitions to democracy often take place in regional waves. To study the effect of democratization on growth, they instrument democracy with waves of democratization in the region (see also Huntington 1991, Markoff 1996). Similarly, Giuliano and others (2013) argue that the implementation of structural reforms in neighboring countries might trigger domestic reform and, following this argument, they use democracy in neighboring countries as an instrument for domestic reforms. Cherif and others (2018) use a similar approach in standard growth models. Weyland (2008) reports examples of high government officials in Latin America, stressing the importance of a leading pension reformer that triggered a diffusion of similar institutional changes in the region. For instance, the Chilean model of market reforms found imitators throughout South America. In the context of fiscal rules, Altunbas and Thornton

(2017) argue that the increase in the overall number of debt rules in place across countries (called fiscal rules “popularity”) is a good predictor of adoption.

These channels of policy diffusion across countries have also been extensively investigated in the political science literature. For instance, Dobbin, Simmons, and Garrett (2007) and Shipan and Volden (2008) have identified five channels of diffusion of public policies: coercion, competition, imitation, learning, and socialization.⁶ All types of channels could be at play when one think about the diffusion of fiscal rules. For example, policy makers willing to minimize the cost of borrowing can decide to adopt fiscal rules since those have been linked to lower sovereign spreads (Poterba and Rueben 1999, Iara and Wolff 2014, Johnson and Kriz, 2005). Consequently, if fiscal rules are seen as policies achieving their objectives, e.g. containing fiscal deficits and therefore sovereign debt, then policymakers will be more incline to *imitate* and *learn* from rules adopters. In some instances, countries without fiscal rules could be pressured, *coerced* by peers, close economic allies, and possibly international organizations via *socialization*, to adopt fiscal rules if they are proven to help ensuring fiscal sustainability.

In the context of fiscal rules, there are several anecdotal examples that support our presumption that countries look at neighbors’ experience when introducing fiscal rules. For instance, in Latin America, the fiscal rule *à la Chile* has been regarded as the leading example.⁷ In the public debate in Uruguay, for instance, Chile and Brazil have often been mentioned as models to be followed.⁸ A bill presented by one of the opposition parties proposing a fiscal rule in 2015 explicitly mentioned the examples of Chile and Brazil: “*The legislative experience in Brazil and Chile, that have laws of this type, illustrate the effects of this instrument over public finance.*”⁹ In Colombia, the Minister of Finance declared that “*In Latin America, the reference in fiscal rule is the one adopted by Chile at the beginning of this*

⁶ The *coercion* hypothesis rests on power-asymmetry through which stronger actors can impose their policy on weaker ones. In the *competition* channel, the likelihood of policy change is triggered by spillovers, from trading partners for example. The *imitation* hypothesis posits that policy makers can be influenced by large neighbors or large political allies. This channel is consistent with the theory of “leaders” and “laggards”, where policymakers in small or “laggard” countries, for example, aspire to be like the “leaders”. In the *learning* channel, policymakers are searching for policies that have been successful, that have brought benefits to other policy makers. Finally, the *socialization* hypothesis relies on shared beliefs among policymakers, as a result of a global political culture for example. Fiscal rules could be adopted because countries are part of an economic union or because they are part of international organizations that support such policies. This diffusion channels can be the result of peer pressures or legal constraints. In principle, all the above-mentioned channels could be at play when studying the diffusion of adoption of fiscal rules. We do not intend to disentangle which channels are particularly at play for each adoption case. Independently of each specific case of fiscal rule adoption, some channels may be stronger and faster, in theory, than others.

⁷ Refer to Lledó and others (2017) for a description of countries’ fiscal rules.

⁸ Parliamentary discussion over Budget law for the period 2010-2014; <http://www.diputados.gub.uy/wp-content/uploads/2014/11/d3670.pdf>. Uruguayan Think Tank proposing fiscal rule *à la Chile*: <https://www.elobservador.com.uy/talvi-no-estamos-crisis-estamos-dificultades-n921907>

⁹ <http://vamosuruguay.com.uy/proyecto-de-ley-regla-fiscal-estructural-y-creacion-de-fondo-de-reservas-para-politicas-contraciclicas/> “*La experiencia legislativa de Brasil y de Chile, que cuentan con leyes de esta índole, nos ilustra acerca de los efectos de este instrumento de gestión de las finanzas públicas*”.

(continued...)

decade, that has allowed the country to manage well its mineral resources".¹⁰ Similarly, the US and Mexico adopted spending caps in 2011 and 2013, respectively. Given the economic, geographical, and cultural proximity between the two countries, the adoption of similar types of fiscal rules, two years apart, presents further suggestive evidence of the diffusion argument. In the European context, it is well known that when Germany decided to introduce a debt brake, the role model was the debt brake of the Swiss Confederation introduced in 2001, and effective since 2007 (Kirchgassner 2017). In Eastern European countries, the introduction of debt brake limits in Poland and Slovakia triggered reforms in Czech Republic, where the Czech house approved debt brakes in 2016, but rejected putting them in the constitution.¹¹ Figure 1 gives a graphical representation of the adoption of fiscal rules across time and countries, showing a gradual spread of rules' adoption throughout the early 1990s in Europe, followed by South America and Africa in the last 1990s, and in Eastern Europe and Central Asia in the 2000s.

While an ideal source of exogenous variation of fiscal rule's adoption is difficult to find, we believe that this anecdotal evidence supports the argument in favor of using rules in neighboring countries as an instrument.

Construction of the instrumental variable: the diffusion of the adoption of fiscal rules

Our instrumental strategy relies on the idea that the adoption of fiscal rules by neighboring countries influences the home country's decision to adopt a rule. To capture the process of geographical diffusion, we define the instrument in the following way:¹²

$$contiguity_IV_{i,t} = \sum_{j \neq i}^{n-i} FR_{j,t} * X_{j,i,t} \quad (1)$$

Where j is the neighboring country of domestic country i . $FR_{j,t}$ is a dummy variable taking a value 1 when country j has a fiscal rule at time t , and 0 if country j does not have a fiscal rule. $X_{j,i,t}$ takes the value 0 when countries have no common borders and sum the number of countries with common borders.¹³ Therefore, the variable $contiguity_IV_{i,t}$ captures the number of fiscal rules in place in countries with common borders with respect to the domestic economy.

¹⁰ See Echeverry and others (2011). In Spanish: "En América Latina, el referente más conocido de regla fiscal es Chile, en donde se adoptó una regla desde comienzos de esta década, lo que le ha permitido beneficiarse significativamente de su riqueza minera".

¹¹ <http://visegradrevue.eu/lessons-from-the-first-year-of-the-slovak-fiscal-council/>

¹² Economic proximity can be proxied by other indicators. For example, physical distance (e.g. distance between capitals) and bilateral trade flows are often used to account for interconnectedness between countries. Moreover, several studies found bilateral trade flows to be explained by cultural, social and historical links between countries, beyond the simple cost of transportation proxied by distance (see for example Reynaud and Vauday, 2009, for an application to geopolitical linkages between countries, and Poulain and Reynaud, 2017, for an application to IMF lending and economic spillovers).

