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António Afonso, André Teixeira

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Rua Miguel Lúpi 20,
1249-078 Lisboa,
Portugal

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Rua Miguel Lupi, 20
1249-078 LISBOA
Portugal

Telephone: +351 - 213 925 912
E-mail: rem@iseg.ulisboa.pt

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Bank Regulation and Sovereign Risk: A Paradox*

António Afonso† André Teixeira‡

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Abstract

This paper investigates the impact of banking prudential regulation on sovereign risk. We show that prudential regulation reduces sovereign risk and induces governments to spend more. As a result, countries with tight prudential regulation have lower primary budget balances and accumulate more government debt over time. This means that prudential regulation reduces private debt, while paradoxically increasing government debt. We explore several explanations for this paradox. Our results suggest that prudential regulation enables governments to accumulate debt because they improve the nation's credit rating and its borrowing conditions in sovereign bond markets.

Keywords: bank regulation, fiscal policy, macroprudential policy, sovereign debt, sovereign risk.

JEL Codes: E52, E58, E62, H3, G28.

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‡ ISEG, REM/UECE, Universidade de Lisboa, R. Miguel Lúpi 20, 1249-078, Lisbon, Portugal. Email: aafonso@iseg.ulisboa.pt.
‡ Corresponding author. ISEG, REM/UECE, Universidade de Lisboa, R. Miguel Lúpi 20, 1249-078, Lisbon, Portugal. Email: ateixeira@iseg.ulisboa.pt.

1. Introduction

There is a general consensus that prudential regulation improves financial stability. The reason is intuitively obvious: prudential regulation reduces non-performing loans and minimizes risk in the banking system. Yet, the idea that prudential regulation may also influence sovereign risk seems still to be lacking in the literature. This neglect is somewhat surprising given the implications of sovereign risk for financial stability.

This paper asks whether banking prudential regulation affects sovereign risk. No hard or fast answer can be given to this question, since prudential regulation may either increase or decrease sovereign risk. On the one hand, stricter prudential regulation prevents a deluge of risky loans. This could lead to favorable conditions in sovereign bond markets. If that's the case, prudential regulation may decrease sovereign risk. As a consequence, we expect governments to increase spending and issue additional debt. Still, it is almost paradoxical that prudential regulation may reduce debt in the private sector while increasing debt in the public sector, but it is not implausible. On the other hand, stricter prudential regulation reduces credit availability and increases the cost of borrowing. This may result in firm bankruptcies and defaulting borrowers, which may hinder growth and reduce tax revenue. In this case, prudential regulation may increase sovereign risk. Therefore, governments may reduce spending and issue less debt. The net effect of these potentially opposing forces remains ambiguous.

We begin by proposing a simple framework that formalizes this trade-off between financial stability and credit availability and why it matters for sovereign risk. We use this framework to show that there is an optimal level of prudential regulation that minimizes sovereign risk. In general, our results suggest that prudential regulation reduces sovereign risk and enables governments to spend more. At a certain point, though, too much regulation may impede growth and lead to an increase in sovereign risk. The effect of prudential regulation on sovereign risk depends on the level of financial stability, the stock of public debt, and the

degree of economic development.

Next, we test this framework using a variety of econometric techniques and proxies for sovereign risk in 120 countries. We find empirical evidence supporting the view of a "paradox" in prudential regulation, whereby regulation reduces sovereign risk and enables governments to accumulate debt over time. Specifically, we find that the impact of an extra prudential rule on bond yields is between -0.021 and -0.045 percentage points in a year. These estimates are very similar when we use different proxies for sovereign risk like bond spreads and credit default swap (CDS) spreads. Consistent with these results, we also find that an extra prudential rule reduces the primary balance by -0.09 to -0.133 percentage points of GDP in the same period. Once again, the estimates remain in the same ballpark when we consider alternative fiscal variables like government expenditure as a percent of GDP or the debt-to-GDP ratio. Using different regression model specifications, we show that the effect of prudential regulation on sovereign risk is non-linear, with diminishing marginal returns beyond a certain level of sovereign debt. The effectiveness of prudential regulation in reducing sovereign risk depends on the level of government debt and the economic development of a country. These results are robust to several estimation methods that account for the endogeneity of prudential regulation. Overall, we come to the paradoxical conclusion that prudential regulation which is designed to prevent excessive leverage in the banking sector may result in too much debt in the public sector.

We explore a couple of explanations for this paradox. The first potential explanation is that prudential regulation constrains credit to the private sector while easing credit to the public sector. The reasoning is straightforward. As prudential rules mount, individuals and firms are pushed out of the credit market. Yet, banks have to maintain or expand profits. There is a possibility, then, that banks make credit cheaper and more easily available to the public sector. A simple way to test this is by examining how prudential regulation affects the share of credit to the public sector in relation to the private sector. For this line of reasoning to be correct, the share of credit to the public sector should increase disproportionately with

the adoption of prudential rules. Notwithstanding, we find little evidence that this is the case.

A second possibility is that prudential regulation may improve the overall quality of credit. If so, then sovereign debt ratings should improve and governments should have easier and cheaper access to finance. Furthermore, banks should come to prefer government bonds to other non-earning bank balances because bonds are a reliable source of liquidity and collateral and they receive preferential treatment in regulatory requirements. This increased credit availability could, of course, induce governments to borrow more money at favorable terms. We test this hypothesis by looking at the impact of prudential rules on sovereign debt ratings and government bond issues. Our results provide strong evidence that prudential rules improve sovereign debt ratings and enable governments to issue more debt. These results are consistent with the view that prudential regulation leads to better sovereign debt ratings and increases bank's demand for government bonds (e.g., Afonso et al., 2012; Bonner, 2016).

Our paper builds on and contributes to a number of literatures. First, our findings are closely related to the recent literature examining the effects of financial regulation on banks' incentives to hold sovereign bonds (Acharya and Steffen, 2015; Bonner, 2016; Gropp et al., 2019). Previous papers use bank-level data to look at the effect of financial regulation on banks' balance sheets. Instead, we use a rich dataset to examine the broader effects of regulation on sovereign risk and ultimately on fiscal policy. As far as we know, nobody has yet provided empirical evidence on the impact of prudential regulation on fiscal developments. The results presented in this paper point to a paradox in prudential regulation: central banks may effectively fund government deficits through the implementation of strict prudential rules, especially when these rules do not improve financial stability. This finding is also in line with recent evidence that long-term financing operations reduce the perception of sovereign risk and promote financial stability (Afonso and Jalles, 2019).

Second, our findings add to the burgeoning literature on the real effects of prudential

regulation. A few recent papers find that prudential regulation constrains credit and imperils growth, mainly by reducing private spending (e.g., Lim et al., 2011; Cerutti et al., 2017; Teixeira and Venter, 2023). We complement these papers by showing that prudential regulation also affects public spending. Importantly, we provide strong and consistent evidence of a causal effect of prudential regulation on the accumulation of sovereign debt. Our results stand up to a variety of endogeneity tests that include alternative proxies for sovereign risk and government spending, panel data models with fixed effects, two-step Generalized Method of Moment (GMM) estimators, and instrumental variables (IV) to control for differences in prudential regulation across countries.

The paper proceeds as follows. Section 2 sets the stage with a simple framework that analyzes the effect of prudential regulation on sovereign risk. Section 3 explains the data. Section 4 explains the empirical strategy and presents the results. Section 5 looks at potential explanations for the effect of prudential regulation on sovereign risk. Section 6 concludes.

2. Prudential Regulation and Sovereign Risk

In this section, we review the literature to discuss the costs and benefits of prudential regulation with a focus on its effects on financial stability and growth[1]. We then propose a simple theoretical framework to formalize our discussion. This framework is useful to generate testable hypotheses, which we explore in subsequent sections. The hypotheses are tested using different empirical approaches that do not necessarily depend on the assumptions of this framework.

[1] A growing body of research analyzes how prudential regulation affects the redistribution of income and wealth. For an in-depth discussion on the redistributive effects of prudential regulation, see Delis et al. (2014), Frost (2018) and Teixeira (2023).

2.1. The Costs and Benefits of Prudential Regulation

A large and contentious literature has focused on the benefits of prudential regulation for financial stability. This literature shows that prudential regulation enhances financial stability by reducing the likelihood and severity of financial crises (e.g., Kraft and Galac, 2011). This finding is perhaps not too surprising, since prudential regulation is designed to ensure that financial institutions have limited risk exposure. As a consequence, prudential regulation reduces excessive leverage, the likelihood of bank failures, and the cost of bank runs and bailouts (e.g., Lim et al., 2011; Demirgüç-Kunt and Huizinga, 2010; Claessens et al., 2013). Similarly, prudential regulation often requires financial institutions to implement sound risk management practices, which reduces non-performing loans and other forms of financial distress (e.g., Laeven and Levine, 2009; Dell'Ariccia et al., 2012). These papers provide compelling evidence that prudential regulation improves financial stability, which should reduce systemic risk and lower the yields on government bonds.

While the benefits of prudential regulation have been widely studied, its costs have received much less attention. Theoretical papers suggest that prudential regulation has negative effects on growth by restricting credit and reducing consumption (Hall, 2011; Angellini et al., 2014; Farhi and Werning, 2016). Moreover, during periods of rapid deleveraging, prudential regulation may increase precautionary savings and further depress private spending (Eggertsson and Krugman, 2012; Guerrieri and Lorenzoni, 2017). These ideas are supported by a small number of empirical studies showing that prudential regulation impedes growth (e.g., Lim et al., 2011; Cerutti et al., 2017; Akinci and Olmstead-Rumsey, 2018; Teixeira and Venter, 2023). This group of papers suggests that prudential regulation may harm growth, which may increase systemic risk and lead to higher yields on government bonds.

These potential effects of prudential regulation on credit and growth may also have implications for sovereign risk. A few recent papers find that prudential regulation influences banks' demand for government bonds. For example, Acharya and Steffen (2015) find that

capital requirements influence banks' incentives to hold sovereign bonds. Similarly, Bonner (2016) shows that liquidity and capital buffers increase banks' exposure to sovereign bonds. Finally, Gropp et al. (2019) find that capital requirements lead to a more stable demand for government bonds, as banks increase their capital ratios by reducing risk-weighted assets.

