# Debt, Defaults and Dogma: politics and the dynamics of sovereign debt markets*

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**Abstract**

Using data from 40 nations, we obtain new stylized facts regarding the impact of political leanings of the ruling government on sovereign debt yields and fiscal policy. Left-wing governments' yields are 166 basis points higher and 23% more volatile than yields of right-wing governments. Moreover, left-wing governments face more counter-cyclical yields. Left-wing governments have higher levels of government spending and right-wing governments collect lower tax revenue as a percent of GDP. A calibrated sovereign default model with elections and two politically heterogeneous policy makers who differ in the marginal impact of their fiscal choices on their re-election probabilities delivers the above-mentioned facts.

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**Keywords:** Sovereign default, Interest rate spread, Political turnover, Left-wing, Right-wing, Cyclicality of fiscal policy.

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# 1 Introduction

The political orientation of governing parties (left vs. right) has an impact on the dynamics of sovereign debt markets. While the financial press often comments on the inter-linkages between elections and fiscal policy, noting the impact of politics on the pricing of sovereign debt, both the empirical and theoretical literature on sovereign debt have paid scant attention to these issues.[1] Our paper contributes new stylized facts about these inter-linkages as well as a model that seeks to explain them. We present two recent headlines (one for the right and another for the left) that exemplify the kind of phenomena we explore in this paper:

*"Argentine markets rallied as a decisive win for the ruling centre-right coalition in congressional elections on Sunday raised hopes for the reelection of ... president Mauricio Macri. Argentina's ... dollar bonds rose 1.8 per cent."*

Financial Times on October 23, 2017.

*"Greek stocks and government bonds fell, ... after the anti-austerity party Syriza swept to victory in national elections ... Yields on Greek 10-year government bonds rose to 8.7%."*

CNN Money on January 26, 2015.

These headlines suggest the possibility that there is a systematic relationship between the sovereign bond yields faced by left wing and right wing parties. These parties may differ in their tolerance for "austerity", which may refer either to higher taxes, lower government spending or both, and these differences in turn may cause international lenders to assign different risk profiles to governments dominated by left and right ideologies.[2] To explore this possibility we amalgamate three international data sets covering 40 countries over 22 years. Our data combines information on fiscal and macroeconomic variables from the World Development Indicators Database, information on country spreads (the difference between the yield on a nation's international debt and the equivalent US treasury) from J.P. Morgan's EMBI Global Index, and information on the political affiliation of national governments from the IDB's Database

[1] Both the empirical and theoretical literature have focused on the impact of political instability. See our literature review section below.

[2] To be sure, we are ignoring several additional inter-linkages between politics, default and elections, some of which will be discussed in the literature review later, but this choice is deliberate in order to isolate, highlight and quantify the mechanisms at hand.

of Political Institutions.[3] This pooled dataset yields significant new facts.

- Left wing governments, on average, incur higher borrowing costs on world financial markets than their right wing counter-parts. While our headlines focus on movements in yields around changes in the political affiliation of the governing party, our empirical finding is more general. Left wing governments' spreads are 166 basis points (bps.) higher than right wing government's spreads even after controlling for the state of the economy and debt levels (the usual covariates in spreads regressions).

- Both left and right-wing governments face rising spreads as per capita GDP growth declines, however left-wing governments face bigger increases in spreads than right-wing governments for a similar decline in economic conditions. These differences persist after controlling for changes in debt levels.

- The higher counter-cyclicality of the spreads of nations with left-wing governments implies that they face much more volatile spreads than those with right wing governments: our dataset reveals a standard deviation of 594 bps. for left compared to 481 bps. for right governments, which is 23 percent higher. These differences in the volatility of spreads can have serious consequences for emerging nation business cycles as has been highlighted in the work of Neumeyer and Perri (2005) and Uribe and Yue (2006), among others.

- The headlines above suggest that left-wing and right-wing governments differ in their tolerance for "austerity", which we take to mean differences in their fiscal policy stance. Our dataset allows us to confirm that the political label (left vs. right) attached to governing parties matters as far as average government consumption expenditures and tax levels are concerned. Average tax revenue to GDP is 18.2% for left parties compared to 15.4% for right parties. Similarly average government consumption to GDP is 15.3% for the left compared to 13.8% for the right.

In order to explain these stylized facts, we build a quantitative model of a small open economy where the government funds spending through taxation and by borrowing from inter-

[3]We define Left-wing and Right-wing parties following the IDB's Database of Political Institutions. We call Right-wing parties ($R$) those defined as conservative, Christian democratic, or right-wing. We call Left-wing parties ($L$) those defined as communist, socialist, social democratic, or left-wing. For details on the political database see Cruz, Keefer and Scartascini, 2001.

national lenders using one period debt that is subject to default. The government is formed by one of two political parties that face uncertain election outcomes every four years, on average. Our point of departure from similar models discussed in the literature review section below is the presence of a reelection technology that makes each party's probability of winning elections a function of its fiscal choices. This reelection technology is such that the incumbent's probability of getting reelected is increasing in government spending as well as in household consumption (i.e., it is decreasing in taxes). Consistent with the empirical political science literature also discussed below, the left and right parties differ in the marginal gain from changes in these variables - the left gains more from delivering higher government spending while the right gains more from delivering lower taxes. These political differences between the parties are reflected in their equilibrium decisions regarding the level of taxation, government spending, and more interestingly, the level of international debt to carry as well as their choice of when to default. Moreover, the default sets of left and right governments reflect the differentially changing tolerance for "fiscal austerity" as output levels vary for a given debt level. Our model, calibrated to our international data, suggests that left-wing governments systematically default at higher income levels than right-wing governments. As the income level of the economy rises, both left and right will increase the size of the government and cut taxes but the left reduces taxes less than the right, leading to a steeper fall in bond yields. Conversely, in very bad times, the left finds further spending reductions politically unpalatable at a higher output level than the right, leading to an overall higher probability of default.

Differences in the equilibrium debt levels and the probability of default chosen by left and right parties are reflected in the equilibrium price of their government bonds. Our calibrated model delivers a mean spread difference between left and right governments of 116 bps. which is close to the observed value of 166 bps. All governments in our model make fiscal decisions that lead to a negative relationship between bond yields and output, ie., spreads are counter-cyclical. Consistent with our data, spreads of left-wing parties in our model are more counter-cyclical than those of right wing parties. Moreover left wing government bond spreads are more volatile than their right wing counterparts which is also in line with our new stylized facts. We note that none of these features are targeted in our calibration.

Another feature of the model that is consistent with the data is that the probability of reelection is increasing in the income level. This fact has been noted and captured by other

studies such as Chatterjee and Eyigungor (2017). In our study, it emerges from the interaction of politics with the costs of international borrowing. When times are good, the costs of borrowing fall. This allows the incumbent to borrow more and either reduce taxes or increase government spending as a fraction of output or both. These fiscal actions raise the probability of reelection for the incumbent government. Similarly reelection prospects are diminishing in the debt level. Higher debt servicing costs reduce the ability of an incumbent government to increase government spending, cut taxes, or both, resulting in lower reelection probabilities.

The differences in the cyclicality of fiscal choices between left and right parties is driven by the interaction of our calibrated reelection technology with the endogenous cost of international borrowing implied by sovereign default models. Briefly, when income varies, the relative cost of funding government spending from the domestic tax base versus international borrowing also changes. The governing party responds to the changing cost landscape by re-optimizing over the two sources of funding. Political differences built into the reelection technology imply that right-wing governments prefer to cut taxes more aggressively than left-wing governments when domestic income rises. Beyond party differences, the model results in pro-cyclical government spending behavior by both parties. This is not directly built into the model but results from mechanisms which are similar to Cuadra, Sanchez and Sapriza (2010). Basically, when times are good, the probability of default is low so spreads shrink, lowering borrowing costs thus allowing an expansion of government spending relative to income.

Our results regarding the different behavior of left and right wing governments do not come at the expense of standard results from the sovereign default literature. Private and public consumption are both more volatile than output and positively correlated with it. The trade balance is negatively correlated with GDP. Spreads rise with debt levels and fall with output increases, ceteris paribus.

### 1.1 Related literature.

Our empirical work builds on the vast empirical literature that explores the determinants of variations in sovereign bond yield spreads. For example, classical works like Edwards (1984) and Cline and Barnes (1997) find that the spread depends on a nation's growth in gross domestic product and exports. Cantor and Packer (1996) as well as Eichengreen and Mody (2000)

document that the cost of borrowing is highly dependent on domestic economic conditions as measured through the credit rating channel. However, none of these studies include the political labels of the government as an independent variable in their analysis, which we find to be relevant and significant.

This study considers a dynamic stochastic small open economy with incomplete markets, endogenous political turnover, and default risk. It builds on the seminal study on international lending and sovereign default by Eaton and Gersovitz (1981), and on the more recent quantitative models by Aguiar and Gopinath (2006), Arellano (2008), and Cuadra et al. (2010), among others. Like our paper, Cuadra et al. (2010) are interested in the relationship between endogenous fiscal policy and sovereign debt markets but do not make the connection to reelection probabilities that we highlight in this paper. Cuadra et al. (2010) show that their model generates pro-cyclical fiscal policy, ie., government spending increases with output while taxes fall. Our model also generates these results which are consistent with the evidence.

Most studies in the sovereign debt literature abstract from political factors. Notable exceptions include Cuadra and Sapriza (2008) and Hatchondo, Martinez and Sapriza (2009) who introduce exogenous political turnover into this class of models and study the role of varying the reelection probability, which they call political instability, on debt accumulation and default risk. Later we discuss the impact of endogenizing the reelection probability on our results. Hatchondo et al. (2009) introduce policy makers who differ from each other in their degree of patience. "Political defaults" may occur when the impatient type replaces the patient type. In contrast, in our paper, both the left wing and right-wing government discount the future at the same rate and have the same preferences. Endogenous fiscal choices influence the likelihood of remaining in (gaining) power and in this probabilistic sense parties choose their degree of patience through fiscal policy. In addition to political instability, Cuadra and Sapriza (2008) study the impact of polarization on the international sovereign default market. Parties vary in the weight they attach to the consumption of two groups of consumers and this creates an interesting strategic motive for the incumbent party to tilt consumption towards its favored group while making debt level and default decisions. These motives are absent in our model as both parties care equally about the consumption of all consumers. Instead both parties assign a weight to private versus government (public) consumption. In our baseline model, this weight is the same for both parties but we show the impact of allowing the left to have a different

weight from the right as part of our extension exercises. Interestingly, this cannot help explain why the spreads of the left have different dynamics from the right.

