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The Macroeconomic Effects of Fiscal Rules

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List of acronyms

ATT	Average Treatment Effect
BBR	Budget Balance Rule
CAB	Cyclically-Adjusted Overall Balance
CAPB	Cyclically-Adjusted Primary Balance
CEMAC	Central African Economic and Monetary Community
DG ECFIN	Directorate-General for Economic and Financial Affairs
DR	Debt Rule
EMU	Economic and Monetary Union
ER	Expenditure Rule
EU	European Union
FCC	European Former Communist Countries
FP	Fiscal Performance
FR	Fiscal Rule
FRSI	Fiscal Rules Strength Index
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GMM	Generalized Method of Moments
ICRG	International Country Risk Guide
IMF	International Monetary Fund
IQ	Income Inequality
IT	Inflation Targeting
IV	Instrumental Variables
LSDV	Least Square Dummy Variable
LSDVC	Bias Corrected Least Square Dummy Variable
ME	Marginal Effect
MTBF	Medium-term budgetary frameworks
MTO	Medium-term budgetary objective

List of acronyms (*continued*)

NCC	EU Non-Communist Countries
NFR	National Fiscal Rules
OB	Overall Balance
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PB	Primary Fiscal Balance
PS	Public Spending
PSM	Propensity Score Matching Method
RR	Revenue Rule
SB	Structural Balance
SFR	Supranational Fiscal Rule
SGP	Stability and Growth Pact
SWIID	Standardized World Income Inequality Database
UNCTAD	United Nations Conference on Trade and Development
WAEMU	West African Economic and Monetary Union

SUMMARY (EN)

The macroeconomic stance during the late 1970s is characterized by severe high-inflation episodes. One of the most important messages delivered by the post-1970s oil shocks literature was that rules might be preferred to discretionary policies. The key argument of this "new momentum" is grounded in the idea that discretion involves absence while *rules* involve *commitment* and *credibility*. Capitalizing on such arguments, a growing number of countries adopted fiscal rules with the aim of attaining sound and credible fiscal positions. Compared to only a handful of countries in the mid-1980s, around 100 countries currently present at least a type of fiscal rule according to the IMF Fiscal Rules Dataset.

This PhD, entitled "***The macroeconomic effects of fiscal rules***", is composed of two parts, each containing two chapters, for a total of four chapters. Each chapter is organized as a manuscript and presents an *original contribution on the effects of fiscal rules*. The first two chapters revisit the relationship between fiscal rules and fiscal discipline, by focusing on the European Union countries. Instead, the last two chapters show that, beyond fiscal discipline, fiscal rules may trigger side-effects on various macroeconomic aggregates.

In the *first part* of the PhD we revisit the relationship between fiscal rules and fiscal discipline through two contributions that focus on the European Union countries.

Chapter I

The early 1990 brought two important changes in Europe. On the one hand, Central and Eastern European countries experienced massive changes in their political and economic systems, caused by the fall of their communist regimes in the context of the end of the Cold War. On the other hand, Western European countries agreed, through the Treaty of Maastricht (1992), to accomplish a monetary union by the end of the millennium. These two events ultimately converged when Central and Eastern European countries joined the European Union in the mid-2000s, i.e. ten such countries entered the EU between 2004 and 2007.

However, despite joining the EU, it is intuitively appealing to consider that Central and Eastern Europe former communist countries are still fairly different from Western Europe countries, given that they experienced almost half a century of structurally-different political and economic conditions. Consequently, the goal of the first chapter, entitled "***A multi-speed fiscal Europe? Fiscal rules and fiscal performance in the EU Former Communist Countries***", is to explore the effect of fiscal rules on fiscal performance in EU Former Communist Countries. Results based on the bias-corrected least squares dummy (LS-DVC) estimator, which is justified by the relatively-small sample (eleven countries analyzed during the period 1995-2014), are as follows.

The presence of fiscal rules does not have a significant effect on the primary fiscal balance in the EU former communist countries. At odds with the favorable effect of fiscal rules in Western EU countries, this finding may be explained by a loose understanding of, and commitment to fiscal rules by EU former communist countries' governments in terms of fiscal performance, and is robust when changing the sample, using alternative estimators, or considering various measures of fiscal performance. In addition, such a lack of significant effect is also found for various types of fiscal rules, when looking at the age and the number of fiscal rules, and in the case of national or supranational fiscal rules, or medium term budgetary frameworks (MTBF). Lastly, and on the contrary, an improvement in the strength of fiscal rules is found to significantly increase the fiscal performance of former communist countries, and the size of this effect overweighs the favorable impact of fiscal rules in Western EU countries.

Consequently, simply adopting fiscal rules may trigger possible threats of a multi-speed fiscal Europe, as they significantly improve fiscal performance in Western EU but not in Central and Eastern EU countries. Instead, enforcing fiscal rules may improve the fiscal cohesion of the EU, as they enhance the fiscal performance of both Western and Central and Eastern EU countries. From a broader perspective, fiscal policies should go beyond the simple adoption of fiscal rules and insist on their enforcement in the countries that are expected to join the Euro area or the EU in the years to come.

Chapter II

The differences between the EU countries highlighted in the first chapter call for a more detailed analysis of the effect of fiscal rules on fiscal discipline. Indeed, along with various reforms of the fiscal framework, came out the idea that fiscal rules must be supported by national frameworks, namely processes or procedures that influence the behavior of national policymakers. As a result, various political, economic, and social institutions, related in particular to countries' historical heritage, may shape fiscal rules' effectiveness particularly regarding their capacity to improve countries' fiscal discipline.

However, with few exceptions, most studies devoted to fiscal discipline considered the effects of fiscal rules and institutions in isolation. Consequently, the goal of the second chapter, entitled "***One size really does not fit all: Fiscal rules and institutional quality in the EU***", is to explore the joint effect of fiscal rules and institutions on fiscal discipline by distinguishing between two groups of EU countries, i.e. previously-communist countries (CC) and non-communist countries (NCC). Such a distinction captures the fundamentally-different institutional paths followed by these countries after the Second World War, as highlighted by several contributions. Our analysis performed using two decades of data reveals the following.

Strengthening fiscal rules increases the fiscal discipline of non-communist countries as institutions improve (a complementarity effect), but decreases the fiscal discipline of previously-communist countries as institutions improve (a substitution effect). Robust when e.g. tackling endogeneity related to fixed-effects in dynamic models and reversed causality, capturing fiscal performance with various measures, or using a semi-parametric model to account for nonlinearities in the effect of institutions, such differences are echoed by different impacts of political, economic, and social institutions. The fiscal rules-institutions complementarity observed in non-communist countries owes to political and economic institutions (but not to social institutions), while the substitution observed in former communist countries is driven by political and social institutions (and a complementarity effect is found for economic institutions).

From a policy perspective, our findings suggest that a one-size-fits-all approach to fiscal rules' design may result, due to differences in the institutional environment, into fairly-different impacts on fiscal performance between non-communist and former communist EU countries. Consequently, EU policymakers should bear in mind that the interactions between fiscal rules and institutions are possibly complex, and as such integrate a national dimension, i.e. which would account for national institutions, when designing fiscal reforms that go along with the enforcement of fiscal rules.

In the *second part* of the PhD we look at possible side-effects of fiscal rules. Indeed, only a sparse literature looks at the side-effects of fiscal rules, and mainly focuses on fiscal policy, with few exceptions analyzing their economic growth and inflation performances. We extend this literature through two contributions on the side effects of fiscal rules, one devoted to the composition of public spending and the other to income inequality.

Chapter III

Rules-based fiscal frameworks have become considerably prevalent for the conduct of fiscal policy in the recent years—as a response to the fiscal legacy fetched by the Great Recession—with the goal of ruling out the roots of *deficit bias* in the political process. Despite the increased popularity of fiscal rules supported by their benefits in terms of fiscal performance, some contributions point out to a more skeptical perspective regarding these potential benefits or even underline undesirable effects of fiscal rules in terms of governments' procyclical behavior. This lack of consensus illustrates the existential crises faced by the rule-based fiscal frameworks in the recent years, and also may underline the need to assess the possible "side-effects" of fiscal rules that could partly influence their stimulative effects.

Since all types of fiscal rules encompass a goal of targeting public spending (except for revenue rules), such controversies are undeniably linked to the way fiscal rules shape governments' spending behavior. Taking stock of the existing literature, the goal of the third chapter entitled "***How Do Fiscal Rules Shape Public Spending Composition?***" is to examine the way fiscal rules may influence government's behavior, particularly by exploring

the nexus between fiscal rules and the composition of public spending. Estimations based on the entropy balancing method applied in a large sample of 185 countries reveal the following.

Fiscal rules are found to significantly reduce total public spending and public consumption, leave public investment mostly unaffected, and increase the public investment-to-public consumption ratio. Moreover, our findings differ with respect to the type of fiscal rule and countries' level of economic development. Finally, the features of fiscal rules (e.g. independent fiscal bodies, investment-friendly FR, supranational FR, enforcement procedures) seem to be the major driving force of the way public spending—and, particularly, total spending and public investment—are changed in response to fiscal rules' adoption.

Consequently, the key policy takeaways can be summarized as follows. Fiscal rules are found to promote fiscal discipline by triggering a significant decrease of total spending. In addition, while public consumption is often significantly reduced, governments (predominantly in developing countries) seem to protect public investment following the adoption of fiscal rules. Contrary to some pessimistic views expressed particularly in the early 2000s that fiscal rules would result into public investment cuts, our results show that public investment contractions are mostly related with other policies but fiscal rules (e.g. fiscal consolidations being an appealing candidate).

Lastly, providing a more granular perspective, we show that not all fiscal rules' features are desirable in terms of supporting the fiscal discipline effects of fiscal rules. In particular, while some features (such as enforcement and a strong legal basis) usually promote the fiscal discipline effects of fiscal rules, the impact of a high degree of flexibility and of supporting procedures or institutions is fairly mixed. Therefore, our contribution calls for a careful assessment of these features, especially for governments that may look at other goals beside fiscal discipline.

Chapter IV

Going beyond the standard approach of examining the relationship between fiscal rules and fiscal discipline largely employed by the existing literature, the previous chapter of the thesis confirmed that fiscal rules might exert salient macroeconomic side-effects on the com-

position of public spending. This important result drives us to utterly consider a rather different angle through which fiscal rules may significantly affect other critical macroeconomic outcomes closely linked to governments' spending behavior, and in particular income inequality.

Indeed, there are serious reasons to believe in a significant side-effect of fiscal rules on inequality, rooted in at least three grounds. First, due to their effect on fiscal balances, fiscal rules most likely shape both government spending and revenues, and therefore may alter their impact on inequality. Second, following the Great Recession, many countries enacted fiscal rules together with fiscal consolidation programs, in accordance with previous evidence supporting a key role of fiscal rules for them; consequently, by altering the nature of fiscal consolidations, fiscal rules are likely to affect inequality. Third, fiscal rules are found to influence fiscal policy cyclicality and governments' borrowing costs; through these channels that affect the fiscal stance from a medium-long-run perspective, fiscal rules may yet again influence inequality.

Nevertheless, since the channels through which fiscal rules may generate a side effect on inequality are numerous and possibly contradictory, the identification of each precise channel—and, particularly, the direction and the magnitude of its respective contribution—is a fairly complex if not impossible task. To avoid making a hazardous conjecture about the direction (and the magnitude) of the potential impact of fiscal rules on inequality, the fourth and last chapter of the thesis entitled "***On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality***" extends the literature on the side-effects of fiscal rules by exploring the causal direct effect of fiscal rules adoption on income inequality in a large panel of developing countries.

Drawing upon the propensity score matching method, our estimations show that fiscal rules have a significant side-effect on income inequality: countries that adopted fiscal rules experience a significant decrease in their income inequality with respect to comparable countries that did not. The robustness of our findings is supported when using an alternative measure of inequality, augmenting the model with additional controls, employing an alterna-

tive estimation method, or when changing the sample. Moreover, when looking at possible differences in the effect of fiscal rules on inequality, we find that the type of fiscal rule matters: while balanced-budget rules and debt rules have a favorable effect on inequality, expenditure rules are found to increase it. Lastly, we unveil important heterogeneities in the relationship between fiscal rules and inequality driven by fiscal, monetary, international, and other structural factors.

From a policy perspective, our contribution fills an important gap in the literature devoted to the side-effects of fiscal rule. Even if fiscal rules are not primarily designed to address the issue of income inequality, our results show not only that fiscal rules are not neutral in terms of inequality, but also reveal particular cases in which they may decrease or even increase income inequality. Consequently, our results may provide insightful evidence for governments aiming at adopting fiscal rules or improving the existing rule-based fiscal framework.

RÉSUMÉ (FR)

La situation macroéconomique de la fin des années 1970 est caractérisée par des épisodes de forte inflation. L'un des messages les plus importants délivrés par la littérature ultérieure aux chocs pétroliers des années 1970 était que les règles pourraient être préférées aux politiques discrétionnaires. L'argument clé de ce "nouvel élan" repose sur l'idée que la discrétion implique l'absence tandis que les *règles* impliquent *engagement* et *crédibilité*. En capitalisant sur de tels arguments, un nombre croissant de pays ont adopté des règles budgétaires dans le but d'atteindre des positions budgétaires saines et crédibles. Par rapport à seulement une poignée de pays au milieu des années 1980, environ 100 pays présentent actuellement au moins un type de règle budgétaire selon la base de données du FMI portant sur les règles budgétaires.

Cette thèse de doctorat, intitulée "***Les effets macroéconomiques des règles budgétaires***", est composée de deux parties contenant chacune deux chapitres, pour un total de quatre chapitres. Chaque chapitre est organisé comme un manuscrit et présente une *contribution originale sur les effets des règles budgétaires*. Les deux premiers chapitres revisitent la relation entre règles budgétaires et discipline budgétaire, en se concentrant sur les pays de l'Union Européenne. Quant à eux, les deux derniers chapitres montrent qu'au-delà de la discipline budgétaire, les règles budgétaires peuvent engendrer des effets secondaires sur différents agrégats macroéconomiques.

Dans la *première partie* de la thèse, nous revisitons la relation entre les règles budgétaires et discipline budgétaire à travers deux contributions qui se concentrent sur les pays de l'Union Européenne.

Chapitre I

Le début des années 1990 a apporté deux changements importants en Europe. D'une part, les pays d'Europe centrale et orientale ont connu d'importants changements dans leurs systèmes politiques et économiques, provoqués par la chute de leurs régimes communistes

dans le contexte de la fin de la guerre froide. D'autre part, les pays d'Europe occidentale se sont engagés, par le Traité de Maastricht (1992), de réaliser une union monétaire avant la fin du millénaire. Ces deux événements ont finalement convergé lorsque les pays d'Europe centrale et orientale ont rejoint l'Union Européenne au milieu des années 2000, i.e. dix de ces pays sont entrés dans l'UE entre 2004 et 2007.

Cependant, malgré l'adhésion à l'UE, il est intuitif de considérer que les anciens pays communistes d'Europe centrale et orientale sont encore assez différents des pays d'Europe occidentale, étant donné qu'ils ont connu près d'un demi-siècle de conditions politiques et économiques structurellement différentes. Par conséquent, l'objectif du premier chapitre, intitulé "***Une Europe budgétaire à plusieurs vitesses ? Règles budgétaires et performance budgétaire dans les anciens pays communistes de l'UE***" , est d'explorer l'effet des règles budgétaires sur la performance budgétaire dans les anciens pays communistes de l'UE. Les résultats basés sur l'estimateur des moindres carrés corrigés du biais (LSDVC), qui est justifié par l'échantillon relativement petit (onze pays analysés durant la période 1995-2014), sont les suivants.

La présence de règles budgétaires n'a pas d'effet significatif sur le solde budgétaire primaire dans les anciens pays communistes de l'UE. En contradiction avec l'effet favorable des règles budgétaires dans les pays occidentaux de l'UE, ce résultat peut s'expliquer par une compréhension et un engagement vagues envers des règles budgétaires par les gouvernements des anciens pays communistes de l'UE en termes de performance budgétaire, et demeure robuste lorsque l'on change l'échantillon, en utilisant d'autres estimateurs ou en considérant diverses mesures de performance budgétaire. En outre, une telle absence d'effet significatif est également trouvée pour différents types de règles budgétaires, lorsqu'on examine l'âge et le nombre de règles budgétaires, et pour des règles budgétaires nationales ou supranationales, ou des cadres budgétaires à moyen terme (MTBF). Enfin, et au contraire, une amélioration de la force des règles budgétaires augmente significativement la performance budgétaire des anciens pays communistes, et l'ampleur de cet effet l'emporte sur l'impact favorable des règles budgétaires dans les pays occidentaux de l'UE.

Par conséquent, la simple adoption de règles budgétaires peut soutenir une Europe budgétaire à plusieurs vitesses, car elles améliorent considérablement les performances budgétaires dans l'UE occidentale mais pas dans les pays de l'UE centrale et orientale. Au lieu de cela, un renforcement des règles budgétaires peut améliorer la cohésion budgétaire de l'UE, car il améliore les performances budgétaires des pays occidentaux et du centre et de l'est de l'UE. Dans une perspective plus large, les politiques budgétaires devraient aller au-delà de la simple adoption de règles budgétaires et insister sur leur renforcement dans les pays qui devraient rejoindre la zone euro ou l'UE dans les années à venir.

Chapitre II

Les différences entre les pays de l'UE mises en évidence dans le premier chapitre appellent une analyse plus détaillée de l'effet des règles budgétaires sur la discipline budgétaire. En effet, ensemble avec diverses réformes du cadre budgétaire, est ressortie l'idée que les règles budgétaires doivent être soutenues par des cadres nationaux, à savoir des processus ou des procédures qui influencent le comportement des décideurs nationaux. En conséquence, diverses institutions politiques, économiques et sociales, liées notamment à l'héritage historique des pays, peuvent façonner l'efficacité des règles budgétaires notamment en ce qui concerne leur capacité à améliorer la discipline budgétaire des pays.

Cependant, à quelques exceptions près, la plupart des études consacrées à la discipline budgétaire ont considéré de manière isolée les effets des règles et des institutions budgétaires. Par conséquent, l'objectif du deuxième chapitre, intitulé "***Les dangers d'une politique unique : règles budgétaires et qualité institutionnelle dans l'UE***", est d'explorer l'effet conjoint des règles budgétaires et des institutions sur la discipline budgétaire, en distinguant deux groupes de pays de l'UE, i.e. les pays anciennement communistes (CC) et les pays non communistes (NCC). Une telle distinction rend compte des trajectoires institutionnelles fondamentalement différentes suivies par ces pays après la Seconde Guerre mondiale, comme le soulignent plusieurs contributions. Notre analyse portant sur une vingtaine d'années révèle ce qui suit.

Le renforcement des règles budgétaires augmente la discipline budgétaire des pays non

communistes à mesure que les institutions s'améliorent (un effet de complémentarité), mais diminue la discipline budgétaire des pays auparavant communistes à mesure que les institutions s'améliorent (un effet de substitution). Robuste par exemple lorsque l'on contrôle l'endogénéité liée aux effets fixes dans les modèles dynamiques et à la causalité inversée, pour différentes mesures de performance budgétaire, ou en présence d'un modèle semi-paramétrique pour tenir compte des non-linéarités dans l'effet des institutions, de telles différences sont expliquées par différentes influences des institutions politiques, économiques et sociales. La complémentarité entre règles budgétaires et institutions observée dans les pays non communistes est due aux institutions politiques et économiques (mais pas aux institutions sociales), tandis que la substitution observée dans les anciens pays communistes est engendrée par les institutions politiques et sociales (et un effet de complémentarité est trouvé pour les institutions économiques).

D'un point de vue de politique économique, nos résultats suggèrent qu'une approche unique dans la conception des règles budgétaires peut générer, en raison des différences dans l'environnement institutionnel, des impacts assez différents sur la performance budgétaire dans les pays de l'UE non communiste et anciennement communistes. Par conséquent, les décideurs politiques de l'UE doivent garder à l'esprit que les interactions entre les règles budgétaires et les institutions sont probablement complexes et, ainsi, intégrer une dimension nationale, i.e. qui tiendrait compte des institutions nationales, lors de la conception des réformes budgétaires qui vont de pair avec le renfoncement des règles budgétaires.

Dans la *seconde partie* de la thèse, nous examinons de possibles effets secondaires des règles budgétaires. En effet, seule une rare littérature examine les effets secondaires des règles budgétaires, et elle se concentre principalement sur la politique budgétaire, à quelques exceptions près dédiées à l'analyse de leurs performances en matière de croissance économique et d'inflation. Nous prolongeons cette littérature à travers deux contributions portant sur les effets secondaires des règles budgétaires, l'une consacrée à la composition des dépenses publiques et l'autre à l'inégalité du revenu.

Chapitre III

Les cadres budgétaires fondés sur des règles budgétaires sont devenus très répandus pour la conduite de la politique budgétaire au cours des dernières années—en réponse à l'héritage budgétaire de la Grande Récession—avec l'objectif d'éliminer les sources du *biais de déficit* dans le processus politique. Malgré la popularité croissante des règles budgétaires soutenue par leurs bénéfices en termes de performance budgétaire, certaines contributions apportent une perspective plus sceptique quant à ces avantages potentiels ou soulignent même des effets indésirables des règles budgétaires en termes de comportement pro-cyclique des gouvernements. Ce manque de consensus illustre les crises existentielles rencontrées par les cadres budgétaires fondés sur des règles budgétaires durant ces dernières années, et peut également souligner la nécessité d'évaluer les éventuels "effets secondaires" des règles budgétaires qui pourraient en partie influencer leurs effets stimulants.

Étant donné que toutes les catégories de règles budgétaires englobent un objectif de ciblage des dépenses publiques (à l'exception des règles de revenu), de telles controverses sont indéniablement liées à la manière dont les règles budgétaires façonnent le comportement de dépenses des gouvernements. En s'appuyant sur la littérature existante, l'objectif du troisième chapitre intitulé "***Comment les règles budgétaires déterminent la composition des dépenses publiques ?***" est d'examiner la manière dont les règles budgétaires peuvent influencer le comportement du gouvernement, notamment en explorant le lien entre règles budgétaires et la composition des dépenses publiques. Les estimations basées sur la méthode *entropy balancing* appliquée à un large échantillon de 185 pays révèlent ce qui suit.

Les règles budgétaires réduisent significativement les dépenses publiques totales et la consommation publique, laissent l'investissement public plutôt inchangé et augmentent le ratio investissement public/consommation publique. De plus, nos résultats sont différents en fonction du type de règle budgétaire et du niveau de développement économique des pays. Enfin, les caractéristiques des règles budgétaires (par exemple, les conseils budgétaires indépendants, les règles budgétaires favorables à l'investissement, le règles budgétaires supranationales, les procédures de renforcement des règles) semblent être le principal mo-

teur de la manière dont les dépenses publiques—et, en particulier, les dépenses totales et l'investissement public—sont modifiés en réponse à l'adoption des règles budgétaires.

Par conséquent, les principaux enseignements de politique économiques peuvent être résumés comme suit. Les règles budgétaires favorisent la discipline budgétaire en générant une diminution significative des dépenses totales. De plus, alors que la consommation publique est souvent significativement réduite, les gouvernements (principalement dans les pays en développement) semblent protéger l'investissement public suite à l'adoption de règles budgétaires. Contrairement à certaines opinions pessimistes exprimées en particulier au début des années 2000 selon lesquelles les règles budgétaires entraîneraient des réductions des investissements publics, nos résultats montrent que les contractions de l'investissement public sont principalement liées à d'autres politiques économiques que les règles budgétaires (e.g. les consolidations budgétaires étant un candidat pertinent).

Enfin, offrant une perspective plus granulaire, nous montrons que toutes les caractéristiques des règles budgétaires ne sont pas souhaitables en ce qui concerne la discipline budgétaire des règles budgétaires. En particulier, alors que certaines caractéristiques (telles que le renforcement des règles budgétaires et une base juridique solide) favorisent généralement la discipline budgétaire des règles budgétaires, l'impact d'un degré élevé de flexibilité et des procédures ou institutions censées soutenir les règles budgétaires est assez mitigé. Par conséquent, notre contribution appelle à une évaluation minutieuse de ces caractéristiques, en particulier pour les gouvernements qui sont intéressés par d'autres objectifs économiques que la discipline budgétaire.

Chapitre IV

Allant au-delà de l'approche standard consistant à examiner la relation entre règles budgétaires et discipline budgétaire largement explorée par la littérature existante, le chapitre précédent de la thèse a confirmé que les règles budgétaires pourraient exercer d'importants effets secondaires macroéconomiques sur la composition des dépenses publiques. Ce résultat majeur nous conduit à considérer un angle assez différent, en vertu duquel les règles budgétaires peuvent affecter de manière significative d'autres agrégats macroéconomiques clé

étroitement liés au comportement de dépenses des gouvernements, et en particulier l'inégalité du revenu.

En effet, il existe de sérieuses raisons de croire à un effet secondaire important des règles budgétaires sur les inégalités, enraciné dans au moins trois motifs. Premièrement, en raison de leur effet sur le solde budgétaire, les règles budgétaires influencent très probablement à la fois les dépenses et les recettes publiques, et peuvent donc modifier leur impact sur les inégalités. Deuxièmement, à la suite de la Grande Récession, de nombreux pays ont adopté des règles budgétaires ainsi que des programmes de consolidation budgétaire, conformément aux travaux antérieurs soutenant un rôle clé des règles budgétaires pour eux ; par conséquent, en modifiant la nature des consolidations budgétaires, les règles budgétaires sont susceptibles d'affecter les inégalités. Troisièmement, on constate que les règles budgétaires influencent la cyclicité de la politique budgétaire et les coûts d'emprunt des gouvernements ; par ces canaux qui affectent la situation budgétaire dans une perspective de moyen-long terme, les règles budgétaires peuvent également influer sur les inégalités.

Néanmoins, étant donné que les canaux par lesquels les règles budgétaires peuvent générer un effet secondaire sur les inégalités sont nombreux et éventuellement contradictoires, l'identification de chaque canal précis—et, en particulier, la direction et l'ampleur de sa contribution respective—est une tâche assez complexe, voire impossible. Pour éviter de faire une conjecture hasardeuse sur la direction (et l'ampleur) de l'impact potentiel des règles budgétaires sur les inégalités, le quatrième et dernier chapitre de la thèse intitulé "***Sur les effets secondaires de la politique budgétaire : règles budgétaires et inégalité du revenu***" étend la littérature sur les effets secondaires des règles budgétaires en explorant l'effet causal direct de l'adoption des règles budgétaires sur l'inégalité du revenu dans un large panel de pays en développement.

En s'appuyant sur la méthode d'appariement par score de propension, nos estimations montrent que les règles budgétaires ont un effet significatif sur les inégalités de revenu : les pays qui ont adopté des règles budgétaires connaissent une diminution significative de leurs inégalités de revenu par rapport aux pays comparables qui n'ont pas adopté de telles règles.

La robustesse de nos résultats est étayée par l'utilisation d'une mesure alternative d'inégalité, le développement du modèle pour y introduire des variables de contrôle supplémentaires, l'utilisation d'une méthode d'estimation alternative ou lorsque l'on change l'échantillon. De plus, lorsque l'on examine les éventuelles différences dans l'effet des règles budgétaires sur les inégalités, nous constatons que le type de règle budgétaire est important : alors que les règles de budget équilibré et les règles d'endettement ont un effet favorable sur l'inégalité, les règles de dépenses l'augmente. Enfin, nous dévoilons d'importantes hétérogénéités dans la relation entre règles budgétaires et inégalités, provoquées par des facteurs budgétaires, monétaires, internationaux et autres facteurs structurels.

Dans une perspective de politique économique, notre contribution comble une lacune importante dans la littérature consacrée aux effets secondaires des règles budgétaires. Même si les règles budgétaires ne sont pas principalement conçues pour traiter la question des inégalités de revenu, nos résultats montrent non seulement que les règles budgétaires ne sont pas neutres en termes d'inégalités, mais révèlent également des cas particuliers dans lesquels elles peuvent diminuer ou même augmenter les inégalités de revenu. Par conséquent, nos résultats peuvent fournir des éléments intéressants pour les gouvernements qui souhaitent adopter des règles budgétaires ou améliorer le cadre budgétaire existant fondé sur des règles budgétaires.

REZUMAT (RO)

Situaţia macroeconomică de la sfârşitul anilor 1970 a fost caracterizată de episoade severe de inflaţie ridicată. Unul dintre cele mai importante mesaje transmise de literatura economică a acelor timpuri—perioada şocurilor petroliere post-1970—a fost că regulile ar putea fi preferate politicilor discreţionare. Argumentul cheie al acestui "nou impuls" se bazează pe convingerea că discreţia implică absenţă în timp ce *regulile* implică *angajament* şi *credibilitate*. Pe baza acestui tip de argumente, un număr tot mai mare de ţări au adoptat reguli fiscale cu scopul de a obţine poziţii fiscale solide şi credibile. Comparativ cu un număr redus de ţări la mijlocul anilor 1980, aproximativ 100 de ţări au adoptat în prezent cel puţin un tip de regulă fiscală conform bazei de date privind regulile fiscale a Fondului Monetar Internaţional.

Prezenta teză de doctorat, intitulată "***Efectele macroeconomice ale regulilor fiscale***", este compusă din două părţi, fiecare cuprinzând două capitole, cumulând astfel un total de patru capitole. Fiecare capitol este organizat ca un manuscris şi reflectă o *contribuţie originală în ceea ce priveşte efectele regulilor fiscale* asupra diferitelor agregate macroeconomice. Primele două capitole revizuiesc relaţia dintre regulile fiscale şi disciplina fiscală, concentrându-se asupra ţărilor Uniunii Europene (UE). În schimb, ultimele două capitole arată că, dincolo de disciplina fiscală, regulile fiscale pot declanşa efecte secundare asupra diferitelor agregate macroeconomice.

În *prima parte* a acestei teze de doctorat, revizuim relaţia dintre regulile fiscale şi disciplina fiscală prin două contribuţii care se concentrează asupra ţărilor membre ale Uniunii Europene.

Capitolul I

Începutul anilor 1990 a fost marcat de două schimbări importante în Europa. Pe de o parte, ţările din Europa Centrală şi de Est au experimentat schimbări masive în sistemele lor politice şi economice, cauzate de dizolvarea regimurilor comuniste în contextul sfârşitului

Războiului Rece. Pe de altă parte, ţările din Europa de Vest au convenit, prin Tratatul de la Maastricht (1992), să realizeze o Uniune Monetară până la sfârşitul mileniului. Aceste două evenimente s-au aliniat în cele din urmă, când ţările din Europa Centrală şi de Est au aderat la Uniunea Europeană la mijlocul anilor 2000, i.e. zece astfel de ţări au aderat la UE între 2004 şi 2007.

Cu toate acestea, în ciuda aderării la UE, este intuitiv să considerăm că fostele ţări comuniste din Europa Centrală şi de Est sunt încă destul de diferite comparativ cu grupul de ţări din Europa de Vest, având în vedere că au experimentat aproape o jumătate de secol condiţii politice şi economice structurale diferite. În consecinţă, scopul primului capitol, intitulat "***A multi-speed fiscal Europe? Fiscal rules and fiscal performance in the EU former communist countries***", este de a explora efectul regulilor fiscale asupra performanţei fiscale în fostele ţări comuniste ale UE. Rezultatele bazate pe estimatorul LSDVC (bias-corrected least squares dummy estimator), care este justificat de eşantionul relativ mic supus analizei econometrice (unsprezece ţări analizate în perioada 1995-2014), pot fi prezentate după cum urmează.

Prezenţa regulilor fiscale nu are un efect semnificativ asupra soldului fiscal primar în fostele ţări comuniste din UE. În contradicţie cu efectul favorabil al regulilor fiscale în ţările occidentale din UE, aceast rezultat poate fi explicat printr-o înţelegere slabă şi lipsa unui angajament ferm faţă de regulile fiscale în ceea ce priveşte performanţa fiscală a guvernelor fostelor ţări comuniste din UE. Robusteţea acestor rezultate este confirmată atunci când eşantionul suportă modificări, se utilizează estimatori alternativi sau se iau în considerare diferite măsuri ale performanţei fiscale. În plus, o astfel de lipsă de semnificativitate statistică în efectul regulilor fiscale asupra performanţei fiscale în ţările foste comuniste este confirmată pentru diferite tipuri de reguli fiscale, atunci când se analizează vârsta şi numărul regulilor fiscale, în cazul regulilor fiscale naţionale sau supranaţionale, sau când considerăm în analiza noastră cadrele bugetare multianuale (MTBF) ca alternativă la prezenţa regulilor fiscale. În plus, contrar rezultatelor obţinute anterior, se constată că o îmbunătăţire a "forţei" regulilor fiscale (particularităţi ce privesc design-ul regulilor fiscale, şi nu numai simpla lor prezenţă)

creşte semnificativ performanţa fiscală a fostelor ţări comuniste, iar dimensiunea acestui efect depăşeşte impactul favorabil al regulilor fiscale în ţările occidentale din UE.

În consecinţă, simpla adoptare a regulilor fiscale poate declanşa posibile ameninţări în sensul generării unei Europe fiscale cu mai multe viteze, deoarece acestea îmbunătăţesc semnificativ performanţa fiscală în ţările membre ale UE din Vest, dar nu şi în ţările din Europa Centrală şi de Est. În schimb, îmbunătăţirea regulilor fiscale (i.e. îmbunătăţirea design-ului regulilor, cu scopul de a spori eficienţa acestora) poate stimula coeziunea fiscală a UE, deoarece acestea cresc performanţa fiscală atât în ţările din Vest, cât şi în cele din Europa Centrală şi de Est. Dintr-o perspectivă mai largă, politicile fiscale ale UE ar trebui să meargă dincolo de simpla adoptare a regulilor fiscale şi să insiste asupra consolidării acestora (în termeni de eficienţă, prin îmbunătăţirea design-ului lor) în ţările considerate potenţiale candidate pentru integrarea în UE în anii următori.

Capitolul II

Diferenţele dintre ţările UE evidenţiate în primul capitol atrag atenţia asupra necesităţii unei analize mai detaliate a efectului regulilor fiscale asupra disciplinei fiscale. Alături de numeroase reforme ale arhitecturii fiscal-bugetare, s-a constatat faptul că regulile fiscale trebuie să fie susţinute de cadrele naţionale, şi anume, de acele procese sau proceduri care influenţează comportamentul factorilor de decizie naţionali. Drept urmare, diverse instituţii politice, economice şi sociale, legate în special de moştenirea istorică a ţărilor, pot modela eficacitatea regulilor fiscale, în special în ceea ce priveşte capacitatea lor de a îmbunătăţi disciplina fiscală a acestor ţări.

Cu toate acestea, cu puţine excepţii, majoritatea studiilor dedicate disciplinei fiscale au considerat efectele regulilor fiscale şi ale instituţiilor în mod izolat. În consecinţă, obiectivul celui de-al doilea capitol, intitulat "***One size really does not fit all: Fiscal rules and institutional quality in the EU***", este de a explora efectul cumulat al regulilor fiscale şi al instituţiilor asupra disciplinei fiscale, făcând distincţia între două grupuri de ţări din UE: ţări foste comuniste (CC) şi ţări care nu au trecut printr-un regim comunist (NCC). După cum subliniază mai multe contribuţii, o astfel de distincţie captează traiectoriile instituţionale

fundamental diferite urmate de aceste ţări după cel de-al doilea război mondial. Folosind două decenii de date, analiza noastră relevă următoarele.

Consolidarea regulilor fiscale creşte disciplina fiscală a ţărilor non-comuniste pe măsură ce instituţiile se îmbunătăţesc (un efect de complementaritate), dar scade disciplina fiscală a ţărilor foste comuniste pe măsură ce instituţiile se îmbunătăţesc (un efect de substituţie). Aceste rezultate rămân robuste atunci când, de exemplu, controlăm problema endogeneităţii legată de efectele fixe în modele dinamice şi cauzalitate inversă, captăm performanţa fiscală prin diferite măsuri alternative sau utilizăm un model semi-parametric pentru a ţine cont de neliniarităţi în efectul instituţiilor, şi sunt determinate de arhitectura diferitelor instituţii politice, economice şi sociale. Complementaritatea dintre reguli fiscale-instituţii observată în ţările non-comuniste se datorează instituţiilor politice şi economice (dar nu şi instituţiilor sociale), în timp ce efectul de substituţie observat în fostele ţări comuniste este susţinut de instituţiile politice şi sociale (şi contrastează cu efectul de complementaritate observat pentru instituţiile economice).

Dintr-o perspectivă de politică economică, concluziile noastre sugerează că o abordare unică în ceea ce priveşte design-ul regulilor fiscale poate avea ca rezultat, din cauza diferenţelor observate în mediul instituţional, un impact diferit al regulilor fiscale asupra performanţei fiscale în ţările non-comuniste comparativ cu ţările foste comuniste din UE. În consecinţă, factorii de decizie politică din UE ar trebui să ţină cont de faptul că interacţiunile dintre reguli fiscale şi instituţii sunt cel mai probabil de natură complexă şi, ca atare, să integreze o dimensiune naţională, care ar surprinde specificităţile instituţiilor naţionale, atunci când proiectează reforme fiscale însoţite de consolidarea regulilor fiscale.

În a *doua parte* a acestei teze de doctorat, analizăm posibilele efecte secundare ale regulilor fiscale. Într-adevăr, există o literatură foarte restrânsă care evaluează efectele secundare ale regulilor fiscale şi care se concentrează în principal pe politica fiscală (cu câteva excepţii de studii care analizează performanţele regulilor fiscale în relaţie cu creşterea economică şi cu inflaţia). Extindem această literatură prin două contribuţii privind efectele secundare ale

regulilor fiscale: una dedicată compoziţiei cheltuielilor publice şi cealaltă consacrată inegalităţii veniturilor.

Capitolul III

Cadrele fiscale bazate pe reguli s-au răspândit în mod considerabil în ultimii ani—ca răspuns la moştenirea fiscală adusă de criza economică şi financiară—în scopul eliminării din procesul politic a tendinţei de a adopta politici fiscale nesustenabile care conduc la niveluri ridicate ale deficitelor bugetare (termen consacrat în literatură sub denumirea de "*deficit bias*"). În ciuda popularităţii crescute a regulilor fiscale, susţinută de beneficiile lor în ceea ce priveşte performanţa fiscală, unele contribuţii sunt mai sceptice cu privire la aceste beneficii potenţiale sau chiar subliniază efecte nedorite ale regulilor fiscale în ceea ce priveşte comportamentul prociclic al guvernelor. Această lipsă de consens în literatură ilustrează "crizele existenţiale" cu care s-au confruntat cadrele fiscale bazate pe reguli în ultimii ani şi atrage atenţia asupra necesităţii evaluării posibilelor "efecte secundare" ale regulilor fiscale, care ar putea influenţa într-o anumită măsură efectele lor stimulative.

Întrucât toate tipurile de reguli fiscale cuprind un obiectiv de control al cheltuielilor publice (cu excepţia regulilor privind veniturile), astfel de controverse sunt incontestabil legate de modul în care regulile fiscale modelează comportamentul guvernelor privind cheltuielile publice. Ţinând cont de literatura existentă în domeniu, scopul celui de-al treilea capitol intitulat "***How Do Fiscal Rules Shape Public Spending Composition?***" este de a examina modul în care regulile fiscale pot influenţa comportamentul guvernului, în special prin explorarea legăturii dintre reguli fiscale şi compoziţia cheltuielilor publice. Estimările bazate pe metoda de analiză de impact cunoscută sub numele de "entropy balancing" efectuate pe un eşantion larg de 185 de ţări relevă următoarele.

Regulile fiscale reduc semnificativ cheltuielile publice totale şi cheltuielile de consum public, lasă investiţiile publice în mare parte neafectate şi cresc raportul dintre investiţii publice şi consum public. În plus, aceste efecte diferă în funcţie de tipul de regulă fiscală şi de nivelul de dezvoltare economică a ţărilor. În particular, caracteristicile regulilor fiscale (de exemplu, organisme fiscale independente, reguli fiscale favorabile investiţiilor, reguli fiscale

supranaţionale, proceduri de asigurare a responsabilităţii) par a fi forţa principală a modului în care cheltuielile publice—şi, în special, cheltuielile totale şi investiţiile publice—sunt modificate ca răspuns la adoptarea regulilor fiscale.

În consecinţă, principalele aspecte ce ţin de politica economică pot fi rezumate după cum urmează. Se constată că regulile fiscale promovează disciplina fiscală prin generarea unei scăderi semnificative a cheltuielilor totale. În plus, deşi consumul public este adesea redus semnificativ, guvernele (predominant în ţările în curs de dezvoltare) par să protejeze investiţiile publice în urma adoptării regulilor fiscale. Contrar unor opinii pesimiste exprimate în special la începutul anilor 2000, conform cărora regulile fiscale ar conduce la reduceri ale investiţiilor publice, rezultatele noastre arată că aceste contracţii ale investiţiilor publice sunt în mare parte legate de politici altele decât regulile fiscale (de exemplu, consolidările fiscale pot fi considerate un potenţial candidat în acest sens).

În cele din urmă, oferind o perspectivă mai detaliată, arătăm că nu toate caracteristicile regulilor fiscale sunt dezirabile în ceea ce priveşte efectele lor pozitive asupra disciplinei fiscale. Mai mult, deşi unele caracteristici (cum ar fi un cadru juridic puternic) susţin de obicei efectele pozitive ale regulilor asupra disciplinei fiscale, impactul unui grad ridicat de flexibilitate sau al procedurilor şi instituţiilor fiscale independente menite să sprijine aplicarea regulilor, este destul de controversat. Prin urmare, contribuţia noastră sugerează o evaluare atentă a acestor caracteristici, în special pentru guvernele care ar putea viza, pe lângă disciplina fiscală, şi alte obiective macroeconomice.

Capitolul IV

Depăşind abordarea standard a literaturii existente, ce examinează relaţia dintre regulile fiscale şi disciplina fiscală, capitolul anterior al tezei a confirmat că regulile fiscale ar putea exercita efecte secundare macroeconomice semnificative asupra compoziţiei cheltuielilor publice. Acest rezultat important ne determină să adoptăm o perspectivă relativ diferită, prin prisma căreia regulile fiscale ar putea afecta în mod semnificativ alte agregate macroeconomice, şi în principal inegalitatea veniturilor.

Într-adevăr, există motive solide pentru a crede într-un efect secundar semnificativ al

regulilor fiscale asupra inegalităţii, din perspectiva a cel puţin trei dimensiuni. În primul rând, datorită efectului lor asupra soldurilor bugetare, regulile fiscale cel mai probabil modelează atât cheltuielile guvernamentale cât şi veniturile şi, prin urmare, ele pot influenţa impactul acestora asupra inegalităţii. În al doilea rând, după Marea Recesiune, multe ţări au adoptat reguli fiscale împreună cu programe de consolidare fiscală, în conformitate cu rezultatele anterioare din literatură care susţin un rol cheie al regulilor fiscale pentru aceste programe; astfel, prin modificarea naturii consolidărilor fiscale, regulile fiscale pot afecta inegalitatea. În al treilea rând, se constată că regulile fiscale influenţează ciclicitatea politicii fiscale şi costurile de împrumut ale guvernelor; prin aceste canale care afectează poziţia fiscală dintr-o perspectivă pe termen mediu-lung, regulile fiscale pot influenţa, din nou, inegalitatea.

Cu toate acestea, deoarece canalele prin care regulile fiscale pot genera un efect secundar asupra inegalităţii sunt numeroase şi posibil contradictorii, identificarea fiecărui canal—şi, în special, direcţia şi amploarea contribuţiei sale particulare—este o sarcină destul de complexă, dacă nu chiar imposibilă. Pentru a evita o conjectură hazardată în ceea ce priveşte direcţia (şi amploarea) impactului potenţial al regulilor fiscale asupra inegalităţii, al patrulea şi ultimul capitol al prezentei teze intitulat "***On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality***" extinde literatura consacrată efectelor secundare ale regulilor fiscale prin explorarea efectului cauzal direct al adoptării regulilor fiscale asupra inegalităţii veniturilor într-un grup larg de ţări în dezvoltare.

În baza unei metode de analiză de tratament, estimările noastre arată că regulile fiscale au un efect secundar semnificativ asupra inegalităţii veniturilor: ţările care au adoptat reguli fiscale experimentează o scădere semnificativă a inegalităţii veniturilor în contrast cu ţări comparabile care nu au adoptat. Robusteţea rezultatelor noastre este susţinută când se utilizează o măsură alternativă a inegalităţii, se îmbunătăţeşte modelul cu variabile de control suplimentare, se foloseşte o metodă de estimare alternativă sau se schimbă eşantionul. Mai mult, atunci când analizăm posibilele diferenţe în efectul regulilor fiscale asupra inegalităţii, constatăm că tipul de regulă fiscală contează: în timp ce regulile fiscale de deficit şi cele de datorie publică au un efect favorabil asupra inegalităţii, regulile privind cheltuielile o

sporesc. În cele din urmă, identificăm heterogeneităţi importante în relaţia dintre reguli fiscale şi inegalitate, determinate de factori fiscali, monetari, internaţionali şi alţi factori structurali.

Dintr-o perspectivă de politică economică, contribuţia noastră acoperă o lipsă importantă în literatura dedicată efectelor secundare ale regulilor fiscale. Chiar dacă regulile fiscale nu sunt concepute în primul rând pentru a regla problema inegalităţii veniturilor, rezultatele noastre arată nu numai că regulile fiscale nu sunt neutre în ceea ce priveşte inegalitatea, dar dezvăluie şi cazuri particulare în care acestea pot scădea sau chiar şi creşte inegalitatea veniturilor. În consecinţă, rezultatele noastre pot oferi îndrumări importante pentru guvernele care doresc să adopte reguli fiscale sau să îmbunătăţească cadrele fiscale existente bazate pe reguli.

Table of Contents

GENERAL INTRODUCTION

1 The emergence of fiscal rules: the 1970s disruption

The macroeconomic stance during the late 1970s is characterized by severe high-inflation episodes. One of the most important messages delivered by the post-1970s oil shocks literature was that rules might be preferred to discretionary policies (Kydland and Prescott, 1977). The key argument of this "new momentum" is grounded in the idea that discretion involves absence while *rules* involve *commitment* and *credibility*. To the question of how policies should be set, Kydland and Prescott (1977, page 487) respond: "*Our answer is, as Lucas (1976) proposed, that economic theory be used to evaluate alternative policy rules and that one with good operating characteristics be selected. In a democratic society, it is probably preferable that selected rules be simple and easily understood, so it is obvious when a policymaker deviates from the policy. There could be institutional arrangements which make it a difficult and time-consuming process to change the policy rules in all but emergency situations.*"

These arguments are convincingly settled in macroeconomics by the seminal work of Sargent and Wallace (1981), who distinguish between two policy regimes, monetary dominance and fiscal dominance, showing that fiscal and monetary policies are strongly interconnected (the so-called "unpleasant arithmetic"); as such, a form of monetary restraint or "rule" effectively enforces fiscal discipline. The crucial question that the authors launch at the end of their contribution can be seen as the "inauguration" of a new era in macroeconomics, in which fiscal and monetary authorities conduct policies based on rules (see Sargent and Wallace, 1981, page 7): "[...] *Who imposes discipline on whom?*".

Capitalizing on such arguments, it is worth emphasizing that "rules" were indeed assigned to the monetary policy as central banks became increasingly more independent. In this regard, we can recall some major monetary reforms involving the use of rules, including the Volcker disinflation period of the early 1980s, the creation of the supranational European Central Bank in the 1990s, the Taylor rule proposed in 1993 as a valuable descriptive yardstick for the assessment of the monetary policy stance, or the remarkable spread of inflation targeting regimes starting from the early 1990s. This clear orientation of monetary policy on monetary goals—often addressed as economic "orthodoxism"—raised the burden placed on fiscal policy as a shock absorber. Because of this paradigm shift, many countries around

the world experienced long-lasting deficits that triggered a sharp increase of the global debt starting in the mid-1970s (see Eichengreen et al., 2019).

In addition, over the last decades, an extensive strand of the literature has shown that unconstrained fiscal discretion leads to excessive public debt accumulation. Against the "*mise-en-scène*" of such a high indebtedness stance, a growing number of countries adopted fiscal rules with the aim of attaining sound and credible fiscal positions. Compared to only a handful of countries in the mid-1980s, around 100 countries currently present at least a type of fiscal rule according to the IMF Fiscal Rules Dataset. Although a large number of countries have tailored the conduct of fiscal policy based on fiscal rules, the trend was not linear but rather marked by a sequence of waves (Caselli et al., 2018).

First, in the recent period rules have initially emerged in most industrialized and advanced economies; for example, the US introduced in the mid-1980s numerical rules at the federal level, Canada enacted in 1991 a target on overall public spending, and Japan initiated a balanced-budget rule in 1997. At the same time, such an adoption trend has been observed also in Europe with the implementation of the Maastricht Treaty in 1992, which establishes numerical fiscal rules on both government deficit and debt. A second wave is marked by the early 2000s, when emerging and developing economies became the new adopters. Lastly, the most important episode started as a response to the fiscal legacy of the Great Recession, when the rules-based fiscal frameworks have become the structure of reference for the conduct of fiscal policy around the world (and especially in the European Union) giving birth to a "new generation of fiscal rules".

Although they may take various forms, i.e. they may target the budget balance, the public debt, or the level of expenditure, from a broad perspective fiscal rules are aimed at constraining governments' behavior. Expected to reduce governments' appetite for too high fiscal deficits, fiscal rules should provide predictability and ease the process of fiscal normalization, promote fiscal discipline and ensure the credibility of government policies over time (see e.g. Buchanan and Wagner, 1977; Debrun et al., 2008; Bartsch et al., 2020).

2 An overview of fiscal rules

The virtue of fiscal discipline has been repeatedly acknowledged over time. However, the recognition of the deficit bias in the late 1970s and its future repercussions on public debt stimulated countries to enact fiscal rules as a useful policy framework aimed at removing discretionary intervention.

Fiscal rules have a long history dating back at least to the mid-nineteenth century (Debrun et al., 2008; Asatryan et al., 2018) and the post-World War II period when many industrialized countries (e.g. Germany, Italy, Japan) introduced fiscal rules (most of them being budget balance rules) as an important pillar of the stabilization programs at that time (Kopits, 2001). However, the room left for different practices such as creative accounting or fiscal misbehavior undermined the effectiveness of the rules as well as their compliance, to the point where only few countries were still running fiscal rules by the late 1980s. Nevertheless, the emergence of public indebtedness during 1970-1980 forced many countries to commit themselves to numerical constraints.

Advanced economies were the frontrunners ...

Numerical targets firstly surged in advanced economies during the mid-1980s. For example, the United States established numerical fiscal criteria through the Gramm-Rudman-Hollings Act (1985), later replaced by the Budget Enforcement Act. In Luxembourg (1990), a public expenditure growth target is defined, compatible with the medium-term economic growth prospects. Lately, Canada enacted in the Federal Spending Control Act (1991) that imposes a target on overall public spending, while Japan (1997) imposed constraints on the budget balanced. In addition, various countries from Latin America implemented numerical constraints on fiscal variables in the late 1990s (see Debrun et al., 2008).

Moreover, a rapid expansion occurs in the early 2000s when an increasing number of low and middle-income countries adopted numerical fiscal rules (mainly national fiscal rules). According to Kumar et al. (2009), in 2009 around 50 countries had already national rules in place, with 50 percent of the existing rules being embodied in international treaties mainly related to monetary unions (for example, the Stability and Growth Pact in Europe; the West African Economic and Monetary Union, WAEMU; or the Central African Economic

and Monetary Community, CEMAC).

Nonetheless, the most recent wave occurred after the Global Financial Crisis (GFC), when a new generation of fiscal rules has emerged (Eyraud et al., 2018). Compared with the early fiscal rules that tended to be straightforward, second-generation fiscal rules are characterized as being more operational by providing more guidance and flexibility for governments committed to ensuring a sound implementation of the rules. The number of rules increased considerably in the aftermath of the GFC, most of them being adopted at the national level. In contrast to the early 1990s when only few countries had a form of fiscal rule, as of 2015 around 100 countries had at least one type of fiscal rules (see Figures 1a-b). This upward-sloping trend was observed all over the world, but the increase was more prominent in Europe where the number of rules tripled during the 2000-2015 period (Caselli et al., 2018).

Figure 1a. Number of FR around the World (1990)

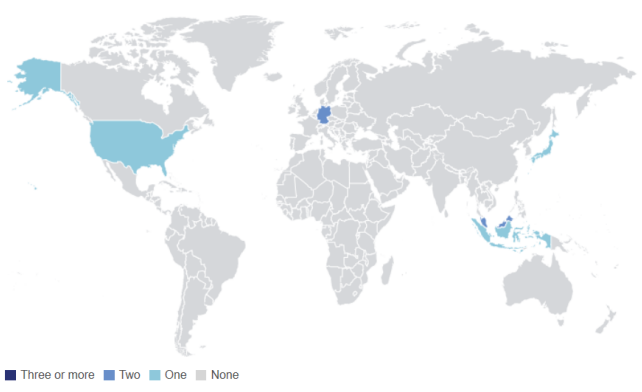
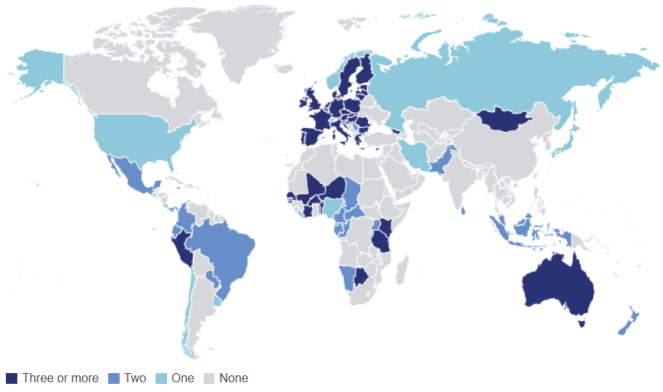


Figure 1b. Number of FR around the World (2015)



Source: Fiscal Rules Dataset 1985-2015, International Monetary Fund Mapper.

Fiscal Rules in the European Union ...

The history of the European Union (EU) rule-based fiscal frameworks has been marked by important episodes in the evolution of these reforms. Undoubtedly, the most important turning point in the European construction took place in the early 1990s when Western European countries finally agreed on clear dates for a monetary union. Moreover, the European Union opened the door to many former communist countries that expressed their interest towards integration. Nevertheless, being part of a monetary union requires strong fiscal institutions willing to credibly commit to fiscal discipline in order to protect the single currency

against, for example, the need for monetization of explosive deficits and debt (Sargent and Wallace, 1981). To avoid such undesirable consequences, European leaders finally signed on 7 February 1992 the Maastricht Treaty that foresaw the creation of the Euro and laid the foundation of a more effective fiscal governance European framework based on fiscal rules.

Supranational fiscal rules were firstly introduced under the Maastricht Treaty as a component of the convergence criteria that European Union member states are required to meet to enter the monetary union: a reference of 3 percent-of-GDP for the general government deficit and a public debt-to-GDP reference of 60 percent. A second wave of reforms took place in the late 1990s, when the Stability and Growth Pact (SGP) entered into force with the aim of improving and complementing the fiscal criteria specified in the Maastricht Treaty. The SGP presents two arms, namely a "preventive arm", which requires all EU countries to reach their medium-term budgetary objectives (or to proceed towards achieving them by adjusting their structural budgetary positions), and a "corrective arm", which lays down the procedures useful to prevent Member States from slipping into an excessive deficit and the sanctions that would be supported by countries that failed to take effective actions to correct their budgetary positions (the so called "excessive deficit procedure").[1]

Successive reforms of the SGP occurred with the intent to add more clarity and economic rationale into the supranational rule frameworks. In 2005, the SGP was refined to add more flexibility and revise the recommendations of the Excessive Deficit Procedure. Then, the so-called "six-pack" of five EU regulations and one EU directive (2011) introduced expenditure growth benchmarks and a new debt reduction rule at the supranational level; the "Fiscal Compact" implied some revisions on the medium-term budgetary objectives (MTO); and, finally, the "two-pack" in 2013 aimed to increase fiscal transparency and strengthen the coordination in the euro area.

The main expectation of these reforms was that well-designed rule-based fiscal frameworks would enhance the rules' compliance and the responsibility for fiscal discipline at the national level. However, since the SGP entered into force, the average compliance with all EU fiscal rules has been around 50%, and lower compliance scores were mostly exhibited by euro area countries (Larch and Santacroce, 2020). Nevertheless, concerning numerical deviations from the deficit and debt targets, a favorable attitude was observed in 2019 when countries in the

[1]Even if the provisions of the Stability and Growth Pact apply to all EU member states, the regulations for imposing sanctions concern only the Euro zone members (Kumar et al., 2009).

European Union overachieved the 3% deficit threshold by 2.6 percentage points and the 60% debt level by 12.3 percentage points on average (see Figure 2a-b). Despite this, profound concerns are emerging nowadays regarding the effectiveness of the present rule-based EU system, mostly due to its complexity driven by the so-called "triangular trade-off" between simplicity, flexibility, and predictability (Wyplosz et al., 2019).

Figure 2a. Deviation from the deficit target

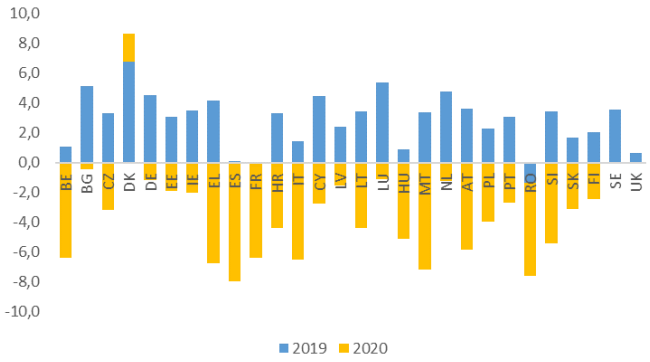
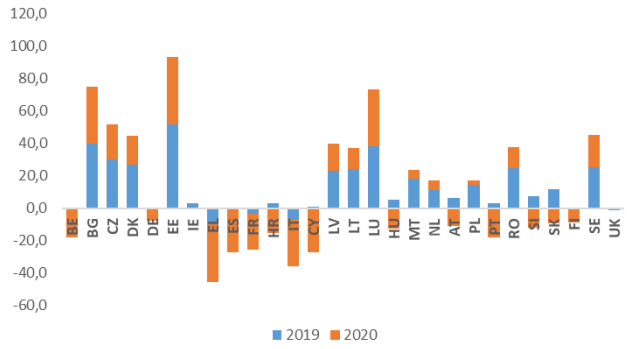


Figure 2b. Deviation from the debt target



Source: Author's construction based on the Compliance Database of the Secretariat of the EFB (2020).
Note: A positive (negative) value means that the budget balance is above (below) the -3% target-of-GDP (the left-hand chart), and a positive (negative) value means that the actual debt is below (above) the 60% target-of-GDP (the right-hand chart).

Conceptual background ...

From a broad perspective, it is hard to identify a simple and operational definition of "fiscal rules" that is widely accepted in the literature. Fiscal rules are broadly seen as numerical limits on budgetary aggregates with the aim of ensuring fiscal sustainability (Lledó et al., 2017). However, this definition is neither exhaustive, nor definitive.

The existing literature often associated the term "fiscal rules" with all procedural and legislative elements that characterize the budgetary processes. According to Alesina et al. (1999), fiscal rules can be conventionally defined as the "*set of rules, procedures and practices according to which budgets are crafted*". A similar definition is also supported by Ayuso-i-Casals et al. (2009), who in addition differentiate between "*procedural and numerical*" fiscal rules. While procedural rules are mostly linked to fiscal governance, i.e. all the procedures that "*govern the elaboration and implementation of the annual budget*", numerical rules are

defined as specific targets (or ceilings) on fiscal aggregates aimed at reducing the deficit bias arising from governments' short-sightedness. Moreover, the term "fiscal rules" might be associated in some contexts with the popular concept of "fiscal reaction function", mainly referring to the fiscal responses adopted by governments as a reaction to relevant macroeconomic variables (Debrun et al., 2008).

From an operational point of view, one of the most cited definitions of fiscal rules is that of Kopits and Symansky (1998): "*a permanent constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance*". The generality of this definition—on which the present thesis is widely based—underpins the goal of the "fiscal rules" concept at several levels. First, regarding their "permanent" feature, there are relatively few countries that have adopted and subsequently repealed fiscal rules, suggesting that fiscal rules are more long-term fiscal reforms whose goal is not to restore fiscal sustainability in the short-run following shocks, but to provide a real and credible anchor towards long-term fiscal sustainability.[2] Second, since they impose long-term changes in governments' fiscal behavior with a direct effect on fiscal performance, the primary rationale is that fiscal rules are more congruent with intergenerational equity and, as a result, more time-consistent.[3]

Different types of fiscal rules ...

Traditionally, there are *four types of fiscal rules* with respect to the fiscal aggregate they target (Schaechter et al., 2012): budget balance rules, debt rules, expenditure rules, and revenue rules. Although different *vis-à-vis* their properties and objectives, all four fiscal rules are bound to safeguard the long-term fiscal sustainability and amend policy biases.

Budget balance rules

Commonly defined in relation with the overall balance, the structural balance, or the balance "over the cycle", budget balance rules (BBR) are aimed to ensure a sound and sustainable path towards debt sustainability, by setting a numerical ceiling or target on the government's budget balance. An example of a deficit rule is the well-known 3 percent-of-

[2]Reflecting an average fiscal policy behavior observed over a given timespan, fiscal rules can be seen as a signaling device that defines a clear perimeter within which fiscal policy discretion can be "*brought into play*" (Lledo et al., 2018).

[3]This definition also suggests that fiscal rules are constraints on fiscal policy that once enacted cannot be frequently and easily changed (Lledo et al., 2017).

GDP ceiling on the general government deficit embodied in the SGP, a target that concerns all EU member states.