¹³ Data are obtained from Frankel and Rose, 2002 and Rose, 2007 (<http://faculty.haas.berkeley.edu/arose>).

III. EMPIRICAL SETUP AND DATA

To estimate the effect of fiscal rules on the fiscal balance, we rely on a standard augmented fiscal reaction function, following Debrun and others (2008) and Baum and others (2017):

$$balance_{i,t} = \beta_1 rule_{i,t} + \beta_2 X_{i,t} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where the nominal budget balance (*balance*) for country i at time t , is a function of the national fiscal rule (*rule*) of country i at time t , a dummy equal to 1 if the country has a fiscal rule, and 0 otherwise, covariates ($X_{i,t}$), and country (α_i) and year (λ_t) fixed effects.

The vector of covariates $X_{i,t}$ includes standard determinants of the fiscal balance: lags of the budget balance itself, lagged debt, GDP per capita, GDP growth, and the output gap (Debrun and others, 2008). To make sure that our results are not driven by an omitted variable bias and as we rely on a global sample, we also include a variable that captures terms of trade movements. Indeed, fiscal balances in low-income countries' (LICs) are particularly affected by the evolution of commodity prices (Baum and others 2017). Since IMF programs often coincide with episodes of fiscal consolidation and might therefore be correlated with the introduction of fiscal rules, a dummy for periods when the countries are under Fund programs is included as well. Finally, we also control for whether the countries are in a currency union, as supra-national fiscal rules could be in place and therefore influence the adoption of national fiscal rules. A good example is the European Union and the Euro area for which the transposition of the supra-national rules to national legislation is in place.

We start the analysis estimating equation (1) using a standard Ordinary Least Square (OLS) estimator. In a second step, we introduce our new instrumental variable, i.e. the diffusion of fiscal rule adoption, and perform several robustness checks. To confirm the contribution of our instrumental variable approach we also test instrumental variables typically used in the related literature, i.e. checks and balance, government fragmentation, and inflation targeting, and perform robustness tests on these instruments' validity. We conclude that in our sample the contiguity instrument performs better both in terms of validity and relevance. In the last step, we go deeper in the definition of our right-hand-side variable, the fiscal rule dummy, by using an index of rule design. Indeed, not all rules are designed in the same way, so their impact on fiscal balance must be differentiated.

The empirical analysis is performed on a global sample of countries over the last three decades. The IMF fiscal rules dataset (IMF, 2017) provides country-specific information on fiscal rules, and their strength, for 96 countries from 1985 to 2015. There are 96 countries with fiscal rules in place in the dataset. Our panel is increased to 142 countries by adding countries without fiscal rules in place. Table A1 and A2 reports the summary statistics and the sources of the variables, respectively.

IV. RESULTS

OLS results

We start the analysis with simple conditional correlates of fiscal rules and fiscal balance. Table 1 shows the OLS point estimates that suggest a positive correlation between fiscal rules and the budget balance. Column 1 includes country fixed effects only. The coefficient is positive, large and significant, suggesting an improvement in the balance equal to 1.3 percent of GDP when countries have fiscal rules in place. Column 2 presents the results adding year fixed effects and shows the importance of controlling for global shocks, since the coefficient is now reduced by 30 percent. This might be explained by the fact that countries tend to adopt rules in time of global turbulence when episodes of fiscal distress are more likely to happen. When we also control for lags of the balance, the coefficient is further decreased to 0.8 (Column 3 and 4). This means that countries with fiscal rules have fiscal balance on average 0.8 percent higher than countries without fiscal rules. These results are in line with the literature, see for instance Heinemann and others (2018).

Instrumental variable estimation using the contiguity instrument

Table 2 reports the baseline results instrumenting the rule dummy with the contiguity instrument. In the first column, we use the contemporaneous instrument, whereas Column (2) and Column (3) reports results with the instrument lagged by one year and with a 3-year moving average, respectively. The coefficient on the fiscal rule dummy loses significance, yet its magnitude is comparable, although slightly larger, to the coefficient estimated with OLS. Importantly, the result is not driven by lack of relevance of the instrument. In fact, an instrument that weakly correlates with the endogenous variable will amplify a very small (and unknown) violation of the exclusion restriction (Jiang 2017, Bound and others 1995). This lack of statistical significance does not appear to be due to a weak instrument, since the F-tests yields values above the Staiger and Stock (1997) rule of thumb value of 10 in all three cases. While we do not obtain extremely large F-stats, we are reassured by the fact that, in exactly identified models, the weak instrument bias tends to be small (Angrist and Pischke, 2009). Another crucial element to check the relevance of the first stage estimation is the correlation between the instrument and the dependent variable. Table 3 shows a strong correlation between the three variations of the instruments, which suggests that the instrumental variable strategy is relevant. Across the three specifications, the fact that neighboring countries adopt a rule increase the probability of adoption in the domestic economy by around 10 percent. These point estimates are all significant at the 99 percent level. In a recent paper Andrews and others (2018) suggest relying on the identification-robust Anderson-Rubin (AR) statistic in the case of a single instrument. Anderson and Rubin (1949) propose a test of structural parameters that is robust to weak instruments, in the sense that identification of the coefficients is not assumed. Figure 3 reports the confidence interval obtained with the AR test and with the standard Wald test (not robust to weak instrument). We notice that both tests give very similar confidence intervals, supporting that the non-statistically significant results are not driven by a weak instrument.

V. ROBUSTNESS CHECKS FOR THE CONTIGUITY INSTRUMENT

In this section we test the robustness of our main result along several dimensions. We start discussing and addressing potential violations of our exclusion restrictions, including other covariates that should capture possible spillovers across countries. We also discuss issues related to bad controls.

In our setting, the identification strategy relies on the assumption that the fiscal rule's adoption in neighboring countries impacts the domestic fiscal balance only through the adoption of a domestic fiscal rule. As it is well known, we cannot test for the validity of the exclusion restriction, but we can discuss potential violation of our identification assumptions. A violation of the exclusion restrictions could occur if the neighbors' fiscal rule impacts the domestic fiscal balance directly, for instance, because the adoption of the rule generates fiscal spillovers through trade linkages. We therefore augment the baseline model with a measure of trade openness, that captures the extent to which a country is exposed to external shocks through trade linkages. Another way of capturing spillovers among countries is to include the average growth in the region where the country adopting the fiscal rule belongs. In Table 4 (Column 1 and 2) we present the results including these two additional controls and we find comparable results to the baseline. The coefficient on the rule is not significant and similar in magnitude to the previous estimation. The average growth in the region shows up as a significant explanatory variable for the fiscal balance.¹⁴ Finally, we also test whether our instrument is still valid when controlling for the land size of countries, as one could argue that large countries are less influenced by other countries. We therefore divide our measure of contiguity by the length of borders (in kilometers). Results, not reported here, are unchanged.

