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**Working Paper**

## Sovereign spreads and corporate taxation

Graduate Institute of International and Development Studies Working Paper, No.  
HEIDWP15-2022

**Provided in Cooperation with:**

International Economics Section, The Graduate Institute of International and Development Studies

*Suggested Citation:* Pallan, Hayley (2022) : Sovereign spreads and corporate taxation, Graduate Institute of International and Development Studies Working Paper, No. HEIDWP15-2022, Graduate Institute of International and Development Studies, Geneva

This Version is available at:

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**Graduate Institute of International and Development Studies  
International Economics Department  
Working Paper Series**

Working Paper No. HEIDWP15-2022

**Sovereign Spreads and Corporate Taxation**

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**June 2022**

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# Sovereign Spreads and Corporate Taxation

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20th May 2022

## Abstract

Do sovereign bond investors care about taxation in the countries where they invest? In this paper, I examine the response of sovereign spreads to changes in tax revenues, bases and rates. In simple OLS regressions there is a negligible relationship between sovereign spreads and taxation. However, there are stronger relationships in emerging markets, specifically for corporate taxation. There is a particularly important role of corporate tax base changes in emerging markets for sovereign spreads - this contemporaneous relationship holds using both annual and daily datasets. Additionally, an assessment of how sovereign spreads respond to tax changes under various fiscal environments highlights the role of initial fiscal space in how sovereign spreads respond to aspects of corporate taxation. Finally, I estimate local projections in order to assess the dynamic response of sovereign spreads to corporate taxation. These results are consistent with the finding that corporate tax base expansion (rather than corporate tax rate hikes) are associated with lower borrowing costs for governments in fiscal precarity - most strongly for countries with low levels of fiscal space in the medium term.

**Keywords:** Sovereign Spreads, Fiscal Space, Corporate Tax Reform

**JEL Classification:** E62, H87, H63

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# 1 Introduction

Does corporate taxation affect sovereign borrowing costs? While much has been said about corporate taxation and the global economy (IMF (2019)) and corporate taxation for domestic revenues (Clausing (2007); Akitoby et al. (2020)), relatively little is known about the implications of corporate taxation for sovereign spreads. In this paper I assess the relationship between taxation and sovereign spreads, which points to an important role for corporate taxation in countries with weak fiscal space.

At a time when debt sustainability concerns have heightened, a key component of required reforms is a deeper understanding of how aspects of fiscal consolidation (and specifically tax reform) may affect a government's borrowing costs. However, there is little empirical work on this relationship. This is despite the fact that it is increasingly understood that the most vulnerable countries (i.e. those requiring greater financing) are also those countries that are most affected by corporate tax evasion and profit shifting (Crivelli et al. (2016)). As a result, policy makers are understandably concerned about how corporate tax changes may affect private sector activity. However, macro policy decisions should be taken in light of how they may affect various aspects of the economy, for example, the cost of sovereign borrowing. In this paper I attempt to fill this gap, which provides another aspect for policy makers to consider.

A sovereign's fiscal outcomes depends on how it spends, collects revenue, and borrows (Barro (1998); Fatás et al. (2019)). As a result, these decisions may shape the perceptions of investors who invest in sovereign bonds. If taxation does influence bond spreads, this would suggest that sovereign bond investors do care about taxation. This may be due to the amount of revenue collected (with more revenue associated with a greater ability to repay) or it could be due to a signalling effect (with different types of reform signalling more or less fiscal credibility and thus affecting sovereign spreads).<sup>1</sup>

As an initial step, I assess how types of taxation (corporate, personal and consumption taxes) may have distinct relationships with sovereign spreads. Furthermore, these relationships are assessed using three tax variables for each tax type: tax revenue, tax base and tax rate. It is apparent in preliminary regressions that there is a weak relationship between all tax variables and sovereign spreads. This result is found using an annual dataset for a sample of 25 countries between 1991-2017. Despite weak pooled effects, I find that depending on a country's stage of development, there are stronger relationships. The strongest relationship in terms of taxation and sovereign spreads is between corporate tax base size (%)

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<sup>1</sup>Wagner et al. (2018) and Baker et al. (2019) are some examples of how tax policy announcements affect the economy. It seems reasonable to question whether and how similar announcements affect the cost of sovereign borrowing.

GDP) and sovereign spreads in emerging markets. Of course, causal statements regarding tax changes and sovereign spreads are a challenge. To address this concern, high frequency data and tax policy announcements are employed. These estimations use data from the IMF’s Tax Policy Reform Database (Amaglobeli et al. (2018)) which documents tax policy announcement dates and confirms the results from annual data.

To address the fact that a country’s stage of development may imply different approaches to fiscal policy (Frankel et al. (2013)), an examination of how correlations between corporate taxation and sovereign spreads vary along the distribution of fiscal space is presented. In marginal effects plots, it is shown that emerging market sovereign spreads are quite sensitive to corporate tax base expansion, most strongly when fiscal space is worse. This result holds under various measures of fiscal space, in particular for sovereign ratings and fiscal balances. Robustness checks with other variables are discussed.

In the final empirical section of the paper, local projections are estimated (following Jordà (2005)), which provide further support for the initial assessment of the relationship between sovereign spreads and corporate taxation. Local projection estimations enable an assessment of the response of sovereign spreads to corporate tax shocks at various horizons, and under specific scenarios. Scenarios examined in this paper include whether countries have high or low fiscal space, whether corporate tax shocks are positive or negative, and scenarios which combine fiscal space and shock direction indicators. Overall, the conclusion from these estimates is that aspects of corporate taxation have heterogeneous effects on sovereign spreads. First, positive tax revenue shocks lead to lower sovereign spreads in countries with weak fiscal space. This result is quite specific, as negative tax revenue shocks have no statistically significant effect on spreads in the various scenarios explored in this paper. Second, the local projection results provide suggestive evidence in support of the role of the corporate tax base. A positive corporate tax base shock is associated with lower sovereign spreads in the medium-term, most strongly for countries with weak fiscal space. Third, in most scenarios, a shock to the corporate tax rate has negligible impact on sovereign spreads.

**Related Literature** This paper relates to three broad strands of literature. First, there is a clear link to research on the determinants of sovereign spreads. Second, there is related work on fiscal composition, timing and macroeconomic outcomes. Third, there is work on the effects of tax reform composition, and in particular on the impact of corporate taxation for macroeconomic outcomes which relates to this paper.

Literature on the empirical determinants of sovereign spreads dates back to Edwards (1984) and Edwards (1986), with more recent surveys covering a broad range of countries and

time periods (Dell’Erba et al. (2013); Mauro et al. (2002)). Regarding the fiscal policy effects for sovereign spreads, Edwards (1984) and Min (1998) find minimal fiscal effects for sovereign spreads. However, these are some of the earliest empirical papers on the determinants of sovereign spreads - so the context and coverage is very different compared to now. I depart from this literature by focusing on the role of taxation as a determinant of sovereign spreads, and by looking at how spreads respond to taxation along the distribution of fiscal space.

Another strand of literature closely related to this paper is research on how the composition of fiscal policy relates to macroeconomic outcomes (of which sovereign spreads are a subset). Distinctions between the role of tax-based and expenditure-based fiscal consolidations are surveyed in Alesina et al. (2019). However, in terms of fiscal composition effects for sovereign spreads, research is limited. Key papers include Akitoby and Stratmann (2008), de Jong (2018) and Born et al. (2020), who focus on government expenditure effects. While there has been focus on both advanced economies (Beetsma et al. (2013); Beetsma et al. (2020); Bernoth and Erdogan (2012)) and emerging markets (Born et al. (2020); David et al. (2022); Keita et al. (2021)), there has been much less assessment of both advanced and emerging markets in the same study. Furthermore, none of these papers examine the response of sovereign spreads to the *composition* or *type* of tax policies. Within the literature on fiscal policy composition effects, there is a sub-strand of research on how fiscal policies have different macroeconomic effects which depend on initial economic conditions (Auerbach and Gorodnichenko (2012); Perotti (1999); Ardagna et al. (2007)). I depart from this literature on fiscal composition for sovereign spreads by focusing on taxation, and more precisely on the components of corporate taxation.

Tax reform composition refers to which types of taxes are part of a reform package (i.e. corporate vs. personal taxes) and the structure of tax changes (i.e. will changes target the base of taxation or simply alter the tax rates).<sup>2</sup> To the best of my knowledge these distinctions have not been examined in relation to their associations with sovereign spreads. Furthermore, within the broad literature on the effects of corporate taxation, this paper relates to two main themes. The first is that which highlights different aspects of corporate tax reform, for example, research on the role of corporate tax rates and tax administration practices for revenues (Basri et al. (2019)). The second is research on how the role of taxation depends on a country’s level of development (Aizenman and Jinjark (2012); Besley and Persson (2014); Crivelli et al. (2016)). I depart from the vast literature on the implications of tax reform and corporate taxation, by focusing on the link between corporate taxation

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<sup>2</sup>On the composition of tax policies, which has not been common in the literature on macroeconomics effects, Dabla-Norris and Lima (2018) distinguish between types of taxation (individual, corporate and value added) and the reform type (whether regarding a base or rate changes) for output and employment. Another exception is Mertens and Ravn (2013), on personal and corporate taxation in the United States.

and sovereign spreads.

**Outline** The rest of the paper is organized as follows. In section 2, data on sovereign spreads and taxation are described. In section 3, correlations between taxation and sovereign spreads are presented. In section 4, an approach to address endogeneity using tax policy announcements is implemented and discussed. In section 5, the role of fiscal space is examined. In section 6, local projection models are estimated to assess how sovereign spreads react overtime. Section 7 concludes.

## 2 Data

The main aspects of the dataset for this paper consist of data on sovereign spreads and data on taxation. A range of emerging markets and advanced economies are represented between 1991 and 2017. Furthermore, control variables and robustness checks, with particular attention to the role of fiscal space, require various data sources.

**Sovereign Spreads Data** Born et al. (2020)’s dataset of sovereign spreads is used as the main dataset for the dependent variable in this paper. The advantage of this data is that it provides a variable of the default premium combining a range of data sources for a range of countries since the early 1990s. Country coverage in the main regression sample is included in Table 2.<sup>3</sup>

**Tax Data** The tax variables used in this paper consist of tax revenue, tax bases and tax rates, for specific categories of taxation (corporate, personal and goods and services taxation). Tax revenue by tax type is available from OECD’s Revenue statistics, described in Modica et al. (2018). In this paper, I use total corporate tax revenues.<sup>4</sup> The main tax

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<sup>3</sup>Note that for emerging markets the spread is from J.P Morgan’s Emerging Markets Bond Index (EMBI), which is the difference between a sovereign’s dollar bond yield and the US government bond yield. Euro area economies are also included in the dataset by using the difference between government bonds of a euro area country and Germany’s government bond yield (“long-term interest rate for convergence purposes”). For non-euro area advanced economies, common-currency spreads are computed. When spreads are not available - i.e. for Germany - CDS spreads are used to proxy default risk. Born et al. (2019) provide additional details on this dataset. Combining sovereign spreads of many countries is not straightforward. For example, France’s sovereign spread is computed as the yield of French bonds minus the yield of German bonds. In that sense it is implicitly assumed that the yield of German bonds is risk-free. That means that the spread for Germany itself should in theory be zero. However, to capture potential risk, Germany is included in the dataset with its CDS as a measure of Germany’s sovereign default premium (while the value is small it should be added to the spread of euro-country spreads for complete comparability).

<sup>4</sup>Therefore, this consists of direct taxation on corporate tax profits and taxation of corporate tax gains. Appendix Table A.1 confirms that most corporate tax revenue is from corporate profits. Therefore, using

rate variables used are from Vegh and Vuletin (2015).<sup>5</sup> A measure of the corporate tax base is constructed in order to maintain the following relationship between revenue, base and statutory rate.<sup>6</sup>

$$\frac{BASE^{CORPTAX}}{GDP} = \frac{REVENUE^{CORPTAX}}{GDP} \times \frac{1}{RATE^{CORPTAX}} \quad (1)$$

**Other Data** Beyond the relationship between sovereign spreads and tax variables, this paper aims to assess the role of initial fiscal conditions as a determinant of that relationship. Several indicators from the World Bank’s Fiscal Space Database (Kose et al. (2018)) are merged with the main dataset for this paper. These include a measure of sovereign ratings, which represents the average of rating agency scores for a country’s foreign currency long-term sovereign debt (where the index ranges from 1-21, with 21 being the best score). Other fiscal space measures include the fiscal balance (as a share of GDP and as a share of total revenue), along with the share of foreign currency debt, the share of short-term debt and the average maturity of sovereign borrowing. Beyond assessing the role of sovereign spreads and taxation along the distribution of fiscal space, fiscal space will also be used as a control variable. Other macroeconomic variables which have been found to be important determinants of sovereign spreads are included in the dataset, such as GDP growth, government consumption as a share of GDP, government debt as a share of GDP and inflation (obtained from World Bank Development Indicators).

**Summary and Description of Main Data** Summary statistics for the main variables in the annual country-level data are presented in Table 1. These statistics are computed over 1991-2017. The advanced economies and emerging markets classifications are listed in Table 2.

There are similar numbers of observations for both country groups in the main sample, which includes 13 emerging markets and 12 advanced economies. One of the main takeaways from the summary statistics by country group is that the average sovereign spread in emerging markets is more than three times the size than in advanced economies, this is consist-

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total corporate tax revenues, which is available for more countries, seems justified. For personal tax revenue I use tax revenue from personal income and for goods & services tax revenue I use the total revenue from that category (which combines several source such as OECD and IMF data).

<sup>5</sup>These include the statutory corporate tax rate, the standard VAT rate and the personal income tax rate.

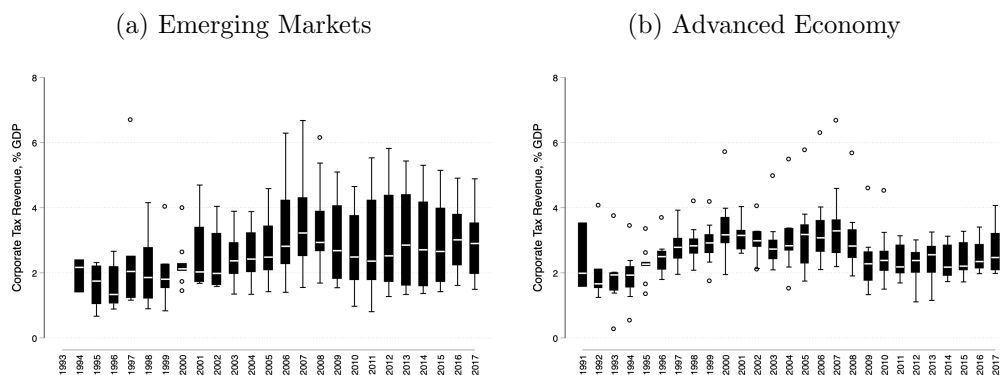
<sup>6</sup>Of course, taxation is much more complex than the macro-view taken here. For example, there may be deductions and variable rates which affect the base of taxation. Nevertheless, an approximation of the *taxable corporate income* subject to the statutory rate can be reasonably assumed to be derived as shown in Equation 1. Analogous bases for personal and goods & services taxation are constructed to be used as control variables in the empirical section.



ent with investors in emerging market sovereign bonds requiring a larger sovereign default premium, perhaps due to greater (perceived) fiscal risks.<sup>7</sup> On the tax side, corporate tax revenue and corporate tax base as a share of GDP are both slightly larger and more volatile in emerging markets compared to advanced economies. In contrast, corporate tax rates are on average larger and less volatile in advanced economies compared to emerging markets. Finally, sovereign ratings tend to be larger in advanced economies, demonstrating higher levels of fiscal space. This preliminary survey of the data suggests potentially important differences in the role of corporate taxation which depend on country type and fiscal space.<sup>8</sup>

In Figure 2 correlations between revenue and the corporate tax base and rate, respectively are shown. From this figure, it is apparent that there is a strong positive unconditional correlation between corporate tax revenue and corporate tax base, while the relationship between revenues and rates tends to be much weaker. These patterns hold for both advanced and emerging markets country groups, as indicated by the similar trend lines in both sub-figures of Figure 2.