In particular, what distinguishes the different types of BBR is not only the fiscal aggregate constrained but also their operational strengths and weaknesses, which need to be measured and understood (Lledo et al., 2018). On the one hand, *overall balance rules* are the easiest to compute, communicate, and monitor type of BBR. Largely under the control of policymakers, they provide strong operational guidance and are closely linked to the objective of debt sustainability. However, the main drawback of this particular type of rules is the lack of any stabilization feature, which may favor procyclical movements in the governments' spending behavior (Blanchard and Giavazzi, 2004) and also provide incentives for excessive cuts in public investment, since governments find it much easier to reduce them compared to current spending (Guerguil et al., 2017).[4] On the other hand, conversely, governments may target the *overall balance net of capital expenditures* (the so-called "golden rules"). However, a particular concern *vis-à-vis* these type of rules is the risk concerning debt sustainability. Since not all capital expenditure are eventually productive, the incentive towards low social returns investments increases (particularly in the absence of a proper classification of the spending items), which may also favor creative accounting and off-budget operations (see e.g. Balassone and Franco, 2000, or Kumar et al., 2009, for detailed discussions on "golden rules").

In addition to the overall budget balance rules, BBR can be equally specified in terms of a *cyclically-adjusted balance* or as *structural rules*. By correcting for the deviation of potential output from the actual output and letting the automatic stabilizers to run freely, cyclically-adjusted balance rules provide good operational guidance and a relatively strong link to the macroeconomic stabilization objective. In addition, structural balance rules account for additional one-off fiscal measures and other non-discretionary changes in the budget that are not closely correlated with the business cycle (Bornhorst et al., 2011).[5] However, although they may provide insightful information for the governments based on enhanced stabilization properties, flexibility often comes at the expense of increased complexity, which may create

[4] A version of the overall balance rule is the primary balance rule. However, by excluding the net interest payments on consolidated government liabilities from the target, this rule might place the debt ratio on an explosive trajectory (Escolano, 2010).

[5] According to Eyraud et al. (2018), some examples of one-off fiscal operations could be: revenue windfalls, transfer of profits from the central bank, and other non-recurrent fiscal operations.

real challenges for governments to compute, monitor and even enforce these types of rules. Specifically, their implementation requires strong technical forecasting capacity, good data quality, full operation of automatic stabilizers, while discretionary actions should be used only for rare events.

Lastly, according to Kumar et al. (2009), another variant of BBR involves the achievement of a *nominal budget balance ceiling on average over a full cycle*. Compared to cyclically-adjusted balance or structural rules, "over-the-cycle" rules provide a greater flexibility to output fluctuations, since they allow for discretionary fiscal measures. However, their main drawback is that they may lead to procyclicality since at the end of the cycle tightening (relaxation) might be required if fiscal policy was too loose (tight) by then.

Debt rules

Compared with deficit rules, debt rules (DR) provide a greater and more effective anchor to the objective of debt sustainability. On the contrary, although they are also easy to communicate and monitor, debt rules do not ensure clear operational guidance in the short-run for policymakers; to avoid this issue, many governments around the world jointly consider debt and budget balance rules as part of their fiscal framework (Eyraud et al., 2018). Moreover, debt rules are the prevailing national rules in low-income countries, while budget balance rules (and expenditures rule) are more dominant in advanced and emerging countries (Schaechter et al., 2012). One of the most popular examples of debt rules is the one defined in the European supranational fiscal framework: the 60 percent-of-GDP debt ceiling included in the Stability and Growth Pact (1997). Furthermore, debt rules may play a much greater role nowadays, when a forceful response to the COVID-19 pandemic is needed and the legacy of very large deficits and debts seems inevitable (see the excellent debate on the future of EU fiscal framework at the 2021 European Fiscal Board conference). In particular, Carnot et al. (2021) suggests a revision in the calibration of the parameters of debt rules, by either raising the targeted value or introducing a differentiated adjustment pace.

Expenditure rules

Usually set in levels, growth rates, or as a ratio of GDP, expenditure rules (ER) impose bounds to the total, primary, or current spending. As discussed by Eyraud et al. (2018), reliance on expenditure rules can be an effective approach to stimulate flexibility, since they

provide clear operational guidance, allow for economic stabilization, and do not encourage discretionary measures (especially in emerging markets). Moreover, compared with the other types of rules, expenditure rules are seen as the easiest to understand and monitor as they directly target the size of the government. However, the adoption and compliance with expenditure rules may trigger some challenges mostly related to: procyclicality (when defined in ratio of actual GDP), creative accounting, small impact on debt dynamics (when they do not account for changes in revenues), cuts in public investment (which are sometimes said to be politically-easier to cut compared with current spending), as well as forecasting errors (when defined in relation to the potential output).

Revenue rules

Revenue rules (RR) have a much narrower role in the world's rule-based fiscal frameworks. According to Lledo et al. (2018), some examples of RR may include: the supranational 20%-of-GDP revenue floor in the member countries of the West African Economic and Monetary Union (and for Kenya at the national level), the revenue rule in Lithuania (since 2008) that requires excessive revenue to be used to reduce the general government deficit, or a windfall revenue rule calling for the use of 50% of the additional revenue to reduce debt in the Netherlands (since 2011). By setting floors on government revenues, the primary goal of these rules is to avoid unwarranted tax burden and boost revenue collection (Schaechter et al., 2012). However, their main weakness is that they might undermine fiscal sustainability, since public spending is not constrained by the rule. Besides, as they do not account for the operation of automatic stabilizers in bad times and some of them constrain revenue mobilization in good times, RR could encourage procyclicality in the governments' fiscal behavior.

Supranational versus national fiscal rules ...

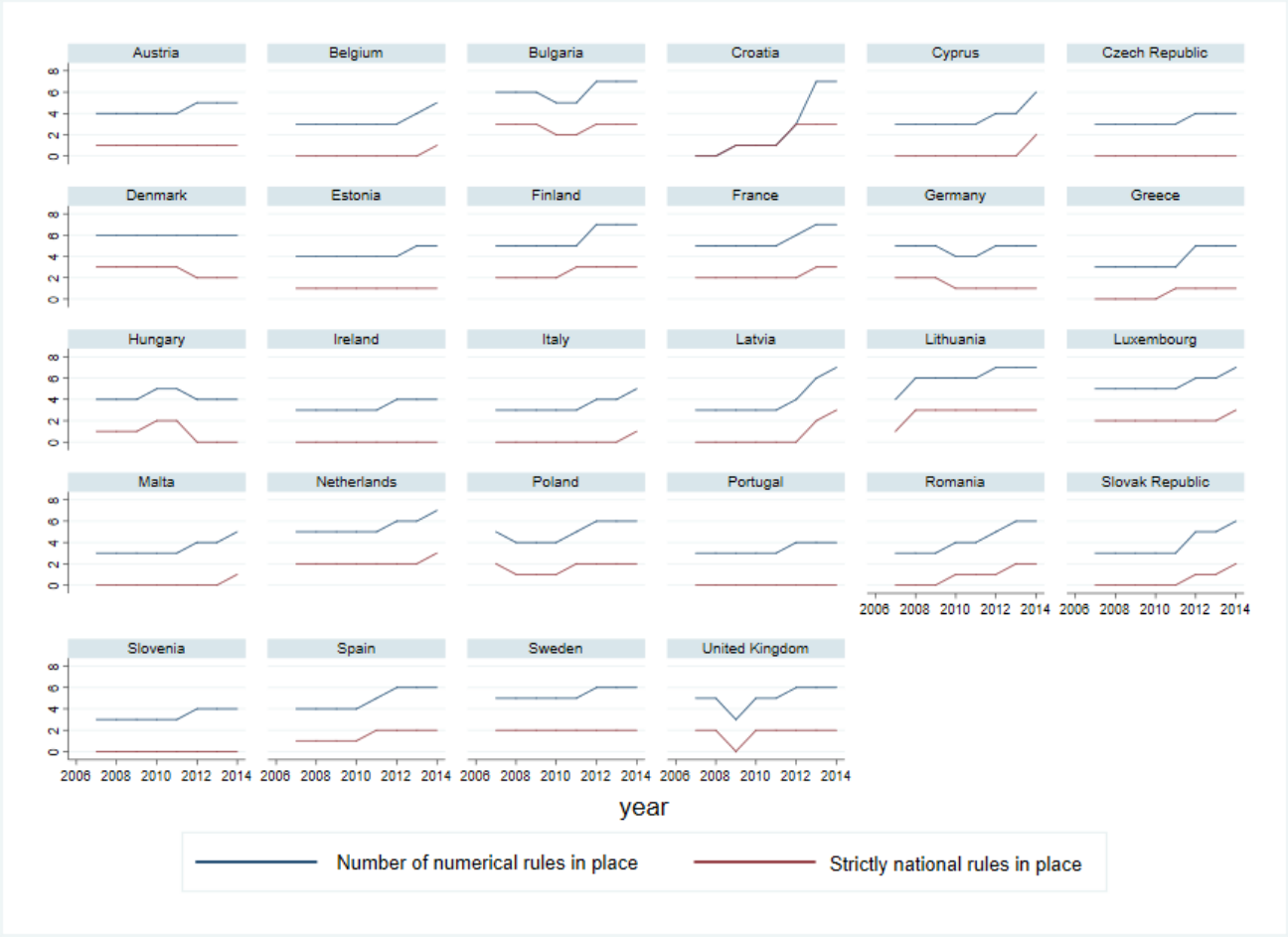
A striking number of countries introduced by the end of 2015 several types of fiscal rules at the supranational as well as at the national level. Fiscal policy in an economic and monetary union is commonly backed up by supranational rule-based fiscal frameworks and complemented by national rules.[6] Supranational fiscal rules are typically enacted through international treaties, whereas national fiscal rules are established through a mix of statutory

[6]See e.g. the SGP in the EU, the Eastern Caribbean Currency Union, the Central African Economic and Monetary Community, or the West African Economic and Monetary Union (Lledo et al., 2018).

norms (see Schaechter et al., 2012).

Moreover, after the Global Financial Crisis, national fiscal rules have become more widespread. For example, at the end of 2014, many countries in the European Union had at least two strictly national fiscal rules embedded in their national fiscal frameworks, complementing the supranational fiscal framework. As depicted by Figure 3, in countries such as France, Luxembourg, Netherlands, Finland, Bulgaria, Latvia, Lithuania or Croatia, three out of seven fiscal rules are strictly national, while in Denmark, Poland, Romania, or Sweden this is the case for two out of six rules. These national fiscal rules are completed by the supranational fiscal rules, since an increasing number of European countries became subject to such supranational rules following their entrance in the EU (Caselli et al., 2018).

Figure 3. Evolution of strictly national fiscal rules in the EU



Source: Author's computation based on IMF Fiscal Rules Dataset (2017).

However, the simultaneous existence of both supranational and national fiscal frameworks remains a question of large debates in the literature. Since many countries frequently breach them without considerable sanctions, supranational rules become often subject to insufficient compliance (Tapsoba, 2012). In this vein, the existing literature emphasizes that a supranational fiscal framework does not necessarily lead to compliance with national rules, and thus to greater fiscal discipline (Bergman et al., 2016), while the EMU membership may come along with bailout expectations that seem to alter the compliance with supranational fiscal rules (Badinger and Reuter, 2017).

The hazard of multiple fiscal rules frameworks ...

As emphasized by Caselli et al. (2018), a pronounced international trend towards multiple fiscal rules emerged since the early 2000s: to achieve multiple objectives, many governments around the world decided to adopt and combine multiple fiscal rules, and particularly budget balance rules with debt rules or expenditure rules.

Several features have been proposed by Kopits and Symansky (1998) to define the basic criteria for the selection of fiscal rules. A "good fiscal rule" should be (1) simple and resilient; (2) preserve fiscal sustainability; (3) ensure economic stabilization; (4) provide operational guidance for policy makers, while being (5) easy to understand and monitor (Lledo et al., 2018). Even though this list is far from being exhaustive, it is straightforward to understand that one single rule cannot simultaneously achieve all these possibly-conflicting criteria.

To minimize these trade-offs, governments around the world introduced multiple rules—embedded either in statutory norms or international treaties—to exploit their benefits. This phenomenon has been prominent especially in Europe. Compared to the early 2000s, in 2014 most EU countries combine budget balance rules with debt rules, 23 countries complement the popular "duo" with expenditure rules, and 4 countries have in place all four types of fiscal rule (see Figure 4a-b).[7]

[7]Besides the large appetite for fiscal rules, this wave is also related to the so-called "eastern enlargement" in 2004 which opened the door for ten new countries into the EU and the accession that followed in 2007 and 2013, respectively.

Figure 4a. Number of EU countries combining different rules (2000)

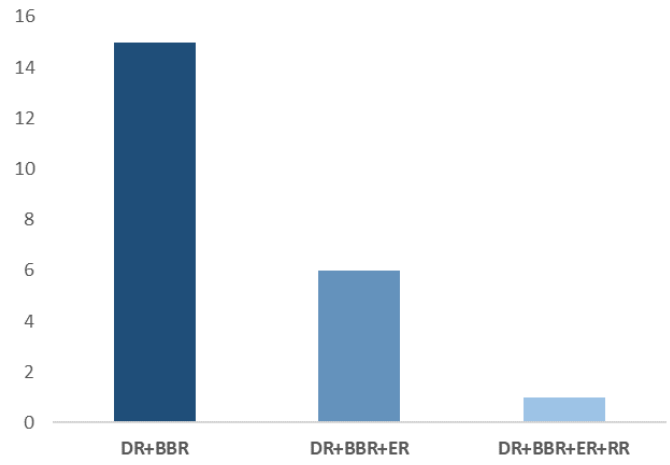
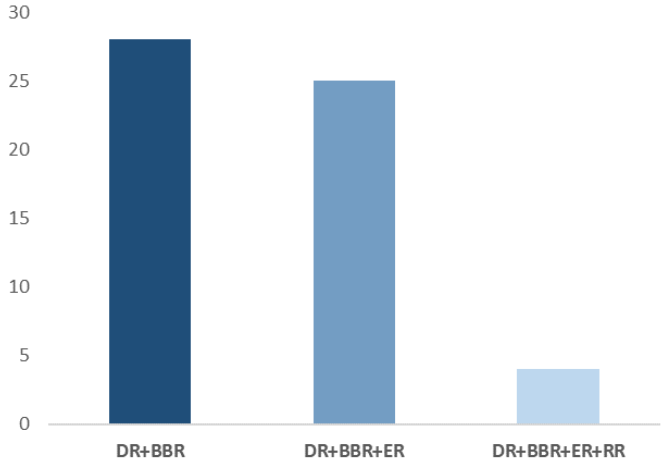


Figure 4b. Number of EU countries combining different rules (2014)



Source: Fiscal Rules Dataset 1985-2015, International Monetary Fund Mapper.

Furthermore, outside the EU, many countries had three or more rules by the end of 2014 (Caselli et al., 2018). However, more recent evidence from the IMF staff members (see e.g. the discussion in Eyraud et al., 2018) highlights the difficulty to manage multiple fiscal rules, and advocates for a more parsimonious framework tailored to support government's credibility. Some issues raised by these authors include: the overlap between rules (for example, different rules may constrain the same fiscal aggregate to a different degree; or when structural and nominal budget balance rules coincide), the inconsistency between various targets (for example, the 3% deficit and the 60% debt ceilings in the EU), or sub-optimal policies due to over-constrained governments (see also Cordes et al., 2015).

3 Beyond the simple presence of fiscal rules: fiscal rules' features

Introduced before the Global Financial Crisis, the first generation of fiscal rules has received some degree of criticism, and many countries put their rules into abeyance to address the unexpected shocks triggered by the crisis (Schaechter et al., 2012).

In the context of the global economic contraction, rule-based fiscal frameworks were definitely put to a sort of "ultimate" real-life test. Even if the first generation of fiscal

rules tried to combine simplicity with flexibility, most of them failed to provide a clear roadmap and a path of return to compliance in times of crisis.[8] As a result, after the GFC, a new generation of fiscal rules has emerged with the goal of achieving a better balance between flexibility and enforceability. The rationale behind this "paradigm shift" was to strengthen some key features of the first generation of fiscal rules by making them more flexible, operational, enforceable, and resilient (Caselli et al., 2018).

From an operational point of view, the "new" and "improved" generation of fiscal rules includes *several design features* crucial to ensure fiscal discipline, such as: *well-defined escape clauses*; provisions that allow for *temporary deviations from the target* (that may be beneficial from a long-run perspective); better *operational guidance* (e.g. limits on expenditure growth, or corrections for revenue windfalls that are not linked to the business cycle); *monitoring mechanisms* and *guidelines* (independent fiscal institutions that monitor the implementation of the rule); *correction mechanisms* (with clearly-defined circumstances under which they start to operate); *corrective actions* (requirements to restore compliance and the necessary timeframe); or *room for automatic stabilizers* to operate over the business cycle (cyclical adjustments of budget targets). The various fiscal rules features designed to enhance rule effectiveness are often summarized in the literature into what is called *fiscal rules' strength*, and proxied by an index measuring various dimensions of the rules (see Kumar et al., 2009, Schaechter et al., 2012, or Caselli et al., 2018, for details).[9]

Over the last decades, several studies emphasized the importance of fiscal rules' features for fiscal performance. On the one hand, fiscal rules with more binding features are usually associated with better fiscal discipline (see e.g. von Hagen, 1991; Poterba, 1994; Bohn and Inman, 1996; Clemens and Miran, 2012; or Follette and Lutz, 2012), reduced procyclicality, and increased enforceability and transparency (see e.g. Debrun et al., 2008; Afonso and Hauptmeier, 2009; or Bergman et al., 2016). On the other hand, increased flexibility—that may be translated into more resilience to changing circumstances—is considered of a great relevance. In particular, Schick (2010) discusses the "golden rule" that requires a current

[8]Often simplicity made them the too rigid, while flexibility came against enforceability. Although, prior to the GFC, rules started to enclose provisions to account for unexpected events (e.g. escape clauses) or to provide more room for fiscal maneuvers during cyclical downturns (e.g. adjustments for the business cycle in the form of structural budget balance rules), they were relatively underdeveloped.

[9]Caselli et al. (2018) and Eyraud et al. (2018) place emphasis on the cost that poorly designed fiscal rules may involve and describe the way fiscal rules can be refined in order to deliver better results and provide governments with a clear metric of sound policy.

balanced budget but allows the use of borrowing to finance public investment (see also Minea and Villieu, 2009). Daban (2011) militates for monitoring arrangements and escape clauses as part of a new generation of fiscal rules (see also Schaechter et al., 2012). Besides, "good" fiscal rules should allow for discretionary actions that better target "fiscal efforts" and build the necessary fiscal space for the purpose of economic stabilization (Blanchard et al., 2010).

However, in the recent years, many academics and policymakers adopted a more skeptical view on the fiscal rules' effectiveness. Despite their popularity and favorable effects on fiscal performance, rule-based fiscal frameworks are likely to be facing an existential crisis as they resulted into a more complex setup (see Debrun et al., 2018). One of the possible sources of this increased complexity may come from the desire of achieving the "impossible" equilibrium between simplicity, flexibility, and enforceability (see e.g. Debrun and Jonung, 2019).

4 What do we know about the effects of FR?

Before detailing the empirical literature devoted to the evaluation of the impact of fiscal rules, it is convenient to present some theoretical insights on the expected effects of fiscal rules.

The expected effects of fiscal rules: what does the theory teach us ...

Starting the mid-1970s, the governments of many countries engaged in upward-sloping indebtedness paths. The resulting high levels of debts and deficits were often labeled as "*the deficit bias*", signaling that, despite their good intentions, governments may run fiscal deficits beyond those levels that may be considered as socially-desirable.

The theoretical literature emphasizes two prominent issues that may explain the deficit bias, see e.g. Krogstrup and Wyplosz (2009) and Wyplosz (2013). On the one hand, according to the *common pool problem*, policymakers competing over the financing of their preferred public goods may result into increasing competition over public resources, which results into excessively high deficits; see e.g. Weingast et al. (1981), Roubini and Sachs (1989), von Hagen and Harden (1994), Velasco (2000), or Persson et al. (2003). On the other hand, *governments' short-sightedness* makes them under-estimate the future cost of public debt,

given their primary focus on the short-term political gains. When governments borrow with the goal of financing public goods designed (exclusively) to improve their chances of wining elections, public debt and deficits may be too high; see e.g. Persson and Persson (1987), Persson and Svensson (1989), Alesina and Tabellini (1990), or Persson et al. (2006).

Consequently, from a theoretical perspective, owing to their capacity to reduce the *deficit bias*, fiscal rules may exert a positive effect on fiscal discipline. Among others, e.g. von Hagen and Harden (1995), Hallerberg and von Hagen (1999), Beetsma and Uhlig (1999), Beetsma and Debrun (2004, 2005), Primo (2006), or Debrun et al. (2008), provide theoretical support for the idea that—due to the constraints they impose of fiscal behaviors—fiscal rules can effectively act upon the deficit bias and improve governments' fiscal discipline.

The findings of empirical analyses ...

The largest majority of empirical studies analyzing the effects of fiscal rules focus on their impact on fiscal discipline. As a benchmark, several studies, including e.g. Bohn and Inman (1996), Debrun et al. (2008), Afonso and Hauptmeier (2009), Marneffe et al. (2010), Tapsoba (2012), or Caselli et al. (2018), conclude that the presence of fiscal rules is associated on average with a significant improvement in governments' fiscal discipline. However, as discussed in detail by Heinemann et al. (2018) and Barbier-Gauchard et al. (2021), this favorable effect may not survive in various contexts.

A prominent determinant of the statistical strength of the effect of fiscal rules on fiscal discipline is related to the question of endogeneity (see e.g. Eyraud et al., 2018, and Debrun and Jonung, 2019), mainly arising from reversed causality, i.e. fiscal rules may be adopted once a certain level of fiscal discipline is secured. Debrun and Kumar (2009) and Caselli and Reynaud (2020), among others, conclude that the favorable effect of fiscal rules on fiscal discipline fades out when possible endogeneity is taken into account.

Such differences in the robustness of the impact of fiscal rules are equally at work when acknowledging that *not all fiscal rules are alike*. On the one hand, the aggregates covered by the fiscal rules seem to matter in terms of their fiscal discipline effects; for example, while balanced budget rules are usually found to increase fiscal discipline (see e.g. Bergman et al., 2016), debt rules do not lead to a significant improvement of fiscal discipline by themselves (see e.g. Tapsoba, 2012) but only when combined with balanced budget rules (see e.g. De-

brun et al., 2008). On the other hand, beyond the simple presence of fiscal rules, the various fiscal rules dimensions that may make them more likely to bind, often summarized into what is called *fiscal rules' strength* (e.g. including procedures further constraining fiscal discretion, transparency requirements, independent monitoring bodies, enforcement mechanisms, or automatic correction mechanisms), are important. Several studies, including e.g. Debrun et al. (2008), Schaechter et al. (2012), Bergman et al. (2016), Badinger and Reuter (2017), or Caselli and Reynaud (2020), emphasize that strengthening fiscal rules significantly improves governments' fiscal discipline.

Lastly, the stance or environment under which fiscal rules operate equally seems to matter as regards their fiscal discipline effects. Beyond fiscal or monetary factors (see e.g. Tapsoba, 2012, Combes et al., 2018, Reuter, 2019, or Barbier-Gauchard et al., 2021), real or institutional factors may shape the influence of fiscal rules. On the one hand, the level of economic development is of importance, since fiscal rules are found to significantly improve fiscal discipline in developing countries (Tapsoba, 2012), but not in advanced and emerging countries (Cevik and Teksoz, 2014) or in the Euro area countries (Heinemann et al., 2018). On the other hand, institutions (see the theoretical contributions of e.g. Krogstrup and Wyplosz, 2009, or Debrun and Kumar, 2009) are pointed out as a potential determinant of the relationship between fiscal rules and fiscal discipline, although the issue of the direction in which they impact the influence of fiscal rules (i.e. complementarity, as for Debrun and Kumar, 2009, or Hallerberg et al., 2009; or substitution, as for Bergman et al., 2016) still remains to be settled.

Beyond fiscal discipline: The side-effects of fiscal rules ...

Contrary to the large and expanding empirical literature on the effects of fiscal rules on fiscal discipline, only few contributions look at the side-effects of fiscal rules. We can organize these studies in two groups.

First, aside fiscal discipline, some studies investigate the impact of fiscal rules on other dimensions of fiscal policy. Many of such studies focus on fiscal policy cyclicality (see e.g. Debrun et al., 2008; Bova et al., 2014; Bergman and Hutchison, 2015; Sacchi and Salotti, 2015; Combes et al., 2017; Guerguil et al., 2017; or Larch et al., 2021), with various results. For example, Debrun et al. (2008) reveal an association between fiscal rules and less pro-

cyclical policies, a finding shared by Guerguil et al. (2017) for investment-friendly rules, while Combes et al. (2017) and Larch et al. (2021) show that the efficiency of fiscal rules in reducing fiscal policy procyclicality depends upon the type of fiscal rule or the ratio of public debt. Instead, other studies examine the relevance of fiscal rules for other dimensions of fiscal policy, including fiscal consolidations (see e.g. Guichard et al., 2007), fiscal policy discretion (see e.g. Badinger, 2009), or sovereign bonds risk premia (see e.g. Heinemann et al., 2014; Badinger and Reuter, 2017; Thornton and Vasilakis, 2018; or Sawadogo, 2020). Most of these studies illustrate significant side-effects of fiscal rules in terms of e.g. governments' ability to generate larger and longer adjustments, or to benefit from lower borrowing costs.

Second, only a handful of contributions inspect possible side-effects of fiscal rules on other macroeconomic aggregates outside the fiscal policy. Among them, Castro (2011) reveals that the fiscal rules embedded in the Stability and Growth Pact are not harmful for economic growth, and they may even improve economic growth in the European Union countries. More recently, using a large database, Combes et al. (2018) highlight that fiscal rules significantly reduce inflation when combined with an inflation targeting monetary framework, although the magnitude of their effect varies among the various types of fiscal rules. Altogether, these studies suggest exploring more in detail the side-effects of fiscal rules.

5 Plan of the PhD

The PhD is composed of two parts, each containing two chapters, for a total of four chapters. Each chapter is organized as a manuscript and presents an *original contribution on the effects of fiscal rules*. The first two chapters revisit the relationship between fiscal rules and fiscal discipline, by focusing on the European Union countries. Instead, the last two chapters show that, beyond fiscal discipline, fiscal rules may trigger side-effects on various macroeconomic aggregates.

First Part: Fiscal Rules and Fiscal Discipline

In this first part of the PhD we revisit the relationship between fiscal rules and fiscal discipline through two contributions that focus on the European Union countries.

Chapter One

The early 1990 brought two important changes in Europe. On the one hand, Central and Eastern European countries experienced massive changes in their political and economic systems, caused by the fall of their communist regimes in the context of the end of the Cold War. On the other hand, Western European countries agreed, through the Treaty of Maastricht (1992), to accomplish a monetary union by the end of the millennium. These two events ultimately converged when Central and Eastern European countries joined the European Union in the mid-2000s, i.e. ten such countries entered the EU between 2004 and 2007.

However, despite joining the EU, it is intuitively appealing to consider that Central and Eastern Europe former communist countries are still fairly different from Western Europe countries, given that they experienced almost half a century of structurally-different political and economic conditions. Consequently, the goal of the first chapter, entitled "***A multi-speed fiscal Europe? Fiscal rules and fiscal performance in the EU Former Communist Countries***", is to explore the effect of fiscal rules on fiscal performance in EU Former Communist Countries. Results based on the bias-corrected least squares dummy (LS-DVC) estimator, which is justified by the relatively-small sample (eleven countries analyzed during the period 1995-2014), are as follows.

The presence of fiscal rules does not have a significant effect on the primary fiscal balance in the EU former communist countries. At odds with the favorable effect of fiscal rules in Western EU countries, this finding may be explained by a loose understanding of, and commitment to fiscal rules by EU former communist countries' governments in terms of fiscal performance, and is robust when changing the sample, using alternative estimators, or considering various measures of fiscal performance. In addition, such a lack of significant effect is also found for various types of fiscal rules, when looking at the age and the number of fiscal rules, and in the case of national or supranational fiscal rules, or medium term budgetary frameworks (MTBF). Lastly, and on the contrary, an improvement in the strength of fiscal rules is found to significantly increase the fiscal performance of former communist countries, and the size of this effect overweighs the favorable impact of fiscal rules in Western EU countries.

Consequently, simply adopting fiscal rules may trigger possible threats of a multi-speed

fiscal Europe, as they significantly improve fiscal performance in Western EU but not in Central and Eastern EU countries. Instead, enforcing fiscal rules may improve the fiscal cohesion of the EU, as they enhance the fiscal performance of both Western and Central and Eastern EU countries. From a broader perspective, fiscal policies should go beyond the simple adoption of fiscal rules and insist on their enforcement in the countries that are expected to join the Euro area or the EU in the years to come.

Chapter Two

The differences between the EU countries highlighted in the first chapter call for a more detailed analysis of the effect of fiscal rules on fiscal discipline. Indeed, along with various reforms of the fiscal framework, came out the idea that fiscal rules must be supported by national frameworks, namely processes or procedures that influence the behavior of national policymakers. As a result, various political, economic, and social institutions, related in particular to countries' historical heritage, may shape fiscal rules' effectiveness particularly regarding their capacity to improve countries' fiscal discipline.

However, with few exceptions, including e.g. Debrun and Kumar (2009) or Bergman et al. (2016), most studies devoted to fiscal discipline considered the effects of fiscal rules and institutions in isolation. Consequently, the goal of the second chapter, entitled "***One size really does not fit all: Fiscal rules and institutional quality in the EU***", is to explore the joint effect of fiscal rules and institutions on fiscal discipline by distinguishing between two groups of EU countries, i.e. previously-communist countries (CC) and non-communist countries (NCC). Such a distinction captures the fundamentally-different institutional paths followed by these countries after the Second World War, as highlighted by e.g. Shiller et al. (1992) and Kopits (2008). Our analysis performed using two decades of data reveals the following.

Strengthening fiscal rules increases the fiscal discipline of non-communist countries as institutions improve (a complementarity effect), but decreases the fiscal discipline of previously-communist countries as institutions improve (a substitution effect). Robust when e.g. tackling endogeneity related to fixed-effects in dynamic models and reversed causality, capturing fiscal performance with various measures, or using a semi-parametric model to account for nonlinearities in the effect of institutions, such differences are echoed by different impacts of political, economic, and social institutions (see e.g. Legied, 2019; Fuchs-Schündeln and

Schündeln, 2020; and Glawe and Wagner, 2021). The fiscal rules-institutions complementarity observed in non-communist countries owes to political and economic institutions (but not to social institutions), while the substitution observed in former communist countries is driven by political and social institutions (and a complementarity effect is found for economic institutions).

From a policy perspective, our findings suggest that a one-size-fits-all approach to fiscal rules' design may result, due to differences in the institutional environment, into fairly-different impacts on fiscal performance between non-communist and former communist EU countries. Consequently, EU policymakers should bear in mind that the interactions between fiscal rules and institutions are possibly complex, and as such integrate a national dimension, i.e. which would account for national institutions, when designing fiscal reforms that go along with the enforcement of fiscal rules.

Second Part: The Side-Effects of Fiscal Rules

In this second part of the PhD we look at possible side-effects of fiscal rules. As previously highlighted, only a sparse literature looks at the side-effects of fiscal rules, and mainly focuses on fiscal policy, with the notable exceptions of Castro (2011) and Combes et al. (2018) who analyze their economic growth and inflation performances, respectively. We extend this literature through two contributions on the side effects of fiscal rules, one devoted to the composition of public spending and the other to income inequality.

Chapter Three

Rules-based fiscal frameworks have become considerably prevalent for the conduct of fiscal policy in the recent years—as a response to the fiscal legacy fetched by the Great Recession—with the goal of ruling out the roots of *deficit bias* in the political process (Debrun et al., 2008). Despite the increased popularity of fiscal rules supported by their benefits in terms of fiscal performance (e.g. Tapsoba, 2012; Combes et al., 2018; Barbier-Gauchard et al., 2021), some contributions point out to a more skeptical perspective regarding these potential benefits (e.g. Debrun and Kumar, 2009; Heinemann et al., 2018; Caselli and Reynaud, 2020) or even underline undesirable effects of fiscal rules in terms of governments' procyclical behavior (e.g. Alesina and Bayoumi, 1996; Lane, 2003; Dessus et al., 2016). This

lack of consensus illustrates the existential crises faced by the rule-based fiscal frameworks in the recent years (see Debrun and Jonung, 2019), and also may underline the need to assess the possible "side-effects" of fiscal rules that could partly influence their stimulative effects.

Since all types of fiscal rules encompass a goal of targeting public spending (except for revenue rules), such controversies are undeniably linked to the way fiscal rules shape governments' spending behavior. Taking stock of the existing literature, the goal of the third chapter entitled "***How Do Fiscal Rules Shape Public Spending Composition?***" is to examine the way fiscal rules may influence government's behavior, particularly by exploring the nexus between fiscal rules and the composition of public spending. Estimations based on the entropy balancing method applied in a large sample of 185 countries reveal the following.

Fiscal rules are found to significantly reduce total public spending and public consumption, leave public investment mostly unaffected, and increase the public investment-to-public consumption ratio. Moreover, our findings differ with respect to the type of fiscal rule and countries' level of economic development. Finally, the features of fiscal rules (e.g. independent fiscal bodies, investment-friendly FR, supranational FR, enforcement procedures) seem to be the major driving force of the way public spending—and, particularly, total spending and public investment—are changed in response to fiscal rules' adoption.

Consequently, the key policy takeaways can be summarized as follows. Fiscal rules are found to promote fiscal discipline by triggering a significant decrease of total spending. In addition, while public consumption is often significantly reduced, governments (predominantly in developing countries) seem to protect public investment following the adoption of fiscal rules. Contrary to some pessimistic views expressed particularly in the early 2000s that fiscal rules would result into public investment cuts, our results show that public investment contractions are mostly related with other policies but fiscal rules (e.g. fiscal consolidations being an appealing candidate).

Lastly, providing a more granular perspective, we show that not all fiscal rules' features are desirable in terms of supporting the fiscal discipline effects of fiscal rules. In particular, while some features (such as enforcement and a strong legal basis) usually promote the fiscal discipline effects of fiscal rules, the impact of a high degree of flexibility and of supporting procedures or institutions is fairly mixed. Therefore, our contribution calls for a careful assessment of these features, especially for governments that may look at other goals beside fiscal discipline.

Chapter Four

Going beyond the standard approach of examining the relationship between fiscal rules and fiscal discipline largely employed by the existing literature, the previous chapter of the thesis confirmed that fiscal rules might exert salient macroeconomic side-effects on the composition of public spending. This important result drives us to utterly consider a rather different angle through which fiscal rules may significantly affect other critical macroeconomic outcomes closely linked to governments' spending behavior, and in particular income inequality.

Indeed, there are serious reasons to believe in a significant side-effect of fiscal rules on inequality, rooted in at least three grounds. First, due to their effect on fiscal balances (e.g. Debrun et al., 2008; Tapsoba, 2012), fiscal rules most likely shape both government spending and revenues, and therefore may alter their impact on inequality. Second, following the Great Recession, many countries enacted fiscal rules together with fiscal consolidation programs, in accordance with previous evidence supporting a key role of fiscal rules for them (e.g. Guichard et al., 2007); consequently, by altering the nature of fiscal consolidations, fiscal rules are likely to affect inequality. Third, fiscal rules are found to influence fiscal policy cyclicality (e.g. Debrun et al., 2008; Bova et al., 2014; Combes et al., 2017; Guerguil et al., 2017) and governments' borrowing costs (e.g. Badinger and Reuter, 2017; Thornton and Vasilakis, 2018; or Sawadogo, 2020); through these channels that affect the fiscal stance from a medium-long-run perspective, fiscal rules may yet again influence inequality.

Nevertheless, since the channels through which fiscal rules may generate a side effect on inequality are numerous and possibly contradictory, the identification of each precise channel—and, particularly, the direction and the magnitude of its respective contribution—is a fairly complex if not impossible task. To avoid making a hazardous conjecture about the direction (and the magnitude) of the potential impact of fiscal rules on inequality, the fourth and last chapter of the thesis entitled "***On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality***" extends the literature on the side-effects of fiscal rules by exploring the causal direct effect of fiscal rules adoption on income inequality in a large panel of developing countries.

Drawing upon the propensity score matching method, our estimations show that fiscal rules have a significant side-effect on income inequality: countries that adopted fiscal rules

experience a significant decrease in their income inequality with respect to comparable countries that did not. The robustness of our findings is supported when using an alternative measure of inequality, augmenting the model with additional controls, employing an alternative estimation method, or when changing the sample. Moreover, when looking at possible differences in the effect of fiscal rules on inequality, we find that the type of fiscal rule matters: while balanced-budget rules and debt rules have a favorable effect on inequality, expenditure rules are found to increase it. Lastly, we unveil important heterogeneities in the relationship between fiscal rules and inequality driven by fiscal, monetary, international, and other structural factors.

From a policy perspective, our contribution fills an important gap in the literature devoted to the side-effects of fiscal rule. Even if fiscal rules are not primarily designed to address the issue of income inequality, our results show not only that fiscal rules are not neutral in terms of inequality, but also reveal particular cases in which they may decrease or even increase income inequality. Consequently, our results may provide insightful evidence for governments aiming at adopting fiscal rules or improving the existing rule-based fiscal framework.

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PART 1

Revisiting the Effects of Fiscal Rules on Fiscal Performance: Evidence from the European Union

CHAPTER 1

A multi-speed fiscal Europe? Fiscal Rules and Fiscal Performance in the EU Former Communist Countries

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A multi-speed fiscal Europe?
Fiscal Rules and Fiscal Performance in the EU Former Communist Countries

Abstract: This chapter shows that, contrary to their favourable effect in the EU non-FCC (Former Communist Countries), fiscal rules do not significantly affect fiscal performance in the group of EU FCC. This finding, which may echo differences between FCC and other EU inherited from the Cold War period, is robust when considering various estimation methods, dividing fiscal rules along various dimensions, and using several observed and computed measures of fiscal performance. However, when going beyond the simple presence of fiscal rules, we find that an improvement of the strength of fiscal rules significantly affects fiscal performance in EU FCC, with a magnitude higher than that in EU non-FCC. Our findings are particularly important from the perspective of the future Euro zone and European Union enlargements, which involve former communist countries, and go along with the adoption of various types of fiscal rules.

Keywords: fiscal rules; fiscal performance; EU former communist countries; balanced-budget rules.

JEL Codes: E62, H62, O52.

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1 Introduction

In the beginning of the 1990s, most Central and Eastern European countries under dictatorships expressed their desire for profound political changes. The lengthy and painful transition process that started was aimed at generating political, institutional and economic reforms, in order to put these countries on the path of democracy.

These changes undoubtedly nourished the most important turning point in the European construction. On the one hand, following roughly four decades of hesitations since the end of the World War 2, Western European countries finally agreed in the early 1990s on clear dates for a monetary union, which was to be achieved by the end of the millennium. On the other hand, the European Union (EU) opened the door to many Former Communist Countries (FCC) that expressed their interest for joining the EU. A major EU enlargement did effectively occur around the mid 2000s, with the adhesion of 10 FCC in just three years.[1]

Aside from their adhesion to the EU, it is interesting to analyze the FCC from the perspective of possible institutional and cultural reminiscences, inherited from the Cold War period. Such an analysis has a first order importance from the standpoint of the current achievements and the route to follow for the FCC that are part of the EU, all the more in the context of the celebrations of around two decades of the Euro currency. Regarding the former, several FCC grew monetary institutions that allowed them to join the Euro area, namely Slovenia (2007), Slovakia (2009), Estonia (2011), Lithuania (2014) and Latvia (2015). Regarding the latter, the remaining EU FCC are in the process of adopting the single currency.[2]

However, being part of a monetary union requires in particular strong fiscal institutions, capable of delivering a sound and sustainable fiscal stance in order to protect the single currency against, for example, the need for monetization of explosive deficits and debt (see the seminal contribution of Sargent and Wallace, 1981). To avoid such unwanted consequences, all countries in the Euro area are expected to respect supranational fiscal rules (for example, the 3% deficit/GDP and the 60% debt/GDP upper bounds introduced by the Treaty

[1]The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia entered the EU in 2004 (together with the two Southern Europe countries, Cyprus and Malta), while Bulgaria and Romania joined them in 2007 and Croatia in 2013.

[2]For example, as of 2018 Bulgaria and Romania respect respectively 4 and 5 of the 7 convergence criteria needed to join the Euro Area (which will take place probably during the 2020s).

of Maastricht in 1992 and revised through the six- and two-pack, see e.g. European Fiscal Board, 2019), which are completed with national rules in most EU countries. Particularly popular in Western EU countries, such national fiscal rules have been more recently adopted also in EU FCC with the aim of supporting better fiscal outcomes. Nevertheless, the existing literature does not undoubtedly point out to favourable effects of fiscal rules on fiscal performance.[3] While fiscal rules are found to improve fiscal outcomes by e.g. Debrun et al. (2008), Tapsoba (2012), Combes et al. (2018), their impact is not significant in Debrun and Kumar (2007), Escolano et al. (2012), or Cevik and Teksoz (2014), to the point where the meta-analysis of Heinemann et al. (2018) indicates only a weakly-significant (around the 10% significance level) favourable effect.

Consequently, the goal of the present paper is to explore the effect of fiscal rules on fiscal performance in EU FCC. Focusing on the FCC is motivated by at least two major considerations. On the one hand, to the best of our knowledge, only few studies investigate the fiscal performance of the EU FCC. Aside from the descriptive discussion of Budina and van Wijnbergen (1997), these studies however focus on a wide range of political institutions, including electoral systems, political fragmentation, voter participation or the different phases of the budget process and particularly the executive-legislative interaction (see Ylaoutinen, 2004; Fabrizio and Mody, 2006; Schneider and Zapal, 2006; Mulas-Granados et al., 2009; Hallerberg and Ylaoutinen, 2010), and only Fabrizio and Mody (2006) look at the quality of fiscal institutions approached by a multidimensional index inspired by Gleich (2003). On the other hand, EU FCC are combined with the other EU countries, i.e. EU non-FCC, in the existing studies devoted to fiscal rules and fiscal performance (see e.g. Debrun et al., 2008). However, by focusing on the EU FCC alone, our analysis unveils significant differences between them and the other EU countries. Using the bias-corrected least squares dummy (LSDVC) estimator, which is particularly appealing for our small sample of 11 EU FCC observed during the 1995-2014 period, our results are as follows.

First, we find that in the EU FCC the presence of fiscal rules does not significantly influence the primary fiscal balance, which is our main measure of fiscal performance. This

[3]In addition to the fiscal performance, other dimensions of fiscal policy were found to be affected by fiscal rules, including fiscal policy cyclicality (with pros: Debrun et al., 2008; Combes et al., 2017; and cons: Blanchard and Giavazzi, 2004; Dessus et al., 2016) or government borrowing costs (see e.g. Badinger and Reuter, 2017; Thornton and Vasilakis, 2018; Afonso and Jalles, 2019).

result is at odds with the strong favourable effect of fiscal rules on the primary fiscal balance that we illustrate for the other 17 EU countries, or for all the 28 EU countries in our sample.

Second, we show that this finding is robust in various ways, namely when performing estimations (i) by alternatively excluding each of the eleven countries to control for possible outliers; (ii) by extending the sample to include nine additional FCC countries that were part of the former Soviet Union and Albania; (iii) by using the LSDV estimator without correction and with several alternative corrections of the Nickel (1991) bias between the lagged dependent variable and country-fixed effects; and (iv) by adding time-fixed effects. In addition, fiscal rules are not found to significantly affect alternative measures of fiscal performance, either observed (namely, the overall fiscal balance) or computed (namely, the cyclically-adjusted overall and primary balance, or the structural balance).

Third, we explore heterogeneities related to different types of fiscal rules. None of the various types of fiscal rules considered, namely, budget balance rules (BBR), debt rules (DR), or expenditure rules (ER), significantly influences fiscal performance in EU FCC, contrary to the favourable effect of BBR and DR in the EU non-FCC. Moreover, the same holds when looking at the age and the number of fiscal rules, and the presence and the number of national and supranational fiscal rules. Finally, the presence of medium term budgetary frameworks (MTBF) is not found to affect fiscal performance in the EU FCC, consistent with our main findings.

Fourth, we extend our analysis and investigate the importance of the strength of FR. We find that an increase in the strength of FR significantly improves fiscal performance in EU FCC, with a magnitude stronger than that estimated for the EU non-FCC. This finding completes our previous results, as it shows that in the EU FCC it is not the mere presence of FR that matters for fiscal performance, but rather the way FR are enforced.

Altogether, our analysis draws attention on a possible threat of a multi-speed fiscal Europe: contrary to the other EU countries, simply adopting fiscal rules is not sufficient to significantly influence fiscal performance in the EU FCC. This finding may be explained by structural differences between the FCC and the other EU countries, mainly reflecting (i) almost half a century of fundamental differences in institutions, which, despite several decades of transition, still conserve some of their pre-1990 characteristics, including a dependency to the party state or resistance (fear) to change; and (ii) poor post-communist institutions, characterized by the common-pool problem and possibly a zero-sum (non-cooperative) po-

litical process, as summarized by the excellent discussion of Kopits (2008). Such issues may translate into a loose understanding and commitment by governments of fiscal rules in terms of fiscal performance in the EU FCC.

Instead, when incentives are created by enforcing their implementation, fiscal rules significantly improve fiscal performance in the EU FCC. Consequently, from the perspective of the adoption of the Euro by several EU FCC, and potentially by other FCC that are in the process of joining the EU (for example, countries that were part of the former Socialist Federal Republic of Yugoslavia), an appropriate strategy should go beyond the simple adoption of fiscal rules towards measures of enforcement in order to make them count for fiscal discipline.

The paper is organized as follows. Section 2 describes the methodology, section 3 presents the data, section 4 reports the main results and their robustness, section 5 accounts for various types of fiscal rules, section 6 goes beyond the simple presence of fiscal rules and considers the impact of their strength, and section 7 provides some conclusive remarks.

2 Methodology

The goal of our analysis is to study the effects of fiscal rules (FR) on fiscal performance (FP) in the panel composed of the former communist countries (FCC) that are part of the European Union (EU), namely

$$FP_{it} = \alpha + \beta FR_{it} + \gamma X_{it} + \epsilon_{it}, \tag{1}$$

with X the vector of control variables and ϵ_{it} the residuals. Starting from this simple OLS setup, we perform several corrections in order to obtain our benchmark model.

First, the vector of control variables intends to clean the effect of FR on FP from country-specific factors that may lead to biased estimates if uncontrolled for. However, once accounted for, the impact of FR on FP may still be polluted by country-specific factors that are unobserved. To account for such factors, we extend model (1) to add country-fixed effects.

Second, as previously emphasized by the existing literature (see, e.g. Combes et al., 2018), a certain share of fiscal outcomes are hardly modified between consecutive years. To account for this potential persistence, we further extend model (1) by including the lagged

value of fiscal performance. Consequently, with μ_i the country-fixed effects and FP_{it-1} the lagged fiscal performance, model (1) now rewrites

$$FP_{it} = \alpha + \delta FP_{it-1} + \beta FR_{it} + \gamma X_{it} + \mu_i + \epsilon_{it}. \quad (2)$$

Finally, the influence of FR on FP may be subject to endogeneity, since governments may decide to adopt fiscal rules when fiscal conditions are favourable, including in terms of fiscal performance. Particularly challenging for fiscal policy macroeconomic time series data, this issue may ideally be addressed by instrumenting the variable FR;[4] however, as indicated by Debrun et al. (2008) and Combes et al. (2018), given the difficulties of finding appropriate time-varying instrumental variables (IV), the common solution is to resort to lagged values, possibly within regression-based techniques such as the system-GMM estimator of Blundell and Bond (1998). Nevertheless, this technique provides fairly robust estimates when the number of countries is (much) larger than the number of years, which is not the case in our setup. Instead, to account for the relatively small size of our sample, we draw upon the Least Squares Dummy Variable (LSDV) method, which may outperform GMM methods in small samples (see e.g. Arellano and Bond, 1991; Kiviet, 1995, 1999, Judson and Owen, 1999; Bun and Kiviet, 2003). In addition, to deal with the Nickell (1981) bias that characterizes dynamic panel models, i.e. the fact that the correlation between the lagged dependant variable and the residual term yields inconsistent estimates, we draw upon the bias-corrected LSDV estimator (LSDVC) of Bruno (2005a,b) that is appropriate for unbalanced panels like ours.

3 Data

We test the effect of fiscal rules on fiscal performance using yearly data for the period 1995-2014 in the 11 central and eastern former communist countries (FCC) that are currently part of the European Union, namely: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

Our main variables are measured as follows. On the one hand, the presence of fiscal rules (FR) is captured by a dummy variable equal to 1 if a country has a fiscal rule in a certain

[4] Alternatively, following the work of Tapsoba (2012), several studies, e.g. Guerguil et al. (2017) and Combes et al. (2019), considered the adoption of fiscal rules as random once its main determinants are controlled for, and compare fiscal performance in countries that adopted FR and that did not adopt FR.

year, and to 0 if not. Data come from the IMF Fiscal Rules dataset, which provides the largest data coverage on fiscal rules. On the other hand, in our main analysis we capture fiscal performance using the primary fiscal balance (PB), computed as the difference between general government's fiscal revenues and public spending, excluding interest payments.[5]

The vector of control variables includes, in addition to the lagged measure of fiscal performance, various variables that may affect fiscal performance. First, according to Bohn (1998), in the presence of large public debt governments are likely to conduct higher fiscal surpluses in order to stabilize possible unsustainable debt dynamics; to mitigate a possible simultaneity bias, we introduce the one-period lagged debt. Second, we consider the inflation rate (normalized to be equal to inflation divided by 1+inflation), given that monetary conditions, such as an inflation targeting framework, may raise fiscal discipline as suggested by Minea and Tapsoba (2014). Finally, we use two more variables, namely the (log of) real GDP per capita and the openness degree to account for domestic real conditions and the international activity. This parsimonious specification seems appropriate given our relatively small sample.[6]

4 Fiscal rules and fiscal performance

We begin by generating a counterfactual through looking at the effect of FR in the other EU countries, i.e. EU non-FCC. Then, we report the impact of FR on FP in the EU FCC. Lastly, we discuss the robustness of our results.

4.1 Preliminaries: FR and FP in the EU non-FCC

Given the debates in the literature on the effect of fiscal rules on fiscal performance, we first consider the sample of 17 EU non-FCC.[7] Results are reported in Table 1.

[5]Given the complexity of the concept of fiscal performance, our robustness analysis will consider several alternative measures chosen to capture its various facets.

[6]We report that the use of other variables does not allow improving this specification; for example, unemployment was found not to significantly affect fiscal performance, consistent with Fabrizio and Mody (2006) or Hallerberg and Ylatoutinen (2010).

[7]These countries are: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Malta, Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Table 1: FR and FP in the EU non-FCC

	(1)	(2)	(3)	(4)
Estimator	OLS	LSDV	LSDVC	LSDVC
Lag PB	0.749***	0.698***	0.784***	0.707***
	(0.0331)	(0.0368)	(0.0359)	(0.0448)
FR	1.287***	1.353***	1.458***	1.894***
	(0.435)	(0.470)	(0.499)	(0.432)
Debt				0.0510***
				(0.0097)
Inflation				25.00***
				(8.292)
RGDPpc				1.021
				(1.922)
Openness				0.00866
				(0.0225)
N	356	356	356	251
R2	0.600	0.523	-	-

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

According to column (1), simple OLS pooled estimations show that, aside from the strong persistence in the primary fiscal balance (see the large and significant coefficient of its lagged value) supporting the use of dynamic panel estimators, the presence of FR significantly increases the primary fiscal balance with a magnitude compared to previous estimates (see the discussion in Heinemann et al., 2018). These findings are confirmed when using the LSDV estimator in column (2), and the correction suggested by Bruno (2005a) in column (3). Finally, this significant favourable effect is still at work when including in column (4) our vector of control variables, namely public debt, inflation, real GDP per capita, and the openness degree; in particular, governments are found to significantly respond to higher debt by increasing their primary balance, and, given the modest inflation rates in these countries over the considered period, a higher inflation rate may be the sign of strong demand-driven economic growth, which provides additional fiscal revenues that raise the primary fiscal balance. Consequently, we find a positive effect of FR on fiscal performance measured by the primary fiscal balance in the EU non-FCC countries.

4.2 Main results: FR and FP in the EU FCC

The estimated effect of FR on the EU FCC is reported in Table 2. Although its persistence is comparable with the other EU countries, the primary fiscal balance is no longer significantly affected by FR in OLS estimations in column (1). This result is at work when using the LSDV estimator in column (2) and the LSDVC estimator in column (3). Moreover, adding control variables in column (4) leaves the effect of fiscal rules unchanged; in particular, governments positively adjust their primary balance when facing larger public debt, as suggested by Bohn (1998), and a higher inflation and real GDP per capita are associated with a higher primary fiscal balance.

Finally, to go one step further, we report in the remaining columns of Table 2 LSDVC estimations for various samples. First, we look in column (5) at the effect of FR on the primary fiscal balance for a sample composed (based on data availability) of nine former communist countries that are not currently part of the EU (non-EU FCC), namely Albania and eight former Soviet Union countries (Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation and Ukraine). Comparable with our findings for the EU FCC, FR do not exert a significant effect on the primary fiscal balance. Second, we mix the eleven EU FCC and the nine non-EU FCC to obtain a wider sample of twenty FCC. Estimations reported in column (6) confirm the lack of significant effect of FR on the primary fiscal balance in the sample of FCC, be them currently in the EU or not.

Consequently, our analysis reveals that FR do not significantly influence fiscal performance measured by the primary fiscal balance in the group of EU FCC. This finding is all the more important that FR significantly foster the primary fiscal balance in the EU non-FCC and also for all EU countries without (column 7) or with the non-EU FCC (column 8). This finding suggests that the simple presence of FR may not be sufficiently binding to foster fiscal performance in EU FCC. A possible explanation, supported by the lack of a significant effect of FR equally in the non-EU FCC, may be related to the heritage from the communist era, making fiscal institutions not to significantly connect their fiscal performance with the presence of FR.

Given the central role of fiscal rules in the European construction process at least since the Treaty of Maastricht of 1992, this heterogeneity in the response of the primary fiscal balance to FR within the EU should be accounted for from the standpoint of the stability

Table 2: FR and FP in the EU FCC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimator	OLS	LSDV	LSDVC	LSDVC	LSDVC	LSDVC	LSDVC	LSDVC
Sample	FCC	FCC	FCC	FCC	Sov. Un.	FCC&SU	FCC&EU	FCC&EU&SU
Lag PB	0.733***	0.668***	0.776***	0.503***	0.410***	0.552***	0.659***	0.661***
	(0.0575)	(0.0663)	(0.0651)	(0.117)	(0.139)	(0.0861)	(0.0393)	(0.0341)
FR	0.117	0.119	0.0995	0.299	-0.0379	0.0572	1.237***	1.103***
	(0.442)	(0.482)	(0.635)	(0.563)	(3.024)	(0.531)	(0.363)	(0.363)
Debt				0.0628**	0.0232	0.0168	0.0485***	0.0278***
				(0.0276)	(0.0226)	(0.0189)	(0.0122)	(0.0068)
Inflation				18.36**	0.138	2.548	19.78***	3.133*
				(7.136)	(2.698)	(2.882)	(4.525)	(1.902)
RGDPpc				5.915**	0.666	1.274	3.075**	1.304
				(2.417)	(1.836)	(1.199)	(1.276)	(1.032)
Openness				-0.0275	0.0300	-0.000306	-0.0139	-0.0048
				(0.0186)	(0.0236)	(0.00967)	(0.0116)	(0.0099)
N	171	171	171	97	76	173	348	424
R2	0.492	0.391	-	-	-	-	-	-

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

of the current Euro zone and the perspective of its enlargement to new FCC.

4.3 Robustness

We explore the robustness of the disconnection between FR and FP measured by the primary fiscal balance in the EU FCC in various ways. First, to control for possible outliers, we perform our main estimations by progressively excluding each of the eleven EU FCC. As shown by columns (1)-(11) in Table 3, our previous findings do not seem to be driven by a specific country.

Next, we consider different estimations methods. First, in addition to country-fixed effects, we augment our model with time-fixed effects whose aim is to account for time-varying unobserved events, including changes at the EU level, international shocks and so forth. Column (1) of Table 4 shows that accounting for time-fixed effects does not change our previous findings.[8] Second, for a different look at the issue of endogeneity, we perform

[8]Comparable conclusions arise if we control for the Great Recession period (results are available upon request).

Table 3: FR and FP in the EU FCC: potential outliers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	drop	drop	drop	drop	drop	drop	drop	drop	drop	drop	drop
	Bulgaria	Cz. Rep.	Svk. Rep.	Estonia	Latvia	Hungary	Lithuania	Croatia	Slovenia	Poland	Romania
Lag PB	0.455***	0.675***	0.519***	0.491***	0.505***	0.202*	0.498***	0.502***	0.504***	0.506***	0.503***
	(0.0885)	(0.113)	(0.118)	(0.0892)	(0.114)	(0.105)	(0.106)	(0.0853)	(0.123)	(0.114)	(0.117)
FR	-0.173	-0.0139	0.396	0.702	0.657	0.167	0.224	0.307	0.618	0.0987	0.299
	(0.753)	(0.711)	(0.654)	(0.652)	(0.638)	(0.693)	(0.713)	(0.735)	(0.840)	(0.892)	(0.563)
Debt	0.134***	0.0623*	0.0497	0.0614**	0.0599**	0.00612	0.0629**	0.0629**	0.0675**	0.0637**	0.0628**
	(0.0361)	(0.0358)	(0.0338)	(0.0279)	(0.0262)	(0.0221)	(0.0317)	(0.0295)	(0.0264)	(0.0275)	(0.0276)
Inflation	15.40**	14.81**	18.30**	21.90***	21.50**	13.98**	20.57***	18.27**	18.43***	21.36***	18.36**
	(7.510)	(6.544)	(7.411)	(8.474)	(9.024)	(6.544)	(6.170)	(8.430)	(6.891)	(7.970)	(7.136)
RGDPpc	7.309***	3.812	5.648**	4.317*	7.059***	4.666*	6.597**	5.948***	6.104*	5.410*	5.915**
	(2.580)	(2.412)	(2.251)	(2.452)	(2.640)	(2.423)	(2.663)	(1.902)	(3.142)	(3.099)	(2.417)
Openness	-0.0394	-0.00701	-0.0318*	-0.0253	-0.0348**	0.00633	-0.0267	-0.0278	-0.0332	-0.0197	-0.0275
	(0.0264)	(0.0233)	(0.0170)	(0.0169)	(0.0155)	(0.0234)	(0.0241)	(0.0244)	(0.0209)	(0.0223)	(0.0186)
N	91	85	87	85	88	85	90	92	85	85	97

Notes: LSDVC estimators. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

two-stage least squares estimations (2SLS), in which we instrument fiscal rules by their one period-lag. As indicated by column (2), the absence of a significant effect of FR is still at work.[9] Third, in our previous regressions we corrected the bias of the LSDV estimator using the correction of Nickell (1981) of order T^{-1}. Subsequent work provides more precise corrections of the bias, of order $N^{-1}T^{-1}$ (Kiviet, 1995) and $N^{-2}T^{-1}$ (Kiviet, 1999). As shown by columns (3) and (4) in Table 4, using the latter two corrections leaves our previous results qualitatively unchanged.

Finally, so far we approached fiscal performance by one of the most popular measures in the existing literature, namely the primary fiscal balance (PB). However, given the complexity of the concept of fiscal performance, PB may seize only some of its dimensions. Consequently, we consider alternative measures of fiscal performance in Table 4. First, by subtracting interest payments (i.e. the debt burden) from the PB, we obtain the overall fiscal balance (OB). Estimations in column (5) show the lack of a significant effect of FR on OB in the EU FCC, corroborating our previous finding. Second, we move away from observed measures of fiscal performance (such as PB or OB), and look at transformed measures. On

[9]These results, which continue to hold if we instrument FR with both their first and second lag, join the conclusions of Caselli and Reynaud (2019) who fail to find a significant effect of fiscal rules on fiscal balances when accounting for endogeneity.

Table 4: FR and FP in the EU FCC: different methods and FP measures

	(1)[a]	(2)[b]	(3)[c]	(4)[d]	(5)	(6)	(7)	(8)
FP Measure	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.390***	0.385***	0.528***	0.540***				
	(0.089)	(0.115)	(0.115)	(0.118)				
FR	0.642	0.0415	0.302	0.308	0.271	0.440	0.250	0.313
	(0.661)	(0.797)	(0.559)	(0.559)	(0.760)	(0.511)	(0.679)	(0.851)
Debt	0.0984***	0.0704*	0.0617**	0.0704*	0.0477	0.0833*	0.0468	0.0395
	(0.0320)	(0.0371)	(0.0275)	(0.0371)	(0.0295)	(0.0494)	(0.0317)	(0.0338)
Inflation	3.963	19.93***	18.04**	19.93***	17.35***	7.815	5.146	9.532
	(8.823)	(7.258)	(7.061)	(7.258)	(5.864)	(5.486)	(5.168)	(10.73)
RGDPpc	9.789***	5.670**	5.969**	5.670**	6.555***	0.143	-0.712	-1.407
	(3.435)	(2.286)	(2.427)	(2.286)	(2.400)	(3.151)	(2.431)	(4.696)
Openness	-0.0111	-0.0183	-0.0286	-0.0183	-0.0148	-0.0195	-0.000153	0.0248
	(0.0225)	(0.0214)	(0.0186)	(0.0214)	(0.0219)	(0.0209)	(0.0170)	(0.0328)
Lag OB					0.425***			
					(0.117)			
Lag CAPB						0.273**		
						(0.124)		
Lag CAB							0.499***	
							(0.103)	
Lag SB								0.327**
								(0.144)
N	97	97	97	97	102	72	114	78
R2	0.542	0.457	-	-	-	-	-	-

Notes: [a] LSDV estimator with time fixed effects. [b] 2SLS estimator with FR instrumented by its lag. [c] and [d] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

the one hand, we consider the cyclically-adjusted balance (CAB) and the cyclically-adjusted primary balance (CAPB). According to columns (6) and (7), FR do not exert a significant effect on these business-cycle corrected measures of fiscal performance. On the other hand, we consider the structural balance (SB), which is corrected for the effects of the business cycle and one off events. Column (8) shows that the effect of FR on the SB is not significant.

Consequently, the absence of a significant effect of FR on fiscal performance in the EU FCC appears robust to the use of alternative methods and measures of fiscal performance. In the following, we investigate if this finding still holds when considering different types of fiscal rules.

5 FR and FP in the EU FCC: different types of FR

The previous section confirmed that FR, measured by a dummy that equals 1 irrespective of the type of FR, do not affect fiscal performance. In the following, we disentangle FR in various ways.