A significant part of our sample is constituted by European and Euro Area countries. As it is well known, these countries are subject to supranational fiscal rules, as they adopted a deficit and debt rule as part of the European Union Treaties. This means, for instance, that the core European Union countries, that signed the Maastricht Treaty in 1992, are recorded in the database as having a rule since that year (unless they had a rule in place before). Similarly, all the countries that entered with the 2004 European Union enlargement are recorded as having a rule starting in that year.¹⁵ Considering the different supra-national dynamics that occur for the European Union, we implement a robustness eliminating the European Union countries from the sample, as well as all the European countries. The results are presented in Table 4 (Column 4 and 3, respectively).¹⁶ The coefficients on the rule remain insignificant. Column (5) and (6) present some additional robustness exercises, excluding the global financial crisis, that might have triggered adoption of rules around the world, and removing year fixed effects. The non-significant effect of the rule is confirmed.¹⁷

¹⁴ We obtain similar results when excluding the growth rate of the country itself from the average regional growth calculation.

¹⁵ This is the case if they did not introduce national rules before joining the EU.

¹⁶ We keep controlling for other currency unions that might be subject to similar supranational fiscal criteria.

¹⁷ The first stage results of these robustness exercises (not reported) also show a strong correlation between the instrument and the endogenous variable.

Our identification strategy relies on a conditional independence assumption: conditional on a set of covariates, fiscal rules' adoption in neighboring countries predicts domestic fiscal rule's adoption but has no direct impact on the fiscal balance. An important aspect of this assumption, particularly discussed in the treatment effect literature, is the fact that controls should not be affected by the treatment, because this would likely introduce some bias in the estimation. These variables, that are themselves outcome variables are the so-called bad controls (see Angrist and Pischke 2009). While introducing more controls increases the efficiency of the estimation and reduces concerns of omitted variables bias, we cannot rule out that these are bad controls. As a robustness, we therefore implement the IV estimation removing all control variables. The magnitude of the coefficients and their statistical significance are not affected by this change, as shown by Column 7 in Table 4. The first stage regression of all the implemented robustness exercises is reported in Table A4.

Finally, we test common instrumental variables used in the literature. These include indicators of political stability and monetary policy variables. For instance, a recent paper by Badinger and Reuter (2017) argues that government fragmentation, checks and balance and the adoption of inflation targeting are good instruments to fiscal rules. Debrun and others (2008) use the lag of the fiscal rule and a variable identifying countries having adopted the commitment approach to centralize the budget process, and do not find any difference between OLS and instrumental variables estimations focusing on a European sample. We test these instruments and find that they perform poorly in our sample and following our specification. We use two criteria to assess the quality of instruments: they have to be relevant (i.e. correlated with the fiscal rules) and exogenous (i.e. excluded from the fiscal balance equation). In our global sample, government fragmentation, checks and balance and inflation targeting are found to be weak, relying on the first stage Kleinbergen-Paap F-stat. For all the four specifications testing the instruments, the F-stat is well below the Staiger and Stock (1997) rule of thumb value of 10 (Table 5 Columns 1 to 4). Finally, while exogeneity cannot be tested empirically, several arguments might suggest that government fragmentation, checks and balance and inflation targeting directly affect the fiscal balance: (i) Kontopoulos and Perotti (2002) show that government fragmentation can affect fiscal outcomes directly through coordination problems; (ii) Alesina and Perotti (1996) argue that checks and balance can impede fiscal discipline because they guarantee the rights of the minority, emphasize moderation and compromise, and may therefore delay the implementation of "tough" fiscal adjustments when needed; finally (iii) Combes and others (2017) show that inflation targeting has a direct effect on fiscal balances by mitigating fiscal dominance.

VI. EXTENSIONS TO FISCAL RULE STRENGTH

So far, we have been looking at the effects of introducing an average rule on the fiscal balance. However, there is evidence that improving the rule design can have a significant effect on fiscal performance (Eyraud and others 2018, Caselli and others 2018). While introducing any type of rule might not have a significant impact on the fiscal balance, one might argue that introducing a well-designed rule can instead make a difference. To test this

hypothesis, we replace the fiscal rules dummy with a continuous index of fiscal rule strength and we estimate the following specification.¹⁸

$$balance_{i,t} = \beta_1 FRS_{i,t} + \beta_2 X_{i,t} + \alpha_i + \lambda_t + \varepsilon_{i,t} \quad (3)$$

We construct an instrument for rules' strength in a similar spirit to the one used in the previous section. In this case the dummy for fiscal rule (*FR*) is replaced by the IMF fiscal rule strength (*FRS*) index and the denominator averages the indices instead of summing the dummies. The strength index (Schaechter and others 2012) measures the following dimensions: broad institutional coverage, independence of the monitoring and enforcement bodies, legal base, flexibility to respond to shocks, existence of correction mechanisms and sanctions (for a description of the IMF fiscal rule index, see IMF, 2009). One caveat of the strength index is that it captures only characteristics related to rules' design and not their implementation. The index is equal to zero for countries without rules and ranks from 0.1 (poorly designed) to 1 (well designed) for countries with rules. Figure 2 shows significant skewness of the index, with an average strength index of 0.26 (Table A3), suggesting that there is still room for improvement in most countries. Formally, the instrumental variable is defined as follows:

$$strength_IV_{i,t} = \frac{1}{\sum_{j \neq i} X_{j,i,t}} \sum_{j \neq i}^{n-i} FRS_{j,t} * X_{j,i,t} \quad (4)$$

where $FRS_{j,t}$ is the fiscal rule strength index of the country j at time t or 0 if country j does not have a rule. $X_{j,i,t}$ is an indicator variable which takes value 1 when countries i and j share a border and 0 otherwise. Intuitively, the fiscal rule strength in country i is instrumented using the average strength of fiscal rules in place in bordering countries. The set of covariates remain the same as in the baseline regression.

When the instrument is applied to the fiscal rule strength index, the results point to a positive and significant relation (at the 95 percent level) between the index of rule strength and fiscal balance (Table 6, Column 1). The first stage results (shown in Table A5) support the idea that our instrument is strongly correlated with the domestic rule. To provide an interpretation of the size of the coefficient, it is important to take into account the distribution of the strength index (Figure 2). Moving from a badly designed rule (i.e. a fiscal rule strength index in the 25th percentile) to a better designed rule (i.e. a fiscal rule strength index in the 75th percentile) results in an improvement of the budget balance by 0.64 percent of GDP.¹⁹

We then implement the same set of robustness checks that we considered for the rule dummy and the results are generally robust. They lose significance when we exclude European countries from the sample. This might be because European countries generally exhibit the strongest rules and removing them from the sample significantly reduces the sample variation. The standard deviation of the index is reduced from 1.4 to 0.65.

¹⁸ For details on the construction of the FRS Index, see Schaechter and others, 2012.

¹⁹ We multiply the coefficient on the strength index (3.4) by the actual change in the index from the 25th to 75th percentile (0.19).

An important caveat of this analysis is that the index of rule strength is admittedly an imperfect indicator of the “quality” of rules. It only focuses on design, rather than implementation, leaving aside the key enabling factor of the public and political support to the rule. In addition, it does not capture some important characteristics of the fiscal framework, such as the quality of budgeting practices (which are important preconditions for the rule effectiveness).