So far, the literature does not explicitly address the impact of prudential regulation on sovereign risk and government spending. If prudential regulation is too strict, it may lead to a reduction in credit and growth, which could ultimately impact the ability of sovereigns to meet their debt obligations. However, if prudential regulation is too lax, this could also weaken investor confidence in the financial system, which may increase the likelihood of a financial crisis. In both cases, investors may begin to doubt the ability of governments to repay their debts and will demand higher yields on government bonds, making it more difficult for governments to finance their debt. To formalize the preceding discussion, we present a stylized framework in the next section.

2.2. A Simple Framework

Consider an economy that is composed of a representative agent, banks and the government. The representative agent will maximize a lifetime utility function by consuming, saving and investing in a risk-free asset. The banks provide loans to the agent for consumption and investment purposes, while the government provides public goods and services financed through taxes and debt issuance. Moreover, we assume that banks are subject to prudential regulation and that central banks impose these rules to ensure that banks have sufficient capital to cover potential losses from non-performing loans. The objective of the central bank is to choose an optimal amount of prudential rules, taking into account the trade-off between the benefits of financial stability and the costs of reduced lending.

The government's spending decision is constrained by the level of sovereign risk, which depends on both the government's outstanding debt and the stability of the banking sector. Specifically, the higher the probability of sovereign default, the higher the (long-term)

interest rate the government has to pay to finance its debt, which can crowd out private investment and hinder economic growth. Mathematically, these relationships may be described as follows:

$$\mathrm{r} = \phi(\mathrm{D}, \theta) \tag{1}$$

where r is the interest rate on government debt (i.e., bond yields), D is the level of government debt, and θ is the level of financial stability in the banking sector. For simplicity, we assume that $\mathrm{r} > 0$ or governments would have an extra incentive to increase public spending.

The central bank's choice of optimal prudential stance affects the level of financial stability in the banking sector (θ) and determines the interest rate on government debt according to the function $\phi(.)$ above. The specific form of $\phi(.)$ depends on the characteristics of the economy. There are two cases here. If $\phi(.)$ is decreasing in θ, then stricter prudential regulation reduces the probability of default and the government can issue more debt at a lower interest rate. Conversely, if $\phi(.)$ is increasing in θ, a higher level of financial stability increases the interest rate on government debt. This is the case when prudential regulation is too strict, leading to a reduction in banking lending and a contraction in the economy. This could result in a higher probability of sovereign default, since the reduction in economic activity leads to lower tax revenue and makes it more difficult to service existing debt, which raises the headline fiscal ratios. Thus, we can derive the following hypothesis:

Hypothesis 1: There exists an optimal level of prudential regulation, θ^*, that minimizes sovereign risk.

Assuming that the government wants to maximize spending subject to a target debt-to-GDP ratio, the government's spending decision can be derived from the flow government budget constraint, as follows:

$$\Delta \mathrm{D} = \mathrm{G} + \mathrm{rD} - \mathrm{T} \tag{2}$$

where G is primary government spending, T is government revenue, and ΔD is the change

in government debt. Government spending determines the level of government debt, D, which in turn influences the interest rate on government debt. Following the literature, we expect higher levels of government spending and debt to reduce the effectiveness of prudential regulation (i.e., $\partial\theta/\partial \mathrm{G} < 0$, $\partial\theta/\partial \mathrm{D} < 0$). Furthermore, the marginal impact of G and D on the effectiveness of θ should decrease as G and D increase (i.e., $\partial^2\theta/\partial \mathrm{G}^2 < 0$, $\partial^2\theta/\partial \mathrm{D}^2 < 0$). Equally important, the effect of prudential regulation on government spending is non-linear. It is immediately obvious that $\partial\phi/\partial\theta$ and $\partial\phi/\partial \mathrm{D}$ are not constant for, at least, two reasons. First, the effect of prudential regulation is probably stronger for lower levels of prudential regulation, and weaker for higher levels of prudential regulation. Second, the effect of prudential regulation may also depend on a country's characteristics (ϕ), particularly on its level of financial stability and debt. These characteristics should be captured by the country's level of economic development (Demirgüç-Kunt and Detragiache, 1998). Based on our simple framework and the discussion above, we formulate the following hypotheses:

Hypothesis 2: If prudential regulation improves financial stability, higher levels of prudential regulation should lead to higher government spending. Conversely, if prudential regulation is too strict and worsens financial stability, government spending should remain stable or even decrease over time.

Hypothesis 3: The effectiveness of prudential regulation in reducing sovereign risk is influenced by the level of government debt, with diminishing marginal returns to prudential regulation beyond a certain level of debt.

Hypothesis 4: The relationship between prudential regulation, sovereign risk, and government spending, is mediated by the level of economic development.

Substituting (1) into the above equation, we obtain:

$$\Delta \mathrm{D} = \mathrm{G} - \mathrm{T} + \phi(\mathrm{D}, \theta)\mathrm{D} \tag{3}$$

Rearranging the equation, the government's primary spending decision can be expressed as follows:

$$G = \Delta D + T - \phi(D, \theta)D \tag{4}$$

In summary, equation (4) shows that the government's spending decision is influenced by both the level of financial stability in the banking sector (θ) and the level of government debt (D). If prudential regulation improves financial stability, the government can increase spending without increasing taxes. However, if prudential regulation is too stringent, it may reduce bank lending, which could limit economic growth and, in turn, reduce tax revenue. This simple framework shows that central banks should strike a balance between financial stability and credit availability to promote growth and also consider, to some extent, that governments must maintain a stable debt-to-GDP ratio to ensure fiscal sustainability (see, for instance, Afonso and Jalles, 2017). Of course, a theory is only vindicable if its hypotheses are empirically valid. It is to these matters that we turn next.

3. Data

The data used in this paper is collected from multiple sources. Our primary variables of interest are sovereign risk and government spending. To assess sovereign risk, we analyze bond yields, bond spreads (relative to the US. Bond rate) and CDS spreads. This data comes from Datastream financial database. To examine government spending, we look at the primary balance, government expenditure as a percent of GDP and debt-to-GDP ratio. This data are taken directly from the IMF Global Debt Database. As a supplementary analysis, we investigate the impact of prudential regulation on sovereign debt ratings and government bond issues. The sovereign debt ratings are a simple average of the rating given by the three major credit rating agencies, namely Moody's, Fitch, and Standard & Poor's. Finally, we calculate the growth rate in government bond net issues. The data is publicly available at the Bank of International Settlements (BIS).

We build a ratings database with sovereign debt ratings attributed by the three main rating agencies: Moody's, Fitch Ratings and Standard & Poor's. The data on sovereign debt ratings are collected from Bloomberg. The rating of a particular year is the rating attributed on the 31st of December. The ratings are grouped into 21 categories. The few observations in our sample with a rating below B- are given a value of two, while AAA observations receive a value of 21 (see full numerical scale in Appendix B). The sovereign debt rating is calculated as a simple average of the ratings attributed by the three main rating agencies. Of course, not all countries have a rating attributed by the three agencies. In such cases, we calculate the average rating based on the ratings given by two agencies or rely on the single rating provided by the only agency available.

We measure the level of prudential regulation in each country as the number of prudential policies in effect every quarter. The data on prudential regulation is taken from Alam et al.(2019), who provide a comprehensive dataset of prudential policies implemented worldwide. We do not differentiate between borrower-based and capital-based measures nor do we take into account the strictness of the prudential rules. However, we do consider reversals in prudential policy. For instance, if a country tightens two prudential policies but loosens one previous policy, the overall change in the prudential stance for the quarter will be one. On average, each country in our sample has 2.373 prudential rules in effect each quarter. However, the standard deviation is 4.092 rules, which suggests that the level of prudential regulation varies considerably across countries. This measure is a simple and tractable way to compare the level of prudential regulation across countries over time.

In addition, we use several control variables to account for potential factors driving sovereign risk. These variables control for GDP growth, domestic credit, public debt, inflation, financial crises and financial openness. Some model specifications use a standard fiscal reaction function that also includes the primary balance as a control variable. These variables are obtained from the IMF International Financial Statistics (IFS) database. Furthermore, we use data from other sources to supplement our analysis. For example, we rely

on the CBI index proposed by Romelli (2022) to measure central bank independence based on a wide range of central bank characteristics in 154 countries. The CBI index ranges between 0 (no independence) and 1 (full independence). Finally, we use a rich and novel dataset constructed by Sutherland (2022) to identify the periods in which central banks use forward guidance. A more detailed description of the variables is provided in Appendix A.

Table 1 presents descriptive statistics for all the variables used in our analyses. Our main sample consists of a panel of 120 countries spanning the period 1990-2020. Figure 1 depicts the dynamics of sovereign risk in countries that implement prudential regulation at year 0 relative to other countries that do not implement prudential regulation at that time. The figure shows that the adoption of prudential regulation is, on average, preceded by a temporary peak in sovereign risk. The pattern in this figure suggests that prudential regulation reduces sovereign risk, but it also highlights the need to carefully address endogeneity in our analysis. The next section explains how we estimate the relationship between prudential regulation, sovereign risk and government spending in a way that mitigates endogeneity concerns.

4. Estimation and Results

4.1. How Does Prudential Regulation Affect Sovereign Risk?

If prudential regulation reduces sovereign risk, it may be the case that governments will increase spending and issue more debt at favorable terms. To test this prediction, we estimate a dynamic panel similar to the one before using different proxies for sovereign risk in the dependent variable, as shown below:

$$\mathrm{SR}_{\mathrm{i,t}} = \beta_0 + \beta_1 \mathrm{SR}_{\mathrm{i,t-4}} + \beta_2 \mathrm{PR}_{\mathrm{i,t-4}} + \beta \mathrm{X}_{\mathrm{i,t}} + \alpha_{\mathrm{i}} + \epsilon_{\mathrm{i,t}} \tag{5}$$

where $SR_{i,t}$ is a measure of sovereign risk for country i in period t, $SR_{i,t-4}$ is the dependent variable lagged four quarters to capture the persistence of government spending over time, $PR_{i,t-4}$ is the level of prudential regulation for country i in period $t-4$, $X_{i,t}$ is a vector of country-specific characteristics that influence sovereign risk in that period, α_i are country fixed effects, and $\epsilon_{i,t}$ is the error term. We lag the variable on prudential regulation to account for possible delayed effects on sovereign risk, since banks and households are slow to adjust their behavior to regulation (e.g., Cerutti et al, 2017; Teixeira and Venter, 2023)[2]. We consider three proxies for sovereign risk: government bond yields, government bond spreads relative to the U.S. Treasury bond rate, and sovereign CDS spreads. The model is estimated using pooled ordinary least squares (OLS), a within estimator, and a two-step GMM estimator. The standard errors are corrected for heteroskedasticity and serial correlation at the country level.