5.1 The fiscal aggregate covered by the fiscal rule

Our general measure of fiscal rules does not differentiate between balanced budget rules (BBR), debt rules (DR), or expenditure rules (ER).[10] Yet, each rule presents particularities related to different objectives, such as operational guidance, economic stabilization functions, linkage to debt sustainability, flexibility and transparency (Schaechter, 2012; Caselli et al., 2018). Therefore, capitalizing on existing studies that highlight different effects of these rules on the fiscal behaviour (e.g. Tapsoba, 2012; Combes et al., 2018), we investigate their effect on the fiscal performance of the EU FCC.

5.1.1 Budget Balance Rules (BBR)

Budget balance rules usually set an explicit limit on the budget deficit, e.g. the well-known 3% target embodied in the SGP. Providing a better response mechanism to output shocks when defined as structural or "over the cycle", BBR may also support economic

[10] We disregard the revenue rules for being fairly rare in our sample.

stabilization; however, due to their complexity, such BBR are difficult to be monitored and communicated.

Table 5: BBR and FP in the EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)	(8)	(9)
FP Measure	PB	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.707***	0.508***	0.383***	0.533***	0.546***				
	(0.045)	(0.115)	(0.0903)	(0.112)	(0.115)				
BBR	1.894***	0.210	-0.248	0.215	0.222	0.283	0.0171	-0.0132	-0.483
	(0.431)	(0.694)	(0.927)	(0.692)	(0.693)	(0.617)	(1.038)	(0.572)	(0.986)
Lag OB						0.426***			
						(0.120)			
Lag CAPB							0.276**		
							(0.134)		
Lag CAB								0.502***	
								(0.101)	
Lag SB									0.325**
									(0.151)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	251	97	97	97	97	102	72	114	78
R2	-	-	0.537	-	-	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC countries, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

According to column (1) in Table 5, the presence of BBR significantly increases the primary fiscal balance in the group of EU non-FCC countries, consistent with some of the existing studies (see e.g. Debrun et al., 2008; Tapsoba, 2012; Combes et al., 2018). However, column (2) shows that the presence of BBR is not associated with a significant change in the primary fiscal balance for the EU FCC. This lack of a significant effect of BBR is confirmed when using the LSDV estimator with time fixed effects and the LSDVC estimator with the bias corrections of Kiviet (1995, 1999) in columns (3)-(5). Finally, columns (6)-(9) of Table 5 illustrate that the presence of BBR leaves statistically unchanged the various measures of fiscal performance (namely: the overall fiscal balance, the cyclically-adjusted balance, the cyclically-adjusted primary balance and the structural balance). Consequently, contrary to the other EU countries, the simple adoption of BBR appears unrelated to fiscal performance in the EU FCC.

5.1.2 Debt rules (DR)

Compared with BBR, DR are the most effective type of fiscal rule in terms of setting up a specific target for the public debt-to-GDP ratio (e.g. the 60% target included in the SGP). However, DR may be associated with procyclical behaviours when the economy is hit by shocks (Schaechter et al., 2012), due to their binding nature and the fact that they are not meant to provide short-term operational guidance (Caselli et al., 2018). Even though DR are found to be less discipline-enhancing for public spending behaviour (Guerguil et al., 2017), they act like a commitment device and are easier to monitor and communicate.

Table 6: DR and FP in EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)	(8)	(9)
FP Measure	PB	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.707***	0.503***	0.385***	0.526***	0.538***				
	(0.045)	(0.114)	(0.0897)	(0.112)	(0.114)				
DR	1.894***	0.297	0.435	0.304	0.312	0.110	0.200	0.144	-0.181
	(0.432)	(0.556)	(0.697)	(0.549)	(0.547)	(1.001)	(0.664)	(0.661)	(0.866)
Lag OB						0.425***			
						(0.119)			
Lag CAPB							0.274**		
							(0.126)		
Lag CAB								0.500***	
								(0.103)	
Lag SB									0.329**
									(0.145)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	251	97	97	97	97	102	72	114	78
R2	-	-	0.539	-	-	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC countries, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Consistent with previous studies (see e.g. Debrun et al., 2008; Bergman et al., 2016), DR are found to significantly increase the fiscal performance of EU non-FCC countries, measured by the primary fiscal balance in column (1) of Table 6. However, DR do not significantly affect the primary fiscal balance of the EU FCC, irrespective of the use of the LSDVC estimator (column 2), the LSDV estimator with time fixed effects (column 3), or the

LSDVC estimator with various corrections (columns 4 and 5). In addition, the same holds when using different measures of fiscal performance in columns (6)-(9) of Table 6. Therefore, similar to BBR, the simple presence of DR does not significantly affect the fiscal performance of the EU FCC, contrary to their favourable effect in the other EU countries.

5.1.3 Expenditure rules (ER)

Compared with the other types of FR, ER aim to limit the current, primary or total government expenditure by setting a numerical ceiling usually expressed in absolute terms or growth rates. Being directly linked to the size of the government and due to their simplicity and flexibility, ER can provide a strong guidance for achieving fiscal discipline and limiting the deficit bias (Schaechter et al., 2012; Eyraud et al., 2018).

Table 7: ER and FP in the EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)
FP Measure	PB	PB	PB	PB	PB	OB	SB
Lag PB	0.714***	0.492***	0.348***	0.514***	0.528***		
	(0.050)	(0.114)	(0.0895)	(0.112)	(0.114)		
ER	0.454	2.327	3.417*	2.293	2.271	1.712	-0.0630
	(0.593)	(2.149)	(1.718)	(2.134)	(2.126)	(1.893)	(2.634)
Lag OB						0.418***	
						(0.121)	
Lag SB							0.326**
							(0.149)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	251	97	97	97	97	102	78
R2	-	-	0.561	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC countries, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

As shown by column (1) in Table 7, contrary to BBR and DR, ER do not significantly affect the primary fiscal balance in the group of EU non-FCC countries, a finding consistent with some existing studies (see e.g. Debrun et al., 2008; Reuter, 2015; Bergman et al., 2016). In addition, ER equally leave unaffected fiscal performance in the EU FCC, irrespective of

the method used (except for a weakly-significant effect when using the LSDV estimator with no correction, see columns 2-5) or the fiscal performance measure (see columns 6-7).[11]

Altogether, these results show yet again that the simple presence of fiscal rules, which is found to be sufficient in the other EU countries, does not significantly impact fiscal performance in the EU FCC.

5.2 The age and the number of fiscal rules

We now look at two different dimensions of fiscal rules, namely their age and their number. Regarding the former, we measure the age of fiscal rules by a variable equal to the number of years since the adoption of the rule, e.g. equal to 1 the year of adoption, to 2 in the second year and so forth.

Table 8: The age of FR and FP in the EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)	(8)	(9)
FP Measure	PB	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.696***	0.432**	0.337*	0.453***	0.508***				
	(0.0598)	(0.175)	(0.188)	(0.170)	(0.176)				
Age FR	-0.102*	-0.290	-0.126	-0.292	-0.292	-0.280	-0.382	-0.0999	-0.331
	(0.0583)	(0.310)	(0.460)	(0.311)	(0.314)	(0.278)	(0.497)	(0.316)	(0.516)
Lag OB						0.360**			
						(0.157)			
Lag CAPB							0.208		
							(0.147)		
Lag CAB								0.476***	
								(0.153)	
Lag SB									0.558***
									(0.159)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	221	57	57	57	57	61	42	61	47
R2	-	-	0.599	-	-	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

[11] The LSDVC estimator fails to converge when using the CAPB and the CAB as alternative FP measures.

According to column (1) in Table 8, the favourable effect of the presence of FR on the primary fiscal balance of the EU non-FCC countries, estimated around 1.9 in Table 1, decreases by around 0.1 for each additional year since the adoption. However, the age of the rule has no significant effect on the primary fiscal balance of the EU FCC, irrespective of the method used (see columns 2-5). Finally, using various FP measures in columns (6)-(9) confirms the lack of significant impact of the age of FR on FP in the EU FCC.

Table 9: The number of FR and FP in the EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)	(8)	(9)
FP Measure	PB	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.685***	0.506***	0.378***	0.530***	0.543***				
	(0.0451)	(0.114)	(0.0903)	(0.111)	(0.114)				
Number FR	0.546***	0.0484	-0.212	0.0510	0.0542	0.0120	-0.225	-0.0704	-0.363
	(0.0968)	(0.263)	(0.312)	(0.261)	(0.261)	(0.278)	(0.291)	(0.178)	(0.348)
Lag OB						0.426***			
						(0.126)			
Lag CAPB							0.269**		
							(0.130)		
Lag CAB								0.506***	
								(0.101)	
Lag SB									0.314**
									(0.151)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	251	97	97	97	97	102	72	114	78
R2	-	-	0.539	-	-	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Moving to the number of fiscal rules, in recent years a wide number of countries adopted multiple fiscal rules (Caselli et al., 2018), with the goal of strengthening their fiscal discipline. Therefore, we look if the presence of several fiscal rules affects our previous findings. As shown by column (1) in Table 9, the primary fiscal balance positively responds to a higher number of fiscal rules for the EU non-FCC. Contrasting with this strong effect, column (2) shows that having a higher number of FR does not significantly affect the primary fiscal balance in the EU FCC. This result remains unchanged when considering different methods and corrections in columns (3)-(5) and when employing alternative observed and transformed FP measures in columns (6)-(9). Consequently, extending our benchmark findings, we reveal that adopting

several fiscal rules is not a viable solution to significantly improve fiscal performance in the EU FCC. Our finding may provide support to the argument of Eyraud et al. (2018), suggesting that multiple FR are difficult to manage and may raise different issues, including the inconsistency between various targets (for example, the 3% deficit and the 60% public debt ceilings in EU[12]), the overlap between rules (for example, different rules may constrain the same fiscal aggregate to a different degree or may target different measures of the same aggregate[13]), or sub-optimal policies due to over-constrained governments (Cordes et al., 2015).

5.3 National and supranational fiscal rules

Both national and supranational fiscal rules underpin fiscal behaviours in the Euro area. On the one hand, an increasing number of countries became subject to supranational rules (such as the 3% deficit and the 60% debt targets of the SGP) following their entrance in the EMU (Caselli et al., 2018). On the other hand, many countries adopted national fiscal rules in response to the fiscal legacy of the global financial crisis and to provide a credible commitment to sound fiscal frameworks (Schaechter et al., 2012). However, supranational rules are often subject of insufficient compliance, as many countries frequently infringe them without considerable sanctions (Tapsoba, 2012). Although the resilience of supranational rules to recessionary shocks outperforms that of national rules, recent studies show that a supranational fiscal framework does not lead to compliance with national rules and thus to more fiscal discipline (Bergman et al., 2016), while the EMU membership may lead to bailout expectations that seem to alter the compliance with supranational FR (e.g. Reuter, 2017).

We consider in Table 10 the impact of national fiscal rules (NFR) on the primary fiscal balance. As shown by LSDVC estimations in columns (1)-(2), both the presence of NFR and a higher number of NFR significantly increase the primary fiscal balance in EU non-FCC. Although weaker in magnitude, a comparable effect is at work when extending the sample by adding the EU FCC (see columns 3-4). However, column (5) shows the lack of a significant effect of NFR on the primary fiscal balance in EU FCC, a finding confirmed when

[12]According to Eyraud et al. (2018), a 3% deficit rule would be consistent with a 60% public debt in the long run provided that the annual nominal GDP growth is high, around 5%; instead, the required nominal GDP growth would be around 3% with a 2% deficit rule.

[13]For example, in Bulgaria and Romania there exist both structural and nominal budget balance rules.

considering the total number of NFR in columns (6). Consequently, neither the presence nor a higher number of NFR are sufficiently binding to increase fiscal performance measured by the primary fiscal balance in EU FCC.

Table 10: National FR and FP

	(1)	(2)	(3)	(4)	(5)	(6)
FP measure	NFR	Number NFR	NFR	Number NFR	NFR	Number NFR
Sample	EU non-FCC	EU non-FCC	All EU	All EU	EU FCC	EU FCC
Lag PB	0.690***	0.677***	0.656***	0.638***	0.491***	0.509***
	(0.0466)	(0.0470)	(0.0398)	(0.0367)	(0.117)	(0.119)
NFR	0.829*		0.626**		-0.286	
	(0.425)		(0.316)		(0.708)	
Number NFR		0.563**		0.526**		0.271
		(0.238)		(0.210)		(0.461)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	251	251	348	348	97	97

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 11: Supranational FR and FP

	(1)	(2)	(3)	(4)	(5)	(6)
FP measure	SFR	Number SFR	SFR	Number SFR	SFR	Number SFR
Sample	EU non-FCC	EU non-FCC	All EU	All EU	EU FCC	EU FCC
Lag PB	0.707***	0.732***	0.659***	0.668***	0.509***	0.510***
	(0.0448)	(0.0462)	(0.0407)	(0.0404)	(0.113)	(0.114)
SFR	1.894***		1.053**		-0.0209	
	(0.432)		(0.418)		(0.648)	
Number SFR		0.671***		0.338*		-0.0101
		(0.134)		(0.173)		(0.281)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	251	251	348	348	97	97

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Moving to supranational fiscal rules (SFR), columns (1)-(2) in Table 11 show that the presence of SFR and more SFR significantly increase the primary fiscal balance in the EU non-FCC. While these effects are confirmed, although with a weaker magnitude, when ex-

tending the sample to include the EU FCC (see columns 3-4), performing the estimations on the EU FCC alone reveals a different picture: neither the presence of SFR (column 5), nor a higher number of SFR (column 6), significantly affect their primary fiscal balance. This result supports the reforms suggested by Caselli et al. (2018), towards a smaller number of FR that can better combine three guiding principles, namely flexibility, enforceability and simplicity.

5.4 Medium Term Budgetary Frameworks

Most EU countries introduced a different form of fiscal constraints, namely the Medium Terms Budgetary Frameworks (MTBF). Narrowly, MTBFs refer to fiscal arrangements covering the preparation, execution and monitoring of multiannual budgets and projections proposed by EU member states. However, compared with fiscal rules, MTBFs represent a slighter form of commitment and are applied in various ways across EU countries (see the summary of Sherwood, 2015).

In this section, we investigate the effect of MTBF on fiscal performance. We draw upon the European Commission's country-specific composite index that captures the quality of the MTBF taking into account five criteria: coverage of the ceilings, the link between the ceilings included in the MTBF plans, the use of the coalition agreement or involvement of parliament in the preparation of the medium-term fiscal plans, the fiscal council's implication in the preparation of the medium-term fiscal plans, and, finally, the level of details included in MTBFs. A higher composite index signals a higher MTBF quality.

Given that MTBFs are not observed on a yearly basis, we estimate a more parsimonious model with debt and inflation as control variables. As shown by column (1) in Table 12, corroborating the effect of FR, MTBF significantly increase the primary fiscal balance in EU non-FCC. Moving to EU FCC, MTBF are not found to affect their primary fiscal balance (see column 2), a result confirmed when using the LSDV estimator with time fixed effects or the LSDVC estimator with alternative corrections (see columns 3-5). In addition, a lack of significant effect is equally at work when using alternative measures of fiscal discipline, both observed (the overall fiscal balance in column 6) and computed (the cyclically-adjusted balance and the structural balance, in columns 7-8). Consequently, similar to FR, the MTBFs appear unrelated to fiscal performance in the EU FCC.

Table 12: MTBF and FP in the EU FCC

	(1)[%]	(2)	(3)[a]	(4)[b]	(5)[c]	(6)	(7)	(8)
FP Measure	PB	PB	PB	PB	PB	OB	CAB	SB
Lag PB	0.435***	0.837***	0.590***	0.829***	0.851***			
	(0.0829)	(0.273)	(0.101)	(0.263)	(0.268)			
MTBF	8.661***	-1.266	3.529	-1.191	-1.269	-1.205	4.542	2.155
	(2.983)	(6.459)	(2.931)	(6.527)	(6.340)	(6.650)	(30.99)	(3.865)
Lag OB						0.862***		
						(0.279)		
Lag CAB							0.548	
							(0.386)	
Lag SB								0.625**
								(0.309)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	119	73	73	73	73	73	67	73
R2	0.670	-	0.709	-	-	-	-	-

Notes: [%] estimations performed on the EU non-FCC countries, as benchmark. [a] LSDV estimator with time fixed effects. [b] and [c] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

6 The design of FR and fiscal performance

Keeping in mind that, by and large, the presence of FR was not found to be a significant determinant of fiscal performance in EU FCC, we now adopt a different perspective and look at the design of fiscal rules.[14]

6.1 Conceptual background

Since the late 1990s, an important strand of literature discusses possible ways to improve the operational feature of FR, negatively affected by some of their characteristics, including rigidity, complexity and weak enforceability. First, many studies suggest that rules with more binding features can result into stronger discipline (see e.g. Bohn and Inman 1996; Clemens and Miran, 2012; Follette and Lutz, 2012). Second, stronger rules are more likely to reduce

[14]Prior to this analysis, we considered additional measures of fiscal performance, namely: government debt, tax revenues, value-added taxes, the fiscal balance in ratio of tax revenues, and sovereign debt maturity. Estimations reveal, yet again, a lack of significant effect of FR on these variables (results are available upon request).

procyclical policies and increase enforceability and transparency (see e.g. Debrun et al., 2008; Afonso and Hauptmeier, 2009; Bergman et al., 2016). Third, different arguments were put forward to support more flexible fiscal rules; for example, Schick (2010) discusses the "golden rule" that requires a current balanced budget but allows the use of borrowing to finance public investment (see Minea and Villieu, 2009), and Daban (2011) militates for monitoring arrangements and escape clauses as part of a new generation of fiscal rules (Kumar et al., 2009; Schaechter et al., 2012). Finally, an impressive effort was put up recently by the IMF staff (Eyraud et al., 2018, and Caselli et al., 2018) to summarize the way fiscal rules can be improved in terms of consistency, compliance, flexibility, accountability and sustainability, in order to deliver better results.[15]

Capitalizing on these studies that emphasize the importance of the features of fiscal rules for fiscal performance, we extend our analysis by looking beyond dummy variables to capture the features of fiscal rules.

6.2 Fiscal Rule Strength Index

Aside from social welfare, fiscal policy may be used by policymakers for a variety of goals, and in particular for electoral purposes. Since election-motivated fiscal policy increases information asymmetry and leads to harmful policy behaviour and large fiscal discretion, better-informed voters, which can sanction bad policies and reward the good ones, lead to stronger outcomes (see e.g. Beetsma et al., 2017, 2018). Although FR are usually associated with better fiscal discipline or more countercyclical fiscal policy (see e.g. Debrun et al., 2008; Tapsoba, 2012; Combes et al., 2017; Guerguil et al., 2017), they may also lead to "one-off" measures, creative accounting, off-budget operations or unproductive spending encouraged by myopic policymakers (see e.g. Milesi-Ferretti, 2003; von Hagen and Wolff, 2006; Koen and Van den Noord, 2006; Debrun et al., 2008). Consequently, poorly-designed FR cannot support fiscal performance and reduce costs related to fiscal discretion, all the more in the

[15]Some of the key benefits include: (i) avoiding excessive deficits and improving international positions (a greater compliance with the rules improves countries' risk profile by reducing reputation costs, which makes borrowing cheaper); (ii) enhancing fiscal transparency and accountability by reducing fiscal gimmickries (the presence of fiscal councils that monitor the compliance with the rule acting as public watch dogs); (iii) incentives for better compliance and flexibility (allowing for past deviations from the target, corrections mechanisms or escape clauses); or (iv) preserving fiscal space (by letting automatic stabilizers to operate over the cycle and allowing for discretionary fiscal support when necessary).

EU FCC whose Cold War-inherited institutions may still affect governments' capacity to ensure fiscal sustainability.

To analyze such effects, we draw upon a comprehensive time-varying composite index, namely the Fiscal Rule Strength Index (FRSI) from the DG ECFIN Fiscal Rule Index Database. The methodology used for the construction of the index aims at capturing the influence of the main institutional features that can affect the effectiveness of FR in the EU. Based on five criteria, namely: statutory base, binding character, bodies monitoring compliance and the correction mechanisms, correction mechanisms, and resilience to shocks, the FRSI comprises quantitative and qualitative information on various characteristics of the FR going beyond their simple presence.

6.3 Preliminaries: FRSI and FP in the EU non-FCC

We revive the analysis performed in section 4 using the Fiscal Rule Strength Index. We begin by looking at the effects of the FRSI in the EU non-FCC.

Table 13: FRSI and FP in the EU non-FCC

	(1)	(2)	(3)	(4)[a]	(5)[b]
Estimator	OLS	LSDV	LSDVC	LSDVC	LSDVC
Lag PB	0.663***	0.612***	0.696***	0.710***	0.714***
	(0.0395)	(0.0451)	(0.0485)	(0.0477)	(0.0484)
FRSI	0.459***	0.438**	0.410**	0.403**	0.402**
	(0.151)	(0.219)	(0.167)	(0.166)	(0.166)
Debt	0.0208***	0.0623***	0.0616***	0.0614***	0.0614***
	(0.00433)	(0.0114)	(0.0125)	(0.0125)	(0.0125)
Inflation	3.378	16.78**	17.14**	17.11**	17.12**
	(6.041)	(8.118)	(8.011)	(7.987)	(7.983)
RGDPpc	0.502	0.932	0.934	0.921	0.919
	(0.662)	(1.519)	(1.710)	(1.711)	(1.710)
Openness	0.00436	0.0197	0.0184	0.0183	0.0183
	(0.00277)	(0.0166)	(0.0226)	(0.0227)	(0.0227)
N	251	251	251	251	251
R2	0.671	0.554	-	-	-

Notes: [a] and [b] LSDVC estimator with Kiviet (1995, 1999) corrections. Standard errors in parentheses. Standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

As shown by column (1) in Table 13, simple OLS pooled estimations show that a higher strength of the fiscal rule index significantly increases fiscal performance measured by the primary fiscal balance. These findings are confirmed when using the LSDV estimator in column (2), or the LSDVC estimator with the corrections suggested by Bruno (2005a) and Kiviet (1995, 1999) in columns (3), (4) and (5). Using these results as counterfactual, we now look at the EU FCC.

6.4 Main results: FRSI and FP in the EU FCC

The estimated effect of FRSI on the FP of the EU FCC is reported in Table 14. Simple OLS pooled estimations in column (1) show that the coefficient of the FRSI is positive and significantly different from zero, suggesting that FR with stronger features are associated with a better primary fiscal balance in the EU FCC. Various methods considered in the columns (2)-(6), namely the LSDV estimator, the 2SLS estimator with FRSI instrumented by its first lag and the LSDVC estimator with the usual corrections, confirm this finding.[16]

We investigate the strength of our finding when considering alternative measures of fiscal performance, namely the overall fiscal balance, the cyclically-adjusted balance, the cyclically-adjusted primary balance and the structural balance. LSDVC estimations reported in columns (7)-(10) of Table 14 show that the estimated effect of the FRSI is still statistically significant and positive. Corroborating our findings for the primary fiscal balance, these results support a significant effect of the strength of fiscal rules on fiscal performance.

At odds with the lack of significant effect of the simple presence of FR (see section 4), our finding highlights that the effectiveness of FR is related to characteristics that can enforce the compliance with the rule and therefore lead to better fiscal outcomes (see e.g. Bohn and Inman, 1996; Debrun et al., 2008; Caselli et al., 2018; Heinemann et al., 2018). This seems to be all the more the case under the particular fiscal frameworks of the EU FCC, since the size of the favourable estimated effect of FRSI on the primary fiscal balance is fairly stronger in these countries (for example, 1.339 in LSDVC estimations in column 4 of Table 14), compared with its effect in the EU non-FCC (for example, 0.410 in LSDVC estimations in column 3 of Table 13).

[16] We report that our findings are equally supported when adding the FR variable whose effect continues to lack significance (results are available upon request).

Table 14: FRSI and FP in the EU FCC

	(1)[a]	(2)[b]	(3)[c]	(4)	(5)[d]	(6)[e]	(7)	(8)	(9)	(10)
FP Measure	PB	PB	PB	PB	PB	PB	OB	CAPB	CAB	SB
Lag PB	0.558***	0.348***	0.332***	0.457***	0.480***	0.490***				
	(0.0693)	(0.078)	(0.109)	(0.120)	(0.119)	(0.122)				
FRSI	0.680**	1.352***	1.936***	1.339***	1.331***	1.330***	1.195*	1.220**	1.533**	1.291*
	(0.272)	(0.460)	(0.714)	(0.436)	(0.435)	(0.435)	(0.643)	(0.573)	(0.650)	(0.669)
Debt	0.00851	0.0691***	0.0685***	0.0634**	0.0623**	0.0618**	0.0473*	0.0579	0.0564	0.0508
	(0.0105)	(0.0253)	(0.0228)	(0.0283)	(0.0282)	(0.0282)	(0.0285)	(0.0467)	(0.0357)	(0.0346)
Inflation	13.22**	21.82***	22.62***	20.69***	20.43***	20.33***	19.33***	9.636*	6.794	11.71
	(5.239)	(5.789)	(7.937)	(6.760)	(6.695)	(6.689)	(5.715)	(5.528)	(5.166)	(9.699)
RGDPpc	0.235	5.917***	6.020***	6.142***	6.182***	6.202***	6.877***	-1.304	-0.847	-2.265
	(0.710)	(1.901)	(1.953)	(2.294)	(2.302)	(2.305)	(2.420)	(3.223)	(2.240)	(4.554)
Openness	0.0094	-0.0352**	-0.0428**	-0.0395**	-0.0402**	-0.0406**	-0.0246	-0.0190	-0.0166	0.0114
	(0.0065)	(0.0166)	(0.0186)	(0.0171)	(0.0171)	(0.0172)	(0.0216)	(0.0180)	(0.0145)	(0.0284)
Lag OB							0.380***			
							(0.106)			
Lag CAPB								0.249*		
								(0.128)		
Lag CAB									0.450***	
									(0.0950)	
Lag SB										0.301**
										(0.145)
N	97	97	97	97	97	97	102	72	114	78
R2	0.558	0.509	0.401	-	-	-	-	-	-	-

Notes: [a], [b] and [c] OLS, LSDV and 2SLS estimator with FRSI instrumented by its lag. [d] and [e] Kiviet (1995, 1999) corrections. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

7 Conclusion

Going beyond the literature that focuses on the European Union (EU) as a whole, this paper emphasizes important differences in the effect of fiscal rules on fiscal performance among EU countries. Indeed, contrary to their favourable effect in the EU non-FCC (Former Communist Countries), the presence of FR does not significantly affect fiscal performance in the EU FCC. This finding, which may be explained by the differences between FCC and other EU countries inherited from the Cold War period (involving, for example, different political practices, procedural arrangements and policymakers' credibility stock), does not change when (i) considering various estimation methods, (ii) dividing FR based on the aggregate they target (deficit, debt and expenditure), their age and number, their coverage (national or supranational), or instead considering medium-term budgetary frameworks, and (iii) using several observed and computed measures of fiscal performance. However, when going beyond the simple presence of FR, we show that an improvement of the strength of fiscal rules significantly affects fiscal performance in EU FCC, with a magnitude higher than that estimated for the EU non-FCC.

Consequently, the main takeaway of our paper is that the simple presence of fiscal rules may not be enough *per se* to affect the fiscal performance of the EU Former Communist Countries. Our finding is particularly important from the perspective of the future Euro zone and European Union enlargements, which involve former communist countries and go along with the adoption of various types of fiscal rules. To avoid potential risks of multi-speed fiscal performance in Europe, the European Commission could pay greater attention to fiscal institutions in these countries. This may be done in at least two ways. First, the technical assistance about the definition and implementation of fiscal rules can be strengthened. As recently proposed by Eyraud et al. (2018), the way fiscal rules are improved in terms of consistency, compliance, and flexibility matters in delivering better fiscal outcomes. In this context, the European Commission may help policymakers to proceed to the aim of ensuring greater enforceability of their rules-based fiscal frameworks by combining the sustainability objective with more flexibility allowing for past deviations from the target, including well-specified escape clauses and correction mechanisms, promoting greater fiscal space by letting automatic stabilizers to operate over the cycle, or allowing for discretionary fiscal support

when necessary. Second, enhancing fiscal transparency and accountability may ensure a better compliance with the rules and reduce fiscal gimmickries. A deeper policy reform could be one in which the European Commission strengthens the requirements regarding the implementation of independent fiscal councils in FCC. As emphasized by the recent work of Beetsma and Debrun (2018) and Beetsma et al. (2018), fiscal councils are technical bodies acting as public watch-dogs aimed at guiding fiscal policymakers' discretion, and their presence may clear the smokescreens related to the budget process, improve countries' risk profile by reducing reputation costs, or foster and support the compliance with fiscal rules. Such features may be valuable for improving fiscal performance in the EU Former Communist Countries.

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APPENDIX CHAPTER 1

A multi-speed fiscal Europe?
Fiscal Rules and Fiscal Performance in the EU Former Communist Countries

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Table A: Descriptive statistics (EU FCC)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Number of FR	220	2.209	2.209	0	7
Fiscal rules	220	.632	.483	0	1
Number national FR	220	.659	.92	0	3
National FR	220	.432	.496	0	1
Number supranational FR	220	1.55	1.659	0	4
Supranational FR	220	.482	.501	0	1
Balanced Budget Rules	220	.532	.5	0	1
Debt Rules	220	.591	.493	0	1
Expenditure Rules	220	.209	.408	0	1
MTBF	84	.526	.186	0	.96
CAPB	144	-1.926	2.663	-13.844	4.134
FRSI	220	.059	.905	-1.008	3.548
Primary Balance	182	-.773	3.663	-12.403	17.296
Overall Balance	187	-2.806	3.739	-14.13	15.782
Inflation	220	.069	.1	-.014	.914
Debt	197	32.654	21.103	3.7	141.3
Openness	143	103.429	31.947	32.269	190.58
Log of Real GDP per capita	170	9.551	.34	8.699	10.197
CAB	194	-3.141	3.06	-12.638	3.989
SB	170	-3.163	2.991	-14.233	2.056
Age of the rule	139	7.741	4.871	1	22

Table B: Year of beginning of FR

Country	Year of adoption
Bulgaria	2003
Croatia	2009
Czech Republic	2004
Estonia	1993
Hungary	2004
Latvia	2004
Lithuania	1997
Poland	1999
Romania	2007
Slovak Republic	2004
Slovenia	2000

Table C: Description and sources of variables

Variable	Description	Source
Fiscal rule	Dummy variable equal to 1 in a given year if a numerical constraint is imposed on any fiscal aggregate and 0 otherwise	IMF's Fiscal Affairs Department Fiscal Rules Database, Fiscal Policy and Surveillance Division
Number of rules	Number of fiscal rules in place in a given year imposed on any fiscal aggregate	
Budget Balance Rule	Dummy variable equal to 1 in a given year if a numerical constraint is imposed on government fiscal balance and 0 otherwise	
Expenditure Rule	Dummy variable equal to 1 in a given year if a numerical constraint is imposed on government expenditure and 0 otherwise	
Debt Rule	Dummy variable equal to 1 in a given year if a numerical constraint is imposed on government debt and 0 otherwise	
National rules	Fiscal rule dummy variable equal to 1 in a given year if a national rule is imposed on any fiscal aggregate and 0 otherwise	
Supranational rules	Fiscal rule dummy variable equal to 1 in a given year signalling the presence of supranational fiscal rules in a country's fiscal framework and 0 otherwise	
Medium-term budgetary frameworks	A composite country-specific index based on the existence and properties of national MTBFs in force	European Commission Directorate-General for Economic and Financial Affairs
Fiscal Rule Strength Index	A composite Fiscal Rule Index calculated by taking into account different criteria: (1) the statutory base of the rule, (2) the room for revising objectives (3) the mechanisms of monitoring compliance and enforcement of the rule, (4) the existence of pre-defined enforcement mechanisms, and (5) media visibility of the rule	
Age of the rule	Variable equal to 1 in the year of adoption, to 2 in the following year, etc.	Author's calculations based on IMF's Fiscal Affairs Department Fiscal Rules Database, Fiscal Policy and Surveillance Division
Cyclically adjusted balance	Cyclically adjusted balance.	World Bank: A Cross-Country Database of Fiscal Space
Cyclically adjusted primary balance	Cyclically adjusted primary balance.	IMF's Fiscal Monitor Dataset
General government structural balance	The general government cyclically adjusted balance adjusted for non-structural elements beyond the economic cycle.	World Economic Outlook
Overall fiscal balance	Difference between general government revenue and total expenditure.	
Primary fiscal balance	Difference between general government revenue and non-interest expenditure.	
Inflation	Inflation rate, normalized as inflation/(1+inflation), to mitigate the influence of high inflation rates.	Author's calculations, based on World Economic Outlook
Debt	Gross General government debt.	Ali Abbas et al. (2010), updated
Trade openness	Sum of imports and exports divided by GDP.	Penn World Table (PWT.8.1)
Real GDP per capita	Logarithm of per capita real GDP (at constant prices).	Author's calculations, based on Penn World Table

CHAPTER 2

One size really does not fit all:
Fiscal rules and institutional quality in the EU

This chapter is extracted from a study conducted together with Xavier Debrun (National Bank of Belgium and European Fiscal Board).

One size really does not fit all:
Fiscal rules and institutional quality in the EU

Abstract: As fiscal policy became instrumental in macroeconomic stabilization, credible commitments to public debt sustainability are more critical than ever. The paper suggests that well-designed fiscal rules and sound institutional frameworks contribute to fiscal credibility. In a panel of EU countries, we focus on the interlinkages between rules and the broader institutional setup shaping policymakers' incentives. A natural prior is that rules nested in high quality institutions should be more effective. In fact, we find striking heterogeneity across member states, with a clear dividing line between formerly communist countries (CC) and others (NCC). While the expected complementarity between rules and institutional quality cannot be rejected for NCCs, substitution is the norm in CCs. We dissect the drivers of that heterogeneity, exploring the role of various institutions. Considering these results, EU fiscal governance should involve national arrangements tailored to the relevant economic, political and social institutions.

Keywords: fiscal performance; fiscal rules; institutions; threshold effects; European Union.

JEL Codes: E62, H62, O52, O57, P35.

Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity.

—Robert Schuman (9 May 1950)

1 Introduction

Since the global financial crisis of 2008, fiscal policy has been at the core of macroeconomic stabilization efforts in many countries. The combination of conventional monetary policy instruments at their effective lower bound and of an apparent "flattening" of the Phillips curve turned fiscal policy into the policy tool of choice to influence aggregate demand. The economic shock related to the COVID-19 crisis turned the game between monetary and fiscal authorities into one of strategic complementarity where monetary policy creates space for fiscal policy to stimulate demand through deficit spending (Bartsch et al., 2020).

While there is consensus on the need for an expansionary policy mix when monetary policy is in the ropes and ample macro policy support is needed, concerns for public debt sustainability are never far. In fact, both the effectiveness of fiscal stabilization and the prospect of a smooth exit from high deficits are premised on credible commitments to keep public indebtedness under control over the longer run. Absent such credibility, Ricardian effects would undermine fiscal stabilization and the exit from unprecedented policy support would be anything but smooth.

A vast literature has shown that unconstrained fiscal discretion leads to excessive public debt accumulation and unwarranted fiscal procyclicality. In reality, policymakers' discretion is constrained by a range of institutions (e.g. checks and balances in the political system, the importance of transparency and democratic accountability) and formal constraints on deficits and debts ("fiscal rules"). This has long been recognized in the European Union (EU), where fiscal rules have been in place at the EU level since the early 1990s.

Following the global financial crisis, sharp increases in fiscal deficits and debts in the EU have pointed to the need for stronger and more effective fiscal governance frameworks, both at the national and supranational levels. The crisis, and even more the recent sanitary shock, revealed long-standing gaps in EU architecture—especially in the euro area—and the need to address them to prevent further systemic stress (Allard et al., 2013). The fiscal framework is rooted in the prevention of deficit monetization and fiscal dominance (Sargent and Wallace, 1981; Bergin, 2000), a precondition for central banks to successfully aim at price stability. Bouts of sovereign debt markets stress in 2011-12 showed that sustainable fiscal policies were

essential for a smooth functioning of the euro area, let alone for its existence. To this end, sound fiscal institutions have a key role to play to preserve commitments to sustainable fiscal trajectories, and this even more so with the COVID-19 legacy of very large deficits and debts.

Since the latest reform of the EU fiscal framework in 2010, the need for supportive national frameworks—in addition to the supranational layer—has been explicitly recognized in the name of cementing national ownership of the rules. Behind the notion of "ownership" lies the realization that fiscal policy is inextricably linked to the processes, procedures and rules that shape collective decision-making in a country. These reflect a vast array of political, economic and social institutions that inevitably reflect in part national history and political customs. The underlying presumption of this two-pronged (national and supranational) reform of the EU fiscal framework was that the effectiveness of fiscal rules was bound to vary with many other institutional features of the countries.

Although assessing the determinants of fiscal performance—including rules and institutions—is the subject of a vast literature (discussed in the next section), interest in what makes rules themselves more or less effective is more recent. In particular, empirical studies have often considered the impact of fiscal rules and of other relevant institutions in isolation. Early efforts to explore possible interactions include contributions to a volume edited by Ayuso-i-Casals et al. (2009)—including e.g. Debrun and Kumar (2009)—and Bergman et al. (2016). Using data for 27 EU countries, Bergman et al. (2016) show that the favorable effect of fiscal rules on fiscal performance decreases as institutions improve, while this effect was found to increase in the EU-15 countries by Debrun and Kumar (2009). As suggested by Vinturis (2021), who emphasizes differences in the impact of fiscal rules in various EU countries, these conflicting findings call for a reassessment.

Taking stock of existing studies, this paper explores the joint effect of fiscal rules and institutions in the EU. Our empirical approach is premised on the idea that institutional setups (including political, social and economic institutions) are fundamentally path-dependent. Hence, we see potentially great value in distinguishing between two groups of EU countries that experienced radically different institutional developments in their post-WWII history, namely the previously-communist countries (CC) and the non-communist countries (NCC). The communist reminiscences in the CC group have been emphasized by e.g. Shiller et al. (1992) and Kopits (2008). Our goal is to exploit this contrasted heritage to better identify the effect of fiscal and institutional reforms—in isolation and together—on fiscal performance.

The existence of meaningful differences between the two groups would provide a strong indication of the importance of countries' broader institutional architecture in the effectiveness of fiscal policy rules, with clear lessons in terms of designing and implementing fiscal policy rules as part of a broader package of consistent and properly sequenced reforms.

Our analysis conducted over the period 1995-2014 documents several interesting empirical regularities. First, strengthening fiscal rules affects differently the fiscal performance of NCC and CC. In NCC, the favorable effect of strengthening fiscal rules increases as institutions improve; however, whenever significant, this *complementarity* effect is quantitatively weak (at most 0.5 pp, following an improvement of fiscal rules strength by one standard deviation). On the contrary, a *substitutability* effect between fiscal rules and institutions is at work in CC, whose magnitude is strong when institutions are weak (above 3 pp, following an improvement of fiscal rules strength by one standard deviation). Robust to the use of alternative specifications (e.g. when accounting for endogeneity arising from fixed effects in dynamic models and reversed causality, and using alternative measures of fiscal performance), these differences between NCC and CC suggest that a one-size-fits-all approach to fiscal rule design may trigger very different effects on fiscal performance across EU countries depending on their institutional environment.

Another salient result is that not all institutions have the same influence on the effectiveness of fiscal policy rules. Specifically, we follow the relevant literature and distinguish between three key dimensions of institutions: political (e.g. Glawe and Wagner, 2021), economic (e.g. Fuchs-Schündeln and Schündeln, 2020), and social (e.g. Legied, 2019). In NCC, the fiscal rules-institutions complementarity is supported by political and economic institutions but not by social institutions. In CC, the fiscal rules-institutions substitutability originates in political and social institutions, while a complementarity effect emerges with respect to economic institutions. These findings are confirmed by subsequent estimations based on a semi-parametric model that accounts for institution-driven nonlinearities.

Aside from these policy recommendations, our conclusions contribute to the euro area enlargement debate. CC wishing to join the Eurozone must respect the fiscal rules embedded in the convergence criteria, but the impact of fiscal rules on fiscal performance is likely to depend upon their institutional heritage from the communist era. Consequently, from the perspective of a seamless integration of several CC (and, possibly, of the EU integration of other former CC) into the euro, EU policymakers should remain mindful of the complex

interactions between fiscal rules and institutions when recommending economic reforms along with national fiscal rules. More generally, it seems desirable for any future reform of the EU fiscal framework to incorporate a significant national dimension that encourages concomitant adjustments in relevant national institutions.

The rest of the paper is organized as follows. Based on a review of the relevant literature, section 2 specifies the hypotheses tested in the paper. After a description of the methodology and the data (section 3), section 4 discusses the benchmark results; section 5 assesses their robustness; section 6 identifies the institutional channels driving these results, while section 7 explores institution-driven nonlinearities. Section 8 summarizes our findings and suggests directions for future research.

2 State of the art and testable hypotheses

2.1 Fiscal rules and fiscal performance

Since the adoption of the Maastricht Treaty in 1992, the history of the EU rule-based fiscal framework has been marked by multiple episodes of stress and crisis—from the early 2000's slowdown to the COVID-19 shock—that often led to significant amendments to the system (the 1997 adoption of the Stability Growth Pact [SGP], meant to clarify the Treaty's provisions, the 2005 SGP reform, the 2011 Six Pack, the 2012 Fiscal Compact, and the 2013 Two Pack). The centerpiece of these reforms was in general to make the rules more flexible (contingent on the state of the economy) and more easily enforceable.[1] However, the quest for rules that would simultaneously constrain fiscal discretion to stick to sustainable public debt paths and allow adequate responses to economic and financial conditions led to inextricable complexity that arguably undermines the effectiveness of the system (Debrun and Jonung, 2019). If there is one element of consensus about the next reform of EU fiscal rules is that they must be drastically simplified.

Not surprisingly, the rapidly growing empirical literature seeking to assess the impact of fiscal rules on fiscal performance is not unanimous. As usual in economic policy matters, correlations between outcomes and institutions seem to go in the "right" direction (the presence of fiscal rules is associated with greater fiscal discipline), but the issue of causality remains wide open. Indeed, while several studies underline the effectiveness of fiscal rules in improv-

[1] A popular definition of fiscal rules is the one of Kopits and Symansky (1998): "*a permanent constraint on fiscal policy, typically defined in terms of an indicator of overall fiscal performance*".

ing fiscal outcomes (e.g. Debrun et al., 2008; Tapsoba, 2012; Guerguil et al., 2017; Caselli et al., 2018; Combes et al., 2018),[2] other contributions openly question the causal nature of the relationship (e.g. Debrun and Kumar, 2009; Heinemann et al. 2018; Caselli and Reynaud, 2020; see also the discussions in Eyraud et al., 2018, and Debrun and Jonung, 2019). Interestingly, however, results supporting causality are generally stronger when the analysis acknowledges that not all fiscal rules are born equal. They can come in many different forms. Indices capturing the extent to which the rule features dimensions that are more likely to make it bind (often summarized as capturing the *strength* of a rule and including procedural rules further constraining fiscal discretion, transparency requirements, independent monitoring bodies, enforcement mechanisms, or automatic correction mechanisms) often "perform better" in empirical models of fiscal behaviors than a mere dummy variable capturing the existence of rule. In other words, an institutional background conducive to greater compliance with rules seem to matter a great deal (e.g. Debrun et al., 2008, Schaechter et al., 2012; Bergman et al., 2016; Badinger and Reuter, 2017; Caselli et al., 2018; Caselli and Reynaud, 2020).

From a theoretical perspective, such a favorable effect of fiscal rules on fiscal performance must come from their capacity to constrain fiscal behavior and, as such, to reduce the *deficit bias*—the fact that even well-intended governments may run fiscal deficits in excess of what is socially desirable. Two prominent sources of the deficit bias were highlighted, namely the common pool problem and governments' short-sightedness (Krogstrup and Wyplosz, 2009; Wyplosz, 2013). The former problem (well documented by e.g. Weingast et al., 1981; Roubini and Sachs, 1989; von Hagen and Harden, 1994; Velasco, 2000; or Persson et al., 2003), suggests that various policymakers competing over the financing of their preferred public goods results into fiscal pressure and excessively high deficits. The latter problem (thoroughly explained by e.g. Persson and Persson, 1987; Persson and Svensson, 1989; Alesina and Tabellini, 1990; or Persson et al., 2006) consists of governments under-estimating the future cost of debt due to their focus on short-term political gains. In equilibrium, public debts are too high as borrowed resources are used to finance public goods whose sole purpose is to raise reelection prospects. As a result, a large literature, including e.g. von Hagen and Harden (1995), Hallerberg and von Hagen (1999), Beetsma and Uhlig (1999), Beetsma and Debrun (2004, 2005), Primo (2006), or Debrun et al. (2008), provides support of the idea that fiscal rules can, through their constraining effect, reduce the deficit bias.[3]

[2] Other studies look at the impact of fiscal rules on other dimensions of fiscal policy, including its cyclicality (Larch et al., 2021) or sovereign bonds risk premia (Heinemann et al., 2014).

[3] Debrun et al. (2008) equally discuss other solutions for dealing with the deficit bias.

2.2 Adding institutions

Aside from fiscal rules, good governance and better institutions have also been associated with higher fiscal performance. Capitalizing on the seminal work of Alesina and Perotti (1995), showing that budgetary procedures and institutions influence fiscal outcomes, several studies account for a wide range of institutions including appropriate budget centralization (Wyplosz, 2005), policy-makers' accountability (Corbacho and Schwartz, 2007), or the presence of domestic fiscal institutions (Beetsma and Debrun, 2018; Beetsma et al., 2018).[4] However, only relatively few studies look at the joint effect of institutions and fiscal rules on fiscal performance.

A volume edited by Ayuso-i-Casals et al. (2009) gathers several contributions on the topic. On the theoretical side, Krogstrup and Wyplosz (2009) emphasize the merits of a supranational deficit rule combined with national fiscal institutions that pre-commit on their fiscal policy. In the same vein, Debrun and Kumar (2009) suggest that the performance of a fiscal rule is subject to institutions arrangements that make the costs of deviating from its target sufficiently important.[5] On the empirical side, using EU-15 data, Hallerberg et al. (2009) analyze the role of political institutions and find, among other results, that more stringent fiscal rules are more effective in countries with fragmented government coalitions. An even more direct favorable impact of institutions is found by Debrun and Kumar (2009): using data for the EU-15, they unveil a robust and positive impact on fiscal performance of the interactive term between the strength of fiscal rules on the one hand, and an index of government stability or a dummy indicating a "commitment" approach to budget centralization on the other hand. In contrast to these earlier results obtained on a panel of EU-15 countries, Bergman et al. (2016) suggest that the impact of fiscal rules on fiscal performance actually *decreases* as the quality of institutions increases in a larger sample of EU-27 countries comprising also Central and Eastern European countries. Such a sharp contrast is sufficiently intriguing to warrant a detailed investigation, which the rest of this paper develops.

2.3 NCC versus CC: testable hypotheses

The comparison of the results found by the last two studies may suggest that the EU is not a homogenous area when it comes to the influence of fiscal rules and institutions on

[4]Other studies look at the role of institutions for fiscal policy cyclicality (see e.g. Gootjes and de Haan, 2020), including when combined with fiscal rules (see e.g. Bergman and Hutchison, 2015).

[5]Imposing such high costs may be done by independent watchdogs or a national fiscal monitoring commission (see e.g. Kirsanova et al., 2009, and Stéclebout-Orseau and Hallerberg, 2009).

fiscal performance.[6] We thus see value in exploring this intuition by comparing the rules-institutions interaction effects on fiscal performance in the NCC and CC groups respectively.[7] Beyond the surface of empirical correlations, it bears wondering what deeper factors could be at play.

The most natural observation is that institutions are path-dependent and, as such, materially different between CC and NCC. Unlike NCC, CC present a very different institutional history that was shaped during almost half a century (i.e. from the end of World War II until the disintegration of communist regimes) by their gravitation around the former Soviet Union. That institutional background significantly influenced the post-1990 dynamics of institutions in the CC group. As emphasized by Pop-Eleches (2007), institutional legacy is the main determinant of these countries' post-communist trajectories. Vachudova (2009) specifically discusses the survival of extensive corruption in the post-communist era. Second, fiscal reforms are different in CC compared to NCC. As shown in Kopits (2008), aside the common pool problem (that is equally affecting NCC), fiscal reforms in CC are hindered by three specific shortcomings: (a) the dependency syndrome rooted in the former (unique) party-state regime, which biases policymakers actions towards populist fiscal measures pandering to interest groups; (b) a zero-sum game between the various political parties, which amplifies the discontinuity of fiscal policies when incumbent and opposition parties alternate in power, and leads to stop-and-go patterns and reform reversals; and (c) an inherent resistance to change, reflected by both the elderly population (i.e. post-communism *nostalgia*) and a younger, more protectionist part of the population. In that context, it is particularly difficult to enact and sustain sufficiently ambitious fiscal reforms commanding broad and stable voters' support. To these issues, Hamm et al. (2012) add the strong negative effects of mass privatization on governments' fiscal capacity.

In light of this literature, we derive two testable hypotheses guiding our investigation. First, consistent with earlier theoretical and empirical findings, we expect institutions to improve the favorable effect of strengthening fiscal rules on fiscal performance in the group

[6]Compared to studies devoted to the EU, relatively fewer studies look at CC. Regarding fiscal rules, motivated by Budina and Wijnbergen (1997), Vinturis (2021) emphasizes that fiscal rules adoption does not significantly affect fiscal performance in former communist EU. Regarding institutions, existing studies focus on political institutions and their fiscal features: studies in the former group show that electoral institutions had an important role during the transition period (Birch, 2003) and for the government's share in the economy (Schneider and Zapal, 2006), while political stability seems critical to tackle the common pool problem (Ylaoutinen, 2004); studies in the latter group outline the role of a strong finance minister (Mulas-Granados et al., 2009), fiscal governance (Hallerberg and Ylaoutinen, 2010), budgetary procedures (Gleich, 2003), or fiscal institutions (Fabrizio and Mody, 2006) for fiscal outcomes.

[7]Our approach follows previous studies that equally separate countries based on their institutional features; for example, Hallerberg et al. (2009) contrast EU countries with large and respectively small ideological distance among the parties that compose the government.

of NCC. By contrast, a host of legacy effects may be at work in CC, possibly suppressing or even inverting the favorable impact of stronger fiscal rules. The absence of complementarity between fiscal rules and institutions would be consistent with the evidence in Pop-Eleches and Tucker (2011) emphasizing the limited trust in institutions in CC that would result from both the experience under communism and its rapid collapse, sometimes through traumatic transitions.

H1. Overall Institutions. *Better overall institutions increase the positive impact of strengthening fiscal rules on fiscal performance in NCC (a complementarity effect), and leave it unchanged or decrease it in CC (no or substitution effect).*

Second, when analyzing the determinants of conservatism across EU countries, Aspelund, et al. (2013) stress the crucial role of three broad types of institutions, labeled as *political*, *economic*, and *cultural* institutions. Building on that interesting lead, we disaggregate our overall measure of institutional quality into three dimensions: political institutions, economic institutions, and social institutions. Existing studies point to interesting regularities. (*i*) According to Glawe and Wagner (2021), political institutional dynamics (such as government effectiveness, regulatory quality, rule of law, and control of corruption) are a key driver of the institutional clubs constituted by NCC and CC countries. (*ii*) Fuchs-Schündeln and Schündeln (2020) show that economic institutions in Eastern European countries have largely converged to those in the West. (*iii*) Lastly, according to Legied (2019), similar to historical legacies, cultural and religious institutions have had a fundamental impact on the formation of new elites in post-communist countries. Consequently, we expect our measures of political and social institutions to influence fiscal performance in a similar way as overall institutions, and a favorable, i.e. complementarity, effect of economic institutions in both NCC and CC. Our second hypothesis summarizes these considerations.

H2. Disaggregated Institutions.

a. Better political institutions increase (decrease) the favorable effect of strengthening fiscal rules on fiscal performance in NCC (CC).

b. Better economic institutions increase the favorable effect of strengthening fiscal rules on fiscal performance in both NCC and CC.

c. Better social institutions increase (decrease) the favorable effect of strengthening fiscal rules on fiscal performance in NCC (CC).

In the remainder of the paper, we test **H1** and **H2** using a methodology and data discussed in the next section.

3 Methodology and data

3.1 Methodology

Following a well-established practice in the literature, we estimate the joint effect of fiscal rules (FR) and the quality of institutions (QI) on fiscal performance (FP) using a panel data model

$$FP_{it} = \beta_1 FR_{it} + \beta_2 QI_{it} + \beta_3 FR_{it} QI_{it} + \phi Controls_{it} + u_{it}, \quad (1)$$

with i and t the cross-section and time dimensions, $Controls$ a vector of control variables, and u_{it} the error term. Starting from this general specification, two remarks must be made.

On the one hand, the impact of FR on FP at different QI levels can be easily computed as the marginal effect (ME) using the first-derivative: $ME(QI_{it}) := \frac{\partial FP_{it}}{\partial FR_{it}} = \beta_1 + \beta_3 QI_{it}$. Following Brambor et al. (2006), we augment this ME with a measure of its significance based on confidence intervals computed around $ME(QI_{it})$ at different QI values: $CI_{it}^{-+} = ME(QI_{it}) \mp t_{1-\alpha}\sqrt{\sigma^2_{ME(QI_{it})}}$, with $t_{1-\alpha}$ the Student's t for the significance level $1-\alpha$ (usually, 95%), and $\sigma^2_{ME(QI_{it})} = \sigma^2_{\beta_1} + QI_{it}^2\sigma^2_{\beta_3} + 2QI_{it}cov(\beta_1, \beta_3)$ the variance of the ME computed using the variances of the two estimated coefficients and their covariance (i.e. $\sigma^2_{\beta_1}$, $\sigma^2_{\beta_3}$ and $cov(\beta_1, \beta_3)$). In particular, as Norton et al. (2004) highlight, one should refrain from assessing the significance of the ME based on the significance of β_1 or β_3 alone, and instead rely upon the variance of the full marginal effect $\sigma^2_{ME(QI_{it})}$.

On the other hand, the quality of our estimations depends on how well we can pre-empt conventional sources of bias, with a direct bearing on how we define our vector of control variables. First, to mitigate a possible omitted variables-bias, we augment the conventional "fiscal reaction function" model in several ways: besides public debt (see Bohn, 1998), we introduce a range of potential macroeconomic and political determinants of fiscal performance. Second, to mitigate a possible bias arising from unobserved heterogeneity, we exploit the panel dimension and introduce both country (μ_i) and time (η_t) fixed effects. Finally, we account for persistence in our dependent variable. Therefore, our benchmark specification is a dynamic model with both country- and time-fixed effects and a wide set of relevant control variables

$$FP_{it} = \gamma FP_{it-1} + \beta_1 FR_{it} + \beta_2 QI_{it} + \beta_3 FR_{it} QI_{it} + \mu_i + \eta_t + \sum_j \phi_j Macro_{it}^j + \sum_k \phi_k Pol_{it}^k + \varepsilon_{it}. \quad (2)$$

3.2 Data

Data exhibit annual frequency, covering 28 EU countries for the period 1995-2014. Since our goal is to compare former communist (CC) and non-communist (NCC) EU countries, we distinguish between two groups. The first group includes the 11 central and eastern former CC that are part of the EU: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The second group includes the remaining 17 EU NCC: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Malta, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

Our variables of interest are fiscal performance, fiscal rules, and institutions. In the benchmark estimations, we capture FP using the primary fiscal balance (PB), computed as the general government's overall fiscal balance (i.e. revenues minus expenditure) excluding interest payments (source: Government Finance Statistics, IMF). By excluding interest payments, we focus on the performance indicator that is directly relevant for public debt sustainability (Bohn, 1998).

Aside from the simple adoption of fiscal rules, various studies stress the importance of improvements in fiscal rules' design (e.g. Debrun et al., 2008; Ayuso-i-Casals et al., 2009; Caselli et al., 2018; Caselli and Reynaud, 2020; Vinturis, 2021).[8] Consequently, we measure fiscal rules with the Fiscal Rule Strength Index (FRS) (source: DG ECFIN Fiscal Rule Index Database), which is available on an annual basis for the 28 EU countries. By capturing many different features of rule-based fiscal frameworks, such as the legal base of the fiscal rules, their binding character, the monitoring bodies, the existence of correction mechanisms, and the resilience to shocks, this index goes well beyond binary measures for the simple presence of fiscal rules.

As regards institutional quality, we rely on indicators from the ICRG database that capture various facets of political, economic, and social institutions. In our benchmark model, we consider an overall (i.e. aggregate) measure of institutional quality (QI) computed as the average of twelve dimensions of institutions. Subsequently, we use three institutional variables scoring political institutions (corruption, government stability, democratic accountability, bureaucracy quality, and law & order), economic institutions (investment profile, and socioeconomic conditions), and social institutions (religious tensions, military in politics, ethnic tensions, internal conflicts, and external conflicts).

[8] Key benefits of well-designed FR highlighted by these studies include: better compliance and flexibility; enhanced fiscal transparency; reduced fiscal gimmickry; reduced costs related to fiscal discretion; or procyclical policy limitation.

In line with the literature, we consider potential macroeconomic and political determinants of fiscal behavior. First, concerns for solvency are expected to encourage governments to improve the primary balance in response to rising public debts (Bohn, 1998). Second, a consistent record of price stability (that may result from various monetary arrangements, such as inflation targeting, see Minea and Tapsoba, 2014) may improve fiscal balances through a fiscal discipline-enhancing effect. Third, following Bergman et al. (2016) and Combes et al. (2018), we also account for the business cycle, the level of economic development, demographics, and foreign trade. Accordingly, macroeconomic controls include the lagged public debt-to-GDP ratio, the inflation rate, the lagged output gap, the (log of) real GDP per capita, the dependency ratio, and trade openness.

On the political environment, the Database of Political Institutions of the Inter-American Development Bank[9] provides useful information on factors that may affect the conduct of fiscal policy, including: the number of years left in the incumbent's term, the seat shares in parliament of all parties supporting the executive, ideology, years of executive elections, legislative elections, and the existence of a plurality voting system. Appendix D provides variables' definition and descriptive statistics.

4 Benchmark results

Our benchmark estimations of model (2) with both country and time fixed effects and the full set of control variables are presented in Table 1.[10] We compare EU countries that were under a communist regime until the late 1980s (the CC group, column [2]) with the remaining EU countries (the NCC group, column [1]). The overall fit of our model is satisfactory, with an R2 above 70%. Regarding control variables (see the full table in Appendix A), the significant coefficient of the lagged primary balance (PB) confirms persistence in fiscal behavior, while the significant positive effect of higher debt reveals the attention paid to solvency. However, several differences emerge between the two groups: (i) fiscal policy is acyclical in NCC but procyclical in CC; (ii) in contrast to NCC, the PB increases with our measure of economic development in CC; (iii) the PB rises with the dependency ratio in CC only; and (iv) ideology influences the PB only in NCC (with left-leaning governments posting lower primary balances on average). These findings suggest notable differences in the determinants of fiscal behavior in the two groups of countries.

[9]Originally compiled by the World Bank Development Research Group, the database is currently hosted by the Inter-American Development Bank (see Cesi et al., 2018, for details).

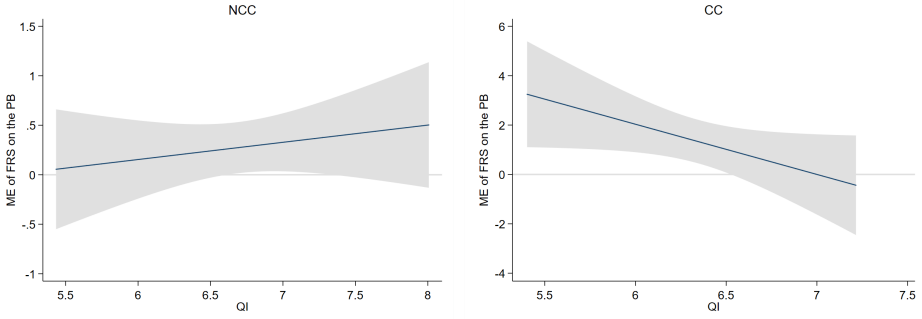
[10]We report that estimations available upon request show a substitution effect between FRS and QI as regards their effect on fiscal performance in the EU28 (consistent with Bergman et al., 2016).

Table 1: Fiscal rules strength, institutions, and fiscal performance: benchmark results

	[1] NCC	[2] CC
PB(-1)	0.597***	0.494***
	(0.041)	(0.064)
FRS	-0.890	14.23*
	(1.499)	(6.738)
QI	1.599*	0.560
	(0.762)	(1.596)
FRS*QI	0.174	-2.033*
	(0.223)	(1.060)
Controls	Yes	Yes
Country-FE	Yes	Yes
Time-FE	Yes	Yes
N/R2	309/0.761	159/0.704

Note: clustered-robust standard errors in brackets. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure 1: The marginal effect of FRS on the PB depending on QI: benchmark results.



To test **H1**, Figure 1 shows the estimated marginal effect of strengthening fiscal rules on the primary balance depending on the quality institutions for the NCC (the left-chart) and CC (the right-chart), respectively (grey bands represent the 95% confidence intervals). The results are as follows. First, fiscal rules and institutions have *complementary* effects on fiscal performance in NCC: an improvement in QI *increases* the favorable effect of fiscal rules' strength (FRS) on PB. This effect, which is significant for QI-values roughly one SD below and above the mean, is quantitatively modest (around 0.3 percentage points (pp) for the QI-mean value), and only increases moderately as institutions improve: a one-point-increase in QI (representing around two SD), raises the marginal effect by around 0.17 pp on average.

Second, the marginal effect of FRS on the PB is comparatively strong in CC when the QI is weak, namely up to around 3 pp. Moreover, contrary to NCC, the strength of fiscal rules and institutional quality appear to have offsetting effects on fiscal performance in CC: as institutions improve, the marginal effect of FRS on the PB decreases. While the estimated effectiveness of fiscal rules remains fairly strong (around 1.5 pp) when institutional quality is

at its sample mean, it quickly loses statistical significance at higher QI levels (from around 0.75 standard deviation above the mean).