VII. CONCLUSION

Several well-known factors can generate endogeneity concerns affecting the estimation of the link between fiscal rules and fiscal outcomes. Countries may have certain observed or unobserved characteristics that foster good fiscal policy, such as a preference for fiscal prudence, whether or not a fiscal rule is in place (Poterba, 1996). Countries can also adopt fiscal rules in periods of economic stress or crisis, or after consolidation episodes. Establishing the presence of a causal link going from fiscal rules to the fiscal balance requires finding an instrumental variable that has a direct effect on the rule but no effect on the balance.

In this paper we propose a new instrumental variable that captures the diffusion of fiscal rules across countries. The intuition for our new instrument is that fiscal reforms in neighboring countries may affect the adoption of domestic reforms through peer pressure and imitation effects (Buera and others, 2011; Giuliano and others, 2013). While capturing a completely exogenous source of variations in fiscal rules’ adoption is difficult, this instrumental-variable strategy ensures that changes in a country’s institutional set-up (the adoption of fiscal rules) are exogenous to the outcome (the budget balance), and therefore do not bias the estimates.

Our results support the idea recently proposed in a meta-analysis by Hainemann and others (2018) that any type of fiscal rules have no statistically significant impact on the fiscal balance, once endogeneity is adequately controlled for. Eyraud and others (2018) note that this result may be due to heterogeneity across types of countries and rules. While the inclusion of fixed effects as a proxy for fiscal preferences does not make a systematic difference, instrumental variables or quasi-experimental designs lead to significantly lower levels of significance and a less constraining impact. In our setting, the non-significant result is not driven by a weak instrument problem, as our first stage results point to a strong relevance of the instrument.

While we do not find a statistically significant result on the average rule, design features can make fiscal rules effective. A more granular analysis that also considers the design of fiscal rules finds that better designed rules have a positive and significant impact on the fiscal balance. These results are in line with the country evidence reviewed in Eyraud and others (2018). They show that successful rules generally have broad institutional coverage, are tightly linked to fiscal sustainability objectives, are easy to understand and monitor, and support countercyclical fiscal policy.

VIII. REFERENCES

Acemoglu, D., S. Naidu, P. Restrepo, and J. Robinson. 2019. "Democracy Does Cause Growth", *Journal of Political Economy*, vol. 127, no. 1.

Alesina, A. and P. Giuliano. 2015. "Culture and Institutions", *Journal of Economic Literature*, Vol. 53, No. 4, pp. 898-944.

Alesina, A. and R. Perotti. 1996. "Fiscal Discipline and the Budget Process", *The American Economic Review*, Vol. 86, No. 2.

Altunbas, Y., and J. Thornton. 2017. "Why do countries adopt fiscal rules?" *The Manchester School* Vol. 85, No. 1, 65-87.

Anderson, J.; van Wincoop, E. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle", *The American Economic Review*. 93: 170–192.

Angrist, J. and J. S. Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press.

Andrews, I., Stock, J, and L. Sun. 2018. "Weak Instruments in IV Regression: Theory and Practice", https://scholar.harvard.edu/files/stock/files/wirev_080218-posted.pdf.

Badinger, H. and W. Reuter. 2017. "The Case for Fiscal Rules", *Economic Modelling*, 60, pp. 334-343.

Baum, A., A. Hodge, A. Mineshima, M. Moreno Badia, and R. Tapsoba. 2017. "Can They Do It All? Fiscal Space in Low-Income Countries", *IMF Working Papers* No. 17/110.

Buera, F., A. Monge-Naranjo, and G. Primiceri. 2011. "Learning the Wealth of Nations", *Econometrica*, Vol. 79. No. 1, pp.1-45.

Caselli, F., Eyraud, L., Hodge, A., Diaz Kalan, F., Kim, Y., Lledo, V., Mbaye, S., Popescu, A., Reuter, W.H., Reynaud, J., Ture, E., and Wingender, P., 2018. "Second-Generation Fiscal Rules: Balancing Simplicity, Flexibility, and Enforceability –Technical Background Papers", *IMF IMF Staff Discussion Notes* No. 18/04.

Cherif, R., Hasanov, F., and L. Wang. 2018. "Sharp Instrument: A Stab at Identifying the Causes of Economic Growth", *IMF Working Papers* No. 18/117.

Combes, J. L., X. Debrun, A. Minea, and R. Tapsoba. 2018. "Inflation Targeting, Fiscal Rules and the Policy Mix: Cross-effect and Interactions", *The Economic Journal*, Volume 128, Issue 615.

Debrun, X., L. Moulin, A. Turrini, J. Ayuso-i-Casals, M. Kumar, A. Drazen, and C. Fuest. 2008. "Tied to the Mast? National Fiscal Rules in the European Union", *Economic Policy*, Vol. 23, No. 54, pp. 297-362.

Dobbin, F., Simmons, B. and Garrett, G. 2007 "The Global Diffusion of Public Policies: Social Construction, Coercion, Competition, or Learning?", *Annual Review of Sociology* 33(1): 449–472.

Echeverry Garzon, J. C., Suesun Melo, R., and Alonso Masmela, G. 2011. "Regla Fiscal Para Colombia", *Ministerio de Hacienda y Credito Publico, Nots Fiscales*, No. 4, January.

Eyraud, L, Debrun, X., Hodge, A., Lledo, V., and Pattillo, C. 2018. "Second-Generation Fiscal Rules: Balancing Simplicity, Flexibility, and Enforceability", *IMF Staff Discussion Notes* No. 18/04.

Frankel, J. and D. Romer. 1999. "Does Trade Cause Growth?", *The American Economic Review*, Vol. 89, No. 3, pp. 379-399.

Frankel, J. and A. Rose. 2002. "An Estimate of the Effect of Common Currencies on Trade and Income", *The Quarterly Journal of Economics*, vol. 117, issue 2, 437-466.

Giuliano, P., P. Mishra, and A. Spilimbergo. 2013. "Democracy and Reforms: Evidence from a New Dataset," *American Economic Journal: Macroeconomics*. Vol.5, No. 4.

Heinemann, F., M. D. Moessinger, and M. Yeter. 2018. "Do Fiscal Rules Constrain Fiscal Policy? A Meta-Regression Analysis," *European Journal of Political Economy*. Vol 51, pp. 69-92.

Huntington, S. 1991. "The Third Wave: Democratization in the Late Twentieth Century", *University of Oklahoma Press*.

Iara, A., and Wolff, G. 2014, "Rules and risk in the Euro area", *European Journal of Political Economy*, vol. 34, issue C, 222-236.

International Monetary Fund. 2009. "Fiscal Rules – Anchoring Expectations for Sustainable Public Finances," *IMF Policy Paper* available at www.imf.org/external/np/pp/eng/2009/121609.pdf.