Table 2 reports the estimated effect of prudential regulation on sovereign risk. In almost all cases, the effect of prudential regulation on sovereign risk, shown in the first row, is negative and significant at the 1% level. Not too surprisingly, the only exceptions occur for bond yields and bond spreads in the case of pooled OLS. These coefficients are inconsistent and biased upwards because of unobserved time-invariant heterogeneity, most likely country-specific characteristics that we have omitted in the model. By including country-fixed effects in columns 4-6, we eliminate this source of bias. The within estimates indicate that an extra prudential rule reduces bond yields, bond spreads and CDS spreads by -0.045, -0.025 and -0.021 percentage points, respectively. All coefficients are highly significant. The reason why we report pooled OLS estimates is that they are useful to evaluate the credibility of both within and GMM estimates. The estimates from pooled OLS can be seen as an upper-bound estimate for the effects of prudential regulation. Ideally, the GMM estimates should be close to or above the within estimates and below the pooled OLS estimates. This is indeed the case for the vast majority of our results.

[2] The reader should, however, be assured that the results are qualitatively similar when we do not lag this variable or we lag all the variables in the model.

Of course, the within estimates may still be biased because we include a lagged dependent variable in the model. This variable accounts for the persistence of sovereign risk over time and improves the fit of the model. Nevertheless, a lagged dependent variable may lead to dynamic panel bias or "Nickell bias" when the lagged dependent variable is correlated with country-specific effects. This bias should, however, be small because our panel is fairly long and the number of periods is quite large.

In any case, we repeat our estimations using a two-step GMM estimator for the model above; the only difference is that we treat the dependent variable and the variable on prudential regulation as endogenous and instrument them with lags. The first step of the GMM estimator uses the lagged values of the dependent variable and prudential regulation to estimate the relationship between these variables. The residuals from this first-step regression represent the part of the variation in sovereign risk that is not explained by the instrumental variables. The second step uses the residuals from the first-step regression to construct an estimator for the covariance matrix of the error term, which is then used to calculate the efficient GMM estimator. The GMM estimator ensures that the moment conditions are orthogonal to the first-step residuals and addresses potential endogeneity and measurement error in the explanatory variables.

The GMM estimates, shown in columns 7-9 of Table 2, are consistent estimates of the effect of prudential regulation on sovereign risk even when a lagged dependent variable is included in the model. As we anticipated, the GMM estimates are remarkably similar to the within estimates. The only noticeable difference is that the GMM estimator points to a greater impact of prudential regulation on CDS spreads, resulting in a reduction of approximately -0.040 percentage points in a year. These results motivate the use of the within estimator as the starting point in our subsequent analyses of sovereign risk. More interestingly, the GMM estimates indicate that bond yields fall faster than bond spreads. This is interesting because it means that the spread between the country's bond rate and the U.S. Treasury bond rate is narrowing. Put differently, prudential regulation increases

the relative safety of a nation's government bonds when compared to a benchmark rate.

Importantly, the estimated coefficients for the lagged dependent variables are always between 0 and 1, which provides additional evidence that the GMM estimates are stable and consistent over time[3]. For transparency's sake, we report the number of countries and instruments in every model. This allows us to check whether the models suffer from the "too-many-instruments" problem (Alvarez and Arellano, 2003). This is important because the number of moment conditions in the GMM estimator is of the order of T. For large values of T, too many instruments can lead to an asymptotic bias of order 1/N. We address this issue by computing the GMM estimates based on the last quarter of each year across countries. By doing so, we ensure that the number of instruments is smaller than the number of countries in each model. We also test the validity of the GMM estimates is tested in the bottom rows of columns 7-9. Specifically, we report the p-value of a test for serial correlation in the first-differences residuals. The p-values for this test range from 0.325 to 0.977, which indicates that we cannot reject the assumption of no serial correlation. These tests show that our estimates are consistent. The p-values for the Hansen overidentification test range from 0.220 to 0.394, showing no evidence of model misspecification. Overall, our models are highly robust and they reveal a negative relationship between prudential regulation and sovereign risk.

To test for the existence of an optimal level of prudential regulation, as posited in our second hypothesis, we repeat the estimations using a quadratic term for prudential regulation. The sign of the quadratic term allows us to determine whether the relationship between prudential regulation and sovereign risk is concave or convex. Table 3 presents the results of these estimations, indicating that the coefficients of the linear terms are always positive, while the coefficients of the quadratic terms are consistently negative, with statistical significance across all model specifications. This suggests that the relationship between prudential regulation and sovereign risk is non-linear and likely concave. Initially, prudential regula-

[3] The effect of the lagged dependent variable on its current values should be positive and bounded between 0 and 1 to ensure dynamic stability.

tion has a substantial impact on lowering sovereign risk, but this effect gradually diminishes as the level of prudential regulation increases. Beyond a certain level of prudential regulation, the negative effect may become positive, meaning that further increases in prudential regulation can increase sovereign risk. The quadratic term allows for the possibility that the relationship between prudential regulation and sovereign risk is not linear and suggests that there is an optimal level of prudential regulation that minimizes sovereign risk. These findings are consistent with our framework above and support our first hypothesis.

Overall, our results provide strong and consistent evidence that higher levels of prudential regulation are associated with lower sovereign risk. That said, we also find that too much regulation may jeopardize growth and lead to higher sovereign risk. This finding is one of our basic results that will reappear in the discussions below. Next, we turn to the impact of prudential regulation on government spending.

4.2. If Prudential Regulation Reduces Sovereign Risk, Does It Affect Government Spending?

Our second hypothesis suggests that if prudential regulation reduces sovereign risk, then the government may have the opportunity to increase spending and issue debt at more favorable terms. To test this prediction, we estimate a dynamic panel similar to the one above but with different proxies for fiscal developments in the dependent variable, as below:

$$\mathrm{GS_{i,t}} = \beta_0 + \beta_1 \mathrm{GS_{i,t-4}} + \beta_2 \mathrm{PR_{i,t-4}} + \beta \mathrm{X_{i,t-4}} + \alpha_\mathrm{i} + \epsilon_\mathrm{i,t} \tag{6}$$

where $\mathrm{GS_{i,t}}$ is a measure of government spending for country i in period t, $\mathrm{GS_{i,t-4}}$ is the dependent variable lagged four quarters to capture the persistence of government spending over time, $\mathrm{PR_{i,t-4}}$ is the level of prudential regulation for country i in period $\mathrm{t-4}$, $\mathrm{X_{i,t-4}}$ is a vector of country-specific characteristics that influence government spending in period $\mathrm{t-4}$, α_i are country fixed effects, and $\epsilon_\mathrm{i,t}$ is the error term. Note that we lag all our variables

four quarters because a country-specific shock is not expected to have an immediate impact on government spending. If prudential regulation becomes tighter or inflation rises more than expected, the government will take some time to decide how to allocate tax revenue in the next government's budget. This is in sharp contrast with bond yields and CDS spreads that should respond almost immediately to events in the economy. As before, we consider three alternative proxies for fiscal developments: primary balance, government expenditure as a percent of GDP, and debt-to-GDP ratio. The model is estimated using the pooled OLS estimator, the within estimator and two-step GMM estimator.

Table 4 presents the estimated effect of prudential regulation on government spending. The columns are structured in a manner similar to those in Table 2. In all model specifications, we find that prudential regulation reduces the primary balance, increases government expenditure, and leads to an accumulation of debt over time. Once again, we report pooled OLS estimates for government spending because they serve as a benchmark to assess the validity and robustness of both within and GMM estimates. The within estimates show that an extra prudential rule lowers the primary balance by approximately -0.114 percentage points in a year. This result is consistent with a 0.075 percentage points hike in government expenditure and a consequent 0.148 percentage point rise in the debt-to-GDP ratio. To be sure, these coefficients are quite large. The average country in our sample has 2.3 prudential rules in effect every quarter; the evidence provided here suggests that prudential regulation causes the debt-to-GDP ratio of an average country to rise by at least 0.3 percentage points in a year. Our results also suggest that prudential regulation facilitates an increase in government spending only in situations where it enhances financial stability. To check this, we can look at the coefficients of financial crisis, which serve as a direct measure of financial stability. Our analysis reveals consistently positive and highly significant coefficients for both prudential regulation and financial crisis, except obviously for the case of the primary balance that has a negative coefficient. These results lend support to our second hypothesis that prudential regulation leads to higher government spending only when it contributes to

improving financial stability.

The estimates from GMM closely resemble the within estimates both in terms of size and magnitude. The results are also highly significant. However, some of the GMM estimates must be interpreted with caution for two reasons. First, the number of instruments exceeds, albeit by a very small margin, the number of countries when the dependent variable is the primary balance or the debt-to-GDP ratio. There is a chance that some of the coefficients and standard errors are biased. Second, when the dependent variable is government expenditure as a percent of GDP, the model does not suffer from the "too-many-instruments" problem but the p-value for the AR2 test indicates that there is some degree of serial correlation of the idiosyncratic error term. Despite these issues, the p-values for the Hansen tests suggest that our models are reasonably well specified. The point estimates from GMM are also very similar to the pooled OLS estimates and within estimates, which is reassuring.

Taken together, our results suggest that prudential regulation leads to an increase in government spending, consistent with our previous findings on sovereign risk. However, the magnitude of this effect may depend on the level of government debt. To explore this relationship further, we investigate whether the effect of prudential regulation on sovereign risk is influenced by the level of sovereign debt.