Thus, the estimated benchmark models cannot reject **H1**. Strengthening fiscal rules generally enhances fiscal performance in NCC and only in those CC characterized by poor institutions. For instance, based on their QI country-averages, Bulgaria and Romania would strongly improve their PB by strengthening their fiscal rules. Conversely, in the Czech Republic and Hungary, such fiscal reforms would not significantly improve fiscal performance. Among NCC, Austria or Germany would benefit from stronger rules, contrary to Greece, Italy, or Spain that were particularly concerned with stress on sovereign debt markets.

In the end, these results suggest that uniform pressures on EU member states to tighten fiscal policy rules—e.g. by imposing specific best-practice standards by way of a Directive—might in fact increase fiscal fragmentation instead of mitigating it. By implication, the results point to the benefits of reforming rules-based fiscal governance in the EU through a combination of central initiatives and country-specific adjustments that should reflect each member state institutional landscape.

5 Robustness

This section explores the robustness of our benchmark findings. First, while country- and time-fixed effects mitigate a possible endogeneity coming from omitted variables, we consider two other possible sources of endogeneity arising from combining fixed effects with a dynamic setup and from reversed causality. Second, while benchmark estimations focus on the PB, we consider several alternative measures of fiscal performance.

5.1 Endogeneity: fixed effects in a dynamic model

The dynamic specification of our model is crucial to capture the persistence of the PB. However, since we also include fixed effects to account for unobserved heterogeneity, this yields an endogeneity problem arising from the correlation between the lag of the dependent variable and the error term, i.e. the Nickell (1981) bias. To overcome this issue, it is common to estimate the model with the generalized method of moments (GMM), using a specification either in first-differences (Arellano and Bond, 1991) or by combining first-differences and levels in a system (Blundell and Bond, 1998). However, these methods are useful when the number of cross-sections is (much) larger than the number of periods, which is not the case in our analysis. Consequently, we revert to the corrected least square dummy variable estimator (LSDVC) developed for unbalanced panel data by Bruno (2005), which adjusts

the LSDV estimator to account for the Nickell bias.

Table 2: Robustness: LSDVC estimations

	[1] NCC	[2] CC	[3] NCC	[4] CC	[5] NCC	[6] CC	[7] NCC	[8] CC	[9] NCC	[10] CC
PB(-1)	0.681***	0.604***	0.657***	0.560***	0.663***	0.568***	0.695***	0.619***	0.706***	0.648***
	(0.053)	(0.076)	(0.066)	(0.085)	(0.057)	(0.076)	(0.052)	(0.073)	(0.052)	(0.073)
FRS	-0.825	14.63**	-0.711	14.60**	-0.857	14.17***	-0.795	14.66**	-0.784	14.76**
	(1.719)	(5.906)	(2.407)	(6.669)	(1.875)	(5.314)	(1.700)	(5.854)	(1.680)	(5.772)
QI	1.296**	0.165	1.426	0.571	1.363**	0.455	1.245*	0.126	1.206*	0.0226
	(0.644)	(1.542)	(0.882)	(1.792)	(0.691)	(1.339)	(0.642)	(1.537)	(0.637)	(1.538)
FRS*QI	0.159	-2.104**	0.145	-2.093*	0.165	-2.031**	0.154	-2.109**	0.152	-2.126**
	(0.256)	(0.968)	(0.359)	(1.091)	(0.278)	(0.868)	(0.253)	(0.960)	(0.251)	(0.947)
Initiation	BB	BB	AH	AH	AB	AB	BB	BB	BB	BB
Order	1/T	1/T	1/T	1/T	1/T	1/T	1/NT	1/NT	$1/N^2T$	$1/N^2T$
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	298	159	298	159	298	159	298	159	298	159

Note: bootstrapped standard errors in brackets. BB, AH and AB stand for Blundell-Bond, Anderson-Hsiao and Arellano-Bond estimators.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

LSDVC estimations reported in columns [1]-[2] of Table 2 show that the favorable effect of FRS on the PB increases (decreases) as institutions improve in NCC (CC). Although the complementarity effect between fiscal rules and institutions for NCC is less precisely estimated, the substitutability effect observed in CC is significant below institutional quality values comparable to the benchmark. Finally, comparable conclusions arise when replacing the Blundell and Bond (1998) estimator used to initialize the bias correction by the Anderson and Hsiao (1982) and the Arellano and Bond (1991) estimators (in columns [3]-[4] and [5]-[6], respectively), and when using a narrower accuracy than $1/T$ to approximate the bias (of order $1/(NT)$ and $1/(N^2T)$, see e.g. Kiviet, 1995, in columns [7]-[8] and [9]-[10], respectively). Altogether, accounting for the Nickell bias confirms the differences in the effect of FRS and QI on the PB in NCC compared with CC, consistent with our benchmark findings.

5.2 Endogeneity: reversed causality

Another source of possible endogeneity is reversed causality, namely some countries may change their FRS due to certain fiscal stances, e.g. strengthening fiscal rules may arise as the consequence of a damaged PB. To tackle this issue, the literature has by now considered several instrumental variables.[11] Recently, Caselli and Reynaud (2020) found that using the geographical diffusion of fiscal rules as an instrument does not alter the favorable effect of the index of fiscal rules design on the budget balance. However, the usefulness of such an instrument is weakened in our analysis by the fact that our two groups of countries are

[11]Since FRS is a continuous variable, we can hardly use event methods (e.g. propensity score matching, see Tapsoba, 2012).

geographically clustered, and that possible imitation effects may transit through other things than a common border. For instance, Romania adopted the French accountancy system despite being geographically separated by at least three countries, so even in terms of fiscal rules it may look more at France rather than at its close neighbors that are mostly non-EU countries, such as Serbia, Ukraine, or Moldova. Alternatively, Combes et al. (2018) resorted to internal instruments, i.e. lagged values of the variables, in a system-GMM model. Unfortunately, as already indicated, neither difference- nor system-GMM are appropriate given our small number of countries. Nevertheless, we consider a strategy that mimics these methods, which is based—given the difficulty to find reliable external instruments for our analysis—on lagged values of our main independent variables, as suggested in Debrun et al. (2008).

Table 3: Robustness: reversed causality

	[1] NCC	[2] CC	[3] NCC	[4] CC	[5] NCC	[6] CC
PB(-1)	0.599***	0.415***	0.599***	0.525***	0.593***	0.526***
	(0.102)	(0.110)	(0.043)	(0.067)	(0.047)	(0.069)
FRS	-0.792	18.45**	-0.769	16.22**	-0.575	16.87*
	(1.773)	(8.651)	(1.995)	(7.563)	(2.024)	(8.882)
QI	1.613***	0.460	1.577***	0.578	1.860**	1.132
	(0.626)	(1.167)	(0.557)	(1.168)	(0.819)	(2.713)
FRS*QI	0.153	-2.451*	0.154	-2.201*	0.129	-2.316
	(0.265)	(1.329)	(0.283)	(1.227)	(0.287)	(1.452)
Instrumented	FRS	FRS	FRS	FRS	FRS & QI	FRS & QI
Method	IV-2SLS	IV-2SLS	3SLS	3SLS	3SLS	3SLS
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	309	159	309	159	309	153

Note: robust standard errors in brackets for IV-2SLS estimations. 3SLS estimations adjusted for the small sample. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

We conduct our analysis in three steps. First, we perform 2SLS estimations, in which we instrument FRS with its first and second lags; the use of the first two lags is motivated by poor diagnostic tests when using only the first lag (suggesting that variables are not "strictly exogenous" but possibly "endogenous", using Roodman's, 2009, terminology) and by good practices from GMM estimations that suggest limiting the number of instruments (see Roodman, 2009). Moreover, given that FRS appears in the model equally interacted with QI, we instrument this interactive term with the first two lags of FRS multiplied by QI. Since diagnostic tests do not invalidate our instrumentation strategy,[12] we report the main estimations in columns [1]-[2] of Table 3. These estimations show that the favorable effect

[12]For NCC (CC) countries, the Kleiberngen-Paap underidentification test equals 28.47 (13.51) suggesting that the matrix of reduced form coefficients is identified; the large value of the Cragg-Donald test of 39.84 (10.64) leads to the rejection of the null of weak identification of instruments; and the low Hansen statistic test of 0.144 (1.278) leads to the acceptance of the null of valid instruments.

of FRS on the PB is enhanced in NCC and weakened in CC, consistent with our benchmark findings.

Second, although supported by diagnostic tests, our instrumentation strategy assumes common instruments for both FRS and its interaction with QI. One way to split the instruments among each instrumented variable is to estimate a 3SLS model, which in addition may lead to efficiency gains given the simultaneous estimation of all equations. Columns [3]-[4] of Table 3 confirm the presence of important differences between the groups of NCC and CC.

Finally, we only instrumented FRS. However, in addition to fiscal rules, institutions may equally be subject to reversed causality; for example, countries with good fiscal performance may take advantage of such favorable economic conditions to improve their institutions. Consequently, we add another equation in the 3SLS model, in which we instrument QI with its first two lags. Estimations in columns [5]-[6] of Table 3 confirm, yet again, our benchmark findings: as QI increases, fiscal reforms that strengthen fiscal rules have a differentiated effect on fiscal performance in NCC and CC.

5.3 Alternative measures of fiscal performance

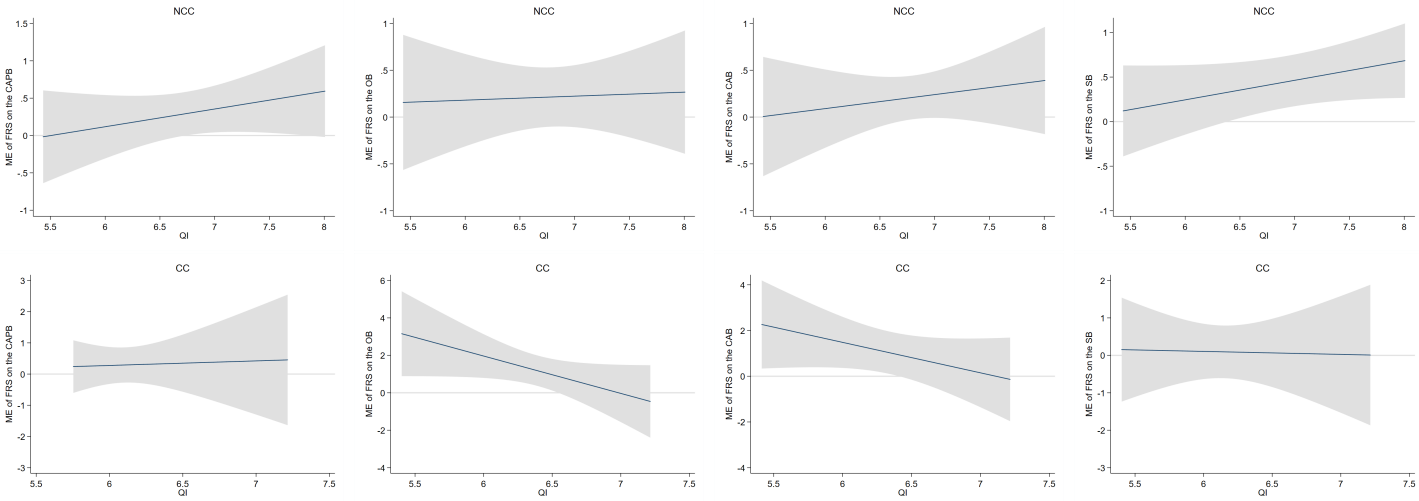
Compared with benchmark estimations performed using the PB, we look at several alternative measures of fiscal performance with the aim of capturing its various facets. On the one hand, we consider a broader observable FP-measure, namely the overall fiscal balance (OB) that includes interest payments (i.e. the cost of debt). On the other hand, we retain unobservable FP measures that correct the annual budget for the impact of the economic cycle (and other one-off or provisional measures): the cyclically-adjusted primary balance (CAPB), the cyclically-adjusted balance (CAB), and the structural balance (SB).

Table 4: Alternative measures of fiscal performance

	[1] CAPB NCC	[2] CAPB CC	[3] OB NCC	[4] OB CC	[5] CAB NCC	[6] CAB CC	[7] SB NCC	[8] SB CC
Lag FP	0.627***	0.160	0.645***	0.505***	0.583***	0.183	0.687***	0.173**
	(0.061)	(0.097)	(0.039)	(0.072)	(0.076)	(0.117)	(0.077)	(0.075)
FRS	-1.307	-0.601	-0.0756	13.94*	-0.807	9.473	-1.071	0.583
	(1.461)	(5.627)	(1.659)	(6.975)	(1.510)	(5.886)	(1.002)	(5.086)
QI	0.670	-0.708	1.793**	0.741	1.663**	0.466	1.025***	-0.246
	(0.456)	(1.656)	(0.715)	(1.613)	(0.696)	(1.318)	(0.289)	(2.065)
FRS*QI	0.237	0.146	0.0427	-1.996*	0.150	-1.332	0.219	-0.0796
	(0.216)	(0.921)	(0.243)	(1.089)	(0.221)	(0.925)	(0.143)	(0.826)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N/R2	300/0.75	124/0.64	309/0.73	159/0.68	312/0.65	154/0.52	286/0.77	145/0.60

Note: clustered-robust standard errors in brackets. Country and time fixed effects included. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Figure 2: Alternative measures of fiscal performance.



Based on Table 4, Figure 2 reveals a complementarity effect between FRS and QI in terms of CAPB in NCC (top-charts), while in CC the FRS is not found to robustly affect the CAPB irrespective of the QI level (bottom-charts). Moreover, strengthening fiscal rules significantly increases both the OB and CAB in CC, and this favorable effect declines as QI improves consistent with our benchmark findings; on the contrary, OB and CAB do not significantly respond to FRS in NCC. Finally, regarding the SB, while a FRS-QI complementarity appears in NCC once QI is above a certain level, strengthening fiscal rules is not found to significantly affect the SB of CC at any QI level. Consequently, although the marginal effect of fiscal rules may differ across the measures of fiscal performance (mainly regarding its significance), strengthening fiscal rules has different effects in NCC versus CC, corroborating benchmark findings. The next section looks at possible institutional channels that may explain these differences.

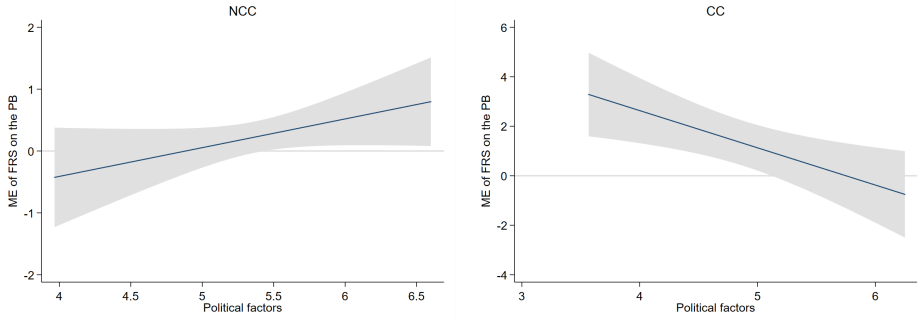
6 Transmission channels: disaggregated institutions

As we could not reject **H1**, our benchmark estimations—backed up by several robustness tests—point to important differences between NCC and CC in the effect of the strength of fiscal rules on fiscal performance, conditional upon the quality of institutions. In this section, we test **H2** by providing estimations that capture the effect of political, economic, and social institutions, respectively.

6.1 Political institutions

Based on Tables B1-2 in Appendix B, Figure 3a reports the effect of fiscal rules strength of fiscal performance conditional upon the quality of political institutions for NCC (left-hand chart) and CC (right-hand chart). Results cannot reject **H2a**. On the one hand, whenever significant, better political institutions improve the favorable effect of fiscal rules on fiscal performance in NCC. On the other hand, the favorable effect of fiscal rules on the fiscal performance of CC decreases as political institutions improve (and becomes non-significant only above an institutional quality level estimated at about two standard deviations above the sample mean).

Figure 3a. FRS and FP: Political institutions



For the sake of completeness we explore the drivers of these results be performing estimations that use the five disaggregated measures of political institutions, namely corruption, government stability, democratic accountability, bureaucracy quality, and law & order. Using the estimations in Table B1 of Appendix B, we report in Table 5 the effect of each political variable on the relationship between fiscal rules strength and political institutions (Figure B1a in Appendix B provides graphical illustrations).

Table 5: A summary of the interactions between fiscal rules strength and institutions

	Non Communist Countries (NCC)		Communist Countries (CC)	
	Effect	Significance	Effect	Significance
QI aggregate index	C	(M-0.5*SD; M+1*SD)	S	(below M+0.5*SD)
Political institutions	C	(above M)	S	(below M+1*SD)
Corruption	C	(M; M+1*SD)	S	(below M+2*SD)
Government stability	C	(M-0.5*SD; M+0.5*SD)	S	(below M+1*SD)
Democratic accountability	S	(M-1.5*SD; M+0.5*SD)	S	Always
Bureaucracy quality	C	(above M)	S	(below M+0.5*SD)
Law & order	C	(above M)	S	(below M+1*SD)
Economic institutions	C	(above M-0.5*SD)	C	(above M-1*SD)
Investment profile	C	(above M)	C	(above M-1*SD)
Socioeconomic conditions	C	(above M-0.5*SD)	C	(above M-1*SD)
Social institutions	L	Never	S	(below M+1*SD)
Religious tensions	C	(above M)	C	Always
Military in politics	C	(above M-0.5*SD)	S	Always
Ethnic tensions	C	(M-1*SD; M)	C	(above M-1.5*SD)
Internal conflicts	C	(M; M+0.5*SD)	S	(below M+1*SD)
External conflicts	S	(M-2*SD; M)	S	(below M+1*SD)

Note: M=mean, SD=standard deviation, C=complementarity, S=substitution, L=linear.

On the one hand, NCC with levels of bureaucracy quality and law & order above a threshold (estimated around the mean, for both variables) could significantly improve their primary balance by strengthening their fiscal rules and/or further increasing the quality of these institutions. Such a favorable FRS-QI interaction appears for corruption and government stability, but is significant only around their respective means.[13] Altogether, these four political institutions support the FRS-QI complementarity observed in NCC both for political and overall institutions.[14] On the other hand, the substitution effect between FRS and both political and overall institutions observed in CC is supported by all political factors except for an almost-linear marginal effect for corruption.[15] Consequently, the effect of strengthening fiscal rules increases in NCC and decreases in CC when most political institutions improve, in line with our presumption in **H2a**. Altogether, political factors are an important channel explaining the differences in the effect of FRS on the PB between NCC and CC featured in our benchmark estimations.

[13]Conversely, the substitution effect that we reveal between FRS and democratic accountability may partly explain the statistical weakness of the complementarity emphasized for political institutions altogether.

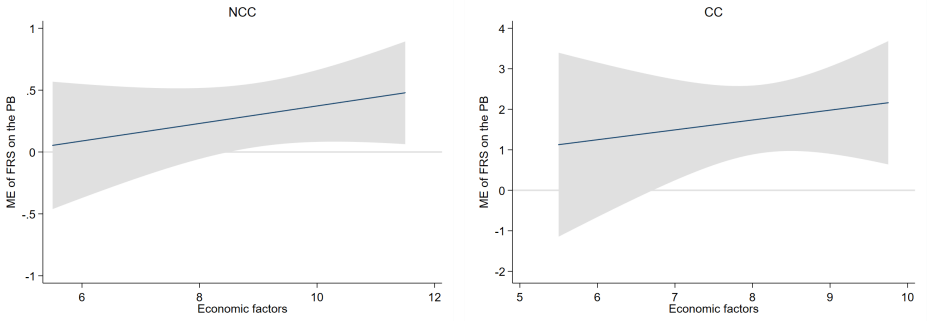
[14]We can identify various patterns among NCC. Based on country-averages, FRS significantly improves the PB in e.g. Austria or Germany for most disaggregated political institutions, while only for one or two measures of political institutions for e.g. Greece and Portugal.

[15]Despite some poor political institutions, some countries may improve their PB by strengthening fiscal rules. For example, the magnitude of the favorable effect of FRS on PB is strong in Czech Republic and Poland (that present a low level of government stability), Latvia and Slovenia (despite low democratic accountability), Romania and Bulgaria (who present low bureaucracy quality), and Bulgaria and Lithuania (with low levels of law & order). However, the impact of FRS weakens and is no longer significant when these institutions are above a certain threshold, consistent with evidence for political institutions altogether.

6.2 Economic institutions

We illustrate in Figure 3b (based on Tables B1-2 in Appendix B) the impact of strengthening fiscal rules on fiscal performance with respect to economic institutions. For both NCC (left-hand chart) and CC (right-hand chart), estimations reveal a complementarity effect: whenever significant, the favorable effect of FRS on the PB increases when economic institutions improve, in line with our prior underlying **H2b**.

Figure 3b. FRS and FP: Economic institutions

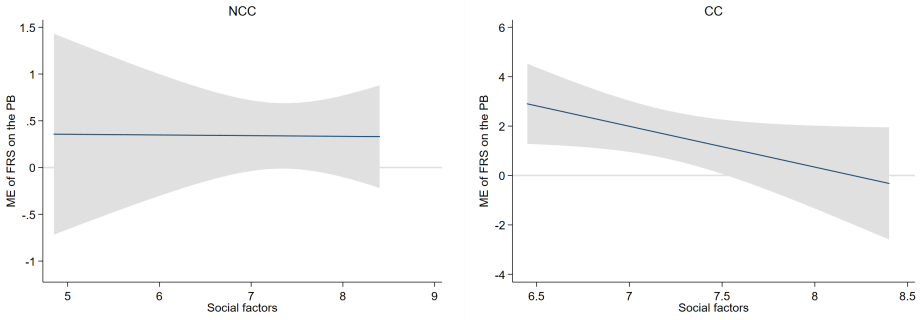


These findings seem to be confirmed when looking at the two disaggregated measures of economic institutions, namely the investment profile and socioeconomic conditions. As illustrated by Table 5 (and confirmed by Tables B1-2 and Figure B1b in Appendix B), FRS, and both investment profile and socioeconomic conditions, are complements (an effect that is significant for institutional levels above their respective means) in NCC and in CC. For the former group of countries, because of its weak economic institutions, Greece is not expected to significantly improve its PB by strengthening fiscal rules, while in e.g. Belgium, Italy, or Portugal the effect is either weak or not significant. Conversely, strong effects are expected in e.g. Luxemburg, Finland, or Denmark, given their good economic institutions. For the latter group of countries, a strong effect of FRS arises in e.g. Estonia or the Czech Republic, while, Romania and Bulgaria should drastically improve their economic institutions for their PB to benefit from a significant and/or strong effect of FRS. Altogether, these findings, which reflect the priors in **H2b**, suggest an unambiguous policy recommendation: strengthening fiscal rules and economic institutions is a virtuous (dominant) policy for improving the PB of EU countries, be they NCC or CC.

6.3 Social institutions

Finally, based on Tables B1-2 in Appendix B, we display in Figure 3c the relationship between fiscal rules strength, fiscal performance, and social institutions. Our findings are not fully consistent with our formulation of **H2c**: while in CC we reveal a substitution effect between fiscal rules strength and social institutions on fiscal performance, in NCC social institutions do not influence the impact of fiscal rules strength on fiscal performance—the latter being also statistically insignificant.

Figure 3c. FRS and FP: Social institutions



As for political and economic institutions, we take a look at the five disaggregated variables capturing social institutions, namely religious tensions, military in politics, ethnic tensions, internal conflicts, and external conflicts. Results reported in Table 5 (based on Tables B1-2 and Figure B1c in Appendix B) show the following. For NCC, the interaction effect between the various measures of social institutions and FRS is fairly mixed, both in sign (i.e. substitution for external conflicts and complementarity for the other four social institutions measures) and statistical significance (i.e. significant for relatively high values for religious tensions and military in politics, but only around the average values of the remaining three social institutions variables);[16] this may explain the lack of a clear impact of social institutions altogether in NCC. In CC, FRS significantly impacts the PB for all five measures of social institutions and for wide range of institutional levels, consistent with the significant estimated effect between FRS and overall social institutions.[17] Consequently, the

[16] In several countries the quality of their social institutions is too low for FRS to significantly affect the PB (e.g. for most social institutions in Cyprus and France). Conversely, a significant effect of FRS on the PB is found in Denmark or Germany for most social institutions variables.

[17] As such, FRS benefits the most to the PB of Croatia and Bulgaria with respect to most social institutions, except religious tensions for which the effect is significantly higher in Slovenia and the Czech Republic (high values denoting low religious tensions) compared with Slovakia and Romania (low values denoting high religions tensions).

influence of most disaggregated social institutions is consistent with the effect observed for overall institutions in both groups of countries.

We can summarize our findings based on disaggregated measures of institutions as follows. First, except for the effect of social institutions in NCC, estimations cannot reject **H2a-b-c**. Second, the FRS-QI complementarity observed in NCC (hypothesis **H1**) is driven by all economic factors, and most political and social factors. Third, the FRS-QI substitutability observed in CC (hypothesis **H1**) is driven by most political factors, only three out of the five social factors, and none of the two economic factors. One way to look into more detail at these differences between NCC and CC is to allow for potentially-stronger institutions-driven nonlinearities in the marginal effect of FRS on fiscal performance.

7 A closer look at institutions-driven nonlinearities

So far, our results point to important differences related to institutional quality in the effect of fiscal rules strength on fiscal performance between NCC and CC. Fiscal rules and institutions are found to be complements (substitutes) in NCC (CC), which directly echoes our null hypotheses. In this section, we subject our findings to a deliberate stress test by looking for possibly stronger nonlinearities between fiscal rules and institutions. To that end, we no longer constrain the effect of fiscal rules on fiscal performance to be linear with respect to the quality of institutions.[18]

Formally, the marginal effect of FR on FP using model (2): $ME(QI_{it}) := \frac{\partial FP_{it}}{\partial FR_{it}} = \beta_1 + \beta_3 QI_{it}$, is *linear* in QI; indeed, since $\frac{\partial ME(QI_{it})}{\partial QI_{it}} = \beta_3$, a one-unit change in QI has the *same* impact on the ME irrespective of the *initial level* of QI. We loosen this assumption and allow the initial level of QI to potentially influence the ME of FR on FP.

7.1 The model

We consider a more general specification than (2)

$$FP_{it} = \gamma FP_{it-1} + \beta_1 FR_{it} + \beta_2 QI_{it} + \beta_3 FR_{it} f(QI_{it}) + \mu_i + \eta_t + \phi Controls_{it} + \varepsilon_{it}, \quad (3)$$

in which $f(QI_{it})$ is a function to be defined below. The ME of FR on FP with respect to QI becomes $\frac{\partial ME(QI_{it})}{\partial QI_{it}} = \beta_3 \frac{\partial f(QI_{it})}{\partial QI_{it}}$. In the estimations performed so far, $f(QI_{it}) = QI_{it}$ and

[18] For example, we would let the data reveal a substitution effect between FR and QI for some NCC, and a complementarity effect for other NCC, depending upon the QI level (and such nonlinearities in CC as well).

the right-hand side derivative equals 1, making the ME constant and equal to β_3 . However, with a more general $f(\bullet)$, the ME of FR on FP depends nonlinearly on the QI level.

Various models may be used to estimate such nonlinear effects with panel data. In an early contribution, Hansen (1999) develops a method for testing and estimating threshold effects by assuming a brutal transition (i.e. a "jump") between two adjacent regimes. Subsequent work (Gonzalez et al., 2005) extends this setup to allow for a smooth (i.e. continuous) transition between regimes, or for a dynamic panel specification (Kremer et al., 2013). However, all these methods assume a parametric specification of the function $f(\bullet)$; given that we have limited information about the precise shape of $f(\bullet)$, we revert to a nonparametric specification that puts no ex-ante constraints on it. Following Hainmueller et al. (2019), we assume $f(\bullet)$ to be a Gaussian kernel function: $f(QI_{it}) = K^G(\frac{QI_{it}-QI^0}{b})$, with QI^0 each institutional value from the sample and b the bandwidth parameter that drives the smoothness of the adjustment (which increases with the value of b).

We perform the estimation in two steps, following Xu et al. (2017). In the first step we look for potential nonlinearities. Specifically, we estimate a group-interaction model by splitting the sample in several groups defined using the increasingly-ordered QI values (i.e. the variable that drives the nonlinearity). Then, we compare this group-interaction model with our benchmark model (in which the marginal effect is linear with respect to QI), using a Wald test in which the null is that the two models are statistically equivalent. The rejection of the null suggests the presence of possible nonlinearities, which we estimate in the second step using a nonlinear semi-parametric double fixed-effects dynamic panel model in which the interaction term is modeled using the Gaussian kernel

$$FP_{it} = \gamma FP_{it-1} + \beta_1 FR_{it} + \beta_2 QI_{it} + \beta_3 FR_{it} K^G \left(\frac{QI_{it} - QI^0}{b} \right) + \mu_i + \eta_t + \phi Controls_{it} + \varepsilon_{it}. \quad (4)$$

7.2 Results: aggregate institutions

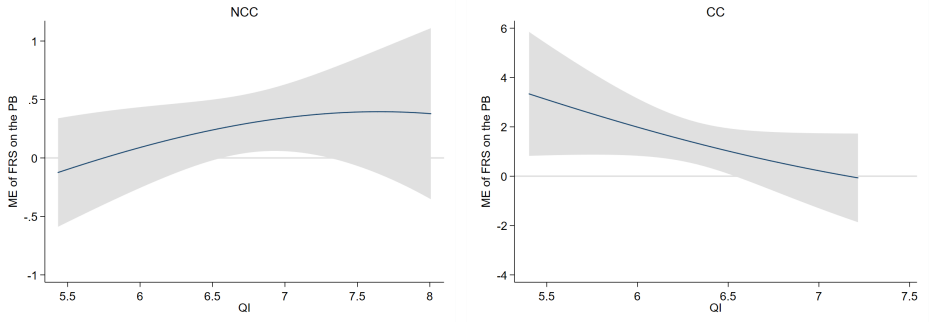
When considering our aggregate measure of institutions, the low p-values of the Wald test conducted using a five QI-groups interaction model reported at the bottom of Table 6 suggest the rejection of the null of linear interaction for both NCC (column [1]) and CC (column [2]).

Table 6: Institutions-driven nonlinearities: aggregate institutions

	[1] NCC	[2] CC
PB(-1)	0.602***	0.494***
	(0.041)	(0.064)
FRS	0.379	-0.0676
	(0.373)	(0.916)
QI	1.475*	0.232
	(0.760)	(1.406)
FRS*K(QI)	0.0159	-1.689*
	(0.290)	(0.919)
Wald p-value/Bandwidth	0.00/1.62	0.00/1.14
Controls/Fixed effects	Yes/Yes	Yes/Yes
N/R2	309/0.806	159/0.765

Note: clustered-robust standard errors in brackets. The null of the Wald test is the statistical equivalence between the interaction model and the interaction model estimated on five QI-groups. The optimal bandwidth parameter is selected through a cross-validation procedure (see Xu et al., 2017). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure 4. Nonlinearities: Aggregate institutions



Our findings are illustrated by Figure 4 based on estimations of model (4) in Table 6 (the optimal bandwidth parameters are selected automatically through a cross-validation procedure, see Xu et al., 2017). The marginal effect of FRS on the PB is decreasing in a decelerated way (i.e. below the linear pace) in CC (the right chart) and describes an inverted-U shape in NCC (the left chart) with respect to QI. In particular, allowing for more complex nonlinearities confirms the differences between NCC and CC unveiled by our benchmark estimations: whenever significant, the marginal effect of FRS on the PB increases (decreases) in a decelerated way, as institutions improve in NCC (CC). These findings are again in line with the priors expressed in **H1**.[19]

7.3 Further evidence from disaggregated institutions

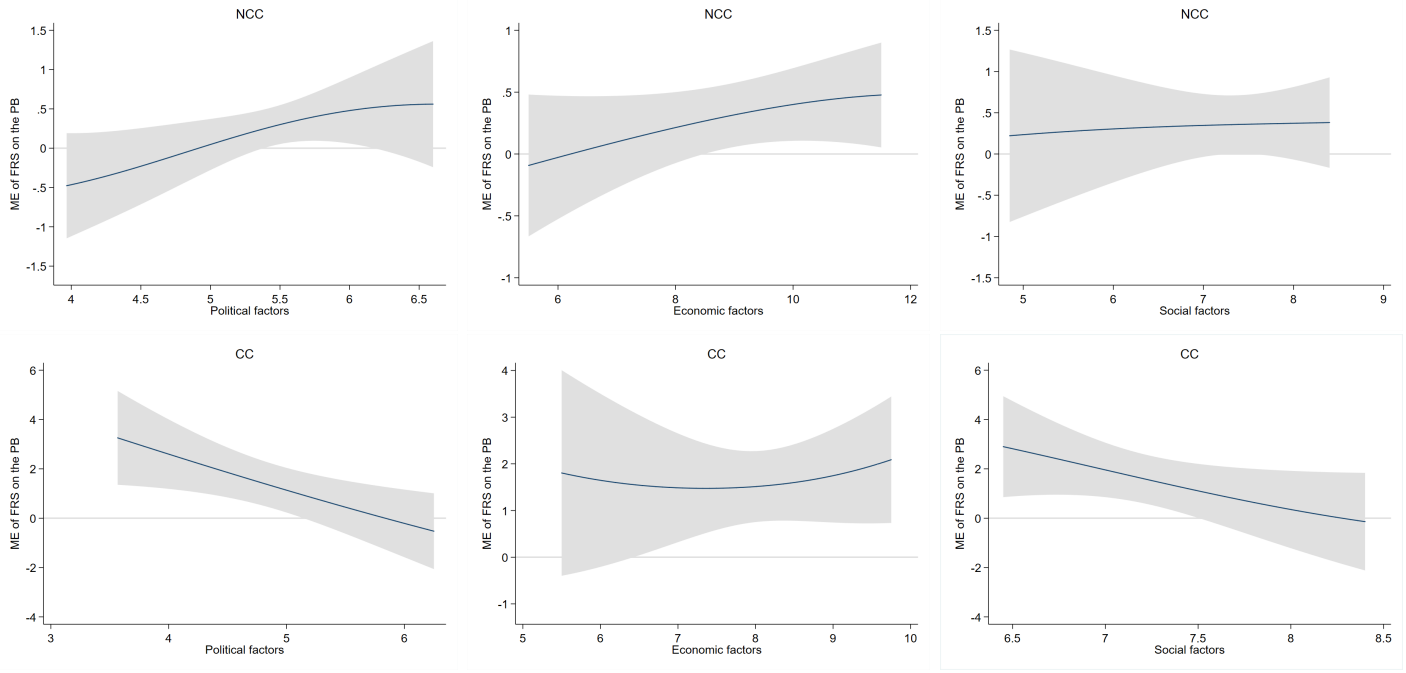
The low p-values of the Wald tests for the equivalence between the linear-interaction model and the group-interaction model (reported in Tables C1-2 in Appendix C for NCC

[19]Estimations available upon request show that, despite allowing for potentially more nonlinearities that may better seize the differences between NCC and CC, pooling all EU countries still misses crucial findings; for example, FRS does not significantly affect the PB for low QI-values in EU-28, while it does in CC.

and CC, respectively) suggest the presence of a nonlinear institutions-driven marginal effect of FRS on the PB for disaggregated institutions.[20] Figure 5 (based on Tables C1-2) illustrates our findings for political, economic, and social institutions.

For political institutions, the complementarity that we still observe for NCC flattens and becomes non-significant for high political institutions, which is consistent with our previous findings based on the linear and nonlinear models with aggregate QI; besides, the substitution effect previously outlined in CC is confirmed. Next, the complementarity found in NCC flattens for high economic institutions; however, for CC a substitution effect exists only above a certain level, prior to which FRS and economic institutions are complements, i.e. a U-shaped marginal effect. Finally, allowing for nonlinearities only modestly changes the influence of FRS on the PB at various social institutions levels compared with previous findings.

Figure 5. Kernel estimations based on political, social, and economic institutions.



Altogether, these results cannot wholly reject **H2** when accounting for a nonlinear impact of institutions on the FRS-PB relationship. Compared with our benchmark estimations, better economic institutions improve the favorable effect of FRS on PB only above a threshold; below this threshold, institutions and FRS are substitutes.

[20]Table C3 and Figures C1a-c in Appendix C provide information for each disaggregated institutional variable.

Moreover, we can refine our understanding of the institutional channels driving the impact of FRS on the PB. Regarding NCC, the lack of significance for low QI is driven by all three dimensions of institutions, namely political, economic, and social institutions. Besides, political and economic institutions, but not social institutions, are the drivers of the significant effect observed for aggregate QI values around the mean.

Finally, despite a significant effect for high economic institutions, the lack of significance for high aggregate QI values is driven by political and social institutions. Regarding CC, political and social institutions, but not economic institutions, trigger a significant and large marginal effect of FRS on the PB for low aggregate QI levels. This decreasing marginal effect is no longer significant after a QI threshold, a result that is due again to political and social institutions. However, better economic institutions foster the benefits of FRS on the PB, since the marginal effect accelerates when economic institutions improve. Overall, relaxing constraints on the nonlinear effect of QI on the relationship between fiscal rules strength and fiscal performance does not put earlier results into question.

8 Summary and future research

The Treaty of Maastricht introduced formal fiscal restraints with the aim of promoting more uniform fiscal performance (or standards of fiscal responsibility) across countries called to form a currency union. Many of the EU countries adopted and subsequently adapted national fiscal policy rules, a trend embraced by countries that subsequently joined the EU. An extensive body of research lends at least tentative supports to such policies by documenting a positive association between the binding nature of fiscal policy rules and standard indicators of fiscal performance. As our own work confirmed, establishing the causal nature of that relationship remains a daunting challenge. Yet, as a sizable number of other studies before us, taking potential causality issues as seriously as we could did not lead us to reject such causation.

The particular angle adopted in this paper is to allow for significant heterogeneity in the effectiveness of rules-based fiscal frameworks across countries. Our conjecture is that in addition to not being born equal, fiscal rules also must live and grow up in broader institutional and political environments that may affect their expected influence on fiscal behavior (i.e. their effectiveness). To be trivial, if Belgium were to adopt line-by-line the German ”debt brake” rule, it is unlikely that Belgian public finances would respond in the same way as German fiscal performance did.

Informed by a significant literature on the institutional peculiarities of former communist countries (CC) compared to the other EU countries (NCC), we investigated the differentiated impact of institutional quality on fiscal rules effectiveness in each these two groups. The idea is that if a broad set of political, economic and social institutions matter for fiscal rules to do the job, it might not even be in the same way within two clusters of countries with very contrasted governance backgrounds.

We find, first, that strengthening fiscal rules has rather different consequences on fiscal performance: fiscal rules' strength and broad institutional quality are complements in NCC and substitutes in CC. Second, when getting more granular in the specific types of institutions driving such differentiation, we found that political and economic institutions were key in NCC, while political and social institutions were the main culprits for uneven fiscal rule effectiveness in CC.

This has a bearing on the design of any future reform of EU fiscal governance, and in particular on the balance to be found between centralized guidance and reliance on national initiatives. Indeed, our results unambiguously suggest that in both country groups local political customs and processes could come in the way of centralized efforts to impose a convergence of national fiscal frameworks on some sort of "best practice" consistent with a smoother functioning of the euro area. While a new momentum in economic reforms—leading to a greater convergence in economic institutions—could foster a more uniform response of fiscal performance in NCC, the important role of deeper social norms in the effectiveness of fiscal policy rules could expose the group of CC to significantly greater fiscal divergence.

This paper suggests several lessons for future work on rule-based fiscal framework. First, while we document institutions-driven nonlinearities in the effect of rules on fiscal performance, one might think of a model allowing for a joint estimation of the potentially non-linear impact of both fiscal rules strength and institutions on the marginal effect of strengthening fiscal rules on fiscal performance.[21] Second, it now seems clear that panel data analyses of fiscal rules' effectiveness cannot ignore the considerable heterogeneity stemming from interactions with other relevant institutions for the conduct of fiscal policy. Not only rules are not born equal, but they grow and mature in institutional ecosystems that ultimately determine their effectiveness. This has first-order implications not only for the empirical strategy to assess the impact of rules, but also for the pragmatic tailoring of those rules to a country's institutional landscape.

[21] Results available upon request show that the marginal effect of strengthening fiscal rules on fiscal performance depends nonlinearly (both in significance and magnitude) upon the initial level of fiscal rules strength.

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APPENDIX CHAPTER 2

One size really does not fit all:

Fiscal rules and institutional quality in the EU

Appendix A. Fiscal rules strength, institutions and fiscal performance: benchmark results

	[1] NCC	[2] CC
PB(-1)	0.597***	0.494***
	(0.041)	(0.064)
FRS	-0.890	14.23*
	(1.499)	(6.738)
QI	1.599*	0.560
	(0.762)	(1.596)
FRS*QI	0.174	-2.033*
	(0.223)	(1.060)
Debt(-1)	0.0394***	0.173***
	(0.0118)	(0.0475)
Inflation	52.80	-8.353
	(30.33)	(11.12)
Output Gap(-1)	-11.42	-50.85**
	(14.60)	(16.35)
Real GD pc	-6.108**	17.54***
	(2.534)	(4.858)
Dependency ratio	-0.0587	0.387*
	(0.0884)	(0.203)
Openness	0.00193	0.0375
	(0.00944)	(0.0280)
Years left term	0.107	0.270
	(0.0882)	(0.180)
Seat shares	-0.00000979	0.0000408
	(0.00000944)	(0.0000242)
Party color	-0.167*	-0.341
	(0.0949)	(0.227)
Executive elections	0.456	0.566
	(0.314)	(0.790)
Legislative elections	-0.103	-0.0624
	(0.289)	(0.495)
Plurality voting	–	-0.225
	–	(1.497)
Country-FE	Yes	Yes
Time-FE	Yes	Yes
N	309	159
R2	0.761	0.704

Note: clustered-robust standard errors in brackets.

Appendix B. Fiscal rules strength and fiscal performance: disaggregated institutions

Table B1. Disaggregated measures of institutions: the group of NCC

NCC	(1) POL	(2) ECON	(3) SOC	(4) CORR	(5) GSTAB	(6) DEMACC	(7) BURQL	(8) LAW	(9) INVPR	(10) SOCCON	(11) RELTEN	(12) MILPOL	(13) ETHTEN	(14) INTCON	(15) EXTCON
PB(-1)	0.627***	0.602***	0.635***	0.643***	0.623***	0.645***	0.645***	0.646***	0.635***	0.594***	0.646***	0.637***	0.648***	0.614***	0.646***
	(0.0396)	(0.0519)	(0.0404)	(0.0434)	(0.0431)	(0.0464)	(0.0426)	(0.0449)	(0.0494)	(0.0459)	(0.0480)	(0.0421)	(0.0457)	(0.0506)	(0.0438)
FRS	-2.269	-0.336	0.392	-0.729	-0.432	1.988	-1.101	-1.650	-0.277	-0.270	-0.526	-0.0409	0.0159	-0.301	0.943
	(1.496)	(0.602)	(1.531)	(0.788)	(0.830)	(2.222)	(0.847)	(1.296)	(0.604)	(0.626)	(0.915)	(1.468)	(0.523)	(1.377)	(0.867)
QI	0.779	0.444*	0.710	0.162	0.327	0.166	0.307	-0.118	0.0903	0.496***	-0.153	0.818*	-0.185	0.453*	0.196
	(0.605)	(0.243)	(0.440)	(0.137)	(0.270)	(0.226)	(0.604)	(0.287)	(0.147)	(0.159)	(0.312)	(0.437)	(0.192)	(0.228)	(0.150)
FRS*QI	0.465	0.0708	-0.00730	0.230	0.0934	-0.279	0.386*	0.362	0.0606	0.0658	0.155	0.0739	0.0730	0.0631	-0.0566
	(0.278)	(0.0655)	(0.207)	(0.182)	(0.106)	(0.383)	(0.218)	(0.239)	(0.0568)	(0.0720)	(0.168)	(0.252)	(0.127)	(0.129)	(0.0816)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309
R2	0.811	0.811	0.809	0.755	0.760	0.754	0.755	0.756	0.754	0.761	0.754	0.755	0.754	0.759	0.755

Note: clustered-robust standard errors. Country and time fixed effects included.

Table B2. Disaggregated measures of institutions: the group of CC

CC	(1) POL	(2) ECON	(3) SOC	(4) CORR	(5) GSTAB	(6) DEMACC	(7) BURQL	(8) LAW	(9) INVPR	(10) SOCCON	(11) RELTEN	(12) MILPOL	(13) ETHTEN	(14) INTCON	(15) EXTCON
PB(-1)	0.490***	0.504***	0.480***	0.515***	0.499***	0.501***	0.486***	0.518***	0.513***	0.504***	0.506***	0.495***	0.543***	0.488***	0.509***
	(0.0628)	(0.0615)	(0.0599)	(0.0633)	(0.0572)	(0.0716)	(0.0672)	(0.0660)	(0.0575)	(0.0666)	(0.0661)	(0.0682)	(0.0627)	(0.0660)	(0.0576)
FRS	8.652**	-0.213	13.56*	1.618	5.025**	3.946	6.561**	4.551	0.627	0.154	-0.363	4.277	1.345	9.856*	8.654*
	(2.741)	(3.333)	(6.332)	(1.383)	(1.855)	(3.284)	(2.684)	(2.870)	(2.526)	(1.714)	(2.910)	(4.207)	(1.592)	(5.280)	(4.351)
QI	0.359	-0.0929	0.201	-1.251*	0.172	-0.196	-1.208	0.766*	0.117	-0.365	1.052**	-4.311*	1.098*	0.00974	-0.463
	(0.592)	(0.562)	(1.585)	(0.569)	(0.157)	(1.308)	(0.819)	(0.415)	(0.278)	(0.316)	(0.396)	(2.190)	(0.499)	(0.691)	(0.502)
FRS*QI	-1.505**	0.244	-1.653*	-0.0219	-0.443*	-0.430	-1.722	-0.643	0.100	0.259	0.397	-0.511	0.0458	-0.750	-0.655
	(0.554)	(0.405)	(0.876)	(0.456)	(0.215)	(0.597)	(0.985)	(0.609)	(0.245)	(0.248)	(0.609)	(0.747)	(0.366)	(0.471)	(0.413)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
R2	0.770	0.761	0.767	0.703	0.708	0.695	0.701	0.702	0.695	0.698	0.699	0.702	0.703	0.704	0.703

Note: clustered-robust standard errors. Country and time fixed effects included.

Figure B1a. Transmission channels: disaggregated political institutions

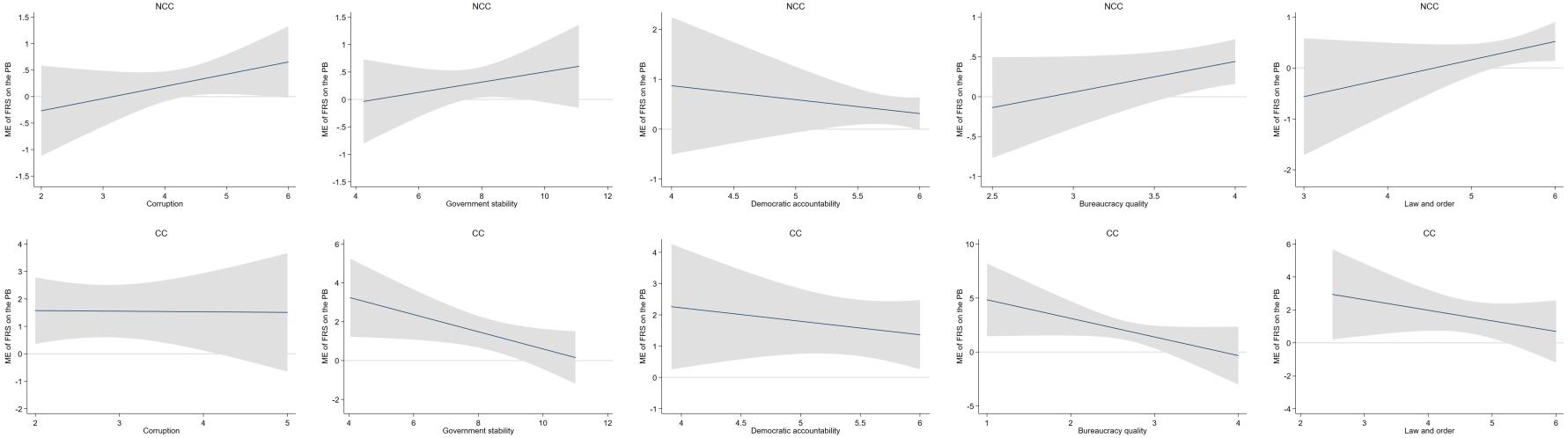


Figure B1b. Transmission channels: disaggregated economic institutions

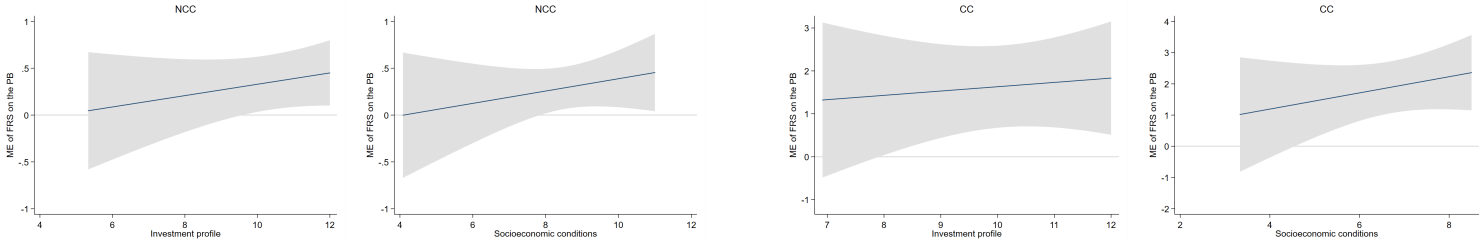
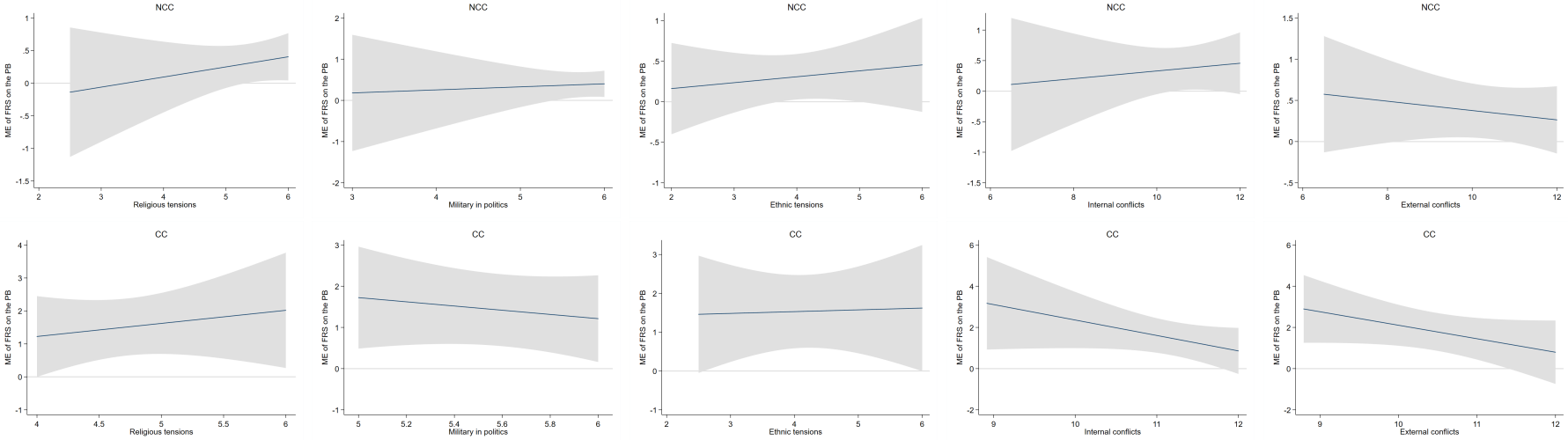


Figure B1c. Transmission channels: disaggregated social institutions



Appendix C. Fiscal rules strength and fiscal performance: deep nonlinearities

Table C1. Disaggregated measures of institutions: deep nonlinearities in NCC

NCC	(1) POL	(2) ECON	(3) SOC	(4) CORR	(5) GSTAB	(6) DEMACC	(7) BURQL	(8) LAW	(9) INVPR	(10) SOCCON	(11) RELTEN	(12) MILPOL	(13) ETHTEN	(14) INTCON	(15) EXTCON
PB(-1)	0.606***	0.626***	0.626***	0.626***	0.614***	0.646***	0.636***	0.619***	0.658***	0.607***	0.643***	0.614***	0.593***	0.615***	0.579***
	(0.0292)	(0.0443)	(0.0362)	(0.0405)	(0.0376)	(0.0433)	(0.0374)	(0.0324)	(0.0430)	(0.0416)	(0.0484)	(0.0362)	(0.0333)	(0.0418)	(0.0357)
FRS	0.561	0.477**	0.381	0.738**	0.613	0.285*	0.456***	0.539***	0.507**	0.408	0.493**	0.554***	0.870***	0.420	0.442**
	(0.409)	(0.216)	(0.280)	(0.340)	(0.368)	(0.156)	(0.133)	(0.165)	(0.181)	(0.236)	(0.170)	(0.153)	(0.286)	(0.253)	(0.184)
QI	0.850	0.516**	0.608	0.166	0.273	0.211	0.591	-0.0701	0.133	0.538***	-0.152	-0.367	-0.523*	0.445*	-0.308
	(0.611)	(0.242)	(0.456)	(0.207)	(0.223)	(0.222)	(0.604)	(0.370)	(0.146)	(0.167)	(0.331)	(0.528)	(0.265)	(0.221)	(0.323)
FRS*K(QI)	0.249	0.0440	-0.0139	0.296	0.105	-0.414	0.320	0.337	0.0490	0.0430	0.238	0.216	0.330**	0.0164	0.0859
	(0.357)	(0.0654)	(0.204)	(0.212)	(0.107)	(0.416)	(0.216)	(0.196)	(0.0550)	(0.0835)	(0.177)	(0.261)	(0.147)	(0.131)	(0.184)
Wald p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0195	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
Bandwidth	1.0483	3.7857	2.2399	1.5924	4.3115	1.2619	0.9464	0.7536	4.2064	4.3641	2.2084	0.7536	1.0048	3.4703	0.8717
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309
R2	0.819	0.807	0.804	0.829	0.818	0.807	0.805	0.807	0.807	0.808	0.808	0.803	0.815	0.809	0.790

Note: clustered-robust standard errors in brackets. Country and time fixed effects included. The null of the Wald test is the statistical equivalence between the interaction model and the interaction model estimated on IQ-groups. The optimal bandwidth parameter is selected through a cross-validation procedure (see Xu et al., 2017).

Table C2. Disaggregated measures of institutions: deep nonlinearities in CC

CC	(1) POL	(2) ECON	(3) SOC	(4) CORR	(5) GSTAB	(6) DEMACC	(7) BURQL	(8) LAW	(9) INVPR	(10) SOCCON	(11) RELTEN	(12) MILPOL	(13) ETHTEN	(14) INTCON	(15) EXTCON
PB(-1)	0.469***	0.511***	0.461***	0.462***	0.499***	0.479***	0.466***	0.520***	0.534***	0.495***	0.508***	0.404***	0.470***	0.482***	0.499***
	(0.0673)	(0.0648)	(0.0716)	(0.0745)	(0.0576)	(0.0908)	(0.0656)	(0.0625)	(0.0570)	(0.0695)	(0.0674)	(0.0794)	(0.0650)	(0.0780)	(0.0602)
FRS	-0.526	2.088**	-0.140	1.899*s	0.266	0.841	0.127	0.679	1.731**	2.237***	1.881*	1.160**	1.251*	0.842	0.810
	(0.783)	(0.691)	(1.009)	(1.014)	(0.651)	(0.465)	(1.390)	(1.002)	(0.677)	(0.589)	(0.854)	(0.416)	(0.578)	(0.591)	(0.794)
QI	0.300	-0.129	0.386	-1.162*	0.176	0.512	-1.210	0.834*	-0.00232	-0.262	0.772*	-3.893*	1.411**	0.0669	-0.747
	(0.611)	(0.425)	(1.595)	(0.559)	(0.158)	(1.086)	(0.744)	(0.457)	(0.273)	(0.293)	(0.349)	(1.816)	(0.459)	(0.802)	(0.508)
FRS*K(QI)	-1.429**	0.431	-1.558*	0.0870	-0.427**	-0.950	-1.366	-0.708	0.181	0.251	0.168	-0.902	0.0295	-0.744	-0.745
	(0.488)	(0.346)	(0.745)	(0.434)	(0.182)	(0.751)	(0.988)	(0.651)	(0.232)	(0.270)	(0.655)	(0.885)	(0.333)	(0.527)	(0.432)
Wald p-value	0.0006	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bandwidth	1.6931	1.6920	1.2304	1.8929	4.3904	0.8294	1.8929	2.2084	3.2074	3.2599	1.2619	0.6310	1.3934	1.9455	2.0243
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
R2	0.770	0.800	0.748	0.767	0.768	0.749	0.767	0.783	0.771	0.779	0.761	0.743	0.762	0.766	0.769

Note: clustered-robust standard errors in brackets. Country and time fixed effects included. The null of the Wald test is the statistical equivalence between the interaction model and the interaction model estimated on IQ-groups. The optimal bandwidth parameter is selected through a cross-validation procedure (see Xu et al., 2017).

Table C3. The nonlinear interactions between fiscal rules strength and institutions

	Non Communist Countries (NCC)		Communist Countries (CC)	
	Effect	Significance	Effect	Significance
QI aggregated index	C	(M-0.5*SD; M+1*SD)	S	(below M+0.5*SD)
Political institutions	C	(M; M+2*SD)	S	(below M+1*SD)
Corruption	C	(above M)	C	(below M+2*SD)
Government stability	C	(M-0.5*SD; M+0.5*SD)	S	(below M+1*SD)
Democratic accountability	S	(M-2*SD; M+0.5*SD)	Bell-shape	(M-2*SD; M+1*SD)
Bureaucracy quality	C	(above M)	S	(below M+0.5*SD)
Law & order	C	(above M)	S	(M-2*SD; M+1*SD)
Economic institutions	C	(above M-0.5*SD)	Bell-shape	(above M-1*SD)
Investment profile	C	(above M)	U-shape	(above M-1*SD)
Socioeconomic conditions	C	(M-0.5*SD; M+1.5 SD)	C	(above M-1*SD)
Social institutions	L	Never	S	(below M+1*SD)
Religious tensions	C	(above M)	C	Always
Military in politics	C	(above M-1*SD)	S	Always
Ethnic tensions	C	(above M-0.5*SD)	N-shape	(above M-1.5*SD)
Internal conflicts	C	(M-0.5*SD; M+0.5*SD)	S	(below M+1*SD)
External conflicts	C	(above M+0.5 SD)	S	(below M+1*SD)

Note: M=mean, SD=standard deviation, C=complementarity, S=substitution.

Figure C1a. Deep nonlinearities: political institutions

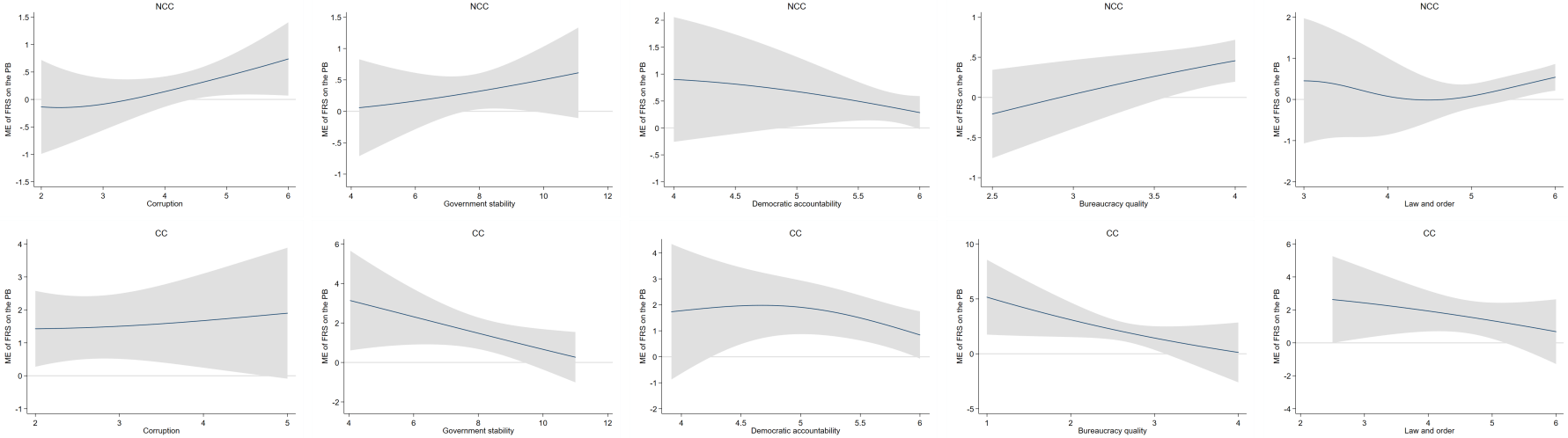


Figure C1b. Deep nonlinearities: economic institutions

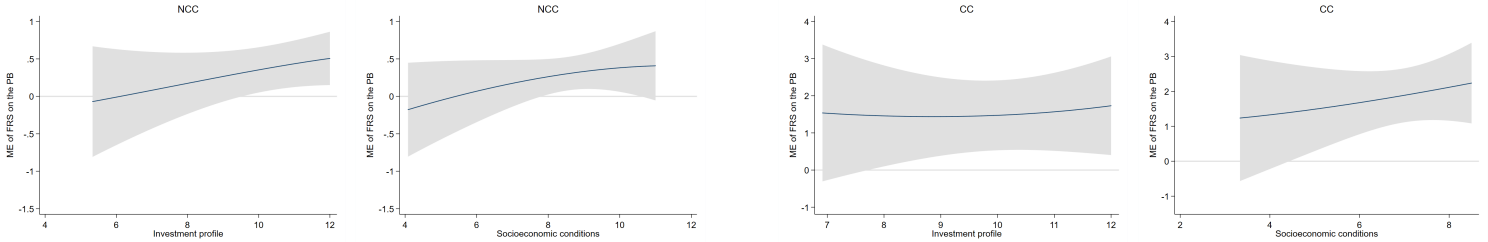
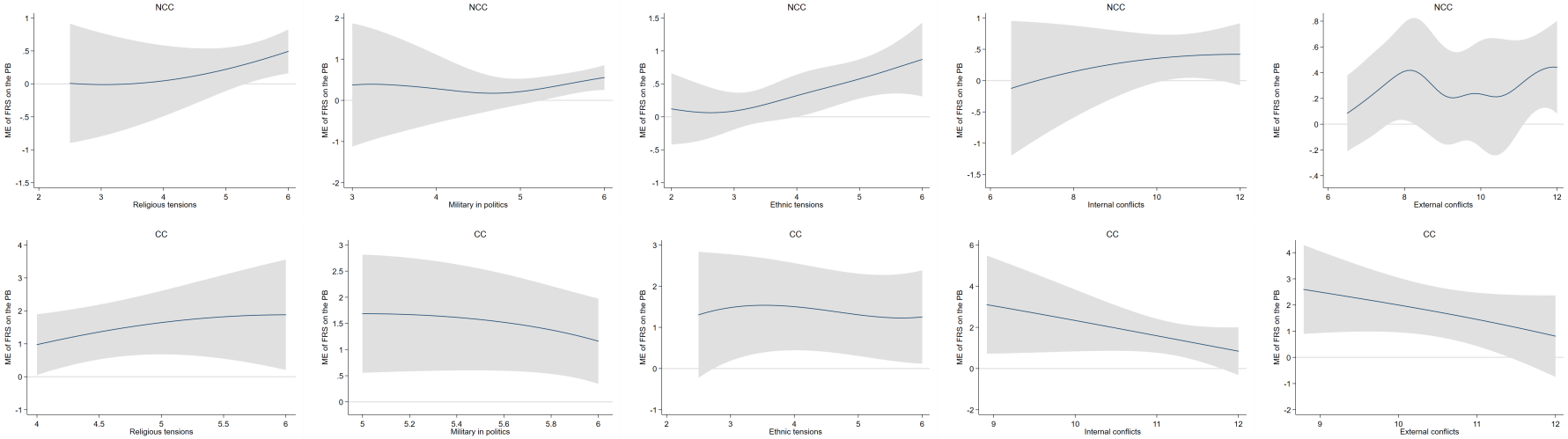


Figure C1c. Deep nonlinearities: social institutions



Appendix D. Variables' descriptive statistics and definitions.