_____. 2017. *Fiscal Rules Dataset*. March 2017. Available at <http://www.imf.org/external/datamapper/fiscalrules/map/map.htm>

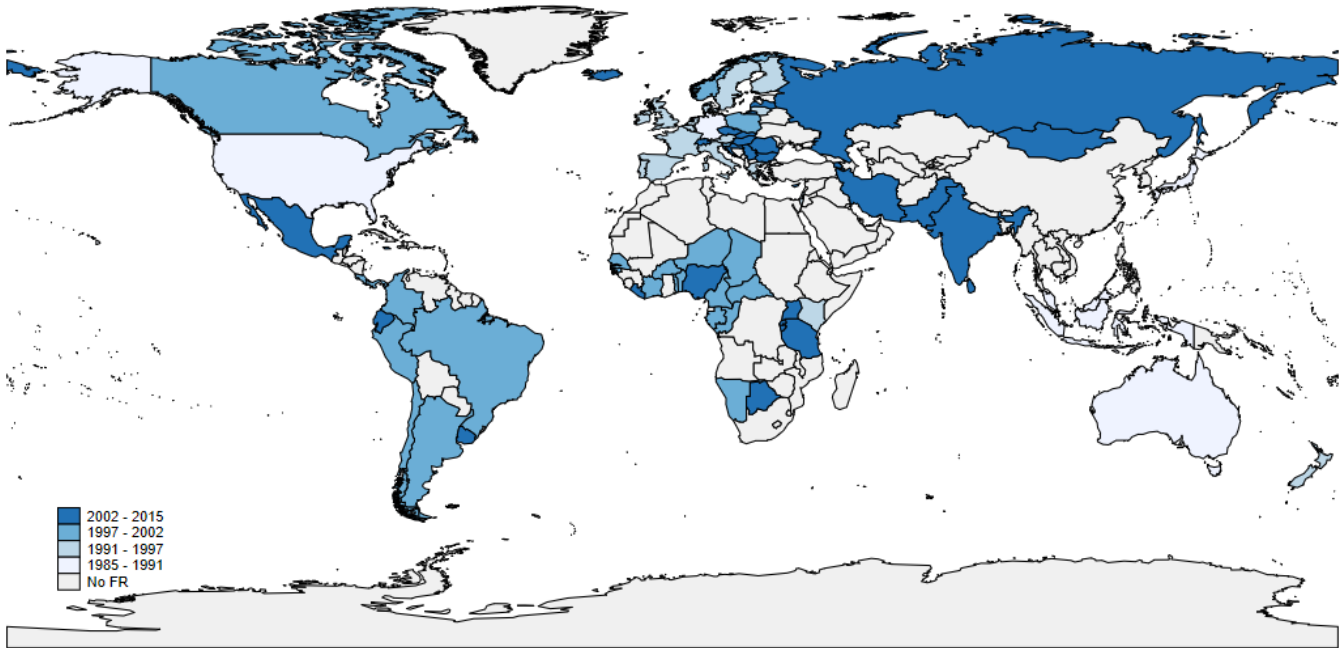
Johnson, C., and K. Kriz. 2005. "Fiscal Institutions, Credit Ratings, and Borrowing Costs", *Public Budgeting and Finance*, Volume 25, Issue 1, March, Pages 84–103.

Kirchgassner, G., 2017. "The debt brake of the German states: a faulty design?," *Constitutional Political Economy*, Springer, vol. 28(3), pages 257-269, September.

- Kontopoulos, Y. and R. Perotti. 2002. "Fragmented fiscal policy", *Journal of Public Economics*, vol. 86, issue 2, 191-222.
- Lang, V. and Marina Mendes Tavares. 2018. "The Distribution of Gains from Globalization", IMF Working Paper, No. 18/54.
- Lledó, V., S. Yoon, X. Fang, S. Mbaye, and Y. Kim. 2017. *Fiscal Rules at a Glance*, IMF database on Fiscal Rules, available at: <http://www.imf.org/external/datamapper/FiscalRules/map/map.htm>
- Poulain, J-G., and J. Reynaud, J. 2017. "IMF Lending in an Interconnected World", IMF Working Paper, No. 17/155.
- Markoff, J. 1996. *Waves of Democracy: Social Movements and Political Change*, Newbury Park, CA: Pine Forge Press.
- Poterba, J. M. and Rueben, K. 1999. 'State Fiscal Institutions and the U.S. Municipal Bond Market', *Fiscal Institutions and Fiscal Performance I*(January): 181–208.
- Reynaud, J. and J. Vauday 2009. "Geopolitics in International Organizations: An Empirical Study on IMF Facilities", *Journal of Development Economics*, Volume 89, Issue 1, 139-162.
- Rose, A. 2007. "The Foreign Service and Foreign Trade: Embassies as Export Promotion", *The World Economy*, Volume 30, Issue 1, 22-38.
- Schaechter, A., Kinda, T., Budina, N., and Weber A. 2012. 'Fiscal Rules in Response to the Crisis—Toward the "Next-Generation" Rules. A New Dataset', IMF Working Paper, No. 12/187.
- Shipan, C. R. and Volden, C. 2008. 'The Mechanisms of Policy Diffusion', *American Journal of Political Science* 52(4): 840–857.
- Simmons, B. A. and Elkins, Z. 2004. 'The Globalization of Liberalization: Policy Diffusion in the International Political Economy', *The American Political Science Review* 98(1): 171–189.
- Staiger, D. and J. Stock. 1997. "Instrumental Variables Regression with Weak Instruments", *Econometrica* Vol. 65, No. 3, pp. 557-586.
- Weyland, K. 2008. "Toward a New Theory of Institutional Change", *World Politics*, Vol. 60, No. 2, pp. 281-314.

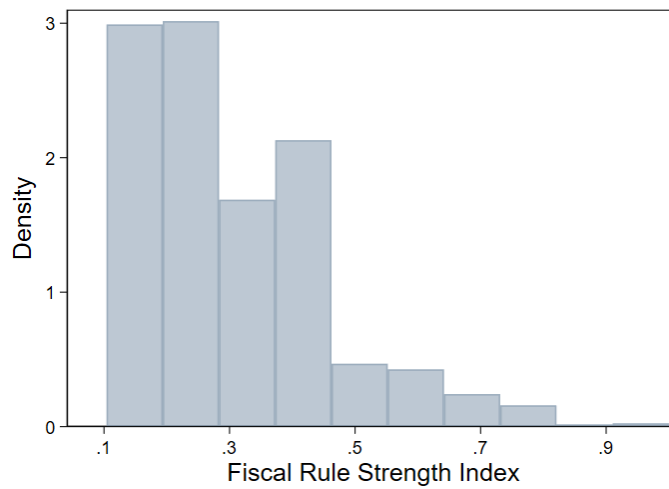
IX. FIGURES

Figure 1. Diffusion of fiscal rules adoption across countries and time

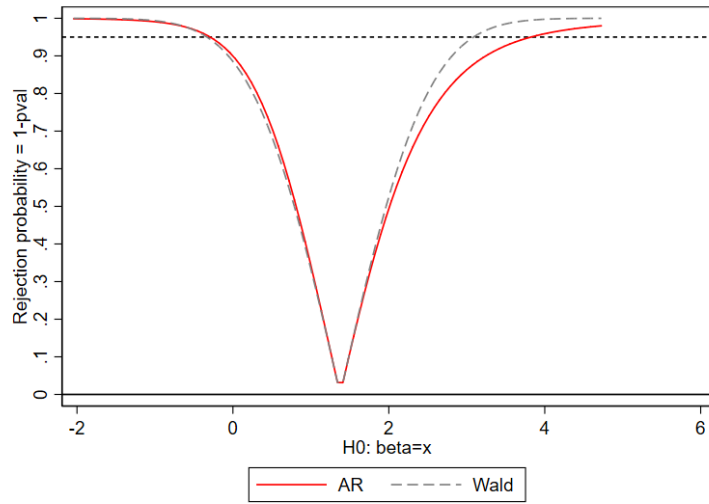


Note: Based on IMF Fiscal Rules dataset

Figure 2. Distribution of the IMF's fiscal rules strength index for countries with a rule



Note: The histogram reports the distribution of the strength index for countries with a rule in place.

