Political Constraints and Sovereign Default Premia

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Abstract

I study the relationship between political constraints and the probability of sovereign default on external debt using a dynamic stochastic model of fiscal policy augmented with legislative bargaining and default. I find that political constraints and default probability are inversely related if the output cost of default is not too high. The model government comprises legislators who bargain over policy instruments, including over a local public good that benefits only the regions they represent. Higher political constraints are equivalent to more legislators with veto power over fiscal policies. This implies that during a default, the released resources need to be distributed among more regions as local public goods, with a smaller benefit accruing to each region, discouraging default. However, if default is too costly, even governments with lower political constraints default less frequently. Empirical evidence from South American countries is consistent with this result. I calibrate the infinite horizon model to Argentina. It confirms the negative relationship. A counterfactual exercise with even higher political constraints shows that the default by Argentina in 2001 could not be avoided.

Keywords— Sovereign debt, Default risk, Interest rates, Political economy, Minimum winning coalition, Endogenous borrowing constraints.

JEL— D72, E43, F34, E62, F41

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1 Introduction

Political constraints play an important role in determining the fiscal policies of the government, including its decision to default on external debt. Conventional wisdom in this issue is divided. Less constrained governments are more powerful and able to take unpopular austerity measures whenever necessary. On the other hand, the same may be tempted to default and misuse available resources whenever possible. For the latter case, more political constraints are seen as a source of credibility by the international lenders. In this paper, I analyze the incentives for the sovereign to default resulting from its interaction with several degrees of political constraints using a political-economy model of fiscal policy (Battaglini and Coate (2008)), augmented by lack of commitment to repay (Arellano (2008)).

In most sovereign countries, fiscal policies are enacted by legislation that requires consent from the legislature. Voting requirements in various spheres of the government represent political constraints. In countries run by dictators, political constraints are absent. On the other hand, most countries require majority or super-majority votes in the legislature to pass a policy. This process is further complicated by group formation within the legislature supporting or opposing a bill. Thus, even though a bill might require a simple majority to pass, governments effectively face constraints that may be lower or higher than the majority requirement. In this paper, I consider an overall measure of political constraints and focus on its interaction with fiscal policy and default[1].

An example of a country with low political constraints is Venezuela. Even though the country has a National assembly with elected representatives, the president of the country can bypass them using his political clout. This claim is more appropriate for the regime of Hugo Chavez. On the other hand, a country with high political constraints is Chile. Their administration has two representative houses. The president does not have absolute control over the policies implemented. In the data, political constraints are captured by the POLCONv index, created by Henisz (2000)[2]. I find that it is negatively related to sovereign spreads, an indicator of the probability of default, in a sample of South American countries with median immediate output loss[3] in default lower than the cross country median[4]. Figure 1 plots the relationship between POLCONv and country spreads. The left panel represents the relationship for countries with low output loss in default for the sample period between 1995 and 2018. The relationship is significantly negative. On the other hand the right panel plots the same for countries with higher immediate output loss in default. It

[1] I do not elaborate on the microeconomic foundations of political constraints and use aggregate data and the model to determine the implied level of political constraints.

[2] Or XCONST representing Executive Constraints from the POLITY IV database.

[3] Of course, the immediate output loss in default may not be the best proxy for the *output cost* of default. The results in this paper go through anyway.

[4] Countries with low output loss in default are Dominican Republic, Venezuela, Mexico, Chile and Brazil. Those with high costs are Ecuador, Mexico, Panama and Peru.

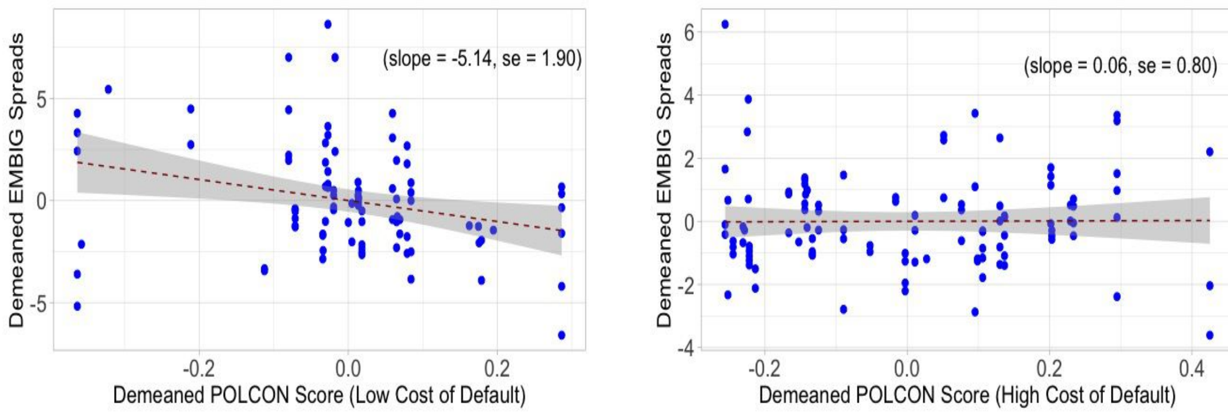


Figure 1: Relationship between political constraints and country spreads
Note: Each point in the above figure represents a country-year observation. Each observation is demeaned using the country mean for both POLCONv and spreads to avoid country-specific level effects. The shaded area around the line of best fit represents the 95% confidence interval. The data source for EMBIG spreads is J.P. Morgan Ltd.

shows no significant relationship, as is evident from the slope and standard deviation of the line of best fit reported at the top right corner of the figure.[5]

In the model economy, legislators, each representing a region, bargain every period over a set of policies. These include spending on a pure public good, distortionary taxes on labor income, spending on region-specific (local) public goods, external borrowing, and default. Within a period, for every round of bargaining, a proposer is picked randomly. His/her policy proposal must obtain the support of a subset of legislators (minimum winning coalition, henceforth *mwc*) to be implemented. An arrangement that requires the support of a bigger *mwc* represents a more constrained government.

The government borrows from international risk-neutral lenders. They price the sovereign bonds by taking into account the government's ability to default on debt. The lenders discipline the government borrowing by offering lower prices if the probability of a default is high. The lenders thus also take into account the political constraints faced by the government.

The ability to provide local public goods by the government is key to understanding the relationship between political constraints and the probability of default. A less constrained government levies taxes and borrows on behalf of the entire polity, but cares only about the consent of the members of the *mwc*. Whenever possible, it needs to provide local public goods to the members of the *mwc*. There are three main channels through which political constraints influence the probability of default. First, a smaller *mwc* induces the government to borrow more. This is because the borrowed resources are distributed as local public goods among fewer legislators. Lenders perceive higher borrowing to be associated with a higher probability of future default and offer a lower price on the debt. The lower prices increase the chances of current default. This channel is called *overborrowing*.

[5]Please see the empirical section for a rigorous investigation of the above relationship.

Second, for a given level of debt, default is more rewarding for the less constrained government because the released resources are distributed as local public goods among fewer legislators. This is the *static* channel. However, at the margin, if the debt burden is high enough, default may be equally or more lucrative for the more constrained government because the marginal value of the defaulted resources are high. This is true if the released resources are used to provide more valuable pure public goods. This situation is possible only if the output loss in default is high enough so that the government can sustain a high level of debt in the first place.

Finally, the *dynamic* channel affects the probability of default through the continuation value of the government in the current period. Even if defaulting does not release resources to provide for local public goods in the current period, current default incentives are affected by the static channel in the future periods. Lenders price the current debt accordingly.

I solve an infinite horizon version of the model numerically for a Markov perfect equilibrium. I calibrate the model to Argentina for a period leading up to 2001. I find that there is a negative relationship between political constraints and spreads. The model prediction matches the data reasonably well and predicts default in the same period as that in the data. In an event study for the 2001 default episode for Argentina, I find that even a counter-factually higher degree of political constraints for the same period could not have prevented the default.

In the model[6], I find that fiscal policies are pro-cyclical. In periods of low productivity shock, the international lenders demand higher yields on the debt. The government depends more on tax financing and lowers public spending because it is more expensive to borrow.

The rest of the paper is organized as follows. Section 2 describes the related literature. Section 3 describes the economic environment, including the government policies and the political process. Section 4 defines the political equilibrium. Section 5 partially characterizes the equilibrium and discusses the mechanisms of the model. Section 6 describes the calibration and quantitative results. Section 7 describes the counterfactual event study on Argentina. Section 8 discusses the data and empirical results from a sample of South American countries. Section 9 concludes.

2 Related work

This paper connects the literature on the cyclical behavior of fiscal policy with that on sovereign default and is related to the empirical literature on political constraints and its relationship with country risk.

The tax smoothing model by Aiyagari et al. (2002) studies the fiscal policy behavior of the government facing a stochastic shock on government spending and incomplete markets. In an environment with incomplete markets, the government self insures by accumulating assets. In the stationary equilibrium, the government no longer needs to borrow; it uses its assets to finance spending. To generate realistic borrowing behavior, the authors used an ad-hoc upper bound on

[6]Similar to Cuadra et al. (2010).

the level of assets accumulated by the government. Battaglini and Coate (2008) and Barseghyan et al. (2013) introduced political frictions in the same tax smoothing environment. In their model, policies are determined by legislative bargaining similar to the one proposed by Baron and Ferejohn (1989). The legislative bargaining process generates endogenous lower bounds for taxes and upper bounds for government spending. Azzimonti et al. (2016) use the same environment to study the effect of balanced budget rules on fiscal policies. In this paper, I borrow the legislative bargaining framework of Barseghyan et al. (2013) and introduce default. With both legislative bargaining and limited commitment to repay debt, my model generates both an endogenous upper and lower bound for all the fiscal policies. Using a similar environment, Cusato Novelli (2020) study the interaction between political fragmentation and borrowing behavior. He explains how political myopia can result in excessive borrowing and higher spreads but abstracts from other fiscal policies and the impact of higher output costs on default behavior.

The literature addressing the cyclical behavior of fiscal policies finds and explains counter-cyclical or acyclical fiscal policies for advanced economies. Empirical evidence from developed countries suggests that even though fiscal policies are slightly pro-cyclical in developed countries, they are much more so in the emerging markets. Gavin and Perotti (1997) note that financial frictions, as opposed to political ones, are responsible for pro-cyclicality. More specifically, they note that in recessions borrowing constraints are tighter, which leads to contractionary fiscal policies. However, during booms, the borrowing constraints are relaxed, and the government depends less on taxes for revenue. The literature on sovereign default also creates financial frictions yielding pro-cyclical fiscal policies. Arellano (2008) uses the default environment in Eaton and Gersovitz (1981) to show how default events are accompanied by interest rate spikes and deep recessions. Aguiar and Gopinath (2006) uses a similar environment to point out the effect of a stochastic trend in explaining the behavior of macroeconomic aggregates in emerging market economies. Chatterjee and Eyigungor (2012) uses a similar environment to study long term debt while Mihalache (2020) proposes how defaults can be resolved through maturity extension. In my paper I use one-period debt and focus mainly on the default incentives resulting from political frictions. Cuadra et al. (2010) introduces government spending and fiscal policies in the same environment and shows that default incentives generate financial frictions that generate pro-cyclical fiscal policies. However, the literature on sovereign default mostly assumes a benevolent government, maximizing the welfare of a representative agent. I deviate from this assumption and introduce political frictions. Political turnover and its impact on default behavior have been studied in Cuadra and Sapriza (2008). Hatchondo et al. (2009) models how turnover, specifically among heterogenous governments can impact default. They focus on the future discount factor induced by political frictions. In my paper, I focus on the politics of redistribution while keeping the effective discount factor constant. Hatchondo and Martinez (2010) presents an excellent survey of the literature on the interaction of politics and sovereign default.