Figure 1. Trends in Corporate Tax Revenue

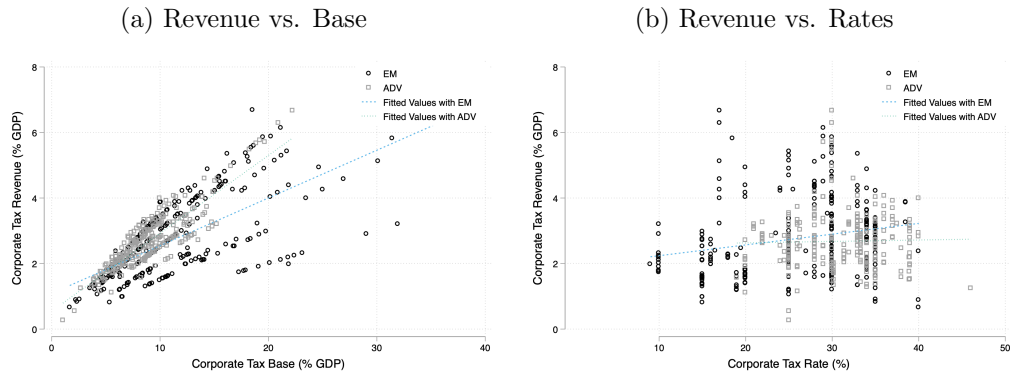


Notes: These figures show trends in the distribution of corporate tax revenue for emerging markets and advanced economies. The white bars represent the mean value of corporate tax revenue in the year indicated. The filled-in boxes show the 25th and 75th percentiles, the lines show the lower and upper adjacent values, and the dots are outliers. Economies covered are listed in Table 2.

<sup>7</sup>Plotting the time series of sovereign spreads, the distribution of sovereign spreads for the countries used in this paper shows that emerging markets and advanced economies have not only different levels of sovereign spreads, but also exhibit different patterns since the early 1990s (Figure A.1).

<sup>8</sup>Figure A.2 shows trends in corporate tax revenue for advanced and emerging markets.

Figure 2. Correlations between Corporate Tax Revenues, Rates and Bases



Notes: These figures present scatter plots of the corporate tax base (% GDP) and the corporate tax rate (%) with corporate tax revenues (% GDP). These are annual data points for the period 1991-2017, for all countries in the main sample (refer to Table 2).

Table 1. Summary Statistics

<b>Panel A: Emerging Markets</b>					
Variable	Obs	Mean	Std. Dev.	Min	Max
Spread	235	3.28	2.36	0.01	13.93
Corporate Tax Revenue (% GDP)	235	2.80	1.30	0.81	6.68
Personal Tax Revenue (% GDP)	235	3.48	2.26	0.13	9.04
Goods and Services Tax Revenue (% GDP)	235	10.68	2.90	4.38	16.78
Corporate Tax Base (% GDP)	235	12.06	6.12	2.22	39.27
Personal Tax Base (% GDP)	235	12.16	8.76	0.38	35.49
Consumption Tax Base (% GDP)	235	58.46	11.91	27.49	83.91
Corporate Tax Rate (%)	235	24.89	7.63	9.00	40.00
Personal Tax Rate (%)	235	32.00	8.81	10.00	55.00
VAT Tax Rate (%)	235	18.28	3.43	10.00	27.00
GDP growth (%)	235	0.60	0.92	-3.47	3.10
Sovereign Rating (1-21)	235	11.66	2.96	3.28	17.67
Government Consumption (% GDP)	235	15.42	3.38	9.93	23.01
<b>Panel B: Advanced Economies</b>					
Variable	Obs	Mean	Std. Dev.	Min	Max
Spread	265	0.91	1.74	0.02	16.14
Corporate Tax Revenue (% GDP)	265	2.71	0.83	1.15	6.67
Personal Tax Revenue (% GDP)	265	10.89	5.42	2.59	26.20
Goods & Services Tax Revenue (% GDP)	265	11.44	1.71	6.41	15.67
Corporate Tax Base (% GDP)	265	9.06	3.11	2.71	22.24
Personal Tax Base (% GDP)	265	22.65	9.67	5.55	47.15
Consumption Tax Base (% GDP)	265	56.45	6.73	42.53	80.85
Corporate Tax Rate (%)	265	30.77	4.95	20.00	46.00
Personal Tax Rate (%)	265	47.58	7.43	29.75	68.00
VAT Tax Rate (%)	265	20.47	3.29	10.00	25.00
GDP growth (%)	265	0.33	0.58	-2.25	1.60
Sovereign Rating (1-21)	265	18.74	3.36	4.15	21.00
Government Consumption (% GDP)	265	21.00	2.82	15.95	27.94

Notes: Spread is from Born et al. (2020) aggregated to the country-year level. Revenue variables are from OECD (Modica et al. (2018)). Rate variables are from Vegh and Vuletin (2015), which they have updated to cover more recent years since publication. Base variables are constructed from the available data on revenue and rates as described in the data section of the paper. GDP growth and government consumption are from World Development Indicators, while sovereign rating is from Kose et al. (2018). The summary statistics shown here correspond to the main regression sample, which covers 1991-2017 and the countries listed in Table 2.

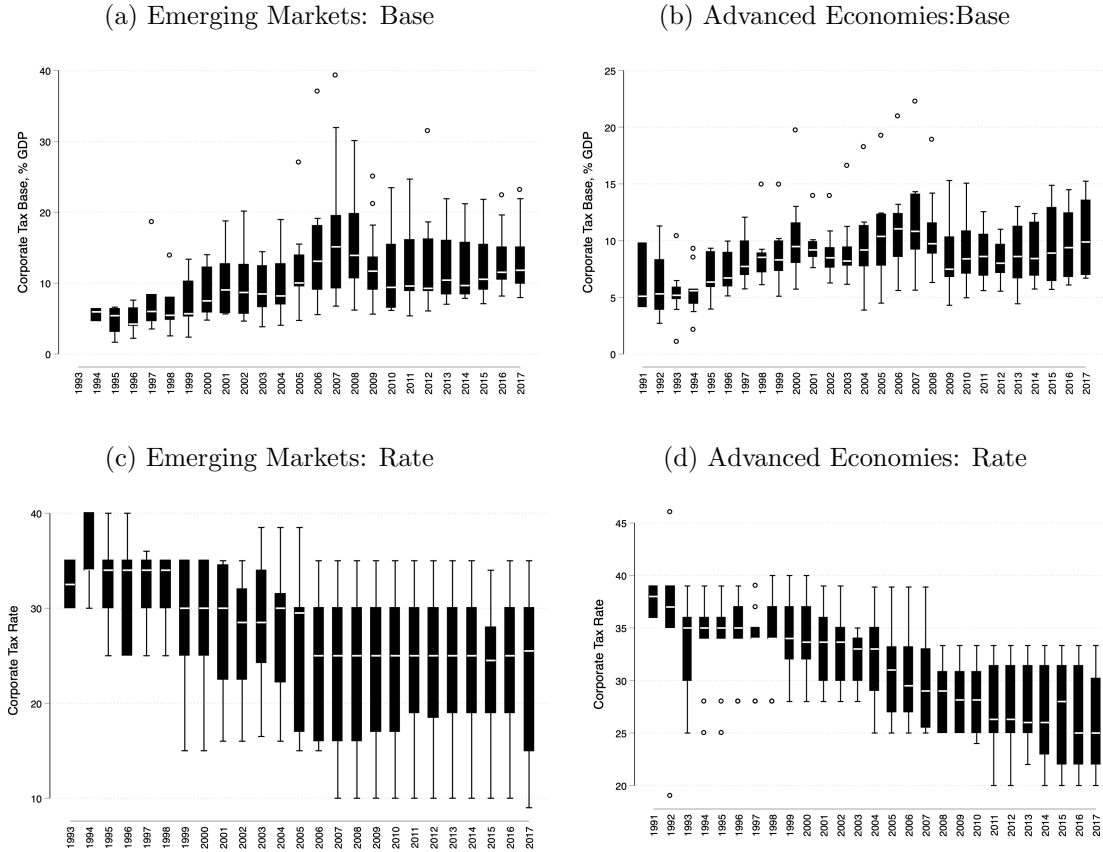
Table 2. Countries in the Main Sample

Country	Sovereign Rating (Average over 1991-2017)	EM Indicator	High or Low Sovereign Rating
Argentina	6.5	1	L
Australia	20.7	0	H
Austria	20.9	0	H
Belgium	19.5	0	H
Bulgaria	10.6	1	L
Chile	16.2	1	H
Colombia	11.4	1	L
Denmark	20.6	0	H
El Salvador	10.0	1	L
Finland	20.5	0	H
France	20.6	0	H
Germany	21.0	0	H
Greece	12.1	0	H
Hungary	13.3	1	H
Italy	17.3	0	H
Latvia	13.6	1	H
Lithuania	14.5	1	H
Mexico	13.5	1	H
Peru	11.3	1	L
Portugal	16.3	0	H
South Africa	12.7	1	H
Spain	18.4	0	H
Sweden	20.3	0	H
Turkey	9.2	1	L
Uruguay	10.8	1	L

Notes: This table lists the countries used in the main regression sample. The classification used (whether emerging or not) is included above. The sovereign rating is a rating obtained from the World Bank's Fiscal Space Database by Kose et al. (2018). The 25th percentile of sovereign ratings in the dataset is 11.6 (over the period studied, 1991-2017), therefore countries are further classified as having low or high sovereign ratings based on this threshold.

Furthermore, comparing the trends in corporate tax bases and rates in Figure 3, there are different patterns overtime. The mean corporate tax base in both country groups is slightly larger (as a share of GDP) in 2017 than it was in the early 1990s. However, over the same period, statutory corporate tax rates have declined in both emerging markets and advanced economies.

Figure 3. Evolution of the Corporate Tax Base and Rate



Notes: These figures plot the distribution of the corporate tax base (in panels a and b) and the corporate tax rate (in panels c and d). The countries included are those listed in Table 2. The white bars represent the mean value of the relevant corporate tax variable in the year indicated. The filled-in boxes show the 25th and 75th percentiles, the lines show the lower and upper adjacent values, and the dots are outliers.

### 3 Correlations between Taxation and Sovereign Spreads

In this section, I assess the contemporaneous relationships between tax variable and sovereign spreads. The baseline specification aims to assess the relationship between sovereign spreads and corporate tax variables (such as revenues, base and rate):

$$SPR_{it} = \beta_0 + \beta_1 CorporateTax_{it} + (X_{it})\Gamma + \mu_i + \nu_t + \epsilon_{it} \quad (2)$$

In Equation 2 the dependent variable is the sovereign spread of country  $i$  in year  $t$ . The regressors include tax variables (with the focus being on the coefficient  $\beta_1$ ). The corporate tax variables can be set to corporate tax revenue, base or rate. Additional regressors, including other tax variables (such as personal tax variables and consumption tax variables) are included in  $X_{it}$ . Other control variables contained in  $X_{it}$  are taken from the literature on the determinants of sovereign spreads (such as GDP growth, sovereign ratings, and government consumption). Country and year fixed effects are included ( $\mu_i$ ,  $\nu_t$ ), and the residual is denoted as  $\epsilon_{it}$ .

There may be important structural differences due to fiscal constraints, which lead to different relationships for emerging markets and advanced economies. With that in mind, an additional specification includes interactions between tax variables and an emerging market (EM) indicator:<sup>9</sup>

$$SPR_{it} = \beta_0 + \beta_1 CorporateTax_{it} + \beta_2 EM_i \times CorporateTax_{it} + (X_{it})\Gamma + \gamma EM_i + \nu_t + \epsilon_{it} \quad (3)$$

In later sections, concerns regarding endogeneity are addressed by using high-frequency tax policy announcements as identification, with high frequency data. Furthermore, local projections take into account the dynamic responses for which exogenous tax shocks are constructed.

Relationships between corporate taxation and sovereign spreads are presented in Table 3. Table 3 reports regression results from estimating Equation 2. They show that most tax variables share a weak relationship with sovereign spreads. Column (1) in Table 3 shows the role of tax revenue variables, while columns (2) and (3) show results for tax rates and bases, respectively. The control variables have the expected coefficients. First, GDP growth puts downward pressure on sovereign spreads. The relationship with government consumption is positive, that is more spending is associated with higher spreads. Finally, sovereign ratings (where a higher rating is associated with more fiscal space) shares a negative relationship with sovereign spreads.

Results with the emerging markets indicator suggest that there are stronger relationships between aspects of corporate taxation and sovereign spreads in emerging markets. This holds under specifications with and without time fixed effects. Here, country fixed effects are omitted as those would absorb the emerging markets indicator. From Table 4, columns (1) and

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<sup>9</sup>A specification replacing  $\gamma EM_i$  with  $\alpha_i$  is also estimated below.

Table 3. Baseline Results: Are Taxes Correlated with Sovereign Spreads?

Dep var. Tax Variable	(1) spr Rev	(2) spr Rate	(3) spr Base
Corporate Tax	0.123 (0.103)	-0.993*** (0.172)	0.017 (0.036)
Personal Tax	0.023 (0.059)	-0.457*** (0.065)	-0.020 (0.026)
Consumption Tax	-0.198 (0.131)	0.140* (0.075)	-0.034* (0.018)
GDP Growth	-0.931*** (0.176)	-0.863*** (0.155)	-0.950*** (0.159)
Sov. Rating	-0.538*** (0.070)	-0.427*** (0.041)	-0.504*** (0.075)
Govt. Consump.	0.164** (0.065)	0.061 (0.037)	0.170* (0.089)
Constant	9.404*** (2.072)	2.862 (1.886)	9.226*** (2.145)
Observations	500	500	500
R-squared	0.827	0.825	0.827

Notes: The dependent variable is sovereign spreads. Regressors include tax revenues (% GDP) in column (1), tax rates (%) in column (2) and tax bases (% GDP) in column (3). Additional control variables in each column include GDP growth rate, sovereign ratings and government consumption. Country and year fixed effects are included. Standard errors are clustered by country and year. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

(2), it is inferred that corporate tax revenues alone do not have a strong relationship with sovereign spreads. However the components of revenue do. In columns (3) and (4), an increase in the corporate tax rate is associated with a rise in sovereign spreads in emerging markets. That is, increasing the corporate tax rate increase the cost of government borrowing. In columns (5) and (6), an increase in the corporate tax base is associated with a decline in sovereign spreads in emerging markets. Similar results are found when country fixed effects are included with the interaction term in Table 5 - the most important take-away for this paper being the statistically significant coefficients on the  $EM \times CorporateTax$  terms, and the opposite directions in the base and rate columns.

In comparing these base and rate effects, one might conclude that different approaches to fiscal prudence have different implications for the cost of government borrowing. This may be the case due to the credibility and the feasibility of certain changes. For example, higher rates may be difficult to enforce, which aligns with such increases not resulting in a decline in borrowing costs, despite the (perhaps) fiscally prudent motivation. However, a larger corporate tax base may coincide with more credibility signalling and efforts in tax administration to increase the base on which taxes are collected, thus being more successful at reducing the cost of borrowing.

Table 4. Results with EM Indicator Interactions

Dep. Var Tax Variable	(1) spr REV	(2) spr REV	(3) spr RATE	(4) spr RATE	(5) spr BASE	(6) spr BASE
Corporate Tax	0.129 (0.111)	0.106 (0.131)	-0.0525 (0.0347)	-0.0759** (0.0340)	0.0576* (0.0321)	0.0768** (0.0365)
EM $\times$ Corporate Tax	-0.145 (0.161)	-0.0627 (0.171)	0.119*** (0.0394)	0.136*** (0.0432)	-0.0758** (0.0364)	-0.0800* (0.0408)
Personal Tax	0.0296 (0.0251)	0.0353 (0.0262)	0.0153 (0.0115)	0.0171 (0.0116)	0.00952 (0.0116)	0.01000 (0.0123)
EM $\times$ Personal Tax	-0.192** (0.0794)	-0.199** (0.0734)	-0.0105 (0.0197)	-0.0168 (0.0206)	-0.0540*** (0.0192)	-0.0522** (0.0193)
Consumption Tax	-0.0425 (0.0352)	-0.0608 (0.0474)	0.00259 (0.0345)	-0.0137 (0.0373)	-0.0134 (0.0146)	-0.0153 (0.0116)
EM $\times$ Consumption Tax	0.0371 (0.0469)	0.0793 (0.0579)	0.0905 (0.0648)	0.103 (0.0693)	0.0128 (0.0198)	0.0166 (0.0173)
GDP growth	-0.886*** (0.166)	-1.046*** (0.198)	-0.855*** (0.148)	-0.968*** (0.191)	-0.860*** (0.141)	-0.985*** (0.181)
Sov. Rating	-0.462*** (0.0447)	-0.458*** (0.0404)	-0.407*** (0.0340)	-0.408*** (0.0346)	-0.444*** (0.0432)	-0.444*** (0.0420)
Govt. Consump.	0.0631* (0.0340)	0.0558* (0.0314)	0.0105 (0.0407)	0.00763 (0.0405)	0.0524 (0.0335)	0.0430 (0.0343)
EM	0.549 (0.961)	-0.0486 (1.052)	-4.565** (1.678)	-5.130** (1.953)	0.524 (1.344)	0.283 (1.213)
Constant	8.338*** (1.123)	8.678*** (1.198)	9.429*** (1.347)	10.49*** (1.361)	8.430*** (1.272)	8.584*** (1.172)
Observations	500	500	500	500	500	500
R-squared	0.729	0.786	0.740	0.797	0.734	0.790
FEs	None	Year	None	Year	None	Year

Notes: The dependent variable is sovereign spreads. Regressors include tax revenues (% GDP) in columns (1-2), tax rates (%) in columns (3-4) and tax bases (% GDP) in columns 5-6). Additional control variables in each column include GDP growth rate, sovereign ratings and government consumption. Standard errors are clustered by country and year. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Overall, these results suggests that sovereign investors care about tax policies, as spreads decline in countries that have a larger corporate tax base. Robustness checks reported in the appendix show that the main relationship of interest here - between corporate tax base and sovereign spreads - generally holds in alternative estimations. For example, Appendix Table B.1 confirms the negative correlation between the corporate tax base and sovereign spreads in emerging markets when lagged sovereign spreads are included as a regressor.<sup>10</sup>

<sup>10</sup>Additional checks incorporate the inclusion of extra control variables (Appendix Table B.2). These results include government debt and inflation as control variables, and they show a negative and statistically significant coefficient on the EM  $\times$  Corporate Tax Base term and a positive and statistically significant coefficient on the EM  $\times$  Corporate Tax Rate term. Appendix Table B.3 presents results where both the base and rate of corporate taxation are included in the same estimation.