Figure 3. Weak instrument test

Note: the vertical axis is 1 – the p-value for a test of the null hypothesis performed using the Wald and Anderson - Rubin respectively. The Wald test assumes a strong instrument, while the Anderson-Rubin test relaxes this hypothesis allowing for weak inference.

X. TABLES

Table 1. OLS results

VARIABLES	(1) Balance	(2) Balance	(3) Balance	(4) Balance
Fiscal rule	1.36*** (0.43)	1.03** (0.46)	0.70*** (0.23)	0.80*** (0.22)
L1 Balance			0.50*** (0.04)	0.45*** (0.04)
L2 Balance				0.05* (0.03)
L3 Balance				0.04** (0.02)
Real GDP growth	0.18*** (0.03)	0.13*** (0.03)	0.12*** (0.02)	0.12*** (0.02)
Log GDP per capita	0.30 (0.78)	0.96 (1.32)	0.33 (0.66)	0.43 (0.67)
L1 Debt	-0.01 (0.01)	-0.01 (0.01)	0.00 (0.00)	0.00* (0.00)
Output gap	0.12** (0.05)	0.04 (0.04)	0.02 (0.03)	0.04 (0.04)
Delta terms of trade	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.04*** (0.01)
IMF program	0.06 (0.30)	0.18 (0.31)	0.23 (0.17)	0.29 (0.18)
Currency union	0.62 (0.59)	0.22 (0.62)	-0.02 (0.32)	-0.04 (0.31)
Observations	3,027	3,027	3,027	2,823
R-squared	0.56	0.60	0.71	0.71
Country FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes

Note: the table presents the results of the OLS estimation of Equation (2) with different sets of fixed effects. The dependent variable is the nominal balance as a percent of GDP. The associated standard errors, clustered at the country level, are reported in brackets.

Table 2. Contiguity instruments results

VARIABLES	(1) Balance	(2) Balance	(3) Balance
Fiscal rule	0.86 (0.76)	1.38 (0.87)	1.17 (0.90)
L1 Balance,	0.45*** (0.04)	0.44*** (0.04)	0.44*** (0.04)
L2 Balance	0.05* (0.03)	0.05* (0.03)	0.05 (0.03)
L3 Balance	0.04** (0.02)	0.04** (0.02)	0.05** (0.02)
Real GDP growth	0.12*** (0.02)	0.12*** (0.02)	0.12*** (0.02)
Log GDP per capita	0.44 (0.68)	0.47 (0.69)	0.47 (0.72)
L1 Debt	0.00* (0.00)	0.00** (0.00)	0.00** (0.00)
Output gap	0.04 (0.04)	0.04 (0.04)	0.04 (0.04)
Delta Terms of trade	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
IMF program	0.31* (0.18)	0.30 (0.18)	0.25 (0.18)
Currency union	-0.04 (0.31)	-0.05 (0.31)	-0.03 (0.33)
Observations	2,797	2,797	2,693
R-squared	0.30	0.30	0.30
Number of id	142	142	142
IV	Contiguity	L1 Contiguity	MA of contiguity
Sample	Full	Full	Full
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Kleinberg-Paap rk test	15.24	11.23	12.46
Stock-Wright p-value	0.00	0.00	0.00

Note: the table reports the results of the IV estimation of Equation (2) with three different variations of the contiguity instrument. Column (1) uses the contemporaneous instrument, Column (2) the first lag, and Column (3) the a 3-year moving average. All the 3 models include country and time fixed effects. Standard errors are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

Table 3. First stage results – contiguity instrument

VARIABLES	(1) Fiscal rule	(2) Fiscal rule	(3) Fiscal rule
Contiguity	0.11*** (0.03)		
Lag 1 contiguity		0.08*** (0.03)	
Contiguity MA			0.103*** (0.031)
Lag 1 balance	0.00* (0.00)	0.00** (0.00)	0.004* (0.002)
Lag 2 balance	0.00 (0.00)	0.00 (0.00)	0.000 (0.001)
Lag 3 balance	-0.00 (0.00)	-0.00 (0.00)	-0.001 (0.001)
Real GDP growth	0.00 (0.00)	0.00 (0.00)	0.000 (0.002)
Log GDP per capita	-0.08 (0.11)	-0.07 (0.11)	-0.069 (0.116)
Lag 1 debt	-0.00 (0.00)	-0.00 (0.00)	-0.001 (0.001)
Output gap	-0.00 (0.00)	-0.00 (0.00)	-0.000 (0.002)
Delta terms of trade	-0.00* (0.00)	-0.00* (0.00)	-0.000** (0.000)
IMF program	0.01 (0.03)	0.01 (0.03)	0.007 (0.028)
Observations	2,797	2,797	2,693
R-squared	0.42	0.40	0.405
Number of id	142	142	142
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: the table reports the results of the first stage IV estimation of Equation (2) with the three different variations of the contiguity instrument. Column (1) uses the contemporaneous instrument, Column (2) the first lag, and Column (3) the a 3-year moving average. All the 3 models include country and time fixed effects. Standard errors, reported in parenthesis, are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Robustness for contiguity instrument