4.3. Is the Effect of Prudential Regulation on Sovereign Risk Influenced by the Level of Sovereign Debt?

Our third hypothesis predicts that the effectiveness of prudential regulation in reducing sovereign risk is influenced by the level of government debt, with diminishing marginal returns to prudential regulation beyond a certain level of debt. To test this, we include an interaction term between the level of prudential regulation and sovereign debt in each country:

$$\begin{aligned} \mathrm{SR}_{\mathrm{i,t}} = \beta_0 + \beta_1 \mathrm{SR}_{\mathrm{i,t-4}} + \beta_2 \mathrm{PR} * \mathrm{Debt}_{\mathrm{i,t-4}} \\ + \beta_3 \mathrm{PR}_{\mathrm{i,t-4}} + \beta_4 \mathrm{Debt}_{\mathrm{i,t-4}} + \beta_{\mathrm{i}} \mathrm{X}_{\mathrm{i,t-4}} + \alpha_{\mathrm{i}} + \epsilon_{\mathrm{i,t}} \end{aligned} \tag{7}$$

where $SR_{i,t}$ is a measure of sovereign risk for country i in period t, $SR_{i,t-4}$ is the dependent variable lagged four quarters to capture the persistence of sovereign risk over time, $PR * Debt_{i,t-4}$ is an interaction term between prudential regulation and debt level for each country i in period $t-4$, $PR_{i,t-4}$ is the level of prudential regulation for country i in period $t-4$, $Debt_{i,t-4}$ is a dummy variable that equals 1 when the country debt level in the period is above the median debt level of the country during the sample period, $X_{i,t-4}$ is a vector of country-specific characteristics that influence sovereign risk in period $t-4$, α_i are country fixed effects, and $\epsilon_{i,t}$ is the error term. We replicate the previous analysis using the same estimators and proxies for sovereign risk.

Table 5 presents the results for the interaction term between prudential regulation and sovereign debt in our models. The coefficients reported in the first row capture the change in the impact of prudential regulation on sovereign risk as government debt increases. In almost all model specifications, the coefficients are negative and statistically significant, ranging from -0.065 to -0.366 percentage points. Moving across the columns, the magnitudes of the coefficients become stronger. Our results show that the GMM method is more appropriate for estimating the combined effect of prudential regulation and sovereign debt. An interesting finding is that the coefficient of the linear term of prudential regulation becomes positive and highly significant in the GMM estimates. These results seem to suggest that prudential regulation is being implemented in a way that is not effective. Most likely, the benefits of prudential regulation have already been realized up to a certain level of debt, after which increasing regulation has only negative effects on sovereign risk. These findings are consistent with our third hypothesis that the effect of prudential regulation on sovereign risk is contingent on the level of government debt.

In summary, our findings suggest that, as government debt levels increase, the effectiveness of prudential regulation in reducing sovereign risk diminishes. Put simply, prudential regulation is most effective in reducing sovereign risk when government debt levels are relatively low. These results reinforce our previous conclusion that prudential regulation exhibits

diminishing marginal returns beyond a certain point of government debt.

4.4. Is the Effect of Prudential Regulation on Sovereign Risk Mediated by the Level of Economic Development?

Our framework also suggests that a country's level of economic development could influence the effectiveness of prudential regulation in reducing sovereign risk. To test this issue more formally, we include an interaction term between prudential regulation and the level of economic development, as below:

$$\begin{aligned} \mathrm{SR_{i,t}} =& \beta_0 + \beta_1 \mathrm{SR_{i,t-4}} + \beta_2 \mathrm{PR} * \mathrm{ED_{i,t-4}} \\ &+ \beta_3 \mathrm{PR_{i,t-4}} + \beta_4 \mathrm{ED_{i,t-4}} + \beta_{\mathrm{i}} \mathrm{X_{i,t-4}} + \alpha_{\mathrm{i}} + \epsilon_{\mathrm{i,t}} \end{aligned} \tag{8}$$

where $\mathrm{SR_{i,t}}$ is a measure of sovereign risk for country i in period t, $\mathrm{SR_{i,t-4}}$ is the dependent variable lagged four quarters to capture the persistence of sovereign risk over time, $\mathrm{PR} * \mathrm{ED_{i,t-4}}$ is an interaction term between prudential regulation and the level of economic development of country i in period $\mathrm{t-4}$, $\mathrm{PR_{i,t-4}}$ is the level of prudential regulation for country i in period $\mathrm{t-4}$, $\mathrm{ED_{i,t-4}}$ is a dummy variable that equals 1 when a country is classified as an upper-middle or high-income economy according to the World Bank's country classification by income level and zero otherwise, $\mathrm{X_{i,t-4}}$ is a vector of country-specific characteristics that influence sovereign risk in period $\mathrm{t-4}$, α_{i} are country fixed effects, and $\epsilon_{\mathrm{i,t}}$ is the error term. Once again, we repeat the analysis using the same estimators and proxies for sovereign risk as before.

Table 6 presents the results. The coefficient of the interaction term is negative and highly significant in all models, suggesting that the effectiveness of prudential regulation in reducing sovereign risk varies with the level of economic development. Specifically, our results indicate that prudential regulation is more effective in reducing sovereign risk in countries with lower levels of economic development. This effect is not only significant, but it is also sizable. The

coefficients for the interaction term range from -0.169 percentage points for bond spreads to -0.390 percentage points for CDS spreads. In general, the estimated coefficients are higher for CDS spreads. One possible explanation for this is that CDS spreads are generally more sensitive to changes in sovereign risk than bond yields. Alternatively, CDS markets are typically less liquid than bond markets, which could amplify the impact of changes in sovereign risk on CDS spreads. Further research would be necessary to determine the exact reasons why CDS spreads are more responsive to changes in prudential regulation in countries with varying degrees of development. Regardless, our findings are robust to various proxies of sovereign risk and estimation methods.

Our findings are also consistent with a small body of literature that has investigated the effects of prudential regulation using cross-country data. A few papers argue that prudential regulation has a stronger effect on emerging economies with underdeveloped financial systems (e.g., Cerutti et al., 2017; Teixeira, 2022). While these papers do not specifically address sovereign risk, they suggest that the impact of prudential regulation is tied to the level of development of the financial system. In a related study, Dieckmann and Plank (2012) have shown that financial instability can increase sovereign risk by causing government interventions that transfer risk from the private to the public sector. Interestingly, the authors observe that the transfer of risk is higher in countries with greater exposure to the financial system, particularly to the subprime mortgage sector. Consistent with these ideas, our findings suggest that prudential regulation has a more substantial impact on sovereign risk in emerging economies, where financial systems tend to be less developed and stable over time. This is important because most of these countries are also subject to significant fiscal constraints. Section 5 explores the reasons why prudential regulation reduces sovereign risk, particularly in emerging economies.

4.5. Controlling for Potential Endogeneity

There are two potential concerns with the analysis above. First, it is possible that sovereign risk or government spending determines the stringency of prudential regulation rather than the other way around. If sovereign risk is high, the central bank may impose stricter prudential regulations to reduce the risk of default. Second, some omitted country characteristics may be correlated with prudential regulation. For instance, political instability or the quality of the legal system may affect the efficacy of prudential regulation. These potential sources of endogeneity may bias the estimates. This bias, however, is likely to be small because the within estimates control for time-invariant unobservable factors and the GMM estimates control for both observable and unobservable factors.

That said, we repeat the estimations using a two-stage least squares (2SLS) regression as an additional robustness check. The 2SLS regression accounts for the endogeneity between prudential regulation and sovereign risk by using an IV that is correlated with prudential regulation but not directly correlated with sovereign risk or government spending. In the first stage, the IV is used to estimate the effect of prudential regulation on the endogenous variable (either sovereign risk or government spending). The IV is correlated with prudential regulation but is not correlated with the error term in this first-stage regression. This allows us to isolate the exogenous variation in prudential regulation and obtain an estimate that is not biased by endogeneity. In the second stage, the predicted values of prudential regulation from the first stage are used as the explanatory variable in the regression for sovereign risk or government spending. The 2SLS regression estimates the causal effect of prudential regulation adjusted for potential endogeneity.

We use two instruments. The first instrument is central bank independence (CBI). An independent central bank is more likely to have the power to enforce prudential regulation without political interference (e.g., Klomp and Haan, 2009; Valencia and Ueda, 2012; Doumpos et al., 2015). At the same time, CBI is exogenous to banks' behavior and should

not affect sovereign risk. Moreover, CBI changes over time and across countries, providing the necessary variation for isolating the causal effect of financial stability on sovereign risk. We rely on the CBI index proposed by Romelli (2022), which covers a wide range of central bank characteristics in 154 countries. The results from the first-stage IV regression confirm that CBI is a valid instrument: the prudential regulation coefficient is highly correlated (2.624) and significant at the 1% level (t-value: 4.210).

Table 7 presents the estimates of the effect of prudential regulation on sovereign risk using CBI as an instrument. We confirm that prudential regulation reduces sovereign risk. In particular, the estimated effect of an extra prudential rule on bond yields, bond spreads and CDS spreads is -0.806, -0.360 and -0.140 percentage points, respectively. These results are extremely close to the within estimates and the GMM estimates obtained before. In fact, the coefficients become slightly more negative when we instrument prudential regulation with CBI. This makes sense because more independent central banks are also more likely to manage monetary policy and maintain financial stability in the country. Additionally, more independent central banks signal to investors a stronger commitment to financial stability, which could further reduce sovereign risk (e.g., Klomp and Haan, 2009). These estimates largely corroborate the findings in our previous analysis, providing further evidence that our estimates are highly robust.

However, the use of CBI as an instrument is unlikely to isolate the effect of prudential regulation on government spending. This is because CBI is inversely related to government spending, as independent central banks are less likely to finance government deficits. To further examine the relationship between prudential regulation and government spending, we use forward guidance as an alternative instrument. We contend that central banks using forward guidance enforce stricter prudential rules, but forward guidance should not affect, at least directly, the level of government spending. The results from the first-stage IV regression show that forward guidance is a valid instrument: the coefficient for prudential regulation is positively correlated (2.219) and significant at the 1% level (t-value: 8.219).