Like our study, Scholl (2017), studies the interplay between fiscal policy and endogenous electoral outcomes in a model of sovereign default. Society is polarized as in Cuadra and Sapriza (2008) between two types of agents who prefer more or less government spending and two parties who only govern to maximize the welfare of their "supporters". The interesting departure is a political equilibrium in which the voting decisions of individuals involve a comparison of the economic benefit from having either party in power against the non economic ideological aspects which are also polarized. The presence of "popularity shocks" introduces uncertainty into electoral outcomes over and above those implied by movements in GDP. Our work differs in that we do not model the voting directly but capture differences in support/popularity of right and left parties through a calibrated reelection technology that may (and indeed does) differ across parties. An advantage is that we do not need to rely on shocks to the reelection technology in order to generate time variation in reelection probabilities. Moreover we build into our reelection function competing differences between the left and right party that could potentially allow either one to be more predisposed to default and allow the calibration, based on our international dataset, to determine which force dominates. While this is discussed in more detail later, left parties gain more support by increasing government spending while right parties gain more support by lowering taxes. As such, both have a reason to borrow internationally as well as repudiate debt in bad times for political ends. In Scholl (2017), the party that prefers higher government spending has an inbuilt economic disadvantage due to the presence of distortionary taxation and this plays a role in reducing their ability to repay debt. We eschew this feature in order to focus on a purely political source of difference between the two parties. The papers also differ in focus - ours is more concerned with differences in the dynamics of the spread of left versus right parties while Scholl (2017) is more concerned with explaining the interaction of political stability with debt default.

Endogenous electoral outcomes in the absence of heterogeneous decision makers can also be found in the sovereign default model of Chatterjee and Eyigungor (2017). Governments in office have the ability to obtain private benefits in the process of providing public goods. Voting decisions are influenced by the private utility of the voter such that the incumbent is more likely to remain in power in good times. The fear of the loss of private benefits from

Table 1: Spreads, fiscal policy and politics.

| | **Left** | **Right** |
|---|---|---|
| EMBI Spread (in bps.) | 518 | 463 |
| Tax revenue / GDP | 18.2% | 15.4% |
| Gov. spending / GDP | 15.3% | 13.8% |
| $\sigma(Spread_L)/\sigma(Spread_R)$ | 1.23 | |

losing power makes the incumbent behave myopically in bad times relative to good times and this endogenously time-varying level of patience leads to increased volatility in the sovereign spread. As mentioned previously our model also has this empirically relevant feature without the presence of private benefits for the incumbent.

**Layout.** The rest of the article proceeds as follows. Section 2 presents our empirical findings. Section 3 introduces a quantitative model of sovereign borrowing, default and political elections. Section 4 dicusses the calibration of the model, and section 5 studies the main results and quantitative implications of the theory. Section 6 contains a robustness analysis and section 7 concludes.

## 2 Empirical findings

Sovereign spreads, tax revenue, and government spending vary substantially with the type of political party in office, as can be seen in the unconditional moments reported in Table 1. When a nation is ruled by a left-wing ($L$) government, it faces on average an interest rate spread that is 54 bps. higher and 23 percent more volatile, than when a nation is governed by a right-wing ($R$) party. Tax revenues and government spending are also higher under a $L$ ruling party.

We proceed with an empirical analysis to determine how much of the difference in interest rates spread is due to the political stance of the governing party, and how much can be explained by other macroeconomic variables. Our data set consists of yearly series (1994–2015) on 40 economies, and it is obtained from the World Development Indicators Database, J.P. Morgan's EMBI Global Index, and from the IDB's Database of Political Institutions. [4]

As our theoretical model illustrates, the spread reflects the probability of default of a par-

[4]The Appendix provides further details on each source of data in our sample.

Table 2: OLS estimation

| Dep. variable: Spreads | $(i)$ | $(ii)$ |
|---|---|---|
| constant | $507.5^{***}$ | 275.4 |
| Left | $166.0^{**}$ | $149.5^{*}$ |
| Debt/GDP | $7.5^{***}$ | $9.6^{***}$ |
| GDP growth | $-28.4^{***}$ | $-34.0^{***}$ |
| GDP growth $\times$ Left | $-46.2^{***}$ | $-46.5^{***}$ |
| Year and region FE | no | yes |
| Adj. $r^2$ | .27 | .28 |
| Sample size | 276 | 276 |

Note: Statistical significance is denoted by *** 0.001, ** 0.01, and * 0.05.

ticular country. In turn, the default likelihood depends on a nation's debt level and potential output realizations. Hence, observed data on the spread can be used to formally analyze the way in which the debt-to-GDP ratio, the GDP growth rate, and the political stance affect the level of this perceived probability:

$$s = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \epsilon \tag{1}$$

where the $s$ stands for the country spread, $X_i$'s are the determinants of the probability of default, and the $\beta_i$'s are the coefficients of interest. We also check whether our coefficients are robust to the inclusion of yearly and region-specific fixed effects.

Table 2 has the regression results. In line with the conditional means, the coefficient for "Left" (which is an indicator variable that takes a value of 1 if the ruling party is of left-wing orientation and a value of 0 otherwise) is positive and significant in both specifications of the empirical regression model. The coefficients for "Debt-to-GDP" and "GDP growth" are significant, have the expected signs (positive and negative, respectively) and are in line with our theoretical predictions. Interestingly the coefficient for the interaction between "Left" and the "GDP growth" is negative and statistically significant, showing that $L$ governments pay more countercylical spreads than $R$ governments, even after controlling for the usual explanatory variables found in spreads regressions.

**Summary of empirical findings.** From this empirical study of our novel panel data set we take away three main facts. $L$ governments pay sovereign spreads that are: (1) higher, (2) more countercyclical, and (3) more volatile than those of $R$ governments. In the coming sections we propose a quantitative theory of political turnover, fiscal policy and default incentives that is able to rationalize these empirical findings.

# 3 The Model

We consider a small open economy populated by a continuum of households. There are also two political parties ($L$ and $R$) which alternate in power.[5] The economy trades one-period non-state-contingent bonds with a mass of competitive foreign lenders and has no commitment to repaying its debts.

We use recursive notation, where *un-primed* variables (e.g. $x$) represent current values, while *primed* variables (e.g. $x'$) represent next-period values. Time is discrete and goes on forever: $t = 0, 1, 2, \ldots$.

## 3.1 Households

The representative household derives utility from the consumption of both private ($c$) and public ($g$) goods according to the following per-period utility function:

$$U(c, g) = \alpha\, u(c) + (1 - \alpha)\, u(g), \tag{2}$$

where the function $u(\cdot)$ is of the CRRA type:

$$u(x) = \frac{x^{1-\gamma} - 1}{1 - \gamma}, \qquad \text{for } x = \{c, g\}. \tag{3}$$

The parameter $\gamma$ controls the degree of relative risk aversion, which is common across goods. This feature where government spending gives utility is also present in Cuadra et al. (2010) and Scholl (2017).

Households receive a stochastic stream of tradable income $y$ which is assumed to have

[5] These parties are office-motivated (i.e. they prefer to be in power than not) and when in power they have per-period felicity functions that are identical to the households' preferences.

compact support $\mathcal{Y}$ and to follow a Markov process with transition function $\mu(y', y)$. They also face a proportional income tax rate, $\tau$, which is decided by the government and may be time-varying. As it is typical in the models following Eaton and Gersovitz (1981), the households are hand-to-mouth agents: the government does all the intertemporal smoothing for them and implements the desired allocation via changes in the tax rate. The budget constraint of the households is then given by:

$$c = (1 - \tau)y,$$

which states that households just consume their after-tax income every period. In case of a government default the households suffer an income loss, and hence their budget constraint is:

$$c = (1 - \tau)y_a,$$

where $y_a$ represents a reduced income level due to default.[6]

### 3.2 Political Turnover

An election may occur in any period with an exogenous probability $\pi$. This is similar to the way elections are modeled in Chatterjee and Eyigungor (2017) and Scholl (2017). If an election occurs, the incumbent party may be replaced by the other party. We endogenize political turnover through a technology that governs the probability of winning elections. In this we are guided by evidence illustrating that the reelection probability of incumbents dependent on their choice of taxation (with higher taxes decreasing reelection chances) and government spending (with higher spending increasing reelection chances).

**Evidence on the role of taxes.** Several studies have concluded that an increase in real taxes has negative effects on the incumbent's probability of reelection in the US. Most notably, Besley and Case (1995) show that for each income group, increases in a state's own taxes increase the probability of incumbent defeat. This negative impact of taxes on reelection prospects has also been found in studies for the UK, Belgium, Canada, Spain, and Sweden. [7]

[6] At this point in the model's exposition it suffices to state that $y_a \leq y \, \forall y$. See section 3.4 for further details.

[7] Niemi, Stanley and Vogel (1995) use large-scale surveys and aggregate data on state tax increases in the UK and conclude that state governors are held accountable for increasing taxes. In Belgium, incumbents are also found to be punished for higher taxes via an analysis of municipal elections in Flanders during the period

Furthermore, Tillman and Park (2009) study 102 national elections between 1990 and 2006 in 19 countries and find that: a 1 percentage point increase in the basic income tax rate reduces the incumbent's vote share by over 0.5%. Importantly for us, they also provide evidence that right-wing incumbents are more strongly affected by changes in basic income tax levels than left-wing governing parties.

**Evidence on the role of public spending.** Other empirical studies show that incumbents gain support through strategic government spending. Levitt and Snyder (1997) find strong evidence that federal spending benefits congressional incumbents in the US, estimating that $100 per capita in spending is worth as much as 2 percent of the popular vote. Evidence of strategic government spending has also been found in Canada, Chile, India, Mexico, and Sweden.[8] Shin (2016) examines 197 lower chamber elections in 31 OECD countries from 1980 to 2013, and finds that incumbent parties gain benefits from expansionary welfare spending. Moreover, Shin (2016) concludes that as the ideology of government moves closer to the left, the effects of welfare spending on the incumbent's vote share become stronger.

**Reelection technology.** Grounded on the above empirical evidence, we model the incumbent's reelection probability as a function $P_i(\tau, g)$, where $i \in \{L, R\}$. This reelection function (or technology) has the following properties:

$i$- increasing taxes lowers the probability of reelection for the incumbent,

1982 to 2000 (Vermeir and Heyndels, 2006). Happy (1992) uses aggregate economic data for Canadian federal elections from 1953 to 1988 to examine the effect of incorporating taxation into the incumbency voting model. Happy's results illustrate that the relationship between between taxation and incumbency voting is negative, both through its effect on after-tax income and also independent of income. Bosch and Solé-Ollé (2007) use a database of nearly 3,000 Spanish municipalities and analyze three local elections (1995, 1999 and 2003) to conclude that increases in the property tax rate entail significant electoral costs for local governments. In Sweden, Hibbs and Madsen (1981) investigate the impact of macroeconomic conditions and fiscal choices on political support for governing parties over the period 1967-1978, and find that voters react favorably to sharp reductions in direct taxation.