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Balance	Balance	Balance	Balance	Balance	Balance	Balance
Fiscal rule	1.29 (0.91)	1.38 (0.93)	0.49 (0.91)	0.77 (0.95)	1.08 (0.79)	0.69 (0.54)	1.10 (0.92)
Lag 1 balance	0.44*** (0.04)	0.44*** (0.04)	0.40*** (0.05)	0.41*** (0.05)	0.46*** (0.07)	0.46*** (0.04)	0.43*** (0.05)
Lag 2 balance	0.05* (0.03)	0.05* (0.03)	0.05* (0.03)	0.05* (0.03)	0.00 (0.04)	0.04 (0.03)	0.10* (0.06)
Lag 3 balance	0.04** (0.02)	0.04* (0.02)	0.06** (0.02)	0.06*** (0.02)	0.10*** (0.03)	0.02 (0.02)	-0.00 (0.04)
Real GDP growth	0.12*** (0.02)	0.11*** (0.03)	0.09*** (0.03)	0.09*** (0.03)	0.08*** (0.02)	0.10*** (0.02)	
Log GDP per capita	0.42 (0.70)	0.44 (0.69)	0.41 (0.84)	0.39 (0.82)	0.11 (0.51)	-0.46 (0.57)	
Lag 1 debt	0.00** (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.01*** (0.00)	0.01*** (0.00)	
Output gap	0.03 (0.04)	0.04 (0.04)	0.06 (0.05)	0.06 (0.05)	0.07 (0.04)	0.07* (0.04)	
Delta terms of trade	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	
IMF program	0.23 (0.19)	0.24 (0.19)	0.33 (0.21)	0.31 (0.20)	0.35** (0.17)	0.22 (0.19)	
Currency union	-0.06 (0.31)	-0.01 (0.31)	-0.45 (0.54)	-0.46 (0.55)	0.15 (0.30)	0.07 (0.30)	
Trade as % of GDP	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	0.00 (0.00)	
Growth in the region		0.11** (0.05)	0.09 (0.07)	0.07 (0.05)	0.11* (0.05)	0.35*** (0.04)	
Observations	2,744	2,744	1,921	2,124	2,047	2,744	3,309
R-squared	0.30	0.30	0.27	0.28	0.31	0.37	0.25
Number of id	142	142	104	116	142	142	157
Sample	Full	Full	No Europe	No EU	No GFC	Full	Full
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	No	Yes
Kleinberg-Paap rk test	10.89	10.73	23.36	20.37	10.87	28.24	11.80
Stock-Wright p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: the table reports robustness exercises for the IV estimation of Equation (2). The instrument is the first lag of the contiguity instrument. Column (3) excludes all the European countries in the sample (as defined by the IMF). Column (4) excludes the European Union countries. Column (5) excludes the global financial crisis. Column (6) excludes year fixed effects. Standard errors, reported in parenthesis, are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

Table 5. Testing IVs in the literature

VARIABLES	(1) Balance	(2) Balance	(3) Balance	(4) Balance
Fiscal rule	0.38 (1.56)	-2.35 (7.48)	-9.60 (14.38)	0.38 (1.56)
Lag 1 balance	0.45*** (0.04)	0.48*** (0.06)	0.52*** (0.08)	0.45*** (0.04)
Lag 2 balance	0.05* (0.03)	0.05* (0.03)	0.04 (0.03)	0.05* (0.03)
Lag 3 balance	0.04** (0.02)	0.03 (0.02)	0.02 (0.03)	0.04** (0.02)
Real GDP growth	0.12*** (0.02)	0.12*** (0.03)	0.12*** (0.03)	0.12*** (0.02)
Log GDP per capita	0.41 (0.67)	0.08 (0.87)	-0.40 (1.60)	0.41 (0.67)
Lag 1 debt	0.00 (0.00)	0.00 (0.01)	-0.00 (0.01)	0.00 (0.00)
Output gap	0.04 (0.04)	0.01 (0.04)	0.03 (0.05)	0.04 (0.04)
Delta terms of trade	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
IMF program	0.30* (0.18)	0.28 (0.19)	0.45 (0.39)	0.30* (0.18)
Currency union	-0.03 (0.31)	-0.10 (0.37)	0.18 (0.77)	-0.03 (0.31)
Observations	2,823	2,660	2,732	2,629
Number of id	144	140	141	140
IV	IT	Govfrac	Checks	Checks IT Govfrac
Kleinberg-Paap rk test	7.65	0.51	0.65	2.07
Stock-Wright p-value	0.01	0.48	0.42	0.11

Note: The table reports the results based on Equation (2). The instruments are: inflation targeting, government fragmentation, and checks and balance. In Column (4), a specification with the 3 IVs used jointly is presented. Standard errors, reported in parenthesis, are clustered at the country level.

Table 6. Results with the fiscal rules strength index

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
Strength Index	3.91** (1.69)	3.83** (1.84)	4.43** (1.97)	0.81 (2.57)	2.86 (3.31)	3.96** (1.73)	2.69** (1.32)	2.54* (1.41)
L1 balance	0.44*** (0.04)	0.44*** (0.04)	0.44*** (0.04)	0.40*** (0.05)	0.41*** (0.05)	0.45*** (0.07)	0.46*** (0.04)	0.43*** (0.05)
L2 balance	0.05* (0.03)	0.05** (0.03)	0.06** (0.03)	0.06* (0.03)	0.05* (0.03)	0.01 (0.04)	0.04 (0.03)	0.10* (0.06)
L3 balance	0.04** (0.02)	0.05** (0.02)	0.04** (0.02)	0.06** (0.02)	0.06*** (0.02)	0.11*** (0.03)	0.02 (0.02)	-0.00 (0.04)
Real GDP growth	0.12*** (0.02)	0.12*** (0.02)	0.11*** (0.03)	0.10*** (0.03)	0.09*** (0.03)	0.08*** (0.02)	0.10*** (0.02)	
Log GDP per capita	0.45 (0.69)	0.42 (0.70)	0.45 (0.69)	0.37 (0.83)	0.42 (0.82)	0.12 (0.53)	-0.67 (0.57)	
L1 debt	0.00 (0.00)	0.00* (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.01*** (0.00)	0.01*** (0.00)	
Output gap	0.04 (0.04)	0.03 (0.04)	0.03 (0.04)	0.06 (0.05)	0.06 (0.05)	0.07 (0.04)	0.07* (0.04)	
Delta terms of trade	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	
IMF program	0.28 (0.18)	0.21 (0.18)	0.21 (0.18)	0.33 (0.21)	0.30 (0.19)	0.34** (0.16)	0.21 (0.18)	
Currency union	-0.34 (0.34)	-0.32 (0.33)	-0.30 (0.34)	-0.44 (0.53)	-0.49 (0.59)	-0.14 (0.32)	-0.12 (0.32)	
Trade as % of GDP		-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	
Growth rate in the region			0.15*** (0.05)	0.09 (0.07)	0.07 (0.05)	0.15** (0.06)	0.37*** (0.04)	
Observations	2,797	2,744	2,744	1,921	2,124	2,047	2,744	3,309
R-squared	0.302	0.30	0.30	0.27	0.28	0.31	0.37	0.25
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Number of id	142	142	142	104	116	142	142	157
Kleinberg-Paap rk test	19.01	18.23	17.40	20.88	15.93	18.68	31.82	26.61
Stock-Wright p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sample	Full	Full	Full	No Europe	No EU	No GFC	Full	Full

Note: the table reports the results of the IV estimation of Equation (3), using the index of fiscal rule's strength. The instrument is the first lag of variable described in Equation (4). Column (3) excludes all the European countries in the sample (as defined by the IMF). Column (4) excludes the European Union countries. Column (5) excludes the global financial crisis. Column (6) excludes year fixed effects. Standard errors, reported in parenthesis, are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

XI. APPENDIX

Table A1. Variables' sources

Variable	Source
Fiscal rule	IMF Fiscal Rule Dataset (available at https://www.imf.org/external/datamapper/fiscalrules/map/map.htm)
Strength Index	IMF Fiscal Rule Dataset (available at https://www.imf.org/external/datamapper/fiscalrules/map/map.htm)
Fiscal balance	IMF WOE and GFS databases (latest vintage, available at www.imf.org)
Real GDP growth	IMF WEO (latest vintage, available at www.imf.org)
Real GDP per capita	(latest vintage, available at www.imf.org)
Government debt	IMF WEO, GFS, and GDD databases (latest vintage, available at www.imf.org)
Output gap	IMF WEO (latest vintage, available at www.imf.org)
Terms of trade	IMF WEO (latest vintage, available at www.imf.org)
IMF program	Poulain and Reynaud (2017)
Currency Union	Frankel and Rose (2002)
Trade openness	IMF WEO (latest vintage, available at www.imf.org)
Contiguity IV	Professor Andrew K. Rose's (available at http://faculty.haas.berkeley.edu/arose) and IMF DOTS databases (latest vintage, available at www.imf.org)