The broader idea of how political constraints affect fiscal behavior, in general, was introduced by De Mesquita et al. (2005). The main idea of their book explains when is good politics bad policy and vice versa. They show that if the executive power depends on a small coalition for support, there is no incentive to work for the benefit of the entire electorate. In this paper, I study how various coalition sizes, signifying various degrees of political constraints affect fiscal policies and also the default behavior of the government. Here also the executive cares only about the supporting coalition. The impact is clear on fiscal policies.

Eichler (2014) uses a data-set on twenty-three emerging market countries and finds that default probabilities are unrelated to political constraints. However, among certain groups of countries, he finds that the relation can be significant. He uses ICRG data for political constraints while I use the POLCONv index by Henisz (2000) and XCONST from the POLITY IV database, and find a significant negative effect among a particular group of countries. Saiegh (2009) compares the default propensities of coalition ruled governments to single-party governments. He uses a sample of 48 developing countries from 1971 to 1997 to find that coalitions governments default less. My paper uses a broader definition of political constraints and introduces a positive theory of the relationship between political constraints and default. Block and Vaaler (2004) study empirically how the possibility of political turnover can impact default risk. Bussiere and Mulder (2000) find that indicators of political uncertainty can magnify the possibility of a crisis. In my paper, the probability of a turnover is constant. I control for political uncertainty due to turnover risk to find effect of political constraints on the probability of sovereign default.

3 Economic Environment

In this section, first I describe the household behavior given government policies. Then, I describe the government policies both in the state of repayment and default. Finally, I describe the legislative and default protocol, including the timing of events within a given period.

3.1 Preferences and Production

Time is discrete. The economy is populated by a continuum of infinitely lived agents living in n uniformly populated regions, denoted by $i = 1, 2, ..., n$. The population in each district is normalized to 1. There is a single non-storable consumption good denoted by x, produced using a single factor, labor, denoted by l, and a linear technology $x = zl$. The citizens are endowed with 1 unit of labor every period. There is a pure public good, denoted by g, produced from the consumption good using a linear technology $g = x$ and a region-specific local public good, s_i, for region i, produced from the consumption good using a similar linear technology $s_i = x$. Agents consume x, supply labor for production, and enjoy both the pure public good and the local public good. They discount the future at a rate β. Each citizen living in region i has a period utility function given by

$$U(x, l, g, s_i) = \frac{1}{1-\sigma}\left(x - \frac{l^{1+\gamma}}{1+\gamma}\right)^{1-\sigma} + \frac{\pi}{1-\sigma} g^{1-\sigma} + s_i \tag{1}$$

where $\sigma > 0$ is the risk-aversion parameter. The parameters $\gamma > 0$ and $\pi > 0$ capture the Frisch elasticity of labor supply, and the relative importance of pure public goods relative to consumption and leisure. The utility weight of the local public good s_i is normalized to 1.

The utility function is assumed to have a GHH specification (Greenwood et al. (1988)) in consumption and labor, and additively separable in g and s_i. I further assume that the agent's preferences are quasi-linear in the local public good s_i. This assumption is innocuous. Its makes the model numerically tractable and has no qualitative effect.

Labor productivity, $z \in Z$, varies randomly with some persistence. I assume that it follows a first-order Markov process $\mu(z'|z)$, where $\mu(.)$ is the probability of realization of a specific value of the productivity shock z', given z.

Labor markets in the economy are competitive. Given the linear production technology for the consumption good, the wage rate in the economy (w) fluctuates one-one with the labor productivity shock z in equilibrium.

3.2 Government Policies

At the beginning of a period, the government finds itself either in good standing with the international capital markets, denoted by $\Omega = 1$ or in default, denoted by $\Omega = 0$. In good standing, the government is free to access the international capital markets to borrow or save, by buying or selling respectively, one-period non-contingent bonds. The resources raised by the government from capital markets is denoted by $-qb' + b$, where a positive value of b' is the face value of the current assets of the government, and a positive value of b, the face value of the last period's assets. q denotes the unit price of the new issuance.

In periods with good financial standing, the government supplements the resources raised by borrowing with a proportional income tax, denoted by τ. The tax revenue and the borrowed funds are used to finance pure public goods and region-specific local public goods. However, there is limited commitment to repay the maturing debt, $-b$. If the government reneges on its current debt obligations, it is immediately barred from participating in the international credit markets, and its credit standing is downgraded to $\Omega = 0$. This exclusion continues for a stochastic number of periods determined by an exogenous parameter θ. The decision to default on its debt is denoted by the indicator d', that takes the value 1 if the government defaults, and 0 otherwise. If the government decides to default, it only relies on tax revenues to finance both the pure and local public goods.

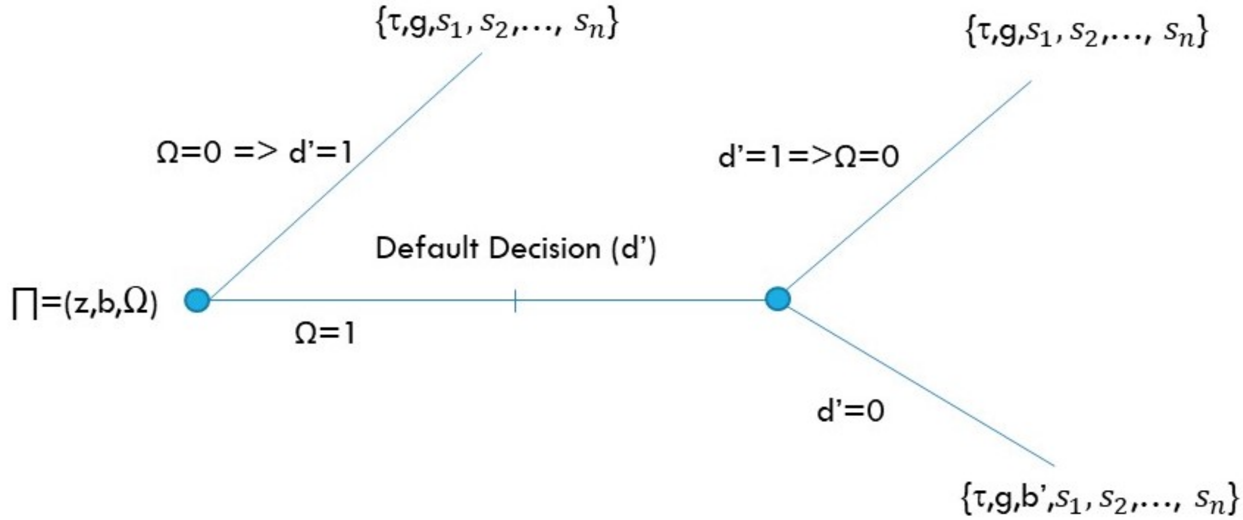


Figure 2: Timeline of Events

The government starts a period with a realized productivity shock z, the current debt stock, and knows whether it is eligible to participate in the international capital markets. The state of the economy is summarized by $\Pi = (z, b, \Omega)$. If the government cannot borrow or lend (Ω=0), it chooses the policies $\{\tau, g, s_1, s_2, ..., s_n\}$. In a period starting with no market access, d' is constrained to be 1. On the other hand, in good standing, the government chooses whether to renege on its debt obligations before choosing other policies. This is the Eaton and Gersovitz (1981) timing, as depicted in Figure 2. If the government defaults, its debt obligations are reduced to zero and it loses access to credit markets immediately. Therefore, its policy instruments available are the same as those in default. If it chooses to repay, it maintains good standing and its policy choice is described by the $n + 3$ tuple $\{\tau, g, b', s_1, s_2, ..., s_n\}$. This timing protocol is different from that in Cole and Kehoe (2000), where the government can issue new debt before the default decision in the current period.

The citizens in the economy are not allowed to borrow or save. The government borrows or saves on their behalf. Following Na (2015), this decision can be easily decentralized and the same equilibrium can be implemented. Given the current government policies and the realization of productivity shock, each citizen solves the following problem to determine his supply of labor.

$$l^*(\tau, z) = \arg\max_{l} \left\{ \frac{1}{1-\sigma} \left((1-\tau)zl - \frac{l^{1+\gamma}}{1+\gamma} \right)^{1-\sigma} + \frac{\pi}{1-\sigma} g^{1-\sigma} + s_i \right\} \tag{2}$$

where $(1-\tau)zl$ is the disposable income of a citizen. It is easy to show that $l^*(\tau, z) = [z(1-\tau)]^{\frac{1}{\gamma}}$.

The government budget must satisfy two feasibility constraints. Firstly, revenues must cover the expenditures. Assume that in the current period the productivity shock in z and the stock of maturing assets is b. Then, given the policy choice of the government, $\{\tau, g, (1-d')b', d', s_1, s_2, ..., s_n\}$[7] the government's revenue is given by

$$n\tau z l^*(\tau, z) = n\tau z[z(1-\tau)]^{\frac{1}{\gamma}} \tag{3}$$

Feasibility requires that the government's net of local public goods provision surplus, denoted by $B(\tau, g, b', d'; \Pi) = n\tau z l^*(\tau, z) - g + (1-d')[b - qb']$ must be equal or exceed the total amount of resources allocated for pure public good provision across all regions, $\sum_{i=1}^{n} s_i$.

$$B(\tau, g, b', d'; \Pi) \geq \sum_{i=1}^{n} s_i \tag{4}$$

Secondly, to rule out lump-sum taxes we further assume that $s_i \geq 0$.

3.3 The Political Process

Government policies are decided by a legislative bargaining process. Representatives from n regions bargain over the policy instruments $\{\tau, g, b', d', s_1, s_2, ..., s_n\}$ in periods of good market standing and, $\{\tau, g, s_1, s_2, ..., s_n\}$ is periods of default. Since each region is populated by a uniform population, the identity of the representative is insignificant. The legislature meets every period and takes up only a negligible amount of time to decide on the policies.