[8] Landon and Ryan (1997) conclude that government spending on goods and services is shown to reduce both the probability of incumbent defeat and the percentage of vote going to the opposition in their study on political costs of taxes in Canada. In Chile, incumbents are found to have higher votes in counties which receive a larger share of government subsidies (Cerda and Vergara, 2008). Arulampalam, Dasgupta, Dhillon and Dutta (2009) also find that government funds are used strategically on the basis of political consideration in India. Experimental data show that targeted programs in Mexico led to substantive increases in voter turnout and in the incumbent's vote share in the 2000 presidential election (De La and Ana, 2013). Furthermore, incumbent governments are also found to be using grant programs in order to win votes in Sweden (Dahlberg and Johansson, 2002; Johansson, 2003).

*ii*- increasing government spending increases the probability of reelection for the incumbent,

*iii*- the $L$ party gains more support from increasing government spending, and

*iv*- the $R$ party gains more support from lowering taxes.

In particular we propose

$$P_i(\tau, g) = \left(\frac{c(\tau)}{y} - \kappa_i\right)^{\phi} + \left(\frac{g}{y}\right)^{\omega_i}, \tag{4}$$

where we make explicit the functional dependence of private consumption on taxes, $c(\tau)$. The only difference between parties is in the slope and curvature parameters $\kappa_i$ and $\omega_i$ of the function above. These parameters govern the relative gains of the different parties from decreasing taxes and increasing spending, respectively. Two last points deserve further clarification: (i) note that what really matters for reelection are taxes and spending relative to income, and not the levels per se (this is in line with the empirical evidence reviewed above), and (ii) in our quantitative exercises we guarantee that the parameter values for $\phi$, $\kappa_i$'s and $\omega_i$'s satisfy properties *i*–*iv*.

### 3.3 Government finances

Given an initial level of debt ($b$) and a realization for the stochastic income process ($y$), and assuming the incumbent does not default, then there are two distinct fiscal decisions to be made: *(i)* how much public consumption ($g$) to provide, and *(ii)* how to finance total expenditures ($g + b$) – that is to choose the best combination of taxes ($\tau$) and borrowing ($b'$). Therefore, the government budget constraint is:

$$g + b = \tau y + b' q(b', y) \tag{5}$$

where $q(b', y)$ is the per-bond price of the one-period non-state-contingent government debt. Given that there is lack of commitment to financial obligations, the government may choose to default on its debt. If so, it will face financial exclusion for a random number of periods, and

its budget constraint while in autarky is:

$$g = \tau y_a, \tag{6}$$

where $y_a$ represents the reduced income level due to the income loss of default.

### 3.4 Determination of government policies

Each period, conditional on being in good financial standing, incumbent $i \in \{L, R\}$ chooses whether to honor its outstanding foreign debt or default. Hence, the political party in power compares the cost of temporary exclusion from international financial markets and depressed income levels against the direct costs of repayment. This intertemporal problem can be written as a dynamic programming problem. Let $V_i(b, y)$ denote incumbent $i$'s value function when the government has access to credit markets, begins the period with a debt level $b$, and income level $y$ is realized. Also, let $V^R(b, y)$ represent the value associated with the government's decision to repay its debt, and $V_i^D(y)$ the value function when the incumbent decides to default. The problem can be expressed as follows:

$$V_i(b, y) = \max\{V_i^R(b, y), V_i^D(y)\}. \tag{7}$$

When incumbent $i$ has access to financial markets it chooses public spending, the tax rate and foreign debt in order to maximize the households' lifetime utility, taking into account the government's and household's budget constraints:

$$V_i^R(b, y) = \max_{g,\tau,b'} \Bigg\{ U(c, g) + \beta(1 - \pi) \int_{y'} V_i(b', y')\mu(y', y)dy' + \\ \beta\pi \Bigg[ P_i(\tau, g) \int_{y'} V_i(b', y')\mu(y', y)dy' + (1 - P_i(\tau, g)) \int_{y'} \bar{V}_i(b', y')\mu(y', y)dy' \Bigg] \Bigg\} \tag{8}$$

subject to

$$c = (1 - \tau)y,$$
$$g = \tau y + q_i(b', z)b' - b,$$

where $\beta \in (0,1)$ is a discount factor common across parties. The value function of political party $i$ when it is not in power and the country is in good financial standing is $\bar{V}_i(b,y)$, and will be defined shortly. When the government defaults on its debt obligations the country is excluded from international financial markets and it suffers an income loss. The problem is:

$$V_i^D(y) = \max_{g,\tau} \Bigg\{ U(c,g) + \beta(1-\pi)\Bigg(\theta \int_{y'} V_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} V_i^D(y')\mu(y',y)dy'\Bigg) \\ + \beta\pi\Bigg[P_i(\tau,g)\Bigg(\theta \int_{y'} V_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} V_i^D(y')\mu(y',y)dy'\Bigg) + \\ (1-P_i(\tau,g))\Bigg(\theta \int_{y'} \bar{V}_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} \bar{V}_i^D(y')\mu(y',y)dy'\Bigg)\Bigg]\Bigg\} \quad (9)$$

subject to

$$c = (1-\tau)y_a,$$

$$g = \tau y_a,$$

with

$$y_a = \begin{cases} y & \text{if } y \leq \psi\bar{y}, \\ \psi\bar{y} & \text{otherwise,} \end{cases}$$

where $\bar{y}$ is the mean income level, and parameter $\psi$ controls the income loss in periods of financial autarky. This formulation generates an asymmetric income cost of default, as in Arellano (2008), which has been shown to be critical to match the counter-cyclicality of sovereign spreads.

The economy gets excluded from international credit markets in the default period, but it could regain access in any future period with probability $\theta$. When the economy returns to credit markets, it does so without a debt burden (a feature captured by the zero in the value functions $V_i(0,y')$ and $\bar{V}_i(0,y')$). Alternatively, the economy may remain in autarky with probability $1-\theta$.

**Default decision.** The default policy of incumbent $i$ is characterized by

$$d_i(b,y) = \begin{cases} 0 & \text{if } V_i^R(b,y) \geq V_i^D(y) \\ 1 & \text{otherwise.} \end{cases} \tag{10}$$

Let $\mathcal{D}_i(b)$ represent the set of income realizations for which the incumbent $i$ finds it optimal to default, given a debt level $b$:

$$\mathcal{D}_i(b) = \{y \in \mathcal{Y} : d_i(b,y) = 1\}.$$

Hence, the next-period default probability of the political party in power is

$$\lambda_i(b',y) = \int_{\mathcal{D}_i(b)} \mu(y',y)dy' \,.$$

**Value while not in power.** If political party $i$ is not in power, then $\bar{V}_i(b,y)$ depends on the opponent's decision. Let $\bar{V}_i^R(b,y)$ represent the the value function of party $i$ when the incumbent fulfills the government's debt obligations and $\bar{V}_i^D(y)$ denote the value function when the incumbent defaults. Optimal decisions of the opponent are denoted by $-i$. Hence, the value functions of party $i$ while not in office are given by:

$$\begin{aligned} \bar{V}_i^R(b,y) &= \beta(1-\pi)\int_{y'} \bar{V}_i(b'_{-i},y')\mu(y',y)dy' \\ &+ \beta\pi\Big[(1-P_{-i}(\tau_{-i},g_{-i}))\int_{y'} V_i(b'_{-i},y')\mu(y',y)dy' + P_{-i}(\tau_{-i},g_{-i}))\int_{y'} \bar{V}_i(b'_{-i},y')\mu(y',y)dy'\Big] \end{aligned} \tag{11}$$

$$\begin{aligned} \bar{V}_i^D(y) = \beta(1-\pi)&\Big(\theta\int_{y'} \bar{V}_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} \bar{V}_i^D(y')\mu(y',y)dy'\Big) \\ &+ \beta\pi\Big[(1-P_{-i}(\tau_{-i},g_{-i}))\Big(\theta\int_{y'} V_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} V_i^D(y')\mu(y',y)dy'\Big) \\ &+ P_{-i}(\tau_{-i},g_{-i})\Big(\theta\int_{y'} \bar{V}_i(0,y')\mu(y',y)dy' + (1-\theta)\int_{y'} \bar{V}_i^D(y')\mu(y',y)dy'\Big)\Big]\Big\} \end{aligned} \tag{12}$$

$$\bar{V}_i(b_{-i}, y) = \begin{cases} \bar{V}_i^R(b_{-i}, y) & \text{if } d_{-i}(b_{-i}, y) = 0 \\ \bar{V}_i^D(y) & \text{if } d_{-i}(b_{-i}, y) = 1 \end{cases} \tag{13}$$

In other words: we model the value of being out of office as the discounted expected value of returning to power.

### 3.5 Foreign Lenders

Foreign lenders are risk neutral and assign the value $1/(1+r^*)$ to payoffs received in the next period, where $r^*$ is the international risk-free interest rate. Lenders have perfect information about the income process of the small open economy and each party's reelection function. Bonds are priced in a competitive market inhabited by a large number of identical lenders, which implies that bond prices are pinned down by a zero expected profit condition. The risk of default (of both parties) and the reelection probability of the current incumbent $i$ are both taken into consideration by foreign lenders when pricing the sovereign bond:

$$\begin{aligned} q_i(b', y) \quad = \quad & \pi \left[ P_i(\tau, g) \left( \frac{1 - \lambda_i(b', y)}{1 + r^*} \right) + (1 - P_i(\tau, g)) \left( \frac{1 - \lambda_{-i}(b', y)}{1 + r^*} \right) \right] \\ & + (1 - \pi) \left( \frac{1 - \lambda_i(b', y)}{1 + r^*} \right). \end{aligned} \tag{14}$$

As equation (14) shows, the bond price is a weighted average of the different next-period repayment probabilities (of the different potential parties in office in the next-period). In that sense, our pricing function is a natural extension of the ones found in standard models à la Eaton and Gersovitz (1981).