Table 5. Results with EM Indicator Interactions and Country Fixed Effects

Dep Var. Tax Variable	(1) spr REV	(2) spr RATE	(3) spr BASE
Corporate Tax	0.438*** (0.095)	-0.048 (0.036)	0.155*** (0.049)
EM × Corporate Tax	-0.469** (0.212)	0.165** (0.061)	-0.160*** (0.055)
Personal Tax	0.005 (0.092)	0.005 (0.026)	0.002 (0.031)
EM × Personal Tax	0.142 (0.226)	-0.017 (0.026)	-0.016 (0.045)
Consumption Tax	0.073 (0.148)	0.174 (0.125)	-0.001 (0.017)
EM × Consumption Tax	-0.334 (0.236)	-0.169 (0.157)	-0.039 (0.032)
GDP growth	-0.876*** (0.206)	-0.902*** (0.175)	-0.914*** (0.162)
Sov. Rating	-0.527*** (0.066)	-0.392*** (0.069)	-0.516*** (0.073)
Govt. Consump.	0.172** (0.068)	0.076 (0.065)	0.199** (0.090)
Constant	7.390*** (2.141)	4.643** (1.728)	7.221*** (1.653)
Observations	500	500	500
R-squared	0.832	0.836	0.833
FEs	Country, Year	Country, Year	Country, Year

Notes: The dependent variable is sovereign spreads. Regressors include tax revenues (% GDP), tax rates (%), and tax bases (% GDP) in each column, respectively. Additional control variables in each column include GDP growth rate, sovereign ratings and government consumption. Standard errors are clustered by country and year. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The estimated equation here is a slight modification of Equation 3, in order to include country fixed effects (by dropping estimation of the coefficient directly on  $EM_i$ ):

$$SPR_{it} = \beta_0 + \beta_1 CorporateTax_{it} + \beta_2 EM_i \times CorporateTax_{it} + (X_{it})\Gamma + \alpha_i + \nu_t + \epsilon_{it}$$

## 4 The Role of Tax Policy Announcements

Next, I propose to address endogeneity concerns by testing the relationship between taxation and sovereign spreads with high frequency data.<sup>11</sup> Fiscal policies and sovereign spreads may be endogenous - the direction of their relationship is not clear ex-ante. For example, it could be that sovereign spreads affect a government’s policy choices. For example, suppose a sovereign’s borrowing costs are worsening (spreads are increasing), putting strain on public finances. As public finances are depleted, the government may “respond” to rising costs and fiscal pressure by tightening fiscal policy (either increasing revenues or reducing spending). On the other hand, fiscal policies may be an important determinant of sovereign spreads. This is the hypothesis proposed in this paper - that taxation affects government borrowing costs. However, as noted above, it is not clear ex-ante in which direction sovereign spreads and taxation are related. In low-frequency, annual regressions, without a solid identification strategy, the direction of the relationship between sovereign spreads and fiscal policies is ambiguous. I use high-frequency data on tax policy announcements and daily sovereign spreads to corroborate the low frequency results, and provide evidence that taxes affect sovereign spreads.

**Data** In assessing the role of taxation for sovereign spreads, I use daily data on sovereign spreads from Datastream/Thomson Reuters. To capture the role of tax changes, I employ data on tax policy announcement dates. Tax policy announcement data is available through the IMF’s Tax Policy Reform Database (TPRD) (Amaglobeli et al. (2018)). This is a country-day level dataset, from 1990-2014 consisting of 23 advanced and emerging economies. Each observation describes the type of tax (i.e. corporate, individual or VAT), the direction of the reform (increase or decrease) and the type of reform (base or rate change).

**Specification** The baseline high-frequency specification to assess the impact of tax policy announcements on sovereign spreads is given by:

$$\begin{aligned} SPR_{id} = & \beta_0 + \beta_1 TaxAnnounce_{id}^+ + \beta_2 TaxAnnounce_{id}^- \\ & + \beta_3 SPR_{i,d-1} + \mu_{it} + \epsilon_{id} \end{aligned} \quad (4)$$

The dependent variable in Equation 4 is the daily sovereign spread in country  $i$ , on day

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<sup>11</sup>Tax policies come in many forms. In this paper I focus on corporate tax policies, though in robustness checks and the set of control variables I distinguish between types of domestic tax policy announcements, which can be classified into specific taxes (VAT, CIT and PIT).

*d.* The main coefficients of interest are those on tax policy announcement indicators ( $\beta_1$  and  $\beta_2$  in Equation 4).<sup>12</sup> The tax policy announcement indicators are set to one when in country  $i$ , on day  $d$ , a particular type of tax policy change is announced. For example, there are different types of corporate tax policy changes. These may be associated with increases to the corporate tax base or rate (represented by dummy variable,  $TaxAnnounce_{id}^+$ ), or specific measures that decrease the base or rate of taxation (represented by dummy variable,  $TaxAnnounce_{id}^-$ ). Lagged sovereign spreads is included as a regressor, along with country-year fixed effects ( $\mu_{it}$ ). The error term is denoted by  $\epsilon_{id}$ . Driscoll-Kraay standard errors are computed to account for heteroskedasticity, serial correlation and autocorrelation across countries.

While high-frequency identification provides a setting with more plausible assumptions than settings with annual data - there remain concerns regarding the exogeneity of announcements due to (potentially) confounding anticipation effects (Ramey (2016)). In an attempt to minimize confounding effects, I take the tax announcement variables to be precisely when tax policies are announced rather than when tax policies are implemented. If financial markets adjust to new information quickly, then sovereign spreads should adjust to tax policy changes upon announcement, thus minimizing anticipation effects between announcement and implementation.<sup>13</sup>

**Results** High-frequency results confirm the main findings. Table 6 shows the results from estimating Equation 4. These results confirm that corporate tax tightening announcements reduce sovereign spreads (denoted by a negative and statistically significant coefficients on the Corporate Tax Increase variable), while corporate tax loosening announcements increase sovereign spreads (denoted by a positive and statistically significant coefficients on the Corporate Tax Decrease variable). This conclusion aligns with results in columns (1) and (3) in Table 6, where the country sample is restricted to emerging markets.<sup>14</sup> The same pattern is not apparent in the advanced economy sample, with results reported in columns (2) and (4). These conclusions are generally robust to controlling for other tax policy announcement indicators (such as personal income taxation and VAT), as reported in columns (3) and (4).

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<sup>12</sup>Equation 4 is motivated by research on how announcements and/or fiscal policy affect sovereign spreads using high-frequency data. For example, Gulati et al. (2020) examine how sovereign yields react to changes to sovereign bondholders' claimant status. Keita et al. (2021) is an example which tests the relationship between sovereign spreads and the quality of fiscal governance. Other recent papers include Born et al. (2020) and David et al. (2022) on how sovereign spreads respond to fiscal changes.

<sup>13</sup>Of course, fiscal policies are often debated in a lengthy, public process, so an announcement is not completely exogenous. However, an announcement date is arguably more unanticipated than an implementation date.

<sup>14</sup>The emerging markets included here are restricted to those with available sovereign spreads *and* tax policy announcement information. See Appendix Table C.1 for details on coverage.

Table 6. Corporate Tax Policy Announcements

	(1) EM	(2) AE	(3) EM	(4) AE
Lagged SPR	0.972*** (0.003)	0.986*** (0.008)	0.972*** (0.003)	0.986*** (0.008)
Corporate Tax Increase	-5.075** (2.040)	-4.617 (2.973)	-9.929** (4.795)	-5.351* (3.189)
Corporate Tax Decrease	4.748** (2.304)	0.006 (0.870)	4.025* (2.111)	-0.416 (0.948)
Personal Tax Increase			21.691*** (7.506)	4.916* (2.784)
Personal Tax Decrease			3.225 (4.367)	0.879 (1.263)
Consumption Tax Increase			-2.752 (8.646)	-3.232* (1.874)
Consumption Tax Decrease			1.212 (2.658)	1.492 (2.377)
Constant	-6.449*** (1.270)	-3.711** (1.621)	-6.617*** (1.292)	-3.710** (1.621)
Observations	28,768	68,140	28,768	68,140
R-squared	0.019	0.013	0.019	0.013

Notes: The dependent variable is the daily sovereign spread. Columns alternate between being restricted to the emerging markets and advanced economies in the sample. Controls include lagged sovereign spread and tax policy announcement indicators. Country-year fixed effects are included. Driscoll-Kraay standard errors are computed. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Next, results are shown based on extending the specification in Equation 4 to include base and rate announcement types separately. Table 7 provides further granular support to the conclusions made with annual data. The main conclusion from the annual data regressions is that corporate tax base expansion shares a strong negative correlation with sovereign spreads. Column (1) supports these findings, which reports that on a day in which a corporate tax base increase announcement is made, sovereign spreads decline by 6.5 p.p., on average for the emerging markets sample. However, the same strong, statistically significant result is not found in the sample of advanced economies, shown in column (2). This robust result indicates that sovereign bond investors perceive corporate tax base increases as an increase in fiscal sustainability and the country's ability/credibility to pay them back, which results in lower sovereign spreads. One may further note that corporate tax base decreases do not have a similar, symmetric impact. The symmetry of positive and negative fiscal changes will be examined explicitly in Section 6.

Overall, the high-frequency results corroborate the annual correlation conclusions regarding corporate tax base expansion in emerging markets. In general, these results provide further support to the view that bond investors care about domestic revenue mobilization

Table 7. Corporate Tax Policy Announcements: Base vs. Rate Effects

Country Group	(1) EM	(2) AE
Lagged SPR	0.972*** (0.003)	0.986*** (0.008)
Base Increase	-6.583*** (1.982)	-5.476 (5.209)
Base Decrease	1.176 (1.771)	0.264 (1.174)
Rate Increase	-0.562 (1.044)	-3.563** (1.654)
Rate Decrease	14.846*** (5.378)	-0.483 (1.288)
Constant	-6.448*** (1.270)	-3.710** (1.621)
Observations	28,768	68,140
R-squared	0.019	0.013

Notes: The dependent variable is daily sovereign spreads. Columns alternate between being restricted to the emerging markets and advanced economies in the sample. Controls include lagged sovereign spread and corporate tax policy announcement indicators. Country-year fixed effects are included. Driscoll-Kraay standard errors are computed. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

and specific fiscally prudent policies. Furthermore, robustness checks of the high-frequency results are conducted, finding support for the main results.<sup>15</sup>

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<sup>15</sup>Appendix Table C.2 shows that country-specific results support the conclusion of corporate tax base increases having a generally negative impact on sovereign spreads. Not all emerging markets in the sample have experienced all type of announcements once CIT increases are separated into rate and base changes. The spread reducing impact of CIT increases appears driven by base changes. These range between -2.22 p.p. in Brazil and -11.08 p.p. in India. Finally, looking at non-corporate tax policy announcements in Appendix Table C.3 there does not appear to be statistically significant tax effects in emerging markets.

## 5 Marginal Effects: The Role of Fiscal Space

To further understand the relationship between sovereign spreads and taxation, I explore the role of initial fiscal conditions through interaction effects between fiscal space variables and tax variables. As emerging markets tend to be associated with a particular approach to fiscal policy (Frankel et al. (2013)) and tax policy (Vegh and Vuletin (2015)), incorporating the role of fiscal space in the relationship between corporate taxation and sovereign spreads is justified.

Building on Equation 3, an interaction between fiscal space measures and corporate tax variables is included below:

$$\begin{aligned} SPR_{it} = & \beta_0 + \beta_1 CorporateTax_{it} + \beta_2 EM_i \times CorporateTax_{it} \\ & + \beta_3 FS_{it} \times CorporateTax_{it} + \beta_4 CorporateTax_{it} \times FS_{it} \times EM_i \\ & + \zeta_2 FS_{it} + \gamma EM_i \times FS_{it} + (X_{it})\Gamma + \alpha_i + \nu_t + \epsilon_{it} \end{aligned} \quad (5)$$

The description of Equation 5 follows the descriptions of specifications presented in Section 3 using annual data.<sup>16</sup> The key difference here is the inclusion of two additional terms, composed of a fiscal space variable  $FS_{it}$ .  $FS_{it} \times CorporateTax_{it}$  and  $CorporateTax_{it} \times FS_{it} \times EM_i$ , allow for estimation of 1) the specific effect of corporate tax changes along the distribution of fiscal space and 2) the specific effect of corporate tax changes along the distribution for emerging markets specifically, respectively. The overall coefficient of interest in assessing the impact of a corporate tax change is given by  $\frac{\partial SPR}{\partial CorporateTax} = \beta_1 + \beta_2 EM_i + \beta_3 FS_{it} + \beta_4 FS_{it} \times EM_i$ .

Figure 4 plots results obtained from estimating Equation 5. In this specification the dependent variable is annual sovereign spreads, which varies by country  $i$  and year  $t$ . The tax variable included is one of either corporate tax revenue (panel (a)), corporate tax base (panel (b)), or the corporate tax rate (panel (c)). The fiscal space variable ( $FS_{it}$ ) is sovereign ratings (1-21) from Kose et al. (2018).<sup>17</sup> I include a set of macroeconomic control variables

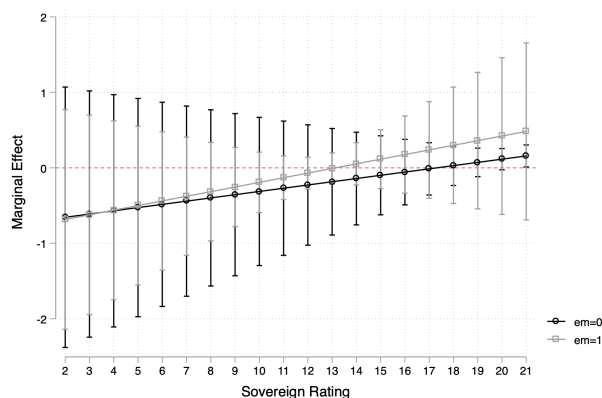
<sup>16</sup>This is in contrast to Section 4, which examines the relationship between taxation and sovereign spreads using daily data. However, the remaining sections of this paper use annual data. While high-frequency data would be better suited for this analysis, there are some limitations in using such data here. Of course, for the dependent variable (sovereign spreads), high frequency data is available at higher frequencies and for many countries. The main restriction is that data on tax rates, bases, and revenues are only available for a wide range of countries at the annual level. Tax policy announcements are only available for five emerging market countries. Extending the coverage of the IMF's Tax Policy Reform Database (Amaglobeli et al. (2018)) would aid in addressing these issues. Furthermore, adding a quantitative dimension would enhance the use of tax policy announcements - currently the tax policy announcements used in this paper are merely indicators (0/1) of announcement types.

<sup>17</sup>A higher sovereign rating suggests more fiscal space. 10.8 is the 25th percentile of sovereign ratings. The

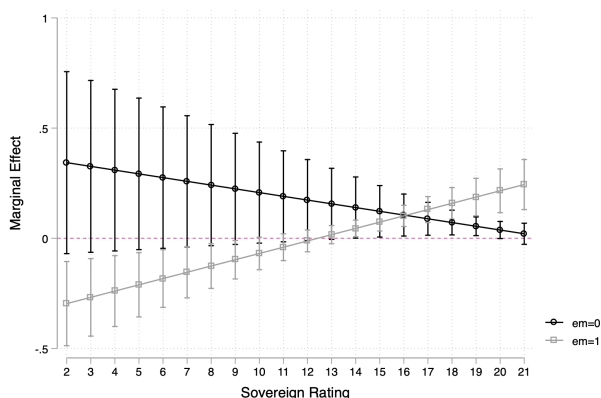
(such as GDP growth rate and government consumption), in addition to year fixed effects. Robust standard errors are computed by country-year. These results provide more nuance to the OLS results without fiscal space interaction terms.