Suppose the legislature meets at the beginning of a period with the current level of outstanding assets equal to b and the productivity shock equal to z. One legislator, representing a particular region is chosen at random to make the first proposal. A proposal is a set of feasible policies denoted by $\{\tau, g, d', b', s_1, s_2, ..., s_n\}$, when Ω takes the value 1, and $\{\tau, g, s_1, s_2, ..., s_n\}$, when Ω takes the value 0. The proposal requires $m \leq n$ votes to be implemented. If the proposal succeeds to obtain the required number of votes, the policy is implemented and the legislature adjourns. It meets again in the following period with a possibly different debt stock -b and a different realization of the productivity shock z. If the proposal fails to obtain the required number of votes, the legislative process moves to the next proposal round in which another legislator is chosen at random to propose. If no agreement can be reached in $T \geq 2$ proposal rounds, a legislator is appointed to choose a reference policy. The reference policy is restricted to have the same allocation of local public goods for every region.

4 Political Equilibrium

In this section, I describe the proposer's optimization problem given households' policy functions, the problem of the foreign lenders, and then define the competitive equilibrium for this economy.

[7] This format for representing policies helps to describe repayment and default states together.

4.1 The Proposer's Problem

I focus attention on symmetric Markov-perfect equilibrium. Though behavior in the current period depends on the history of defaults, past behavior can be summarized by an additional state variable. Similar to the Arellano (2008), past default behavior is summarized by Ω. Since the equilibrium is symmetric, any proposer in round $k \in \{1, 2, ..., T\}$ will choose the same policies.

In equilibrium, the proposer's choice in round k and state Π is described by the policies $\{\tau^k, g^k, d'^k, b'^k, s_1^k, ..., s_n^k\}_{k=1}^T$, given that Ω takes the value 1 in the beginning of the current period[8]. If the economy is in default, that is, $\Omega = 0$, the the proposer's choice is given by, $\{\tau^k, g^k, s_1^k, ..., s_n^k\}_{k=1}^T$. Here τ^k denotes the proposed tax rate, g^k denotes the proposed level of pure public goods, and s_i^k $\forall i = 1, 2, ..., n$ denote the level of local public goods chosen by the proposer. Since the other $n-1$ legislators are ex-ante identical, the $m-1$ coalition members whose consent is required to pass the legislation are randomly chosen from them. The proposer obtains consent for his policy by providing local public goods to the *mwc*. In equilibrium, the proposer does not provide local public goods to the legislators outside the *mwc*, and by symmetry, provides each member an equal amount of the same. The proposer's region receives an allocation of local public goods of the value $B(\tau^k, g^k, b'^k, d'^k; \Pi) - (m-1)s^k$ if the period starts with good credit standing. Else, the allocation is $B(\tau^k, g^k; \Pi) - (m-1)s^k$.

Equilibrium value functions are given by $\{V_0^k, V_c^k, V_d^k, V_n^k, J_0^k, J_d^k\}_{k=1}^{T+1}$. If $\Omega = 1$, the proposer obtains a value V_0^k. It is defined as

$$V_0^k = \max\{V_c^k, V_d^k\} \tag{5}$$

The proposer decides to default in proposal round k if the value it obtains in default, denoted as V_d^k, is higher than the value if the proposer decides to repay, denoted by V_c^k. On the other hand, in a period with $\Omega = 0$, the value obtained by the proposer is V_n^k. The values in round $T+1$ represent the reference values if all proposal rounds fail. The value expected by the legislators in round $k+1$ if the economy is in good credit standing in the current period is given by J_0^{k+1}, otherwise, the proposer expects J_d^{k+1}. Expected values differ from the proposer's current values because the current proposer may not be chosen to propose in the following round. Thus, he takes an expectation over his status in the legislature in round $k+1$ while formulating the current proposal. Policies in round $k+1$ reflect the choices of a randomly chosen proposer in round $k+1$.

I focus on an equilibrium such that in any proposal round k, the proposal is accepted immediately and the legislature dissolves. On the equilibrium path, proposal rounds $2, ..., T$ does not occur. This reflects the assumption that any coalition member accepts a policy mix that ensures that he is weakly better off than the value expected in the next round. The enters the current

[8] All the fiscal policies and value functions are functions of the state Π. It is suppressed for convenience of notation

proposer's problem as an incentive compatibility constraint. His problem in proposal round k, if the economy is in good credit standing and, he decides to repay is given by

$$
\begin{aligned}
V_c^k(\Pi) = \quad & \max_{\{\tau,g,s,b'\}} U(c,l^*,g) + B(\tau,g,b';\Pi) - (m-1)s + \beta E_{z'} J_0(\Pi') \\
\text{s.t.} \quad & c = (1-\tau)zl^* \\
& U(c,l,g) + s + \beta E_{z'} J_0(\Pi') \geq J_0^{k+1}(\Pi) \\
& B(\tau,g,b';\Pi) \geq (m-1)s \\
& s \geq 0
\end{aligned}
\tag{6}
$$

In this problem, $B(.)$ is defined as $n\tau zl^* - g + b - q(z,b')b'$. The government understands that its demand for external funds can influence the bond prices offered by the lenders. The first constraint of the problem (6) describes household behavior, given policies. The second constraint is the incentive compatibility constraint for the members of the *mwc*. The third constraint ensures the feasibility of government policies. Resources net of local public goods must be higher than the resources diverted to provide the local public goods to the coalition members. Finally, as already mentioned before, the level of local public goods provided to any region must be non-negative. The expected future value in proposal round one in the following period is $J_0(\Pi')$. This takes into account the fact that all equilibrium proposals are accepted in the first round. Superscript for proposal round 1 is dropped for convenience.

If the economy is in good credit standing, and the proposer defaults, then the problem of the proposer is as follows.

$$
\begin{aligned}
V_d^k(\Pi) = \quad & \max_{\{\tau,g,s\}} U(c,l^*,g) + B(\tau,g;\Pi) - (m-1)s + \beta E_{z'}[\theta J_0(\Pi') + (1-\theta)J_d(\Pi')] \\
\text{s.t.} \quad & c = (1-\tau)zl^* \\
& U(c,l,g) + s + \beta E_{z'}[\theta J_0(\Pi') + (1-\theta)J_d(\Pi')] \geq J_0^{k+1}(\Pi) \\
& B(\tau,g;\Pi) \geq (m-1)s \\
& s \geq 0
\end{aligned}
\tag{7}
$$

After default, the government can gain access to the capital markets with probability θ. In this contingency, the proposer expects J_0 in the following period. However, with the remaining probability, it stays in default and obtains value J_d. The default choice of the proposer, in round k is given by

$$
d'^k(\Pi) = \begin{cases} 1 & \text{if } V_c^k < V_d^k \\ 0 & \text{otherwise} \end{cases}
\tag{8}
$$

If the economy is already in default, the default policy function, d' is constrained to take the value 1. The proposer's problem, in this case, is given as

$$\begin{aligned} V_n^k(\Pi) = \quad & \max_{\{\tau,g,s\}} U(c,l^*,g) + B(\tau,g;\Pi) - (m-1)s + \beta E_{z'}[\theta J_0(\Pi') + (1-\theta)J_d(\Pi')] \\ \text{s.t.} \quad & c = (1-\tau)zl^* \\ & U(c,l,g) + s + \beta E_{z'}[\theta J_0(\Pi') + (1-\theta)J_d(\Pi')] \geq J_d^{k+1}(\Pi) \\ & B(\tau,g;\Pi) \geq (m-1)s \\ & s \geq 0 \end{aligned} \tag{9}$$

The only difference between the problem of the proposer if he *chooses* to default, and if the economy is already in default, is the expected value in round $k+1$. This is because, in good standing, the proposer in round k expects the future proposer to optimally choose the default policy. However, on the equilibrium path, both the default problems are the same. By symmetry, if the proposer in round $k+1$ chooses to default, it is also optimal for the proposer in round k to default.

The repayment set, $\Psi(b)$, is defined as the set of productivity shocks z such that the proposer chooses to repay.

$$\Psi(b) = \{z \in Z : d'^k(z,b) = 0\} \tag{10}$$

Similarly, the default set, $\Upsilon(b)$, is defined as the set of productivity shocks z such that the proposer chooses default.

$$\Upsilon(b) = \{z \in Z : d'^k(z,b) = 1\} \tag{11}$$

In equilibrium, given the future expected values, the proposer chooses policies consistent with problems (6), (7) and (9). The future expected value functions are in turn determined by the policies chosen by the proposer in the following period. In equilibrium, if the proposer in a given period, with state Π, proposal round k, and $\Omega = 1$, chooses policies $\{\tau, g, s, b', d'\}$ then

$$J_0^k(\Pi) = U(c(\tau^k, z), l^*, g^k) + \frac{B(\tau^k, g^k, b'^k; \Pi)}{n} + \beta E_{z'} J_0(\Pi') \tag{12}$$

if it is optimal to repay.

If the proposer defaults or enters the period with no market access, that is, $\Omega = 0$, then

$$J_d^k = J_0^k = U(c(\tau^k, k), l^*, g^k) + \frac{B(\tau^k, g^k; \Pi)}{n} + \beta E_{z'}(\theta J_0 + (1-\theta)J_d(\Pi')) \tag{13}$$

To understand the logic behind the above value functions, consider J_0. In every proposal round, the proposer is chosen with probability $\frac{1}{n}$. If the optimal policy in the current period is repayment, the proposer receives $U(c(\tau,z),l^*,g)+B(\tau,g,b';\Pi)-(m-1)s+\beta E_{z'}J_0(\Pi')$. If the legislator is not chosen to propose, but is part of the mwc, which happens with probability $\frac{m-1}{n}$, he receives $U(c(\tau,z),l^*,g)+s+\beta E_{z'}J_0(\Pi')$. If the legislator is neither a proposer, nor part of the mwc, with unconditional probability $\frac{n-m}{n}$, he receives $U(c(\tau,z),l^*,g)+\beta E_{z'}J_0(\Pi')$. Taking expectation over these three possibilities, we obtain $J_0(\Pi)$ in (12). The other expression is derived using the same logic and default policy functions.

Finally, off the equilibrium path, if all the T proposal rounds fail, then the reference proposal round is activated. The proposer is restricted to choose a policy such that the local public good is distributed equally across all the n regions. If the proposer decides to repay in a state Π, with $\Omega = 1$, then his problem is

$$\begin{aligned} V_c^{T+1}(\Pi) = \quad & \max_{\{\tau,g,s,b'\}} U(c,l^*,g)+\frac{B(\tau,g,b';\Pi)}{n}+\beta E_{z'}J_0(\Pi') \\ \text{s.t.} \quad & c=(1-\tau)zl^* \\ & B(\tau,g,b';\Pi)\geq 0 \end{aligned} \tag{14}$$

Similar to the proposer's problem is round k, the reference round proposer is also restricted from accessing international capital markets in periods of no market access, that is $\Omega = 0$, or when the proposer decides to default in a period that starts with $\Omega = 1$. The proposer's problem in both these *default* situations is given as

$$\begin{aligned} V_d^{T+1}(\Pi) = \quad & \max_{\{\tau,g,s\}} U(c,l^*,g)+\frac{B(\tau,g;\Pi)}{n}+\beta E_{z'}(\theta J_0(\Pi')+(1-\theta)J_d(\Pi')) \\ \text{s.t.} \quad & c=(1-\tau)h(z)l^* \\ & B(\tau,g;\Pi)\geq 0 \end{aligned} \tag{15}$$

The default decision is made by comparing the values V_c^{T+1} and V_d^{T+1}.