Non-Communist Countries (NCC)

Variable	Obs.	Mean	SD	Max	Min
Primary balance	318	0.9	3.7	9.6	-27.4
Fiscal rules strength	340	0.3	1.1	3.1	-1.0
Quality of institutions index	340	6.9	0.5	8.0	5.4
Debt(-1)	320	65.2	28.3	170.3	5.5
Inflation	340	0.0	0.0	0.1	-0.0
Output Gap(-1)	340	-0.0	0.0	0.1	-0.0
Real GD pc	340	10.5	0.4	11.6	9.6
Dependency ratio	340	49.7	3.3	58.2	41.4
Openness	340	107.4	71.1	392.8	37.1
Years left term	340	1.9	1.3	4.0	0.0
Seat shares	340	45045.4	60269.7	204489.0	804.0
Party color	340	1.9	0.9	3.0	0.0
Executive elections	340	0.1	0.2	1.0	0.0
Legislative elections	340	0.3	0.4	1.0	0.0
Plurality voting	340	0.4	0.5	1.0	0.0
Corruption	340	4.4	1.0	6.0	2.0
Government stability	340	8.4	1.5	11.1	4.3
Democratic accountability	340	5.8	0.4	6.0	4.0
Bureaucracy quality	340	3.7	0.5	4.0	2.3
Law and order	340	5.4	0.7	6.0	3.0
Investment profile	340	10.1	1.9	12.0	5.3
Socioeconomic conditions	340	8.4	1.4	11.0	4.1
Religious tensions	340	5.3	0.8	6.0	2.5
Military in politics	340	5.7	0.5	6.0	3.0
Ethnic tensions	340	4.7	1.1	6.0	2.0
Internal conflicts	340	10.6	1.3	12.0	6.5
External conflicts	340	10.9	1.2	12.0	6.5
Political index	340	5.5	0.5	6.6	4.0
Economic index	340	9.3	1.5	11.5	5.5
Social index	340	7.4	0.7	8.4	4.8

Communist Countries (CC)

Variable	Obs.	Mean	SD	Max	Min
Primary balance	182	-0.8	3.7	17.3	-12.4
Fiscal rules strength	220	0.1	0.9	3.5	-1.0
Quality of institutions index	200	6.2	0.4	7.2	5.4
Debt(-1)	206	32.9	23.1	172.3	3.7
Inflation	220	0.1	0.1	0.9	-0.0
Output Gap(-1)	205	-0.0	0.0	0.1	-0.1
Real GD pc	220	9.3	0.4	10.1	8.2
Dependency ratio	220	46.3	3.3	52.6	38.5
Openness	220	105.5	32.6	181.6	43.7
Years left term	218	1.8	1.3	4.0	0.0
Seat shares	220	18827.1	23071.8	75116.0	1464.0
Party color	220	1.4	1.2	3.0	0.0
Executive elections	220	0.2	0.4	1.0	0.0
Legislative elections	220	0.3	0.4	1.0	0.0
Plurality voting	220	0.5	0.5	1.0	0.0
Corruption	200	2.9	0.8	5.0	2.0
Government stability	200	7.8	1.4	11.0	4.0
Democratic accountability	200	5.4	0.5	6.0	3.0
Bureaucracy quality	200	2.6	0.7	4.0	1.0
Law and order	200	4.4	0.7	6.0	2.5
Investment profile	200	9.6	1.6	12.0	4.6
Socioeconomic conditions	200	5.9	1.3	8.5	1.3
Religious tensions	200	5.2	0.5	6.0	4.0
Military in politics	200	5.4	0.5	6.0	4.0
Ethnic tensions	200	4.2	1.0	6.0	2.5
Internal conflicts	200	10.8	0.8	12.0	8.1
External conflicts	200	10.7	0.8	12.0	8.8
Political index	200	4.6	0.5	6.3	3.6
Economic index	200	7.8	1.2	9.8	4.0
Social index	200	7.2	0.4	8.4	6.4

Variables' definitions.

Variable	Description	Source
Fiscal Rule Strength Index	A composite Fiscal Rule Index calculated by taking into account different criteria: (1) the statutory base of the rule, (2) the room for revising objectives (3) the mechanisms of monitoring compliance and enforcement of the rule, (4) the existence of pre-defined enforcement mechanisms, and (5) media visibility of the rule	European Commission Directorate - General for Economic and Financial Affairs
Cyclically adjusted balance	Cyclically adjusted balance.	World Bank: A Cross-Country Database of Fiscal Space
Cyclically adjusted primary balance	Cyclically adjusted primary balance.	IMF Fiscal Monitor Dataset
General government structural balance	The general government cyclically adjusted balance adjusted for non-structural elements beyond the economic cycle.	World Economic Outlook
Overall fiscal balance	Difference between general government revenue and total expenditure.	
Primary fiscal balance	Difference between general government revenue and non-interest expenditure.	
Inflation	Inflation rate, normalized as inflation/(1+inflation), to mitigate the influence of high inflation rates.	Authors' calculations, based on World Economic Outlook
Debt	Gross General government debt.	Ali Abbas et al. (2010), updated
Output Gap	Output gap: difference between the logarithm of real GDP and the logarithm of a Hodrick-Prescott filtered trend of real GDP (smoothing parameter of 100).	Authors' own calculations, based on World Development Indicators
Real GDP per capita	Logarithm of per capita real GDP (at constant prices).	Authors' calculations, based on Penn World Table
Trade openness	Sum of imports and exports divided by GDP.	Penn World Table (PWT.8.1)
Dependency Ratio	The ratio of dependent people (younger than 15 or older than 64) to the working-age population (aged between 15-64).	World Development Indicators
Years left in current term	Only full years are counted. So as, the variable is equal to "0" in an election year, and n-1 in the year after an election, where n counts for the time span.	Database of Political Institutions
Herfindahl Index Government	The sum of the squared seat shares of all parties in the government.	
Party orientation with respect to economic policy	The variable is coded based on the party position, namely: Right (1), Center (2), and Left (3).	
Legislative Election	The variable equals to "1" if there was a legislative election in this year, and "0" otherwise.	
Executive Election	The variable equals to "1" if there was a executive election in this year, and "0" otherwise.	
Plurality	In "plurality" systems, legislators are elected using a winner-take-all / first past the post rule. "1" if this system is used, 0 if it is not.	
ICRG Index	An aggregated measure of institutions computed as the average of the various measures of institutions	Authors' calculations, based on International Country Risk Guide rating

Variables' definitions (*continued*).

Variable	Description	Source
Corruption	The level of corruption within the political system. High values signal low levels of corruption.	The International Country Risk Guide (ICRG)
Government stability	The assessment of the government's ability to carry out its declared programs, and its capacity to stay in office. High values equate to very low risk.	
Democratic accountability	A measure of government's responsiveness to its people. High values signal a better accountability (lowest risk).	
Bureaucracy quality	The institutional strength and quality of the bureaucracy. High values are attributed to low-risk countries where the bureaucracy has the expertise to govern without drastic changes in policy or interruptions in government services.	
Law & order	A measure of the strength and impartiality of the legal system as well as an assessment of popular observance of the law. High values indicate a strong judicial system, while low values are assigned to those countries with a very high crime rate and where the law is ignored.	
Investment profile	An assessment measure of the factors affecting the risk to investment (not covered by other political, economic and financial risk components). High values equate to very low risk.	
Socioeconomic conditions	A measure of socioeconomic pressures that could constrain the government's actions or intensify social dissatisfaction. High values equate to very low risk.	
Religious tensions	A measure of religious domination (a single religious group that intends to replace the civil law by religious law, to exclude other religions from the political and social process, to dominate governance or express its own identity). High values equate to very low risk.	
Military in politics	A measure of the involvement of military in politics (such a situation would imply the distortion of government policy). High values indicate a small degree of military participation in politics and a reduced level of political risk.	
Ethnic tensions	An assessment measure of the degree of tension within a country attributable to racial, nationality, or language divisions. High values equate to very low risk.	
Internal conflicts	A measure of political violence and its actual or potential impact on governance. High scores are given to those countries where no armed or civil opposition to the government take place.	
External conflicts	A measure of government risk with respect to foreign actions (ranging from non-violent external pressure - high score - to violent external conflicts such as cross-border conflicts to total war - low score).	

PART 2

On the side effects of Fiscal Rules: government spending composition and income inequality

CHAPTER 3

How Do Fiscal Rules Shape Public Spending Composition?

This single-authored chapter is extracted from an ongoing research study.

How Do Fiscal Rules Shape Public Spending Composition?

Abstract: At odds with the large literature devoted to the fiscal discipline effects of fiscal rules, only few contributions investigate their impact on public spending. Estimations based on the entropy balancing method performed in a large sample of 185 countries reveal the following causal effects: fiscal rules significantly reduce total public spending and public consumption, leave public investment mostly unaffected, and increase the public investment-to-public consumption ratio. Moreover, the type of fiscal rule and countries' level of economic development influence the way fiscal rules shape public spending composition. The various features of fiscal rules seem to be the major driving force of the way public spending—and, notably, total spending and public investment—are changed in response to the adoption of fiscal rules. Consequently, the public investment decline during recent times should mostly be attributable to other things but fiscal rules (which sometimes even increase public investment); and a serious attention should be given to the various features of fiscal rules, which may enforce or—on the contrary—weaken their fiscal discipline performances.

Keywords: fiscal rules, composition of public spending, public investment, features of fiscal rules, developed and developing countries.

JEL Codes: E62, H62, O52.

1 Introduction

As a response to the fiscal legacy of the Great Recession, rules-based fiscal frameworks have become the new fashion for the conduct of fiscal policy. According to the IMF Fiscal Rules Dataset (2015), around 100 countries—both developed and developing—implemented a form of fiscal rule. As indicated by Kopits and Symansky (1998), fiscal rules are commonly illustrated as "*a permanent constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance*". Specifically, in the face of changing economic circumstances, fiscal rules (FR) are aimed at setting the course for a government's responsible fiscal policy. Even if FR may differ in terms of the fiscal aggregate constrained, most of the rules set specific limits on government's deficit or debt so as their primary objective is to correct or even suppress the *deficit bias* in the political process (Debrun et al., 2008).

Certainly, the increased popularity of FR is rooted into their fiscal performances, particularly regarding their capacity to support macroeconomic stability by improving fiscal outcomes (e.g. Tapsoba, 2012; Combes et al., 2018) and fiscal discipline (e.g. Debrun et al., 2008; Barbier-Gauchard et al., 2021), supporting more counter-cyclical policies (e.g. Combes et al., 2017; Guerguil et al., 2017; Larch et al., 2021) or reducing government borrowing costs (e.g. Thornton and Vasilakis, 2018; Sawadogo, 2020). Nevertheless, in spite of this growing appetite for FR, other contributions point out to a more skeptical perspective regarding these potential benefits (e.g. Debrun and Kumar, 2009; Heinemann et al., 2018; Caselli and Reynaud, 2019; Vinturis, 2021).[1] This lack of consensus underlines the existential crises faced by the rule-based fiscal frameworks in the recent years (see Debrun and Jonung, 2019, for an excellent discussion on the so-called "*fiscal rules' trilemma*").

Such controversies are undoubtedly related to the way FR may influence government's behavior, particularly regarding public spending.[2] Yet, the literature on FR and public spending is surprisingly scarce. For total spending, using data for 22 OECD countries, Dahan and Strawczynski (2013) show that fiscal rules mostly reduce the growth rate of total

[1] Some of these studies even underline detrimental effects of FR, including governments' procyclical behavior (e.g. Alesina and Bayoumi, 1996; Lane, 2003), or a bias towards more procyclical public investment (e.g. Dessus et al., 2016).

[2] Compared with taxes that are much more elastic to economic conditions (see e.g. Girouard and André, 2005), public spending may be considered to be more discretionary (see also the discussion in Bergman et al., 2016, or Schmidt-Hebbel and Soto, 2018).

public expenditure, a result confirmed by Barbier-Gauchard et al. (2021). For disaggregated types of spending, consistent with the early findings of Peree and Valila (2005) and Valila and Mehrotra (2005), Delgado-Tellez et al. (2020) find that fiscal rules do not significantly affect public investment in the developed world, in line with the conclusions of Dahan and Strawczynski (2013) for the growth rate of the ratio between various components of public spending (with the notable exception of expenditure rules). Taking stock of these studies, the goal of our paper is to provide a comprehensive analysis of the impact of FR on public spending, which contributes to the existing literature on several grounds.

First, an important strand of literature suggests that the effect of fiscal rules on fiscal policy may dramatically change if one does not properly account for endogeneity arising from reversed causality (see e.g. the meta-analysis of Heinemann et al., 2018). We tackle this issue using a treatment effect analysis, in which the adoption of FR is not considered to be endogenous but related to some observable macroeconomic characteristics. Second, compared with existing studies that focus exclusively on developed countries, we use a large database of 185 countries. This is particularly important, since the presence of many countries allows constructing quality counterfactuals that support a proper implementation of our treatment effect analysis. Third, in addition to estimations performed for total public spending, all fiscal rules, and all countries, we provide evidence for disaggregate measures of both fiscal rules and public spending, and for developed and developing countries. Lastly, we explore in detail the various features of fiscal rules, and illustrate the way they may influence the effect of fiscal rules on public spending.

Our results are as follows. First, the adoption of fiscal rules is found to significantly reduce total public spending relative to comparable countries that did not adopt fiscal rules. Moreover, regarding the composition of public spending, while public consumption significantly decreases, public investment is not significantly affected. As a result, the ratio between public investment and public consumption significantly increases.

Second, these findings differ with the type of fiscal rule. Contrary to expenditure rules (ER), both debt rules (DR) and balanced-budget rules (BBR) significantly reduce total spending. In addition, while all types of FR significantly reduce public consumption, public investment significantly increases following the adoption of BBR and DR, but is not significantly affected by ER. As such, the ratio of public investment-to-public consumption significantly increases only for the two former types of rules.

Third, although the effect of all fiscal rules in developed and developing countries is comparable with their impact in the full sample, the level of economic development matters when differentiating between the various types of fiscal rules. Contrary to DR and BBR that reduce total spending in both groups of countries, ER significantly decreases total spending only in developing countries. Moreover, although all types of fiscal rules significantly reduce public consumption in both groups of countries, the strongest effect (in absolute value) is triggered by BBR in developed countries and by ER in developing countries. In addition, while public investment only marginally responds to ER in developed countries, DR and BBR significantly increase it in developing countries. As a result, the public investment-to-public consumption ratio increases in both groups of countries in response to the adoption of DR or BBR, but does not significantly change following the adoption of ER.

Lastly, we explore if and how the features of fiscal rules may influence their impact on public spending. By further reducing total spending, some features of fiscal rules may enhance their fiscal discipline effect (e.g. independent fiscal bodies, investment-friendly fiscal rules, supranational fiscal rules, or a "hard" legal basis); on the contrary, other features weaken the fiscal discipline-enhancing role of fiscal rules (e.g. fiscal responsibility laws, a higher number of fiscal rules, national fiscal rules, or a "soft" legal basis, as well as cyclically-adjusted or multi year features for BBR and expenditure ceilings for ER); and a last group of features (e.g. formal enforcement procedures or escape clauses) enhance or weaken—depending on countries' level of economic development and the type of fiscal rule—the fiscal discipline effects of fiscal rules. In addition, while—aside from some differences between developed and developing countries—public consumption responds similarly to total spending, we notably find that most features of fiscal rules have mixed effects on public investment (notably depending on countries' level of economic development and the type of fiscal rule), while some of them either always penalize it (e.g. independent fiscal bodies or monitoring outside the government), or always support public investment either by no longer decreasing it or even by increasing it (e.g. investment-friendly fiscal rules or ER with expenditure ceilings).

The policy takeaway of our analysis is as follows. Fiscal rules are found—by and large—to promote fiscal discipline by significantly reducing total spending. Moreover, while public consumption is often significantly decreased, governments—particularly in developing countries—seem to spare public investment following the adoption of fiscal rules particularly for DR and BBR, which in some cases may even significantly increase public investment.

Against some fears—going back at least to the early 2000s—that fiscal rules would result into public investment cuts, this finding shows that public investment slowdowns are mostly related with other policies but fiscal rules (for example, fiscal consolidations may be a good candidate). Finally, not all the features of fiscal rules are desirable from a fiscal discipline perspective. Enforcement—related to monitoring outside the government and formal enforcement procedures—and a strong legal basis usually promote the fiscal discipline effects of fiscal rules, while the impact of a high degree of flexibility and of supporting procedures or institutions is mixed. This calls for a careful implementation of these features, all the more for governments that may look at other goals beside fiscal discipline, and in particular at public investment.

The rest of the paper is organized as follows. Section 2 surveys the literature and builds the testable hypotheses, Section 3 describes the methodology, Section 4 presents the data, Section 5 reports our main results, Sections 6 investigates various types of fiscal rules, Section 7 compares developed and developing countries, Section 8 looks at the functional components of public spending, Section 9 explores the influence of the features of fiscal rules, and Section 10 summarizes our findings and suggests several research perspectives.

2 Literature and testable hypotheses

2.1 The rationale of fiscal rules

One of the most important messages delivered by the post-1970s oil shocks literature was that rules may be preferred to discretionary policies (Kydland and Prescott, 1977). In light of the findings of Sargent and Wallace (1981), such "rules" were indeed assigned to the monetary policy as central banks became increasingly more independent (see e.g. the Volcker disinflation period of the early 1980s, the creation of the supranational European Central Bank in the 1990s, or the remarkable spread of inflation targeting regime starting in the early 1990s). This marked focus of monetary policy on monetary goals (often labeled economic "orthodoxism") raised the burden placed on fiscal policy as a shock absorber. As a result, many countries around the world experienced long-lasting deficits that fueled upward-sloping public debt paths starting in the mid 1970s (see Minea and Villieu, 2009, 2012), whose levels reached unprecedented heights prior to the Great Recession and have further been increased by Governments' response to it (and, more recently, by the Covid-related fiscal stimuli).

In face of the dangers raised by such a high indebtedness stance on fiscal sustainability, many countries around the world adopted fiscal rules: compared to only a handful of countries in the mid-1980, around 100 countries present currently at least a type of fiscal rule. Although they make take various forms (for example, they may target the budget balance, the public debt, or the level of expenditure), fiscal rules are aimed at constraining governments' behavior. As such, they are expected to reduce governments' appetite for too high fiscal deficits, and promote fiscal discipline (e.g. Buchanan and Wagner, 1977; Debrun et al., 2008).

2.2 Fiscal rules and fiscal performance

Fiscal rules are a widely-accepted policy to promote fiscal discipline. Although there exist alternative policies that may equally support fiscal discipline, and particularly fiscal consolidations, the two policies are different in two important dimensions.

First, a fiscal consolidation is usually short-lived, i.e. a "shock therapy": according to Bamba et al. (2020), half of the 123 fiscal consolidations that they identify have a life of at most 2 years, and less than one in five is above 5 years. On the contrary, among the 185 countries used in our study, only around a dozen dropped a fiscal rule after having adopted it, suggesting that fiscal rules are "*long-lasting constraint*[s] *on fiscal policy*" (Lledo et al., 2017, page 8).

Second, the fiscal discipline goals that they target are equally different. Fiscal consolidations are short-term operations whose goal is to avoid an imminent risk of large fiscal imbalance (including: a debt crisis, a debt default, government's fiscal insolvency, and so forth). On the opposite, fiscal rules are designed as part of a new fiscal strategy, whose goal is to achieve a lasting sustainable regime characterized by smaller deficits; contrary to fiscal consolidations that signal a disequilibrium situation, fiscal rules are meant to persist and drive the economy towards a new equilibrium.

Such a more long-term perspective of fiscal rules is equally embraced by the literature devoted to evaluating the effect of fiscal rules on the deficit bias: as emphasized by e.g. Krogstrup and Wyplosz (2009) since fiscal rules are intended to fight governments' short-sightedness and tackle the common pool problem, they require a structural change in the conduct of the fiscal policy. Moreover, Debrun and Kumar (2009) conclude that the favorable influence of fiscal rules on fiscal performance rests upon their features of acting as commitment devices and signaling tools. Finally, Berganza (2012) finds that fiscal rules have been more effective for long-term sustainability, rather than for coping with shocks.

2.3 Testable hypotheses

Based on our previous discussion, we can derive several hypotheses regarding the expected effect of fiscal rules on public spending.

(1) On the one hand, since fiscal rules are expected to improve fiscal discipline, they may act on *total government spending*.

This potential effect may be supported by two important arguments. First, except for revenue rules (which are too few to be studied through a robust econometric analysis), all types of fiscal rules enclose a goal of targeting public spending. Balanced-budget rules target the budget balance, whose improvement rests upon government's capacity to reduce public spending. Debt rules target the public debt, whose control depends on governments' capacity to generate primary surpluses, which are fostered by public spending cuts. And—even in a more direct way—expenditure rules are precisely designed to keep public spending under control. Together with the established finding that that taxes are significantly more elastic to output variations, and as such more endogenous than spending (see Girouard and André, 2005, for a formal analysis, and Bergman et al., 2016, and Schmidt-Hebbel and Soto, 2018, for a discussion), it comes that government are likely to adjust (discretionary) public spending to cope with the target imposed by the fiscal rules.

Second, many theoretical and empirical studies support a favorable effect of FR on fiscal performance (see e.g. Hallerberg and von Hagen, 1999; Beetsma and Debrun, 2004, 2005; or Debrun et al., 2008, for theory, and Debrun et al., 2008; Tapsoba, 2012; Guerguil et al., 2017; Caselli et al., 2018; Combes et al., 2018, for empirical confirmations). This positive effect of FR on fiscal performance may likely be supported by a decrease of public spending. The following hypothesis summarizes these arguments.

H1: The adoption of FR is expected to decreases total public spending.

(2) On the other hand, fiscal rules may equally affect the various *components* of public spending.

Assessing such effects may be inspired by the related literature on fiscal consolidations. A rich and long-lasting literature reveals that fiscal consolidations are performed by reducing public investment (see e.g. Roubini and Sachs, 1989; Oxley and Martin, 1991; Alesina and Perotti, 1995; De Haan et al., 1996), and even by cutting public consumption as shown by more recent studies (see Castro, 2017). Taking into account these two findings, Bamba et al. (2020) reveal a composition effect: although fiscal consolidations reduce both public investment and public

consumption, the reduction of the former is significantly higher compared with that of the latter.

However, as previously outlined, fiscal rules are different from fiscal consolidations. The prevalence of large public investment cuts may be explained by the "shock therapy" nature of fiscal consolidations: since they are expected to be short-lived, short-termist governments may prefer to additionally cut public investment instead of public consumption spending that are more likely to damage their chances of being reelected. On the contrary, governments are aware that fiscal rules are reforms that will last for several electoral cycles. As such, compared with public consumption cuts, reducing public investment to respect fiscal rules may not only undermine their credibility from a long-term perspective, but also generate a long-lasting negative effect by decreasing the growth potential, and as such penalize economic development and economic conditions over the forthcoming political terms. Such a view is not inconsistent with existing evidence. Turrini (2004) and Bacchiocchi et al. (2011) report that public debt—rather than the Stability and Growth Pact fiscal rules—constrained public investment in EU countries. In addition, against the fears expressed by Balassone and Franco (2000) and Blanchard and Giavazzi (2004), formal empirical tests reported by Peree and Valila (2005) and Valila and Mehrotra (2005) conclude that the decline of public investment reductions is unrelated to EMU fiscal rules but rather to episodes of fiscal consolidations. This evidence can be summarized into the following hypotheses.

H2a: The adoption of FR is expected to decreases public consumption.
H2b: The adoption of FR is expected not to reduce (i.e. to leave statistically-unchanged or to increase) public investment.

The hypothesis **H2b** deserves some additional explanation. Since governments are aware that FR are reforms that will last, they may equally take advantage of FR adoption to reshape their fiscal policy. As such, if the reduction in public consumption arising from FR adoption is sufficiently vigorous, governments may slightly increase public investment in search for an economic growth bonus. Such an assumption is consistent with the early evidence in Turrini (2004), who suggests that the EU fiscal rules may have created room for public investment in some EU countries, and is equally supported by the findings of Ardanaz et al. (2021) who reveal that fiscal rules protect public investment in times of fiscal consolidations, and Castro (2011) who concludes that the introduction of FR not only did

not reduce economic growth but even raised it in some European Union countries.[3]

Finally, when combining hypotheses H2a-b, we derive a hypothesis on the composition effect of FR on public spending.

H3: The adoption of FR is expected to increase (or to leave unchanged) the public investment-to-public consumption ratio.

Obviously, the statistical strength of this composition effect depends upon the strength of the two effects that compose it. Statistical significance is expected if the decline in public consumption and/or the increase in public investment is sufficiently strong. Conversely, a moderate decline in public consumption and/or a lack of significant response of public investment may leave the public investment-to-public consumption ratio statistically unchanged.

3 Methodology

3.1 Description of the methodology

Our goal is to study how the adoption of FR influences public spending (PS) in the countries that adopted fiscal rules compared to those that did not. However, since the adoption of FR may not be a random process but correlated with a set of observable variables that may equally affect government's spending behavior, a major empirical challenge is to establish a causal link between the adoption of FR and PS.

To tackle this issue, we draw upon the Entropy Balancing method developed by Hainmueller (2012). As a generalization of conventional matching methods, entropy balancing allows estimating causal effects by constructing a pre-processing scheme. Accordingly, weights are used to adjust the control units such as a large set of covariates are balanced between the control and the treated group, which leads to consistent estimates of the average treatment effect. This methodology has been recently employed by Neuenkirch and Neumeier (2016) to assess the impact of U.S. sanctions on poverty; Balima (2017) to estimate the effect of domestic sovereign bond market participation on financial dollarization; Neumeier (2018) to analyze the economic performance of US state governors with a business background; or

[3]Other studies that explore the possible "side effects" of FR look at their interaction with inflation (Combes et al., 2018), or at their effect on income inequality (Combes et al., 2019).

Balima et al. (2021) to evaluate the role of IMF-supported programs in mitigating sovereign defaults in borrowing countries.

Based on country-year observations, entropy balancing estimates the causal effect of FR on PS, namely the average treatment effect on the treated (δ), computed as

$$\delta = \mathbb{E}[PS_{i(1)} \mid FR_i = 1] - \mathbb{E}[PS_{i(0)} \mid FR_i = 1], \tag{1}$$

where PS is our outcome variable (public spending) and FR indicates whether fiscal rules are in place (FR=1) or not (FR=0). Therefore, $\mathbb{E}[PS_{i(1)} \mid FR_i = 1]$ is the expected outcome for countries that adopted FR (treatment group), and $\mathbb{E}[PS_{i(0)} \mid FR_i = 1]$ is the ideal counterfactual—the outcome that these countries would have had in the absence of FR.

Unfortunately, the latter term is not observable, and the model must be reassessed. A simple approach would be to compare the PS average between countries that adopted FR and countries that did not; this could have been possible if the treatment assignment was a random event. However, as largely discussed in the literature devoted to FR (see e.g. Debrun and Kumar, 2009; Tapsoba 2012; Combes et al., 2019; Barbier-Gauchard et al., 2021), the adoption of fiscal rules depends on several macroeconomic variables that may equally affect PS, which makes our treatment endogenous. To overcome this so-called "self-selection problem" (which can lead to biased estimates of the average treatment effect), we replace the latter term of the equation (1) by the PS in countries that did not adopt FR but present similar pre-treatment characteristics. Following Neumeier (2018), we select relevant pre-treatment characteristics that are potentially correlated with the country's decision to adopt fiscal rules and with the government's spending behavior.

Hence, we estimate the impact of the adoption of fiscal rules by comparing FR and Non-FR countries that are as similar as possible in terms of observable characteristics

$$\delta = \mathbb{E}[PS_{i(1)} \mid FR_i = 1, X = x] - \mathbb{E}[PS_{i(0)} \mid FR_i = 0, X = x], \tag{2}$$

where $X = x$ is the vector of relevant observable covariates that can affect both countries' decision to adopt FR and the level of public spending, and $\mathbb{E}[PS_{i(1)} \mid FR_i = 1, X = x]$ and $\mathbb{E}[PS_{i(0)} \mid FR_i = 0, X = x]$ are the PS for countries that adopted FR and for the countries that did not (synthetic control group), conditional on the pre-treatment characteristics. By balancing the treatment and the synthetic group based on observable characteristics, this matching approach allows us to mimic a randomized experiment.

3.2 Implementation and benefits

The entropy balancing framework is grounded in a simple two-step procedure. In the first step we implement a reweighting scheme by computing weights for non-treated units (i.e. Non-FR country-year observations). Involving sample moments of pre-treatment characteristics (for example, their mean or variance) the use of these weights should satisfy the pre-balance constraints. Following the existing literature, our main estimations are based on balance constraints that require equal covariate means across the treatment and the control group: on average, our synthetic control group comprises units not subject to the treatment (Non-FR countries) that are as close as possible to units that received the treatment (FR countries). In the second step, these weights are used to estimate the average treatment effect (δ), which in our model measures the average conditional difference in PS between FR and Non-FR countries. We do so by performing a regression analysis with the treatment variable (FR) as our main explanatory variable and the level of public spending (PS) as the main dependent variable.

Because it combines *the matching approach* by assigning scalar weights to each untreated group to ensure that both groups are comparable (in the first step) and *the regression approach* (in the second step), entropy balancing presents some advantages over other common matching techniques (see e.g. Hainmueller, 2012; Neuenkirch and Neumeier, 2016; Balima, 2017), summarized as follows.

First, interpreted as a generalization of the common matching methods such as e.g. propensity score matching, entropy balancing was found to outperform other matching techniques in terms of ensuring a high covariate balance between the treatment and the control group (Hainmueller, 2012).[4] Commonly with conventional matching methods, the control group comprises units that are not subject to the treatment and represent—in terms of a balancing score—the "best matches" for the treated units to which they are assigned (e.g. Hainmueller, 2012; Diamond and Sekhon, 2013; Neuenkirch and Neumeier, 2016). As such, each untreated unit receives a weight of 0 if it is not considered a perfect match for a treated unit, and of 1 if it is considered to be a perfect match for one treated unit.[5] However, when the number of the untreated units is limited and the number of pre-treatment characteris-

[4]Based on Monte Carlo simulations, Hainmueller (2012) shows that entropy balancing outperforms other matching techniques in terms of bias estimation and mean squared error.

[5]If the matching procedure allows for replacement, an untreated unit can receive the value of a positive integer greater than 1 if the event represents a perfect match. Although matching with replacement is proven to increase the quality of the matching in terms of covariate balance, its efficiency is weakened when the number of observations used to estimate the average treatment effect decreases (see e.g. Caliendo and Kopeinig, 2008).

tics is large, this procedure does not ensure an appropriate covariate balance between the treatment and control group, which likely leads to biased estimates.

Entropy balancing addresses these shortcomings by constructing a synthetic control group based on weights that can take any non-negative real number, which can be considered a picture-perfect counterfactual of the treatment group (Hainmueller, 2012). Instead of checking for the covariates balance after the pre-processing, entropy balance identifies a set of weights (which are as close as possible to uniform base weights) that allows balancing *ex-ante* the covariates, based on the imposed balance constraints. By including the auxiliary information about the known sample moments and adjusting the weights to obtain exact covariate balance for the moments comprised in the reweighting scheme, entropy balance prevents the loss of information. Besides, since the weights can vary smoothly across units, entropy balancing is more effective in reducing covariate imbalance than other alternative impact assessment methodologies, and as such allows obtaining unbiased estimates of the average treatment effects.

Second, compared with regression-based or matching approaches (including difference-in-difference or propensity score matching) that require a parametric specification, entropy balancing is a non-parametric technique. This is a particularly important feature for our analysis, since it avoids imposing a specific model for the presence of fiscal rules (treatment variable). Consequently, entropy balancing has the merits of avoiding a misspecification regarding the functional form of the model.

Finally, entropy balancing enables us to mitigate the potential endogeneity issues that may arise from unobserved heterogeneity, by accounting for both country- and time-fixed effects (in the second step of the model). On the one hand, the inclusion of country-fixed effects controls for any country-specific time-invariant unobserved factors that may be a source of differences in the governments' spending behavior across countries. On the other hand, the use of time-fixed effects captures unobserved time-heterogeneity that may reflect time-specific shocks (various types of crises, wars, and so forth).

4 Data

We perform our estimations using a large panel of 185 countries, observed during a period of around three decades (1985-2015). Our two main variables are public spending (the dependent variable) and fiscal rules (the main independent variable, or the treatment). First, as highlighted by our hypotheses, we are interested in several measures of public

spending. To test hypothesis **H1**, we consider total government spending, measured as total expense and net acquisition of nonfinancial assets (in ratio of GDP). Moreover, to test hypotheses **H2** and **H3**, we consider two types of public spending. On the one hand, public consumption is approached by the general government final consumption expenditure, which includes all government current expenditures for purchases of goods and services, including the compensation of employees (in ratio of GDP). On the other hand, public investment is approached by the general government investment, which includes the general government gross fixed capital formation (in ratio of GDP). Second, we measure fiscal rules (FR) by a dummy variable that equals 1 if a given country at a certain year presents a fiscal rule, and 0 if not. Besides this aggregate measure, we will also look at the various types of fiscal rules, namely expenditure rules (ER), debt rules (DR), and balanced budget rules (BBR).

In addition, when estimating the effect of FR on public spending, we introduce—along country- and time-fixed effects—a wide vector of control variables. First, previous studies (e.g. Bamba et al., 2020) emphasize that fiscal policy, and particularly public spending, are a persistent variable. Consequently, we include in the control variables the one-period *lag of the dependent variable*. Second, existing studies show that FR significantly affect fiscal discipline (e.g. Debrun et al., 2008), which depends upon both government spending and revenues. Since our goal is to measure the effect of FR on public spending, we neutralize potential changes in revenues by controlling for the one-period *lag of government revenues*. Third, we include the one-period *lag of public debt* (in ratio of GDP) to control for the influence of the fiscal stance on the impact of FR on public spending; since we equally control for fiscal revenues, the inclusion of public debt follows the logic of the so-called Bohn (1998)'s "fiscal reaction function". Fourth, we control for various facets of the domestic and external economic stance. Regarding the former, we include *real GDP growth* to capture real economic conditions and the demand for government spending (e.g. Dahan and Strawczynski, 2013), which are an important determinant of the fiscal policy behavior. For comparable reasons we include *private investment*, whose presence is equally likely to control for possible crowding-in/out effects between public and private spending, and the *inflation deflator* as a measure of prices' dynamics, which are a long-standing determinant of government's fiscal behavior (e.g. Combes et al., 2019). Regarding the latter, since more open economies are further exposed to external shocks that may equally affect the governments' fiscal behavior (e.g. Barbier-Gauchard et al., 2021), we capture external conditions through the variable *trade*, computed as the sum between exports and imports in ratio of GDP. Finally, we complete our set of control variables with measures of the structural conditions. On the one hand, population dynamics, which we capture by the *growth rate of the population*,

are an important determinant of fiscal policy (e.g. Calderon and Schmidt-Hebbel, 2008). On the other hand, we account for the *bureaucratic quality* as a measure of the quality of government's institutions, which can influence government's fiscal behavior (e.g. Debrun et al., 2008). Definitions and sources of data are detailed in *Appendix 1.*

5 Fiscal rules and public spending: benchmark results

We present in this section our benchmark results, organized in three subsections devoted to the effect of FR on total public spending, public consumption and public investment, and the public investment-to-public consumption ratio (a composition effect), respectively.

5.1 Total public spending

5.1.1 Balancing results

The first stage of our estimation consists of building weights such as the sample moment—in our main estimations, the average—of each of our covariates is not statistically different between the treated group and the synthetic control group.[6] Since this procedure is conditional upon the set of variables included, we consider the entire set of relevant covariates presented in the previous section.

Table 1: Descriptive statistics *before* weighting

Variable	[1] FR	[2] Non-FR	[3]=[2]-[1] Difference	[4] t-test	[5] p-value
Lag total public spending	35.12	28.09	7.03	14.11	0.00
Lag government revenues	33.36	26.50	6.86	13.66	0.00
Lag debt	54.61	52.11	2.50	1.58	0.11
GDP growth	3.21	4.26	-1.05	-6.74	0.00
Private investment	17.23	13.48	3.75	14.84	0.00
Bureaucracy quality	2.81	2.08	0.72	16.69	0.00
Inflation	3.73	9.29	-5.56	-13.29	0.00
Trade	95.42	75.61	19.80	8.21	0.00
Population growth	1.06	1.81	-0.75	-12.42	0.00
Observations	1103	1342			

[6]To increase the quality of our estimations and ensure the comparability between the two groups, we dropped from the control group the countries that present a GDP per capita lower than that of the treated country with the lowest GDP, and a total population lower than that of the treated country with the lowest total population. After having dropped the ten countries concerned, we obtain our final sample of 185 countries.

Table 2: Descriptive statistics *after* weighting

Variable	[1] FR	[2] Non-FR	[3]=[2]-[1] Difference	[4] t-test	[5] p-value
Lag total public spending	35.12	35.07	0.04	0.09	0.93
Lag government revenues	33.36	33.32	0.03	0.07	0.95
Lag debt	54.61	54.67	-0.05	-0.04	0.97
GDP growth	3.21	3.22	-0.01	-0.07	0.95
Private investment	17.23	17.20	0.04	0.15	0.88
Bureaucracy quality	2.81	2.80	0.01	0.16	0.88
Inflation	3.73	33.83	-0.10	-0.38	0.71
Trade	95.42	95.36	0.05	0.02	0.98
Population growth	1.06	1.07	-0.01	-0.01	0.83
Observations	1103	1103			

As illustrated by Table 1, except for the public debt, all control variables present statistically-different averages in the group of countries with (column 1) and without FR (column 2). Columns 3-5 reveal that the presence of FR is associated with higher total public spending, government revenues, private investment, bureaucratic quality, and trade; and with lower real GDP growth, inflation, and population growth. Such important differences between the two groups may bias the estimation of the effect of FR on public spending.

To neutralize these differences, we perform the first step of our estimation by applying weights to the control group in order to select our synthetic control group based on the constraint of statistically-equal averages of covariates. Table 2 shows that the average values of the covariates in the synthetic control group (column 2) are no longer significantly different from their corresponding values of the treated group (column 1), as illustrated by columns 3-5. Consequently, we can consider that our synthetic control group provides an appropriate counterfactual such as differences in FR cannot be imputed to differences in the covariates.

5.1.2 Estimation results

In the second step, we use the weights previously obtained to estimate the effect of FR on public spending with a Weighted OLS model, in which we control for all the covariates used to balance the two groups. Estimations reported in Table 3 reveal the following.

Table 3: Fiscal rules and total public spending

	[1]	[2]	[3]	[4][a]	[5][b]	[6][c]
FR	-0.297***	-0.822***	-0.885***	-0.896***	-0.737***	-2.688***
	(0.093)	(0.147)	(0.174)	(0.182)	(0.164)	(0.639)
Covariates in the second step	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects in the second step	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects in the second step	No	No	Yes	Yes	Yes	Yes
Observations	2445	2445	2445	2445	2445	2445

Note: standard errors in brackets. [a]time-fixed effects added in the 1st stage. [b]balancing performed both on the average and the variance in the 1st stage. [c]the growth of total public spending as dependent variable. ***$p < 0.01$.

Relative to comparable countries that do not present FR, countries that adopted FR experienced a significant decrease in their total public spending (in ratio of GDP), as shown by column 1. To gauge the robustness of this finding, in columns 2 and 3 we tackle a potentially-important source of endogeneity, namely unobserved heterogeneity. Adding country-fixed effects (column 2) or both country- and time-fixed effects (column 3) does not affect the negative impact of FR on public spending. Moreover, the last two columns confirm the robustness of our finding when further tackling unobserved heterogeneity by adding time-fixed effects in the first stage (column 4) or when performing the balancing in the first step using both the average and the variance of the covariates (column 5).

In addition to being statistically significant, this effect is economically meaningful: according to our benchmark estimation (column 3), the adoption of FR leads to a decrease of around 0.9 percentage points on average of the total public spending-to-GDP ratio. This is equivalent to a 0.9 pp enhancement of the Government's balance (expressed as a ratio of GDP), which represents a sizeable improvement (recall that this effect is estimated under *ceteris paribus* conditions as regards government revenues, i.e. when potential changes in government revenues are controlled for). Finally, as a last robustness check, we look if our results obtained for the level of total public spending (in ratio of GDP, to capture the direction of the dynamic, i.e. increase or decrease) are corroborated when we use as dependent variable the growth rate of total public spending, which captures the pace of the dynamic (i.e. if the pace of its decrease or increase is stronger or weaker). Column 6 of Table 3 shows that the presence of FR is associated with a significant decrease in the growth rate of total public spending, which is consistent with the decrease that we observed in the total public spending-to-GDP ratio.

To summarize, estimations do not reject our hypothesis **H1**: the adoption of FR yields a discipline effect by significantly reducing total public spending. Importantly, since the method we use allows building an appropriate counterfactual group, our estimated effect

points out to a causality relationship running from the adoption of FR towards the reduction of total public spending.

5.2 Public consumption and public investment

Having established that FR reduce total public spending, we now look at their effect on different types of public spending, namely public consumption and public investment. Notice that, for each type of public spending, we perform again the balancing of the first stage in which we replace the lag of total public spending by the lag of the appropriate type of public spending (results are available upon request).

5.2.1 Public consumption

We report the estimations of the impact of FR on public consumption in Table 4. According to column 1, in which we control for the full set of covariates and for country- and time- fixed effects, the presence of FR significantly decreases public consumption. This finding is confirmed by various robustness tests, namely when adding time-fixed effects in the first stage (column 2), performing the balancing on both the average and the variance of the covariates (column 3), or adding the one-period lag of public investment (in ratio of GDP) to account for the influence of possible changes in public investment (following the FR adoption) on the behavior of public consumption (column 4). In addition, estimations in columns 5 reveal that FR significantly decrease the growth rate of public consumption, consistent with our benchmark findings.

Table 4: Fiscal rules and public consumption

	[1]	[2][a]	[3][b]	[4][c]	[5][d]
FR	-0.342***	-0.420***	-0.273***	-0.341***	-2.433***
	(0.076)	(0.081)	(0.075)	(0.076)	(0.580)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Observations	2405	2405	2405	2405	2405

Note: standard errors in brackets. [a]time-fixed effects added in the 1st stage. [b]balancing performed both on the average and the variance in the 1st stage. [c]one-period lagged public investment (in ratio of GDP) included in the specification (in both steps). [d]the growth of public consumption as dependent variable. ***$p < 0.01$.

These results do not reject our hypothesis **H2a**: with respect to comparable countries without FR, public consumption significantly decreases in countries that adopted FR. This

causal effect shows that the previously-revealed discipline-enhancing impact of FR on total public spending is supported by a significant contraction of public consumption.

5.2.2 Public investment

We now look at the effect of FR on public investment. Column 1 in Table 5, in which we report the benchmark estimation, shows that the effect of FR on public investment is not significant. This lack of significant influence of FR on public investment is confirmed by subsequent estimations with various robustness specifications (columns 2-4), and also when looking at the response of the growth rate of public investment (column 5).

Table 5: Fiscal rules and public investment

	[1]	[2][a]	[3][b]	[4][c]	[5][d]
FR	0.064	0.019	-0.022	0.037	0.936
	(0.073)	(0.078)	(0.077)	(0.072)	(1.918)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Observations	2452	2452	2452	2452	2452

Note: standard errors in brackets. [a]time-fixed effects added in the 1st stage. [b]balancing performed both on the average and the variance in the 1st stage. [c]one-period lagged public consumption (in ratio of GDP) included in the specification (in both steps). [d]the growth of public investment as dependent variable.

These findings do not reject our hypothesis **H2b**: the adoption of FR is not harmful for the public investment, whose dynamic is not statistically different in countries that enacted FR with respect to comparable countries that did not. Consequently, the adjustment of total public spending following the adoption of FR is not found to be echoed by a significant change in public investment.

5.3 Composition effects

Our previous estimations revealed different responses of the different types of public spending following the adoption of FR: while public consumption significantly decreases in countries with FR, public investment is not found to be significantly affected by their introduction. To analyze the joint strength of these two effects we report in Table 6 estimations of the effect of FR on the public investment-to-public consumption ratio.

Table 6: Fiscal rules and the public investment-to-public consumption ratio

	[1]	[2][a]	[3][b]	[4][c]	[5][d]
FR	1.517***	1.397**	1.081*	1.255*	2.976[x]
	(0.580)	(0.602)	(0.596)	(0.691)	(1.984)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes
Observations	2405	2405	2405	2405	2405

Note: standard errors in brackets. [a]time-fixed effects added in the 1st stage. [b]balancing performed both on the average and the variance in the 1st stage. [c]one-period lagged public consumption and public consumption (in ratio of GDP) included in the specification (in both steps) instead of the ratio public investment/public consumption. [d]the growth of public investment-to-public consumption ratio as dependent variable. ***$p < 0.01$. **$p < 0.05$. *$p < 0.10$. [x]$p < 0.15$.

According to our benchmark results reported in column 1, FR significantly increase the ratio of public investment-to-public consumption. This significant effect survives when adding time-fixed effects in the first stage (column 2), performing the balancing on both the average and the variance of the covariates (column 3), or when using the lag of public consumption and public investment (both in ratio of GDP) instead of the lag of their ratio to perform the balancing and the regression (column 4). In addition, although its significance is weaker, the increase of the growth rate of the public investment-to-public consumption ratio reported in column 5 is consistent with our findings.

These results, which do not reject hypothesis **H3**, complete our global view over the way FR shape government's spending behavior. The adoption of FR reduces total public spending and public consumption but does not significantly change public investment. It is the statistical strength of the former effect that mainly drives a significant increase in the public investment-to-public consumption ratio. This positive composition effect suggests a policy reorientation towards public investment (in relative terms): against the reduction of public consumption, governments seem to protect public investment following the adoption of FR.

Our findings are consistent with the arguments that we developed previously. Compared with fiscal consolidations that were found to strongly reduce public investment (even more than the reduction of public consumption, see Bamba et al., 2020), the adoption of FR does not cause a significant change in public investment. This finding is explained by the fact that—contrary to fiscal consolidations—FR are more long-term fiscal reforms whose goal is not to restore fiscal sustainability in the short-run following shocks, but to provide—through their commitment and signaling features—an anchor towards long-term fiscal sustainability, as discussed in detail in the previous section 2.

6 Various types of fiscal rules

So far, we considered all types of fiscal rules together. However, the existing literature emphasizes important differences in the effect of various types of fiscal rules on fiscal discipline (see e.g. Tapsoba, 2012; Combes et al., 2018). Therefore, we investigate in this section if the type of FR, namely expenditure rules (ER), debt rules (DR), or balanced-budget rules (BBR), matters as regards governments' behavior in terms of public spending.

6.1 Individual fiscal rules

Table 7 presents the results for ER, DR, and BBR. As shown by the column 1, total public spending respond quite differently to the various types of fiscal rules. Compared with DR and BBR that are found to significantly reduce total public spending (similar to the effect of all FR), the effect of ER on total public spending is not statistically-significant. Besides, the strongest contraction of public spending arises following the adoption of BBR, namely around 1 pp on average.

Table 7: Various types of fiscal rules and public spending

	[1]TPS	[2]C	[3]I	[4]I/C
ER	-0.129	-0.255***	-0.047	0.374
	(0.142)	(0.049)	(0.058)	(0.396)
Observations	2445	2405	2452	2405
DR	-0.830***	-0.361***	0.082	1.629***
	(0.202)	(0.089)	(0.082)	(0.586)
Observations	2445	2405	2452	2405
BBR	-0.957***	-0.327***	0.111^{x}	1.719***
	(0.172)	(0.074)	(0.072)	(0.580)
Observations	2445	2405	2452	2405
Covariates (2nd step)	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. $^{***}p < 0.01$. $^{x}p < 0.15$.

Moreover, in columns 2-3 we look at the different types of public spending. As shown by column 2, all types of fiscal rules significantly reduce public consumption. The strongest effects arise for DR and BBR (around 0.35 pp), followed by ER (around 0.25 pp). Besides,

as shown by column 3, none of the three fiscal rules significantly affect public investment. However, although not significant, the estimated response of public investment is slightly positive for DR and BBR (significant at 15% for the latter), and slightly negative for ER. As discussed in the next paragraph, these different responses of public investment contribute to differences in the significance of the public investment-to-public consumption ratio.

Finally, column 4 reports estimations for the composition effect of the various types of fiscal rules. Both DR and BBR significantly increase the public investment-to-public consumption ratio. This significant change in the structure of public spending is driven by the reduction in public consumption and supported by a positive (although not significant) response of public investment. Conversely, we do not reveal a significant composition effect of ER: since they decrease both public consumption and public investment (the latter effect being not significant), ER leave statistically unchanged the public investment-to-public consumption ratio.

Although broadly in line with our hypotheses **H1-2-3**, these findings allow for slight amendments that reflect particularities in the way the various types of fiscal rules shape public spending. Regarding **H1**, DR and BBR are the most efficient types of fiscal rules for fiscal discipline, as they significantly reduce total public spending. Regarding **H2a**, while all types of fiscal rules reduce public consumption, we detected some differences in the magnitude of this effect, notably between DR and BRR versus ER. Regarding **H2b**, although public investment is not significantly changed in response to the adoption of the various types of fiscal rules, it slightly increases in response to DR or BBR but decreases in response to ER. To take a closer look at these differences, we performed additional estimations in which we model salient differences in the various types of fiscal rules. Specifically, while ER target only public spending, BBR and DR—by targeting overall fiscal aggregates—can affect both public spending *and* revenues. Therefore, we performed again the estimation in column 3 of Table 7 when taking out government revenues. Interestingly, while the estimated effect of ER on public investment does not change (the coefficient equals -0.008 and is still not significant), the effect of DR and BBR is found to be equal to +0.149 (with a *p-value* of 0.06) and +0.134 (with a *p-value* of 0.06), respectively.[7] This suggests that government revenues may enforce the transmission channel through which the most popular types of fiscal rules—namely DR and BBR—trigger a change in government's behavior towards a significant increase in public investment.[8] Consequently, BBR and DR—but not ER—contribute to the significant change

[7]These positive effects remain significant if e.g. we introduce time-fixed effects in the first stage or if we perform the balancing on covariates' average and variance (results are available upon request).

[8]We report that taking out government revenues was not found to trigger other changes in the impact of the various types of fiscal rules on the various types of public spending (results are available upon request).

in the public investment-to-public consumption ratio effect (hypothesis **H3**).

To summarize, these results show that governments adjust differently their public spending behavior following the adoption of BBR or DR versus ER. Due to their binding features, only the former contribute to a significant change of governments' fiscal policy towards higher fiscal discipline, which results into a significant contraction of public consumption that allows public investment to be conserved (and even increased, when its estimated response includes the effect of BBR and DR on government revenues).

6.2 Combined fiscal rules

In complement to our previous findings, we now look at countries that present combinations of two of the various types of fiscal rules, and even all three fiscal rules.

Table 8: Combined types of fiscal rules and public spending

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	ER*DR				DR*BBR			
	-0.236^{x}	-0.178***	-0.043	0.257	-0.875***	-0.362***	0.130^{x}	1.815***
	(0.147)	(0.052)	(0.058)	(0.314)	(0.194)	(0.085)	(0.080)	(0.579)
Observations	2445	2405	2452	2405	2445	2405	2452	2405
	BBR*ER				ER*DR*BBR			
	-0.437***	-0.238***	-0.056	0.326	-0.327**	-0.184***	-0.047	0.165
	(0.137)	(0.044)	(0.053)	(0.369)	(0.138)	(0.047)	(0.051)	(0.270)
Observations	2445	2405	2452	2405	2445	2405	2452	2405
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. $^{***}p < 0.01$. $^{**}p < 0.05$. $^{x}p < 0.15$.

Estimations reported in Table 8 show the following. When combined with other rules, ER inherit the fiscal discipline properties of BBR by significantly decreasing total public spending, but they neutralize the fiscal discipline effects of DR by making the decrease of public spending to be weakly-significant (at the 15% level); while the joint effect of DR and BBR on total spending is close to their individual effect. Moreover, the significant decrease of public consumption for combined fiscal rules is comparable with its decrease observed for individual fiscal rules, while the response of public investment is mostly non-significant (except for a weak significance when DR and BBR are combined). As a result, the public investment-to-public consumption ratio significantly increases only in the presence of DR and BBR. Finally, the joint presence of the three rules significantly reduces total spending and public consumption (but with a magnitude lower than that of DR or BBR alone), and leaves

investment statistically unchanged (its negative coefficient owing to ER). To summarize, combining different fiscal rules still improves fiscal discipline but almost always with a lower magnitude compared with the individual effect of DR or BBR, while the previous responses of public consumption and public investment are only marginally affected.

7 Developed versus developing countries

Using the IMF's classification, we now investigate the effect of fiscal rules on public spending in developed compared with developing countries.

7.1 All types of fiscal rules

We look in this section at all FR together. The first four columns of Table 9 report the estimations for the developed countries, with the last four being devoted to developing countries.

Table 9: Fiscal rules and public spending: Developed versus Developing countries

	[1]TPS	[2]C	[3]I	[4]I/C	[5]TPS	[6]C	[7]I	[8]I/C
	Developed Countries				Developing Countries			
FR	-0.827***	-0.276***	-0.044	0.694^{x}	-0.771***	-0.367**	0.169	2.358**
	(0.221)	(0.071)	(0.072)	(0.441)	(0.259)	(0.143)	(0.133)	(1.188)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	829	829	829	829	1616	1576	1623	1576

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. ***$p < 0.01$. **$p < 0.05$. $^{x}p < 0.15$.

According to columns 1 and 5, the presence of fiscal rules is found to significantly decrease total public spending both in developed and developing countries, as this was the case for the entire sample. Moreover, we look at the response of the different types of public spending, reported in columns 2-3 and 6-7. On the one hand, public consumption is significantly reduced by fiscal rules in both developed and developing countries, with a slightly higher magnitude in the latter group. On the other hand, although the response of public investment is not found to be significant, the estimated coefficient is negative in developed countries but positive in developing countries. These opposite-sign coefficients influence the significance of the composition effect: according to columns 4 and 8, the increase of the public investment-to-public consumption ratio is significant in developing countries, and only weakly-significant

(at the 15% significance level) in developed countries.

Consequently, governments of both developed and developing countries adjust in a comparable way their total and public consumption spending following the adoption of fiscal rules (hypotheses **H1** and **H2a** are not rejected for both types of countries). However, some differences are found regarding the sign of the response of public investment, which is negative (positive) in developed (developing) countries. Although, individually, these effects are not significant (hypothesis **H2b** is not rejected in both groups of countries), they contribute to a differentiated composition effect (hypothesis **H3**). Following the adoption of fiscal rules, developing countries significantly change the structure of their public spending towards higher public investment and lower public consumption. However, since fiscal rules trigger a reduction in both public consumption and public investment, the change in the composition of public spending is only weakly-significant in developed countries. Such differences suggest exploring the response of public spending in developed and developing countries following the adoption of the various types of fiscal rules.

7.2 Various types of fiscal rules

The estimated effect of the various types of fiscal rules, namely ER (top line), DR (middle line), and BBR (bottom line), on the different types of public spending in developed countries (the first four columns) and developing countries (the last four columns) is reported in Table 10.

Table 10: Fiscal rules and public spending: Developed versus Developing countries

	[1]TPS	[2]C	[3]I	[4]I/C	[5]TPS	[6]C	[7]I	[8]I/C
	Developed Countries				Developing Countries			
ER	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
DR	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
BBR	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	829	829	829	829	1616	1576	1623	1576

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. ***$p < 0.01$. **$p < 0.05$. *$p < 0.10$. $^{x}p < 0.15$.

Columns 1 and 5 show that both DR and BBR significantly reduce total public spending in developed and developing countries. However, the lack of effect of ER for the entire sample is supported only by our findings in developed countries; on the contrary, ER significantly reduce total public spending in developing countries, with a magnitude slightly stronger (in absolute value) than that of DR and BBR.

Such differences between developed and developing countries are enforced when looking at disaggregated types of public spending in columns 2-3 and 6-7. On the one hand, although all types of fiscal rules significantly reduce public consumption, (*i*) the magnitude of this effect is stronger (in absolute value) for each type of fiscal rule in developing countries (i.e. up to almost 4 times for ER), and (*ii*) the strongest contraction of public consumption is observed for BBR for developed countries, but for ER for developing countries. On the other hand, the reaction of public investment varies across both countries and fiscal rules. First, DR increase public investment in developing countries, while this positive effect is only weakly-significant (at the 15% significance level) in developed counties. Second, BBR robustly increase public investment in developing counties, but do not significantly influence it in developed countries. Third, while the response of public investment following the adoption of ER is not significant in developing countries, we reveal a decrease (although of weak significance) of public investment in developed countries.

These findings influence the composition effect of fiscal rules, reported in columns 4 and 8. First, DR and BBR trigger a robust and high-magnitude change in the composition effect in developing countries: the decrease in public consumption corroborated with the increase in public investment significantly increases the public investment-to-public consumption ratio by up to 4.4 percentage points (column 8, for DR). Such a significant effect is also found in developed countries, but its magnitude is weaker—at most around 35% of the effect recorded in developing countries (column 4, for BBR). Second, ER are not found to generate a significant change in the composition effect in either developed or developing countries (i.e. the decrease in public consumption does not statistically overweigh that of public investment).

We can summarize these results as follows. Except for ER in developed countries, all fiscal rules are effective in improving fiscal discipline by significantly reducing total public spending. Moreover, while public consumption is reduced in both groups of countries, the magnitude of this effect is bigger in developing countries. Interestingly, the public consumption cut in developing countries is associated with a significant increase in public investment under DR and BBR, but not under ER. Instead, ER reduce both public consumption and public investment, and the public investment contraction is more significant in developed countries.

Consequently, contrary to ER whose exclusive focus on the spending side trigger a reduction of all types of spending, BBR and DR yield a reassessment of public spending: our findings suggest that governments may take advantage of a strong reduction of public consumption to restore public investment, an effect whose magnitude is more important in developing countries. These findings may be explained by the arguments developed in section 2: fiscal rules impose long-term changes in governments' fiscal behavior, and therefore may trigger changes towards improving fiscal sustainability (lower public consumption) and favoring the growth potential (higher public investment), except when their goal is to constrain all types of public spending—in particular, for ER. But even then, our results reveal that governments are still reluctant to significantly reduce public investment—particularly in developing countries—as part of the change of their fiscal policy following the adoption of ER.

7.3 Combined types of FR

We complete our analysis of the effect of individual fiscal rules with estimations that look at the effect of combined types of fiscal rules.

Table 11: Combined types of fiscal rules: Developed versus Developing countries

	[1]TPS	[2]C	[3]I	[4]I/C	[5]TPS	[6]C	[7]I	[8]I/C
	Developed Countries				Developing Countries			
ER*DR	-0.293	-0.111*	-0.063	-0.084	-0.287	-0.211**	-0.046	0.488
	(0.223)	(0.061)	(0.054)	(0.312)	(0.262)	(0.107)	(0.136)	(0.812)
DR*BBR	-0.822***	-0.169**	0.168***	1.076***	-0.929***	-0.622***	0.436**	5.777***
	(0.251)	(0.082)	(0.065)	(0.374)	(0.322)	(0.178)	(0.180)	(1.579)
ER*BBR	-0.401*	-0.163***	-0.076	0.192	-1.168***	-0.578***	0.006	0.952
	(0.217)	(0.056)	(0.058)	(0.387)	(0.218)	(0.092)	(0.106)	(0.721)
ER*DR*BBR	-0.294	-0.111*	-0.063	-0.084	-0.263	-0.399***	0.337**	2.332***
	(0.223)	(0.061)	(0.054)	(0.312)	(0.254)	(0.098)	(0.142)	(0.835)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	829	829	829	829	1616	1576	1623	1576

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. ***$p < 0.01$. **$p < 0.05$. *$p < 0.10$.

Results in Table 11 show the following. First, regarding developed countries, when combined with other rules ER either weaken in absolute value the reduction of total spending

(together with BBR) or make it statistically not significant (together with DR, or both with DR and BBR). The same holds in developing countries, except that ER and BBR trigger a significant effect that is larger in absolute value than the joint effect of DR and BBR. Second, while public consumption always significantly decreases, the response of public investment is mostly not significant, with the notable exception of the joint positive effect of DR and BBR in both developed and developing countries. As a result, the public investment-to-public consumption ratio is equally not significant in most cases, and positive only when DR and BBR are combined.