Figure 4. Role of Sovereign Ratings

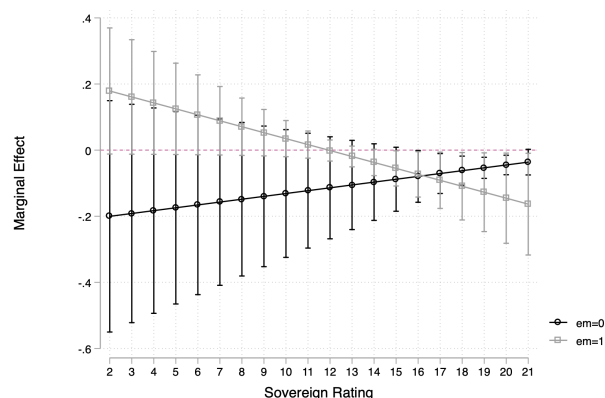
(a) ME of Corporate Tax Revenue (%GDP)



(b) ME of Corporate Tax Base (%GDP)



(c) ME of Corporate Tax Rate (%)



Notes: These figures plot the marginal effects of an increase in corporate tax revenue (Panel a), an increase in the corporate tax base (Panel b) and an increase in the corporate tax rate (Panel c), along the distribution of a sovereign ratings measure. The sovereign ratings measured is obtained from the World Bank's Fiscal Space Database (Kose et al. (2018)), it captures market perceptions of a sovereign's foreign currency long-term debt. The measure ranges between 1 and 21, with 21 being the best score. Point-estimates are shown in the figures above, along with 95-percent confidence bands, separately for emerging and advanced economies (denoted by grey and black plots, respectively).

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mean is 14.6 and median 14.3.

First, it is apparent that along the distribution of sovereign ratings, in neither advanced nor emerging markets does an increase in corporate tax revenue have a statistically significant effect on sovereign spreads (Figure 4, panel (a)). However, for both base and rate increases, there is much more nuance in the response of sovereign spreads along the distribution of sovereign ratings.

An increase in the corporate tax base has benefits for emerging market countries with low sovereign ratings (Figure 4, panel (b)). That is, an increase in the corporate tax base by 1% (as a share of GDP), is associated with a decline in sovereign spreads when the sovereign rating is less than or equal to 11. This is in line with the story developed so far, that corporate tax base expansion is interpreted by markets in a positive way - thus leading to lower sovereign borrowing costs as base expansion may signal credible tax policies and fiscal prudence. Given the negative/positive cutoff of the marginal effect of a corporate tax base increase in emerging economies, it appears that countries tend to benefit from larger bases when fiscal space is most precarious. In contrast, sovereign spreads worsen with an increase in the corporate tax base when sovereign ratings are larger than 11. This may be due to market penalties if fiscal prudence is deemed unnecessary - such as when fiscal space (sovereign ratings) are sufficiently strong. While the results for the marginal effects of corporate tax base changes appear to be nuanced and complex, the marginal effects of corporate tax rate changes are much less noticeable (for both emerging and advanced economies - as shown in Figure 4, panel (c)). These distinct corporate tax effects (of revenues, rates and bases) are not specific to the distribution of sovereign ratings, as similar patterns are also seen along the distribution of the fiscal balance (Appendix Figure D.1).

Other proxies of fiscal space are assessed in the analysis in the Appendix. There appears to be no important impact of corporate taxation in emerging markets along the distribution of average debt maturity (Appendix Figures D.2). However along the distribution of foreign currency debt there are important effects (Appendix Figure D.3). For example, in emerging markets with high foreign currency debt as a share of total debt, above 40 percent, an increase in the corporate tax base reduces sovereign spreads. However, when the share of foreign currency debt is lower, there are positive effects on sovereign spreads, perhaps due to fiscal prudence deemed as unnecessary or excessive. Results for short-term debt point to opposite effects (Appendix Figure D.4). These results show that with a high amount of short-term debt, corporate tax base expansion does not reduce the cost of government borrowing. This may be due to the longer-term nature of the corporate tax base effects.<sup>18</sup>

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<sup>18</sup>In Appendix Figure D.4, here you can see that when the share of short-term government debt is greater than 50% of total government debt, an increase in the corporate tax base has an effect of increasing borrowing costs. However, below a share of 50%, an increase in the corporate tax base may signal credible fiscal reforms thus having a negative or negligible effect on sovereign spreads.



## 6 Dynamic Effects

In order to examine the dynamic effects of tax shocks, the following local projections specification is presented:<sup>19</sup>

$$SPR_{i,t+h} = \beta^h \hat{\nu}_{i,t} + X_{it} \Omega^h + \alpha_i^h + \lambda_t^h + \epsilon_{i,t+h} \quad (6)$$

The dependent variable is the sovereign spread measure for country  $i$  in year  $t + h$ . The coefficient of interest is  $\beta^h$  which represents the relationship between corporate taxation and the sovereign spread at horizon  $h$ . The variable  $\hat{\nu}_{i,t}$  can be set to a corporate tax revenue shock, a statutory corporate tax rate shock or a corporate tax base shock.<sup>20</sup> Macroeconomic controls are included in  $X_{it}$ . Driscoll-Kraay standard errors are estimated to account for serial correlation and correlation across countries. Country and year fixed effects are included as  $\alpha_i^h$  and  $\lambda_t^h$ , respectively. The error term is denoted as  $\epsilon_{i,t+h}$ , assumed to have mean zero and positive variance.

**Revisiting Fiscal Space** To assess the dynamic response in different fiscal environments, interactions with a measure of fiscal space are included:

$$\begin{aligned} SPR_{i,t+h} = & (LOW_i)(\beta_{LOW}^h \hat{\nu}_{i,t} + X_{it} \Omega_{LOW}^h + \alpha_{i,LOW}^h + \lambda_{t,LOW}^h) \\ & + (1 - LOW_i)(\beta_{HIGH}^h \hat{\nu}_{i,t} + X_{it} \Omega_{HIGH}^h + \alpha_{i,HIGH}^h + \lambda_{t,HIGH}^h) + \epsilon_{i,t+h} \end{aligned} \quad (7)$$

In Equation 7  $LOW_i$  is an indicator variable. It is set to one when country  $i$  is classified as a ‘low sovereign rating’ country, and set to zero for ‘high sovereign rating’ country. As a result, this specification allows separate impulse response functions under high and low sovereign rating scenarios to be assessed. Note that high and low sovereign rating countries can be defined in different ways. In the empirical exercises presented below, a low sovereign rating scenario is when a country has a historical average sovereign rating less than the 25th percentile and the sovereign ratings measure is that provided in the World Bank’s Fiscal Space Database (Kose et al. (2018)).

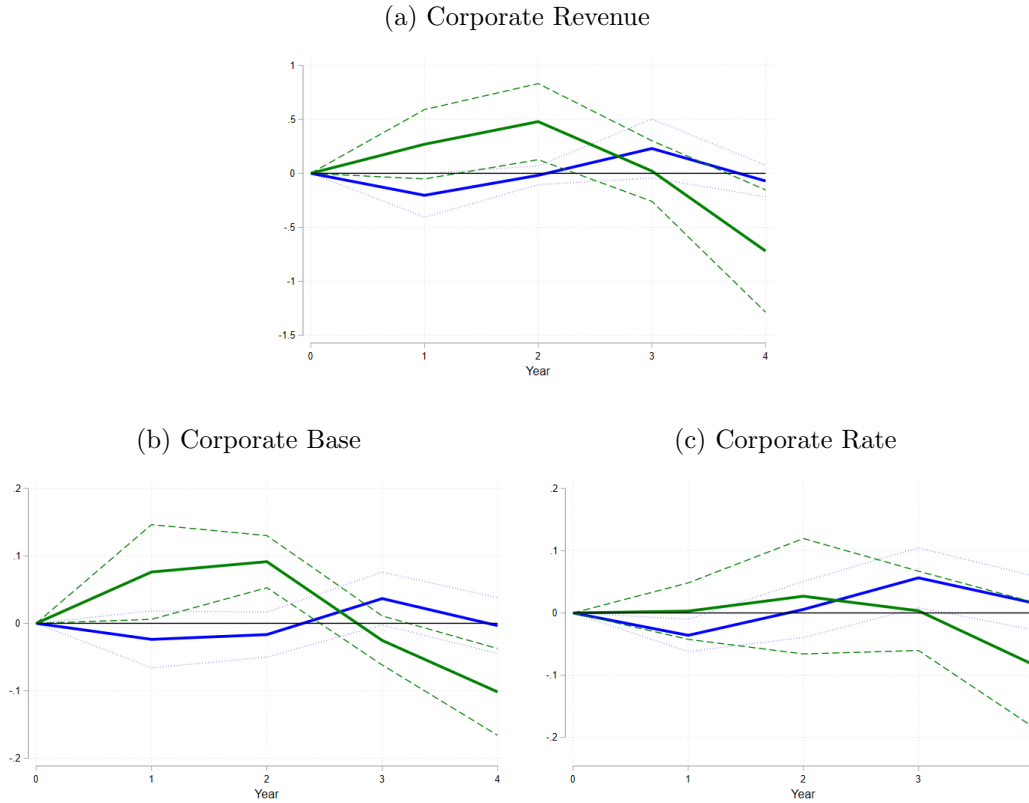
Figure 5 shows the response of sovereign spreads to corporate tax shocks, under low and high sovereign ratings conditions. In the short run (2 years) the response to a corporate tax revenue shock in low and high sovereign rating countries diverges, however, in the longer

<sup>19</sup>Several papers assess fiscal policy and/or sovereign spreads dynamically. Examples include Born et al. (2020), David et al. (2022), Gunter et al. (2018), Kalbhenn and Stracca (2020).

<sup>20</sup>The focus in this section is on corporate taxation. However, this approach can be extended to assess the role of other taxes, for example, replacing  $\hat{\nu}_{i,t}$  with the corresponding shocks for personal tax or consumption tax variables.

run, a corporate tax revenue shock is associated with a decline in sovereign spreads in low sovereign ratings countries. This result appears to be driven by corporate tax base shocks rather than corporate tax rate shocks, based on comparing panels (b) and (c) in Figure 5. These results are consistent with the baseline correlations and marginal effects plots - that corporate tax base expansion reduces sovereign spreads (though here it is apparent that this takes time).

Figure 5. Corporate Taxation on Sovereign Spreads: High vs. Low Sovereign Ratings



Notes: These figures plot the impulse response functions of an exogenous shock to corporate tax revenues corporate tax base, or corporate tax rate on sovereign spreads. Low Sovereign Ratings countries (whose responses are denoted by green lines) consists of those with an average sovereign rating below the 25th percentile (11/21), where 21 is the best sovereign rating score. High sovereign rating countries are all other countries (responses in blue). These results correspond to estimating Equation 7. The dashed lines represent 90% confidence intervals around the IRF estimates.

Appendix Figure E.1 shows results restricted to advanced economies only. Here it is clear that strong effects must be driven by patterns in emerging markets, as the response of sovereign spreads to corporate tax shocks appears to be quite weak in advanced economies. Furthermore, separately estimating impulse response functions on the sample of high and low sovereign rating countries (as in Appendix Figure E.2) corroborates the results from estimating Equation 7. These plots show that corporate tax base shocks tend to lower sovereign spreads, while tax rate shocks increase sovereign spreads. Beyond the impact of corporate tax shocks for sovereign spreads, the appendix provides additional results. Appendix Figure E.3 checks the impact of corporate tax revenues vs. total tax revenues shocks on sovereign spreads. Impulse response functions for the impact on other variables are presented in Figure E.4 and Figure E.5. There are minimal effects on other macroeconomic outcomes, and little difference in high/low fiscal space scenarios.

**Tax Shocks and Potential Asymmetries** In order to assess the role of corporate taxation, or the impact of any fiscal policy, it is important to extract the exogenous component of the policy. A simplistic way to do so is to take the difference between the actual outcome (i.e. actual corporate tax revenues) minus a forecast (i.e. a prediction of what corporate tax revenues will be at time  $t$ , based on corporate tax revenues and other macroeconomic variables at time  $t-1$ ). However, forecasting tax variables poses several challenges and are not widely available (as compared to other macroeconomic forecasts, and in particular government consumption forecasts as documented in Born et al. (2020)).<sup>21</sup> As a consequence of this lack of forecast reliability and availability, reasonable predictions of tax revenue, base and rates need to be estimated in order to generate a series of exogenous tax shocks.

I propose to address this issue by predicting tax revenue, base and rate using the following equations:

$$CORPTAX_{it} = \gamma_0 + \gamma_1 CORPTAX_{i,t-1} + X_{it}\Omega + \alpha_i + \lambda_t + \epsilon_{it} \quad (8)$$

In estimating Equation 8, the  $CORPTAX$  variable is replaced with corporate tax revenue, base or rate. Thus, there are three equations to estimate. Country and year fixed effects are included ( $\alpha_i$  and  $\lambda_t$ ), and  $\epsilon_{it}$  is the residual. For each of those three equations, the predicted value of each tax measure is used in the following form to generate three tax shocks ( $\hat{\nu}_{it}$ ) - one for each of corporate revenue, base and rate:

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<sup>21</sup>Buettner and Kauder (2010) and Leal et al. (2008) discuss the complexities of fiscal forecasting. Golosov and King (2002) compare actual and forecasted (by the IMF) tax revenues in the 1990s - they find that forecasts were not very accurate. Auerbach (1995) and Auerbach (1996) discuss revenue estimation, though the focus is on the United States. To the best of my knowledge, there does not exist a widely available, cross-country series of (corporate) tax variable forecasts.

$$\hat{\nu}_{it} = CORPTAX_{it} - \widehat{CORPTAX}_{it} \quad (9)$$

Figure 6 compares predictions to actual tax variables, along with the distribution of shocks for advanced and emerging economies. These plots are shown separately for corporate tax revenue, corporate tax base and corporate tax rate. As expected, the shocks tend to be centered around zero. The mass tends to be more negative in emerging markets for revenue, base and rate shocks - suggesting that emerging markets experience more negative (fiscal loosening) than positive corporate tax shocks (fiscal tightening), which is reflected in summary statistics reported in Appendix Table A.3.

In order to assess potential asymmetries in how sovereign spreads respond to corporate tax shocks, the following specification is estimated and associated impulse responses function plotted:

$$\begin{aligned} SPR_{i,t+h} = & (I_{it}^+)(\beta_+^h|\hat{\nu}_{i,t}| + X_{it}\Omega_+^h + \alpha_{i,+}^h + \lambda_{t,+}^h) \\ & + (I_{it}^-)(\beta_-^h|\hat{\nu}_{i,t}| + X_{it}\Omega_-^h + \alpha_{i,-}^h + \lambda_{t,-}^h) + \epsilon_{i,t+h} \end{aligned} \quad (10)$$

Indicators for positive and negative shocks are constructed and incorporated in Equation 10.<sup>22</sup> These are  $I^+$  and  $I^-$ , where  $I^+ = 1$  when shocks are greater than zero and set to 0 otherwise, and where  $I^- = 1$  when shocks are less than zero and set to 0 otherwise. The second step is to generate a new shock series. This series is equivalent to the original series of shocks, with the negative shocks set to their absolute value. Call this new series  $|\hat{\nu}_{it}|$ . Finally,  $|\hat{\nu}_{it}|$  is interacted with the indicator variables to isolate the sovereign spread responses to positive and negative shocks separately, in order to assess whether there are asymmetric effects.

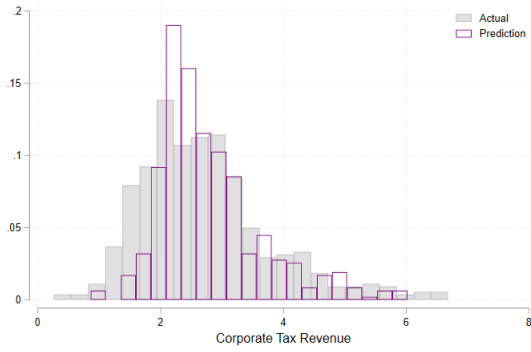
The estimates associated with Equation 10 are shown in Figure 7; panel (a) plots the response of sovereign spreads to positive and negative corporate tax revenue shocks, while panels (b) and (c) do the same for corporate tax base shocks and corporate tax rate shocks, respectively. Regarding tax revenue shocks, negative shocks (i.e. a reduction in corporate tax revenue) are associated with a negligible impact on sovereign spreads. However, positive revenue shocks are associated with a negative and statistically significant response of sovereign spreads in the fourth year post-shock. While positive and negative shocks lead

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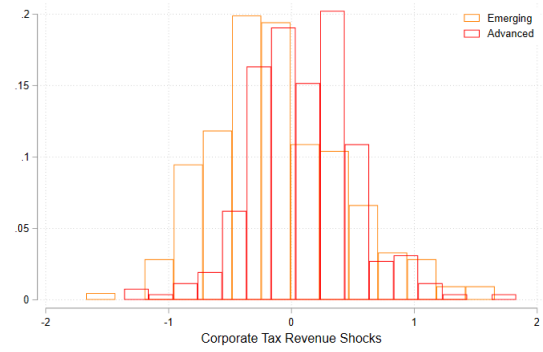
<sup>22</sup>Table A.3 summarizes negative and positive shocks for high and low sovereign ratings scenarios. For emerging markets with low sovereign ratings, there are more negative than positive shocks, though they are similar in size, with means -1.97 and 2.03, respectively. In general positive shocks are more volatile. In advanced economies, there are more positive shocks, and standard deviations are much lower than in emerging markets. Similar to emerging markets, in advanced economies there appears to be symmetry in the size of positive and negative shocks, with means in advanced economies being 1.31 and -1.25, respectively.