4.2 International Lenders

There is an infinite number of identical, risk-neutral international lenders. These creditors have the option to borrow and lend at a risk-free rate r from the international capital market. They can also lend to the government of the small open economy in a perfectly competitive market.

Lenders maximize their expected profits, given by the following equation.

$$qb' - \frac{\delta(z,b')}{1+r}0 - \frac{1-\delta(z,b')}{1+r}b' \tag{16}$$

The first term in the above equation denotes the resources the creditors lend to the government in the current period. Since b' denotes assets, the amount of bonds issued in the current period is $-b'$. The price of each newly issued bond is q. In the following period, the government may default on the accumulated debt with probability $\delta(z,b')$ and, repays with probability $1-\delta(z,b')$.

Since the lenders operate in a perfectly competitive market, profit maximization implies zero profits. From this condition, bond prices are given by

$$q(z,b') = \frac{1-\delta(z,b')}{1+r} \tag{17}$$

The bond price schedule implies that the government is willing to lend any amount, given that bond prices satisfy the zero-profit condition. The price mirrors the probability of default of the government. The probability of default is given as

$$\delta(z,b') = \sum_{z' \in \Upsilon(b')} \mu(z'|z) \tag{18}$$

Note that default probability is 0 if the default set $\Upsilon(b') = \varnothing$. In this situation, the government can borrow at a risk-free rate. In case if the default set covers the full support of $z \in Z$, then the probability of default in the following period is 1.

4.3 Productivity Cost of Default

Along with a market exclusion cost default is also assumed to affect aggregate productivity. The rationale for this cost of defaulting is that default involves trade disruptions that hinder production in the domestic economy, as explained by Rose (2005). Besides, sovereign bonds are held by domestic banks before a default episode (Broner et al. (2014)). This can crowd out private investment when the economy comes close to a default. Balance sheet effect on banks reduce lending activities and are responsible for a loss in productivity. This transmission mechanism is explained in Bocola (2016). To capture these effects I introduce a cost of default function similar to Chatterjee and Eyigungor (2012).

$$z = \begin{cases} z & \text{if } d' = 0 \\ z - \max\{0, \alpha_0 z + \alpha_1 z^2\}, \alpha_1 \geq 0 & \text{if } d' = 1 \end{cases} \tag{19}$$

This cost function embeds several possible situations. If $\alpha_0 = 0$, and $\alpha_1 > 0$, then the cost of default is proportional. If $\alpha_1 > 0$, and $\alpha_0 = 0$, then the cost rises more than proportionally to the rise in productivity. If $\alpha_0 < 0$, and $\alpha_1 > 0$, then for $z < -\frac{\alpha_0}{\alpha_1}$, the default cost is 0, but the cost rises more than proportionally for higher realizations of z. This concave cost of default is similar to Arellano (2008), except, it allows for one more free parameter for the calibration. Mendoza and Yue (2012) estimate a similar concave cost function associated with sovereign default using a model with imported inputs.

4.4 Equilibrium Definition

A symmetric, competitive Markov-Perfect equilibrium for this economy is characterised by a set of policy functions, $\{\tau^k(\Pi), g^k(\Pi), b'^k(\Pi), s^k(\Pi), d'^k(\Pi)\}_{k=1}^{T+1}$ when $\Omega = 1$, and $\{\tau^k(\Pi), g^k(\Pi), s^k(\Pi)\}_{k=1}^{T+1}$ when $\Omega = 0$, a set of value functions $\{V_0^k, V_c^k, V_d^k, V_n^k, J_0^k, J_d^k\}_{k=1}^{T+1}$, default set $\Upsilon(b)$, repayment set $\Psi(b)$, the labor supply policy of the households $l^*(z,\tau)$ and the bond price schedule $q(z,b')$ such that

1. Given fiscal policies, households solve their problem described in (2) to obtain the labor supply policy function $l^*(\tau, z)$.

2. Given the household's labor supply policy function, $l^*(\tau, z)$, the bond price schedule $q(z, b')$, and the expected future value functions, $\{J_0^k, J_d^k\}_{k=1}^{T+1}$, the government solves for policy functions, $\{\tau^k(\Pi), g^k(\Pi), b'^k(\Pi), s^k(\Pi), d'^k(\Pi)\}_{k=1}^{T+1}$ in periods starting with $\Omega = 1$, and $\{\tau^k(\Pi), g^k(\Pi), s^k(\Pi)\}_{k=1}^{T+1}$ in periods starting with $\Omega = 0$ from the equations (6), (7), (9), (12) and (13). In the process, the government obtains the value functions $\{V_0^k, V_c^k, V_d^k, V_n^k\}_{k=1}^{T+1}$.

3. The policy functions and the value functions must be consistent with the value functions $\{J_0^k, J_d^k\}_{k=1}^{T+1}$ as described in (12) and (13).

4. The bond price schedule $q(z, b')$ must be consistent with the foreign creditor's zero profit condition (17) and, the repayment and default sets in (10) and (11) respectively.

5 Characterization and Mechanism

In this section, I partially characterize the equilibrium defined in the last section, and provide intuitions for the main result of this paper: how does political constraints affect the probability of default under different conditions.

5.1 Characterization

First, I present two propositions that make the computation of the equilibrium numerically tractable. The first proposition shows that there exists a problem equivalent to the proposer's problem in section 4 that solves for the same policy functions as that of the proposer.

An equivalent problem that solves for the proposer's policies in all the T proposal rounds, if the proposer decides to repay is given as

$$\begin{aligned} H_c(\Pi) = \quad & \max_{\{\tau,g,b'\}} U(c, l^*, g) + \frac{B(\tau, g, b'; z, b)}{m} + \beta E_{z'} J_0(\Pi) \\ \text{s.t.} \quad & c = (1-\tau) z l^*(\tau, z) \\ & B(\tau, g, b'; z, b) \geq 0 \end{aligned} \tag{20}$$

If the proposer defaults when it enters a period with $\Omega = 1$, or is already in default, that is, enters the period with $\Omega = 0$, then, the equivalent problem is as follows.

$$\begin{aligned} H_d(\Pi) = \quad & \max_{\{\tau,g\}} U(c, l^*, g) + \frac{B(\tau, g; z)}{m} + \beta E_{z'}(\theta J_0(\Pi') + (1-\theta)J_d(\Pi')) \\ \text{s.t.} \quad & c = (1-\tau)zl^*(\tau, z) \\ & B(\tau, g; z) \geq 0 \end{aligned} \tag{21}$$

In periods with $\Omega = 1$, the proposer defaults if $H_d(\Pi) > H_c(\Pi)$.

Proof: See appendix.

The above equivalent problem states that the proposer's optimization problem is *as if* he distributes the surplus net of public good provision evenly across the members of the *mwc*.

5.1.1 Nature of Equilibrium Fiscal Policies

From Proposition 1, it is clear that the proposer effectively maximizes the utility of m coalition members. If the economy is in good financial standing, the level of outstanding debt is not too high and the realized productivity shock is not too low, the proposer provides the Samuelson level of pure public goods, $(\pi * m)^{\frac{1}{\sigma}}$. Any surplus in the government's budget is used to provide local public goods. This is because the marginal gain from providing local public goods is constant while the gain from providing pure public goods is diminishing. However, if the level of outstanding debt is high, the tax revenue and the borrowed resources are used for funding pure public goods. The provision of local public goods in this situation requires higher taxes or lower pure public good spending. Both these options are costlier compared to the gain from the local public good provision. Thus, equilibrium fiscal policies for a given productivity shock, z, depend on a threshold level of debt $(-b^*)$, beyond which local public goods are not provided. For debt levels lower than than the threshold, pure public good spending is constant and, local public goods are provided in equilibrium.

However, the government may choose to default. In default, the government still maximizes the joint utility of m coalition members[9]. Fiscal policies in default are independent of the level of debt on which the government defaults. For a high realization of the productivity shock, z, the government may have enough tax revenue to provide the Samuelson level of pure public goods. The surplus is used to provide local public goods. However, similar to repayment, if the productivity shock is low, the marginal benefit of providing local public goods is much smaller compared to the cost of increasing taxes or decreasing pure public goods provision. Thus, the nature of fiscal policies in default depends on a threshold level of productivity shock z^*, beyond which the government

[9] I refer to the equivalent problem as the proposer's problem from here on. However, the proposer does not maximize the joint utility of m coalition members. It is only *as if* he does so.

provides local public goods. As mentioned before, default policies are the same irrespective of whether the proposer chooses to default or the economy is already in default.

5.2 Mechanism

There are three main channels through which political constraints (m) affect the probability of default. First, governments run by smaller sized coalitions, (small m) tend to issue more debt. Even though a higher debt level is associated with a lower price charged by international lenders, the incentive to borrow more may dominate. This trade-off can be easily seen from the borrowing decision of the proposer in periods of market access. If the government's budget is not constrained, then the borrowing decision of the proposer can be summarized by the following condition.

$$b' = \arg\max_{b'} \frac{-q(z,b')b'}{m} + \beta\, \mathbb{E}_{z'}\, J_0(\Pi') \tag{22}$$

A lower value of m implies a higher marginal benefit from borrowing today. However, the marginal cost of borrowed resources is independent of m. This explains a greater incentive to borrow for a smaller *mwc*. Intuitively, the borrowed resources are distributed as local public goods to fewer members of the *mwc*. Each member is entitled to a bigger share. I call this the *Overborrowing* channel. However, bond prices can discipline the incentive to borrow excessive amounts. The disciplining effect of the bond prices on the incentive to borrow is a quantitative question and will be discussed later.

Second, for any given level of debt, the incentive to default varies with the size of the *mwc*. This incentive can be further broken down into two parts. The *static* channel creates incentives for the proposer to default and provide local public goods to the coalition members in the current period. The *dynamic* channel influences the current default decision through the continuation value of the proposer even if no local public goods are paid out in the current period. It is the *static* channel at work in the future periods, which in turn affects the current default decision through bond prices. In what follows, I will use a one-period model to analytically characterize the *static* channel. The *dynamic* channel will be explained in the quantitative section.