To summarize, combining different fiscal rules mostly weakens their fiscal discipline effects, with some exceptions in developing countries where the joint effect of several fiscal rules may be of higher magnitude (in absolute value). Besides, while public consumption always significantly decreases, public investment is mostly not significant—but is statistically higher when DR and BBR are combined (including with ER for developing countries).

8 Functional components of public spending

We look in this section at the impact of fiscal rules on the functional components of public spending. The components that we analyze, which provide more granular measures of public spending, are: education, health, defense, transport communication, social protection, fuel, and agriculture expenditure. We first look at all fiscal rules together, and then at disaggregated types of fiscal rules.

8.1 All fiscal rules

After using the benchmark specification to compute the synthetic control group, we estimate the impact of fiscal rules on each functional component of public spending. Estimations reported in Table 12 show the following.

Table 12: Functional components of public spending: all fiscal rules

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
All countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
FR	0.012	-0.126**	-0.106***	-0.327***	-0.020	-0.076*	-0.054***
	(0.050)	(0.057)	(0.032)	(0.073)	(0.105)	(0.043)	(0.019)
Observations	1876	1857	1766	1171	1838	1148	2019
Developed countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
FR	0.039	-0.090	-0.063^{x}	-0.526***	0.152	–	-0.054**
	(0.074)	(0.071)	(0.040)	(0.113)	(0.131)	–	(0.021)
Observations	799	793	765	588	795	–	796
Developing countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
FR	0.016	-0.148^{x}	-0.178**	-0.031	-0.101	0.037	0.023
	(0.071)	(0.094)	(0.086)	(0.105)	(0.167)	(0.067)	(0.038)
Observations	1077	1064	1001	583	1043	650	1223
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. – signals the absence of convergence in the 1st step. ***$p < 0.01$. **$p < 0.05$. *$p < 0.10$. $^{x}p < 0.15$.

For the full sample of countries we observe a significant reduction of most functional components of public spending in countries with fiscal rules with respect to comparable countries without fiscal rules, namely: health, defense, transport & communication, fuel, and agriculture; instead, education and social protection are not found to be significantly influenced by the presence of fiscal rules. Further, splitting the countries according to their level of economic development reveals a rather different picture: except for defense spending that are found to be reduced by fiscal rules in both developed and developing countries (although with a weak significance in the former), governments choose to adjust rather differently the various components of public spending. In developed countries fiscal rules trigger a significant reduction of transport & communications and agriculture, while of health in developing countries. Besides, most types of spending are not found to be significantly affected by fiscal rules in developing countries (5 out of 7 estimated coefficients, 3 positive and 2 negative). Using these results as benchmark, we look subsequently at the influence of the different types of fiscal rules.

8.2 Different types of fiscal rules

The estimations of the impact of the different types of fiscal rules, namely ER, DR, and BBR, are reported in Table 13.

Table 13: Functional components of public spending and various types of fiscal rules

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
All countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
ER	-0.069*	-0.030	-0.074*	-0.047	-0.111	0.035**	-0.030***
	(0.037)	(0.039)	(0.038)	(0.054)	(0.079)	(0.016)	(0.011)
DR	-0.061	-0.218***	-0.042	-0.232***	0.020	0.021	-0.017
	(0.058)	(0.0587)	(0.032)	(0.0770)	(0.125)	(0.041)	(0.023)
BBR	-0.047	-0.054	-0.109***	-0.295***	0.007	0.030	-0.060***
	(0.048)	(0.056)	(0.031)	(0.072)	(0.097)	(0.030)	(0.019)
Observations	1876	1857	1766	1171	1838	1148	2019
Developed countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
ER	-0.076^x	-0.034	-0.079**	-0.093	-0.052	0.046**	-0.018^x
	(0.049)	(0.049)	(0.033)	(0.073)	(0.086)	(0.022)	(0.012)
DR	0.042	-0.118x	0.054	-0.402***	0.204	–	-0.030
	(0.082)	(0.081)	(0.040)	(0.123)	(0.153)	–	(0.026)
BBR	-0.036	-0.075	-0.100**	-0.510***	0.152	–	-0.067***
	(0.075)	(0.072)	(0.041)	(0.111)	(0.132)	–	(0.021)
Observations	799	793	765	588	795	498	796
Developing countries	Education	Health	Defense	T&C	Soc. prot.	Fuel	Agriculture
ER	-0.050	-0.044	-0.154*	-0.187*	-0.035	0.006	-0.074***
	(0.077)	(0.082)	(0.085)	(0.095)	(0.179)	(0.032)	(0.024)
DR	-0.064	-0.206**	-0.208*	0.174	-0.102	0.002	0.044
	(0.087)	(0.092)	(0.111)	(0.128)	(0.198)	(0.085)	(0.046)
BBR	-0.033	-0.023	-0.061	0.124	-0.237*	0.076	0.031
	(0.065)	(0.091)	(0.086)	(0.101)	(0.142)	(0.060)	(0.038)
Observations	1077	1064	1001	583	1043	650	1223
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. – signals the absence of convergence in the 1st step. $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

In all countries, three components of public spending are significantly reduced by at least two types of fiscal rules, namely defense (by ER and BBR), transport & communication (by DR and BBR), and agriculture (ER and BBR). Besides, while both ER and BBR trigger the highest number of significant decreases (in 3 out of 7 cases), only ER significantly *increase* a functional component, namely fuel spending. Lastly, social protection spending are never significantly changed irrespective of the type of fiscal rule.

In addition, while results for developed countries are comparable to those for the full sample, several differences are detected in developing countries. None of the various fiscal rules are found to significantly affect education spending (negative coefficients) and fuel spending (positive coefficients). Moreover, transport & communication and agriculture spending are

significantly reduced by ER and not significantly affected by DR and BBR (positive coefficients). Lastly, while ER reduce three functional components of public spending, DR and BBR reduce only two and one types of public spending, namely health and defense (DR) and social protection (BBR).

To summarize, while these findings have the merit of identifying some of the spending that are the most influenced by the various types of fiscal rules, they equally reveal that most of functional components of public spending do not significantly respond to the presence of the various types of fiscal rules. This suggests taking much caution when using these results to gauge the types of spending through which fiscal rules may shape public spending with respect to our hypotheses **H1-2-3**, all the more given that most functional components of public spending may contain both consumption and investment spending. On the contrary, we believe that more valuable insights could be drawn by studying in more detail the various features of fiscal rules.

9 Features of FR

The goal of this section is to identify the way the various characteristics of fiscal rules shape their effect on public spending. Based on Schaechter et al. (2012), the characteristics that we analyze are: supporting procedures or institutions, enforcement procedures, flexibility, and the legal basis, to which we add three other features—namely, the number of fiscal rules, investment-friendly rules, and supranational versus national rules. Following the methodological discussion, we present our results in three blocks: (*i*) features for which we exploit aggregate data for all fiscal rules; (*ii*) features for which we exploit disaggregated data for each type of fiscal rule; and (*iii*) features that are specific to only one type of fiscal rule (BBR or ER).

9.1 Some methodological issues

Our analysis computes the effect of fiscal rules on public spending in countries that adopted fiscal rules with respect to comparable countries that did not adopt fiscal rules. However, fiscal rules come together with features that are designed to influence their behavior, and—as such—may impact their effect on public spending. With respect to our methodology that models the adoption of a fiscal rule as a (first) treatment effect, such features can be understood as a second treatment effect, i.e. among all countries with fiscal rules, in some of them fiscal rules are backed-up by some features.

Consequently, our data can be divided in three groups: observations without fiscal rules (which can be labeled as 0), observations with fiscal rules but without features (labeled as 1), and observations with fiscal rules and with features (labeled as 2). While so far we compared countries with fiscal rules—be them supported by features or not—with countries without fiscal rules (namely, 1-and-2 versus 0), in this section we study the effect of the various features of fiscal rules. Given our methodology in which the treatment variable must necessarily be a dummy variable (equal to one when treated and to zero when not treated), such an analysis may be performed in at least two ways.

(1) *First*, we can directly compare countries with fiscal rules *and* features with countries that present only fiscal rules, namely 2 versus 1, re-parameterized in a dummy variable equal to one and zero, respectively. Naturally, the issue is that both groups of countries (1 and 2) have been selected based on an initial treatment, i.e. the presence of a fiscal rule; as such, this treatment must be accounted for when comparing 2-type and 1-type countries.

To do so, we performed two classes of estimations: (i) after estimating a simple OLS model to explain the presence of fiscal rules, we introduced the obtained residuals ε_{it}^{OLS} in the two steps of our entropy balancing procedure—both in the balancing step to obtain the synthetic control group and in the panel regressions performed using the synthetic control group as counterfactual; (ii) since the presence of fiscal rules is a dummy variable, we explained it using a *probit* model, and subsequently retrieved the residuals $\varepsilon_{it}^{probit}$; then, using these residuals, we computed a transformed variable that is equal to the ratio between the standard normal density of the residuals and 1 minus the cumulative standard normal distribution of the residuals, namely: $\tilde{\varepsilon}_{it}^{probit} := \frac{N(\varepsilon_{it}^{probit})}{1-\Phi(\varepsilon_{it}^{probit})}$.[9] We introduced the transformed residuals $\tilde{\varepsilon}_{it}^{probit}$ in the two steps of the entropy balancing (both to compute the synthetic control group and in the main regressions).

Irrespective of the Inverse Mills Ratio (IMR)-type correction—namely, with the OLS-based residuals from (i) or with the transformed probit-based residuals from (ii)—estimations (available upon request) reveal mostly a non-significant impact of the various features of fiscal rules on public spending, i.e. 2-type countries (with features) do not present statistically-different changes of the various public spending variables compared with 1-type countries (without features) after controlling for their initial treatment (the presence of fiscal rules). Such a systematic lack of significance is puzzling, all the more in light of the significant effects of fiscal rules emphasized so far. A possible explanation is that the counterfactual has profoundly changed: the synthetic control group is no longer based on countries *without*

[9] Transforming the residuals of the non-linear (probit) model allows obtaining *transformed residuals* that display a normal distribution (as required by the standard linear regression models).

fiscal rules but on countries *with* fiscal rules.[10]

(2) *Second*, to conserve the *same* counterfactual group—from which the synthetic control group is chosen—as for the estimations performed so far, we consider an alternative strategy, which consists on building two dummy variables. On the one hand, a FRFEAT1 variable that equals 1 in countries with fiscal rules but without features, and 0 otherwise; in particular, to avoid polluting our estimations, we drop from FRFEAT1 the observations with fiscal rules and features. On the other hand, a FRFEAT2 variable that equals 1 in countries with fiscal rules *and* features, and 0 otherwise; in particular, to avoid polluting our estimations, we drop from FRFEAT2 the observations with fiscal rules but *without* features. As such, the comparison between FRFEAT1 and FRFEAT2 may provide the following information: how do features change the effect of fiscal rules on public spending with respect to countries without fiscal rules (coefficient of FRFEAT2)—*versus*—how do fiscal rules (without features) change public spending with respect to countries without fiscal rules (coefficient of FRFEAT1), namely what is the *contribution of fiscal rules features* to the effects of fiscal rules on public spending?[11] Drawing upon this strategy, we look in the following at the way the various features of fiscal rules may influence the impact of fiscal rules on public spending.

9.2 Features of all fiscal rules

9.2.1 Independent fiscal bodies

To support the corrective action of fiscal rules and better anchor future fiscal decisions in a sustainable path (Beetsma et al., 2018), in some countries emerged new serving fiscal institutions in the form of independent fiscal bodies that set budget assumptions or monitor the implementation of fiscal rules. Using the IMF dataset, we build two dummy variables as explained in the methodological discussion. First, FRIND1 equals 1 when fiscal rules are present but without such bodies as backup, and 0 otherwise (in particular, we drop observations in which fiscal rules are backed-up by bodies that either set budget assumptions or monitor the implementation of the rules). Second, FRIND2 equals 1 when fiscal rules are in place and are supported by independent bodies that either set budget assumptions or

[10] Besides, from a technical standpoint, balancing observations equally based on the IMR (which is a computed variable), in order to compute the synthetic control group, should be formally backed-up by an appropriate methodology.

[11] Our strategy mimics a kind of double "difference-in-difference" approach, which we adapt for the presence of two treatments (fiscal rules and features).

monitor the implementation of the rules (in particular, we drop observations with fiscal rules but no independent bodies). As thoroughly explained in the previous subsection, by comparing the impact of the two dummies we aim at revealing a potential impact of the independent fiscal bodies.

Table 14: Independent fiscal bodies

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
FRIND1	-0.874***	-0.322***	0.105	1.767**	-0.818***	-0.340***	-0.026	0.804^{x}	-0.729**	-0.329**	0.275*	3.115**
	(0.206)	(0.092)	(0.089)	(0.737)	(0.295)	(0.086)	(0.083)	(0.522)	(0.300)	(0.166)	(0.157)	(1.178)
FR	-0.885***	-0.342***	0.064	1.517***	-0.827***	-0.276***	-0.044	0.694^{x}	-0.771***	-0.367**	0.169	2.358**
Benchmark	(0.174)	(0.076)	(0.073)	(0.580)	(0.221)	(0.071)	(0.072)	(0.441)	(0.259)	(0.143)	(0.133)	(1.188)
FRIND2	-1.047***	-0.264***	-0.083	0.278	-0.851**	-0.127	-0.460***	-2.008**	-1.133***	-0.620***	-0.059	0.948
	(0.197)	(0.081)	(0.076)	(0.567)	(0.351)	(0.149)	(0.173)	(0.961)	(0.220)	(0.108)	(0.083)	(0.924)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note for all Tables in this section: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step). $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 14 reveal the following. First, the presence of fiscal independent bodies—that set budget assumptions or monitor the implementation of fiscal rules—increases (in absolute value) the magnitude of the response of total public spending to fiscal rules (compare lines 1 and 3; benchmark findings are recalled on line 2). Second, the presence of such bodies modifies the response of public consumption and public investment. Estimations for all countries reveal that the coefficient of public investment is no longer positive but negative; as such, the public investment-to-public consumption ratio changes from positive to not statistically-significant. Such differences are amplified when comparing developed and developing countries. In the former, the introduction of independent bodies generates a non-significant response of public consumption and a contraction of public investment (compared to an opposite responses in their absence). In the latter, public investment no longer increases but is not significant (and negative), and the significant contraction of public consumption is higher in absolute value. Lastly, in all countries and in developing countries the public investment-to-consumption ratio is no longer positive but not significant (a result equally fueled by the change in the sign of the public investment coefficient from positive to negative). Interestingly, in developed countries the composition effect changes from positive (and significant at the 15% level) to strongly negative in light of the strong contraction of public investment.

To summarize, the presence of fiscal independent bodies that set budget assumptions or monitor the implementation of fiscal rules further supports fiscal discipline by fostering the reduction of total spending (in absolute value). In addition, while the decrease in pub-

lic consumption is no longer significant in developed countries and enforced in developing countries, public investment is significantly reduced in developed countries and no longer significantly increased in developing countries, suggesting that fiscal rules with such features penalize public investment.

9.2.2 Fiscal responsibility laws

In some countries, fiscal rules are embedded within fiscal responsibility laws, whose aim is to further promote fiscal discipline and to set out the principles for a sound fiscal management. Using data from the IMF, we build two dummy variables. First, FRFRL1 equals 1 if a country presents a fiscal rule but not a fiscal responsibility law, and 0 otherwise (in particular, we drop observations with both a fiscal rule and a fiscal responsibility law). Second, FRFRl2 equals to 2 if a country presents a fiscal rule and a fiscal responsibility law, and to 0 otherwise (in particular, we drop observations with a fiscal rule but not a fiscal responsibility law).

Table 15: Fiscal responsibility laws

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
FRFRL1	-1.048***	-0.303***	0.014	1.223*	-0.870***	-0.271***	-0.010	0.968**	-1.035***	-0.545***	0.370*	5.577***
	(0.203)	(0.087)	(0.088)	(0.676)	(0.248)	(0.078)	(0.080)	(0.492)	(0.369)	(0.202)	(0.200)	(1.717)
FR	-0.885***	-0.342***	0.064	1.517***	-0.827***	-0.276***	-0.044	0.694^{x}	-0.771***	-0.367**	0.169	2.358**
Benchmark	(0.174)	(0.076)	(0.073)	(0.580)	(0.221)	(0.071)	(0.072)	(0.441)	(0.259)	(0.143)	(0.133)	(1.188)
FRFRL2	-0.343*	-0.292***	0.052	1.924*	0.440^{x}	-0.133	0.234**	1.406**	-0.645***	-0.411***	-0.059	0.099
	(0.189)	(0.094)	(0.070)	(0.679)	(0.300)	(0.114)	(0.111)	(0.679)	(0.226)	(0.119)	(0.091)	(0.917)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations in Table 15 show the following. First, the presence of a fiscal responsibility law reduces the contraction of total spending following the adoption of fiscal rules in all groups of countries, and even makes total spending to increase (with a significance level of 15%) in developed countries. Second, the same holds for public consumption (in particular, its change is not significant in developed countries), while public investment significantly increase in developed countries and is not significant in developing countries. As a result, the public investment-to-public consumption remains positive and significant in developed countries, but becomes not significant in developing countries (compare lines 1 and 3).

To summarize, fiscal responsibility laws reduce the fiscal discipline effect of fiscal rules, and even neutralize their impact in developed countries. This finding confirms the little

support emphasized by the literature for a possible disciplining effect of fiscal responsibility (see e.g. Thornton, 2009), and shows that combining them with fiscal rules is not likely to improve the fiscal disciplining effect of the latter. Besides, while they turn into not significant the effect of fiscal rules on public consumption in developed countries, fiscal responsibility laws seem to support public investment (by increasing it) in developed countries and penalize it (by preventing public investment to increase) in developing countries.

9.2.3 The number of fiscal rules

Our benchmark estimations, reported at the top of Table 16, recall the impact of the presence of at least a fiscal rule on public spending. In the following, we investigate if having multiple fiscal rules in place may alter these findings. To this end—and given that our method requires a dummy variable to discriminate between countries with and without treatment—we build two dummy variables. First, FRNUM2 equals 1 if the number of FR present in a given country-year is equal to or higher than 2, and 0 otherwise. Second, FRNUM3 equals 1 if the number of FR is equal to or higher than 3, and 0 otherwise. To conserve the same counterfactual group, we dropped observations with only one FR (for FRNUM2) and one and two FR (for FRNUM3).

Table 16: The number of fiscal rules

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
FR	-0.885***	-0.342***	0.064	1.517***	-0.827***	-0.276***	-0.044	0.694^{x}	-0.771***	-0.367**	0.169	2.358**
Benchmark	(0.174)	(0.076)	(0.073)	(0.580)	(0.221)	(0.071)	(0.072)	(0.441)	(0.259)	(0.143)	(0.133)	(1.188)
FRNUM2	-0.421***	-0.237***	0.095	1.236**	-0.492**	-0.185***	-0.001	0.443	-0.522*	-0.456***	0.375**	5.302***
	(0.160)	(0.071)	(0.070)	(0.556)	(0.193)	(0.059)	(0.055)	(0.363)	(0.318)	(0.177)	(0.174)	(1.320)
FRNUM3	-0.434**	-0.167**	0.030	0.356	-0.554**	-0.162***	-0.035	-0.006	0.289	-0.613**	0.365^{x}	4.070**
	(0.179)	(0.079)	(0.065)	(0.412)	(0.222)	(0.063)	(0.058)	(0.327)	(0.490)	(0.267)	(0.252)	(1.647)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step). $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 16 reveal the following. The presence of more than one FR significantly reduces total public spending in all countries, with a magnitude lower compared with our benchmark findings. Comparing developed and developing countries reveals interesting differences: while in the former the decrease of public spending is weaker in countries with more than one FR, in the latter a high number of FR does no longer significantly affect total spending, i.e. the coefficient of FRNUM3 is not significant. Moreover, such differences between the two groups of countries are equally observed for public consumption. Increasing

the number of rules weakens (in absolute value) the magnitude of their effect on public consumption in developed countries (comparable to the findings for all countries), but increases the contraction of public consumption in developing countries. Lastly, while the response of public investment is not changed by the presence of several FR both in all countries and in developed countries, public investment significantly increases in developing countries with at least two FR and—although with a weaker statistical significance—at least three FR. As a result, a higher number of FR triggers a robust and high-magnitude change in the composition of public spending, towards a higher public investment-to-public consumption ratio.

To summarize, having more than one FR always reduces the magnitude of the contraction of total public spending. However, as the number of FR increases, the decrease of public consumption is weaker in developed countries, but higher in developing countries. As a result, public investment is not significantly affected in the former, but significantly increases in the latter, which influences the composition effect: having more than one FR increases the magnitude of the public investment-to-public consumption ratio in developing countries but has no significant effect on this ratio in developed countries. In a nutshell, while more fiscal rules reduce fiscal discipline in both developed and developing countries, the latter may take advantage to increase their public investment.

9.2.4 Investment-friendly rules

Another interesting feature of fiscal rules is the extent to which they are designed to protect public investment; for example, the UK defined a "golden rule" that excludes public investment from the target, and Germany limits the net borrowing to the level of investment (except in times of imbalances). Using IMF data that signals the presence or not of this feature, we construct two dummy variables. First, FRINV1 equals 1 if a country presents in a given year a fiscal rule that does not specify a feature to protect public investment at the national or supranational level, and 0 otherwise (in particular, we drop observations for which the existing fiscal rules protect public investment). Second, FRINV2 equals 1 when fiscal rules are combined with public investment protection features at either the national or supranational level, and 0 otherwise (in particular, we exclude observations for which fiscal rules that are not backed-up by measures to protect public investment).

Table 17: Investment-friendly rules

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
FRINV1	-0.825***	-0.357***	0.026	1.251**	-0.719**	-0.285***	-0.058	0.997*	-0.584**	-0.475***	-0.157^{x}	0.357
	(0.184)	(0.075)	(0.065)	(0.503)	(0.284)	(0.085)	(0.083)	(0.516)	(0.249)	(0.134)	(0.104)	(0.897)
FR	-0.885***	-0.342***	0.064	1.517***	-0.827***	-0.276***	-0.044	0.694^{x}	-0.771***	-0.367**	0.169	2.358**
Benchmark	(0.174)	(0.076)	(0.073)	(0.580)	(0.221)	(0.071)	(0.072)	(0.441)	(0.259)	(0.143)	(0.133)	(1.188)
FRINV2	-1.385***	-0.410***	0.118	2.663**	-1.237***	0.131	-0.083	-0.141	-1.092***	-0.779***	0.560**	8.311***
	(0.286)	(0.139)	(0.145)	(1.236)	(0.463)	(0.148)	(0.186)	(1.084)	(0.412)	(0.238)	(0.243)	(2.242)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 17 reveal the following. First, the public investment feature enforces the fiscal discipline behavior of fiscal rules, as the significant contraction of total spending is enforced in all countries, and also in developed and developing countries (compare lines 1 and 3; line 2 recalls our benchmark findings based on a measure for the presence of fiscal rules that includes fiscal rules without and with public investment protection features). However, public consumption is found to significantly decrease only in developing countries. Second, while public investment is not found to be significantly affected in all and in developed countries, evidence for developing countries is much more clear-cut. Contrary to fiscal rules without public investment features that reduce public investment (with a 15% significance level), the presence of this feature makes fiscal rules to significantly increase public investment relative to comparable developing countries without fiscal rules. Lastly, except for developed countries, the presence of the public investment-protection features improves the public investment-to-public consumption ratio. In all countries the magnitude of this composition effect doubles, while in developing countries it changes from not significant to positive (and significant) owing to a significant increase in public investment.

To summarize, enabling features that protect public investment always improves the fiscal-discipline effect of fiscal rules, and at the same time significantly increases public investment in developing countries.

9.3 Features of each type of disaggregated fiscal rules

9.3.1 Monitoring outside the government

Using the IMF's database, we recover information on the presence of monitoring institutions outside the government. For each type of disaggregated fiscal rule, namely ER, DR, and BBR, we build two dummy variables. First, ERMON1 equals 1 if a country presents an

expenditure rule but does not present a monitoring institution, and 0 otherwise (in particular, we exclude observations in which expenditure rules are backed up by monitoring features, be them supranational or national). Second, ERMON2 equals 1 if a country presents both an expenditure rule and monitoring features (be them supranational or national), and 0 otherwise (in particular, we exclude observations with expenditure rules that are not supported by monitoring features). Following the same strategy, we build the dummy variables corresponding to DR (namely, DRMON1 and DRMON2) and to BBR (namely, BBRMON1 and BBRMON2).

Table 18: Monitoring outside the government

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
ERMON1	0.168	0.019	-0.042	0.073	–	–	–	–	-0.725***	-0.627***	0.066	1.279^{x}
	(0.200)	(0.075)	(0.097)	(0.742)	–	–	–	–	(0.255)	(0.115)	(0.123)	(0.885)
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
Benchmark	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
ERMON2	-0.130	-0.286***	-0.010	0.258	-0.021	-0.245***	0.028	0.274	-0.568***	-0.167*	-0.048	0.708
	(0.155)	(0.053)	(0.043)	(0.236)	(0.247)	(0.062)	(0.051)	(0.272)	(0.218)	(0.097)	(0.089)	(0.531)
DRMON1	-0.493^{x}	0.089	-0.126	-0.460	-0.666*	-0.204**	0.312***	2.675***	-0.426	0.310	-0.151	-0.809
	(0.314)	(0.177)	(0.148)	(1.070)	(0.396)	(0.098)	(0.087)	(0.514)	(0.406)	(0.239)	(0.199)	(1.573)
DR	-0.830***	-0.361***	0.082	1.629***	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
Benchmark	(0.202)	(0.089)	(0.082)	(0.586)	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
DRMON2	-1.057***	-0.422***	0.035	1.451**	-1.030***	-0.205**	0.132*	0.928**	-1.245***	-0.919***	0.397*	7.191***
	(0.221)	(0.095)	(0.090)	(0.647)	(0.269)	(0.086)	(0.070)	(0.402)	(0.404)	(0.216)	(0.223)	(1.881)
BBRMON1	-0.693***	-0.139	0.242**	1.986**	–	–	–	–	-0.161	-0.011	0.133	0.575
	(0.214)	(0.102)	(0.100)	(1.011)	–	–	–	–	(0.251)	(0.141)	(0.120)	(1.252)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
Benchmark	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
BBRMON2	-1.060***	-0.311***	0.025	1.113*	-1.020***	-0.234***	0.006	0.416	-1.344***	-0.837***	0.381*	6.188***
	(0.212)	(0.090)	(0.088)	(0.654)	(0.273)	(0.085)	(0.077)	(0.418)	(0.360)	(0.201)	(0.197)	(1.732)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations in Table 18 show the following. First, the presence of monitoring institutions outside the government mostly raises the significance and the magnitude of the effect of DR and BBR on total public spending, while the effect of ER remains not significant in all and developed countries and negative in developing countries. Moreover, monitoring institutions make the various types of fiscal rules to significantly reduce public consumption (except for some magnitude loss in the effect of ER in developing countries), but mostly let public investment unchanged—except for a significance loss for BBR for all countries (and a magnitude loss for DR in developed countries), and a significance gain for DR and BBR in developing countries. As a result, the ratio of public investment-to-public consumption is

never significantly affected by ER, positive in all and developing countries under BBR, and positive in all groups of countries under DR.

To summarize, the presence of monitoring institutions outside the government is mostly unimportant for the effect of ER, except for a significant contraction of public consumption in all and in developed countries. On the contrary, monitoring enforces the fiscal discipline-impact of DR and BBR by contributing to a stronger decrease of total public spending. While the contraction of public consumption is equally almost always stronger (in absolute value), monitoring has mixed effects on public investment since it may reduce the significance or the magnitude of the effect of fiscal rules, but also turn the effect of some fiscal rules from not significant into positive in developing countries.

9.3.2 Formal enforcement procedures

Aside from being monitored, fiscal rules are subject sometimes to formal enforcement procedures that usually involve close monitoring of adjustment measures, automatic tightening of the targets affecting future budgets, and even correcting actions, with the goal of preventing future governments' reputational costs (Schaechter et al., 2012). Using data from the IMF, we build two dummy variables to study its influence on the effect of each type of fiscal rule, namely ER, DR, and BBR, on public spending. First, ERENF1 equals 1 if a country has an ER but no formal enforcement procedure (be it national or supranational), and 0 otherwise (in particular, we drop countries that present both an ER and an enforcement procedure). Second, ERENF2 equals 1 if a country has both an ER and a formal enforcement procedure (be it national or supranational), and 0 otherwise (in particular, we drop countries that present an ER but no enforcement procedure). In a similar way, we build the corresponding dummy variables for DR (DRENF1 and DRENF2) and for BBR (BBRENF1 and BBRENF2).

Table 19: Formal enforcement procedures

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
ERENF1	0.358**	-0.102^{x}	-0.104	-0.297	0.505*	-0.076	-0.243***	-0.945**	-0.226	-0.246*	-0.056	0.407
	(0.179)	(0.063)	(0.077)	(0.482)	(0.283)	(0.062)	(0.073)	(0.421)	(0.313)	(0.138)	(0.156)	(1.152)
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
Benchmark	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
ERENF2	-0.321*	-0.271***	0.146**	1.315***	-0.544*	-0.188**	0.048	0.408	-1.232***	-0.574***	0.036	1.333***
	(0.174)	(0.059)	(0.059)	(0.462)	(0.313)	(0.076)	(0.070)	(0.523)	(0.212)	(0.093)	(0.062)	(0.380)
DRENF1	-0.902***	-0.346***	0.093	1.633***	-0.911***	-0.188**	0.097	0.816**	-0.921***	-0.392**	0.499**	6.202***
	(0.198)	(0.080)	(0.080)	(0.604)	(0.276)	(0.086)	(0.071)	(0.405)	(0.325)	(0.169)	(0.196)	(1.783)
DR	-0.830***	-0.361***	0.082	1.629***	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
Benchmark	(0.202)	(0.089)	(0.082)	(0.586)	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
DRENF2	-0.733**	-0.161	-0.581***	-1.927*	-0.443	-0.384*	1.457***	-0.669	0.070	-0.604**	-0.019	2.775^{x}
	(0.363)	(0.181)	(0.155)	(1.017)	(0.775)	(0.224)	(0.541)	(1.397)	(0.519)	(0.267)	(0.253)	(1.715)
BBRENF1	-0.571***	-0.198**	0.276***	1.970**	–	0.111	0.130	1.359**	-0.362^{x}	-0.133	0.427***	2.056^{x}
	(0.186)	(0.094)	(0.089)	(0.954)	–	(0.102)	(0.100)	(0.641)	(0.244)	(0.142)	(0.127)	(1.394)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
Benchmark	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
BBRENF2	-1.134***	-0.308***	0.042	1.246*	-1.096***	-0.295***	0.110	1.286***	-1.181***	-0.807**	0.372*	5.786***
	(0.214)	(0.089)	(0.089)	(0.682)	(0.269)	(0.186)	(0.084)	(0.497)	(0.389)	(0.215)	(0.213)	(1.769)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 19 show the following. First, the way formal enforcement procedures influence the effect of fiscal rules on public spending depends upon the type of fiscal rule. On the one hand, ER with enforcement procedures are found to significantly reduce total spending, compared with a positive effect of ER without enforcement procedures in all and developed countries. In addition, enforcement procedures increase (in absolute value) the magnitude of the public spending reduction following the adoption of BBR. On the other hand, enforcement procedures reduce the magnitude of the effect of DR on total spending, and even turn it into not significant in developed and developing countries. Second, while such findings are comparable for public consumption, the response of public investment is rather different. Public investment is no longer decreased by ER with formal enforcement procedures, and even increases for all countries; BBR with enforcement procedures mostly reduce the magnitude and significance of the positive response of public investment; and enforcement procedures are found to trigger a negative impact of DR on public investment in all and developing countries but a positive effect in developed countries. Lastly, while the response of the public investment-to-public consumption ratio is mostly positive, its change following the adoption of DR is not significant and even negative for all countries.

To summarize, the effect of formal enforcement procedures on fiscal discipline is mixed. Such procedures support fiscal discipline when combined with ER and BBR, but the opposite

is found for DR. In addition, while public investment is protected and even increased by ER combined with formal enforcement procedures, the opposite is found for DR (except for a significant increase in developed countries).

9.3.3 Escape clauses

In search for more flexibility, some countries adopted well-defined escape clauses with the goal of managing unexpected (including rare) events (Eyraud et al., 2018). Such escape clauses should be seen as a combination between two features. On the hand, they allow countries to overlook (i.e. deviate) from the constraints imposed by the fiscal rule under such unexpected events. However, on the other hand, they allow to do so under very particular conditions, which imply clear procedures when the country could break the rule and when to return to the rule; this may improve the credibility of the fiscal rule itself—and hence the name *well-defined* escape clauses. These two features may influence in a rather opposite way the governments' behavior in terms of public spending in the presence of fiscal rules with escape clauses.

Using IMF data, we construct two dummy variables for each of the three types of fiscal rules, namely ER, DR, and BBR. First, ERESC1 equals 1 if a country presents an ER but not a well-defined escape clause procedure, and 0 otherwise (in particular, we drop observations with ER and with an escape clause). Second, ERESC2 equals 1 if a country presents an ER and a well-defined escape clause procedure, and 0 otherwise (in particular, we drop observations with ER but without an escape clause). Computed analogously, the corresponding dummy variables are DRESC1 and DRESC2 for DR, and BBRESC1 and BBRESC2 for BBR.

Table 20: Well-defined escape clauses

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
ERESC1	0.121	-0.091*	0.014	0.283	0.239	-0.074	-0.039	0.309	-0.795***	-0.461***	-0.062	0.408
	(0.158)	(0.054)	(0.070)	(0.500)	(0.263)	(0.059)	(0.072)	(0.522)	(0.278)	(0.122)	(0.137)	(0.990)
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
Benchmark	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
ERESC2	-0.475***	-0.352***	-0.051	0.409	-1.271**	-0.204	-0.240**	-1.298*	-0.890***	-0.647***	0.059	1.584***
	(0.227)	(0.089)	(0.070)	(0.439)	(0.589)	(0.165)	(0.121)	(0.668)	(0.234)	(0.108)	(0.076)	(0.519)
DRESC1	-0.937***	-0.312***	0.033	1.453*	-0.891***	-0.165*	-0.002	0.454	-1.171***	-0.422**	0.419**	5.239***
	(0.214)	(0.089)	(0.101)	(0.793)	(0.297)	(0.086)	(0.086)	(0.508)	(0.357)	(0.171)	(0.204)	(1.833)
DR	-0.830***	-0.361***	0.082	1.629***	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
Benchmark	(0.202)	(0.089)	(0.082)	(0.586)	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
DRESC2	-0.540*	-0.163	0.010	0.744	0.054	-0.306*	0.487***	1.594**	0.604	-0.800***	0.360^{x}	6.211***
	(0.303)	(0.139)	(0.104)	(0.659)	(0.604)	(0.184)	(0.147)	(0.779)	(0.496)	(0.292)	(0.228)	(1.654)
BBRESC1	-0.985***	-0.238***	0.045	0.720	-0.842***	-0.139*	-0.088	0.332	-1.027***	-0.296**	0.392**	2.299
	(0.195)	(0.078)	(0.092)	(0.812)	(0.281)	(0.085)	(0.097)	(0.588)	(0.300)	(0.144)	(0.170)	(1.667)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
Benchmark	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
BBRESC2	-0.509**	-0.122	0.114	1.855***	-0.933*	-0.303**	0.309**	2.628***	0.087	-0.574**	0.237	4.408***
	(0.249)	(0.110)	(0.093)	(0.695)	(0.482)	(0.142)	(0.132)	(0.817)	(0.372)	(0.229)	(0.181)	(1.410)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step). $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 20 show the following. First, as expected, escape clauses reduce (in absolute value) the magnitude of the impact of DR and BBR on total public spending for all countries. On the contrary, ER with well-defined escape clauses trigger a significant decrease of total spending, which may be related to the fact that well-defined escape clauses contain additional procedures that may guide governments towards improving their compliance with the ER. Similarly, the presence of escape clauses magnifies the public consumption decrease triggered by ER, but makes it statistically not significant for DR and BBR. Although escape clauses do not influence the reaction of public investment in all countries—which remains non-significant irrespective of the considered fiscal rule—we observe in the composition effect a significance loss for DR and a significance gain for BBR. Second, escape clauses are related with differences in governments' behavior between developed and developing countries. For ER and DR the results are comparable with those for all countries, but for BBR escape clauses enforce the decrease of total spending in developed countries and make them not to significantly change in developing countries. This difference in the effect of BBR is not echoed by differences in the response of public consumption (which is always decreased more in absolute value by the presence of escape clauses for all types of fiscal rules), but by different responses of public investment that significantly increases in developed countries but not in developing countries. Lastly, while escape clauses cancel the

significance of the public investment increase with respect to DR and BBR in developing countries, they make ER to trigger a significant contraction of public investment in developed countries.

To summarize, escape clauses yield opposite effects depending on both the type of fiscal rule and group of countries. Well-defined escape clauses mostly reduce the fiscal discipline effects of BBR and DR, with reversed effects for ER. In addition, while public consumption is little affected by escape clauses, their presence notably influences the behavior of public investment. In developed countries, the presence of well-defined escape clauses makes ER to significantly decrease public investment, and DR and BBR to significantly increase it. However, the opposite is true in developing countries: the favorable impact of both DR and BBR on public investment becomes mostly not significant in the presence of well-defined escape clauses.

9.3.4 Legal basis

Another feature of fiscal rules that may influence their effect on public spending is their statutory or legal basis. According to the IMF data, fiscal rules may have five types of legal basis, namely: political commitment, coalition agreement, statutory, international treaty, and constitutional. Based on this data, we build—for each of the various types of fiscal rules, namely ER, DR, and BBR—two dummy variables to apprehend the role of the legal basis. First, the variable ERLEG1 equals 1 if a country presents an ER but none of the five types of legal basis reported above, and 0 otherwise (in particular, we exclude observations with an ER and with a form of legal basis). Second, ERLEG2 equals 1 if a country presents an ER with at least one form of legal basis be it national or supranational, and 0 otherwise (in particular, we exclude observations with an ER but with no legal basis). In a similar way, we build the dummy variables DRLEG1 and DRLEG2 (for DR) and BBRLEG1 and BBRLEG2 (for BBR).

Table 21: Legal basis

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
Benchmark	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
ERLEG2	-0.162	-0.256***	-0.027	0.479	-0.140	-0.164***	-0.050	0.206	-0.878***	-0.640***	-0.129	0.371
	(0.143)	(0.050)	(0.058)	(0.398)	(0.213)	(0.052)	(0.055)	(0.375)	(0.232)	(0.102)	(0.107)	(0.690)
ERLEG2LOW	0.174	0.079^{x}	0.136*	0.595	–	–	–	–	0.332	0.829***	0.969***	4.099***
	(0.188)	(0.054)	(0.081)	(0.419)	–	–	–	–	(0.596)	(0.175)	(0.279)	(1.431)
ERLEG2HIGH	-0.410**	-0.396***	0.033	1.416***	-0.566*	-0.285***	-0.007	0.642	-0.789***	-0.636***	-0.002	0.709
	(0.181)	(0.066)	(0.065)	(0.533)	(0.300)	(0.075)	(0.074)	(0.555)	(0.200)	(0.091)	(0.084)	(0.631)
DR	-0.830***	-0.361***	0.082	1.629***	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
Benchmark	(0.202)	(0.089)	(0.082)	(0.586)	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
DRLEG2	-0.868***	-0.367***	0.068	1.514***	-0.921**	-0.200**	0.098^{x}	0.765**	-0.846**	-0.456**	0.265^{x}	4.039***
	(0.204)	(0.090)	(0.083)	(0.589)	(0.255)	(0.081)	(0.067)	(0.380)	(0.335)	(0.179)	(0.175)	(1.429)
DRLEG2LOW	-0.464	0.033	-0.046	0.118	–	–	–	–	-1.424*	0.031	-0.630**	-5.541***
	(0.393)	(0.174)	(0.167)	(1.134)	–	–	–	–	(0.732)	(0.407)	(0.284)	(1.899)
DRLEG2HIGH	-0.904***	-0.372***	0.069	1.651***	-0.996***	-0.206**	0.105*	0.871**	-0.834**	-0.584***	0.346*	5.443***
	(0.212)	(0.093)	(0.088)	(0.625)	(0.267)	(0.085)	(0.071)	(0.401)	(0.355)	(0.191)	(0.195)	(1.435)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
Benchmark	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
BBRLEG2	-0.973***	-0.327***	0.101	1.632***	-0.976***	-0.267***	0.034	1.065**	-0.852***	-0.299**	0.251*	2.515*
	(0.173)	(0.074)	(0.073)	(0.581)	(0.226)	(0.174)	(0.073)	(0.450)	(0.267)	(0.148)	(0.141)	(1.287)
BBRLEG2LOW	-0.849***	-0.075	-0.040	0.071	0.929*	0.364*	-0.075	-0.397	-1.593***	-0.415**	-0.605***	-3.963**
	(0.261)	(0.105)	(0.108)	(0.669)	(0.515)	(0.198)	(0.139)	(0.693)	(0.496)	(0.200)	(0.236)	(1.652)
BBRLEG2HIGH	-0.944***	-0.331***	0.119^{x}	1.772***	-1.003***	-0.274***	0.054	1.114**	-0.845***	-0.324***	0.266*	2.816**
	(0.181)	(0.078)	(0.076)	(0.612)	(0.246)	(0.079)	(0.079)	(0.488)	(0.268)	(0.154)	(0.143)	(1.319)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 21 show the following. Due to a very low number of treated observations (i.e. below 5), we decided not to report estimations for the variables ERLEG1, DRLEG1 and BBRLEG1; as such, we may compare the effect of the variables ERLEG2, DRLEG2 and BBRLEG2 with our benchmark findings reported for each type of fiscal rule. However, given that these variables are fairly close to ER, DR, and BBR, respectively, we can not observe adequately the influence of the legal basis (i.e. the estimated effects are fairly close to our benchmark findings).

Consequently, we adopt a different strategy by creating two additional dummy variables that exploit variations in the type of the legal basis. On the one hand, the variable ERLEG2LOW equals 1 if a country presents an ER with what we label as a "soft" legal basis, namely political commitment or coalition agreement, and 0 otherwise (in particular, we exclude observations with an ER and with no or other than soft legal basis). On the other hand, the variable ERLEG2HIGH equals 1 if a country presents an ER with what we label

as a "hard" legal basis, namely statutory, international treaty, or constitutional, and 0 otherwise (in particular, we exclude observations with an ER and with no or other than hard legal basis). We build in an analogous way the four dummy variables for the remaining two types of fiscal rules, namely DRLEG2LOW and DRLEG2HIGH (for DR), and BBRLEG2LOW and BBRLEG2HIGH (for BBR).

Evidence it Table 21 reveals the following. First, in most cases, a hard—but not a soft—legal basis is associated with a significant decrease in total spending; this is the case for example for all groups of countries with ER, for all countries with DR, and for developed countries with BBR (under a soft legal basis, total spending even significantly increase under BBR in developed countries). Instead, in developing countries, under both soft and hard legal basis DR and BBR significantly reduce total spending. Second, such legal basis-driven differences are even more obvious for public consumption and public investment. Regarding the former, except for BBR in developing countries, fiscal rules with hard legal basis are significantly reducing public consumption (while fiscal rules with soft legal basis leave it either significantly unchanged or even increase it, e.g. ER in developing countries or BBR in developed countries). Regarding the latter, public investment is no longer significantly increased (as under soft legal basis) but not statistically affected by ER with hard legal basis, while no longer unaffected (as under soft legal basis) but increased under DR and BBR with hard legal basis. Lastly, regarding the composition effect, while under soft legal basis the ratio public investment-to-public consumption is mostly non-significant or even negative (in developing countries for DR and BBR), under hard legal basis this ratio is positive and significant for almost all groups of countries and types of fiscal rules (except for ER in developing countries).

To summarize, hard legal basis seems—contrary to soft legal basis—to be an important determinant of the fiscal discipline effect of fiscal rules (except in developing countries for BBR and DR). Moreover, this is equally the case for the decrease in public consumption (with the same exceptions as for total public spending). Lastly, contrary to its impact when combined with ER, hard legal basis protects public investment following the adoption of DR and BBR, and even—against the negative effect observed for soft legal basis—consistently increase it in developing countries.

9.3.5 Supranational and national fiscal rules

In our benchmark estimations we combine observations with supranational fiscal rules (SFR), national fiscal rules (NFR), and both supranational and national fiscal rules (BFR).

Using disaggregated data on each type of fiscal rule (ER, DR, and BBR) from the IMF database, we explore in Table 22 potential differences between SFR, NFR, and BFR.

Table 22: Supranational and national fiscal rules

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
Benchmark	All Countries				Developed Countries				Developing Countries			
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
DR	-0.830***	-0.361***	0.082	1.629***	-0.921***	-0.200**	0.098^{x}	0.765**	-0.808**	-0.456***	0.297*	4.425***
	(0.202)	(0.089)	(0.082)	(0.586)	(0.255)	(0.081)	(0.067)	(0.380)	(0.324)	(0.174)	(0.170)	(1.407)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
ER-SFR	-0.920***	-0.331***	-0.301***	-1.865***	-1.458**	-0.300*	-0.304**	-1.586**	0.216	0.164	1.240***	18.10***
	(0.316)	(0.096)	(0.091)	(0.550)	(0.649)	(0.155)	(0.137)	(0.771)	(0.321)	(0.164)	(0.144)	(1.034)
DR-SFR	-1.017***	-0.345***	0.052	1.876**	-1.010***	-0.203*	0.182**	1.064***	-1.272***	-1.226***	0.680**	9.530***
	(0.269)	(0.118)	(0.112)	(0.799)	(0.336)	(0.107)	(0.075)	(0.406)	(0.442)	(0.254)	(0.270)	(2.183)
BBR-SFR	-1.206***	-0.241**	0.007	1.350^{x}	-1.317***	-0.356***	0.088	1.120*	-1.171***	-1.218***	0.609**	8.984***
	(0.280)	(0.191)	(0.125)	(0.912)	(0.382)	(0.110)	(0.111)	(0.605)	(0.434)	(0.250)	(0.264)	(2.163)
ER-NFR	0.130	-0.113*	0.019	0.372	0.239	-0.074	-0.039	0.309	-0.896***	-0.827***	-0.020	1.120^{x}
	(0.160)	(0.058)	(0.068)	(0.493)	(0.263)	(0.059)	(0.072)	(0.522)	(0.252)	(0.108)	(0.111)	(0.714)
DR-NFR	-0.544**	-0.037	0.001	0.762	-0.354	-0.281***	0.288***	1.860***	-0.243	0.077	0.118	1.499
	(0.265)	(0.133)	(0.118)	(0.980)	(0.305)	(0.103)	(0.083)	(0.479)	(0.326)	(0.170)	(0.160)	(1.385)
BBR-NFR	-0.725***	-0.191**	0.191**	1.827**	–	0.047	-0.394**	0.316	-0.550**	-0.096	0.198*	0.714
	(0.192)	(0.090)	(0.090)	(0.913)	–	(0.147)	(0.136)	(0.944)	(0.224)	(0.121)	(0.109)	(1.191)
ER-BFR	-1.155**	-0.043	-0.517***	-2.358***	-1.350**	0.067	-0.209*	-1.118*	-0.865***	-0.149	-0.209**	0.624
	(0.287)	(0.117)	(0.095)	(0.567)	(0.537)	(0.178)	(0.191)	(0.651)	(0.238)	(0.113)	(0.192)	(0.673)
DR-BFR	-1.279***	-0.302***	-0.070	0.630	-0.886^{x}	0.012	0.219	2.051*	-0.267	-0.517***	-0.492***	-1.625**
	(0.243)	(0.090)	(0.087)	(0.515)	(0.575)	(0.184)	(0.192)	(1.235)	(0.292)	(0.135)	(0.103)	(0.689)
BBR-BFR	-0.859***	-0.296***	-0.063	0.277	-0.854**	-0.021	-0.016	-0.002	-1.620***	-0.787***	-0.222***	0.366
	(0.203)	(0.074)	(0.053)	(0.268)	(0.412)	(0.148)	(0.109)	(0.550)	(0.249)	(0.128)	(0.081)	(0.534)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

To ease up the comparison with our previous results, we recall in the first three lines of Table 22 our findings obtained when mixing SFR, NFR and BFR for the various types of FR, namely ER, DR, and BBR. These findings show that fiscal rules mostly reduce total public spending (the coefficient is significant and negative in 7 out of 9 cases) and public consumption (in all 9 cases), leave public investment mostly unchanged (in 7 out of 9 cases), and mostly increase the public investment-to-public consumption ratio (in 6 out of 9 cases). Using these results as a baseline, the remaining nine lines of Table 22 present the impact of SFR, NFR, and BFR on the various types of public spending, respectively.

Our results are as follows. First, the effect of SFR is comparable with our benchmark findings, except for a significant increase in public investment (in 4 out of 9 cases). Important exceptions are related to the effect of ER. On the one hand, contrary to all ER, supranational

ER significantly reduce total spending in all and in developed countries (with reversed findings for developing countries). On the other hand, supranational ER significantly decrease public investment in all and in developed countries, and as such make the composition effect to significantly decrease: the contraction of public investment overweighs that of public consumption. Second, NFR leave the various types of public spending mostly statistically unchanged; in particular, total public spending are significantly reduced in only 4 out of 8 cases. Moreover, public consumption is mostly not significant (in 5 out of 9 cases), which—combined with the lack of significance of public investment (in 5 out of 9 cases)—makes the composition effect to equally become not significant (in 7 out of 9 cases). Interestingly, the response of public investment may be contradictory: while it increases following the adoption of DR in developed countries and BBR in all and developing countries, it decreases following the adoption of BBR in developed countries. Third, except for the significant decrease in total spending (in 7 out of 9 cases), the influence of BFR is fairly different with respect to our benchmark finding. The reaction of public consumption is mostly not significant (in 5 out of 9 cases) or negative (in 4 out of 9 cases). Importantly, public investment mostly significantly decreases (in 5 out of 9 cases), leading to a significant decrease in the composition effect (in 3 out of 9 cases): the public investment contraction is significant and the response of public consumption is not significant following the adoption of ER in all and developed countries, while the relative contraction of public investment overweighs (in absolute value) that of public consumption following the adoption of DR in developing countries.

To summarize, although supranational and national FR significantly reduce total spending in most cases, the former outperforms the latter (8 out of 9 versus only 4 out of 8 estimated coefficients). However, while SFR robustly reduce public consumption, NFR—both alone and when combined with SFR—trigger a slighter reduction of public consumption. Moreover, public investment is significantly reduced in developing countries by BFR irrespective of their type (namely, ER, DR, and BBR), and by ER that are both national and supranational irrespective of the group of countries (namely, all, developed, or developing). On the contrary, all types of SFR (namely, ER, DR, and BBR) significantly improve public investment in developing countries.

9.4 Features specific only to a type of fiscal rule

9.4.1 Balanced-budget targets expressed as cyclically-adjusted or in multi-year terms

A particular feature of fiscal rules—and particularly of balanced-budget rules (BBR)—is the fact that they can be expressed in cyclically-adjusted terms or for a multi-year period, with the aim of combining the sustainability objective with the flexibility needed to face economic shocks. Using IMF data on such an arrangement, we construct two dummy variables. First, BBRCA1 equals 1 if a country presents a BBR that is not expressed in cyclically-adjusted terms or for a multi-year period, and 0 otherwise (in particular, we drop observations with BBR that present this feature). Second, BBRCA2 equals 1 only for countries with BBR expressed in cyclically-adjusted terms or for a multi-year period, and 0 otherwise (in particular, we drop observations with BBR that do not present this feature).

Table 23: Balanced-budget targets expressed as cyclically-adjusted or in multi-year terms

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
BBRCA1	-1.039***	-0.248**	0.169^{x}	1.717*	-1.153***	-0.192*	-0.312*	0.415	-0.840***	-0.315*	0.397**	3.618**
	(0.238)	(0.113)	(0.118)	(1.044)	(0.389)	(0.116)	(0.161)	(1.224)	(0.309)	(0.177)	(0.174)	(1.649)
BBR	-0.957***	-0.327***	0.111^{x}	1.719***	-0.976***	-0.267***	0.034	1.065**	-0.823***	-0.317**	0.277**	2.895**
Benchmark	(0.172)	(0.074)	(0.072)	(0.580)	(0.226)	(0.074)	(0.073)	(0.450)	(0.261)	(0.144)	(0.138)	(1.271)
BBRCA2	-0.910***	-0.345***	-0.001	0.435	-0.919**	-0.220*	-0.054	-0.091	-0.507**	-0.484***	0.049	1.025^{x}
	(0.199)	(0.070)	(0.058)	(0.365)	(0.360)	(0.116)	(0.092)	(0.474)	(0.229)	(0.106)	(0.088)	(0.709)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step). $^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

Estimations reported in Table 23 reveal the following. First, although the presence of BBR specified in cyclically-adjusted terms or for a multi-year period still significantly reduces total spending, the magnitude of this effect is lower in all groups of countries, and particularly in developing countries (a decrease of around 40% when comparing lines 1 and 3). Second, while the contraction of public consumption is slightly higher in all countries, public investment reacts differently in developed and developing countries when BBR are specified in cyclically-adjusted terms or for a multi-year period. While the decrease of public investment is no longer significant in developed countries, its increase is no longer significant in developing countries. Lastly, these opposite dynamics shape the composition effect, which in particular is only weakly-significant (at the 15% level) in developing countries.

To summarize, the presence of cyclically-adjusted terms or a multi-year period feature

reduces the fiscal discipline effect of BBR, particularly in developing countries. In addition, while public consumption is little affected, public investment is protected from decreasing in developed countries but prevented from increasing in developing countries. Even if a stabilization feature—such as expressing the target in cyclically-adjusted terms—could provide operational guidance for governments, our results suggest that too much "sophistication" rather complicates the implementation of rules, by making them to be more difficult to be monitored and communicated especially in countries with limited technical proficiencies of the institutions responsible for policy implementation.

9.4.2 Multi-year expenditure ceilings

Fiscal rules may present multi-year expenditure ceilings. According to the IMF database, such ceilings are more popular at aggregate level, but sometimes that can be applied at ministry or even line-item level. The largest majority of multi-year expenditure ceilings come together with ER, namely for around 75% of observations. Consequently, after dropping observations with ceilings but not ER, we create two dummy variables.[12] First, ERCEIL1 equals 1 if a country presents an ER that is not backed-up by multi-year expenditure ceilings—be them concerned with aggregate, ministry or line item expenditure, and 0 otherwise (in particular, we exclude observations with ER and a form of multi-year expenditure ceiling). Second, ERCEIL2 equals 2 if a country presents an ER and a multi-year expenditure ceiling, and 0 otherwise (in particular, we exclude observations with ER and without any form of multi-year expenditure ceiling).

Table 24: Multi-year expenditure ceilings

	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C	[1]TPS	[2]C	[3]I	[4]I/C
	All Countries				Developed Countries				Developing Countries			
ERCEIL1	-0.475***	-0.420***	-0.149**	0.205	-0.548***	-0.321***	-0.155**	-0.496	-1.137***	-0.787***	-0.187^{x}	-0.048
	(0.168)	(0.059)	(0.068)	(0.516)	(0.241)	(0.062)	(0.065)	(0.477)	(0.278)	(0.114)	(0.128)	(0.852)
ERnew	-0.192	-0.279***	-0.043	0.417	-0.106	-0.183***	-0.045	0.247	-0.901***	-0.707**	-0.131	0.442
	(0.148)	(0.051)	(0.059)	(0.412)	(0.231)	(0.055)	(0.059)	(0.396)	(0.234)	(0.102)	(0.108)	(0.698)
ER	-0.129	-0.255***	-0.047	0.374	-0.135	-0.173***	-0.079^{x}	0.058	-0.889***	-0.651***	-0.122	0.429
Benchmark	(0.142)	(0.049)	(0.058)	(0.396)	(0.211)	(0.052)	(0.055)	(0.369)	(0.231)	(0.101)	(0.107)	(0.690)
ERCEIL2	0.109	-0.094^{x}	0.085	0.560	0.436	-0.025	0.002	0.314	-1.063***	-0.700***	0.249**	2.802***
	(0.194)	(0.065)	(0.074)	(0.416)	(0.346)	(0.079)	(0.084)	(0.477)	(0.252)	(0.127)	(0.122)	(0.722)
Covariates (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE (2nd step)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. TPS=total public spending, C=public consumption, I=public investment, and I/C=public investment-to-public consumption ratio. Covariates and country- and time-fixed effects included in all estimations (2nd step).
$^{***}p < 0.01$. $^{**}p < 0.05$. $^{*}p < 0.10$. $^{x}p < 0.15$.

[12] One can also conserve all observations with ceilings. Since such observations may coexist with BBR or DR, our reference variable is the dummy that includes all FR. We report that results are consistent with our findings in the main text (estimations are available upon request).

Estimations are presented in Table 24. As a baseline, we report on line 2 estimations based on the modified ER dummy (*ERnew*), from which we dropped observations in which multi-year expenditure ceilings did not coexist with ER. As shown by line 2, findings are fairly close to our benchmark findings from the previous sections.

Turning to the main results, our findings are as follows. First, the presence of multi-year expenditure ceilings strongly affects the way ER influence total public spending. In all and in developed countries, the significant decrease we observe for countries without ceilings (line 1) vanishes in their presence (line 3); thus, it is the presence of expenditure ceilings that drives the lack of significant effect on total spending observed for ER (see line 2 for the modified ER, and also our benchmark estimations for the original ER). Besides, although such expenditure ceilings only marginally affect total spending in developing countries, their decrease is slightly weaker in absolute value. Second, while comparable findings arise for public consumption, public investment is affected differently in developed and developing countries. In the former, ER no longer significantly reduce public investment, but leave it statistically unchanged in the presence of expenditure ceilings. In the latter, public investment is no longer reduced by ER (at the 15% level), but significantly increased in the presence of expenditure ceilings. These changes make the sign of the composition effect to be positive, and even statistically-significant in developing countries.

To summarize, the presence of multi-year expenditure ceilings is an important driver of the lack of significant effect of ER on fiscal discipline in all and developed countries (and a reduction of this effect in developing countries). Moreover, while findings for public consumption are comparable with those for total spending, public investment seems to benefit from the presence of multi-year expenditure ceilings: ER either no longer significantly reduce public investment (in developed countries) or significantly increase it (in developing countries).

9.5 Summary of the results

We can summarize the findings of this section using Table 25. First, by further reducing total spending, some features of fiscal rules further support the fiscal discipline effect of fiscal rules, such as independent fiscal bodies, investment-friendly fiscal rules, supranational fiscal rules, monitoring outside the government, or a "hard" legal basis. On the contrary, other features weaken the fiscal discipline effect of fiscal rules, such as fiscal responsibility laws, a higher number of fiscal rules, national fiscal rules, or a "soft" legal basis; and also cyclically-adjusted or multi year features for BBR and expenditure ceilings for ER. Between them,

some features enforce or weaken the fiscal discipline effects of fiscal rules depending on the type of fiscal rule, such as formal enforcement procedures or escape clauses.

Second, while the response of public consumption is comparable to that of total spending (although some differences can arise between developed and developing countries), the impact of most features of fiscal rules on public investment is mixed. Opposite responses of public investment are observed in developed versus developing countries and across various types of fiscal rules, in the presence of some features including e.g. fiscal responsibility laws, supranational and national fiscal rules, monitoring outside the government, formal enforcement procedures, legal basis, or escape clauses. However, some features have more clear-cut effects. The presence of independent fiscal bodies, or a combination of both national and supranational fiscal rules is mostly detrimental for public investment (and mostly in developed countries). On the contrary, a higher number of fiscal rules, investment-friendly rules, and ER expenditure ceilings are beneficial for public investment, as their presence either makes public investment to no longer significantly decrease (mostly in developed countries) or to significantly increase (mostly in developing countries).

These findings—which are mostly in line with our hypotheses **H1** and **H2**—reveal that while the features of fiscal rules mainly determine the *magnitude* of the contraction of total spending and public consumption, they often determine the *significance* (and sometimes even the sign) of the effect of fiscal rules on public investment, thereby strongly affecting the significance of the public investment-to-public consumption ratio (i.e. the composition effect, hypothesis **H3**).

Table 25: A summary of the influence of the features of fiscal rules on the fiscal rules-public spending relationship.

	Feature of FR	**Total Public Spending**	**Public Consumption**	**Public Investment**		
A/ All fiscal rules together						
1. Independent fiscal bodies	Supp. proced./instit.	Higher	Weaker DV/ Higher DI	Weaker DV/DI		
2. Fiscal responsibility law	Supp. proced./instit.	Weaker	Little affected	Higher DV/ Weaker DI		
3. Number of FR	Other	Weaker	Weaker DV/ Higher DI	No effect DV / Higher DI		
4. Investment-friendly FR	Other	Higher	Weaker DV/ Higher DI	No effect DV / Higher DI		
B/ Types of FR (ER, DR, BBR)				*All countries*	*Developed (DV)*	*Developing (DI)*
1. Monitoring outside government	Enforcement	No effect ER / Higher DR BR	Higher (except w-ER-DI)	w-BBR	w-DR	h-DR h-BBR
2. Formal enforcement procedures	Enforcement	Higher ER BBR / Weaker DR	Higher ER BBR (except w-DR)	h-ER w-DR w-BBR	h-ER h-BBR	w-DR
3. Escape clauses	Flexibility	Higher ER / Weaker DR BR	Higher (except w-DR w-BBR)	No effect	w-ER h-DR h-BBR	w-DR w-BBR
4. Legal basis (Hard versus Soft)	Legal basis	Higher ER DR BR	Higher (except w-BR-DI)	w-ER	h-DR	w-ER h-DR h-BBR
5a. Supranational rules	Other	Higher	Higher	w-ER	w-ER h-DR	h-ER h-DR h-BBR
5b. National rules	Other	Weaker	Weaker	h-BBR	h-DR w-BBR	w-DR
5c. Both rules	Other	Mixed	Mostly Weaker	w-ER	w-ER	w-DR w-BBR
C/ **Only BBR/ER**						
1. BBR cycl.-adj. or multi-year	Flexibility	Weaker	Higher	Higher DV / Weaker DI		
2. ER expenditure ceilings	Supp. proced./instit.	Weaker	Weaker	Higher DV / DI		

Note: Higher signals a higher or more-significant response of total public spending or of public consumption (in absolute value), or of public investment, and Weaker has an opposite meaning. Abbreviations "w" and "h" stand for "weaker" and "higher", DV refers to developed countries and DI refers to developing countries, and ER, DR, and BBR signal expenditure, debt, and balanced-budget rules, respectively.