Figure 6. Corporate Tax Shocks

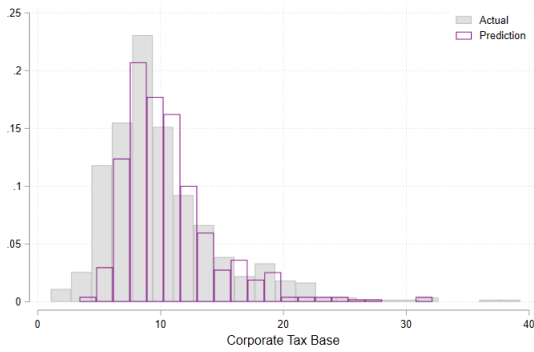
(a) Actual vs. Predicted: Revenue



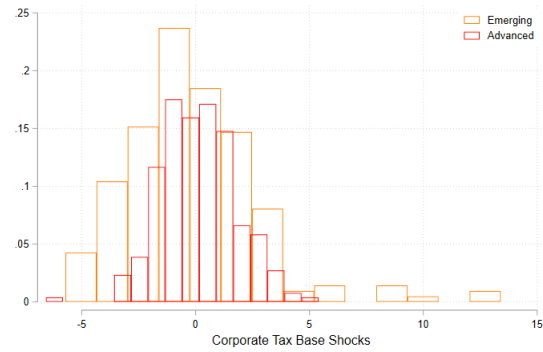
(b) Shocks: Revenue



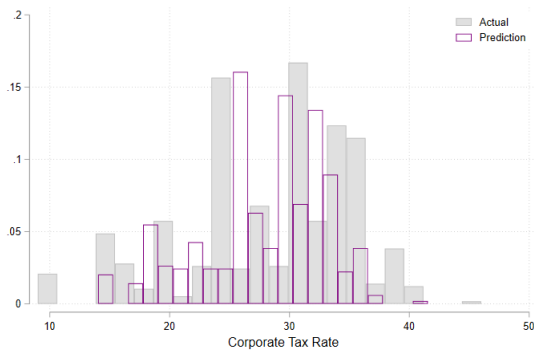
(c) Actual vs. Predicted: Base



(d) Shocks: Base



(e) Actual vs. Predicted: Rate



(f) Shocks: Rate



Notes: These figures plot histograms of actual and predicted corporate tax variables (in sub-figures a, c, e) and compares the distribution of the shock series for advanced economies and emerging markets (in sub-figures b, d, f).

to opposite responses in sovereign spreads, the responses appears to be asymmetric. For example, it appears that a negative shock increases sovereign spreads (as expected in the fiscal prudence view of sovereign investors). However, a symmetric positive shock does not have the same, opposite impact; rather a positive shock has a larger (in absolute value terms) effect on sovereign spreads by year four.

The asymmetric response of sovereign spreads to positive and negative tax revenue shocks appears to be driven by corporate tax base shocks rather than corporate tax rate shocks (this follows from comparing panels (b) and (c) of Figure 7). While the impact of positive or negative base shocks appear to have distinct impacts on sovereign spreads, positive and negative rate shocks appear to be indistinguishable from eachother. The approach to understanding asymmetric effects follow from research on the asymmetric effect of tax policies stemming from dependence on initial conditions and the role of positive or negative changes (for example Born et al. (2020), Auerbach and Gorodnichenko (2012), and Perotti (1999)).

Furthermore, the role of positive or negative shocks in high and low sovereign ratings scenarios can be assessed by estimating the following:

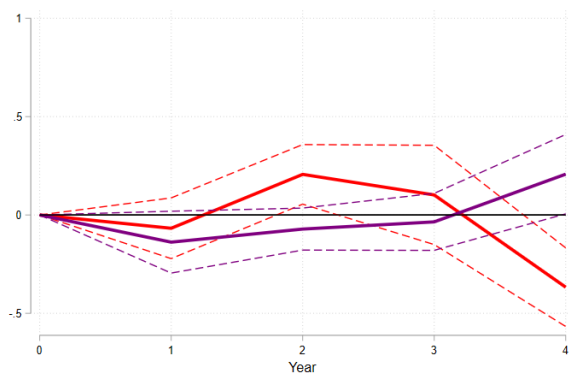
$$\begin{aligned}
SPR_{i,t+h} = & (I_{it}^+)(LOW_i)(\beta_{+,LOW}^h|\hat{\nu}_{i,t}| + X_{it}\Omega_{+,LOW}^h + \alpha_{i,LOW,+}^h + \lambda_{t,LOW,+}^h) \\
& + (I_{it}^+)(1 - LOW_i)(\beta_{+,HIGH}^h|\hat{\nu}_{i,t}| + X_{it}\Omega_{+,HIGH}^h + \alpha_{i,HIGH,+}^h + \lambda_{t,HIGH,+}^h) \\
& + (I_{it}^-)(LOW_i)(\beta_{-,LOW}^h|\hat{\nu}_{i,t}| + X_{it}\Omega_{-,LOW}^h + \alpha_{i,LOW,-}^h + \lambda_{t,LOW,-}^h) \\
& + (I_{it}^-)(1 - LOW_i)(\beta_{-,HIGH}^h|\hat{\nu}_{i,t}| + X_{it}\Omega_{-,HIGH}^h + \alpha_{i,HIGH,-}^h + \lambda_{t,HIGH,-}^h) + \epsilon_{i,t+h}
\end{aligned} \tag{11}$$

In Equation 11, interactions between positive/negative shock indicators and high/low sovereign rating indicators are included. Separating the impulse responses to positive and negative shocks by high and low sovereign country ratings, heterogeneous response are apparent.

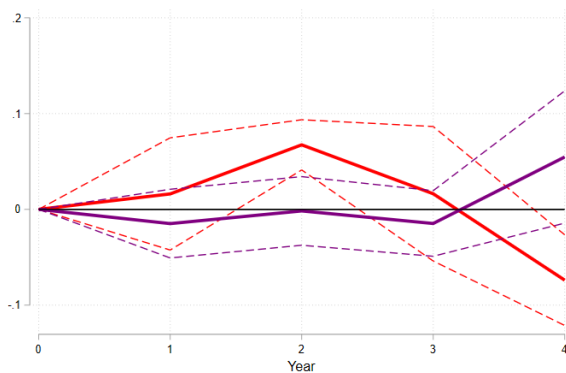
For example, in Figure 8 the green lines show the response of sovereign spreads in low sovereign rating countries, suggesting that it is low sovereign rating countries that drive statistically significant reactions in response to corporate tax revenue and base shocks. More specifically, it appears that statistically significant reactions are associated with positive shocks rather than negative shocks. Overall, the dynamic effects of corporate taxation on sovereign spreads confirm the specific role of corporate tax base effects, in scenarios with precarious fiscal space - which tend to be emerging market countries.

Figure 7. Corporate Taxation on Sovereign Spreads: Positive and Negative Shocks

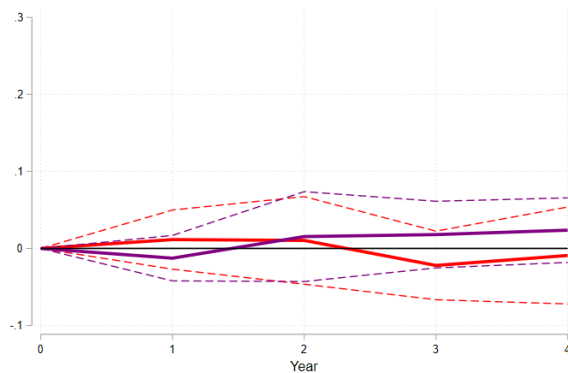
(a) Corporate Tax Revenue Shock



(b) Corporate Tax Base Shock

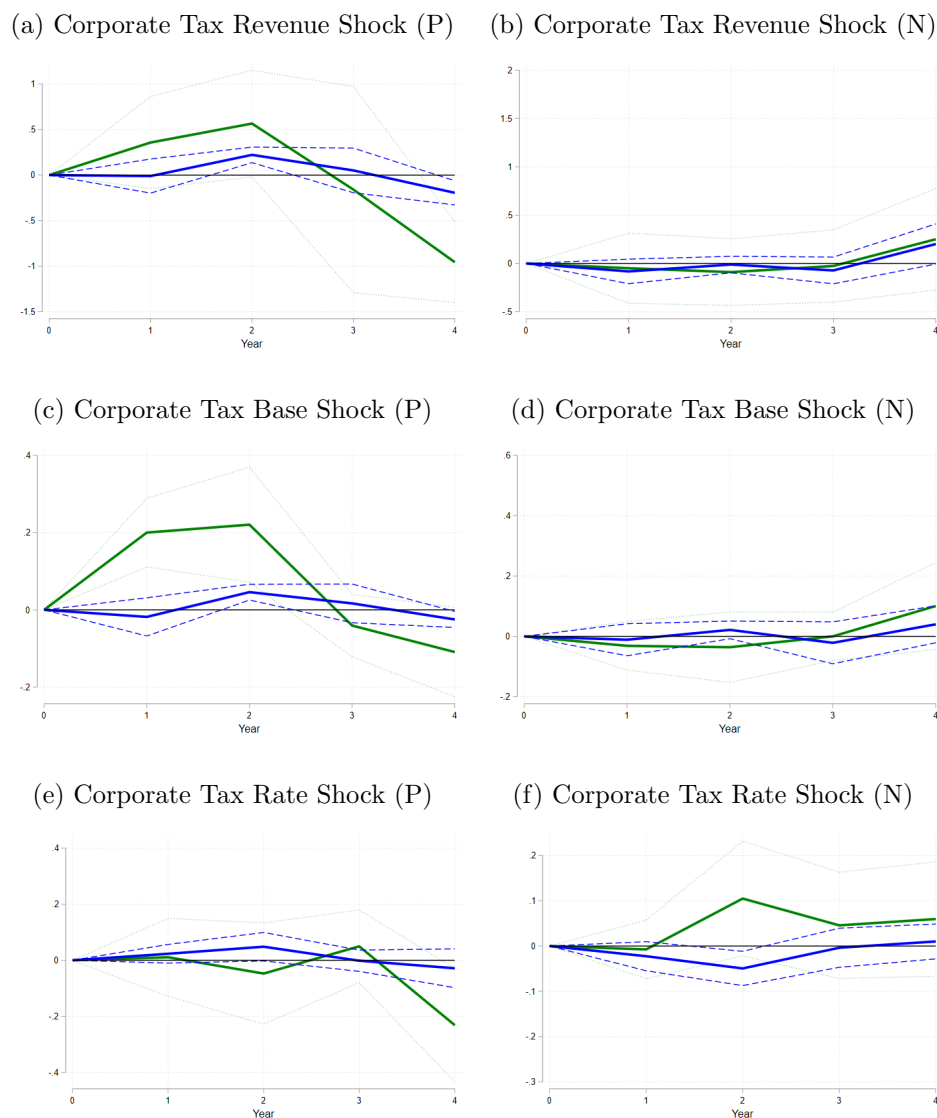


(c) Corporate Tax Rate Shock



Notes: These figures plot the impulse response functions of a shock to a given tax variable on sovereign spreads - separated into negative and positive shocks to test asymmetric effects. The impulse responses to a positive shock are denoted with red lines, while the impulse responses to a negative shock are denoted with purple lines.

Figure 8. Corporate Taxation on Sovereign Spreads: Positive and Negative Shocks for Low and High Sovereign Ratings



Notes: These figures plot the impulse response functions of a shock to a given tax variable on sovereign spreads - separated into positive shocks (sub-figures a, c, e) and negative shocks (sub-figures b, d, f) to test asymmetric effects. Low sovereign rating country responses are denoted by green lines and high sovereign rating country responses are denoted by blue lines. The dashed lines represented the 90-percent confidence bands around each scenario.



## 7 Conclusions

This paper examines the relationship between taxation and sovereign spreads, with a focus on the role of aspects of corporate taxation.

First, exploratory regressions using annual data find that there is a statistically significant relationship between the corporate tax base and sovereign spreads in emerging markets. Second, in a high-frequency setup, this relationship is confirmed using daily data and precise tax policy announcement dates. Third, the relationships between corporate taxation (revenues, bases and rates) and sovereign spreads are assessed along the distribution of fiscal space. The main result is that corporate tax base expansion is associated with declining sovereign spreads in countries with weaker levels of fiscal space. Finally, the dynamic response of sovereign spreads to corporate tax shocks are examined, confirming the general findings regarding corporate tax base changes.

The impact of corporate tax base expansion on lowering sovereign spreads in emerging markets suggests the importance of credible fiscal signalling. For example, as tax rate movements may lead to profit shifting, increasing the rate of taxation in some circumstances may not be a credible revenue generating strategy as perceived by investors. This viewpoint appears to be corroborated in this paper, as rate changes either have no relationship or the opposite relationship (compared to that with base changes) with sovereign spreads. In terms of policy, one way to incorporate the distinct response to rate and base changes would be to put more into tax administration efforts rather than increasing the rate when fiscal space is needed most.

Current policy debates have gravitated toward discussions about corporations paying their fair share, at the same time that governments require fiscal credibility and funds to sustain recovery and development progress.<sup>23</sup> The main insight presented throughout this paper is that corporate taxation can be associated with improved borrowing conditions in emerging markets. While the empirical focus covers the period 1991-2017 and a limited set of emerging markets, one might speculatively draw preliminary conclusion to provide insight in the current policy environment. Currently most countries are in the early stages of recovering from the economic consequences of the COVID-19 pandemic, which has contributed to a pre-existing build-up in government debt at a time when domestic revenue mobilization is seen as increasingly important. Furthermore, there is an increase in global efforts, led by the OECD (OECD (2021)), to design and implement corporate tax reform. A key component of the main proposal is a minimum corporate tax rate - there is of course concern in developing

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<sup>23</sup>Assessment of how other types of taxation affect government borrowing might be addressed in future research. Additional angles to understand include a thorough comparison of local and foreign currency debt costs, as well as the maturity structure of sovereign bonds.

countries that a minimum tax may deter investment in their countries, to the extent that investment is lured by favourable tax conditions in host economies. While rates are an important aspect of tax policies, understanding the role of profit-shifting and the size of the corporate tax base (i.e. profits that multinationals report) is an additional aspect - explored in research such as Crivelli et al. (2016) and Bustos et al. (2019) - which may have unintended macroeconomic consequences. The results in this paper complement this growing strand of research, in finding benefits for countries that expand corporate taxation, in particular through expanding the base of corporate taxation.

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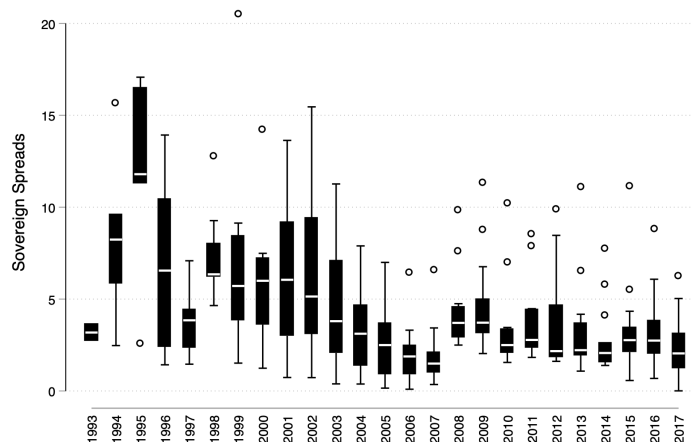
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# Appendices for: “Sovereign Spreads and Corporate Taxation” (April 2022)

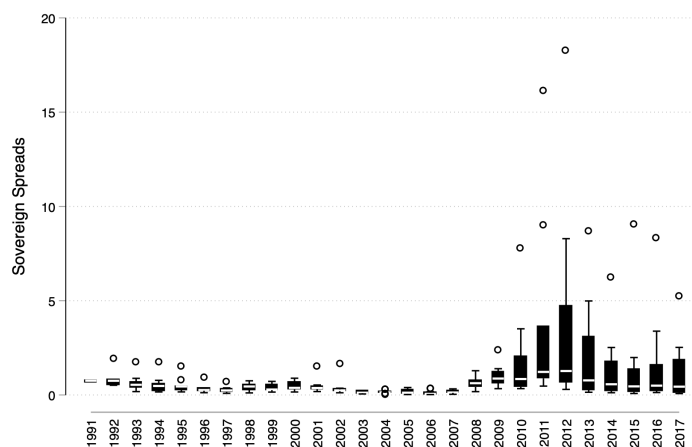
## A Data Appendix

Figure A.1. Sovereign Spreads in Time

(a) Emerging Markets



(b) Advanced Economies



Notes: These figures plot the distribution of sovereign spreads overtime, for emerging markets and advanced economies in the sample. The sovereign spreads measure is aggregated to the annual-country level from Born et al. (2020). The white bars show the mean value in a given year. The filled-in boxes show the 25th and 75th percentiles, the lines show the lower and upper adjacent values, and the dots are outliers. The countries included are those listed in Table 2.