5.2.1 One-Period Model

In the one-period model environment, the government enters with market access, that is, $\Omega = 1$, and, inherits a debt stock $-b$. The productivity shock realized for the current period is z. For this simple model consider a utility cost of default k. The government provides pure public goods, local public goods, and imposes taxes on the citizens similar to the full model. The only restriction is that the government cannot borrow[10]. Since Proposition 1 does not depend on the continuation

[10] No period follows the current period. Hence, no lender will lend to the government, neither will the government want to save.

values, it still holds. The following lemmas summarize the behavior of the fiscal policies in this simple one-period economy.

If the economy is in default, then $\exists$ a $z^*(m)$ such that

1. $\begin{cases} \frac{\partial \tau}{\partial z} = 0, & \text{if } z \leq z^*(m) \\ \frac{\partial \tau}{\partial z} > 0, & \text{if } z > z^*(m) \end{cases}$

2. $\begin{cases} \frac{\partial g}{\partial z} > 0, & \text{if } z \leq z^*(m) \\ \frac{\partial g}{\partial z} = 0, & \text{if } z > z^*(m) \end{cases}$

3. $\begin{cases} \frac{\partial B}{\partial z} = 0, & \text{if } z \leq z^*(m) \\ \frac{\partial B}{\partial z} > 0, & \text{if } z > z^*(m) \end{cases}$

4. $z^*(m)$ is increasing in m.

Proof: See appendix.

Intuitively, if the government defaults, the current debt obligation becomes 0. Surplus net of pure public goods is given as $B(.) = n\tau z l^* - g$. For this model, we assume that there is no productivity cost of default. If the government's budget is not constrained, the first-order condition for the pure public good provision yields $g^* = (\pi * m)^{\frac{1}{\sigma}}$. I define $z^*(m)$ as the value of z such that $n\tau z^*(m) l^* = g^*$.

If $z < z^*(m)$, since the government's tax revenue is increasing in z, the pure public good is under-provided, that is, $g < g^*(m)$. In this case, the marginal benefit from providing g is much higher than that obtained from providing local public goods $(\frac{1}{m})$. All the tax revenue is used to provide g, and no local public goods are provided. This implies $B = 0$. A higher realization of z, with z still less than $z^*(m)$, increases the tax revenue and the provision of g. This explains the first part of statements (2) and (3) of the lemma. Higher z, with $z < z^*(m)$ reduces the marginal cost of taxes, but also reduces the marginal gain from pure public goods. Thus, taxes do not respond to z. This is caused by the same curvature in both g and the consumption-labor supply part of the utility function.

If $z > z^*(m)$, the government's budget is unconstrained. In this situation, g equals $g^*(m)$. For even higher realizations of z, the marginal resources are diverted toward the provision of local public goods. The marginal benefit from local public goods $(\frac{1}{m})$ exceeds that from pure public goods beyond $g^*(m)$. This explains the last part of statements (2) and (3) of the lemma. For higher realizations of z, with $z > z^*(m)$, the marginal cost of a higher tax rate declines, but the benefit is constant since the proceeds are used to pay for local public goods. Then, it is optimal to increase tax rates. The proof of part 4 follows trivially from the lemma.

If the government decides to repay, then, for a given z, $\exists$ a $b^*(z, m)$ such that

1. $\begin{cases} \frac{\partial \tau}{\partial b} = 0, & \text{if } b \geq b^*(z,m) \\ \frac{\partial \tau}{\partial b} < 0, & \text{if } b < b^*(z,m) \end{cases}$

2. $\begin{cases} \frac{\partial g}{\partial b} = 0, & \text{if } b \geq b^*(z,m) \\ \frac{\partial g}{\partial b} > 0, & \text{if } b < b^*(z,m) \end{cases}$

3. $\begin{cases} \frac{\partial B}{\partial b} > 0, & \text{if } b \geq b^*(z,m) \\ \frac{\partial B}{\partial b} = 0, & \text{if } b < b^*(z,m) \end{cases}$

4. $b^*(z,m)$ is increasing in m, decreasing in z, and the fiscal policies are independent of m if $b < b^*(z,m)$.

Proof: See appendix.

First, consider the net of public goods and debt payment surplus, denoted by $B(.) = n\tau zl^* - g + b$, where $-b$ is the debt stock outstanding in the current period. Given z, $b^*(z,m)$ is defined implicitly by the equation, $n\tau zl^* - g^*(m) + b^*(z,m) = 0$. Here, $g^*(m)$ is the maximum pure public goods the government chooses to provide, $(\pi * m)^{\frac{1}{\sigma}}$.

For $b \geq b^*(z,m)$, the government's assets are high and the budget is not constrained. In this situation, tax rates are already at their lowest level and do not respond to a further increase in assets[11]. Since the provision of pure public goods in this situation equals $g^*(m)$, the higher savings are used to finance local public goods, which gives a constant marginal utility $(\frac{1}{m})$. Hence further increase in the provision of g is not optimal. This explains the first part of statements (1), (2) and (3) for lemma 2.

If $b < b^*(m)$, the government's budget is constrained. An additional unit of assets is now used to reduce taxes and increase the provision of g. Local public goods are not provided, since, the benefit from it is constant and lower than reducing taxes and increasing the provision of pure public goods. This explains the second part of statements (1), (2) and (3). (4) follows trivially from the definition of $b^*(z,m)$.

In what follows, I compare two economies, one with $m = m_1$, and the other with $m = m_2$, and $m_1 > m_2$. I assume that both the governments in the current period have market access, that is, $\Omega = 1$, both the economies experience the same productivity shock z and have the same level of outstanding debt. The objective is to show how the default incentives differ across these governments.

5.2.2 Case 1

Let (z, b) be such that $z > z^*(m_1) > z^*(m_2)$, and, both $b^*(m_1)$[12] and $b^*(m_2)$ are high enough such that the government's budget are not constrained both in repayment and default.

[11] Even lower taxes to absorb the increase in assets does not justify the utility gain.

[12] $b^*(z,m)$= $b^*(m)$ for a given z. I drop z to reduce the burden of notation.

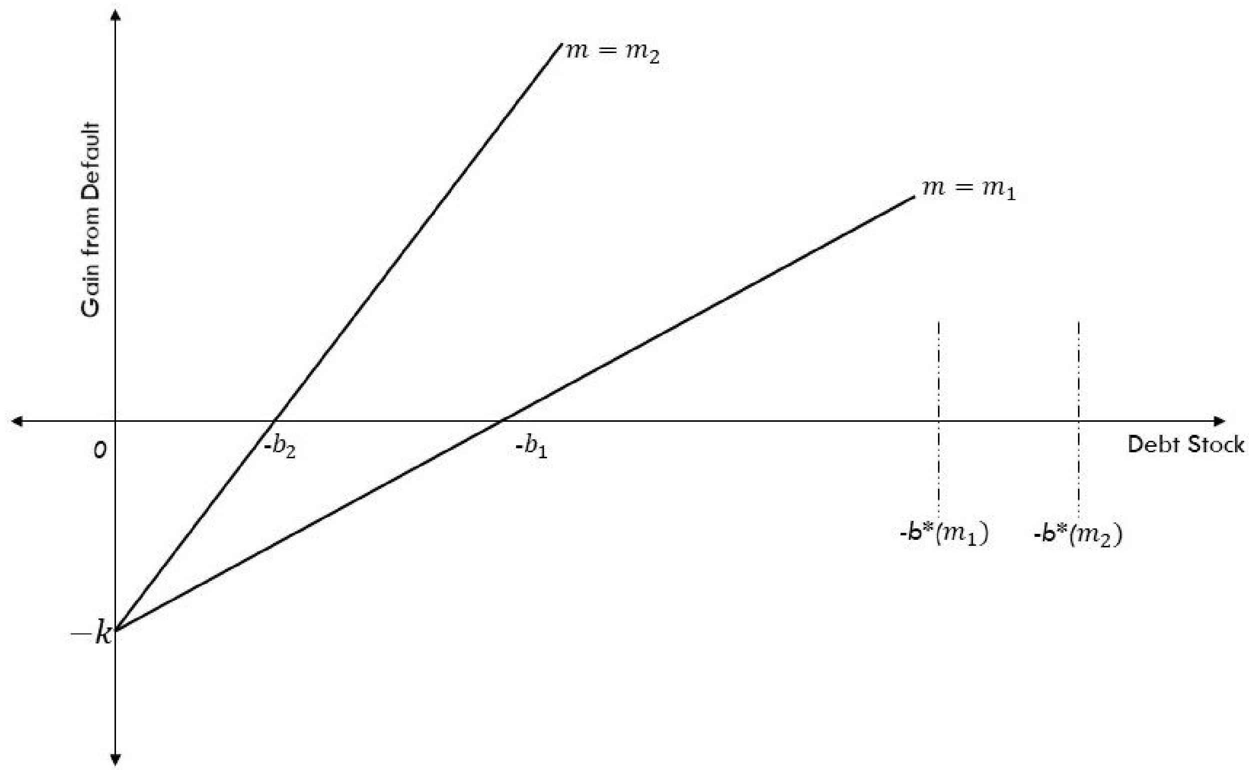


Figure 3: Case 1

Figure 3 plots the gain from default for the two economies characterized by different *mwc*s. Since the government's budget in both the economies is unconstrained, the governments in both economies use the resources released from default to provide local public goods. None of the policies, except for local public good provision differ between the economies. Thus, the gain in both the economies can be denoted by $-\frac{b}{m_i} - k$, $\forall i = 1, 2$. The government with a lower *mwc* has a higher default incentive, and hence sustains a lower level of debt. The government with $m = m_1$ can sustain $-b_1$ debt, while the government with $m = m_2$ can sustain $-b_2$ debt before it defaults.

5.2.3 Case 2

Let (z, b) be such that $z > z^*(m_1) > z^*(m_2)$, but $b^*(m_1)$ is small enough to constrain the budget of the government with $m = m_1$[13]. The assets for the government with $m = m_2$ is the same as in Case 1. In this case, both the governments provide local public goods in default, but only the government with $m = m_2$ provides local public goods in repayment.

Figure 4 plots the gains from default for these two economies. For $m = m_2$, the gains are linear, the same as in Case 1. However, for $m = m_1$ the government's budget is constrained if the debt level rises above $-b_1(m_1)$. For debt levels lower than $-b^*(m_1)$, gains are linear since the marginal benefit from the defaultable resources is constant. For higher levels of debt, the marginal value of resources released by default is higher than $\frac{1}{m_1}$, and increases with higher levels of debt. This

[13]Follows from Lemma 2.