Table 8 presents estimates of the effect of prudential regulation on government spending using forward guidance as an instrument. Once more, we find our results substantially unchanged: an extra prudential rule decreases the primary balance by -0.239 percentage points while increasing government expenditure and debt-to-GDP by 0.126 and 0.387 percentage points, respectively. These results point to a stronger impact of prudential regulation on government spending than previously suggested. This makes sense because the use of forward guidance isolates the exogenous variation in prudential regulation that is not affected by changes in government spending. Even this measure, though, is not immune to bias, as forward guidance could be used to stabilize market expectations during times of fiscal instability, potentially affecting public spending[4]. These results indicate that our previous estimates are on the cautious side and that the true effect of prudential regulation on government spending may be even larger.

Through various model specifications, our results consistently reveal that prudential regulation reduces sovereign risk and increases government spending, rather than the other way around. The resulting financial stability enables governments to take on more debt over time. The next question, then, is why prudential regulation affects sovereign risk.

5. Why Does Prudential Regulation Reduce Sovereign Risk?

Having determined that prudential regulation reduces sovereign risk and increases government spending, we now examine why this occurs. We consider two hypotheses. The first hypothesis is that prudential regulation constrains credit to the private sector but eases credit to the public sector. The simplest way to test this is to check whether the share of credit to the public sector relative to the private sector increases disproportionately with the

[4] In this case, forward guidance could influence public spending. Nonetheless, governments usually need time to adjust their fiscal policy. Additionally, we control for periods of financial instability in the 2SLS regressions

adoption of prudential rules.

Table 9 presents the estimates of the effect of prudential regulation on the public-to-private credit ratio. The first column reports within estimates. The fourth column repeats the estimation using the two-step GMM that mitigates endogeneity concerns. In both cases, we find little evidence that prudential rules lead to an increase in the public-to-private credit ratio. On the contrary, our results point to a marginal decrease in the public-to-private credit ratio by the end of the year. The estimated coefficients range from -0.001 to -0.002 percentage points in a year, which suggests that prudential regulation has more serious consequences for private credit than public credit.

A second hypothesis is that prudential regulation improves the overall quality of credit, which reduces sovereign risk and makes government bonds relatively more attractive. This can encourage governments to increase spending and issue more debt at favorable terms. To check for this, we examine the impact of prudential rules on sovereign debt ratings and government bond net issues. If prudential rules reduce sovereign risk, they should improve sovereign debt ratings. As a consequence, governments should issue more debt than they redeem in those years.

The second and third columns of Table 9 provide strong evidence supporting this hypothesis. Our results suggest that prudential regulation increases sovereign credit ratings and allows governments to issue more bonds. This effect is both sizable and significant. We find that the introduction of an extra prudential rule has a positive impact on the sovereign rating of an average country, increasing it by nearly 1.4 units on a 0-21 scale in only a year. This improvement in the rating is associated with a growth of 0.135-0.199 percentage points in the net issuance of government bonds. Our findings suggest that prudential regulation enhances the overall credit quality and facilitates the issuance of government debt at more favorable terms.

6. Conclusion

This paper uncovers a paradoxical relationship between prudential regulation, sovereign risk and government spending. While prudential regulation may lead to a reduction in private debt, it also appears to increase public debt. We provide strong and consistent evidence that prudential regulation reduces sovereign risk and enables governments to increase spending over time. This is because prudential regulation improves a country's overall credit quality, thereby enabling governments to access debt markets on more favorable terms. The effects of prudential regulation on sovereign risk are generally stronger in countries with lower levels of debt and economic development.

These findings have important implications for policymakers and central banks. On the one hand, prudential regulation helps to reduce the risk of financial instability by limiting excessive lending to the private sector. On the other hand, it may lead to an increase in public sector debt, which can have negative consequences for fiscal sustainability and economic growth. As such, policymakers need to strike a balance between promoting financial stability and ensuring sustainable public finances. Our findings also show that prudential regulation can be an effective tool to reduce sovereign risk and enable governments to increase spending, particularly in countries with relatively low levels of government debt or economic development. Therefore, international financial institutions like the IMF and the World Bank should support the implementation of prudential regulation in developing countries.

Despite the significant insights gained from our analysis, several questions remain unanswered. For instance, what is the optimal level of prudential regulation? While we provide evidence that a certain level of prudential regulation can minimize sovereign risk, we also show that a one-size-fits-all approach is not feasible. The optimal level of prudential regulation will vary across countries and over time, depending on a range of factors, including institutional factors, the structure of the financial system, and macroeconomic events. More research is needed on the way these factors influence the impact of prudential regulation on

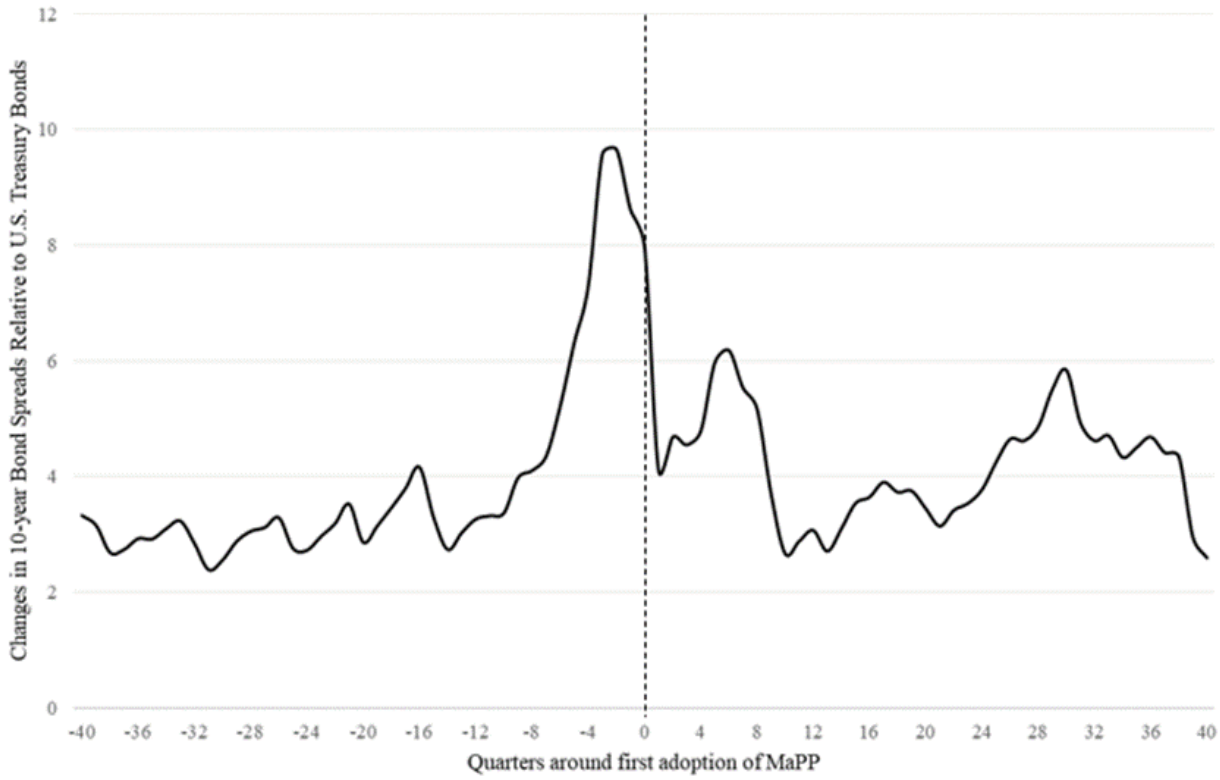
sovereign risk. Another key question is how prudential rules interact with monetary and fiscal policy to reduce sovereign risk. Central banks need guidance on how best to balance these various policy tools, and yet there is a lack of research in this area. Finally, future research could benefit from a more granular analysis of the impact of individual prudential tools on sovereign risk. For instance, how do capital- and borrower-based measures affect sovereign risk? A more nuanced analysis is needed to better understand how different prudential rules affect sovereign risk both across and within countries. Answering these questions could throw more light on the paradox of prudential regulation.

Table 1: Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
PR	15,004	2.373	4.092	0	32
Crisis	15,004	0.215	0.411	0	1
Bond Yield	8,703	7.015	5.036	0.620	19.700
Bond Spread	8,703	3.004	4.665	-2.117	15.137
CBI	8,684	0.596	0.195	0.142	0.929
CDS	3,059	188.735	144.461	25.610	530
Credit-to-GDP	10,152	57.185	48.196	0.491	304.575
Debt-to-GDP	10,152	55.993	44.644	5.627	155.079
Forward Guidance	15,004	0.078	0.267	0	1
GDP Growth	10,838	1.181	4.821	-9.053	11.935
Gov. Expenditure	12,424	31.191	11.862	10.601	57.274
Gov. Bonds Net Issues	6,761	-2.107	24.449	-183.429	95.364
Inflation	14,205	1.553	2.143	-0.949	8.004
Openness	11,552	0.623	1.582	-1.927	2.311
Primary Balance	9,580	0.625	4.537	-9.243	19.613
Public-Private Credit	3,403	0.559	0.390	0.041	1.929
Sovereign Credit Ratings	9,477	14.318	5.120	2	21

Note: This table presents summary statistics for the main variables used in our analysis. "PR" is an overall cumulative macroprudential policy index that sums all cumulative prudential rules in a country in every quarter. "PR Demand-side" are measures targeted at borrowers, particularly LTV and DSTI ratios. "PR Supply-side" are measures targeted at financial institutions, such as capital requirements, countercyclical and conservation buffers, liquidity requirements and other limits to credit growth. "Crisis" is an indicator variable that equals one whenever a country experiences a financial crisis in a given quarter based on the dataset of Laeven and Valencia (2018). "Bond Yield" is the 10-year government bond yield of a country in a given quarter. "Bond Spread" is the 10-year bond yield of a country relative to the U.S. Treasury bond rate. "CBI" is the index of central bank independence proposed by Romelli (2022). "CDS" is the 10-year sovereign credit default swap (CDS) spread of a country in a given quarter. "Credit-to-GDP" is domestic credit to the private sector as a percentage of GDP. "Debt-to-GDP" is gross public debt as a percent of GDP. "GDP Growth" is the growth rate of GDP adjusted for inflation. "Gov. Expenditure" is total government expenditure as a percent of GDP. "Forward Guidance" is a dummy variable that equals one whenever the central bank of a country uses forward guidance in a given year (Sutherland, 2022). "Gov. Bonds Net Issues" is the growth rate in the net issue of government bonds (gross issue – redemptions). "Inflation" is the growth rate in consumer price index using the Laspeyres formula. "Openness" is the Chinn-Ito financial openness index. "Primary Balance" is primary net lending minus borrowing as a percent of GDP. "Public-Private Credit" is the ratio of credit to the general government over domestic credit to the private sector. "Sovereign Credit Ratings" is a simple average of the sovereign credit ratings of the main credit rating agencies (Fitch, Moody's and S&P500). All continuous variables are winsorized at the 1th and 99th percentile.