Figure A.2. Trends in Tax Revenue



Notes: These figures show trends in average tax revenues from corporate taxation, personal taxation and goods & services taxation. Data obtained from OECD as described in Modica et al. (2018).

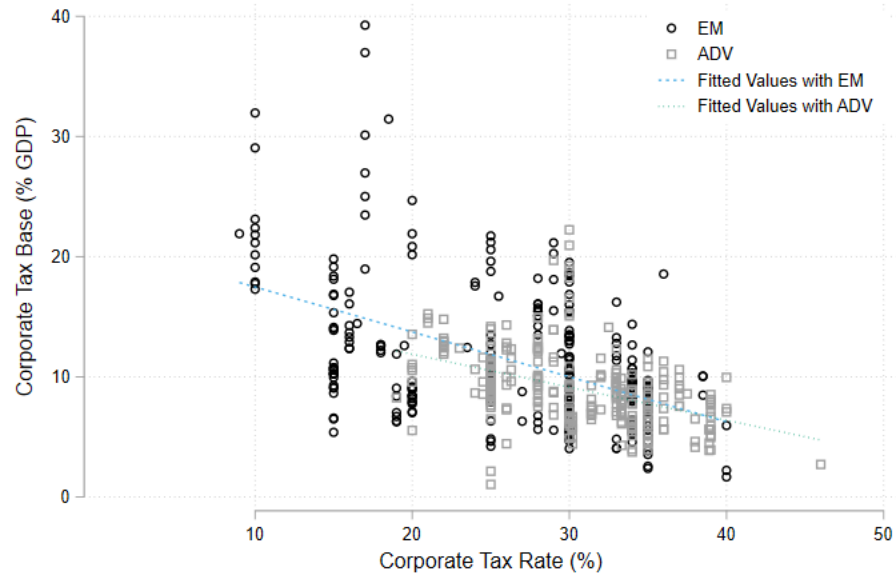
Table A.1. Corporate Tax Revenue Mostly Comes from Profits

Country	Corporate Tax Revenue Total (% GDP)	Corporate Tax Revenue from Profits (% GDP)	Corporate Tax Revenue from Capital Gains (% GDP)
Argentina	2.434	2.434	.
Australia	5.491	5.491	0.000
Austria	2.029	2.029	0.000
Belgium	2.887	2.887	0.000
Brazil	2.797	2.797	.
Bulgaria	2.776	2.645	0.131
Chile	4.009	.	.
Colombia	3.760	3.760	.
Denmark	2.610	2.610	0.000
El Salvador	2.659	2.659	.
Finland	2.821	2.821	0.000
France	2.549	2.549	0.000
Germany	1.785	1.785	0.000
Greece	2.333	2.333	0.000
Hungary	1.983	.	.
Italy	2.866	2.837	0.029
Latvia	1.759	1.759	0.000
Lithuania	1.720	1.720	0.000
Mexico	2.101	.	.
Peru	3.625	3.625	.
Portugal	2.935	.	.
South Africa	3.939	3.939	.
Spain	2.508	.	.
Sweden	2.780	2.780	0.000
Turkey	1.612	1.612	0.000
Uruguay	2.359	2.359	.
Total	2.720	2.710	0.0129

Notes: This table presents the mean of corporate tax revenue variables from OECD's database for the countries used in the main sample. Missing values are denoted by ".".



Figure A.3. Correlations between Corporate Tax Rate and Base



Notes: These figures present scatter plots of the corporate tax base and the statutory corporate tax rate. The country sample shown here corresponds to Table 2 and years 1991-2017.

Table A.2. Correlations between Tax Variables

	Corporate Base	Personal Base	G&S Base	Corporate Rate	Personal Rate
Corporate Base	1.000				
Personal Base	-0.003	1.000			
G S Base	0.189	0.067	1.000		
Corporate Rate	-0.516	-0.178	-0.227	1.000	
Personal Rate	-0.186	0.281	-0.182	0.406	1.000
G&S Rate	-0.028	0.488	-0.222	-0.217	0.249

Notes: This table shows the correlations between base and rate tax variables.

Table A.3. Positive and Negative Corporate Tax Shocks

Direction or Total	N	mean	SD	P50
Panel A.1: Corporate Tax Base and Low Sovereign Ratings				
Negative	94	-1.88	1.32	-1.68
Positive	49	2.01	2.14	1.68
Total	143	-0.54	2.47	-0.79
Panel A.2: Corporate Tax Base and High Sovereign Ratings				
Negative	148	-1.45	1.15	-1.18
Positive	177	1.65	1.80	1.15
Total	325	0.24	2.18	0.14
Panel B.1: Corporate Tax Rate and Low Sovereign Ratings				
Negative	82	-2.14	2.12	-1.42
Positive	78	1.73	1.44	1.66
Total	160	-0.25	2.66	-0.31
Panel B.2: Corporate Tax Rate and High Sovereign Ratings				
Negative	136	-1.80	1.65	-1.57
Positive	196	1.45	0.91	1.54
Total	332	0.12	2.04	0.56
Panel C.1: Corporate Tax Revenue and Low Sovereign Ratings				
Negative	90	-0.43	0.30	-0.41
Positive	53	0.41	0.31	0.33
Total	143	-0.12	0.51	-0.17
Panel C.2: Corporate Tax Revenue and High Sovereign Ratings				
Negative	154	-0.35	0.27	-0.26
Positive	171	0.41	0.33	0.35
Total	325	0.05	0.49	0.02

Notes: This table presents summary statistics for negative and positive corporate tax shocks, when countries have low or high sovereign ratings.

## B Additional Regressions with Annual Data

Table B.1. Robustness: Controlling for Lagged Dependent Variable

Dep. Var Tax Variable	(1) spr REV	(2) spr REV	(3) spr RATE	(4) spr RATE	(5) spr BASE	(6) spr BASE
Lagged SPR	0.455*** (0.084)	0.462*** (0.072)	0.426*** (0.094)	0.436*** (0.081)	0.449*** (0.080)	0.458*** (0.069)
Corporate Tax	0.119 (0.075)	0.065 (0.077)	-0.032 (0.027)	-0.045 (0.027)	0.052 (0.032)	0.055 (0.032)
EM $\times$ Corporate Tax	-0.101 (0.101)	-0.028 (0.098)	0.060* (0.034)	0.068* (0.034)	-0.060* (0.033)	-0.056* (0.033)
Personal Tax	0.006 (0.021)	0.004 (0.016)	0.009 (0.007)	0.009 (0.007)	-0.001 (0.009)	-0.002 (0.008)
EM $\times$ Personal Tax	-0.100 (0.067)	-0.118* (0.059)	0.003 (0.010)	-0.000 (0.011)	-0.031 (0.020)	-0.030 (0.018)
G & S Tax	0.012 (0.016)	0.002 (0.021)	-0.003 (0.019)	-0.009 (0.021)	-0.008 (0.011)	-0.009 (0.009)
EM $\times$ G & S Tax	0.029 (0.048)	0.050 (0.044)	0.065 (0.059)	0.072 (0.054)	0.019 (0.012)	0.019* (0.009)
GDP growth	-0.740*** (0.194)	-0.894*** (0.236)	-0.705*** (0.171)	-0.834*** (0.212)	-0.712*** (0.168)	-0.837*** (0.213)
Sovereign Rating	-0.231*** (0.053)	-0.224*** (0.046)	-0.229*** (0.050)	-0.226*** (0.047)	-0.224*** (0.053)	-0.218*** (0.049)
Govt. Consump.	0.019 (0.031)	0.028 (0.023)	-0.000 (0.022)	0.001 (0.022)	0.021 (0.023)	0.024 (0.022)
EM	0.303 (0.660)	0.063 (0.603)	-2.920 (1.730)	-3.146* (1.661)	-0.110 (0.939)	-0.128 (0.726)
Constant	4.168*** (1.112)	4.181*** (0.868)	5.710*** (1.555)	6.157*** (1.319)	4.474*** (1.301)	4.385*** (0.995)
Observations	452	452	452	452	452	452
R-squared	0.817	0.869	0.819	0.870	0.820	0.870
FEs	None	Year	None	Year	None	Year
Cluster Robust	Y	Y	Y	Y	Y	Y

Notes: The dependent variable is the default premium corresponding to country  $i$  in year  $t$ . The baseline specification is augmented to include the lagged dependent variable term (*LaggedSPR*). The regressors include tax revenues, bases and rates as indicated. Tax revenues and tax bases are included as a percent of GDP and tax rates are in percentages. Other controls include the GDP growth rate, sovereign ratings and government consumption as a share of GDP. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table B.2. Robustness: Including More Control Variables

Dep var. Tax Variable	(1) SPR REV	(2) SPR RATE	(3) SPR BASE	(4) SPR REV	(5) SPR RATE	(6) SPR BASE
Corporate Tax	0.046 (0.111)	-0.066* (0.034)	0.057* (0.030)	0.067 (0.122)	-0.069 (0.043)	0.069* (0.038)
EM $\times$ Corporate Tax	-0.003 (0.133)	0.104** (0.046)	-0.050* (0.027)	-0.017 (0.167)	0.119** (0.045)	-0.075* (0.041)
Personal Tax	0.031 (0.026)	0.019 (0.012)	0.009 (0.012)	0.031 (0.026)	0.016 (0.013)	0.007 (0.013)
EM $\times$ Personal Tax	-0.125** (0.049)	-0.016 (0.020)	-0.037** (0.018)	-0.186** (0.069)	-0.005 (0.020)	-0.047** (0.018)
G&S Tax	-0.048 (0.042)	-0.013 (0.034)	-0.013 (0.010)	-0.068 (0.044)	-0.013 (0.034)	-0.020 (0.016)
EM $\times$ G&S Tax	0.026 (0.049)	0.053 (0.070)	0.000 (0.000)	0.084 (0.050)	0.090 (0.063)	0.000 (0.000)
GDP growth	-0.913*** (0.231)	-0.875*** (0.211)	0.011 (0.012)	-1.037*** (0.206)	-0.979*** (0.194)	0.022 (0.020)
Sovereign Rating	-0.436*** (0.043)	-0.402*** (0.036)	-0.426*** (0.044)	-0.470*** (0.038)	-0.424*** (0.034)	-0.455*** (0.039)
Govt. Consump	0.051* (0.029)	0.012 (0.036)	0.040 (0.035)	0.063* (0.032)	0.018 (0.033)	0.048 (0.035)
Inflation	0.003** (0.001)	0.002* (0.001)	0.002** (0.001)			
Govt. Debt				-0.003 (0.005)	-0.002 (0.006)	-0.003 (0.006)
EM	-0.031 (0.844)	-3.493 (2.210)	0.013 (1.082)	-0.497 (0.909)	-4.919** (1.824)	-0.338 (1.357)
Constant	8.401*** (1.094)	9.887*** (1.426)	8.363*** (1.146)	9.264*** (1.323)	10.608*** (1.382)	9.382*** (1.805)
Observations	480	480	480	483	483	483
R-squared	0.776	0.784	0.780	0.800	0.810	0.806
FEs	Year	Year	Year	Year	Year	Year
Cluster Robust	Y	Y	Y	Y	Y	Y

Notes: The dependent variable is the sovereign spread corresponding to country  $i$  in year  $t$ . The regressors include tax revenues, bases and rates as indicated. Tax bases are included as a percent of GDP and tax rates are in percentages. Other controls include the GDP growth rate, sovereign ratings and government consumption as a share of GDP. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table B.3. Robustness: Including Base and Rate Together

	(1) spr	(2) spr	(3) spr	(4) spr	(5) spr	(6) spr
Corporate Tax Base	-0.055 (0.039)	-0.136** (0.057)	-0.140** (0.059)	0.019 (0.018)	0.003 (0.029)	0.026 (0.027)
Personal Tax Base	-0.112*** (0.027)	0.124** (0.047)	0.127*** (0.044)	-0.004 (0.015)	-0.021 (0.034)	-0.015 (0.028)
G & S Tax Base	0.038 (0.025)	-0.032 (0.029)	-0.020 (0.031)	0.002 (0.011)	-0.042* (0.022)	-0.033 (0.022)
Corporate Tax Rate	0.032 (0.048)	-0.007 (0.060)	0.021 (0.072)	0.026 (0.023)	0.043 (0.032)	0.039 (0.041)
Personal Tax Rate	-0.058** (0.024)	0.118*** (0.039)	0.142*** (0.043)	0.011 (0.011)	-0.005 (0.016)	-0.001 (0.018)
G & S Tax Rate	0.159 (0.098)	0.359* (0.203)	0.361 (0.220)	0.065 (0.051)	-0.013 (0.100)	0.021 (0.097)
GDP growth				-1.050*** (0.207)	-0.789*** (0.138)	-0.960*** (0.181)
Sovereign Rating				-0.428*** (0.041)	-0.492*** (0.070)	-0.496*** (0.064)
Govt. Consump.				0.006 (0.037)	0.177** (0.069)	0.185** (0.084)
Constant	0.759 (3.010)	-8.388 (5.446)	-10.976* (6.323)	6.305*** (1.285)	8.708** (3.695)	7.180* (3.710)
Observations	500	500	500	500	500	500
R-squared	0.380	0.621	0.688	0.781	0.776	0.829
Year FE	X		X	X		X
Country FE		X	X		X	X
Robust Cluster	X	X	X	X	X	X

Notes: The dependent variable is the sovereign spread corresponding to country  $i$  in year  $t$ . The regressors include tax revenues, bases and rates as indicated. Tax bases are included as a percent of GDP and tax rates are in percentages. Other controls include the GDP growth rate, sovereign ratings and government consumption as a share of GDP. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## C High-Frequency Data Restrictions and Additional Results

The assessment using daily data and tax policy announcements is further restricted by availability of a daily measure of sovereign spreads and inclusion in the IMF's Tax Policy Reform Database (Amaglobeli et al. (2018)).

The countries included in the high-frequency regressions are listed in the table below.