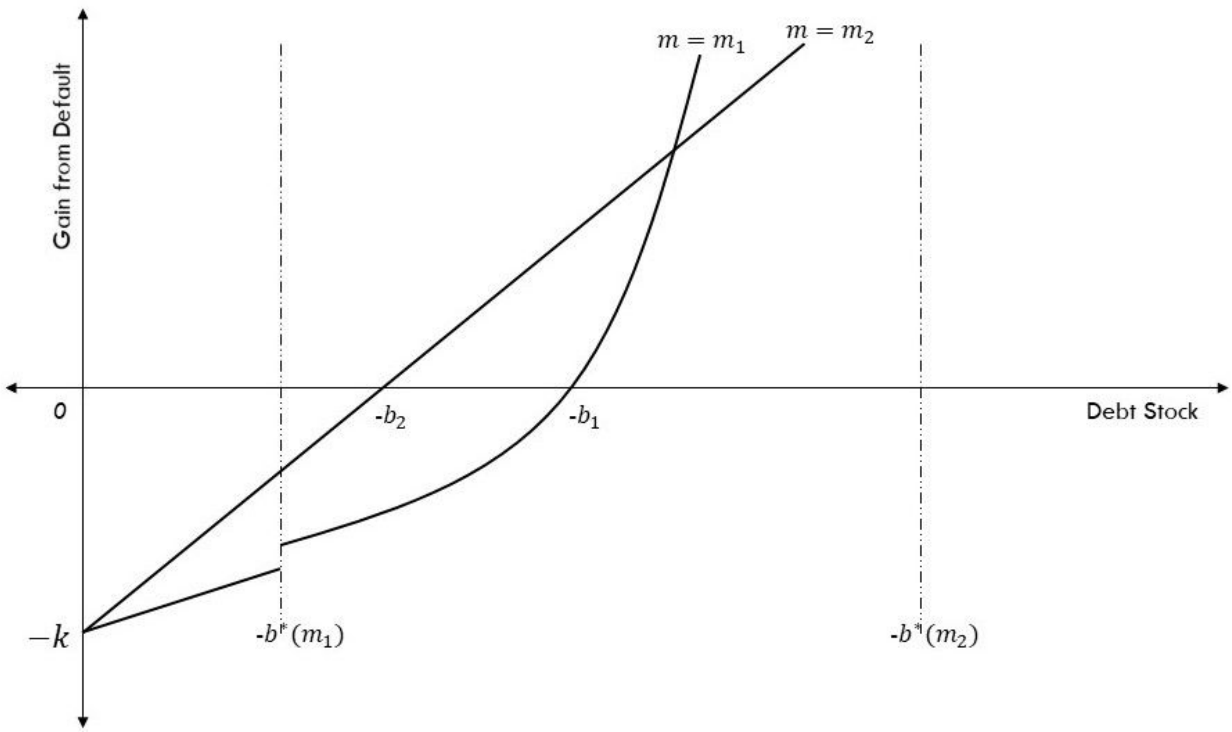


Figure 4: Case 2

explains the convex rise in gains from default for the government with $m = m_2$. Still, the higher *mwc* government sustains a higher level of debt before it defaults ($-b_1$).

For the same state as in Case 2, if default is costlier, $k' > k$, then gains from default are described in Figure 5. A higher cost of default, k', prevents default for both the governments before they accumulate a much higher stock of debt. However, the bigger *mwc* enjoys more gains from defaulting at higher debt stocks, since its budget is constrained and has a higher marginal value of resources. Higher gains from default can induce the $m = m_1$ government to default at a much lower level of debt. This is an example of a situation where a higher cost of default makes bigger coalitions default more frequently than smaller ones.

5.2.4 Case 3

Consider the case where z is such that $z^*(m_1) > z^*(m_2) > z$. In this case, local public goods are not provided in default, as is evident from lemma 1. In the one-period model environment, this also implies that there is no local public good provision in repayment. This implies that (from Lemma 2), $b^*(m_1)$ and $b^*(m_2)$ are both bigger than 0. It follows that the fiscal policies in both repayment and default are the same for both the economies. In this situation, the gains from default can be summarized by Figure 6. Since all the fiscal policies are the same, the gains from default for both the governments coincide in this case. Both the governments can sustain the same debt stock $-b_1 = b_2$.

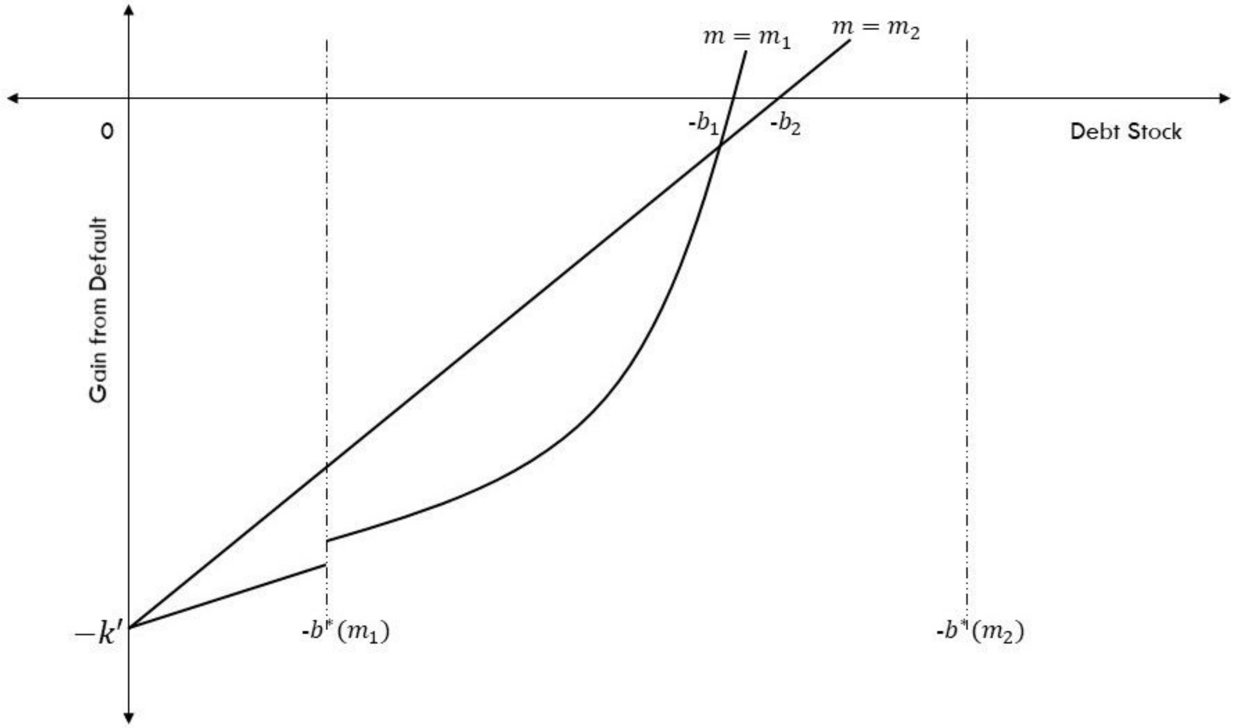


Figure 5: Costlier Default

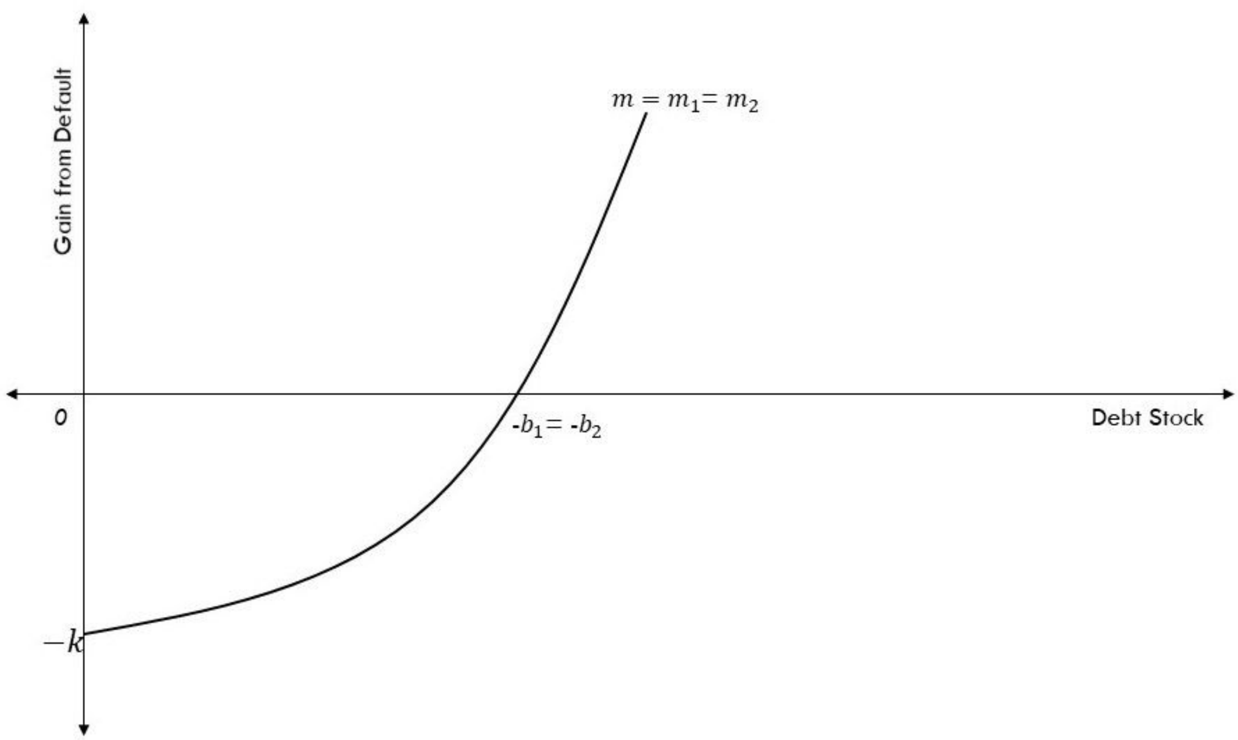


Figure 6: Case 3

Table 1: Calibrated Parameters

Parameter	**Value**	**Target**	**Description**
σ	2		CRRA
γ	0.5		Frisch Elasticity
r	0.01		90 day U.S. Treasury
θ	0.038	6.5 Years of Exclusion	
ρ	0.949	Detrended Real GDP	AR(1)
σ_ϵ	0.023	Volatility of Real GDP	AR(1)
β	0.891	$\frac{\text{Debt Service}}{\text{GDP}} = 0.053$	Jointly Calibrated
m	31	Immediate GDP Drop = -0.08	Jointly Calibrated
α_0	-0.746	$\mathbb{E}(\text{Spreads}) = 8.15\%$	Jointly Calibrated
α_1	0.773	$sd(\text{Spreads}) = 4.43$	Jointly Calibrated
π	11.0	$\frac{\text{g}}{\text{Y}} = 0.16$	Jointly Calibrated

Note that the one-period model only informs about the *static* incentives of default induced by the political constraints, for a given level of debt stock. The dynamic channel is explained later in the quantitative section.

6 Quantitative Results

This section summarizes the calibration technique and the quantitative results. First, I describe the calibration technique used. Then, I use the model simulations to explain the *dynamic channel* described before and perform comparative static exercises by changing the parameter of interest, m.