Figure 1: Sovereign Risk Before and After the Adoption of Prudential Regulation



Note: This figure plots the evolution of sovereign risk as measured by the average 10-year bond spread in each country relative to the U.S. Treasury bond before and after the adoption of PR. The vertical axis plots the 4-quarter ahead bond spreads to account for potential delayed effects of PR on sovereign risk. The horizontal axis corresponds to the time (in quarters) relative to the implementation of PR. To facilitate visualization, the x-axis is restricted to ten years prior and after the adoption of PR.

Table 2: Effect of Prudential Regulation on Sovereign Risk

	Pooled OLS Estimates			Within Estimates			GMM Estimates		
	Bond Yield	Bond Spread	CDS	Bond Yield	Bond Spread	CDS	Bond Yield	Bond Spread	CDS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PR	0.004	0.021***	-1.368***	-0.045***	-0.025**	-2.139***	-0.073***	-0.027***	-4.024***
	(0.005)	(0.005)	(0.306)	(0.014)	(0.012)	(0.601)	(0.006)	(0.006)	(0.254)
LDV	0.896***	0.876***	0.734***	0.752***	0.633***	0.352***	0.727***	0.682***	0.545***
	(0.009)	(0.009)	(0.019)	(0.031)	(0.037)	(0.035)	(0.006)	(0.006)	(0.014)
GDP Growth	-0.016***	-0.026***	-0.543	-0.017***	-0.026***	-0.371*	-0.005	-0.024***	1.308***
	(0.006)	(0.006)	(0.383)	(0.006)	(0.006)	(0.199)	(0.004)	(0.005)	(0.246)
Inflation	0.246***	0.250***	12.516***	0.198***	0.164***	7.319**	0.304***	0.266***	19.630***
	(0.026)	(0.026)	(2.076)	(0.033)	(0.033)	(3.269)	(0.014)	(0.017)	(0.772)
Crisis	0.396***	0.461***	25.288***	0.468***	0.570***	25.837	0.621***	0.728***	39.070***
	(0.059)	(0.059)	(5.493)	(0.154)	(0.176)	(20.313)	(0.044)	(0.046)	(2.185)
Openness	-0.012	-0.022	-6.652***	-0.039	-0.071	-19.212	-0.115***	-0.112***	-14.249***
	(0.015)	(0.016)	(1.310)	(0.094)	(0.099)	(14.467)	(0.031)	(0.023)	(1.493)
Credit-to-GDP	-0.002***	-0.002***	-0.157***	-0.003	0.003	1.150***	-0.007***	-0.008***	-0.329***
	(0.000)	(0.000)	(0.039)	(0.003)	(0.003)	(0.368)	(0.001)	(0.001)	(0.032)
Debt-to-GDP	0.000	0.001	0.306***	-0.005	0.003	0.206	-0.001***	0.000	0.506***
	(0.001)	(0.001)	(0.062)	(0.003)	(0.004)	(0.368)	(0.000)	(0.001)	(0.038)
Intercept	0.232***	0.028	39.240***	1.632***	0.334	26.663	1.853***	1.029***	79.096***
	(0.088)	(0.068)	(5.859)	(0.458)	(0.413)	(49.234)	(0.121)	(0.092)	(3.813)
Observations	4,798	4,798	2,147	4,798	4,798	2,274	1,170	1,170	514
Adjusted R^2	0.897	0.872	0.736	0.893	0.862	0.334			
Countries	79	79	50	79	79	50	77	77	50
Instruments							66	65	47
AR2 test p-value							0.977	0.325	0.577
Hansen test p-value							0.220	0.394	0.275

Note: This table reports the estimated effects of prudential regulation (PR) on sovereign risk as measured by government bond yields (%), government bond spreads relative to the U.S. Treasury bond rate (%) and sovereign credit default swaps (CDS) spreads (in basis points). Cols.1-3 present results from pooled OLS. Cols.4-6 present results from the within estimator, which controls for country fixed effects. Cols.7-9 present results from a two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. The variable on PR is lagged four quarters to account for delayed effects on sovereign risk. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in sovereign risk is a consequence of past risk levels or country-specific risk perceptions. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments in the two-step GMM and the p-value of the Hansen test of overidentification. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 3: Effect of Prudential Regulation on Sovereign Risk, Optimal Level

	Within Estimates			GMM Estimates		
	Bond Yield	Bond Spread	CDS	Bond Yield	Bond Spread	CDS
	(1)	(2)	(3)	(4)	(5)	(6)
PR	-0.135***	-0.086***	-4.904***	-0.228***	-0.177***	-8.015***
	(0.027)	(0.023)	(1.562)	(0.003)	(0.002)	(0.478)
PR^2	0.005***	0.004***	0.179**	0.011***	0.011***	0.385***
	(0.001)	(0.001)	(0.087)	(0.000)	(0.000)	(0.026)
LDV	0.690***	0.588***	0.276***	0.644***	0.600***	0.626***
	(0.027)	(0.025)	(0.037)	(0.002)	(0.001)	(0.011)
GDP Growth	-0.015*	-0.020***	-0.371	0.004**	-0.015***	0.042
	(0.008)	(0.007)	(0.232)	(0.002)	(0.001)	(0.381)
Inflation	0.248***	0.222***	5.553	0.355***	0.354***	22.528***
	(0.055)	(0.059)	(4.240)	(0.005)	(0.001)	(0.433)
Crisis	0.679***	0.753***	62.643*	0.890***	0.886***	61.139***
	(0.241)	(0.283)	(32.276)	(0.009)	(0.014)	(1.001)
Openness	0.012	-0.027	-26.650	-0.177***	-0.175***	-7.571***
	(0.117)	(0.118)	(21.486)	(0.005)	(0.005)	(1.325)
Credit-to-GDP	-0.003	0.003	1.207***	-0.009***	-0.011***	-0.238***
	(0.003)	(0.003)	(0.375)	(0.000)	(0.000)	(0.040)
Debt-to-GDP	-0.003	0.007*	0.088	0.000	0.002***	0.370***
	(0.003)	(0.004)	(0.468)	(0.001)	(0.001)	(0.046)
Intercept	1.932***	0.132	53.092	2.639***	1.552***	57.221***
	(0.456)	(0.432)	(60.957)	(0.050)	(0.045)	(4.463)
Observations	4,798	4,798	2,147	1,170	1,170	514
Adjusted R^2	0.867	0.822	0.247			
Countries	79	79	50	77	77	50
Instruments				95	94	76
AR2 test p-value				0.808	0.845	0.677
Hansen test p-value				0.834	0.908	0.980

Note: This table reports estimates for the impact of the quadratic term of prudential regulation (PR) on sovereign risk to determine whether there is an optimal level of prudential regulation that minimizes sovereign risk. Cols.1-3 present results from the within estimator, which controls for country fixed effects. Cols.4-6 present results from a two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. The variable on PR is lagged four quarters to account for delayed effects on sovereign risk. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in sovereign risk is a consequence of past risk levels or country-specific risk perceptions. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments in the two-step GMM and the p-value of the Hansen test of overidentification. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 4: Effect of Prudential Regulation on Government Spending

	Pooled OLS Estimates			Within Estimates			GMM Estimates		
	Primary Balance	Gov. Expenditure	Debt-to-GDP	Primary Balance	Gov. Expenditure	Debt-to-GDP	Primary Balance	Gov. Expenditure	Debt-to-GDP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PR	-0.090***	0.033***	0.100***	-0.114***	0.075**	0.148**	-0.133***	0.107***	0.104***
	(0.014)	(0.011)	(0.037)	(0.029)	(0.027)	(0.065)	(0.010)	(0.014)	(0.016)
LDV	0.771***	0.972***	0.984***	0.558***	0.826***	0.928***	0.708***	0.807***	0.986***
	(0.012)	(0.003)	(0.003)	(0.039)	(0.021)	(0.018)	(0.011)	(0.016)	(0.007)
GDP Growth	2.189**	-0.641	-1.189	2.084***	-0.957	0.231	0.101***	-0.059***	-0.028
	(0.876)	(0.723)	(2.364)	(0.507)	(0.652)	(2.552)	(0.012)	(0.018)	(0.017)
Inflation	0.013	-0.007	-0.129	-0.019	-0.036	-0.033	0.027	-0.004	-0.283***
	(0.028)	(0.022)	(0.093)	(0.042)	(0.038)	(0.141)	(0.021)	(0.021)	(0.028)
Crisis	-0.456***	0.052	0.142	-0.898**	0.347	1.323	-0.611***	-0.400***	0.079
	(0.083)	(0.077)	(0.239)	(0.425)	(0.333)	(1.047)	(0.112)	(0.105)	(0.091)
Openness	-0.116***	0.136***	0.060	-0.443***	0.085	0.596*	-0.216***	0.707***	0.121**
	(0.026)	(0.024)	(0.077)	(0.117)	(0.106)	(0.349)	(0.027)	(0.065)	(0.040)
Credit-to-GDP	0.117	0.096	1.424***	-0.685	0.634	3.400**	0.003***	0.012***	0.011***
	(0.075)	(0.076)	(0.227)	(0.431)	(0.548)	(1.663)	(0.001)	(0.002)	(0.002)
Debt-to-GDP	0.003**	-0.004***		0.011**	-0.017***		0.008***	0.008**	
	(0.001)	(0.001)		(0.005)	(0.005)		(0.001)	(0.003)	
Primary Balance			-0.383***			-0.465***			-0.304***
			(0.032)			(0.093)			(0.009)
Intercept	0.072	1.116***	0.656**	0.986	6.048***	1.103	-0.257*	4.712***	0.832**
	(0.111)	(0.120)	(0.289)	(0.544)	(0.820)	(1.528)	(0.125)	(0.367)	(0.309)
Observations	4,556	6,185	4,572	4,682	6,365	6,296	1,144	1,553	1,148
Adjusted R^2	0.557	0.965	0.963	0.321	0.648	0.859			
Countries	63	80	63	63	80	63	64	80	64
Instruments							67	67	67
AR2 test p-value							0.931	0.033	0.412
Hansen test p-value							0.407	0.118	0.331