Table C.1. Countries in High-Frequency Regressions

Country	EM = 1 , AE = 0
BRA	1
CAN	0
CHN	1
DEU	0
ESP	0
FRA	0
GBR	0
GRC	0
IND	1
ITA	0
JPN	0
MEX	1
PRT	0

Table C.2. Robustness: Country-by-Country EM Results

Country:	(1) BRA	(2) CHN	(3) IND	(4) MEX
Lagged SPR	-0.015*** (0.004)	-0.020*** (0.003)	-0.011*** (0.002)	-0.017*** (0.004)
Corporate Tax Base Increase	-2.224*** (0.621)	-5.754*** (0.483)	-11.079*** (0.482)	0.000 (0.000)
Corporate Tax Base Decrease	-2.353 (4.515)	2.900 (2.785)	-1.042 (1.483)	-0.387 (0.406)
Corporate Tax Rate Increase	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.144 (0.535)
Corporate Tax Rate Decrease	32.126*** (3.377)	5.292** (2.143)	4.835*** (0.448)	5.984*** (0.647)
Constant	0.000 (0.000)	3.836*** (1.004)	2.291*** (0.668)	9.763*** (2.940)
Observations	3,704	4,639	6,751	4,858
R-squared	0.012	0.013	0.011	0.010

Notes: The dependent variable is daily change in sovereign spreads. Each column restricts the sample to a specific country as indicated. Controls include lagged sovereign spread and corporate tax policy announcement indicators. Driscoll-Kraay standard errors are computed and year FE are included. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table C.3. Non-Corporate Tax Policy Announcements

<b>Panel A: Increases vs. Decreases</b>				
Country Group	(3) EM	(4) AE	(3) EM	(4) AE
Tax Type	Personal	Personal	G&S	G&S
Lagged SPR	-0.028*** (0.003)	-0.014* (0.008)	-0.028*** (0.003)	-0.014* (0.008)
Increase	15.343 (11.254)	3.757 (2.591)	-2.122 (7.421)	-3.546* (1.861)
Decrease	3.687 (4.779)	0.730 (1.163)	2.230 (2.529)	2.287 (2.208)
Constant	-6.568*** (1.288)	-3.705** (1.620)	-6.439*** (1.270)	-3.705** (1.620)
Observations	28,768	68,140	28,768	68,140
R-squared	0.019	0.013	0.019	0.013
<b>Panel B: Base and Rate Changes</b>				
Country Group	(3) EM	(4) AE	(3) EM	(4) AE
Tax Type	Personal	Personal	G&S	G&S
Lagged SPR	-0.028*** (0.003)	-0.014* (0.008)	-0.028*** (0.003)	-0.014* (0.008)
Base Increase	0.000 (0.000)	2.008 (1.668)	-8.160 (7.662)	5.578 (5.799)
Base Decrease	2.984 (5.249)	0.079 (0.955)	3.347 (2.807)	11.340*** (3.831)
Rate Increase	15.343 (11.254)	8.999 (8.815)	15.953 (11.507)	-4.850*** (1.770)
Rate Decrease	10.012*** (0.867)	2.222 (3.116)	0.946 (4.281)	-0.430 (1.923)
Constant	-6.569*** (1.288)	-3.703** (1.620)	-6.435*** (1.271)	-3.708** (1.620)
Observations	28,768	68,140	28,768	68,140
R-squared	0.019	0.013	0.019	0.013

Notes: The dependent variable is daily change in sovereign spreads. Columns alternate between being restricted to the emerging markets and advanced economies in the sample. Each column includes the tax policy announcement type as indicated in each column heading (personal tax announcements in columns 1 and 2, and goods & services tax announcements in columns 3 and 4). Controls include lagged sovereign spread and corporate tax policy announcement indicators. Country-year fixed effects are included. Driscoll-Kraay standard errors are computed. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .



## D Additional Marginal Effects

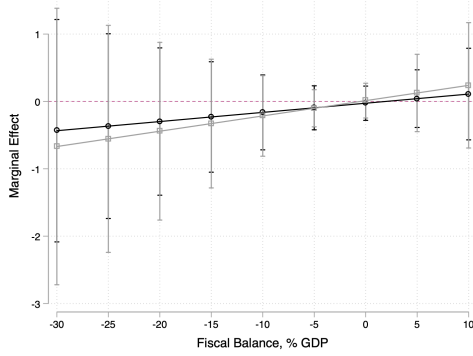
Table D.1. Additional Summary Statistics

<b>Panel A: Emerging Markets</b>					
	Obs	Mean	Std. Dev.	Min	Max
Average Maturity	287	12.51	5.50	1.53	28.30
Foreign Currency Debt (% Total)	90	35.19	25.15	1.42	100.00
Fiscal Balance (% GDP)	282	-2.34	2.78	-11.76	7.91
Fiscal Balance (% Tax Revenues)	282	-14.35	17.44	-83.45	43.55
Short Term Debt (% Total)	292	18.53	11.48	0.40	62.85
<b>Panel B: Advanced Economies</b>					
	Obs	Mean	Std. Dev.	Min	Max
Average Maturity	170	7.41	1.59	1.78	10.93
Foreign Currency Debt (% Total)	126	7.03	8.39	0.00	32.41
Fiscal Balance (% GDP)	274	-2.94	3.55	-15.14	6.74
Fiscal Balance (% Tax Revenues)	274	-12.00	14.61	-70.16	21.69
Short Term Debt (% Total)	185	35.77	9.21	17.27	74.78

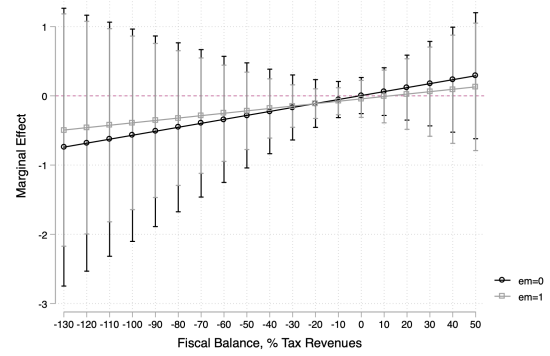
Notes: This table shows summary statistics for variables used in robustness checks and additional results. The sample is restricted to our regression samples. All variables shown are retrieved from the World Bank's Fiscal Space Database (Kose et al. (2018)).

Figure D.1. Role of Fiscal Balances

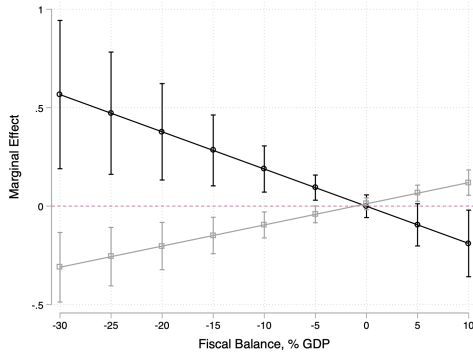
(a) ME of Corporate Tax Revenue (%GDP)



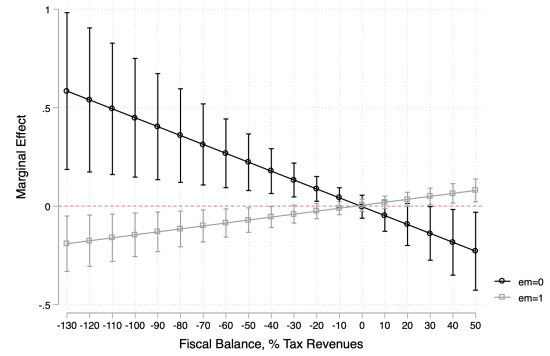
(b) ME of Corporate Tax Revenue (%GDP)



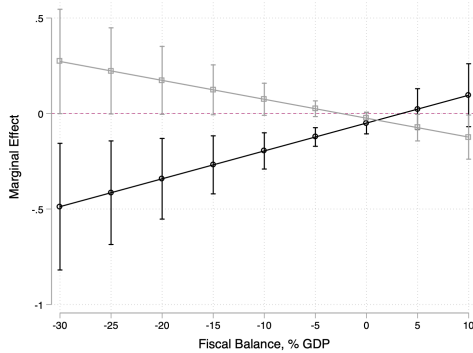
(c) ME of Corporate Tax Base (%GDP)



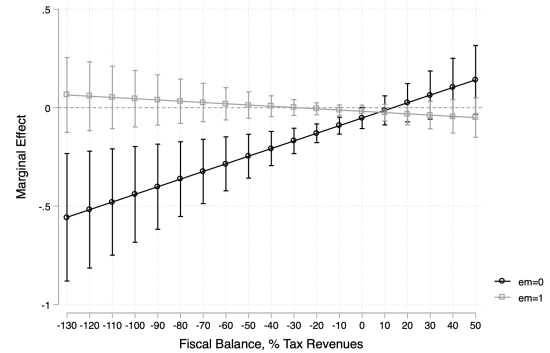
(d) ME of Corporate Tax Base (%GDP)



(e) ME of Corporate Tax Rate (%)

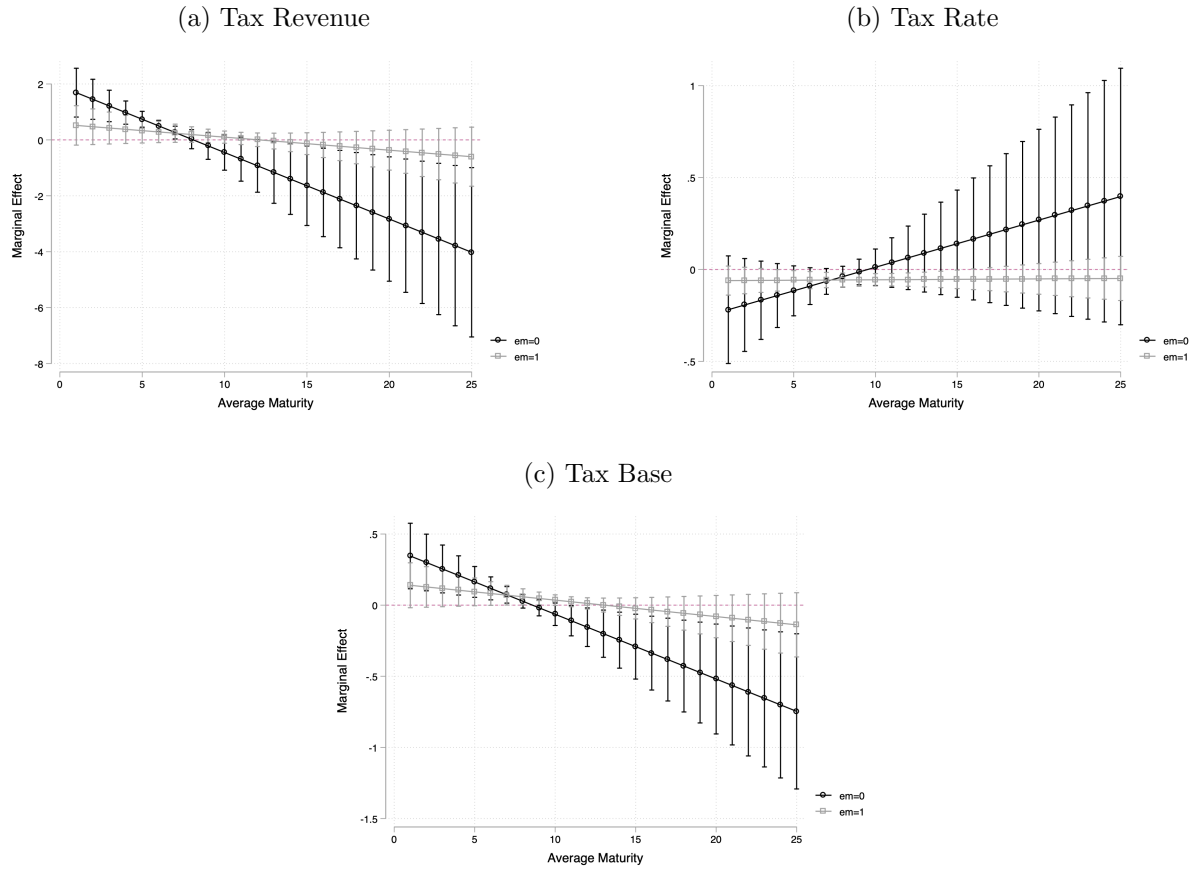


(f) ME of Corporate Tax Rate (%)



Notes: These figures plot the marginal effects of an increase in corporate tax revenue, (Panels a and b), an increase in the corporate tax base (Panels c and d) and an increase in the corporate tax rate (Panels e and f). Plots along two measure of government debt sustainability are shown: the fiscal balance as a share of GDP (in Panels a, c, and e) and the fiscal balance as a share of tax revenues (in Panels b, d, and f). These measures are obtained from the World Bank's Fiscal Space Database (Kose et al. (2018)). Point-estimates are shown in the figures above, along with 95-percent confidence bands, separately for emerging and advanced economies (denoted by grey and black plots, respectively).

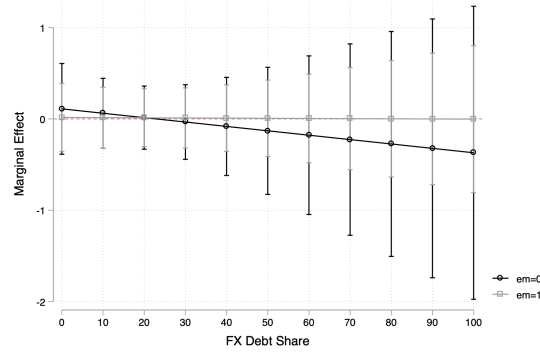
Figure D.2. Role of Average Maturity



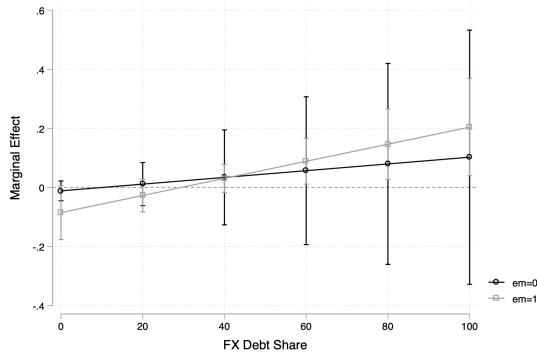
Notes: These figures plot the marginal effects of an increase in corporate tax revenue (Panel a), an increase in the corporate tax rate (Panel b) and an increase in the corporate tax base (Panel c), along the distribution of a the average measure of sovereign debt (in years). This measure is obtained from the World Bank's Fiscal Space Database (Kose et al. (2018)). Point-estimates are shown in the figures above, along with 95-percent confidence bands, separately for emerging and advanced economies (denoted by grey and black plots, respectively).

Figure D.3. Role of Foreign Currency Government Debt (% Total)

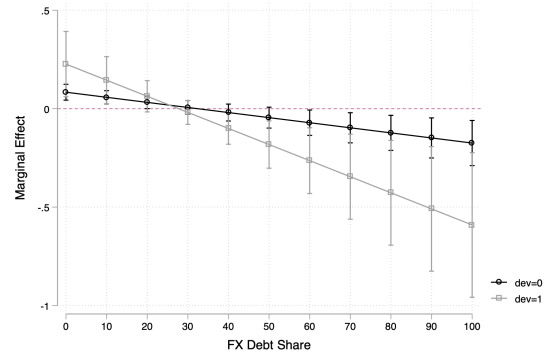
(a) Tax Revenue



(b) Tax Rate



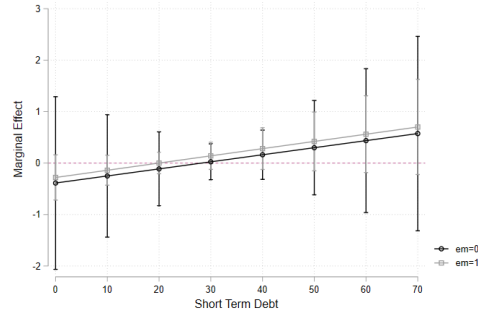
(c) Tax Base



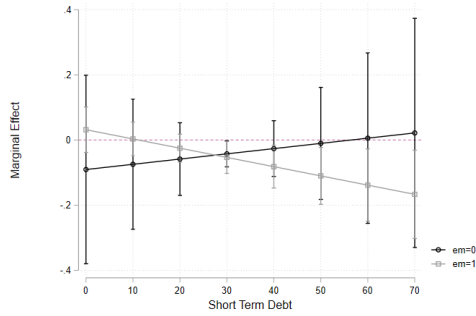
Notes: These figures plot the marginal effects of an increase in corporate tax revenue (Panel a), an increase in the corporate tax rate (Panel b) and an increase in the corporate tax base (Panel c), along the distribution of the share of foreign currency government debt (% Total). This measure is obtained from the World Bank's Fiscal Space Database (Kose et al. (2018)). Point-estimates are shown in the figures above, along with 95-percent confidence bands, separately for emerging and advanced economies (denoted by grey and black plots, respectively).