6.1 Calibration

I calibrate the model to Argentina for the period 1992 Q2 to 2001 Q4. This is the run-up to the 2001 default episode. I use quarterly data on real GDP, consumption, and trade balance (TB) as a share of GDP from Chatterjee and Eyigungor (2012). The data on government spending is at an annual frequency and is retrieved from the World Bank website. For tax rates, I use annual Government Revenue (without grants) as a percentage of GDP from the World Bank. The series on real consumption, real GDP, real government spending, and government revenue are seasonally adjusted, logged and linearly detrended.

Table 1 reports the calibrated parameters and their respective targets in the data. A period is one quarter. The risk aversion parameter in the utility function σ is set to 2, as is common in the literature. The Frisch elasticity of labor supply γ is set to 0.5. This is a conservative choice, given the wide range of values for labor supply elasticity found in the literature. The exogenous productivity shock is assumed to follow an $AR(1)$ process of the form

$$z_{t+1} = (1-\rho)\mu + \rho z_t + \epsilon_{t+1} \tag{23}$$

where $E\epsilon_{t+1} = 0$ and $E\epsilon_{t+1}^2 = \sigma_\epsilon^2$. The income process parameters ρ and σ_ϵ are chosen by fitting the above AR(1) process to the detrended real GDP series given the elasticity of labor supply. The fitted $AR(1)$ process is discretized to 201 possible realizations of the productivity shock using Tauchen and Hussey (1991). I use 100 equally spaced grid points for the borrowing level ranging from 0 to 200 percent of average GDP in the model.

The probability of re-entry into the market following default, θ is set to 0.0385, following Chatterjee and Eyigungor (2012). This is approximately equal to $\frac{1}{\theta} \cong 26$ quarters (6.5 years) of exclusion from the financial markets after a default event. Gelos et al. (2011) use microdata on the time a sovereign spends between default and resumption of market access. On average, they find the period to be 4.7 years long. Richmond and Dias (2009) and Cruces and Trebesch (2013) also estimate the time spent in exclusion by a country after default. As opposed to Gelos et al. (2011), they calculate the period of exclusion as the time between the official end of default and the resumption of market participation. After adjusting for the average time spent by a country *in* default, the average estimate of these studies is 13.1 years of exclusion. Our estimate is conservative and lies between these two. Also, the model results are little sensitive to the exclusion parameter, hence our assumption is robust to other choices of θ.

The risk-free interest rate r is set to 1 percent. It is matched to the 3-month U.S. Treasury bill interest rate for the period under consideration. The discount factor β is calibrated to match the debt-service to GDP ratio. α_0 is calibrated to match the immediate loss in output during default. This is calculated as the average difference in output between the period before default and three consecutive periods into default, if the default lasts for more than or equal to three periods. α_1 is calibrated to match the standard deviation of annualized spreads for the period between 1992 Q2 to 2001 Q4. m is calibrated to match the mean of annualized spreads in the same period. π is calibrated to match the ratio of government spending to GDP in the data. n is set to 100. m, β, α_0, α_1 and π are jointly calibrated by minimizing a quadratic loss function. The model is simulated for the endogenous allocations, consumption, GDP, TB as a share of GDP, spreads, taxes, government spending, and transfers for one million model periods. The values of the initial and final five thousand periods are discarded. Then, the moments for debt service ratio, the mean and standard deviation of spreads, and the government spending to output ratio are computed for forty model periods, conditional on no default, and leading up to a default event in the forty-first period. These moments are matched to those in the data to pin down the parameter values.

Table 2: Business Cycle Statistics: Model versus Data

Moment	Data	Benchmark
$\frac{\sigma(c)}{\sigma(GDP)}$	1.09	1.25
$\sigma(c)$	0.079	0.086
$\sigma(GDP)$	0.072	0.068
$\rho(r-r^{*}, GDP)$	-0.79	-0.17
$\rho(\frac{TB}{GDP}, GDP)$	-0.88	-0.45
$\rho(GDP, c)$	0.98	0.92
$\rho(GDP, g)$	0.67	0.88
$\rho(GDP, tax)$	-0.21	-0.33
$\mathbb{E}(r-r*)$	8.15%	7.69%
$\sigma(r-r*)$	4.40%	5.89%
$\frac{\mathrm{b}}{\mathrm{GDP}}$	0.053	0.049
$\frac{\mathrm{g}}{\mathrm{GDP}}$	0.17	0.17
Output Loss	8.0%	6.5%

6.2 Benchmark Results: Pro-Cyclicality of Fiscal Policies

Table 2 reports the results from the benchmark calibration. The first column lists the moments of interest. The second column is the data counterpart of the model generated moments and, the third column lists the moments generated from the benchmark model.

The moments targeted in the calibration are listed below the horizontal line in the table. The calibration matches $\mathbb{E}(r-r^{*})$, σ(Spreads), $\frac{\mathrm{g}}{\mathrm{GDP}}$ and $\frac{\mathrm{b}}{\mathrm{GDP}}$ reasonably well. However, it misses the median output loss in default by more than one percentage point. Using debt-service to GDP ratio in place of the debt-to-GDP ratio is usual in a model with short term debt.

The correlation coefficients between GDP and taxes and, GDP and TB are negative. The correlation between GDP and pure public goods spending is positive. This reflects the pro-cyclicality of fiscal policies in the model. This is common in emerging market economies. The correlation coefficient between GDP and spreads in the model is negative and matches the data.

The allocation of local public goods is also pro-cyclical[14]. It is easy to see the intuition from the one-period model in Section 5. Following Lemma 2, a high z, for a given asset level b implies that the government's budget is not constrained. In the full model, when the government is allowed to borrow, counter-cyclical spreads create incentives to borrow in good times. This increases the

[14] I do not have data on local public goods. There is no unique way of decomposing government spending into pure and local public good spending. Furthermore, data on the separate heads under which government resources are allocated are not easily available.

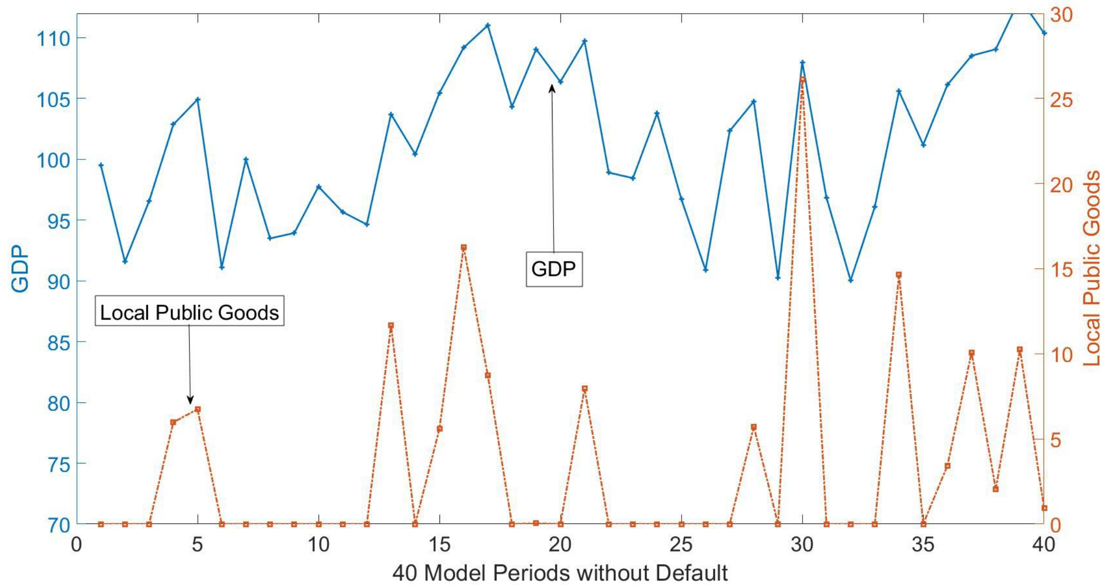


Figure 7: Simulated Local Public Goods

surplus in the government's budget, which is used to finance local public goods. However, in times with low z, the international lenders charge higher interest rates anticipating a higher chance of future default. The lower shock itself decreases the tax revenue. This leaves little room for surplus revenues to be distributed as local public goods from the government's budget.

Figure 7 plots a simulated series for pure public good provision for forty model periods, conditional on no default. The solid (blue) line plots the GDP and, the dot-dashed (red) line plots the series of local public goods. The plot confirms the pro-cyclicality of the local public goods. Figure 8 plots the local public goods policy function of the government for three realizations of the productivity shock. The plot shows that, for any given level of debt, local public good provision is highest in periods with higher z.

Figure 9 plots the interest rates faced by government for the debt issued in the current period, for three values of the productivity shock. The outermost line represents the highest shock. If the government receives a high shock in the current period, the international lenders expect the shock to persist, and are willing to lend a greater amount of resources at the risk-free rate compared to the lower shocks in the figure. However, for lower realizations of the current productivity shock, interest rates rise fast even for lower new debt issuance.

6.3 Effect of Political Constraints on Default Incentives

I change the parameter m to the lower value of 20 and the higher than benchmark value of 75 to study the effect of political constraints in this model.