Note: This table reports the estimated effects of prudential regulation (PR) on government spending as measured by the primary balance (% of GDP), government expenditure (% of GDP) and gross public debt (% of GDP). Cols.1-3 present results from pooled OLS. Cols.4-6 present results from the within estimator, which controls for country fixed effects. Cols.7-9 present results from a two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. All regressors are lagged four quarters to account for delayed effects on governemnt spending. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in government spending is a consequence of recent changes in fiscal policy or country-specific factors that affect government spending. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments in the two-step GMM and the p-value of the Hansen test of overidentification. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 5: Effect of Prudential Regulation on Sovereign Risk, Level of Sovereign Debt

	Within Estimates			GMM Estimates		
	Bond Yield	Bond Spread	CDS	Bond Yield	Bond Spread	CDS
	(1)	(2)	(3)	(4)	(5)	(6)
PRxDebt	-0.065**	-0.063*	-2.359	-0.366***	-0.327***	-9.877***
	(0.027)	(0.033)	(2.022)	(0.018)	(0.020)	(0.309)
PR	-0.017	0.019	-0.449	0.251***	0.267***	6.009***
	(0.022)	(0.028)	(1.743)	(0.022)	(0.018)	(0.440)
Debt	0.081	-0.089	-38.212***	0.799***	0.681***	26.613***
	(0.201)	(0.214)	(12.428)	(0.058)	(0.065)	(2.477)
LDV	0.695***	0.590***	0.273***	0.633***	0.606***	0.617***
	(0.028)	(0.025)	(0.037)	(0.007)	(0.004)	(0.006)
GDP Growth	-0.015**	-0.020***	-0.371	-0.002	-0.023***	-0.554**
	(0.008)	(0.007)	(0.227)	(0.004)	(0.004)	(0.280)
Inflation	0.249***	0.224***	5.121	0.341***	0.330***	21.389***
	(0.055)	(0.059)	(4.165)	(0.011)	(0.010)	(0.883)
Crisis	0.676***	0.752***	63.260*	0.864***	0.860***	61.137***
	(0.239)	(0.280)	(32.726)	(0.061)	(0.074)	(3.197)
Openness	0.029	-0.006	-23.133	-0.172***	-0.098***	-7.496***
	(0.116)	(0.117)	(21.939)	(0.031)	(0.026)	(1.161)
Credit-to-GDP	-0.004	0.003	1.224***	-0.010***	-0.010***	-0.265***
	(0.003)	(0.003)	(0.389)	(0.001)	(0.001)	(0.052)
Debt-to-GDP	-0.003	0.008**	0.299	0.000	0.002**	0.447***
	(0.003)	(0.004)	(0.494)	(0.001)	(0.001)	(0.038)
Intercept	1.762***	0.088	66.094	1.968***	0.679***	28.687***
	(0.472)	(0.447)	(58.448)	(0.127)	(0.097)	(5.126)
Observations	4,798	4,798	2,147	1,170	1,170	514
Adjusted R^2	0.867	0.822	0.245			
Countries	79	79	50	77	77	50
Instruments				68	67	49
AR2 test p-value				0.801	0.860	0.767
Hansen test p-value				0.140	0.433	0.226

Note: This table reports the estimates for the impact of an interaction term between prudential regulation (PR) and debt levels on the different proxies for sovereign risk. The variable Debt is a dummy that equals 1 when the country debt level in the period is above the median debt level of the country during the sample period. Cols.1-3 present results from the within estimator, which controls for country fixed effects. Cols.4-6 present results from a two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. The variable on PR is lagged four quarters to account for delayed effects on sovereign risk. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in sovereign risk is a consequence of past risk levels or country-specific risk perceptions. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments in the two-step GMM and the p-value of the Hansen test of overidentification. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 6: Effect of Prudential Regulation on Sovereign Risk, Level of Economic Development

	Within Estimates			GMM Estimates		
	Bond Yield	Bond Spread	CDS	Bond Yield	Bond Spread	CDS
	(1)	(2)	(3)	(4)	(5)	(6)
PRxED	-0.062**	-0.077***	-0.841	-0.148***	-0.169***	-3.900***
	(0.029)	(0.026)	(1.794)	(0.019)	(0.019)	(0.745)
PR	-0.021	0.027	-1.757	0.028	0.098***	0.704
	(0.023)	(0.021)	(1.552)	(0.018)	(0.019)	(0.708)
LDV	0.696***	0.590***	0.280***	0.627***	0.558***	0.627***
	(0.028)	(0.025)	(0.036)	(0.004)	(0.005)	(0.005)
GDP Growth	-0.015*	-0.020***	-0.379	0.004	-0.015***	-0.143
	(0.008)	(0.007)	(0.233)	(0.004)	(0.005)	(0.620)
Inflation	0.251***	0.225***	5.633	0.326***	0.299***	21.911***
	(0.055)	(0.058)	(4.228)	(0.017)	(0.010)	(1.131)
Crisis	0.670***	0.744***	62.599*	0.963***	0.976***	61.973***
	(0.240)	(0.281)	(32.389)	(0.035)	(0.031)	(2.780)
Openness	0.023	-0.016	-26.263	-0.080***	-0.081***	-5.075***
	(0.117)	(0.116)	(21.507)	(0.019)	(0.023)	(1.568)
Credit-to-GDP	-0.003	0.003	1.228***	-0.010***	-0.010***	-0.201***
	(0.003)	(0.003)	(0.381)	(0.001)	(0.001)	(0.041)
Debt-to-GDP	-0.003	0.008*	0.117	0.002***	0.004***	0.436***
	(0.003)	(0.004)	(0.466)	(0.001)	(0.001)	(0.040)
Intercept	1.773***	0.012	44.815	2.353***	1.157***	40.774***
	(0.458)	(0.429)	(60.592)	(0.092)	(0.100)	(4.560)
Observations	4,798	4,798	2,147	1,170	1,170	514
Adjusted R^2	0.870	0.827	0.249			
Countries	79	79	50	77	77	50
Instruments				67	66	48
AR2 test p-value				0.852	0.732	0.732
Hansen test p-value				0.451	0.743	0.342

Note: This table reports the estimates for the impact of the interaction term between prudential regulation (PR) and economic development (ED) on the proxies of sovereign risk. Economic development is measured using a dummy variable that equals one whenever a country is classified as an upper-middle or high-income economy according to the World Bank. In the interest of space, we only report estimates for the most robust model specifications. Cols.1-3 present results from the within estimator, which controls for country fixed effects. Cols.4-6 present results from a two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. The variable on PR is lagged four quarters to account for delayed effects on sovereign risk. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in sovereign risk is a consequence of past risk levels or country-specific risk perceptions. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments in the two-step GMM and the p-value of the Hansen test of overidentification. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 7: IV Estimates of the Effect of Prudential Regulation on Sovereign Risk (Robustness)

	Bond Yield	Bond Spread	CDS
	(1)	(2)	(3)
	A. 2SLS with Fixed Effects		
PR	-0.806***	-0.360***	-13.530
	(0.249)	(0.109)	(8.951)
LDV	0.535***	0.560***	0.227***
	(0.060)	(0.020)	(0.048)
GDP Growth	-0.007	-0.014**	-0.635
	(0.009)	(0.007)	(0.487)
Inflation	0.144***	0.103***	4.445*
	(0.036)	(0.027)	(2.619)
Crisis	0.515***	0.623***	9.890
	(0.172)	(0.129)	(10.988)
Openness	0.102	-0.009	-18.324**
	(0.094)	(0.068)	(7.451)
Credit-to-GDP	0.012**	0.014***	2.351***
	(0.005)	(0.003)	(0.237)
Debt-to-GDP	0.003	0.009***	0.799***
	(0.003)	(0.002)	(0.249)
Intercept	2.268***	-0.495**	-71.270***
	(0.352)	(0.225)	(23.031)
	B. First-stage Estimates		
CBI	2.624***	4.293***	22.586***
	(0.624)	(-0.626)	(6.301)
LDV	-0.220***	-0.114***	-0.004***
	(0.015)	(0.019)	(0.001)
GDP Growth	0.004	0.007	0.004
	(0.008)	(0.019)	(0.017)
Inflation	-0.011	-0.042	-0.160***
	(0.034)	(0.034)	(0.076)
Crisis	-0.225	-0.435***	0.061
	(0.157)	(0.160)	(0.375)
Openness	0.059	-0.057	0.292
	(0.087)	(0.089)	(0.235)
Credit-to-GDP	0.017***	0.022***	0.0188***
	(0.002)	(0.002)	(0.006)
Debt-to-GDP	0.007***	0.009***	0.009***
	(0.002)	(0.002)	(0.008)
Intercept	-0.590	-3.190***	-13.996***
	(0.432)	(0.396)	(4.486)
F-*statistic*	62.26	39.09	6.82
Observations	4,556	4,377	4,572
Adjusted R^2	0.538	0.960	0.960