### 3.6 Recursive equilibrium definition

**Definition 1.** *A recursive equilibrium for this small open economy is characterized by*

*i. a set of value functions* $V_i(b, y)$, $V_i^R(b, y)$, $V_i^D(y)$, $\bar{V}_i^R(b, y)$, *and* $\bar{V}_i^D(y)$ *for* $i = \{L,\ R\}$,

*ii. a set of borrowing rules* $b_i'(b, y)$, *taxation rules* $\tau_i^R(b, y)$ *and* $\tau_i^D(b, y)$, *government spending rules* $g_i^R(b, y)$ *and* $g_i^D(b, y)$, *and a default decision rule* $d_i(b, y)$ *for* $i = \{L,\ R\}$,

*iii. a set of reelection probability functions* $P_i(\tau, g)$ *for* $i = \{L,\ R\}$*, and*

*iv. a set bond price functions* $q_i(b', y)$ *for* $i = \{L,\ R\}$*,*

*such that*

1. $V_i(b, y)$*,* $V_i^R(b, y)$*,* $V_i^D(y)$*,* $\bar{V}_i^R(b, y)$*, and* $\bar{V}_i^D(y)$ *satisfy the system of functional equations* (7)–(14)*,*

2. *the default policy* $d_i(b, y)$ *and the borrowing* $(b_i'(b, y))$*, taxation* $(\tau_i^R(b, y),\ \tau_i^D(b, y))$ *and spending* $(g_i^R(b, y),\ g_i^D(b, y))$ *rules solve the dynamic programming problem specified in equations* (7)–(14)*,*

3. *the reelection probability function* $P_i(\tau, g)$ *satisfies equation* (4)*, and*

4. *the bond price function* $q_i(b', y)$ *satisfies the lender's zero profit condition implicit in equation* (14)*.*

## 4 Calibration

We solve the model numerically using value function iteration with a discrete state space. The calibration of the model involves assigning values to 13 parameters, and we are guided by annual panel data evidence on 40 countries for the period 1994–2015 (we calibrate the model to an annual frequency). Two of these parameters relate to the endowment process ($\rho$, $\sigma$), three to household preferences ($\beta$, $\gamma$, $\alpha$), three to international financial markets ($r^*$, $\theta$, $\psi$) and five to politics and elections ($\pi$, $\omega_L$, $\kappa_R$, $\kappa_L$, $\phi$).

Table 3 presents the parameter values that are either estimated directly from the data or taken from previous literature. We assume that $y$ follows a lognormal AR(1) process:

$$\log(y') = \rho \log(y) + \epsilon'$$

with $E[\epsilon] = 0$ and $E[\epsilon^2] = \sigma^2$. The persistence and volatility parameters are estimated on linearly detrended yearly real GDP per capita for each country in our panel. We then use the mean of these values.

Table 3: Parameter values set independently.

| Parameter | Symbol | Value | Source |
|---|---|---|---|
| Income autocorr. coeff. | $\rho$ | 0.8 | Estimation |
| Std. dev. of income innovations | $\sigma$ | 0.03 | Estimation |
| Borrower's risk aversion | $\gamma$ | 2 | Prior literature |
| Risk-free rate | $r^*$ | 0.04 | Prior literature |
| Duration of defaults | $\theta$ | 0.154 | Prior literature |
| Probability of elections | $\pi$ | 0.25 | Prior literature |

Next, we assume a coefficient of relative risk aversion of 2, which is the standard value in studies of real business cycles in small open economies. Regarding the financial market parameters, the risk-free rate is set to 4% annually, also a standard value in literature. The probability of reentry to international financial markets is chosen to be 15.4%, so that the government remains excluded for a period of six and a half years after a default episode, on average. Of the political parameters, the probability of elections is the only one that we set independently: it takes a value of 0.25 which implies elections every 4 years, on average (the median presidential/general election frequency in our dataset).

We now turn to the calibration of parameters that are set jointly to match certain moments in the data. These parameters are presented in table 4. Generally speaking, the choice of any parameter in this group will affect all moments of the model to some degree. However, there is always one moment that is affected most for any given parameter. First, the domestic discount factor ($\beta$) is chosen so that the mean spread generated by the model matches the one computed from the data.[9] Next, the parameter governing the income cost during autarky ($\psi$) is set to match the observed debt-to-income ratio. In our model, a default results in creditors receiving nothing, which is far from reality. In order to adjust for this, we calibrate the income loss parameter so that the level of debt in the model is on average equal to the level of unsecured debt in the data. The average haircut imposed on creditors in the post-1980 defaults is about 37% (Cruces and Trebesch, 2013). Thus, we target a debt-to-income ratio that is 37% of the average ratio for all countries in our data set. The welfare weight on public consumption ($\alpha$) is set to match mean government spending in the data during normal times (i.e. away from

[9]Even though our calibrated discount factor ($\beta = 0.65$) may seem low, it is well within the range of discount factors used in quantitative studies of sovereign debt. It is equivalent to a quarterly discount factor of roughly .90.

Table 4: Parameter values set jointly via calibration.

| Parameter | Symbol | Value | Target | Data | Model |
|---|---|---|---|---|---|
| Discount factor | $\beta$ | 0.65 | Mean spread | 495 | 504 |
| Income cost of default | $\psi$ | 0.89 | Mean $b/y$ | 10% | 10% |
| Utility weight on $g$ | $\alpha$ | 0.03 | Mean $g/y$ | 15% | 16% |
| Political parameter | $\phi$ | 0.75 | Mean $T/Y$ | 17% | 17% |
| Political parameter | $\kappa_L$ | 0.55 | Mean $T_L/Y$ | 18% | 18% |
| Political parameter | $\kappa_R$ | 0.59 | Mean $T_R/Y$ | 15% | 15% |
| Political parameter | $\omega_L$ | 0.56 | Avg. reelection prob. | 66% | 66% |

crises).

Regarding the political parameters, all of them have been calibrated to match moments of the fiscal data observed in normal times from our dataset. Parameter $\phi$, which controls the curvature of the tax-part of $P(\tau, g)$, is set to match the average level of tax revenue to income. Parameters $\kappa_R$ and $\kappa_L$, which also enter in the tax-part of the reelection function, are set to match the average tax revenue-to-income ratios observed during $R$ and $L$ governments, respectively. Finally, parameter $\omega_L$, which controls the relative curvature of the expenditure-part of $P(\tau, g)$ for $L$ governments, is set to match the average reelection frequency for both parties. [10]

**Model fit of the targeted moments.** Alongside with the parameter values and targets, Table 4 also presents the moments obtained from the simulations of the model. The last two columns of the table showcase how tightly our calibration matches the targets. It is important to highlight here that we are calibrating to the average spread observed in the economy, but not to the differences in spreads between parties. This latter statistic is key to our results and has remained a non-targeted moment throughout the calibration process.

## 5 Results

First, we study the model's ability to reproduce two of the main empirical regularities documented earlier which are that $L$ parties pay higher and more countercyclical spreads than $R$

[10] Parameters $\omega_R$ and $\omega_L$ are both thought of as "relative parameters," in the sense that their actual values matter only in how they relate to the other party's value. To keep the number of calibrated parameters manageable we normalize $\omega_R$ to one.

Table 5: OLS estimation – data and model simulations

| Dep. variable: Spreads | **Data** | **Model Simulations** |
|---|---|---|
| constant | $507.5^{***}$ | $431.8^{***}$ |
| Left | $\mathbf{165.9}^{***}$ | $\mathbf{116.1}^{***}$ |
| Debt/GDP | $7.5^{***}$ | $12.4^{***}$ |
| $Y$ growth | $-28.4^{***}$ | $-21.2^{***}$ |
| $Y$ growth $\times$ Left | $\mathbf{-46.2}^{***}$ | $\mathbf{-12.2}^{***}$ |
| Year and region FE | no | no |
| Adj. $r^2$ | .27 | .45 |

Note: Statistical significance is denoted by *** 0.001, ** 0.01, and * 0.05.

parties. Secondly, we examine simulations of the model and show that it is able to account for salient features of business cycle dynamics observed in our panel dataset – among those the third main stylized fact reported before, that $L$ parties face more volatile spreads than $R$ parties. Thirdly, we explore the quantitative relevance of having endogenous political turnover. Fourthly, we discuss the cyclical behavior of fiscal policy and equilibrium reelections.

### 5.1 Main results: politics and spreads

Here we study the ability of the benchmark calibration of our model to reproduce two of the main stylized facts we recover from the data: namely, that left-wing governments pay higher and more countercyclical than their right-wing counterparts. To do so, we run the same spread regression that we presented in section 2 but using simulated data from our model. Table 5 contains the estimated coefficients.

From the estimation in table 5 we can see that the model simulated data shares the same properties as the international panel data: the coefficient for "Left" (which is 1 if the country-year observation features a left-wing government and 0 otherwise) is positive and significant, and the interaction between "Left" and "$Y$ growth" (which measures the growth rate of real GDP per capita) is negative and statistically significant. So, in the model, as well as in the data, $L$ parties pay higher and more countercyclical spreads.[11]

[11] As expected, the coefficients for "Debt/GDP" and "$Y$ growth" have the same signs in the simulated data and in the panel data, confirming that the workings of our theoretical model are evident also when estimating the conditional mean effects.

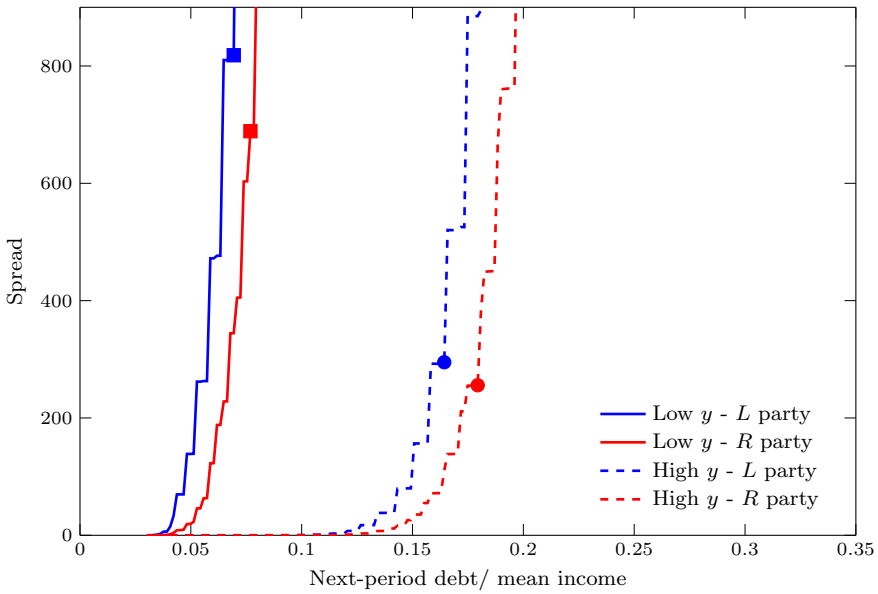


Figure 1: Spread-debt menus. Red (blue) lines represent the spread-debt menu for the $R$ ($L$) party under high (dashed lines) or low (solid lines) income. The solid dots (squares) represent the optimal choices when facing a high (low) income.

In order to understand where these OLS results come from, we look at the equilibrium "spread-debt" menus that the different governments face in international credit markets. Figure 1 plots these menus. We can see that $L$ governments always face worse spread-debt menus than $R$ governments: i.e. their opportunity set is smaller. In both cases illustrated in the figure (high and low income levels), the $L$ government chooses to borrow less and to pay a higher spread than its $R$ counterpart. Further inspection of this figure shows that as income decreases (from High $y$ to Low $y$) the spread of both parties goes up (a typical result in the sovereign debt literature), but the $L$ spread increases more: that is, the $L$ spread is more countercyclical.