Table A2. Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Fiscal balance	-1.99	6.05	-49.58	44.36	-1.99
Real GDP growth	4.02	4.72	-62.08	38.20	4.02
Log real GDP per capita	8.35	1.61	4.88	11.43	8.35
Government debt	59.94	51.60	0.00	789.83	59.94
Output gap	-0.09	3.20	-109.09	22.42	-0.09
Delta TOT	0.75	15.23	-285.32	143.62	0.75
IMF program	0.34	0.47	0.00	1.00	0.34
Currency Union	0.28	0.45	0.00	1.00	0.28
Trade openness	84.02	53.41	0.17	442.62	84.02
Contiguity IV	1.04	1.49	0.00	9.00	1.04
Mean growth in the region	3.99	2.03	-5.15	10.73	3.99

Table A3. Summary statistics of the IMF's fiscal rules strength index

Percentiles			
1%	0.107	Obs.	1,296
5%	0.116	Mean	0.294
10%	0.132	Std. Dev.	0.140
25%	0.181	Variance	0.020
50%	0.259	Skewness	1.076
75%	0.375		
90%	0.484		
95%	0.570		
99%	0.738		

Table A4. First stage for the robustness exercises on the contiguity instrument (dummy)

VARIABLES	(1) Fiscal rule	(2) Fiscal rule	(3) Fiscal rule	(4) Fiscal rule	(5) Fiscal rule	(6) Fiscal rule	(7) Fiscal rule
Lag 1 contiguity	0.084*** (0.025)	0.083*** (0.025)	0.116*** (0.024)	0.103*** (0.023)	0.088*** (0.027)	0.132*** (0.025)	0.082*** (0.024)
L1 balance	0.004** (0.002)	0.004** (0.002)	0.003* (0.002)	0.004* (0.002)	0.006** (0.002)	0.004** (0.002)	0.003* (0.002)
L2 balance	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	0.001 (0.001)
L3 balance	-0.002 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)	-0.003 (0.002)	0.001 (0.002)	-0.001 (0.001)
Real GDP growth	0.001 (0.002)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)	0.004* (0.002)	0.003 (0.002)	
Log GDP per capita	-0.051 (0.113)	-0.053 (0.112)	-0.158 (0.109)	-0.194* (0.105)	-0.053 (0.116)	0.405*** (0.119)	
L1 debt	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)	
Output gap	-0.002 (0.002)	-0.002 (0.003)	-0.001 (0.003)	0.000 (0.003)	-0.005 (0.003)	-0.009*** (0.003)	
Delta ToT	-0.001* (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)	
IMF program	0.002 (0.028)	0.001 (0.028)	0.012 (0.032)	0.016 (0.030)	-0.013 (0.032)	0.025 (0.031)	
Currency union	-0.016 (0.069)	-0.022 (0.068)	0.086 (0.115)	0.078 (0.117)	-0.021 (0.063)	0.088 (0.073)	
Trade as % of GDP	-0.001 (0.001)	-0.001 (0.001)	-0.002** (0.001)	-0.002** (0.001)	-0.001 (0.001)	0.000 (0.001)	
Growth in the region		-0.015** (0.007)	-0.011* (0.006)	-0.009 (0.006)	-0.017** (0.008)	0.002 (0.004)	
Observations	2,744	2,744	1,921	2,124	2,047	2,744	3,643
R-squared	0.406	0.409	0.390	0.391	0.415	0.307	0.387
Number of id	142	142	104	116	142	142	158
Sample	Full	Full	No Europe	No EU	No GFC	Full	Full
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	No	Yes

Note: the table reports the first stage of the robustness exercises of the IV regressions presented in Table 4. The instrument is the first lag of the contiguity instrument defined in Equation (1). Column (3) excludes all the European countries in the sample (as defined by the IMF). Column (4) excludes the European Union countries. Column (5) excludes the global financial crisis. Column (6) excludes year fixed effects. Standard errors, reported in parenthesis, are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

Table A5. First stage for the contiguity strength index regressions

VARIABLES	(1) Strength Index	(2) Strength Index	(3) Strength Index	(4) Strength Index	(5) Strength Index	(6) Strength Index	(7) Strength Index	(8) Strength Index
L1 strength contiguity	0.018*** (0.004)	0.017*** (0.004)	0.017*** (0.004)	0.019*** (0.004)	0.015*** (0.004)	0.017*** (0.004)	0.024*** (0.004)	0.019*** (0.004)
L1 balance	0.001* (0.001)	0.001* (0.001)	0.001** (0.001)	0.001* (0.001)	0.001* (0.001)	0.002*** (0.001)	0.001** (0.001)	0.001 (0.000)
L2 balance	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.000)
L3 balance	-0.001*** (0.000)	-0.001*** (0.000)	-0.001** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.002*** (0.001)	-0.001* (0.000)	-0.001*** (0.000)
Real GDP growth	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	
Log GDP per capita	-0.009 (0.037)	-0.006 (0.038)	-0.007 (0.037)	-0.042 (0.028)	-0.053* (0.028)	-0.007 (0.040)	0.160*** (0.037)	
L1 debt	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	
Output gap	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.002 (0.001)	-0.003*** (0.001)	
Delta ToT	-0.000* (0.000)	-0.000** (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	
IMF program	0.006 (0.010)	0.005 (0.010)	0.004 (0.009)	0.004 (0.008)	0.005 (0.008)	-0.001 (0.011)	0.010 (0.010)	
Currency union	0.050* (0.028)	0.047 (0.029)	0.044 (0.028)	0.036 (0.040)	0.032 (0.041)	0.049* (0.029)	0.077** (0.030)	
Trade as % of GDP		0.000 (0.000)	0.000 (0.000)	-0.000** (0.000)	-0.000* (0.000)	0.000 (0.000)		
Growth in the region			-0.010*** (0.002)	-0.003* (0.001)	-0.001 (0.002)	-0.011*** (0.003)		
Observations	2,797	2,744	2,744	1,921	2,124	2,047	2,797	3,643
R-squared	0.489	0.494	0.503	0.413	0.399	0.507	0.414	0.491
Number of id	142	142	142	104	116	142	142	158
Sample	Full	Full	Full	No Europe	No EU	No GFC	Full	Full
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Note: the table reports the first stage of the IV regressions presented in Table 6. The instrument considered is the lag of the strength index defined in Equation (4). Column (4) excludes all the European countries in the sample (as defined by the IMF). Column (5) excludes the European Union countries. Column (6) excludes the global financial crisis. Column (7) excludes year fixed effects. Standard errors, reported in parenthesis, are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1