Note: This table reports the IV estimates of the effects of prudential regulation (PR) on sovereign risk. Panel A presents 2SLS with country fixed effects instrumenting PR with central bank independence (CBI). Panel B presents the first-stage estimates and the excluded instruments F-*statistic*. The variable on PR is lagged four quarters to account for delayed effects on sovereign risk. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in sovereign risk is a consequence of past risk levels or country-specific risk perceptions. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 8: IV Estimates of the Effect of Prudential Regulation on Government Spending (Robustness)

	Primary Balance	Gov. Expenditure	Debt-to-GDP
	(1)	(2)	(3)
	A. 2SLS with Fixed Effects		
PR	-0.239***	0.126**	0.387**
	(0.065)	(0.057)	(0.170)
LDV	0.575***	0.829***	0.931***
	(0.014)	(0.008)	(0.007)
GDP Growth	0.004	-0.007	-0.011
	(0.007)	(0.005)	(0.018)
Inflation	0.025	-0.059***	-0.177***
	(0.019)	(0.015)	(0.051)
Crisis	-1.237***	0.493***	1.764***
	(0.193)	(0.145)	(0.506)
Openness	-0.424***	0.070	0.421**
	(0.075)	(0.055)	(0.197)
Credit-to-GDP	-0.007***	0.007***	0.036***
	(0.003)	(0.002)	(0.007)
Debt-to-GDP	0.008***	-0.015***	
	(0.002)	(0.002)	
Primary Balance			
			(0.037)
Intercept	1.540***	5.790***	0.804
	(0.248)	(0.277)	(0.657)
	B. First-stage Estimates		
Forward Guidance	2.219***	2.336***	2.219***
	(0.270)	(0.152)	(0.173)
LDV	0.042***	0.014	0.013***
	(0.016)	(0.009)	(0.003)
GDP Growth	0.007	0.002	0.007
	(0.008)	(0.006)	(0.008)
Inflation	0.148***	0.119***	0.148***
	(0.021)	(0.015)	(0.021)
Crisis	-0.850***	-0.462***	-0.854***
	(0.218)	(0.160)	(0.212)
Openness	0.349***	-0.120***	0.346***
	(0.087)	(0.063)	(0.085)
Credit-to-GDP	0.028***	0.027***	0.029***
	(0.002)	(0.002)	(0.002)
Debt-to-GDP	0.013***	0.002	
	(0.003)	(0.002)	
Primary Balance			0.041***
			(0.016)
Intercept	-1.651***	-0.472**	-1.669***
	(0.270)	(0.317)	(0.300)
F-*statistic*	58.09	68.47	58.79
Observations	4,556	4,377	4,572
Adjusted R^2	0.538	0.960	0.960

Note: This table reports the IV estimates of the effects of prudential regulation (PR) on government spending. Panel A presents 2SLS with country fixed effects instrumenting PR with forward guidance. Panel B presents the first-stage estimates and the excluded instruments F-statistic. All regressors are lagged four quarters to account for delayed effects on government spending. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that an increase in government spending is a consequence of recent changes in fiscal policy or country-specific factors that affect government spending. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

Table 9: Potential Explanations for the Effect of Prudential Regulation on Sovereign Risk

	Within Estimates			GMM Estimates		
	Public-Private Credit	Sovereign Credit Ratings	Gov. Bonds Net Issues	Public-Private Credit	Sovereign Credit Ratings	Gov. Bonds Net Issues
	(1)	(2)	(3)	(4)	(5)	(6)
PR	-0.001**	0.014**	0.199	-0.002***	0.003***	0.135***
	(0.000)	(0.007)	(0.159)	(0.000)	(0.001)	(0.020)
LDV	0.822***	0.829***	0.076*	0.802***	1.014***	0.028***
	(0.015)	(0.019)	(0.044)	(0.011)	(0.003)	(0.001)
GDP Growth	0.000	0.004***	0.039	-0.003***	0.001	0.069***
	(0.000)	(0.001)	(0.051)	(0.001)	(0.001)	(0.013)
Inflation	-0.002	-0.084**	-0.314	0.001	-0.083***	0.317***
	(0.001)	(0.032)	(0.197)	(0.001)	(0.006)	(0.051)
Crisis	-0.021**	-0.279*	1.910	-0.009***	-0.147***	0.960***
	(0.009)	(0.145)	(1.672)	(0.003)	(0.011)	(0.143)
Debt-to-GDP	0.001***	-0.013***	-0.005	0.001***	-0.002***	-0.001
	(0.000)	(0.003)	(0.012)	(0.000)	(0.000)	(0.002)
Primary Balance	-0.003***	0.039***	0.104	-0.004***	0.029***	-0.038***
	(0.001)	(0.010)	(0.101)	(0.001)	(0.002)	(0.010)
Reserves	0.013	0.190	0.421	0.006	-0.015	1.428
	(0.019)	(0.411)	(2.708)	(0.009)	(0.074)	(0.905)
Intercept	0.010	3.505***	-1.880*	0.032***	-0.162**	-1.609***
	(0.014)	(0.423)	(1.080)	(0.004)	(0.072)	(0.089)
Observations	2,668	4,513	3,778	669	1,100	946
Adjusted R^2	0.981	0.967	0.01			
Countries	32	58	47	32	58	45
Instruments				67	65	67
AR2 test p-value				0.429	0.116	0.131
Hansen test p-value				1.000	0.861	1.000

Note: This table reports estimates of the effects of prudential regulation (PR) on potential transmission channels into sovereign risk and government spending. Col. 1 compares credit given to the government to credit to the private sector. Col. 3 looks at the average sovereign credit rating. Col. 3 examines the growth rate in the net issue of government bonds. Cols.4-6 repeats the analysis using the two-step system GMM (Arellano and Bover, 1995). The estimates from GMM are based on the last quarter of each year to ensure that the number of instruments is smaller than the number of countries. The AR2 row reports the p-value for the test of serial correlation in the residuals. Additionally, we provide the number of instruments and the p-value of the Hansen test of overidentification. The variable on PR is lagged four quarters to account for delayed effects. We include a lagged dependent variable (LDV) that lags four quarters behind the current period to mitigate the possibility that some channels may be more important than others in some countries. Standard errors reported in parentheses are clustered at the country level. "***", "**" and "*" represents statistical significance at 1%, 5% and 10% levels.

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Appendices

A. Data Description

Data	Type	Source	Description
Bond Spread	Dependent	Datastream	Ten-year bond yield of the country relative to the U.S. Treasury bond rate in each quarter.
Bond Yield	Dependent	Datastream	Ten-year government bond yield of the country in each quarter.
CBI	Instrument	Romelli (2022)	Index of central bank independence proposed by Romelli (2022). The index is computed based on a wide range of central bank characteristics in 154 countries. We take the index exactly as published by the author.
CDS	Dependent	Datastream	Ten-year sovereign credit default swap (CDS) spread of the country in each quarter.
Credit-to-GDP	Control	IMF IFS	Domestic credit to the private sector as a percentage of GDP.
Crisis	Control	Laeven and Valencia (2018)	Indicator variable that equals one whenever a country experiences a financial crisis in a given quarter based on the dataset of Laeven and Valencia (2018). This variable accounts for banking crises, sovereign debt crises and currency crises.
Debt	Independent	IMF IFS	Dummy variable that equals 1 when the country debt level in the period is above the median debt level of the country during the sample period. To measure the level of debt, we use the debt-to-GDP ratio.
Debt-to-GDP	Control	IMF IFS	Gross public debt as a percent of GDP.
ED	Independent	World Bank Open Data	Dummy variable that equals 1 when a country is classified as an upper-middle or high-income economy according to the World Bank's country classification by income level, and zero otherwise
Forward Guidance	Instrument	Sutherland (2022)	Dummy variable that equals one whenever the central bank of the country uses forward guidance during the year.
GDP Growth	Control	IMF IFS	Quarterly growth rate of GDP adjusted for inflation.
Gov. Bonds Net Issues	Dependent	BIS Debt Securities Statistics	Growth rate in the net issue of government bonds (i.e., gross issues minus redemptions).
Gov. Expenditure	Control	IMF Global Debt	Total government expenditure as a percent of GDP.
Inflation	Control	IMF IFS	Quartely growth rate in Consumer Price Index using the Laspeyres formula.
Openness	Control	Chinn and Itô (2020)	Chinn-Itô financial openness index, which measures a country's degree of capital account openness. The index was initially introduced in Chinn and Ito (Journal of Development Economics, 2006). The variable is based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This is the updated version of the index, which contains the information on regulatory restrictions on cross-border financial transactions as of the end of 2020. We take the data exactly as published by the authors.
PR	Independent	IMF iMaPP	Overall cumulative macroprudential policy index that sums all the cumulative prudential rules in a country in each quarter. The index ranges from 0 to 32 prudential rules in effect.
Primary Balance	Control	IMF Global Debt	Primary net lending minus borrowing as a percent of GDP.
Public-Private Credit	Dependent	IMF IFS	Ratio of credit to the general government over domestic credit to the private sector.
Sovereign Credit Ratings	Dependent	Bloomberg	Simple average of the sovereign credit ratings of the three main credit rating agencies (Fitch, Moody's and S&P500). When the credit rating is not available from the three agencies, we calculate the average rating based on the ratings given by the two remaining agencies or rely on a single rating provided by the only agency available.

B. Ratings Numerical Scale

Moody's	S&P	Fitch	Numerical Scale
Aaa	AAA	AAA	21
Aa1	AA+	AA+	20
Aa2	AA	AA	19
Aa3	AA-	AA-	18
A1	A+	A+	17
A2	A	A	16
A3	A-	A-	15
Baa1	BBB+	BBB+	14
Baa2	BBB	BBB	13
Baa3	BBB-	BBB-	12
Ba1	BB+	BB+	11
Ba2	BB	BB	10
Ba3	BB-	BB-	9
B1	B+	B+	8
B2	B	B	7
B3	B-	B-	6
Caa1	CCC+	CCC+	5
Caa2	CCC	CCC	4
Caa3	CCC-	CCC-	3
Ca	CC	CC	2
		C	2
C	SD	DDD	1
	D	DD	1
		D	1