The differences in the spread-debt menus reflect different default policies across parties (recall the bond price equation (14), which basically prices the repayment probability adjusting for the likelihood of party changes). Figure 2 shows the equilibrium default regions for both parties. Here we can see that for both parties it is true that default incentives increase with the debt level and decrease with the income level (exactly as in the Eaton and Gersovitz, 1981 tradition). We can also notice that the $L$ party defaults "before" the right party does, by which we mean the following: fix a debt level (say 10% of mean income) then as income decreases we hit the boundary of $L$'s default set before we hit the corresponding boundary for $R$. This means that default incentives are stronger for the $L$ government, which translates into worse

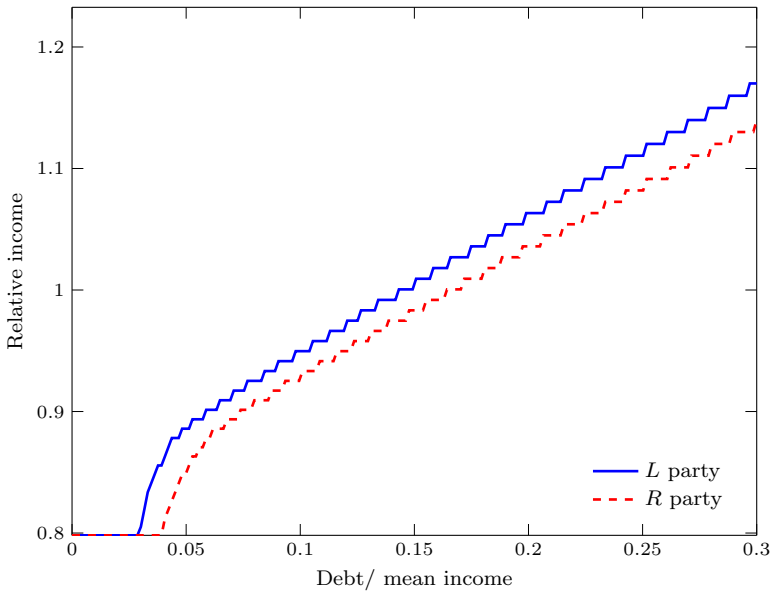


Figure 2: Default sets. The lines show the boundaries of the default sets for both $L$ (dashed blue) and $R$ (solid red) parties. Any point to the South-East of the boundary is one where default is chosen. Relative income refers to the income level as a fraction of mean income.

bond prices (as already seen in figure 1).

Since our model only introduces political differences through the reelection function $P(\tau, g)$, then it must be the case that the observed differences in the default regions of the two parties come from differences in $P(\tau, g)$. To confirm this intuition and understand why default incentives are stronger for $L$ governments we plot the political gain coming from higher public consumption in Figure 3. This figure is constructed for the average debt level observed in the simulations (10% of income) and an income realization for which the $L$ party barely prefers to default (i.e. it is a point in the state space that is just inside the $L$ default region but outside the $R$ default region).

In Figure 3, the two lines represent the reelection probability coming from the choice of government spending, $g$, for both parties. Both lines illustrate that lowering $g$ is politically detrimental for both parties, and it is more so for the $L$ party (both being properties of the calibrated function $P(\tau, g)$). We also mark four points on this plot: these are the optimal choices of government spending under repayment and default for each party (denoted with circles and squares, respectively). Inspecting these four points we understand the trade-off that the governments face. On the one hand, if default is chosen, then the government has larger fiscal space and can therefore increase $g$, which translates into 'popularity gains' (increases in

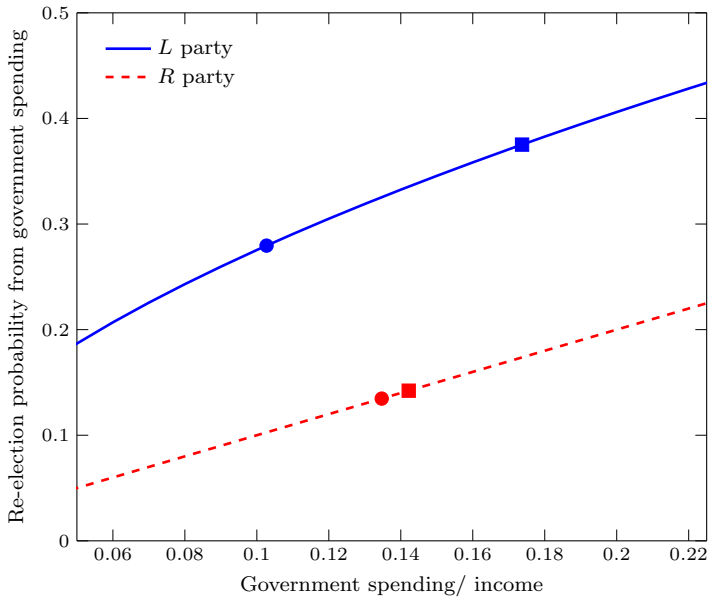


Figure 3: Changes in $g$ and $P$. The red (blue) line is the "political gain" coming from increases in $g$ for the $R$ ($L$) party. The circles (squares) are the optimal choices in case of repayment (default).

$P(\tau, g)$); on the other hand, if repayment is chosen then resources need to be used to service the debt, and so the optimal thing to do (for both parties) is to decrease $g$ (i.e. engage in austerity measures). Comparing across parties it is clear that the size of the austerity needed to be implemented under repayment is larger for $L$ (the horizontal distance between the circle and the square in Figure 3), and consequently the impact on the reelection probability $P(\tau, g)$ is larger. So, austerity can be 'too costly' from a political point of view, and this can trigger a default for one party while not for the other.

In other words, our theory predicts that the $L$ party has a lower tolerance for austerity. Markets understand this, and charge higher spreads (because they anticipate that $L$ is not going to 'bite the bullet' and reduce $g$ as much as $R$ is willing to do during recessions).

### 5.2 Non-targeted business cycle moments

Now we study simulation results and statistical properties of the model economy. Table 6 shows the business cycle moments of several macroeconomic variables for the panel data and our model's simulations. None of these moments were targeted in our calibration strategy.[12] Business cycle statistics are averages over 10000 simulations samples of 22 periods each.[13] All

[12]Recall that the moments that were targeted in the calibration were presented and discussed in section 4.
[13]The sample period length is chosen to match the data.

Table 6: Non-targeted moments.

| | Data | Model |
|---|---|---|
| **Panel A: Spreads** | | |
| $\mathbb{E}(s_L)$ (in bps.) | 518 | 542 |
| $\mathbb{E}(s_R)$ (in bps.) | 463 | 439 |
| $\sigma(s_L)/\sigma(s_R)$ | 1.23 | 1.46 |
| $\rho(GDP, s)$ | -0.35 | -0.49 |
| **Panel B: Relative volatilities** | | |
| $\sigma(C)/\sigma(GDP)$ | 1.53 | 1.45 |
| $\sigma(T)/\sigma(GDP)$ | 3.66 | 3.29 |
| $\sigma(G)/\sigma(GDP)$ | 2.34 | 2.60 |
| **Panel C: Cyclical correlations** | | |
| $\rho(GDP, C)$ | 0.61 | 0.90 |
| $\rho(GDP, G)$ | 0.40 | 0.63 |
| $\rho(GDP, \tau)$ | -0.24 | -0.32 |
| $\rho(GDP, TB/GDP)$ | -0.12 | -0.55 |

Note: $\sigma(x)$ and $\rho(x, z)$ denote the standard deviation of variable $x$ and the correlation coefficient between variables $x$ and $z$, respectively. $T$ is the tax revenue, $C$ is private consumption, $G$ is public consumption, $TB$ is the trade balance, and $\tau$ is the tax rate. The sovereign spread is denoted by $s$.

simulated series are HP-filtered using a smoothing parameter of 100. [14]

Overall, the benchmark calibration of the model is able to account for several salient facts in our panel of emerging economies, as well as to approximate remarkably well the targeted moments. Panel A of table 6 deals with sovereign spreads: as discussed above, the benchmark calibration of our model delivers spreads that are in line with the data, and (importantly) are substantially higher for $L$ governments (roughly 60 basis points higher than $R$ spreads). As usual in this type of model, the sovereign spread is countercylical, reflecting that default incentives are higher in bad times. Our calibration also captures a notable feature of the data: the fact that $L$ governments face more volatile spreads. The intuition for this result can be obtained from inspecting Figure 1 above: as income moves (either from high to low or vice versa) the amplitude of the changes in $L$'s spreads is larger than those in $R$. This feature is present throughout the simulated time series and so we obtain $\sigma(s_L) > \sigma(s_R)$.

Panel B of table 6 shows that our model features relative volatilities that are in line with the data: private consumption, government spending and tax revenues are all more volatile than

[14] Output, public consumption, and government expenditure series are first logged and then filtered.

Table 7: OLS estimation – data, benchmark and exogenous-turnover models.

| Dep. variable: Spreads | **Data** | **Benchmark model** | **Exogenous-turnover model** |
|---|---|---|---|
| constant | $507.5^{***}$ | $431.8^{***}$ | $657.0^{***}$ |
| Left | $\mathbf{165.9}^{***}$ | $\mathbf{116.1}^{***}$ | $\mathbf{-90.5}^{***}$ |
| Debt/GDP | $7.5^{***}$ | $12.4^{***}$ | $16.4^{***}$ |
| $Y$ growth | $-28.4^{***}$ | $-21.2^{***}$ | $-71.5^{***}$ |
| $Y$ growth $\times$ Left | $\mathbf{-46.2}^{***}$ | $\mathbf{-12.2}^{***}$ | $\mathbf{6.7}^{***}$ |

Note: Statistical significance is denoted by *** 0.001, ** 0.01, and * 0.05.

GDP. Our model also captures well the ranking among these relative volatilities. Panel C reports cyclical correlations of several variables. Most notably the model features 'procyclical' fiscal policy.[15] As in the data, in simulations of the model, consumption and output are positively correlated, and the trade-balance is countercyclical.

### 5.3 Disentangling the effects of political turnover

In this section we perform three different exercises. First, we look at an alternative economy where the reelection probabilities are exogenous and constant at their mean levels in the benchmark calibration. By comparing this 'exogenous-turnover' economy with the benchmark calibration we are able to assess the quantitative importance of endogenizing reelections. Secondly, we keep the assumption of exogenous turnover, but now eliminate differences across parties (i.e. we have a common $P$ for $L$ and $R$) in order to study the importance of these asymmetries. Thirdly, we compute a 'no-turnover' economy to further inspect the impact of alternating governments on an economy's access to credit markets and on default incentives.

**Endogenous vs. exogenous turnover: part I.** We define the 'exogenous-turnover' economy as one where we fix $P_L$ and $P_R$ to their averages in the data but make them exogenous (and constant). All other parameters are unchanged. Table 7 shows the results from our main spread regression in the data, the benchmark model and the 'exogenous-turnover' economy.