10 Conclusion

In this paper we investigated the way fiscal rules adoption shapes governments' public spending behavior. Confirming our three hypotheses, our main findings are that fiscal rules trigger a significant decrease of total spending and public consumption, a not-significant or a positive response of public investment, and a not-significant or a positive composition effect (i.e. the ratio between public investment and public consumption).

Moreover the significance and the magnitude of these effects were found to vary with both the type of fiscal rules and countries' level of economic development. Regarding the former, DR and BBR—but not ER—significantly reduce total public spending, and only BBR increase public investment in the full sample of countries (however, with weak significance). Regarding the latter, a positive and strongly-significant composition effect of fiscal rules is found only in developing countries. When combining the two, ER reduce total spending in developing but not in developed countries, while DR and BBR significantly increase public investment in developing but not in developed countries.

Lastly, our analysis provided a more granular perspective by looking at more disaggregated types of public spending and the various features of fiscal rules. In particular, while some features of fiscal rules are found to further support the fiscal discipline effects of fiscal rules, other were shown to weaken and even cancel it. In the same vein, only some features of fiscal rules are always detrimental or beneficial to public investment—in the latter case by either avoiding its decrease or triggering its significant increase.

By providing a systematic analysis of the way fiscal rules shape public spending, our contribution may stimulate future work on the consequences of fiscal rules. On the one hand, by suggesting that fiscal rules can have contradicting fiscal consequences, i.e. by sometimes promoting fiscal discipline and in the same time reducing public investment, it can motivate more research on the optimal design of fiscal rules. On the other hand, since different types of public spending—particularly public consumption and public investment—can have different effects on most macroeconomic outcomes (economic growth and inequality being first-order handful examples), our contribution may help clarifying the channels through which fiscal rules may exert such macroeconomic side-effects. Such issues are expected to receive major attention from researchers and policymakers in the post-Covid times.

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APPENDIX CHAPTER 3

How Do Fiscal Rules Shape Public Spending Composition?

Appendix 1. Definitions and sources of data

Variable	Measurement	Source	Description
General government revenue	Percent of GDP	World Economic Outlook	Revenue consists of taxes, social contributions, grants receivable, and other revenue. Revenue increases government's net worth, which is the difference between its assets and liabilities (GFSM 2001, paragraph 4.20). Note: Transactions that merely change the composition of the balance sheet do not change the net worth position, for example, proceeds from sales of nonfinancial and financial assets or incurrence of liabilities.
General government total expenditure	Percent of GDP	World Economic Outlook	Total expenditure consists of total expense and the net acquisition of nonfinancial assets. Note: Apart from being on an accrual basis, total expenditure differs from the GFSM 1986 definition of total expenditure in the sense that it also takes the disposals of nonfinancial assets into account.
General government gross debt	Percent of GDP	World Economic Outlook	Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future. This includes debt liabilities in the form of SDRs, currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts payable. Thus, all liabilities in the GFSM 2001 system are debt, except for equity and investment fund shares and financial derivatives and employee stock options. Debt can be valued at current market, nominal, or face values (GFSM 2001, paragraph 7.110).
GDP growth (annual %)	Annual %	World Development Indicators	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
Trade (% of GDP)	Percent of GDP	World Development Indicators	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
Population growth (annual %)	Annual %	World Development Indicators	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.
Inflation, GDP deflator (annual %)	Annual %	World Development Indicators	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.
General government final consumption expenditure (% of GDP)	Percent of GDP	World Development Indicators	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation.
General government investment (% GDP)	Percent of GDP	Author's calculations based on IMF Investment and Capital Stock	General government investment (gross fixed capital formation) over GDP.
Private investment (%GDP)	Percent of GDP	Author's calculations based on IMF Investment and Capital Stock	Private investment (gross fixed capital formation) over GDP.
Bureaucracy quality		ICRG database	The institutional strength and quality of the bureaucracy. Higher values are attributed to low-risk countries where the bureaucracy has the expertise to govern without drastic changes in policy or interruptions in government services.
Education expenditure	Percent of GDP	IFPRI SPEED database	Percentage of education expenditure in total GDP
Health expenditure	Percent of GDP	IFPRI SPEED database	Percentage of health expenditure in total GDP
Defence expenditure	Percent of GDP	IFPRI SPEED database	Percentage of defense expenditure in total GDP
Transport and communication expenditure	Percent of GDP	IFPRI SPEED database	Percentage of transport & communication expenditure in total GDP
Social protection expenditure	Percent of GDP	IFPRI SPEED database	Percentage of social protection expenditure in total GDP
Fuel expenditure	Percent of GDP	IFPRI SPEED database	Percentage of fuel expenditure in total GDP
Agriculture expenditure	Percent of GDP	IFPRI SPEED database	Percentage of agriculture expenditure in total GDP

Appendix 1. Definitions and sources of data (*continued*)

Variable	Measurement	Source	Description
FR	Dummy	Author's calculation, based on IMF FAD Database	Dummy: Fiscal Rule (numerical) in place (1 if yes, 0 if not)
BBR	Dummy	Author's calculation, based on IMF FAD Database	Dummy: Balanced-budget rule (numerical) in place (1 if yes, 0 if not)
DR	Dummy	Author's calculation, based on IMF FAD Database	Dummy: Debt Rule (numerical) in place (1 if yes, 0 if not)
ER	Dummy	Author's calculation, based on IMF FAD Database	Dummy: Expenditure Rule (numerical) in place (1 if yes, 0 if not)
ER_supra	Categorical	Author's calculation, based on IMF FAD Database	Expenditure rule at the national level (1), supranational level (2), or both (3)
BBR_supra	Categorical	Author's calculation, based on IMF FAD Database	Budget balance rule at the national level (1), supranational level (2), or both
DR_supra	Categorical	Author's calculation, based on IMF FAD Database	Debt rule at the national level (1), supranational level (2), or both (3)
monitor_n_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, national: Monitoring outside government (1 if yes, 0 if no)
monitor_n_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, national: Monitoring outside government (1 if yes, 0 if no)
monitor_n_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, national: Monitoring outside government (1 if yes, 0 if no)
monitor_s_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, supra: Monitoring outside government (1 if yes, 0 if no)
monitor_s_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, supra: Monitoring outside government (1 if yes, 0 if no)
monitor_s_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, supra: Monitoring outside government (1 if yes, 0 if no)
enforce_n_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, national: Formal enforcement procedure(1 if yes, 0 if no)
enforce_n_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, national: Formal enforcement procedure(1 if yes, 0 if no)
enforce_n_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, national: Formal enforcement procedure(1 if yes, 0 if no)
enforce_s_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, supra: Formal enforcement procedure(1 if yes, 0 if no)
enforce_s_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, supra: Formal enforcement procedure(1 if yes, 0 if no)
enforce_s_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, supra: Formal enforcement procedure(1 if yes, 0 if no)
legal_n_ER	Ordinal	Author's calculation, based on IMF FAD Database	ER, nation: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: Statutory, 4: International Treaty, 5: Constitutional)
legal_n_BBR	Ordinal	Author's calculation, based on IMF FAD Database	BBR, nation: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: Statutory, 4: International Treaty, 5: Constitutional)
legal_n_DR	Ordinal	Author's calculation, based on IMF FAD Database	DR, nation: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: Statutory, 4: International Treaty, 5: Constitutional)
legal_s_ER	Ordinal	Author's calculation, based on IMF FAD Database	ER, supra: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: Statutory, 4: International Treaty, 5: Constitutional)
legal_s_BBR	Ordinal	Author's calculation, based on IMF FAD Database	BBR, supra: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: Statutory, 4: International Treaty, 5: Constitutional)
legal_s_DR	Ordinal	Author's calculation, based on IMF FAD Database	DR, supra: Highest legal basis (1: Pol. commitment, 2: Coalition agreement, 3: 3: Statutory, 4: International Treaty, 5: Constitutional)
escap_n_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, nation: Escape clause (1 if yes, 0 if no)
escap_n_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, nation: Escape clause (1 if yes, 0 if no)
escap_n_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, nation: Escape clause (1 if yes, 0 if no)
escap_s_ER	Dummy	Author's calculation, based on IMF FAD Database	ER, supra: Escape clause (1 if yes, 0 if no)
escap_s_BBR	Dummy	Author's calculation, based on IMF FAD Database	BBR, supra: Escape clause (1 if yes, 0 if no)
escap_s_DR	Dummy	Author's calculation, based on IMF FAD Database	DR, supra: Escape clause (1 if yes, 0 if no)

Appendix 1. Definitions and sources of data (*continued*)

Variable	Measurement	Source	Description
suport_ceil_n_a	Dummy	Author's calculation, based on IMF FAD Database	Nation: Multi-year expenditure ceilings, aggregate (1 if yes, 0 if no)
suport_ceil_n_m	Dummy	Author's calculation, based on IMF FAD Database	Nation: Multi-year expenditure ceilings by ministry (1 if yes, 0 if no)
suport_ceil_n_i	Dummy	Author's calculation, based on IMF FAD Database	Nation: Multi-year expenditure ceilings by line item (1 if yes, 0 if no)
suport_budg_n	Dummy	Author's calculation, based on IMF FAD Database	Nation: Independent body sets budget assumptions (1 if yes, 0 if no)
suport_impl_n	Dummy	Author's calculation, based on IMF FAD Database	Nation: Independent body monitors implementation (1 if yes, 0 if no)
frl	Dummy	Author's calculation, based on IMF FAD Database	Fiscal Responsibility Law (transparency and accountability) (1 if yes, 0 if no)
stab_n	Dummy	Author's calculation, based on IMF FAD Database	National: BB target in cyclically-adjusted terms or over the cycle (1 if yes, 0 if no)
stab_s	Dummy	Author's calculation, based on IMF FAD Database	Supranational: BB target in cyclically-adjusted terms or over the cycle (1 if yes, 0 if no)
no_invest_n	Dummy	Author's calculation, based on IMF FAD Database	National: Rule excludes public investment or other priority items from ceiling (1 if yes, 0 if no)
no_invest_s	Dummy	Author's calculation, based on IMF FAD Database	Supranational: Rule excludes public investment or other priority items from ceiling (1 if yes, 0 if no)

CHAPTER 4

On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality

This chapter is extracted from an ongoing research study, jointly performed with Jean-Louis Combes (UCA), Xavier Debrun (National Bank of Belgium and European Fiscal Board), Alexandru Minea (UCA) and Pegdewende Nestor Sawadogo (The World Bank).

On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality

Abstract: Contributing to an important literature on the side effects of fiscal policy, this paper employs a treatment effect analysis to show that fiscal rules (FR) have significant side effects on income inequality (IQ). Economically meaningful, this favorable causal direct effect is robust to many alternative specifications. Nevertheless, not all FR are alike: balanced budget and debt rules decrease IQ, contrary to expenditure rules that increase it. Finally, the effect of FR on IQ is found to be subject to heterogeneity related to various factors. Given the current upward global IQ trends, our results provide insightful evidence for governments of countries aiming at reducing IQ.

Keywords: fiscal rules; side effects of fiscal policy; income inequality; treatment effect analysis; expenditure rules.

JEL Codes: E62, H62, D63, O23.

1 Introduction

In response to the fiscal imbalances triggered by the large fiscal stimuli implemented following the Great Recession, many countries around the world adopted various types of fiscal rules. Usually defined as "*permanent constraints on fiscal policy expressed in terms of a summary indicator of fiscal performance*" (Kopits and Symansky, 1998), fiscal rules (FR) are nowadays the usual framework for the conduct of fiscal policy. According to the 2015 IMF Fiscal Rules Dataset, around 100 countries present a form of FR, and their spread is continuously increasing worldwide.

A wide literature aims at assessing the performances of FR. On the one hand, a large number of contributions investigate the effect of FR on various dimensions of fiscal policy. FR are found to improve fiscal discipline (see e.g. Debrun et al., 2008; Tapsoba, 2012), lower government borrowing costs (Thornton and Vasilakis, 2018), or reduce fiscal policy cyclicality (Combes et al., 2017).[1] On the other hand, conversely, only few studies explore possible *side effects* of FR, namely, their potential effect on variables that are outside their original goal. Among them, Castro (2011) looks at the FR-economic growth relationship, and concludes that the Stability and Growth Pact (SGP)-related fiscal rules are not harmful, and may sometimes even foster economic growth in the European Union (EU) countries. More recently, Combes et al. (2018) emphasize that countries with FR present significantly lower inflation rates. Inspired by these latter contributions, our paper explores the presence of potential side effects of FR on yet another critical macroeconomic outcome, namely income inequality (IQ).

In addition to the popularity of FR around the world, the motivation for such an analysis is as follows. Within the rich literature devoted to the determinants of IQ (see the next section), fiscal policy holds the front row both for international institutions (e.g. OECD, 2015, chapters 3 and 7; or IMF, 2017) and for academia—for recent surveys, see e.g. Bastagli et al. (2012), Heshmati and Kim (2014), Clements et al. (2015), or Anderson et al. (2017). Compared with previous studies that explore how various dimensions of fiscal policy influence IQ, including e.g. public spending, taxes, or the fiscal balance, our paper fills a gap by testing a *direct* effect of FR on IQ.

[1] The benefits of FR are nevertheless not unanimous; for example, they are found to make public investment more procyclical (Dessus et al., 2016).

The incentive for looking for such a direct effect is twosome. First, by affecting most of the dimensions of fiscal policy, FR may influence IQ both ways; for example, FR may reduce IQ if associated with higher and more redistributive taxes, but increase it if they trigger cuts in transfers and other social expenditure. Since the transmission channels are many, complex and potentially contradictory, the issue of the impact of FR on IQ must be settled by an empirical analysis, which we conduct by having in mind the identification of a direct effect. Second, prior to a proper identification of the exact transmissions channels, one must learn if FR do indeed exert side effects on IQ. A negative response would have the merit of saving future efforts by signaling a dead end. On the contrary, a positive response would open a new chapter in the research agenda devoted to assessing the effects of fiscal policy on inequality. Testing for a direct effect of FR on IQ is a convenient and upfront way to provide support for one of these two alternatives.

To shed light on this issue, we perform an econometric analysis. The major challenge with such an analysis is that the adoption of FR may not be exogenous, but influenced by various economic variables and particularly by IQ. The traditional way to cope with such an endogeneity issue arising from reverse causality is to implement an instrumental-variable (IV) estimation strategy. In this vein, some existing studies—after emphasizing the difficulty of finding time-varying external instruments—rely on internal instruments (i.e. lagged values of FR) in a System-GMM setup; see Combes et al. (2018) for a recent example. However, since such a setup is not appropriate for our analysis—as it requires, in particular, a fairly large number of cross-sections relative to the time dimension—we favor a treatment effect analysis. Given the drawbacks of the popular difference-in-difference (DID) method for our data characterized by serial correlation (see the excellent discussion in Bertrand et al., 2004), we draw upon the propensity score matching (PSM) method that properly overcomes the selection bias related with the adoption of FR.[2] Using the PSM, we estimate potential differences in IQ between countries that adopted FR and that did not adopt FR but present a comparable probability of adopting FR conditional on a set of covariates, i.e. comparable propensity scores (Rosenbaum and Rubin, 1983).

Our analysis conducted on a wide panel of 84 countries over the period 1990-2015 reveals

[2]Initially employed in macroeconomics to analyze inflation targeting adoption (e.g. Lin and Ye, 2007; Minea and Tapsoba, 2014), PSM is equally used to estimate the effects of FR (e.g. Tapsoba, 2012; Guerguil et al., 2017; Thornton and Vasilakis, 2018).

the following. First, countries that adopted FR experience a significant decrease in their IQ with respect to comparable countries that did not adopt FR. Confirmed by a rich robustness analysis,[3] this favorable side effect is economically meaningful (between 18% and 30% of the standard deviation of our IQ measure). Second, contrary to the favorable impact of balanced budget rules (BBR) and debt rules (DR) on IQ, expenditure rules (ER) strongly *increase* IQ probably because they directly constrain government expenditure (e.g. Tapsoba, 2012; Dahan and Strawczinski, 2013), including spending that may contribute to reduce IQ. Third, switching to the control function regression method, we reveal heterogeneities—driven by various factors—in the relationship between FR and IQ. For example, while the favorable effect of FR alone on IQ can be amplified in a context of deteriorated fiscal space, higher trade, better political stability or education, opposite effects are driven by higher economic growth or mineral rents. In addition, these interactive effects are found to differ across the various types of FR.

Consequently, FR exert significant side effects on IQ. In light of our analysis, FR *mostly reduce* IQ. However, not only the magnitude of this effect may vary with the precise type of FR, but ER significantly *increase* IQ. Besides, the effect of various types of FR on IQ may be subject to important heterogeneities, related to a wide set of fiscal, monetary, international, political, or structural factors. Given the importance of IQ in developing countries and its upward trend in many advanced countries (see e.g. IMF, 2017), our results showing not only that FR are not neutral for IQ, but also identifying cases in which various FR may reduce or—on the contrary—increase IQ, may provide insightful evidence for governments aiming at adopting or improving their FR.

The paper is organized as follows. Section 2 uses the existing literature to derive some insights on the FR-IQ relationship, section 3 presents the data and the methodology, section 4 reports our main results, section 5 assesses their robustness, section 6 investigates the impact of various types of FR on IQ, section 7 explores heterogeneities in the effect of FR on IQ related with various factors, and section 8 discusses policy takeaways and concludes.

[3] We consider e.g. an alternative IQ measure, additional control variables, the entropy balancing method as an alternative to the PSM, or different samples (in particular, the inclusion of developed countries).

2 Fiscal rules and income inequality: lessons from the related literature

2.1 Inequality

Inequality trends are periodically scrutinized by economists (see e.g. Anand and Segal, 2008; Piketty, 2014; Alvaredo et al., 2017), probably due to the large consequences of IQ—see e.g. Wilkinson and Pickett (2009) *The Spirit Level: Why More Equal Societies Almost Always Do Better?*, Stiglitz (2012) *The Price of Inequality: How Today's Divided Society Endangers Our Future*, or Atkinson (2015) *Inequality: What Can Be Done?*. From a cross-country perspective, the literature devoted to IQ focuses on mainly three issues.

A first strand of literature, capitalizing on the pioneering work of Kuznets (1955), looks at the drivers of IQ. Prominent determinants include international factors, such as globalization or trade (e.g. Dollar and Kraay, 2004; Goldberg and Pavcnik, 2007; Dreher and Gaston, 2008; Kanbur, 2015), financial factors (e.g. Claessens and Perotti, 2007; Demirguc-Kunt and Levine, 2009), technological change (e.g. Galor and Moav, 2000; Acemoglu, 2002; Jovanovic, 2009), institutions (e.g. Chong and Gradstein, 2007; Acemoglu et al., 2015), inflation (e.g. Romer and Romer, 1999; Albanesi, 2007), or natural resources (e.g. Gylfason and Zoega, 2002; Parcero and Papyrakis, 2016).

Second, IQ is regularly pointed out as a major source of various imbalances. For instance, IQ is found to reduce economic growth (e.g. Persson and Tabellini, 1994; Ostry et al., 2014; Berg et al., 2018, and possibly contribute to the secular stagnation, see Auclert and Rognlie, 2018), or the quality of the institutions (Alesina and Perotti, 1996), to increase inflation (Beetsma and van der Ploeg, 1996) and poverty (Ravallion, 1997), and to contribute to underdevelopment (Easterly, 2007) and even crises—including the recent Great Recession (Rajan, 2010; Reich, 2010).

Third, given these detrimental effects, a wide variety of policies were imagined to bring down IQ. Such policies may be related with e.g. trade (UNCTAD, 2019), FDI (Figini and Gorg, 2011), education (Goldin and Katz, 2009), finance (Brei et al., 2018), technology (UNESCAP, 2018, chapter 4), or the labor market (Berg, 2015).

2.2 Fiscal policy and inequality

With respect to the latter strand of literature, fiscal policy is regularly pointed out as a prominent solution to tackle IQ. Among the various channels identified by the existing literature, three present a particular importance with respect to our analysis.

First, while more recently e.g. Joumard et al. (2012), Martinez-Vazquez et al. (2012), and Higgins and Lustig (2016) discuss the effect of taxes on IQ, the meta-analysis of Anderson et al. (2017) performed on 84 studies emphasizes mitigated findings for the government spending-IQ link: total government spending present a moderate positive relationship with IQ, while some types of government spending, including social or consumption spending, present a moderate negative relationship with IQ. Second, another strand of literature focuses on fiscal consolidations, yet again with conflicting conclusions. Fiscal consolidations may be associated with either higher IQ particularly when based on spending cuts (e.g. Ball et al., 2013; Woo et al., 2013; Agnello and Sousa, 2014), or lower IQ in the case of tax-based fiscal consolidations (Ciminelli et al., 2019). Third, the medium-to-long term fiscal stance may affect IQ. Several contributions analyze the relationship between government's credibility and IQ for example through capital flows (Jaumotte et al., 2013), and the link between public debt and IQ, which is found to be positive in OECD (e.g. Azzimonti et al., 2014; Arawatari and Ono, 2017).

2.3 Fiscal Rules and Inequality: a complex relationship

The rich literature on the effects of fiscal policy on inequality provides two important lessons.

On the one hand, there are serious reasons to belief in the existence of a significant side effect of FR on IQ. Such a potential side effect may be defended on at least three grounds. First, by affecting the fiscal balance (e.g. Debrun et al., 2008; Tapsoba, 2012), FR most likely influence both government spending and revenues, and therefore may alter their impact on IQ. Second, following the Great Recession many countries enacted FR together with fiscal consolidation programs, in accordance with previous evidence supporting a key role of FR for fiscal consolidations (e.g. Guichard et al., 2007); consequently, by shaping the nature of fiscal consolidations, FR are likely to affect IQ. Third, FR are found to influence fiscal policy

cyclicality (e.g. Debrun et al., 2008; Bova et al., 2014; Combes et al., 2017; Guerguil et al., 2017) and government borrowing costs (e.g. Badinger and Reuter, 2017; Thornton and Vasilakis, 2018); through these channels that affect the fiscal stance from a medium-long-run perspective, FR may yet again influence IQ.

On the other hand, the channels through which FR may generate a side effect on IQ are numerous and possibly contradictory, making the identification of each precise channel—and, particularly, the direction and the magnitude of its respective contribution—a fairly complex if not impossible task. An appealing way for overcoming this difficultly is then to estimate a *direct* effect that encloses the overall influence of FR on IQ (through the numerous channels previously highlighted). The benefit of this approach is that it avoids making—in the context of conflicting effects of the various dimensions of fiscal policy on IQ—a hazardous conjecture about the direction (and the magnitude) of the potential side effect of FR on IQ, and instead relies upon an empirical analysis to settle it.

We can nevertheless emit a hypothesis when looking at the various types of fiscal rules. Contrary to balanced-budget rules and debt rules whose effect on IQ is difficult to apprehend given that they target fiscal aggregates whose dynamics are conditional upon both government spending and taxes, and government's perspective on medium-to-long run fiscal sustainability, a more straightforward influence can be attributed to expenditure rules (ER). Indeed, since they are theoretically conceived and empirically found to directly constrain government expenditure (e.g. Tapsoba, 2012; Dahan and Strawczinski, 2013; and the previous chapter 3), we may conjecture that ER are likely to increase IQ. In the following we will draw upon a formal analysis to test these effects.

3 Data and methodology

3.1 Data

We explore the effect of FR on IQ using a yearly panel of 84 developing countries over the period 1990-2015, selected mainly on two grounds.[4] On the one hand, in the developing world the presence of trustworthy fiscal data begins in the 1990s. On the other hand, to ensure the

[4] The robustness analysis shows that our results still hold when extending the data to the presence of developed countries—leading to a sample of around 110 countries.

comparability between the groups of FR and non-FR countries, i.e. for the control group to be a good counterfactual for the treatment group, we exclude from the group of non-FR countries those with a real per capita GDP lower than that of the poorest FR country, and a smaller population than that of the smallest FR country.

Our main variables are IQ and FR. Following previous studies (e.g. Afesorgbor and Mahadevan, 2016), we measure IQ by the Gini index of the disposable net income extracted from the Standardized World Income Inequality Database (SWIID) developed by Solt (2016), which provides comparable data across countries. We capture FR by a dummy variable equal to 1 if for a given country in a given year a fiscal rule is at work and to 0 otherwise, using the IMF Fiscal Rules Dataset. Appendix A in the Online Supplementary Material presents the list of countries and the year of FR adoption.

3.2 Methodology

The presentation of the methodology is standard, and follows the existing work (e.g. Lin and Ye, 2007; Tapsoba, 2012). The average treatment effect of the treated (ATT) equals the average difference between IQ in countries that adopted FR ($FR = 1$), namely IQ^1, and the IQ they would have had in the absence of FR, namely IQ^0

$$ATT = \mathbb{E}[(IQ_i^1 - IQ_i^0)|FR_i = 1] = \mathbb{E}[IQ_i^1|FR_i = 1] - \mathbb{E}[IQ_i^0|FR_i = 1]. \quad (1)$$

Unfortunately, the latter term is not observable, and a solution would be to simply compare the average IQ in countries that adopted FR and countries that did not. However, this would lead to biased results, given that the adoption of FR (i.e. the treatment) is most likely not random but correlated with a set of observable variables that may equally affect IQ (i.e. the "self-section" problem, see e.g. Heckman et al., 1998, and Dehejia and Wahba, 2002). Instead, under the conditional independence assumption (namely, conditional to a set of observed variables X, IQ^1, and IQ^0 are independent of the FR adoption), we can replace the last term of (1) by the IQ in countries that did not adopt FR but present comparable values of the variables X

$$ATT = \mathbb{E}[IQ_i^1|FR_i = 1, X_i] - \mathbb{E}[IQ_i^0|FR_i = 0, X_i]. \quad (2)$$

Although the last term of (2) is observable, matching countries on a large set of variables could raise practical issues. Therefore, we follow Rosenbaum and Rubin (1983), and concentrate the information from set X into the variable $p_{X_i} = Pr[FR_i = 1|X_i]$, which provides, conditional on the set X, the probability of adopting FR. Assuming, for each country that adopted FR, the existence of comparable countries that did not adopt FR (i.e. the common support assumption), the ATT finally rewrites as

$$ATT = \mathbb{E}[IQ_i^1|FR_i = 1, p_{X_i}] - \mathbb{E}[IQ_i^0|FR_i = 0, p_{X_i}]. \quad (3)$$

When estimating (3), we follow the existing literature (e.g. Lin and Ye, 2007; Minea and Tapsoba, 2014), and draw upon a large variety of propensity score-matching methods.

4 Results

4.1 The estimation of the propensity scores

We estimate the propensity scores using a probit model with the FR dummy as the dependent variable. To account for macroeconomic and political factors related to the adoption of FR, we draw upon the existing literature on FR (e.g. Debrun and Kumar, 2007; Tapsoba, 2012; Combes et al., 2017; or Eyraud et al., 2018), and use a wide range of control variables (see Appendix A for the description and sources of variables, and for descriptive statistics).

First, since FR are most likely to be introduced in countries with good macroeconomic performances (e.g. IMF, 2009; Tapsoba, 2012), higher economic growth (measured by the real GDP per capita growth) is expected to increase the probability of FR adoption. Although the same may hold for external debt (in ratio of GDP), FR may equally be adopted to stabilize a large indebtedness, making uncertain the overall effect of debt on the likelihood of FR adoption. Second, given their higher demand for social spending, countries with higher population dependency ratio will have a lower likelihood of FR adoption, facing more difficulties to introduce fiscal discipline (Calderón and Schmidt-Hebbel, 2008). Third, as emphasized by e.g. Kose et al. (2009), a larger capital openness (that we measure using the Chinn and Ito, 2008, index) fosters a more efficient allocation of capital, which may stimulate economic growth and support the adoption of FR. Fourth, since the adoption of

inflation targeting often went along with the establishment of FR and other fiscal reforms (e.g. fiscal responsibility laws, fiscal transparency, fiscal accountability) to ensure fiscal discipline (e.g. Minea and Tapsoba, 2014; Combes et al., 2018), we expect a positive link with FR adoption. At the same time, a higher inflation—measured as log(1+inflation)—may signal a poor quality of monetary institutions, and is expected to negatively affect the likelihood of FR. Fifth, following e.g. Tapsoba (2012), we account for political factors. On the one hand, a high political risk usually signals poor institutions (including fiscal institutions that should guarantee the respect of FR), and should negatively affect the probability of FR adoption. On the other hand, since government fractionalization may raise public spending pressures (e.g. Perotti and Kontopoulos, 2002), voters may support the establishment of strengthened fiscal frameworks to offset them, thereby increasing the need for FR.

Table 1 reports the probit estimates of the PS. As shown by column [1], the coefficients of most variables are significant and confirm our expectations. Among the significant effects, GDP per capita growth, the presence of an inflation targeting regime, and government fractionalization increase the probability of FR adoption, with opposite effects for the dependency ratio, inflation, and political risks.

Table 1: The estimation of propensity scores

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
L.Real gdppc growth	0.00815*	0.00811*	0.00816*	0.00880*	0.00917*	0.0115**	0.00874*	0.00817*
	(0.00478)	(0.00480)	(0.00480)	(0.00489)	(0.00493)	(0.00561)	(0.00481)	(0.00478)
L.Debt	0.00154	0.00154	0.00154	0.00216*	0.00226*	0.00388***	0.00192	0.00155
	(0.00116)	(0.00116)	(0.00116)	(0.00118)	(0.00118)	(0.00119)	(0.00118)	(0.00116)
L.Dependency ratio	-0.00619**	-0.00619**	-0.00619**	-0.00667**	-0.00654**	-0.00685**	-0.00669***	-0.00626**
	(0.00259)	(0.00259)	(0.00259)	(0.00268)	(0.00270)	(0.00283)	(0.00259)	(0.00259)
L.Capital openness	0.0971***	0.0968***	0.0971***	0.0748**	0.0755**	0.0921***	0.0865***	0.0967***
	(0.0292)	(0.0292)	(0.0292)	(0.0296)	(0.0296)	(0.0310)	(0.0290)	(0.0292)
L.Inflation	-5.574***	-5.551***	-5.580***	-5.389***	-5.417***	-5.588***	-5.938***	-5.603***
	(0.914)	(0.947)	(0.943)	(0.915)	(0.922)	(1.062)	(0.926)	(0.917)
IT conservative	0.636***	0.635***	0.636***	0.629***	0.635***	0.641***	0.567***	
	(0.116)	(0.116)	(0.116)	(0.118)	(0.118)	(0.122)	(0.116)	
L.Political risk	-0.0164***	-0.0163***	-0.0164***	-0.0159***	-0.0159***	-0.0212***	-0.0133**	-0.0164***
	(0.00568)	(0.00569)	(0.00569)	(0.00572)	(0.00572)	(0.00600)	(0.00578)	(0.00568)
L.Gov fractionalization	0.430***	0.430***	0.430***	0.422***	0.426***	0.452***	0.452***	0.432***
	(0.152)	(0.152)	(0.152)	(0.155)	(0.155)	(0.159)	(0.153)	(0.152)
Fix regime		0.0564						
		(0.302)						
Floating regime			0.0147					
			(0.309)					
CBI regular				-0.0982				
				(0.234)				
CBI irregular					0.137			
					(0.124)			
Debt default						-0.658***		
						(0.162)		
Resource-Rich							0.368***	
							(0.0893)	
IT default								0.625***
								(0.115)
Observations/Pseudo-R2	1234/0.141	1234/0.141	1234/0.141	1189/0.134	1189/0.135	1151/0.170	1234/0.152	1234/0.141

Note: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

4.2 The results of matching on propensity scores

We match countries that adopted FR with comparable countries that did not, drawing upon four popular matching methods. First, the nearest-neighbor matches each FR country with the non-FR countries with the closest PS (we retain up to $n = 3$ neighbors). Second, the radius matches each FR with all non-FR countries with PS within a radius (we retain a small $r = 0.005$, a medium $r = 0.01$, and a large $r = 0.05$ radius). Third, the local linear regression (Heckman et al., 1998) matches covariates-adjusted outcomes of each FR country with the corresponding ones of non-FR countries. Fourth, Kernel matches each FR country with a weighted-average of all non-FR countries (weights are inversely proportional to the gap between the PS of the FR and non-FR countries). Since the matching estimator has no analytical variance, we compute bootstrapped standard errors (Dehejia and Wahba, 2002).

Before discussing the main results, we report that statistical tests support the quality of our estimations. First, following Sianesi (2004), the pseudo-R2 test analyzes the common support assumption by estimating the PS on matched and non-matched observations to contrast their fit before and after matching. Pseudo-R2 reported in Table 2 are fairly close to zero (i.e. always below 0.01), suggesting that the matching provided balanced scores. Consequently, our estimations are robust with regard to the common support hypothesis. Second, we explore the conditional independence assumption. For unobservables, the lower bound of the Rosenbaum (2002) sensitivity test—conducted at the usual 5% significance level under the assumption of an underestimated ATT—is around 1.4 (see Table 2), comparable with existing studies (e.g. around 1.2 in Guerguil et al., 2017). For observables (see Rosenbaum, 2002), the p-values of the equality test of the mean difference (standardized bias, see Table 2) between the characteristics of countries that adopted and did not adopt FR support the absence of statistical differences after matching (i.e. treated country-year observations are not statistically different from their matched non-treated equivalents). Thus, estimations are equally robust with respect to the conditional independence assumption.

Table 2: Matching results

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching			Local Linear Regression Matching	Kernel Matching
				$r = 0.005$	$r = 0.01$	$r = 0.05$		
	Dependent variable: Gini Index							
[1] ATT: Differences in Inequality	-0.0195**	-0.0217***	-0.0211***	-0.0135**	-0.0144**	-0.0174***	-0.0171***	-0.0175***
	(0.00916)	(0.00778)	(0.00731)	(0.00681)	(0.00615)	(0.00534)	(0.00540)	(0.00570)
Number of observations, of which:	1192	1192	1192	1192	1192	1192	1192	1192
- treated observations	291	291	291	291	291	291	291	291
- control observations	901	901	901	901	901	901	901	901
	Quality of the matching							
Pseudo-R2	0.004	0.005	0.005	0.003	0.002	0.002	0.004	0.002
Rosenbaum bounds sensitivity test	1.8	1.5	1.5	1.1	1.4	1.5	1.3	1.5
Standardized bias (p-value)	0.88	0.79	0.80	0.96	0.86	0.98	0.88	0.98

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Given these diagnostic tests, based on estimated PS from column [1] of Table 1, our benchmark results are reported on line [1] of Table 2. Irrespective of the matching method, the estimated ATT is negative and statistically significant: with respect to comparable countries that did not adopt FR, countries that adopted FR experience a significant IQ reduction. In absolute value, the estimated decrease in IQ ranges between 0.0135 (radius $r = 0.01$) and 0.0217 (neighbor $n = 2$), depending on the retained specification. Since they represent between 18% and 30% of the standard deviation of our IQ variable (equal to 0.073, see Appendix A), these numbers are economically meaningful, all the more that IQ is not the primary goal that motivates the adoption of FR (i.e. a side effect).

5 Robustness

This section investigates the robustness of the favorable effect of FR adoption on IQ.

5.1 An alternative measure of inequality

Our main IQ measure is the Gini index based on the net income from Solt (2016). We consider an alternative IQ measure, from the United Nation University World Institute for Development Economics Research (UNU-WIDER). Given data availability and for consistency with our main measure, we focus on IQ based on equivalized household disposable (post-tax, post-transfer) income. The results of the matching using PS from column [1] in Table 1 are reported in Table 3. Our usual tests support the quality of the matching. Moreover, all ATTs are negative and significant, suggesting that the decrease in IQ following the adoption of FR does not change with the IQ measure. Finally, the estimated decrease in IQ varies in absolute value between 0.0236 and 0.0458 (namely, between 25% and 48% of the standard deviation), a magnitude somewhat higher compared with our benchmark findings.

5.2 Additional controls

We augment the benchmark probit model (column [1] in Table 1) with several additional variables, namely: the exchange rate regime (we distinguish corner, i.e. fixed and floating, regimes from intermediate regimes); the central bank independence (the regular and irregular

change in central banks' governor turnover); debt default experiences; natural resources endowment (signaling resource-rich countries); and the presence of a default (instead of a conservative) inflation targeting regime (Appendix A provides definitions, sources, and descriptive statistics).

According to columns [2]-[8] in Table 1, most additional variables do not have a significant effect, confirming the robustness of our benchmark model. Whenever significant, their effect is consistent with what one may expect; in particular, countries with a history of debt default are less likely to adopt FR, which requires fiscal institutions inconsistent with default, while being a resource-rich country may generate additional fiscal revenues that relax the government's budget constraint and may support its capacity to respect the FR.

Based on PS computed using Table 1, lines [1]-[7] in Table 4 report the ATT. Corroborating our benchmark results, the ATTs are significant and negative irrespective of the considered specification. In addition, the size of the effect is equally consistent with our benchmark findings, ranging (in absolute value) between 0.0140 (neighbor $n = 1$, line [5]) and 0.0257 (neighbor $n = 1$, line [7]). Overall, accounting for additional control variables confirms the significant reduction of IQ in countries that adopted FR.

Table 3: Matching results: Robustness—Inequality measured using the UNU-WIDER database

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching			Local Linear Regression Matching	Kernel Matching
				$r = 0.005$	$r = 0.01$	$r = 0.05$		
	Dependent variable: Gini Index							
[1] ATT: Differences in Inequality	-0.0427***	-0.0362**	-0.0305**	-0.0458***	-0.0378***	-0.0236**	-0.0250**	-0.0244**
	(0.0162)	(0.0145)	(0.0141)	(0.0161)	(0.0143)	(0.0115)	(0.0121)	(0.0116)
Observations/treated observations	447/125							
	Quality of the matching							
Pseudo-R2	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.01
Rosenbaum bounds sensitivity test	1.7	1.6	1.4	2	1.8	1.4	1.5	1.5
Standardized bias (p-value)	0.46	0.46	0.45	0.97	0.90	0.84	0.46	0.84

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 4: Matching results: Robustness—Additional controls

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching			Local Linear Regression Matching	Kernel Matching
				$r = 0.005$	$r = 0.01$	$r = 0.05$		
	Robustness checks							
[1] Adding Fix exchange regime	-0.0206**	-0.0156**	-0.0173**	-0.0186***	-0.0165***	-0.0171***	-0.0167***	-0.0170***
	(0.00853)	(0.00791)	(0.00718)	(0.00691)	(0.00591)	(0.00511)	(0.00549)	(0.00538)
[2] Adding Floating exchange regime	-0.0197**	-0.0164**	-0.0188***	-0.0179***	-0.0165***	-0.0158***	-0.0158***	-0.0156***
	(0.00870)	(0.00767)	(0.00713)	(0.00643)	(0.00611)	(0.00566)	(0.00536)	(0.00549)
[3] Adding CBI regular turnover	-0.0163*	-0.0185**	-0.0162**	-0.0190***	-0.0179***	-0.0183***	-0.0186***	-0.0185***
	(0.00922)	(0.00815)	(0.00766)	(0.00678)	(0.00618)	(0.00551)	(0.00548)	(0.00577)
[4] Adding CBI irregular turnover	-0.0169*	-0.0162**	-0.0167**	-0.0184***	-0.0165***	-0.0172***	-0.0179***	-0.0170***
	(0.00874)	(0.00752)	(0.00726)	(0.00679)	(0.00621)	(0.00558)	(0.00548)	(0.00558)
[5] Adding Debt default dummy	-0.0140*	-0.0146*	-0.0143**	-0.0180***	-0.0166***	-0.0172***	-0.0176***	-0.0173***
	(0.00848)	(0.00750)	(0.00721)	(0.00656)	(0.00627)	(0.00554)	(0.00505)	(0.00539)
[6] Adding Resource-Rich country dummy	-0.0249***	-0.0192**	-0.0221***	-0.0245***	-0.0223***	-0.0248***	-0.0254***	-0.0247***
	(0.00963)	(0.00888)	(0.00780)	(0.00737)	(0.00670)	(0.00625)	(0.00622)	(0.00615)
[7] Using IT Default date	-0.0257***	-0.0220***	-0.0186***	-0.0161**	-0.0169***	-0.0171***	-0.0169***	-0.0171***
	(0.00848)	(0.00757)	(0.00714)	(0.00646)	(0.00628)	(0.00534)	(0.00563)	(0.00529)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

5.3 An alternative estimation method

To check if our main results based on PSM still hold when using an alternative technique, we draw upon the entropy balancing method of Hainmueller (2012)—see Neuenkirch and Neumeier (2016) and Balima et al. (2021) for a presentation of the method. Table 5a shows that a simple comparison of main control variables' averages in countries that adopted FR (column [1]) and that did not adopt FR (column [2]) reveals statistically-significant differences for almost all variables (column [4]). To neutralize the potential influence of such differences on the treatment effect, we compute a synthetic control group by applying weights to non-FR observations such as the averages of the variables in this group (column [5]) are not statistically different from their averages in the FR group (column [2]), as in column [7].

Table 5a: Building the synthetic control group

	[1]	[2]	[3]=[1]-[2]	[4]	[5]	[6]=[5]-[2]	[7]
Variables	Non-FR	FR	difference	p-value	W-Non-FR	difference	p-value
L.real gdppc growth	-7.427	2.319	-9.746	0.000	2.963	0.644	0.738
L.debt	60.867	53.697	7.17	0.034	56.32	2.623	0.873
L.dependency ratio	70.262	66.65	3.611	0.001	66.69	0.04	0.882
L.capital openness	-.248	.05	-.297	0.000	.151	0.101	0.928
L.inflation	.166	.047	.118	0.000	.0510	0.004	0.347
IT conservative	.058	.226	-.168	0.000	.266	0.04	0.889
L.political risk	60.769	62.652	-1.883	0.001	62.439	-0.213	0.898
L.gov fractionalization	.195	.263	-.069	0.000	.273	0.01	0.955
Observations	807	285			285		

Table 5b: Robustness—Entropy balancing estimations

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Baseline	Country-FE	Time-FE	CFE & TFE	Main	MC	MC	MC
	(Only FR)	(CFE)	(TFE)	(CTFE)	Controls (MC)	and CFE	and TFE	and CTFE
FR	-0.0162***	-0.0116***	-0.0122***	-0.0069***	-0.0170***	-0.0097***	-0.0074*	-0.0069***
	(0.00420)	(0.00208)	(0.00442)	(0.00235)	(0.00385)	(0.00218)	(0.00399)	(0.00242)
Obs.	1142							

Notes: Unreported constant included. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Using these weights, Table 5b reports weighted least squares estimations. Column [1] shows that countries that adopted FR present significantly lower IQ with respect to com-

parable countries that did not adopt FR (and the magnitude of the estimated coefficient is close to our findings based on the PSM method). Next, we take advantage of the possibility of modeling the panel dimension with the entropy balancing method, and include country-fixed effects (CFE), time-fixed effects (TFE), and both CFE and TFE. According to columns [2]-[4], the decrease of IQ remains significant in the presence of fixed effects. Moreover, a significant effect is still at work when we add in column [5] the set of eight main control variables used in our PSM benchmark estimation. Finally, comparable results arise when combining the main control variables with different fixed effects in columns [6]-[8]. Consequently, the use of an alternative method—allowing in particular controlling for unobservables through both country and time fixed effects—confirms our baseline conclusion based on the PSM.

5.4 Alternative samples

We now look at the robustness of our benchmark findings when changing the sample. First, we drop former Soviet Union countries due to their particular structural characteristics. Second, we abstract of post-Cold War years (1990-1995) during which many countries experienced particular dynamics of their economies. Third, we look if our results still hold when abstracting of fuel exporter countries. Fourth, we drop hyperinflation episodes, defined by annual inflation rates above 40%. Fifth, we ignore the recent financial crisis years (2008-2009). Sixth, we extend our sample to include the group of developed countries. As illustrated by ATTs reported on lines [1]-[6] in Table 6a, the effect of FR adoption on IQ is significant and in some cases of a higher magnitude compared with our benchmark findings. In addition, Table 6b shows that these results remain robust in the presence of additional control variables, since at least 6 out of 8 ATTs are significant in each set of estimated ATTs (i.e. except for two sets when dropping post-Cold War years), namely in 40 out of the 42 sets of estimated ATTs.[5] Altogether, these results support the robustness of our main findings.

[5] To save space, full results are reported in the Appendix B.

Table 6a: Matching results: Robustness—Alternative samples

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching			Local Linear Regression Matching	Kernel Matching
				$r = 0.005$	$r = 0.01$	$r = 0.05$		
	Dependent variable: Gini Index							
[1] Dropping former Soviet Union countries	-0.0195**	-0.0173**	-0.0166**	-0.0166**	-0.0184***	-0.0227***	-0.0233***	-0.0228***
	(0.00877)	(0.00822)	(0.00734)	(0.00692)	(0.00680)	(0.00574)	(0.00580)	(0.00582)
[2] Dropping post-Cold War years	-0.0150*	-0.0148*	-0.0143*	-0.0138**	-0.0134**	-0.0100*	-0.0112**	-0.0101*
	(0.00856)	(0.00827)	(0.00764)	(0.00667)	(0.00624)	(0.00528)	(0.00560)	(0.00557)
[3] Dropping fuel exporters countries	-0.0252***	-0.0221***	-0.0267***	-0.0279***	-0.0247***	-0.0235***	-0.0242***	-0.0236***
	(0.00879)	(0.00770)	(0.00769)	(0.00692)	(0.00630)	(0.00559)	(0.00530)	(0.00563)
[4] Dropping hyperinflation countries	-0.0119	-0.0152*	-0.0173**	-0.0159**	-0.0162***	-0.0156***	-0.0157***	-0.0158***
	(0.00878)	(0.00788)	(0.00743)	(0.00640)	(0.00612)	(0.00567)	(0.00558)	(0.00529)
[5] Dropping financial crisis years	-0.0198**	-0.0182**	-0.0173**	-0.0188***	-0.0157**	-0.0176***	-0.0177***	-0.0179***
	(0.00996)	(0.00870)	(0.00796)	(0.00722)	(0.00694)	(0.00654)	(0.00606)	(0.00612)
[6] Including developed countries	-0.0392***	-0.0406***	-0.0434***	-0.0396***	-0.0382***	-0.0359***	-0.0354***	-0.0361***
	(0.0130)	(0.0126)	(0.0121)	(0.00734)	(0.00856)	(0.00963)	(0.0106)	(0.00980)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6b: Matching results: Robustness—Alternative samples & Additional controls

Treatment Variable: FR Number of significant ATT coefficients (out of 8)	Fix Exchange Regime	Floating Exchange Regime	CBI Regular Turnover	CBI Irregular Turnover	Debt Default Dummy	Resource Rich Countries	IT Default Dummy
[1] Dropping former Soviet Union countries	8	8	8	8	8	8	8
[2] Dropping post-Cold War years	2	1	6	6	7	8	7
[3] Dropping fuel exporters countries	8	8	8	8	8	8	8
[4] Dropping hyperinflation countries	7	8	8	7	7	8	6
[5] Dropping financial crisis years	6	8	8	7	8	8	7
[6] Including developed countries	8	8	8	8	8	8	8

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

6 Heterogeneity: the type of fiscal rule

The previous section confirmed that the favorable side effect of FR adoption on IQ is robust across many dimensions. We now investigate possible sources of heterogeneity in this effect, related to the type of fiscal rule (this section), and the economic and structural environment (the next section).

As previously emphasized, since FR affect government spending and revenues, fiscal consolidations, and fiscal aggregates, their effect may differ upon the considered type of FR. For example, according to e.g. Tapsoba (2012), Combes et al. (2018), or chapter 3, fiscal aggregates may respond differently in the presence of expenditure rules (ER), balanced budget rules (BBR), or debt rules (DR). Therefore, we look in the following at various FR.[6]

6.1 Expenditure rules (ER)

ER are aimed to limit public spending by setting a ceiling on their growth rate or as a ratio of GDP. The most important feature of ER is that they can directly target the government size (Schaechter et al., 2012).[7] Using the dummy variable ER, equal to 1 in the presence of ER and to 0 otherwise, we use PS (from Table C1a in Appendix C) to estimate the ATT of ER adoption on IQ in Table 7a. Contrary to the results for all FR, the positive (and significant in 7 out of 8 cases) ATTs suggest that ER adoption increases IQ. The magnitude of this effect is fairly strong, between 0.0359 (neighbor $n = 1$) and 0.0413 (Kernel matching).

When accounting for additional variables, ATTs in Table 7a are significant in at least 5 out of 8 cases for each of the lines [2]-[8] (except on line [7]), and the detrimental effect of ER adoption on IQ may climb up to almost 0.06 (neighbor $n = 1$, line [3]). This harmful impact may be related to the fact that, not only ER do not affect taxes (which may be increased under other fiscal rules, e.g. BBR or DR, with favorable effects on IQ of e.g. progressive taxes), but, as illustrated by results in chapter 3 for developing countries, they trigger the strongest reduction of public consumption among all rules (without any compensation in terms of public investment), which may affect spending designed to reduce IQ.

[6] The low number of countries that adopted revenue rules does not allow investigating their impact.

[7] Examples of ER include a nominal expenditure ceiling for the central government (e.g. Sweden), or public expenditure levels below 30% of GDP (e.g. Namibia).

Table 7a: Matching results—ER dummy as the treatment variable

Treatment Variable: ER	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
				Dependent variable: Gini Index				
[1] ATT: Differences in Inequality	0.0362*	0.0362*	0.0359**	0.0241	0.0405**	0.0412***	0.0365**	0.0413**
	(0.0194)	(0.0197)	(0.0183)	(0.0268)	(0.0203)	(0.0154)	(0.0150)	(0.0169)
Observations/treated observations				619/53				
				Quality of the matching				
Pseudo-R2	0.10	0.06	0.04	0.008	0.03	0.03	0.10	0.03
Rosenbaum bounds sensitivity test	1.8	1.5	1.5	1.1	1.4	1.5	1.3	1.5
Standardized bias (p-value)	0.07	0.28	0.59	0.99	0.90	0.79	0.07	0.81
				Robustness checks				
[2] Adding Fix exchange regime	0.0507**	0.0446**	0.0426**	0.0193	0.0226	0.0437***	0.0388**	0.0436***
	(0.0211)	(0.0203)	(0.0185)	(0.0248)	(0.0216)	(0.0152)	(0.0160)	(0.0149)
[3] Adding Floating exchange regime	0.0597***	0.0418**	0.0430**	0.00268	0.0224	0.0435***	0.0385***	0.0438***
	(0.0212)	(0.0193)	(0.0173)	(0.0271)	(0.0225)	(0.0162)	(0.0146)	(0.0161)
[4] Adding CBI regular turnover	0.0409	0.0539***	0.0528***	0.00899	0.0253	0.0479***	0.0457***	0.0489***
	(0.0252)	(0.0208)	(0.0193)	(0.0303)	(0.0251)	(0.0177)	(0.0159)	(0.0170)
[5] Adding CBI irregular turnover	0.0491**	0.0436**	0.0412**	-0.0106	0.0125	0.0484***	0.0437***	0.0450**
	(0.0249)	(0.0214)	(0.0190)	(0.0282)	(0.0221)	(0.0171)	(0.0163)	(0.0178)
[6] Adding Debt default dummy	0.0430**	0.0474**	0.0447***	0.0347	0.0340	0.0446***	0.0439***	0.0445***
	(0.0214)	(0.0191)	(0.0161)	(0.0282)	(0.0231)	(0.0154)	(0.0154)	(0.0150)
[7] Adding Resource-Rich country dummy	0.0462*	0.0413*	0.0313	-0.0152	0.000196	0.0297	0.0342*	0.0278
	(0.0276)	(0.0234)	(0.0215)	(0.0264)	(0.0224)	(0.0197)	(0.0190)	(0.0189)
[8] Using IT Default date	0.0497**	0.0383*	0.0401**	0.0299	0.0393*	0.0410**	0.0364**	0.0419***
	(0.0239)	(0.0196)	(0.0174)	(0.0262)	(0.0210)	(0.0169)	(0.0146)	(0.0142)

Note: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 7b: Matching results—BBR dummy as the treatment variable

Treatment Variable: BBR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
				Dependent variable: Gini Index				
[1] ATT: Differences in Inequality	-0.0183**	-0.0214***	-0.0205***	-0.0210***	-0.0196***	-0.0195***	-0.0201***	-0.0195***
	(0.00878)	(0.00763)	(0.00720)	(0.00588)	(0.00561)	(0.00536)	(0.00526)	(0.00507)
Observations/treated observations				1152/245				
				Quality of the matching				
Pseudo-R2	0.006	0.006	0.005	0.001	0.001	0.001	0.006	0.001
Rosenbaum bounds sensitivity test	1.3	1.5	1.6	1.7	1.6	1.6	1.7	1.6
Standardized bias (p-value)	0.83	0.83	0.89	0.99	0.99	0.99	0.83	0.99
				Robustness checks				
[2] Adding Fix exchange regime	-0.0189**	-0.0233***	-0.0240***	-0.0204***	-0.0202***	-0.0196***	-0.0201***	-0.0196***
	(0.00926)	(0.00821)	(0.00750)	(0.00652)	(0.00537)	(0.00501)	(0.00550)	(0.00512)
[3] Adding Floating exchange regime	-0.0156*	-0.0164**	-0.0202***	-0.0202***	-0.0204***	-0.0196***	-0.0201***	-0.0196***
	(0.00855)	(0.00753)	(0.00735)	(0.00606)	(0.00554)	(0.00548)	(0.00539)	(0.00511)
[4] Adding CBI regular turnover	-0.0200**	-0.0233***	-0.0224***	-0.0219***	-0.0217***	-0.0199***	-0.0212***	-0.0202***
	(0.00865)	(0.00775)	(0.00748)	(0.00579)	(0.00580)	(0.00517)	(0.00545)	(0.00569)
[5] Adding CBI irregular turnover	-0.0157*	-0.0163**	-0.0184**	-0.0198***	-0.0213***	-0.0210***	-0.0219***	-0.0211***
	(0.00952)	(0.00774)	(0.00725)	(0.00623)	(0.00592)	(0.00529)	(0.00526)	(0.00533)
[6] Adding Debt default dummy	-0.0247***	-0.0239***	-0.0207***	-0.0216***	-0.0217***	-0.0214***	-0.0212***	-0.0212***
	(0.00859)	(0.00761)	(0.00703)	(0.00650)	(0.00550)	(0.00529)	(0.00507)	(0.00532)
[7] Adding Resource-Rich country dummy	-0.0261***	-0.0220***	-0.0257***	-0.0285***	-0.0277***	-0.0249***	-0.0259***	-0.0253***
	(0.00895)	(0.00836)	(0.00835)	(0.00689)	(0.00642)	(0.00624)	(0.00680)	(0.00639)
[8] Using IT Default date	-0.0294***	-0.0277***	-0.0230***	-0.0186***	-0.0197***	-0.0194***	-0.0201***	-0.0195***
	(0.00828)	(0.00802)	(0.00705)	(0.00594)	(0.00552)	(0.00547)	(0.00530)	(0.00503)

Note: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 7c: Matching results—DR dummy as the treatment variable

Treatment Variable: DR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
				Dependent variable: Gini Index				
[1] ATT: Differences in Inequality	-0.0279***	-0.0218**	-0.0237***	-0.0220***	-0.0267***	-0.0261***	-0.0261***	-0.0258***
	(0.00980)	(0.00904)	(0.00825)	(0.00695)	(0.00691)	(0.00621)	(0.00600)	(0.00582)
Observations/treated observations				1152/205				
				Quality of the matching				
Pseudo-R2	0.008	0.003	0.003	0.001	0.002	0.002	0.008	0.002
Rosenbaum bounds sensitivity test	1.6	1.4	1.5	1.6	1.9	1.9	2.0	1.9
Standardized bias (p-value)	0.75	0.97	0.98	0.99	0.99	0.98	0.75	0.99
				Robustness checks				
[2] Adding Fix exchange regime	-0.0180*	-0.0200**	-0.0240***	-0.0218***	-0.0249***	-0.0264***	-0.0271***	-0.0256***
	(0.0104)	(0.00901)	(0.00802)	(0.00731)	(0.00669)	(0.00595)	(0.00626)	(0.00629)
[3] Adding Floating exchange regime	-0.0188*	-0.0201**	-0.0193**	-0.0208***	-0.0268***	-0.0261***	-0.0271***	-0.0257***
	(0.00979)	(0.00871)	(0.00818)	(0.00742)	(0.00680)	(0.00644)	(0.00663)	(0.00588)
[4] Adding CBI regular turnover	-0.0192*	-0.0261***	-0.0253***	-0.0262***	-0.0236***	-0.0264***	-0.0271***	-0.0265***
	(0.0105)	(0.00944)	(0.00852)	(0.00726)	(0.00676)	(0.00612)	(0.00634)	(0.00667)
[5] Adding CBI irregular turnover	-0.0418***	-0.0300***	-0.0294***	-0.0276***	-0.0256***	-0.0280***	-0.0273***	-0.0270***
	(0.0105)	(0.00949)	(0.00855)	(0.00746)	(0.00745)	(0.00654)	(0.00657)	(0.00638)
[6] Adding Debt default dummy	-0.0271***	-0.0216**	-0.0221**	-0.0253***	-0.0245***	-0.0264***	-0.0264***	-0.0261***
	(0.00962)	(0.00875)	(0.00862)	(0.00710)	(0.00706)	(0.00620)	(0.00592)	(0.00594)
[7] Adding Resource-Rich country dummy	-0.0162*	-0.0191**	-0.0224***	-0.0241***	-0.0232***	-0.0253***	-0.0266***	-0.0251***
	(0.00943)	(0.00873)	(0.00847)	(0.00726)	(0.00660)	(0.00597)	(0.00656)	(0.00624)
[8] Using IT Default date	-0.0314***	-0.0232**	-0.0223***	-0.0209***	-0.0265***	-0.0261***	-0.0260***	-0.0258***
	(0.0103)	(0.00934)	(0.00829)	(0.00718)	(0.00617)	(0.00628)	(0.00607)	(0.00640)

Note: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

6.2 Balanced budget rules (BBR)

Usually defined in relation with the overall balance, the structural balance, or the balance "over the cycle", BBR are aimed to ensure a sound and sustainable public finance by setting a numerical ceiling or target on the government budget balance.[8] Using the dummy variable BBR equal to 1 if a country has a BBR and to 0 otherwise, based on PS from Table C1b in Appendix C we report the ATT in Table 7b. ATTs are significant irrespective of the matching method, and the favorable effect on IQ is estimated to be up to -0.0214 in absolute value (neighbor $n = 2$).

We assess the robustness of these findings using the additional control variables from our benchmark analysis. All ATT in lines [2]-[8] in Table 7b are significant and, consistent with results on line [1], IQ decreases by up to 0.0294 (neighbor $n = 1$, line [8]). Consequently, the favorable effect of BBR on IQ is slightly stronger (in absolute value) compared with that of all FR taken together. In light of the findings for developing countries in chapter 3, this may be explained by the fact that, compared with ER, BBR are found to reduce relatively less public consumption and even increase public investment, possibly leaving more room for IQ-friendly public spending.

6.3 Debt rules (DR)

By setting an explicit limit on the stock of public debt (for example, the 60% debt/GDP ceiling of the SGP), DR are designed to ensure the convergence to a debt target. Although DR should provide an easy-to-communicate anchor to debt sustainability, they do not ensure a clear short-run operational guidance for policymakers. While BBR and ER are more dominant in advanced and emerging countries, DR are the prevailing national rules in low-income countries (Schaechter et al., 2012).[9] Based on estimated PS (see Table C1c in Appendix C), line [1] in Table 7c reports the ATT. Similar to BBR, all eight ATTs are significant, but the

[8] Examples of BBRs include (see e.g. IMF, 2009) the well-known 3% deficit-to-GDP ratio rule embodied in the Stability and Growth Pact (SGP); limits on structural deficits in line with the "fiscal compact" for EU countries; or the "over-the-cycle" rule that targets the average budget balance over the cycle (e.g. the UK).

[9] To balance flexibility and sustainability, some countries (e.g. Mauritius) included formal escape clause provisions that allow for temporary deviations from their debt rule. Furthermore, to avoid missing the target, some countries (e.g. Slovakia) include automatic correction mechanisms that take effect when the debt-to-GDP ratio reaches a certain level below the target.

size of the decrease in IQ is higher compared with BBR (up to -0.0279, neighbor $n = 1$).

These strong effects are confirmed when accounting for additional variables in lines [2]-[8] of Table 7c: all estimated ATT are significant, and the favorable effect of DR on IQ is reinforced, namely up to -0.0418 (neighbor $n = 1$, line [5]). Consequently, the effect of DR on IQ is of a stronger magnitude than that of BBR or all FR together. Indeed, as shown by chapter 3, the contraction of public consumption is relatively lower for DR than for ER, which in addition are equally found to increase public investment, and therefore may leave enough room for public spending that are favorable for reducing IQ.

6.4 Combined types of fiscal rules

The trend of the last decade is for countries to adopt multiple FR, and particularly combine BBR with DR or ER (Eyraud et al., 2018). We analyze such combined effects of our three FR on IQ using three combinations of two rules (considering all three rules together leads to too few—eleven—treated observations for robust statistical inference). In each case, the treatment variable is a dummy variable equal to 1 if both rules are adopted, and to 0 if not (i.e. if none or only one rule is adopted). Matching results in Table 8 show the following.

First, the joint presence of BBR and DR significantly reduces IQ (line [1]), confirming individual results for BBR and DR. The magnitude of this favorable effect is slightly stronger than that of BBR or DR alone (up to -0.0312), suggesting some complementarities between them for reducing IQ. Second, the joint effect of DR and ER is not significant (line [2]), which may reproduce the conflicting effects of DR alone (decrease) and ER alone (increase) on IQ. Third, the joint influence of BBR and ER is equally mostly not significant (line [3]), reflecting yet again the conflicting effects of BBR and ER alone.

Altogether, these results (which are robust in the presence of additional control variables in Tables C2a-b-c in Appendix C) show that combining different FR should be done with caution in terms of IQ. On the one hand, the detrimental effect of ER adoption on IQ can be neutralized by the presence of either BBR or DR; and the presence of both BBR and DR reduces IQ by more compared to their individual effect. However, on the other hand, the adoption of ER reduces the favorable effects of BBR or DR alone.