Figure D.4. Role of Short-Term Government Debt (% Total)

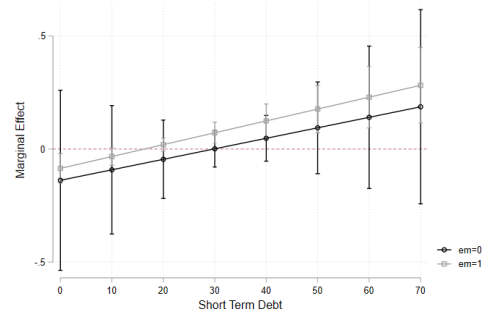
(a) Tax Revenue



(b) Tax Rate



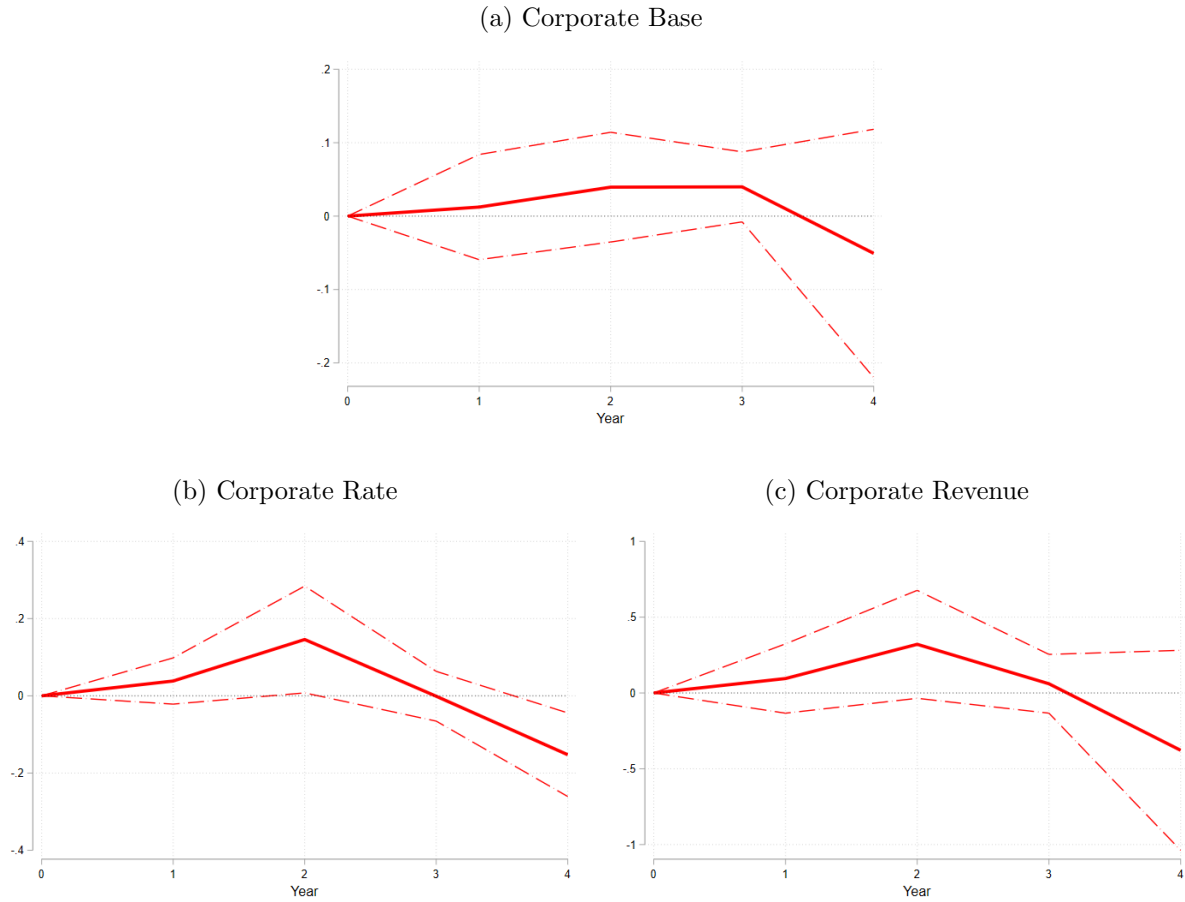
(c) Tax Base



Notes: These figures plot the marginal effects of an increase in corporate tax revenue (Panel a), an increase in the corporate tax rate (Panel b) and an increase in the corporate tax base (Panel c), along the distribution of the share of short-term government debt (% Total). This measure is obtained from the World Bank's Fiscal Space Database (Kose et al. (2018)). Point-estimates are shown in the figures above, along with 95-percent confidence bands, separately for emerging and advanced economies (denoted by grey and black plots, respectively).

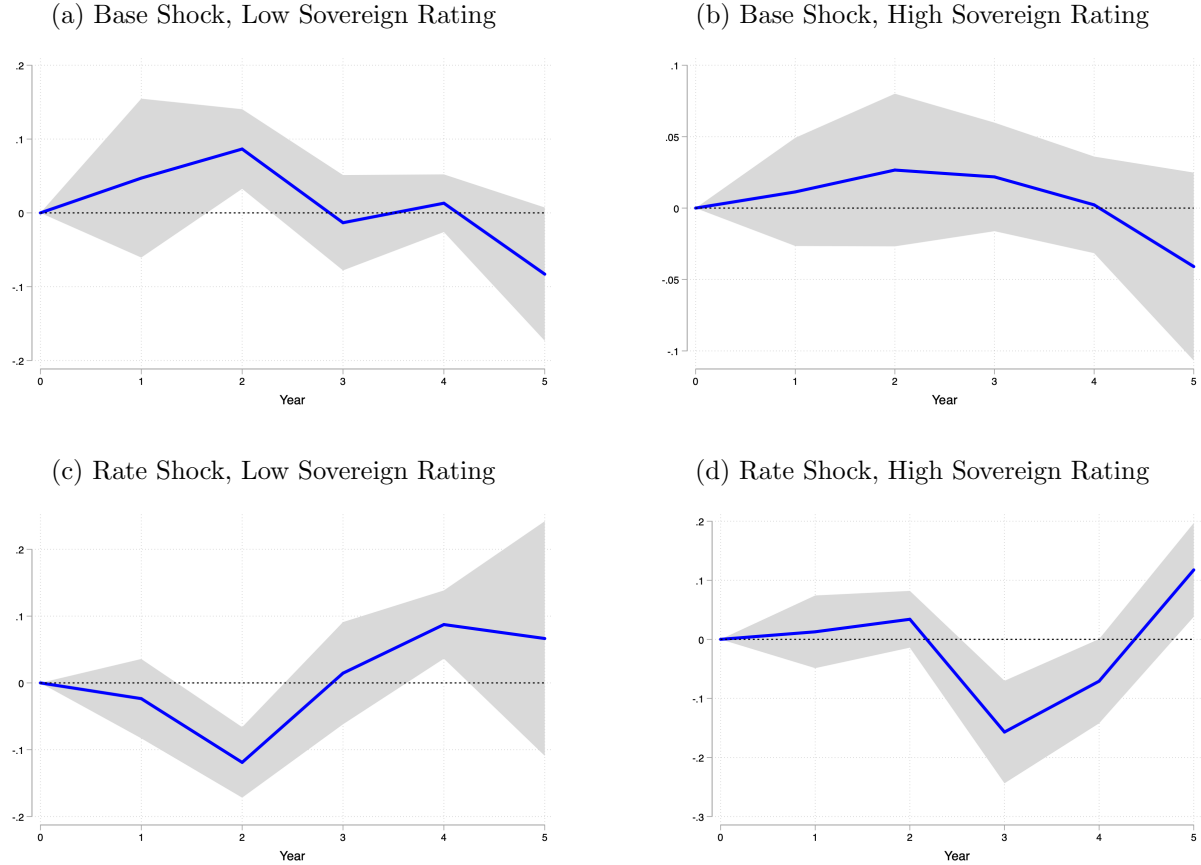
## E Additional Local Projections

Figure E.1. Corporate Taxation on Sovereign Spreads: Advanced Economies



Notes: These figures plot the impulse response functions of an exogenous shock to corporate tax revenue, corporate tax base or corporate tax rate on sovereign spreads in advanced economies only. In the local projection model country fixed effects are included, along with Driscoll-Kraay standard errors. The dashed lines represent 90% confidence intervals around the IRF estimates.

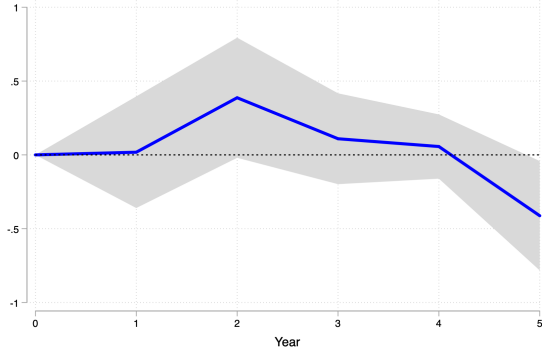
Figure E.2. Corporate Taxation on Sovereign Spreads in Emerging Markets



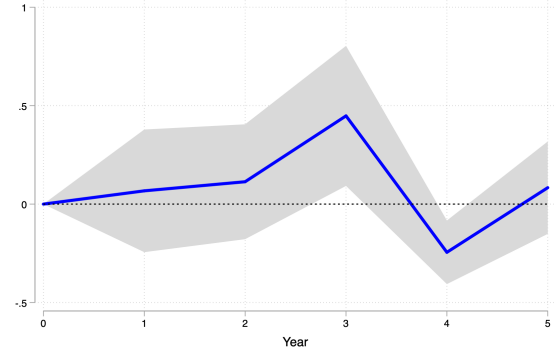
Notes: These figures plot the impulse response functions of an exogenous shock to the corporate tax base or corporate tax rate on sovereign spreads. Low Sovereign Ratings countries consists of those with an average sovereign rating below the 25th percentile (11/21), where 21 is the best sovereign rating score. High Sovereign Ratings countries are all other countries. In the local projection model country fixed effects are included, along with Driscoll-Kraay standard errors. The shaded area plots 90% confidence intervals around the IRF estimates. These results are obtained by running LP estimations with restricted data as indicated in each sub-figure heading.

Figure E.3. Corporate Tax Revenue and Total Tax Revenue on Sovereign Spreads

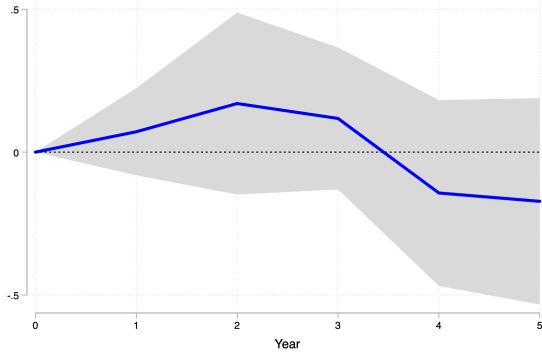
(a) Corp. Rev. in EMs with Low Sovereign Rating



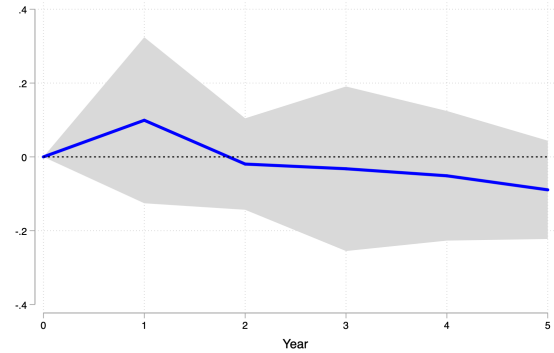
(b) Total Rev. EMs with Low Sovereign Rating



(c) Corp. Rev. EMs with High Sovereign Rating



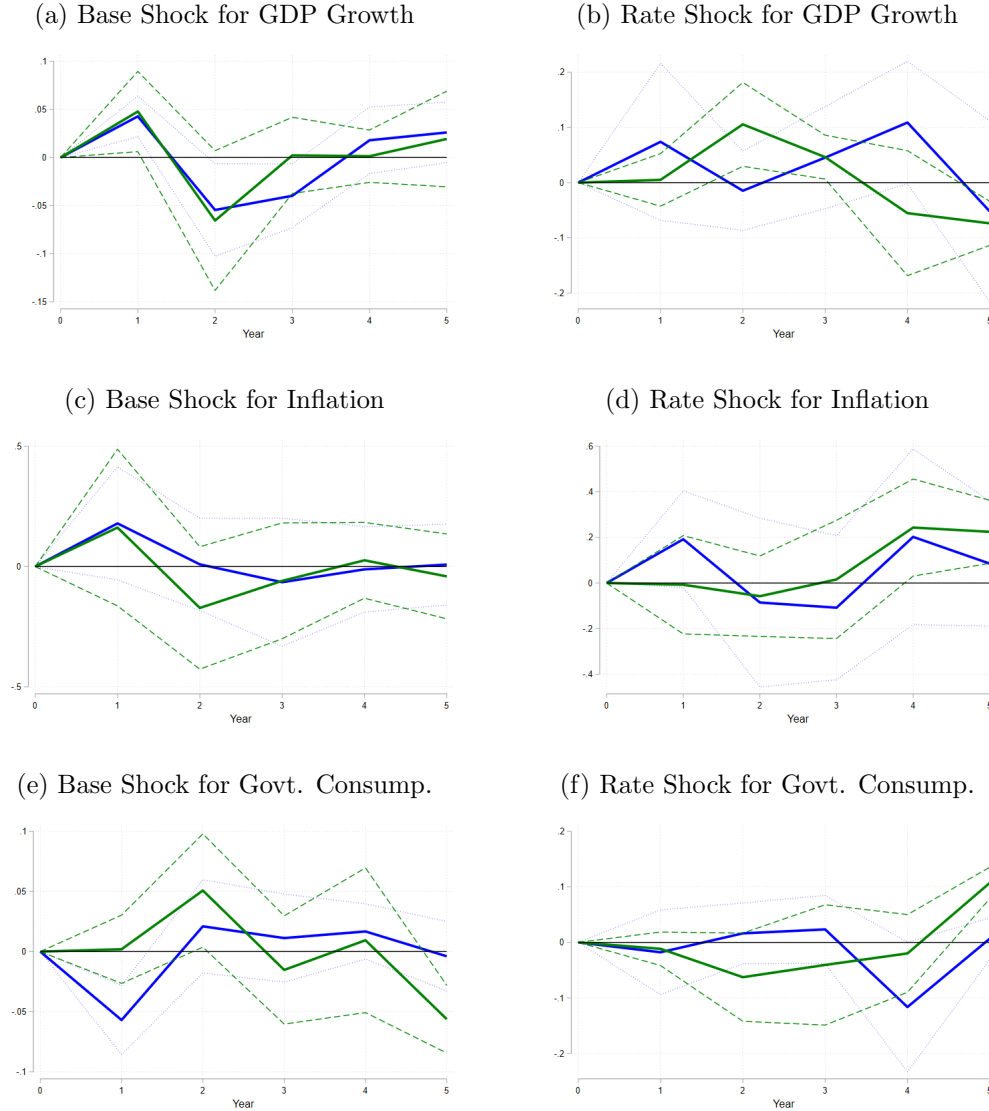
(d) Total Rev. EMs with High Sovereign Rating



Notes: These figures plot the impulse response functions of a shock to the corporate tax revenue or total revenue (defined as the sum of corporate, personal and consumption tax revenues) on sovereign spreads. Panels (a and b) shows the impulse on emerging markets with low sovereign ratings scores, Panel (c and d) shows the impulse on emerging markets with high sovereign ratings scores. In the dataset used here, all advanced economies have high sovereign rating scores. In the local projection model country fixed effects are included, along with Driscoll-Kraay standard errors. The shaded area plots 90% confidence intervals around the IRF estimates.



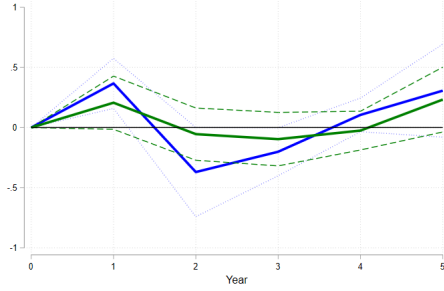
Figure E.4. Corporate Tax Base and Rate Changes on Other Variables



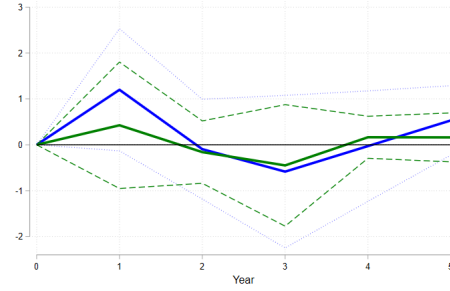
Notes: These figures plot the impulse response functions of a shock to corporate tax revenue on various macroeconomic variables. The green lines show the impulse response function for low sovereign ratings countries, while the blue lines show the impact in high sovereign ratings countries. To designate countries into high and low sovereign ratings groups, the 25th percentile rating of 11/21 is used as a cutoff point (with low sovereign rating countries as those with a rating of  $\leq 11$ ). In the local projection model country fixed effects are included, along with Driscoll-Kraay standard errors. The shaded area plots 90% confidence intervals around the IRF estimates.

Figure E.5. Corporate Tax Revenue Other Variables

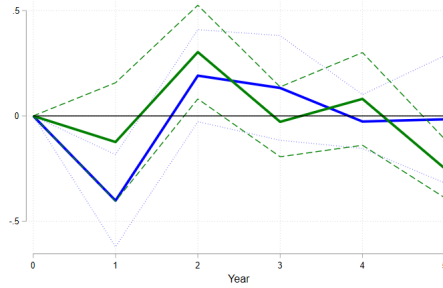
(a) GDP Growth



(b) Inflation



(c) Govt. Consump.



Notes: These figures plot the impulse response functions of a shock to corporate tax revenue on various macroeconomic variables. The green lines show the impulse response function for low sovereign ratings countries, while the blue lines show the impact in high sovereign ratings countries. To designate countries into high and low sovereign ratings groups, the 25th percentile rating of 11/21 is used as a cutoff point (with low sovereign rating countries as those with a rating of  $\leq 11$ ). In the local projection model country fixed effects are included, along with Driscoll-Kraay standard errors. The shaded area plots 90% confidence intervals around the IRF estimates.