[15] We understand a positive correlation between government spending and output, and a negative one between tax rates and output as 'procyclical' fiscal policy in the sense that it amplifies the cycle. We discuss in more detail the cylical properties of fiscal policy in section 5.4.

Relative to the results in the previous table we can see that the main results flip: it is now the $L$ party the one that pays lower spreads and these are still countercyclical but less so than the $R$ spreads. Why do we get this change in behavior? Both the data and our benchmark calibration feature $P_L > P_R$.[16] If now we make $P$ exogenous and constant, then it effectively means that the $L$ party is more patient than $R$ "all the time, and no matter how fiscal policy is conducted." Consistent with previous research on exogeneous political turnover in sovereign default models (e.g. Cuadra and Sapriza, 2008 and Hatchondo et al., 2009), a more patient (more forward looking) government is less likely to default and so it will face lower borrowing costs.

The takeaway from this exercise is that making reelections depend on fiscal policy is actually crucial to replicate the main regularities in the data. Therefore it is not so much about the 'level' of reelection probabilities, but about how this function reacts to changes in public policy. We see this as an appealing feature of our model and an improvement over the previous models of exogenous turnover (in keeping with the Political Science literature).

**Endogenous vs. exogenous turnover: part II.** Digging deeper into the quantitative importance of endogenous turnover we next eliminate political asymmetries across parties that were still present in the 'exogenous-turnover' economy and impose that $P_i(\tau, g) = \bar{P} = 0.66$ (matching the average reelection probability in our dataset, conditional on an election occurring). As before, we keep all other parameters from the benchmark calibration unchanged.

In the presence of endogenous political turnover, the incumbent's reelection probability depends on the choices of taxation and government spending. These, in turn, depend on the government's foreign assets position, which plays a key role in its ability to borrow. The left panel of Figure 4 plots the incumbent's likelihood to remain in power, conditional on elections occurring that period, and the right panel shows the equilibrium next-period debt choice as a function of current debt level for two income levels. It is evident that endogenizing turnover has a substantial effect on the government's ability to borrow.

In the benchmark economy (with endogenous turnover) the incumbent's reelection probability is decreasing in debt , conditional on not defaulting. However, the likelihood of retaining

[16] In the data we observe that $P_L = 0.76$ and $P_R = 0.56$ while our benchmark calibration features 0.75 and 0.51, respectively.

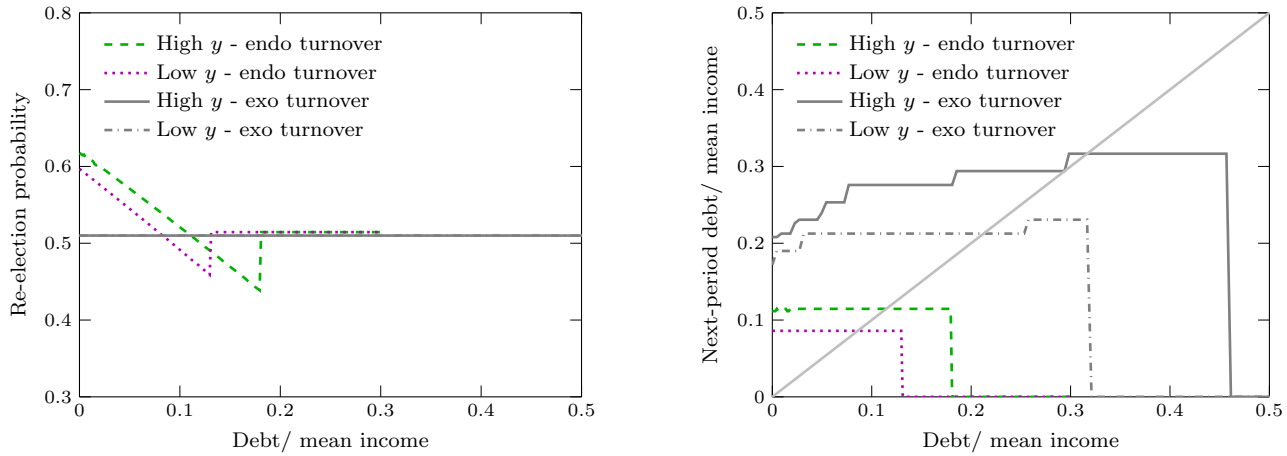


Figure 4: Endogenous vs. exogenous political turnover. The left panel shows the reelection probabilities as a function the current debt-to-income ratio. The right panel shows the borrowing policy functions.

power increases locally with the decision to repudiate on its debt. The funds freed up from debt servicing can now be used to increase public expenditure, or to lower taxes (i.e. a default creates more 'fiscal space'). Hence, this increases the incumbent's reelection probability and induces them to default at much lower debt levels (i.e., this generates political-default incentives). Creditors incorporate this into their pricing function and the decrease in bond prices limits the government from borrowing. This type of electorally motivated defaults are absent in the exogenous-turnover economy, which explains its higher debt capacity.

**Exogenous turnover vs. no-turnover.** To isolate the effect of political turnover we define an 'no-turnover' economy in which we set $P_i(\tau, g) = \bar{P} = 1$, so that parties never alternate in power.[17] As with the previous exercises, we leave all other parameters unchanged. The resulting theoretical framework is similar to the one studied by Cuadra et al. (2010). A notable difference is that we consider an endowment economy rather than endogenizing production.

In order to have a sensible comparative statics exercise (and move only one thing at the time) we study the effect of the mere presence of political turnover by comparing the 'no-turnover' economy with the 'exogenous-turnover' economy without asymmetries across parties (i.e., assuming that $P_i(\tau, g) = \bar{P} = 0.66$). Figure 5 plots the bond price schedule $q(b', y)$ as a function of next-period debt-to-mean income ratio, for two income levels. The introduction of

[17]Since all political differences have been removed in this 'no-turnover economy' the difference between $L$ and $R$ is inmaterial.

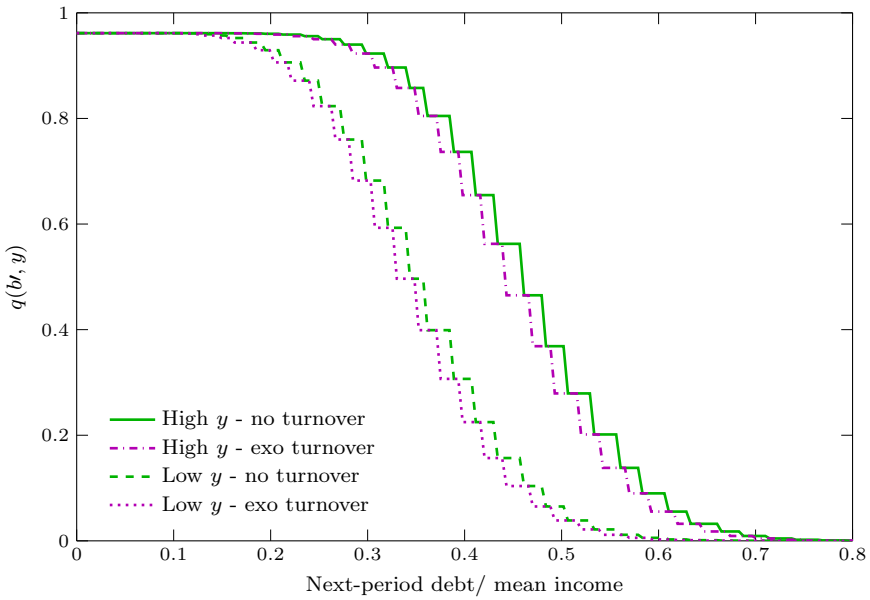


Figure 5: Bond price schedule for 'exogenous-turnover' and 'no-turnover' economies.

exogenous political turnover into the model leads to a decrease in bond prices. The probability of losing office induces short-sighted behavior by the policymaker, providing incentives to take on higher risk and to receive lower prices for its bonds. This result is consistent with the findings in Cuadra and Sapriza (2008) and Hatchondo et al. (2009).

### 5.4 Fiscal policy and equilibrium reelections over the cycle

We finally turn to analyzing the cyclical behavior of fiscal policy and its effect on reelections. Since our theory (following empirical evidence on elections) predicts that incumbents' reelection probabilities are a function of fiscal choices, we begin by analyzing the cyclical properties of the fiscal variables.

**Cyclicality of fiscal policy.** The left panel of Figure 6 plots the deviations from trend for income, private consumption, and public expenditures in a typical simulation sample path from our model. The positive correlation among these three variables is clear. In periods where income is above its trend, the price of borrowing internationally is low, allowing governments to fund their spending through debt and rely less on taxation. In contrast, when income realizations are below trend, borrowing is limited by high interest rates. Hence governments dependence on taxes is heightened. This explains both the procyclicality and the increased

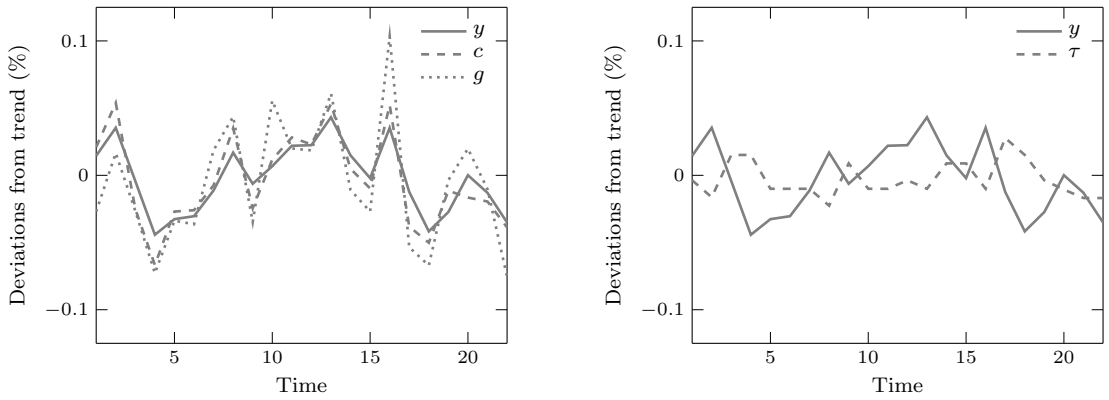


Figure 6: Cyclical behavior of fiscal policy. The left panel shows the dynamics of income, private consumption and government spending. The right panel has the behavior of income and tax rates.

volatility in private consumption and public spending.