Table 8: Matching results—combined types of FR

	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching			Local Linear Regression Matching	Kernel Matching
				$r = 0.005$	$r = 0.01$	$r = 0.05$		
	Dependent variable: Gini Index							
Treatment Variable: BBR*DR Dummy	-0.0231**	-0.0312***	-0.0295***	-0.0275***	-0.0260***	-0.0242***	-0.0226***	-0.0239***
[1] ATT: Differences in Inequality	(0.0108)	(0.00987)	(0.00898)	(0.00755)	(0.00823)	(0.00743)	(0.00706)	(0.00660)
Observations/treated observations	1152/173							
Treatment Variable: DR*ER Dummy	-0.0359	-0.0130	-0.00410	0.00159	-0.00368	-0.000283	0.00316	0.00121
[2] ATT: Differences in Inequality	(0.0279)	(0.0252)	(0.0226)	(0.0337)	(0.0291)	(0.0171)	(0.0154)	(0.0178)
Observations/treated observations	979/27							
Treatment Variable: BBR*ER Dummy	0.0530	0.0625*	0.0517	-0.0152	0.0168	0.0592*	0.0464	0.0576*
[3] ATT: Differences in Inequality	(0.0375)	(0.0357)	(0.0325)	(0.0397)	(0.0381)	(0.0346)	(0.0338)	(0.0344)
Observations/treated observations	934/26							

Note: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

7 Heterogeneity: different economic and structural environments

The previous section revealed that the side effect of FR adoption on IQ varies with the type of FR. In the following, we look for possible heterogeneities in this effect, related to fiscal, monetary, international, political, and other structural variables. Since the PSM does not allow estimating such nonlinear effects, we consider a simple OLS model with an interactive term between FR and the various variables that may trigger heterogeneity. Importantly, we introduce in this model the estimated propensity scores (PS) to correct for possible endogeneity, since the presence of the PS allows neutralizing differences between countries that adopted FR and did not adopt FR. Thus, we obtain the following control function regression (see Heckman and Robb, 1985)

$$IQ_{it} = \alpha + \beta FR_{it} + \gamma PScore_{it} + \delta H_{it} + \phi FR_{it} H_{it} + \varepsilon_{it}, \tag{4}$$

with $PScore$ the estimated PS from the benchmark model, and H the vector of variables that may be a source of heterogeneity. A significant coefficient ϕ would signal the presence of strong heterogeneity, since the effect of FR on IQ would depend upon the values of the variable H. We first look at all FR together, and then at each type of FR.

7.1 All fiscal rules

Column [1] in Table 9 shows that FR significantly decrease IQ on average by 0.0164, consistent with our benchmark results. From column [2] onwards we report only estimations in which the interactive effect between the considered variables and FR (i.e. the coefficient ϕ) is significant at least at the 10% significance level.

First, columns [2]-[4] show that all fiscal variables significantly reduce IQ when combined with FR, suggesting that the favorable effects of FR on IQ may be amplified when FR are in place in a deteriorated fiscal space. Second, regarding monetary variables, columns [5]-[6] reveal that the favorable effect of FR alone on IQ is enforced in the presence of floating exchange rates (while mitigated under fixed exchange rates), suggesting that floating exchange rates may better absorb various types of shocks that could lower the favorable effect of FR

on IQ. Third, among international variables, higher trade combined with FR significantly reduces IQ (column [7]), as access to international markets for goods and services may foster the efficiency of spending designed to reduce IQ within FR-based fiscal policy frameworks. Fourth, all political environment variables, namely the degree of political stability, the absence of internal conflicts, and the absence of ethnic tensions, reduce IQ when combined with FR (columns [8]-[10]), possibly because better political conditions may support more stable fiscal institutions in which the compliance with FR can be combined with more judicious spending policies, including in terms of distributional goals.

Finally, our last set of variables captures other structural characteristics. Column [11] shows that higher economic growth mitigates the favorable effect of FR on IQ, to the point where above a certain growth rate FR increase IQ probably due to poor redistribution. Next, despite relatively few available observations, education is found to reduce IQ when combined with FR (column [12]), since a more educated population could sustain government policies incorporating public spending designed for combating IQ. Moreover, the interactive term between mineral rents and FR is positive (column [13]), suggesting that in our sample of developing countries important mineral rents may increase IQ when combined with FR, possibly echoing the famous "Dutch disease". Lastly, column [14] indicates that the favorable effect of FR on IQ was mitigated during the saving glut (2000-06), possibly due to a shortage of public spending aimed at reducing IQ.

7.2 Different types of fiscal rules

We now look at heterogeneities for each type of FR. To save space, Table 10 reports only the coefficient of the interactive term between each variable and each FR, namely significant (at least at the 10% level) & positive (+), significant & negative (–), or not significant (NS).

Table 10 shows that whenever significant the coefficient of the interaction term between FR and fiscal variables is negative, similar to FR altogether (column [1]). However, in addition to the fiscal stance, the type of FR is of crucial importance: except for short term debt, all other fiscal variables reduce IQ when combined with BBR; only when combined with larger short term debt and higher government size do DR significantly reduce IQ; and a larger government size contributes to the IQ reduction triggered by all FR, except ER. Next, a larger broad money ratio decreases the favorable (unfavorable) effect of BBR and

Table 9: Heterogeneity in the treatment effect—all FR

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
FR	-0.0164***	-0.0194***	-0.00317	-0.0114**	-0.0191***	-0.0556***	0.00794
	(0.00469)	(0.00507)	(0.00660)	(0.00580)	(0.00486)	(0.0166)	(0.0121)
PSCORE		0.0340**	0.0285**	0.0167	0.0425***	0.0418***	0.0211
		(0.0134)	(0.0135)	(0.0136)	(0.0139)	(0.0140)	(0.0134)
Debt default		0.0163***					
		(0.00534)					
FR*Debt default		-0.0492***					
		(0.00995)					
Gross debt			0.0179***				
			(0.00498)				
FR*Gross debt			-0.0351***				
			(0.00952)				
Short term debt				0.0182***			
				(0.00490)			
FR*ST debt				-0.0180*			
				(0.00980)			
Floating regime					0.0414***		
					(0.00870)		
FR*Float. regime					-0.0409**		
					(0.0173)		
Fix regime						-0.0369***	
						(0.00864)	
FR*Fix regime						0.0366**	
						(0.0173)	
Trade							-0.0206***
							(0.00646)
FR*Trade							-0.0323**
							(0.0127)
Observations	1185	1146	1185	1185	1185	1185	1185

Notes: Unreported constant included. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 9: Heterogeneity in the treatment effect—all FR (*continued*)

	[8]	[9]	[10]	[11]	[12]	[13]	[14]
FR	0.00176	-0.00770	-0.00837	-0.0495***	0.0381	-0.0235***	-0.0310***
	(0.00707)	(0.00693)	(0.00637)	(0.00778)	(0.0234)	(0.00512)	(0.00587)
PSCORE	0.0213	0.0190	0.0219	0.0252*	0.147***	0.0172	0.0252*
	(0.0139)	(0.0135)	(0.0134)	(0.0134)	(0.0273)	(0.0137)	(0.0133)
Political stability	0.00410						
	(0.00509)						
FR*Pol. stability	-0.0359***						
	(0.00923)						
Internal conflict		-0.00713					
		(0.00474)					
FR*Int. conflict		-0.0198**					
		(0.00918)					
Ethnic tensions			0.00408				
			(0.00477)				
FR*Eth. tensions			-0.0229**				
			(0.00942)				
GDP growth				-0.00175***			
				(0.000666)			
FR*GDP growth				0.00683***			
				(0.00134)			
Sec. education					-0.00716		
					(0.0125)		
FR*Sec. educ.					-0.00142***		
					(0.000425)		
Mineral rents						-0.0000119	
						(0.000694)	
FR*Min. rents						0.00274**	
						(0.00109)	
Saving glut							-0.0112**
							(0.00526)
FR*Saving glut							0.0291***
							(0.00975)
Observations	1185	1185	1185	1185	216	1185	1185

Notes: Unreported constant included. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 10. Heterogeneity by type of fiscal rule

	[1] All FR	[2] BBR	[3] DR	[4] ER
Fiscal variables				
Debt default	–	–	NS	NS
Gross debt	–	–	NS	–
Short term debt	–	NS	–	–
Government size	NS	–	–	NS
Monetary variables				
Inflation rate	NS	NS	NS	NS
Broad money	NS	+	+	–
Floating regime	–	NS	+	+
Fix regime	+	NS	–	–
International variables				
Trade	–	NS	NS	–
FDI Inflows	NS	NS	NS	NS
Capital openness	NS	NS	NS	–
Political variables				
Political stability	–	–	NS	–
Internal conflict	–	NS	NS	–
Ethnic tensions	–	NS	–	NS
Other structural variables				
Growth rate of GDP	+	+	+	+
Secondary education	–	–	–	–
Mineral rents	+	+	–	+
Post crisis	NS	NS	NS	–
Saving glut	+	+	NS	+
Time	NS	NS	NS	+

Note: the interaction term between each variable and the corresponding type of fiscal rule can be +, -, or NS, namely significant (at least at the 10% level) & positive, significantly & negative, and not significant.

DR (ER) on IQ; however, the interactive term between the exchange rate regimes and BBR is not significant, contrary to their significant impact when combined with DR and ER. Moreover, irrespective of the considered international variable, its interaction with BBR and DR does not significantly affect IQ; on the contrary, both trade and capital openness reduce the positive effect of ER on IQ, and may even turn it into negative for large enough values of these variables. Furthermore, whenever significant, the interactive coefficient between political variables and the various types of FR is negative; in particular, higher political stability and lower internal conflicts significantly reduce the unfavorable effect of ER on IQ, to the point where—for good enough political conditions—the overall effect of ER may turn into negative. Finally, the influence of the other structural variables mostly echoes the results obtained for all FR; in particular, when combined with various FR, higher economic growth rates and mineral rents, and the saving glut period are detrimental for IQ (except in some cases for DR), while the opposite holds for the secondary education. Nevertheless, although the harmful effect of ER on IQ increases with the time since the ER was adopted, during the post crisis period (from 2008 onwards) ER have been less detrimental for IQ.

Altogether, the type of FR is crucial when assessing the effect of different variables on IQ: compared with results for all FR, in some cases the interactive effect may become significant, or—on the contrary—turn into not significant. Moreover, important heterogeneities are at work across various FR for most of the considered variables. Finally, the damaging effect of ER on IQ is weakened when combined with some of the considered variables.

8 Policy takeaways and concluding remarks

Contributing to an important literature on the side effects of fiscal policy, this paper investigated the presence of a side effect of fiscal rules on income inequality. Estimations performed in a large sample of countries revealed the presence of a significant and favorable side effect of FR on IQ, which is economically-meaningful and robust across multiple alternative specifications. However, the type of FR matters: contrary to budget balance and debt rules that reduce IQ, expenditure rules increase IQ. Finally, important heterogeneities were unveiled in the significance, sign, and magnitude of the effect of FR on IQ, depending on various factors.

Consequently, although FR are not originally designed to fight IQ, the important side effect we unveiled suggests that they should not be treated as neutral in terms of IQ. From this perspective, we provide several insights that may prevent FR from raising IQ and even support a favorable effect of FR on IQ. Regarding the former, expenditure rules were found to increase IQ, a detrimental effect whose magnitude is particularly strong. As such, the overall ceiling of ER should be combined with floors on specific social spending that do not directly affect income distribution but help less affluent households by affecting their disposable income. Regarding the latter, higher trade or capital openness are found to reduce the detrimental effect of ER on IQ, while better political institutions foster the favorable side effect of balanced-budget and debt rules on IQ. But, above all, a higher level of education is found to support a favorable effect of FR on IQ, irrespective of the type of FR.

Our study opens several research paths to be explored. On the one hand, close to our analysis, efforts could be made to understand and isolate the various channels that may explain the direct side effect of FR on IQ unveiled by our study. On the other hand, through extending our analysis to include the effect of FR on economic growth, future research could explore the way various types of FR may deal with the famous equality-efficiency tradeoff suggested by Okun (1975).

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APPENDIX CHAPTER 4

On the Side Effects of Fiscal Policy: Fiscal Rules and Income Inequality

APPENDIX A. DESCRIPTIVE STATISTICS

Table A1. The list of countries, and the starting dates of FR

List of Fiscal Rules (FR) and Non-FR countries		Year of adoption of Fiscal Rules	
Non-FR	FR	FR	Year
Albania	Argentina	Argentina	2000
Algeria	Armenia	Armenia	2008
Belarus	Benin	Benin	2000
Bolivia	Brazil	Brazil	2000
Cambodia	Bulgaria	Bulgaria	2003
China	Burkina Faso	Burkina Faso	2000
Djibouti	Burundi	Burundi	2013
Dominican Republic	Cabo Verde	Cabo Verde	1998
Egypt, Arab Rep.	Cameroon	Cameroon	2002
El Salvador	Chile	Chile	2001
Ethiopia	Colombia	Colombia	2000
Fiji	Costa Rica	Costa Rica	2001
Ghana	Cote d'Ivoire	Cote d'Ivoire	2000
Guatemala	Croatia	Croatia	2009
Guinea	Ecuador	Ecuador	2003
Honduras	Equatorial Guinea	Equatorial Guinea	2002
Jordan	Guinea-Bissau	Guinea-Bissau	2000
Kazakhstan	Hungary	Hungary	2004
Kyrgyz Republic	India	India	2004
Lao PDR	Indonesia	Indonesia	1990
Lebanon	Iran, Islamic Rep.	Iran, Islamic Rep.	2010
Macedonia, FYR	Malaysia	Malaysia	1990
Madagascar	Mali	Mali	2000
Malawi	Mauritius	Mauritius	2008
Mauritania	Mexico	Mexico	2006
Moldova	Mongolia	Mongolia	2013
Morocco	Namibia	Namibia	2001
Nicaragua	Niger	Niger	2000
Philippines	Pakistan	Pakistan	2005
Qatar	Panama	Panama	2002
Sierra Leone	Paraguay	Paraguay	2015
South Africa	Peru	Peru	2000
Tajikistan	Poland	Poland	1999
Thailand	Romania	Romania	2007
Tunisia	Russian Federation	Russian Federation	2007
Turkey	Rwanda	Rwanda	2013
Ukraine	Senegal	Senegal	2000
Venezuela, RB	Sri Lanka	Sri Lanka	2003
Vietnam	Tanzania	Tanzania	2013
Yemen, Rep.	Togo	Togo	2000
Zambia	Uganda	Uganda	2013
Zimbabwe	Uruguay	Uruguay	2006

Table A2. Description of variables, and sources

Variable	Description	Source
Gini index (SWIID)	Estimate of Gini index of inequality in equivalized (square root scale) household disposable (post-tax, post-transfer) income, using Luxembourg Income Study data as the standard.	Standardized World Income Inequality Database (SWIID)
Gini UNU-WIDER	Estimate of Gini index of inequality based on disposable income.	World Income Inequality Database (WIID)
IT default date	Binary variable taking the value 1 if in a given year a country operates informally under IT, zero otherwise. When we use the default starting dates of IT, we refer to soft IT.	Roger and Stone (2005); Roger (2009)
IT conservative date	Binary variable taking the value 1 if in a given year a country operates formally under IT, zero otherwise. When we use the conservative starting dates of IT, we refer to full-fledged IT.	
CBI regular turnover	Central banks governor's regular turnover dummy. It is equal to 1 if the change of governor takes place at the end of the official mandate and 0 otherwise. This is proxy of central bank independence.	Dreher et al. (2008, 2010); Sturm and de Haan (2001)
CBI irregular turnover	Central banks governor's irregular turnover dummy. It is equal to 1 if the change of governor takes place in an irregular manner and 0 otherwise. This is proxy of central bank independence.	
Political risk	It is a composite measure of the quality of governance. It represents a simple average of ICRG political variables. Higher value indicates low political risk.	Authors' calculations based on ICRG data
Debt default	Dummy equal to 1 if a country did not pay its debt or restructured it with a lost for investors, and 0 if there was no payment default or debt restructuring.	Reinhart and Rogoff (2009)
Capital openness	It captures the degree of financial openness.	Chinn and Ito (2006)
Fix regime	Dummy equal 1 if ER_Fine is classified as fix regime and 0 if not.	Authors' construction based on Ilzetzki et al. (2017)
Floating regime	Dummy equal 1 if ER_Fine is classified as floating regime and 0 if not.	
Real GDP pc growth	Annual growth rate of real output per capita.	World Economic Outlook
Resource-rich country	Dummy equal to 1 if a country is a resource-rich one and 0 if not.	IMF Fiscal Monitor
Gross debt/GDP	General government gross debt, % of GDP (Government debt sustainability).	Kose et al. (2017)
External debt/GDP	Total external debt stocks, % of GDP (External public and private sector debt).	
Short term debt/Total debt	Short term external debt stocks, % of total (External and private sector debt).	
Government fractionalization	Index measuring the probability that two deputies picked at random among from the government parties will be of different parties.	World Bank DPI database
FDI inflows	Net inflows (new investment inflows less disinvestment) in a given economy from foreign investors, divided by GDP.	World Development Indicators (WDI)
Political stability	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimates give a countryŠs score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	
Trade	Sum of exports and imports of goods and services, % of GDP.	
Secondary education	Secondary duration refers to the number of grades (years) in secondary school.	
Mineral rents	The difference between the value of production for minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.	
Government size	General government final consumption expenditure, % of GDP.	
Inflation	Annual percentage change of consumer price index	
Broad money/GDP	Sum of currency outside banks, demand deposits other than those of the central government, the time, savings, and foreign currency deposits of resident sectors other than the central government, bank and traveler's checks, and other securities such as certificates of deposit and commercial paper, % of GDP.	
Dependency ratio	The ratio of dependent people younger than 15 or older than 64 to the working-age population (aged 15-64), in ratio of dependents per 100 working-age people.	
GDP growth	Annual percentage growth rate of GDP.	
Internal conflict	Political violence and its actual or potential impact on governance. The highest (lowest) score signals no armed or civil opposition to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people (a country embroiled in an on-going civil war).	
Ethnic tensions	The degree of tension within a country attributable to racial, nationality, or language divisions. Higher values signal lower tensions.	
Post crisis	Dummy equal to 1 for the period from 2008 onwards.	Authors' construction
Saving glut	Dummy equal to 1 for the period 2000-2006.	
Time	It captures the time length since fiscal rule adoption.	

Table A3. Descriptive statistics of variables

Variable	Obs	Mean	Std.Dev.	Min	Max
Gini index	1950	.408	.073	.203	.587
Real GDP pc growth	2112	-5.273	19.1	-98.193	110.785
External Debt/GDP	2022	57.888	44.035	.493	583.866
Dependency ratio	2184	69.073	19.708	16.453	119.139
Capital openness	2066	-.172	1.396	-1.904	2.374
Inflation	1953	15.615	53.813	-8.484	951.962
IT conservative date	2184	.097	.295	0	1
Political risk	1740	61.233	9.765	10.33	86.58
Government fractionalization	1788	.209	.268	0	.893
Fix regime	2184	.89	.313	0	1
Floating regime	2184	.099	.299	0	1
CBI regular turnover	1925	.041	.197	0	1
CBI irregular turnover	1924	.141	.348	0	1
Debt default	1625	.215	.411	0	1
Resource-rich country	2184	.286	.452	0	1
IT default date	2184	.101	.302	0	1
Gini index UNU-WIDER	591	.419	.096	.196	.771
Gross debt/GDP	1612	54.091	35.732	.089	260.964
Short term debt/Total Debt	2023	13.531	13.502	0	98.994
Government size	2068	14.368	5.949	2.047	88.983
Broad money/GDP	2060	62.78	563.598	4.894	18347.09
Trade	2112	75.124	39.884	13.753	531.737
FDI inflows	2101	3.566	6.08	-15.989	161.824
Political stability	1428	-.381	.781	-2.81	1.261
Internal conflict	1740	8.615	1.983	0	12
Ethnic tensions	1740	3.982	1.302	0	6
GDP growth	2146	4.096	6.569	-50.248	149.973
Secondary education	347	53.797	23.979	2.036	99.341
Mineral rents	2164	1.491	3.946	0	44.644
Post-crisis	2184	.308	.462	0	1
Saving glut	2184	.269	.444	0	1
Time	2184	1.855	4.162	0	26

APPENDIX B. ROBUSTNESS—Table B1-B6 (full results related to Table 6b)

Table B1. Matching results—Dropping former Soviet Union countries

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0195**	-0.0173**	-0.0166**	-0.0166**	-0.0184***	-0.0227***	-0.0233***	-0.0228***
Differences in Inequality	(0.00877)	(0.00822)	(0.00734)	(0.00692)	(0.00680)	(0.00574)	(0.00580)	(0.00582)
Number of observations, of which	1071	1071	1071	1071	1071	1071	1071	1071
- treated observations	284	284	284	284	284	284	284	284
- control observations	787	787	787	787	787	787	787	787
	Quality of the matching							
Pseudo R2	0.01	0.008	0.009	0.004	0.006	0.003	0.01	0.003
Rosenbaum bounds sensitivity tests	1.4	1.3	1.4	1.5	1.5	1.8	1.8	1.8
Standardized biases (p-value)	0.36	0.61	0.47	0.89	0.71	0.96	0.36	0.95
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.0163*	-0.0178**	-0.0190**	-0.0166**	-0.0191***	-0.0221***	-0.0227***	-0.0223***
	(0.00842)	(0.00761)	(0.00745)	(0.00673)	(0.00642)	(0.00560)	(0.00555)	(0.00565)
[3] Adding Float Exchange Regime	-0.0195**	-0.0191**	-0.0173**	-0.0174***	-0.0196***	-0.0218***	-0.0225***	-0.0219***
	(0.00839)	(0.00784)	(0.00734)	(0.00676)	(0.00627)	(0.00561)	(0.00560)	(0.00569)
[4] Adding CBI regular turnover	-0.0261***	-0.0243***	-0.0232***	-0.0253***	-0.0220***	-0.0237***	-0.0248***	-0.0241***
	(0.00844)	(0.00790)	(0.00744)	(0.00722)	(0.00655)	(0.00618)	(0.00567)	(0.00556)
[5] Adding CBI irregular turnover	-0.0192**	-0.0246***	-0.0266***	-0.0242***	-0.0240***	-0.0230***	-0.0239***	-0.0233***
	(0.00871)	(0.00760)	(0.00723)	(0.00732)	(0.00696)	(0.00554)	(0.00559)	(0.00585)
[6] Adding Debt default dummy	-0.0251***	-0.0214***	-0.0202***	-0.0230***	-0.0229***	-0.0214***	-0.0217***	-0.0215***
	(0.00788)	(0.00824)	(0.00689)	(0.00647)	(0.00629)	(0.00543)	(0.00545)	(0.00538)
[7] Adding Resource-Rich country dummy	-0.0390***	-0.0305***	-0.0328***	-0.0341***	-0.0297***	-0.0314***	-0.0321***	-0.0313***
	(0.0100)	(0.00952)	(0.00872)	(0.00738)	(0.00721)	(0.00630)	(0.00684)	(0.00680)
[8] Using IT Default date	-0.0155*	-0.0203***	-0.0189**	-0.0156**	-0.0187***	-0.0227***	-0.0232***	-0.0227***
	(0.00820)	(0.00775)	(0.00738)	(0.00709)	(0.00652)	(0.00563)	(0.00554)	(0.00556)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B2. Matching results—Dropping post-Cold War years

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0150*	-0.0148*	-0.0143*	-0.0138**	-0.0134**	-0.0100*	-0.0112**	-0.0101*
Differences in Inequality	(0.00856)	(0.00827)	(0.00764)	(0.00667)	(0.00624)	(0.00528)	(0.00560)	(0.00557)
Number of observations, of which	940	940	940	940	940	940	940	940
- treated observations	279	279	279	279	279	279	279	279
- control observations	661	661	661	661	661	661	661	661
	Quality of the matching							
Pseudo R2	0.008	0.002	0.001	0.002	0.001	0.001	0.008	0.001
Rosenbaum bounds sensitivity tests	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
Standardized biases (p-value)	0.61	0.97	0.99	0.99	0.99	0.99	0.61	0.99
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.00585	-0.00529	-0.00589	-0.00746	-0.0102	-0.00947	-0.0104*	-0.00915*
	(0.00892)	(0.00822)	(0.00771)	(0.00706)	(0.00642)	(0.00581)	(0.00537)	(0.00556)
[3] Adding Float Exchange Regime	-0.0134	-0.00936	-0.00804	-0.0103	-0.00912	-0.00917	-0.00999*	-0.00882
	(0.00857)	(0.00821)	(0.00719)	(0.00707)	(0.00606)	(0.00577)	(0.00540)	(0.00564)
[4] Adding CBI regular turnover	-0.0115	-0.0135	-0.0151**	-0.0158**	-0.0134**	-0.0125**	-0.0138**	-0.0124**
	(0.00927)	(0.00829)	(0.00756)	(0.00736)	(0.00620)	(0.00552)	(0.00564)	(0.00589)
[5] Adding CBI irregular turnover	-0.00400	-0.00988	-0.0130*	-0.0127*	-0.0160**	-0.0118**	-0.0127**	-0.0117**
	(0.00911)	(0.00841)	(0.00771)	(0.00706)	(0.00683)	(0.00568)	(0.00586)	(0.00528)
[6] Adding Debt default dummy	-0.0116	-0.0152*	-0.0179**	-0.0151**	-0.0126**	-0.0129**	-0.0138***	-0.0131**
	(0.00865)	(0.00778)	(0.00776)	(0.00706)	(0.00611)	(0.00540)	(0.00513)	(0.00563)
[7] Adding Resource-Rich country dummy	-0.0198**	-0.0225**	-0.0216**	-0.0257***	-0.0230***	-0.0210***	-0.0190***	-0.0210***
	(0.0101)	(0.00908)	(0.00844)	(0.00808)	(0.00744)	(0.00702)	(0.00702)	(0.00673)
[8] Using IT Default date	-0.0143	-0.0152*	-0.0141*	-0.0145**	-0.0115*	-0.0100*	-0.0112*	-0.0101*
	(0.00882)	(0.00793)	(0.00732)	(0.00702)	(0.00625)	(0.00576)	(0.00586)	(0.00546)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B3. Matching results—Dropping fuel exporters countries

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0252***	-0.0221***	-0.0267***	-0.0279***	-0.0247***	-0.0235***	-0.0242***	-0.0236***
Differences in Inequality	(0.00879)	(0.00770)	(0.00769)	(0.00692)	(0.00630)	(0.00559)	(0.00530)	(0.00563)
Number of observations, of which	1012	1012	1012	1012	1012	1012	1012	1012
- treated observations	263	263	263	263	263	263	263	263
- control observations	749	749	749	749	749	749	749	749
	Quality of the matching							
Pseudo R2	0.006	0.004	0.004	0.006	0.001	0.001	0.006	0.001
Rosenbaum bounds sensitivity tests	1.6	1.6	1.8	2	1.9	1.8	1.9	1.9
Standardized biases (p-value)	0.75	0.91	0.90	0.99	0.99	0.99	0.75	0.99
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.0316***	-0.0253***	-0.0281***	-0.0283***	-0.0252***	-0.0234***	-0.0242***	-0.0236***
	(0.00844)	(0.00795)	(0.00806)	(0.00676)	(0.00629)	(0.00536)	(0.00560)	(0.00583)
[3] Adding Float Exchange Regime	-0.0333***	-0.0262***	-0.0274***	-0.0274***	-0.0252***	-0.0235***	-0.0241***	-0.0236***
	(0.00844)	(0.00856)	(0.00751)	(0.00718)	(0.00612)	(0.00562)	(0.00557)	(0.00551)
[4] Adding CBI regular turnover	-0.0339***	-0.0292***	-0.0260***	-0.0273***	-0.0263***	-0.0242***	-0.0251***	-0.0239***
	(0.00915)	(0.00803)	(0.00768)	(0.00702)	(0.00641)	(0.00569)	(0.00548)	(0.00555)
[5] Adding CBI irregular turnover	-0.0175*	-0.0201***	-0.0213***	-0.0244***	-0.0228***	-0.0244***	-0.0252***	-0.0244***
	(0.00921)	(0.00773)	(0.00752)	(0.00685)	(0.00646)	(0.00570)	(0.00579)	(0.00549)
[6] Adding Debt default dummy	-0.0258***	-0.0199***	-0.0228***	-0.0258***	-0.0238***	-0.0241***	-0.0242***	-0.0242***
	(0.00883)	(0.00754)	(0.00727)	(0.00659)	(0.00619)	(0.00541)	(0.00521)	(0.00556)
[7] Adding Resource-Rich country dummy	-0.0381***	-0.0383***	-0.0366***	-0.0362***	-0.0364***	-0.0359***	-0.0390***	-0.0362***
	(0.0103)	(0.00975)	(0.00863)	(0.00771)	(0.00714)	(0.00706)	(0.00714)	(0.00711)
[8] Using IT Default date	-0.0205**	-0.0218***	-0.0217***	-0.0241***	-0.0237***	-0.0233***	-0.0241***	-0.0235***
	(0.00898)	(0.00825)	(0.00754)	(0.00678)	(0.00651)	(0.00563)	(0.00568)	(0.00544)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B4. Matching results—Dropping hyperinflation countries

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0119	-0.0152*	-0.0173**	-0.0159**	-0.0162***	-0.0156***	-0.0157***	-0.0158***
Differences in Inequality	(0.00878)	(0.00788)	(0.00743)	(0.00640)	(0.00612)	(0.00567)	(0.00558)	(0.00529)
Number of observations, of which	1093	1093	1093	1093	1093	1093	1093	1093
- treated observations	290	290	290	290	290	290	290	290
- control observations	803	803	803	803	803	803	803	803
	Quality of the matching							
Pseudo R2	0.007	0.004	0.005	0.003	0.004	0.003	0.007	0.004
Rosenbaum bounds sensitivity tests	1.2	1.3	1.4	1.4	1.4	1.4	1.5	1.4
Standardized biases (p-value)	0.68	0.87	0.85	0.96	0.90	0.92	0.68	0.92
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.0116	-0.0153*	-0.0180**	-0.0178***	-0.0170***	-0.0156***	-0.0156***	-0.0159***
	(0.00838)	(0.00799)	(0.00733)	(0.00688)	(0.00594)	(0.00552)	(0.00517)	(0.00580)
[3] Adding Float Exchange Regime	-0.0197**	-0.0186**	-0.0168**	-0.0190***	-0.0166***	-0.0152***	-0.0153***	-0.0156***
	(0.00841)	(0.00774)	(0.00709)	(0.00683)	(0.00640)	(0.00542)	(0.00540)	(0.00532)
[4] Adding CBI regular turnover	-0.0209**	-0.0185**	-0.0188**	-0.0185***	-0.0170***	-0.0174***	-0.0176***	-0.0174***
	(0.00876)	(0.00821)	(0.00750)	(0.00697)	(0.00638)	(0.00550)	(0.00530)	(0.00546)
[5] Adding CBI irregular turnover	-0.0148	-0.0163**	-0.0173**	-0.0166**	-0.0169***	-0.0171***	-0.0177***	-0.0170***
	(0.00911)	(0.00811)	(0.00716)	(0.00669)	(0.00619)	(0.00557)	(0.00561)	(0.00589)
[6] Adding Debt default dummy	-0.0114	-0.0143*	-0.0171**	-0.0152**	-0.0172***	-0.0167***	-0.0172***	-0.0168***
	(0.00829)	(0.00754)	(0.00726)	(0.00652)	(0.00589)	(0.00543)	(0.00542)	(0.00534)
[7] Adding Resource-Rich country dummy	-0.0167*	-0.0186**	-0.0202**	-0.0244***	-0.0256***	-0.0242***	-0.0253***	-0.0245***
	(0.00920)	(0.00854)	(0.00815)	(0.00737)	(0.00651)	(0.00575)	(0.00645)	(0.00620)
[8] Using IT Default date	-0.0138	-0.0101	-0.0145**	-0.0141**	-0.0152**	-0.0156***	-0.0158***	-0.0158***
	(0.00893)	(0.00769)	(0.00725)	(0.00632)	(0.00624)	(0.00517)	(0.00528)	(0.00518)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B5. Matching results—Dropping financial crisis years

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0198**	-0.0182**	-0.0173**	-0.0188***	-0.0157**	-0.0176***	-0.0177***	-0.0179***
Differences in Inequality	(0.00996)	(0.00870)	(0.00796)	(0.00722)	(0.00694)	(0.00654)	(0.00606)	(0.00612)
Number of observations, of which	1029	1029	1029	1029	1029	1029	1029	1029
- treated observations	239	239	239	239	239	239	239	239
- control observations	790	790	790	790	790	790	790	790
	Quality of the matching							
Pseudo R2	0.01	0.007	0.007	0.004	0.004	0.002	0.001	0.002
Rosenbaum bounds sensitivity tests	1.3	1.3	1.3	1.5	1.4	1.5	1.5	1.5
Standardized biases (p-value)	0.48	0.76	0.78	0.92	0.92	0.98	0.48	0.99
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.00928	-0.0138	-0.0153*	-0.0143*	-0.0151**	-0.0165***	-0.0166***	-0.0167***
	(0.00971)	(0.00862)	(0.00818)	(0.00746)	(0.00688)	(0.00617)	(0.00580)	(0.00619)
[3] Adding Float Exchange Regime	-0.0167*	-0.0164*	-0.0152*	-0.0152**	-0.0161**	-0.0156***	-0.0165***	-0.0159**
	(0.00980)	(0.00866)	(0.00840)	(0.00697)	(0.00690)	(0.00583)	(0.00585)	(0.00616)
[4] Adding CBI regular turnover	-0.0199**	-0.0197**	-0.0213***	-0.0203***	-0.0199***	-0.0188***	-0.0195***	-0.0187***
	(0.00947)	(0.00945)	(0.00793)	(0.00735)	(0.00751)	(0.00594)	(0.00607)	(0.00619)
[5] Adding CBI irregular turnover	-0.0180*	-0.0180**	-0.0121	-0.0194**	-0.0185***	-0.0176***	-0.0187***	-0.0177***
	(0.00972)	(0.00880)	(0.00846)	(0.00752)	(0.00698)	(0.00609)	(0.00604)	(0.00594)
[6] Adding Debt default dummy	-0.0272***	-0.0232***	-0.0197**	-0.0210***	-0.0183***	-0.0164***	-0.0175***	-0.0164***
	(0.00959)	(0.00889)	(0.00827)	(0.00769)	(0.00665)	(0.00601)	(0.00578)	(0.00593)
[7] Adding Resource-Rich country dummy	-0.0316***	-0.0265***	-0.0249***	-0.0246***	-0.0268***	-0.0251***	-0.0270***	-0.0252***
	(0.0107)	(0.00958)	(0.00860)	(0.00809)	(0.00765)	(0.00726)	(0.00686)	(0.00699)
[8] Using IT Default date	-0.0219**	-0.0198**	-0.0173**	-0.00800	-0.0138*	-0.0177***	-0.0177***	-0.0178***
	(0.00972)	(0.00849)	(0.00830)	(0.00739)	(0.00726)	(0.00602)	(0.00627)	(0.00628)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B6. Matching results—Including developed countries

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
FR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0392***	-0.0406***	-0.0434***	-0.0396***	-0.0382***	-0.0359***	-0.0354***	-0.0361***
Differences in Inequality	(0.0130)	(0.0126)	(0.0121)	(0.00734)	(0.00856)	(0.00963)	(0.0106)	(0.00980)
Number of observations, of which	1493	1493	1493	1493	1493	1493	1493	1493
- treated observations	591	591	591	591	591	591	591	591
- control observations	902	902	902	902	902	902	902	902
	Quality of the matching							
Pseudo R2	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
Rosenbaum bounds sensitivity tests	2.1	2.5	2.9	2.3	2.4	2.6	2.7	2.7
Standardized biases (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.0324**	-0.0392***	-0.0443***	-0.0352***	-0.0379***	-0.0371***	-0.0360***	-0.0375***
	(0.0136)	(0.0121)	(0.0119)	(0.00728)	(0.00814)	(0.00976)	(0.0105)	(0.00958)
[3] Adding Float Exchange Regime	-0.0421***	-0.0427***	-0.0425***	-0.0328***	-0.0393***	-0.0372***	-0.0363***	-0.0379***
	(0.0124)	(0.0122)	(0.0119)	(0.00759)	(0.00781)	(0.00990)	(0.0104)	(0.00990)
[4] Adding CBI regular turnover	-0.0302**	-0.0357***	-0.0386***	-0.0311***	-0.0358***	-0.0354***	-0.0354***	-0.0355***
	(0.0133)	(0.0120)	(0.0127)	(0.00727)	(0.00858)	(0.00987)	(0.0111)	(0.0105)
[5] Adding CBI irregular turnover	-0.0423***	-0.0418***	-0.0438***	-0.0382***	-0.0407***	-0.0353***	-0.0350***	-0.0353***
	(0.0141)	(0.0118)	(0.0123)	(0.00745)	(0.00783)	(0.00947)	(0.0105)	(0.00998)
[6] Adding Debt default dummy	-0.0292***	-0.0283***	-0.0259***	-0.0273***	-0.0269***	-0.0243***	-0.0219***	-0.0241***
	(0.00969)	(0.00897)	(0.00826)	(0.00709)	(0.00669)	(0.00665)	(0.00788)	(0.00708)
[7] Adding Resource-Rich country dummy	-0.0305***	-0.0332***	-0.0317***	-0.0303***	-0.0351***	-0.0310***	-0.0298***	-0.0312***
	(0.0110)	(0.0110)	(0.00984)	(0.00799)	(0.00840)	(0.00768)	(0.00823)	(0.00833)
[8] Using IT Default date	-0.0392***	-0.0402***	-0.0423***	-0.0409***	-0.0385***	-0.0367***	-0.0360***	-0.0367***
	(0.0134)	(0.0126)	(0.0124)	(0.00744)	(0.00835)	(0.00932)	(0.0104)	(0.00969)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

APPENDIX C. HETEROGENEITY: DIFFERENT TYPES OF FISCAL RULES

Table C1a. Probit estimates of the propensity score—Expenditure Rule

ER	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
L.Real GDP growth	-0.0142*	-0.0145*	-0.0141	-0.0136	-0.0128	-0.0137	-0.0134	-0.0142*
	(0.00834)	(0.00874)	(0.00862)	(0.00865)	(0.00851)	(0.00871)	(0.00828)	(0.00837)
L.Debt	0.00277	0.00275	0.00278	0.00443	0.00435	0.00435	0.00673**	0.00279
	(0.00311)	(0.00310)	(0.00310)	(0.00298)	(0.00296)	(0.00320)	(0.00313)	(0.00312)
L.Dependency ratio	-0.0613***	-0.0615***	-0.0613***	-0.0588***	-0.0586***	-0.0628***	-0.0627***	-0.0618***
	(0.0104)	(0.0105)	(0.0105)	(0.0104)	(0.0103)	(0.0107)	(0.0103)	(0.0104)
L.Capital openness	0.471***	0.472***	0.470***	0.434***	0.435***	0.523***	0.433***	0.472***
	(0.103)	(0.104)	(0.104)	(0.101)	(0.102)	(0.110)	(0.0985)	(0.104)
L.Inflation	-3.759**	-3.654*	-3.780*	-3.607**	-3.478**	-4.228**	-4.387***	-3.852**
	(1.708)	(2.026)	(1.984)	(1.718)	(1.696)	(2.114)	(1.701)	(1.719)
IT_conservative	1.689***	1.690***	1.689***	1.716***	1.716***	1.656***	1.711***	
	(0.230)	(0.231)	(0.231)	(0.245)	(0.237)	(0.230)	(0.250)	
L.Political risk	-0.0653***	-0.0652***	-0.0653***	-0.0618***	-0.0625***	-0.0782***	-0.0573***	-0.0656***
	(0.0116)	(0.0117)	(0.0116)	(0.0114)	(0.0116)	(0.0130)	(0.0119)	(0.0117)
L.Gov. fractionalization	1.037***	1.042***	1.036***	0.970***	0.988***	1.182***	1.368***	1.042***
	(0.336)	(0.341)	(0.339)	(0.343)	(0.344)	(0.350)	(0.362)	(0.337)
Fix regime		0.0945						
		(0.639)						
Float regime			0.0209					
			(0.644)					
CBI regular				-0.410				
				(0.641)				
CBI irregular					0.134			
					(0.305)			
Default						-1.301*		
						(0.677)		
Resource-Rich							0.648***	
							(0.178)	
IT_default								1.686***
								(0.231)
Constant	5.081***	4.984***	5.081***	4.657***	4.643***	5.939***	4.090***	5.129***
	(1.068)	(1.252)	(1.067)	(1.045)	(1.030)	(1.169)	(1.077)	(1.065)
Observations	621	621	621	613	613	604	621	621
Pseudo R2	0.411	0.411	0.411	0.411	0.410	0.425	0.431	0.411

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table C1b. Probit estimates of the propensity score—Budget Balance Rule

BBR	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
L.Real GDP growth	0.0109**	0.0106**	0.0107**	0.0113**	0.0118**	0.0144**	0.0115**	0.0109**
	(0.00534)	(0.00533)	(0.00533)	(0.00545)	(0.00551)	(0.00621)	(0.00535)	(0.00534)
L.Debt	0.00226*	0.00227*	0.00226*	0.00260**	0.00272**	0.00416***	0.00250**	0.00226*
	(0.00116)	(0.00117)	(0.00117)	(0.00119)	(0.00119)	(0.00119)	(0.00119)	(0.00116)
L.Dependency ratio	0.00257	0.00269	0.00268	0.00211	0.00225	0.0000458	0.00225	0.00253
	(0.00268)	(0.00267)	(0.00267)	(0.00277)	(0.00278)	(0.00289)	(0.00268)	(0.00268)
L.Capital openness	0.109***	0.107***	0.108***	0.0939***	0.0944***	0.122***	0.100***	0.108***
	(0.0295)	(0.0296)	(0.0296)	(0.0301)	(0.0301)	(0.0314)	(0.0291)	(0.0295)
L.Inflation	-5.656***	-5.523***	-5.549***	-5.541***	-5.575***	-5.594***	-5.997***	-5.671***
	(1.037)	(1.075)	(1.071)	(1.045)	(1.054)	(1.176)	(1.039)	(1.038)
IT_conservative	0.296**	0.292**	0.293**	0.312***	0.319***	0.231*	0.209*	
	(0.116)	(0.116)	(0.116)	(0.118)	(0.118)	(0.122)	(0.116)	
L.Political risk	-0.00603	-0.00555	-0.00560	-0.00644	-0.00643	-0.0132**	-0.00272	-0.00602
	(0.00593)	(0.00592)	(0.00593)	(0.00596)	(0.00596)	(0.00615)	(0.00609)	(0.00593)
L.Gov. fractionalization	0.134	0.135	0.135	0.151	0.153	0.208	0.147	0.136
	(0.160)	(0.160)	(0.160)	(0.162)	(0.162)	(0.165)	(0.160)	(0.160)
Fix regime		0.405						
		(0.355)						
Float regime			-0.351					
			(0.362)					
CBI regular				-0.106				
				(0.233)				
CBI irregular					0.163			
					(0.128)			
Default						-0.582***		
						(0.170)		
Resource-Rich							0.380***	
							(0.0918)	
IT_default								0.288**
								(0.115)
Constant	-0.336	-0.780	-0.371	-0.299	-0.341	0.233	-0.620	-0.332
	(0.482)	(0.606)	(0.483)	(0.488)	(0.489)	(0.501)	(0.496)	(0.482)
Observations	1194	1194	1194	1153	1153	1113	1194	1194
Pseudo R2	0.112	0.113	0.112	0.108	0.109	0.135	0.124	0.111

Notes: standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table C1c. Probit estimates of the propensity score—Debt Rule

DR	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
L.Real GDP growth	0.0131***	0.0127***	0.0128***	0.0137***	0.0143***	0.0189***	0.0131***	0.0131***
	(0.00466)	(0.00466)	(0.00466)	(0.00478)	(0.00478)	(0.00515)	(0.00465)	(0.00466)
L.Debt	0.00451***	0.00451***	0.00448***	0.00516***	0.00529***	0.00749***	0.00442***	0.00450***
	(0.00122)	(0.00123)	(0.00122)	(0.00125)	(0.00125)	(0.00137)	(0.00121)	(0.00122)
L.Dependency ratio	0.00205	0.00219	0.00219	0.00156	0.00173	0.00189	0.00219	0.00204
	(0.00281)	(0.00282)	(0.00282)	(0.00293)	(0.00294)	(0.00300)	(0.00280)	(0.00281)
L.Capital openness	-0.0613*	-0.0632**	-0.0627**	-0.0903***	-0.0897***	-0.103***	-0.0589*	-0.0613*
	(0.0319)	(0.0319)	(0.0319)	(0.0326)	(0.0327)	(0.0349)	(0.0319)	(0.0319)
L.Inflation	-7.085***	-6.907***	-6.945***	-6.697***	-6.769***	-7.109***	-7.057***	-7.088***
	(0.954)	(0.980)	(0.978)	(0.935)	(0.945)	(1.010)	(0.963)	(0.954)
IT_conservative	0.100	0.0969	0.0972	0.0740	0.0799	0.0637	0.117	
	(0.127)	(0.126)	(0.126)	(0.129)	(0.129)	(0.134)	(0.129)	
L.Political risk	-0.00709	-0.00647	-0.00649	-0.00513	-0.00510	-0.0109	-0.00813	-0.00708
	(0.00622)	(0.00623)	(0.00623)	(0.00626)	(0.00624)	(0.00679)	(0.00626)	(0.00622)
L.Gov. fractionalization	0.903***	0.907***	0.906***	0.877***	0.882***	0.938***	0.904***	0.904***
	(0.165)	(0.165)	(0.165)	(0.168)	(0.168)	(0.175)	(0.165)	(0.165)
Fix regime		0.638						
		(0.445)						
Float regime			-0.575					
			(0.453)					
CBI regular				-0.107				
				(0.252)				
CBI irregular					0.170			
					(0.136)			
Default						-0.835***		
						(0.187)		
Resource-Rich							-0.110	
							(0.101)	
IT_default								0.0982
								(0.126)
Constant	-0.575	-1.263*	-0.622	-0.708	-0.753	-0.449	-0.490	-0.574
	(0.527)	(0.684)	(0.530)	(0.534)	(0.534)	(0.573)	(0.533)	(0.527)
Observations	1194	1194	1194	1153	1153	1113	1194	1194
Pseudo R2	0.153	0.155	0.154	0.151	0.152	0.190	0.154	0.153

Notes: standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table C2a. Matching results with BBR*DR as the treatment variable

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
BBR*DR Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	-0.0231**	-0.0312***	-0.0295***	-0.0275***	-0.0260***	-0.0242***	-0.0226***	-0.0239***
Differences in Inequality	(0.0108)	(0.00987)	(0.00898)	(0.00755)	(0.00823)	(0.00743)	(0.00706)	(0.00660)
Number of observations, of which	1152	1152	1152	1152	1152	1152	1152	1152
- treated observations	173	173	173	173	173	173	173	173
- control observations	979	979	979	979	979	979	979	979
	Quality of the matching							
Pseudo R2	0.01	0.01	0.01	0.004	0.006	0.004	0.01	0.004
Rosenbaum bounds sensitivity tests	1.3	1.9	1.8	1.8	1.7	1.8	1.7	1.6
Standardized biases (p-value)	0.56	0.34	0.73	0.98	0.95	0.97	0.56	0.97
	Robustness checks							
[2] Adding Fix Exchange Regime	-0.0244**	-0.0284***	-0.0279***	-0.0260***	-0.0263***	-0.0246***	-0.0225***	-0.0238***
	(0.0111)	(0.00986)	(0.00874)	(0.00785)	(0.00707)	(0.00686)	(0.00760)	(0.00738)
[3] Adding Float Exchange Regime	-0.0319***	-0.0316***	-0.0317***	-0.0276***	-0.0259***	-0.0241***	-0.0227***	-0.0239***
	(0.0109)	(0.00968)	(0.00921)	(0.00823)	(0.00702)	(0.00750)	(0.00742)	(0.00694)
[4] Adding CBI regular turnover	-0.0346***	-0.0282***	-0.0279***	-0.0246***	-0.0250***	-0.0249***	-0.0237***	-0.0249***
	(0.0105)	(0.00983)	(0.00932)	(0.00765)	(0.00721)	(0.00695)	(0.00743)	(0.00731)
[5] Adding CBI irregular turnover	-0.0196*	-0.0267***	-0.0248***	-0.0244***	-0.0245***	-0.0242***	-0.0236***	-0.0246***
	(0.0103)	(0.00995)	(0.00923)	(0.00780)	(0.00777)	(0.00733)	(0.00748)	(0.00693)
[6] Adding Debt default dummy	-0.0252**	-0.0230**	-0.0210**	-0.0236***	-0.0243***	-0.0225***	-0.0195***	-0.0215***
	(0.0102)	(0.00906)	(0.00893)	(0.00788)	(0.00750)	(0.00708)	(0.00691)	(0.00675)
[7] Adding Resource-Rich country dummy	-0.0198**	-0.0230**	-0.0264***	-0.0235***	-0.0215***	-0.0240***	-0.0224***	-0.0238***
	(0.00999)	(0.00946)	(0.00873)	(0.00802)	(0.00729)	(0.00711)	(0.00748)	(0.00742)
[8] Using IT Default date	-0.0240**	-0.0288***	-0.0298***	-0.0276***	-0.0261***	-0.0242***	-0.0226***	-0.0238***
	(0.0103)	(0.00930)	(0.00871)	(0.00798)	(0.00694)	(0.00760)	(0.00724)	(0.00711)

Notes: standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table C2b. Matching results with DR*ER as the treatment variable

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
DR*ER Dummy				Dependent variable: Gini index				
[1] Average Treatment on the Treated (ATT)	-0.0359	-0.0130	-0.00410	0.00159	-0.00368	-0.000283	0.00316	0.00121
Differences in Inequality	(0.0279)	(0.0252)	(0.0226)	(0.0337)	(0.0291)	(0.0171)	(0.0154)	(0.0178)
Number of observations, of which	979	979	979	979	979	979	979	979
- treated observations	27	27	27	27	27	27	27	27
- control observations	952	952	952	952	952	952	952	952
				Quality of the matching				
Pseudo R2	0.06	0.04	0.04	0.04	0.05	0.02	0.06	0.02
Rosenbaum bounds sensitivity tests	1.3	1	1	1	1	1	1	1
Standardized biases (p-value)	0.75	0.91	0.92	0.95	0.84	0.97	0.75	0.98
				Robustness checks				
[2] Adding Fix Exchange Regime	0.0157	-0.000172	0.0107	0.0101	0.00125	0.00329	0.00667	0.00405
	(0.0299)	(0.0259)	(0.0224)	(0.0362)	(0.0287)	(0.0190)	(0.0174)	(0.0179)
[3] Adding Float Exchange Regime	0.0167	0.0105	0.00597	0.0231	0.0134	0.00522	0.00645	0.00373
	(0.0281)	(0.0253)	(0.0240)	(0.0328)	(0.0259)	(0.0186)	(0.0174)	(0.0191)
[4] Adding CBI regular turnover	-0.0244	0.00546	0.00919	0.00103	0.00649	-0.000846	0.00646	0.000381
	(0.0329)	(0.0304)	(0.0276)	(0.0539)	(0.0430)	(0.0248)	(0.0239)	(0.0249)
[5] Adding CBI irregular turnover	0.0263	0.00882	0.00473	0.0197	0.0231	0.0100	0.00960	0.00920
	(0.0338)	(0.0304)	(0.0287)	(0.0586)	(0.0446)	(0.0242)	(0.0230)	(0.0251)
[6] Adding Debt default dummy	0.00700	0.00975	0.00869	-0.00246	0.000167	-0.00374	-0.0102	-0.00525
	(0.0309)	(0.0281)	(0.0265)	(0.0356)	(0.0297)	(0.0222)	(0.0219)	(0.0217)
[7] Adding Resource-Rich country dummy	-0.0127	0.00203	0.00609	0.00117	0.000438	-0.000318	0.0115	0.00245
	(0.0290)	(0.0250)	(0.0237)	(0.0364)	(0.0274)	(0.0193)	(0.0186)	(0.0189)
[8] Using IT Default date	-0.0352	-0.0159	-0.00359	0.00580	-0.00669	-0.0000829	0.00316	0.00125
	(0.0295)	(0.0233)	(0.0227)	(0.0372)	(0.0294)	(0.0174)	(0.0159)	(0.0177)

Notes: standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table C2c. Matching results with BBR*ER as the treatment variable

Treatment Variable: FR	1-Nearest Neighbor Matching	2-Nearest Neighbor Matching	3-Nearest Neighbor Matching	Radius Matching $r = 0.005$	Radius Matching $r = 0.01$	Radius Matching $r = 0.05$	Local Linear Regression Matching	Kernel Matching
BBR*ER Dummy	Dependent variable: Gini index							
[1] Average Treatment on the Treated (ATT)	0.0530	0.0625*	0.0517	-0.0152	0.0168	0.0592*	0.0464	0.0576*
Differences in Inequality	(0.0375)	(0.0357)	(0.0325)	(0.0397)	(0.0381)	(0.0346)	(0.0338)	(0.0344)
Number of observations, of which	934	934	934	934	934	934	934	934
- treated observations	26	26	26	26	26	26	26	26
- control observations	934	934	934	934	934	934	934	934
	Quality of the matching							
Pseudo R2	0.23	0.16	0.07	0.04	0.03	0.06	0.23	0.07
Rosenbaum bounds sensitivity tests	1.5	1.6	1.3	1	1	1.3	1.3	1.3
Standardized biases (p-value)	0.03	0.15	0.72	0.98	0.99	0.81	0.03	0.78
	Robustness checks							
[2] Adding Fix Exchange Regime	0.0568	0.0625*	0.0515	-0.0150	0.0170	0.0593*	0.0449	0.0579*
	(0.0391)	(0.0369)	(0.0330)	(0.0391)	(0.0360)	(0.0319)	(0.0319)	(0.0323)
[3] Adding Float Exchange Regime	0.0568	0.0625*	0.0515	-0.0150	0.0170	0.0593*	0.0448	0.0579*
	(0.0399)	(0.0369)	(0.0351)	(0.0397)	(0.0367)	(0.0349)	(0.0326)	(0.0333)
[4] Adding CBI regular turnover	0.0512	0.0478	0.0447	-0.00356	0.00352	0.0595*	0.0465	0.0567
	(0.0381)	(0.0366)	(0.0338)	(0.0401)	(0.0365)	(0.0331)	(0.0326)	(0.0352)
[5] Adding CBI irregular turnover	0.0480	0.0561	0.0480	-0.0210	0.0142	0.0615**	0.0471	0.0594*
	(0.0366)	(0.0342)	(0.0320)	(0.0391)	(0.0346)	(0.0307)	(0.0294)	(0.0305)
[6] Adding Debt default dummy	0.0663	0.0647*	0.0642*	-0.00824	0.00579	0.0702*	0.0546	0.0705*
	(0.0418)	(0.0351)	(0.0367)	(0.0493)	(0.0435)	(0.0366)	(0.0370)	(0.0368)
[7] Adding Resource-Rich country dummy	0.0365	0.0198	0.00267	0.00511	0.0166	0.0107	0.0113	0.0131
	(0.0386)	(0.0337)	(0.0308)	(0.0436)	(0.0410)	(0.0290)	(0.0290)	(0.0302)
[8] Using IT Default date	0.0569	0.0625*	0.0503	-0.0152	0.0170	0.0515	0.0448	0.0575
	(0.0370)	(0.0361)	(0.0348)	(0.0379)	(0.0380)	(0.0331)	(0.0328)	(0.0355)

Notes: standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

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GENERAL CONCLUSION

The post-1970s oil shocks literature insisted on the preference for rules over discretionary policies (Kydland and Prescott, 1977). Such findings brought a profound renewal of macroeconomics, and particularly of the way policymakers conduct their fiscal policy, as an increasing number of countries adopted fiscal rules starting the mid-1980. This PhD is devoted to assessing the macroeconomic effects of fiscal rules, through four original chapters focusing on the impact of fiscal rules on fiscal discipline (the first two chapters, covering the first part of the PhD) and the side-effects of fiscal rules (the last two chapters, covering the second part of the PhD).

1 A summary of the results

As components of the *first part* of the PhD, the first two chapters revisit the relationship between fiscal rules and fiscal discipline, by focusing on the European Union countries.

Chapter One is devoted to the analysis of the impact of fiscal rules on fiscal discipline in the EU Former Communist Countries. Results based on the bias-corrected least squares dummy (LSDVC) estimator, which is justified by the relatively-small sample (eleven countries analyzed during the period 1995-2014), are twosome. On the one hand, the simple presence of fiscal rules is not found to significantly affect the primary fiscal balance in the EU former communist countries. Contrasting with the positive effect of fiscal rules on fiscal performance in Western EU countries, this result may be related to a possible loose understanding of, and commitment to fiscal rules by EU former communist countries' governments in terms of fiscal performance. On the other hand, strengthening fiscal rules is found to significantly increase the fiscal performance of former communist countries, with a magnitude that is higher compared to their effect in Western EU countries. Our analysis delivers a clear-cut economic policy message: simply adopting fiscal rules may enlarge the gap between Western and Central and Eastern EU countries, and raise issues of a multi-speed fiscal Europe. On the contrary, the fiscal cohesion between the various EU countries may be improved by strengthening fiscal rules, since they improve fiscal discipline in both Western and Central and Eastern EU countries. From the standpoint of future Euro or EU enlargements, fiscal policies should not be limited to the simple adoption of fiscal rules, but equally insist on their enforcement.

Chapter Two extends the literature on the interactions between fiscal rules and institutions by considering their joint effect on fiscal discipline in the EU countries. We capture the fundamentally-different institutional paths followed by these countries after the Second World War by separating between previously-communist EU countries (CC) and non-communist EU countries (NCC). We reveal significant differences between the two groups of countries: as institutions improve, strengthening fiscal rules fosters fiscal discipline in non-communist countries and reduces it in previously-communist countries, i.e. a complementarity versus a substitution effect. Subsequently, we show that these different effects are triggered by the impact of the various types of institutions: the complementarity emphasized in non-communist countries is explained by political and economic institutions (but not by social institutions), and the substitution highlighted in former communist countries owes to political and social institutions (with a complementarity effect for economic institutions). Our analysis unveils the uselessness of a one-size-fits-all approach for the design of fiscal reforms, and suggests that EU policymakers should account for national institutions when designing such reforms that involve enforcing national fiscal rules.

As components of the *second part* of the PhD, the last two chapters investigate possible side-effects of fiscal rules on the composition of public spending and income inequality, respectively.

Chapter Three examines the way fiscal rules shape governments' spending behavior, by looking at the relationship between fiscal rules and the composition of public spending in a large sample of 185 countries. While we confirm that fiscal rules significantly reduce total public spending and public consumption, we equally find that they leave public investment mostly unaffected and raise the public investment-to-public consumption ratio. In addition, our analysis emphasizes the importance of the features of fiscal rules as regards the impact of fiscal rules adoption particularly on total spending and public investment. From a policy perspective, it follows that, especially in developing countries, fiscal rules do not trigger significant contractions of public investment, as this was shown to be the case by existing studies for other fiscal reforms (in particular, fiscal consolidations). Besides, while the influence of some features of fiscal rules is clear-cut, others exert an ambiguous effect on the way fiscal rules affect both total spending and public investment. Because of significantly

shaping the composition of public spending, fiscal rules and their features are of primary importance for governments that may consider other goals beside fiscal discipline.

Chapter Four further explores the side-effects of fiscal rules by looking at the way they may influence a critical macroeconomic outcome, namely income inequality. After explaining the rationale for such a potential side-effect, notably related to the way fiscal rules influence the various facets of fiscal policy, this chapter provides estimations supporting a causal effect running from the adoption of fiscal rules towards a significant reduction in income inequality. In addition, it is shown that this effect varies with the precise type of fiscal rule and the fiscal, monetary, or international environment. Consequently, our study points out that, although fiscal rules are not tools specifically designed to affect inequality, they are not neutral as they may either decrease or increase income inequality. Such important side-effects should be taken into account by governments aiming at adopting fiscal rules or improving the existing rule-based fiscal framework.

2 Possible directions for future research

We see at least three directions in which the literature devoted to fiscal rules could be developed in the years to come.

First, the influential contribution of Bohn (1998) introduces the so-called "fiscal reaction function", according to which fiscal sustainability may be signaled by a significant reaction of the government's surplus to an increasing public debt. Subsequent studies, including e.g. Ghosh et al. (2013), Mauro et al. (2015), Checherita-Westphfal and Zyarek (2017), refined this finding and highlighted that the reaction of the surplus is nonlinearly-related to the dynamics of other variables, and particularly to the level of the public debt-to-GDP ratio. An interesting analysis could consider the effect of fiscal rules on the size and magnitude of the response of fiscal surpluses to the public debt, notably by differentiating between the various types of fiscal rules.

Second, by affecting the various types of public spending, fiscal rules are likely to generate side-effects on various variables, even beyond macroeconomic variables. Recent discussions, see e.g. Darvas and Wolff (2021), emphasize the possibility of a "green fiscal pact" that would include a "green golden rule". Since such proposals are likely to receive wider attention in

the next period, it would be appealing to provide a fully-blown quantitative analysis that would estimate the impact of fiscal rules on various measures of the environmental quality.

Lastly, one of the most challenging issues regarding the composition of the policy-mix between the fiscal and the monetary authorities was stated at the end of the seminal contribution of Sargent and Wallace (1981, page 7): "***Which authority moves first, the monetary authority or the fiscal authority?***". Given the importance of side-effects of both fiscal rules and monetary reforms (namely, inflation targeting adoption) emphasized by Combes et al. (2018), it is not unsurprising that the sequencing of the two reforms was found to matter by the empirical analysis of Combes et al. (2014): adopting first fiscal rules and then inflation targeting does not produce the same fiscal and monetary outcomes compared with the reverse sequencing. Building a theoretical model that may illustrate such differences in the impact of the various sequences of reforms, possibly using refinements of the influential setup developed by Barro and Gordon (1983), such as Beetsma and Bovenberg (1997) or Dixit and Lambertini (2003), would provide an additional perspective on the multifaceted effect of fiscal rules in macroeconomics.

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