The right panel of Figure 6 shows a clear negative correlation between taxes and income. This result has been dubbed "optimal procyclical fiscal policy" for emerging economies, in the sense that the fiscal policy (in this case the tax rate) amplifies the cycle. Why is the tax rate "procyclical" in our model? Because when income is high, it is cheaper to borrow and postpone taxation, whereas when income is low, the reverse is true. Thus, we expect periods of high income to be associated with lower tax rates and vice versa. Moreover, when the government defaults it is left only with taxation in order to finance spending, which leads to even more fiscal procyclicality. [18]

**Equilibrium reelections.** A key feature of our reelection function, as argued above, is that it depends positively on the spending-to-income ratio and negatively on the tax rate. However, both variables are endogenous to the problem of the government. We find that, in equilibrium, the election probability of the incumbent $P_i(\tau, g)$ is increasing in income growth. This result comes directly from the fact that optimal fiscal policy is procyclical.

In developing countries that elect their leaders, there is a strong positive link between rate of GDP growth during the leader's tenure and the probability of his or her reelection (Brender and Drazen, 2008). These authors document that a 1 percentage point increase in economic growth during the leader's term in office leads to a 6 to 9 percentage points increase in the probability of their reelection.[19] Figure 7 shows the incumbent's likelihood of being reelected,

[18]This result is by no means new in the literature and it is in fact a more general consequence of capital market imperfections. See Cuadra et al. (2010) and Riascos and Vegh (2003).

[19]Their study included elections in 74 different countries over the period 1960-2003.

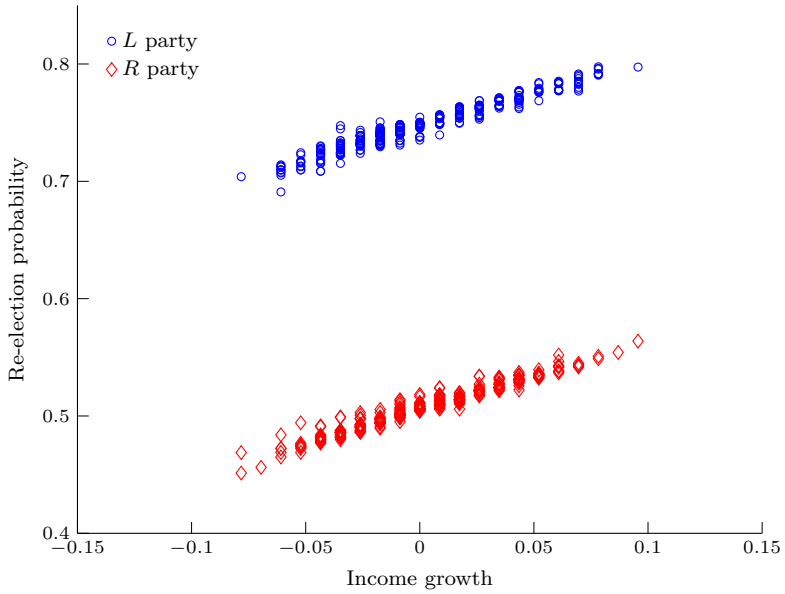


Figure 7: Re-election Probability Scatter

conditional on an election occurring, over income growth for our entire simulation. The plot clearly illustrates that as income grows, so does the incumbent's reelection probability. When the economy experiences increases in the endowment levels, the cost of borrowing drops. This entices the government to rely more on the international credit channel and less on tax revenue in order to fund public expenditure, which increases their likelihood of remaining in power. This procyclicality of reelection probabilities is a feature of the data that previous studies (e.g. Chatterjee and Eyigungor, 2017) directly assumed: our model generates this endogenously as a corollary to procyclical fiscal policy.

## 6 Robustness

In this section we explore the robustness of our main results to variation in the political parameters. First, we study the effect of having different welfare weights for public expenditures (i.e. differences in $\alpha$ in our model) and find that our results are robust to these modifications. Secondly, we analyze the relative importance that taxes and expenditures have in the reelection probability function $P$ and find that the latter seem to explain most of the observed differences across parties.

Table 8: OLS estimation – the role of preferences over $g$

| Dependent variable: Spreads | **Data** | **Benchmark** | **High $\alpha_L$ economies** | | |
|---|---|---|---|---|---|
| | | | *(i)* | *(ii)* | *(iii)* |
| constant | $507.5^{***}$ | $431.8^{***}$ | $438.4^{***}$ | $396.1^{***}$ | $604.8^{***}$ |
| Left | $\mathbf{165.9}^{**}$ | $\mathbf{116.1}^{***}$ | $\mathbf{103.7}^{***}$ | $\mathbf{10.3}^{***}$ | $\mathbf{-0.5}$ |
| Debt/GDP | $7.5^{***}$ | $12.4^{***}$ | $7.7^{***}$ | $9.3^{***}$ | $15.9^{***}$ |
| $Y$ growth | $-28.4^{***}$ | $-21.2^{***}$ | $-18.5^{***}$ | $-13.2^{***}$ | $-65.8^{***}$ |
| $Y$ growth $\times$ Left | $\mathbf{-46.2}^{***}$ | $\mathbf{-12.2}^{***}$ | $\mathbf{-10.3}^{***}$ | $\mathbf{-2.1}^{***}$ | $\mathbf{-1.7}^{***}$ |

Note: Statistical significance is denoted by *** 0.001, ** 0.01, and * 0.05.

### 6.1 Preferences over $g$

A channel commonly explored in the literature is the difference in the parties' preferences over government spending (controlled by parameter $\alpha$ in our model). We test to check the role of this channel in the context of our model, and find that it has little to no effect on the main results. In particular, we follow previous work and assume that the $L$ party has stronger preferences for public consumption ( $\alpha_L > \alpha_R$).[20]

To gain better intuition we will study the effects of increasing $\alpha_L$ in steps, deconstructing the results obtained in the previous section. Table 8 presents results from five spread regressions: the one with the actual panel data (discussed above), the one coming from the simulations of the benchmark calibration (also discussed before), and three more coming from alternative model economies where $\alpha_L = 3\alpha_R$ – we label these as "High $\alpha_L$" economies.

Column $(i)$ in Table 8 presents results for a simple modification to the benchmark economy: making $\alpha_L$ 3 times as large as $\alpha_R$, keeping all other parameters unchanged.[21] The main effect of this change to our model is the desired level of public spending and taxation by the $L$ party: now the $L$ party strongly prefers a larger public sector and that shows in the fact that now the $G_L/G_R$ and $T_L/T_R$ is roughly 2 whereas it was between 1.15 and 1.2 in the benchmark (and in the data). In terms of our spreads regression, we can see from column $(i)$ in Table 8 that the coefficients of interest are barely affected: it is still true that $L$ parties pay over 100 bps in spreads more than $R$ parties, and that $L$'s spreads are more countercyclical than $R$'s.

[20] To be more precise, in this subsection we will study alternative economies where $\alpha_L = 3\alpha_R$.
[21] We keep $\alpha_R = 0.03$, which was the value in the benchmark calibration.

In column $(ii)$ of the above table we go one step further and eliminate the differences in $P$ across parties: we still have that the reelection probabilities are endogenous, but now both parties' $P$ function looks like the $L$ party's. Doing this sharpens our focus on differences in $\alpha$. The regression results show that the sharp differences in preferences for public spending between L and R are insufficient to generate large differences in spreads. The coefficients of interest in column $ii$ are now much smaller than before. This suggests that electoral differences built into our model through the $P$ function have a much stronger impact on spreads than preference differences.

The final step in the analysis is to eliminate the endogenous reelection probabilities, making $P_i = \bar{P} = 0.66 \, \forall i$. Column $(iii)$ shows that this alternative model produces regression results which are at odds with the data: the political affiliation dummy is statistically insignificant and its point estimate even has the wrong sign. From this we take away that having endogenous reelections is key for the model's performance (a result we obtained above) and that this is robust to having different welfare weights for public consumption across parties.

### 6.2 Political gains from taxes and expenditures

As we discussed above, our quantitative theory predicts that the $L$ party has a lower tolerance for austerity, markets understand this, and therefore charge higher spreads. This 'tolerance for austerity' is naturally related to the function $P$ and its calibrated parameters. In this subsection we deconstruct the role of each part of the $P$ function so as to understand better how important each component ($\tau$ and $g$) is.

Mimicking the analysis in the previous subsection, we proceed in steps and study the role of the different components of $P$. The last two columns of Table 9 present the regressions results from simulations of alternative economies in which we decompose $P$.

Column *(i)* of the decomposition corresponds to a modified model in which the probability of reelection is only dependent on tax rates, while all other parameters are the same.[22] In this case the differences across parties collapse to different values for $\kappa$. A lower value implies a higher probability of reelection. A higher reelection probability, in turn, has two opposing effects: it makes the incumbent more patient in good times which lower spreads, but it also makes the

[22] Recall that $P_i = (c/y - \kappa_i)^{\phi} + (g/y)^{\omega_i}$. Given that $g/y < 1$ (both in the data and in the model), the model in column *(i)* of Table 9 is obtained by setting $\omega_i \to \infty \, \forall i$.

Table 9: OLS estimation – political gains from $\tau$ and $g$

| Dep. variable: Spreads | **Data** | **Benchmark** | **Decomposition of $P$** | |
|---|---|---|---|---|
| | | | *(i)* | *(ii)* |
| constant | $507.5^{***}$ | $431.8^{***}$ | $653.3^{***}$ | $685.2^{***}$ |
| Left | $\mathbf{165.9}^{**}$ | $\mathbf{116.1}^{***}$ | $\mathbf{-29.9}^{***}$ | $\mathbf{-9.2}^{***}$ |
| Debt/GDP | $7.5^{***}$ | $12.4^{***}$ | $10.4^{***}$ | $3.2^{***}$ |
| $Y$ growth | $-28.4^{***}$ | $-21.2^{***}$ | $-45.6^{***}$ | $-33.5^{***}$ |
| $Y$ growth $\times$ Left | $\mathbf{-46.2}^{***}$ | $\mathbf{-12.2}^{***}$ | $\mathbf{5.8}^{***}$ | $\mathbf{1.0}^{***}$ |

Note: Statistical significance is denoted by *** 0.001, ** 0.01, and * 0.05.

incumbent more patient in bad time which makes the default option more attractive and this increases spreads. The regression results in column *(i)* show that the first effect dominates the second one, as the $L$ party (for which the calibration features a lower $\kappa$) pays now lower spreads than the $R$ party. Moreover, the $L$ spreads are now less countercyclical than $R$'s.

Column *(ii)* of the decomposition goes one step further and takes the curvature in the "tax part" of $P$ away (i.e. it further imposes that $\phi = 1$). In this case the coefficients of interest are also of the "wrong sign", but their magnitudes are smaller: making the reelection probability function linear effectively makes the two parties more similar.[23]

The main takeaway from this exercise is that our benchmark calibration is such that the "expenditure part" of $P$ is crucial in allowing the model to reproduce the main empirical regularities. As discussed in section 5, our theory predicts that the $L$ party has a lower tolerance for austerity. The "expenditure part" of $P$ drives this differential tolerance for austerity.

## 7 Conclusions

Combining three international datasets respectively containing information on the political leanings of the ruling government in 40 nations; the spreads paid on their sovereign debt; and key macroeconomic quantities, yields a number of new stylized facts regarding the influence of the political leanings of a country's government on their international borrowing costs. First,

[23]It is important to emphasize that the calibration procedure could have rendered political parameters implying $\kappa_L > \kappa_R$, which would have had implied opposite signs in the coefficients of interest in columns *(i)* and *(ii)* in Table 9. It just happened to be the case that our data guided the parameters the way it did.

left wing governments, on average, pay 166 basis points more than right wing governments to borrow on international debt markets. Second, interest rates on left-wing government debt are 23 percent more volatile than their right-wing counterparts. Both parties face counter-cyclical spreads but left wing governments face spreads more negatively correlated with output. Third, political labels such as left and right translate into empirically observable differences in government spending and taxation with the left running bigger governments and the right charging lower taxes on average.

To explain the above stylized facts, we built a sovereign default model in which elections determine which one of two politically heterogeneous policy makers will be in charge of the government. When the two policy makers differ in the marginal impact of their fiscal choices on their reelection probabilities, our model delivers the above-mentioned features of the data. In addition, in keeping with the data, right-wing governments display lower tax rates and government consumption to GDP shares than left-wing governments in our calibrated model. Left governments systematically default at higher income levels than right governments leading to higher average borrowing costs for the left government. The model implies that reelection probabilities are increasing in good times, which comes from the procyclical nature of fiscal policy (another feature of the data that is well captured by our model). These results are obtained without assuming any differences in the preferences of the two types of policy makers.

We uncovered rich dynamics between politics, borrowing costs and default decisions, both in the data and in our theoretical model. These dynamics require both that parties alternate in power, and that this alternation is endogenous to their fiscal policy choices.

As argued in the introduction, it is important to understand what determines EME's debt levels and interest rates' levels and volatilities. We have shown that the political leanings of governments (left vs. right) matter for all three: debt capacity, and the level and volatility of interest rates.

## References


**Aguiar, Mark and Gita Gopinath**, "Defaultable debt, interest rates and the current account," *Journal of International Economics*, 2006, *69* (1), 64–83.

**Arellano, Cristina**, "Default risk and income fluctuations in emerging economies," *The American Economic Review*, 2008, *98* (3), 690–712.

**Arulampalam, Wiji, Sugato Dasgupta, Amrita Dhillon, and Bhaskar Dutta**, "Electoral goals and center-state transfers: A theoretical model and empirical evidence from India," *Journal of Development Economics*, 2009, *88* (1), 103–119.

**Besley, Timothy and Anne Case**, "Incumbent behavior: Vote seeking, tax setting and yardstick competition," *The American Economic Review*, 1995, *85* (1), 25–45.

**Bosch, Núria and Albert Solé-Ollé**, "Yardstick competition and the political costs of raising taxes: An empirical analysis of Spanish municipalities," *International Tax and Public Finance*, 2007, *14* (1), 71–92.

**Brender, Adi and Allan Drazen**, "How do budget deficits and economic growth affect reelection prospects? Evidence from a large panel of countries," *The American Economic Review*, 2008, *98* (5), 2203–2220.

**Cantor, Richard and Frank Packer**, "Determinants and impact of sovereign credit ratings," *The Journal of Fixed Income*, 1996, *6* (3), 76–91.

**Cerda, Rodrigo and Rodrigo Vergara**, "Government subsidies and presidential election outcomes: evidence for a developing country," *World Development*, 2008, *36* (11), 2470–2488.

**Chatterjee, Satyajit and Burcu Eyigungor**, "Endogenous political turnover and fluctuations in sovereign default risk," 2017.

**Cline, William R and Kevin JS Barnes**, *Spreads and risk in emerging markets lending*, Institute of International Finance, 1997.

**Cruces, Juan J and Christoph Trebesch**, "Sovereign defaults: The price of haircuts," *American Economic Journal: Macroeconomics*, 2013, *5* (3), 85–117.

**Cruz, Cesi, Philip Keefer, and Carlos Scartascini**, "Database of Political Institutions Codebook, 2015 Update (DPI2015)," *Inter-American Development Bank. Updated version of T. Beck, G. Clarke, A. Groff, P. Keefer, and P. Walsh*, 2001, pp. 165–176.

**Cuadra, Gabriel and Horacio Sapriza**, "Sovereign default, interest rates and political uncertainty in emerging markets," *Journal of International Economics*, 2008, *76* (1), 78–88.

**_ , Juan M Sanchez, and Horacio Sapriza**, "Fiscal policy and default risk in emerging markets," *Review of Economic Dynamics*, 2010, *13* (1), 452–469.

**Dahlberg, Matz and Eva Johansson**, "On the vote-purchasing behavior of incumbent governments," *American Political Science Review*, 2002, *96* (1), 27–40.

**Eaton, Jonathan and Mark Gersovitz**, "Debt with potential repudiation: Theoretical and empirical analysis," *The Review of Economic Studies*, 1981, *48* (2), 289–309.

**Edwards, Sebastian**, "LDC foreign borrowing and default risk: an empirical investigation," *Review of Economic Dynamics*, 1984, *74*, 726–734.

**Eichengreen, Barry and Ashoka Mody**, "Capital flows and the emerging economies: Theory, evidence, and controversies," 2000.

**Happy, JR**, "The effect of economic and fiscal performance on incumbency voting: The Canadian case," *British Journal of Political Science*, 1992, *22* (1), 117–130.

**Hatchondo, Juan Carlos, Leonardo Martinez, and Horacio Sapriza**, "Heterogeneous borrowers in quantitative models of sovereign default," *International Economic Review*, 2009, *50* (3), 1129–1151.

**Hibbs, Douglas A and Henrik Jess Madsen**, "The impact of economic performance on electoral support in Sweden, 1967–1978," *Scandinavian Political Studies*, 1981, *4* (1), 33–50.

**Johansson, Eva**, "Intergovernmental grants as a tactical instrument: empirical evidence from Swedish municipalities," *Journal of Public Economics*, 2003, *87* (5), 883–915.

**La, O De and L Ana**, "Do conditional cash transfers affect electoral behavior? Evidence from a randomized experiment in Mexico," *American Journal of Political Science*, 2013, *57* (1), 1–14.

**Landon, Stuart and David L Ryan**, "The political costs of taxes and government spending," *Canadian Journal of Economics*, 1997, pp. 85–111.

**Levitt, Steven D and James M Snyder**, "The impact of federal spending on House election outcomes," *Journal of Political Economy*, 1997, *105* (1), 30–53.

**Neumeyer, Pablo A and Fabrizio Perri**, "Business cycles in emerging economies: the role of interest rates," *Journal of Monetary Economics*, 2005, *52* (2), 345–380.

**Niemi, Richard G, Harold W Stanley, and Ronald J Vogel**, "State economies and state taxes: Do voters hold governors accountable?," *American Journal of Political Science*, 1995, pp. 936–957.

**Riascos, Alvaro and Carlos A Vegh**, "Procyclical government spending in developing countries: The role of capital market imperfections," *unpublished (Washington: International Monetary Fund)*, 2003.

**Scholl, Almuth**, "The dynamics of sovereign default risk and political turnover," *Journal of International Economics*, 2017, *108*, 37–53.

**Shin, Jungsub**, "The Consequences of Government Ideology and Taxation on Welfare Voting," *Political Research Quarterly*, 2016, *69* (3), 430–443.

**Tillman, Erik R and Baekkwan Park**, "Do Voters Reward and Punish Governments for Changes in Income Taxes?," *Journal of Elections, Public Opinion and Parties*, 2009, *19* (3), 313–331.

**Uribe, Martin and Vivian Z Yue**, "Country spreads and emerging countries: Who drives whom?," *Journal of International Economics*, 2006, *69* (1), 6–36.

**Vermeir, Jan and Bruno Heyndels**, "Tax policy and yardstick voting in Flemish municipal elections," *Applied Economics*, 2006, *38* (19), 2285–2298.

# A. Appendix

In this appendix we provide further details regarding the data sources, specific series used, as well as country and years coverage.

## A.1 Data Sources

1. Political Data – DPI

   (a) When using the data, please cite: Cesi Cruz, Philip Keefer and Carlos Scartascini (2016). "Database of Political Institutions Codebook, 2015 Update (DPI2015)." Inter-American Development Bank. Updated version of Thorsten Beck, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh, 2001. "New tools in comparative political economy: The Database of Political Institutions." 15:1, 165-176 (September), World Bank Economic Review.

   (b) Variable used: `EXECRLC`

   (c) Download link: https://publications.iadb.org/handle/11319/7408.

2. Fiscal and Macro Data – WDI

   (a) GDP per capita (constant 2010 USD). `NY.GDP.PCAP.KD`. GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

   (b) External debt stocks, public and publicly guaranteed (PPG) (DOD, current USD). `DT.DOD.DPPG.CD`. Public and publicly guaranteed debt comprises long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity.

   (c) GDP (current USD). `NY.GDP.MKTP.CD`. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural

resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used. We used this series to compute the debt-to-GDP ratio.

(d) Tax revenue (% of GDP). `GC.TAX.TOTL.GD.ZS`. Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue.

(e) General government final consumption expenditure (% of GDP). `NE.CON.GOVT.ZS`. General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation.

(f) Output Growth - computed (used in the main regression). Linearly detrended *logy* (where $y$ is `NY.GDP.PCAP.KD` from above).

(g) Region FE. The countries in the dataset are grouped by region according to the IMF Developing Economies Classification.

3. Spreads data – J.P. Morgan's Emerging Market Bond Index Global (EMBIG).

(a) EMBIG is a broader measure than EMBI or EMBI+.

(b) As much of the literature, we use a 'blended' spread – a function from *Datastream* that obtains the spread between the EMBIG Index and the US Treasury Bond. Spreads are reported in basis points.

### A.2 Country and Year Coverage

**Country coverage.** The table below has all the 40 countries in our dataset.

| | | | |
|---|---|---|---|
| Angola | Croatia | Kazakhstan | Poland |
| Argentina | Dom. Rep. | Lebanon | Senegal |
| Belize | Ecuador | Mexico | South Africa |
| Bolivia | El Salvador | Mozambique | Tanzania |
| Brazil | Ghana | Namibia | Thailand |
| Bulgaria | Guatemala | Nigeria | Trinidad & Tobago |
| Chile | Honduras | Pakistan | Tunisia |
| Colombia | Hungary | Panama | Turkey |
| Costa Rica | India | Paraguay | Uruguay |
| Cote d' Ivore | Jamaica | Peru | Vietnam |

**Time coverage.** We have an unbalanced panel with annual data from 1994 till 2015.