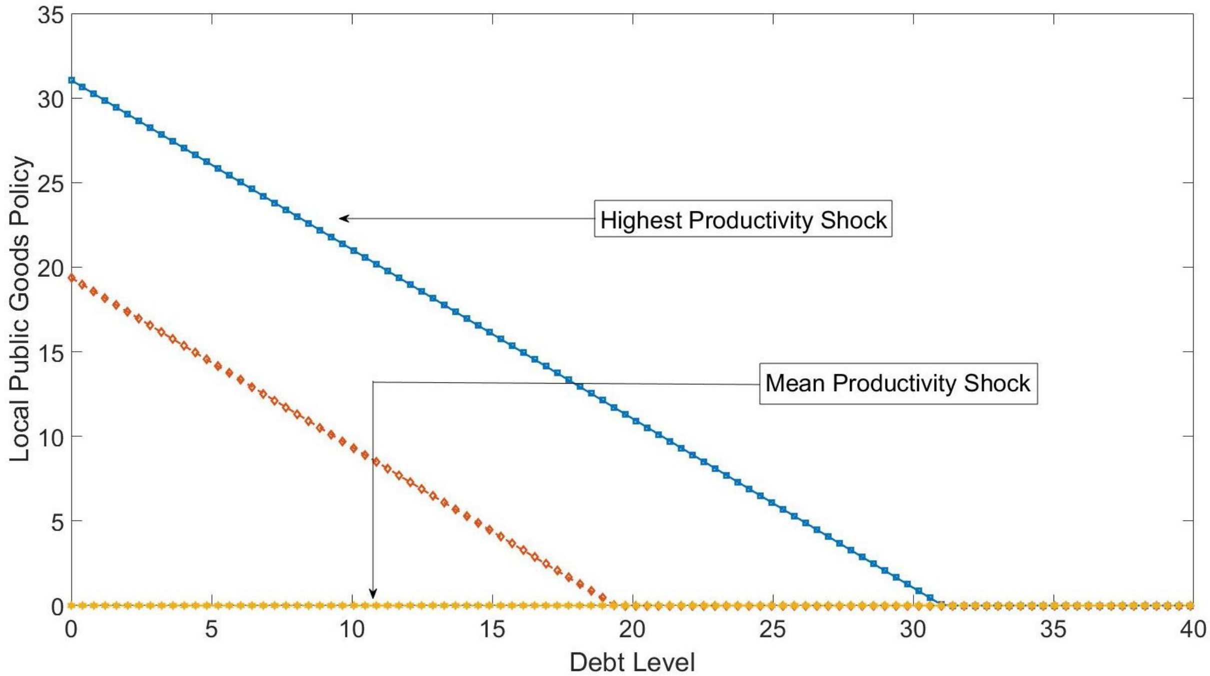


Figure 8: Local Public Goods Policy

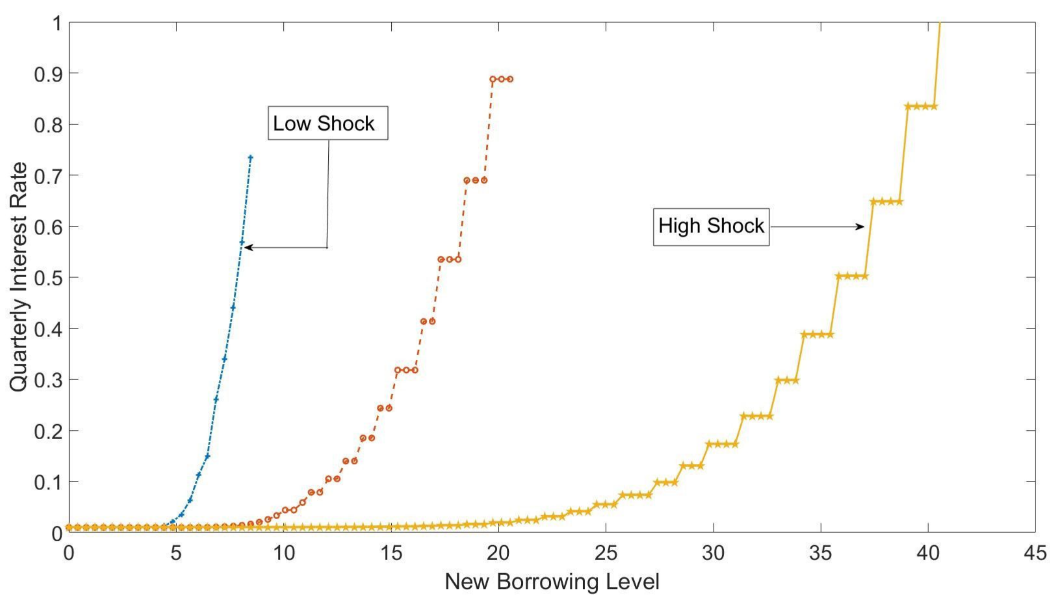


Figure 9: Interest Rate Schedule

Table 3: Comparing Fiscal Policies Across Political Constraints

Moment	**Benchmark**	**m=75**	**m=20**
$\frac{\sigma(\text{c})}{\sigma(\text{GDP})}$	1.25	1.23	0.82
$\sigma(\text{c})$	0.086	0.086	0.053
$\sigma(\text{GDP})$	0.068	0.070	0.064
$\rho(r - r*, \text{GDP})$	-0.17	-0.37	-0.08
$\rho(\frac{\text{TB}}{\text{GDP}}, \text{GDP})$	-0.45	-0.49	-0.17
$\rho(\text{GDP}, \text{c})$	0.92	0.96	0.91
$\rho(\text{GDP}, \text{g})$	0.88	0.94	0.76
$\rho(\text{GDP}, \text{tax})$	-0.33	-0.49	0.47
$\mathbb{E}(r - r*)$	7.69%	4.33%	48.1%
$\sigma(r - r*)$	5.89%	4.61%	96.7%
$\frac{\text{b}}{\text{GDP}}$	0.049	0.040	0.022
$\frac{\text{g}}{\text{GDP}}$	0.17	0.17	0.10
Output Drop	6.5%	6.5%	4.9%

Table 4: Default Probabilities Across Political Constraints (Costlier Default)

Moment	**m=31**	**m=75**	**m=20**
$\mathbb{E}(r - r*)$	9.03%	9.63%	6.59%
$\sigma(r - r*)$	1.39%	1.44%	9.43%

In what follows, first, I discuss the differences in cyclical properties of the fiscal policies resulting from changes in the political constraints. Then, I discuss the dynamic channel of default incentives and, the *Overborrowing* channel, using the quantitative results.

The differences in the cyclical properties of the fiscal policies are reported in Table 3. It also reproduces the benchmark model results for convenience. The first column reports the cyclical properties of the benchmark model, while the second and third columns report the business cycle properties for the case with $m = 75$, and $m = 20$ respectively. The main takeaway from this table is that the spreads in the calibrated model are negatively related to political constraints. In the model with $m = 75$, the average value of spreads is 4.33 percentage points, a little more than half of that reported in the benchmark. On the other hand, in the model with $m = 20$, spreads are close to 48 percentage points. The volatility of the spreads s also affected by the political constraints. Spreads are more volatile in the model with lower political constraints but decrease with the increase in the degree of political constraints.

Among the other fiscal policies, the debt to GDP ratio is highest in the benchmark. Even though spreads are lower in the $m = 75$ model, the government borrows less. However, for the model with $m = 20$, the urge of the government to over-borrow is disciplined by the international lenders who offer lower prices. Since the probability of default is high for the least constrained government, external borrowing is severely restricted, making the fluctuation of the Trade Balance less correlated with GDP.

Government spending to GDP is least for the model with $m = 20$, and highest for the model with $m = 75$. Finally, taxes are counter-cyclical for the less constrained government. Since borrowing is heavily disciplined by the lenders, borrowed funds cannot replace the tax revenue even in good times. Countercyclical taxes are also responsible for lower fluctuation in consumption and GDP.

Table 4 reports the country spreads and its standard deviations across different values of political constraints in the baseline model if default is arbitrarily costlier in terms of productivity. The value of α_1 is -606 with all the other parameter values constant[15]. This is exactly opposite to the baseline result. Higher degree of political constraints are associated with higher spreads. Intuitively, for the lower m government the entire cost of defaulting is borne by fewer coalition members in terms of lower allocation of local public goods, either in the current period or in future periods of default. This creates repayment incentives for the proposer in more states. However, for the government with a higher m, individual share of the extra cost is negligible. It does not change incentives much.

To see how the overborrowing channel works, consider Figure 10. It plots the borrowing policy function for a government with $m = 75$, and that of a government with $m = 31$, both with the about the average realization of the productivity shock. The government's budget is not constrained for low levels of debt for the $m = 31$ government. The borrowing level, in this case, is higher than the government with unanimity. Since the debt level is low, the less constrained government prefers to overborrow and redistribute the proceeds as local public goods. However, for higher levels of debt, the lenders' disciplining effect dominates and makes debt costlier. This is evident from Table 3 .

Finally, consider the *dynamic* channel. For this purpose, it is best to consider two coalition sizes such that none of them can provide local public good in default in the current period[16]. Since overborrowing involves movement along the bond price schedule, and the dynamic channel involves a shift of the bold price schedule, we can easily isolate *dynamic* channel from *overborrowing*.

Figure 11 plots the local public goods policy functions for a government with $m = 31$, and a government with $m = 75$, for the same productivity shock as in Figure 10. Even though the low m government can provide local public goods to the coalition members at a low level of debt, the high m cannot provide local public goods at all. It is also clear from Figure 11 that none of the governments provide local public goods in default and they default at different levels of debt.

[15] The appendix shows a plot of the default cost function with a higher cost relative to the baseline. The result holds for any value of the parameter that implies a higher productivity cost of default.

[16] This helps in separating the effect of the *static* channel from the *dynamic* channel.

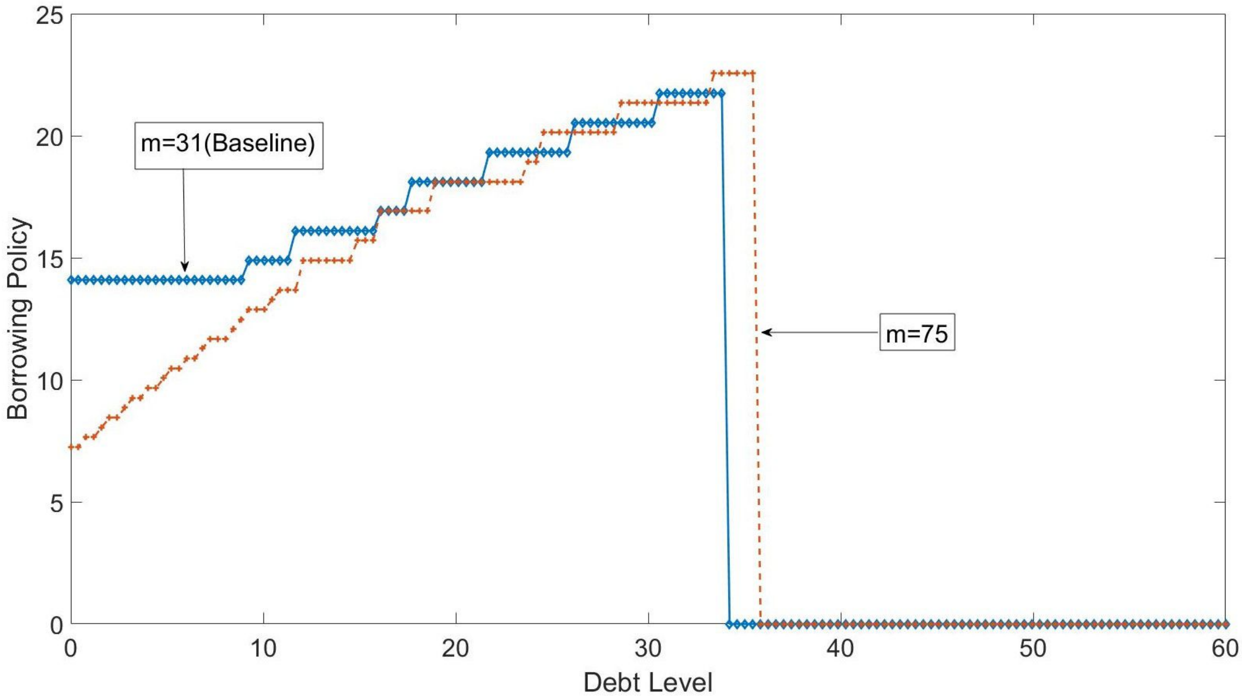


Figure 10: Borrowing Policy Function

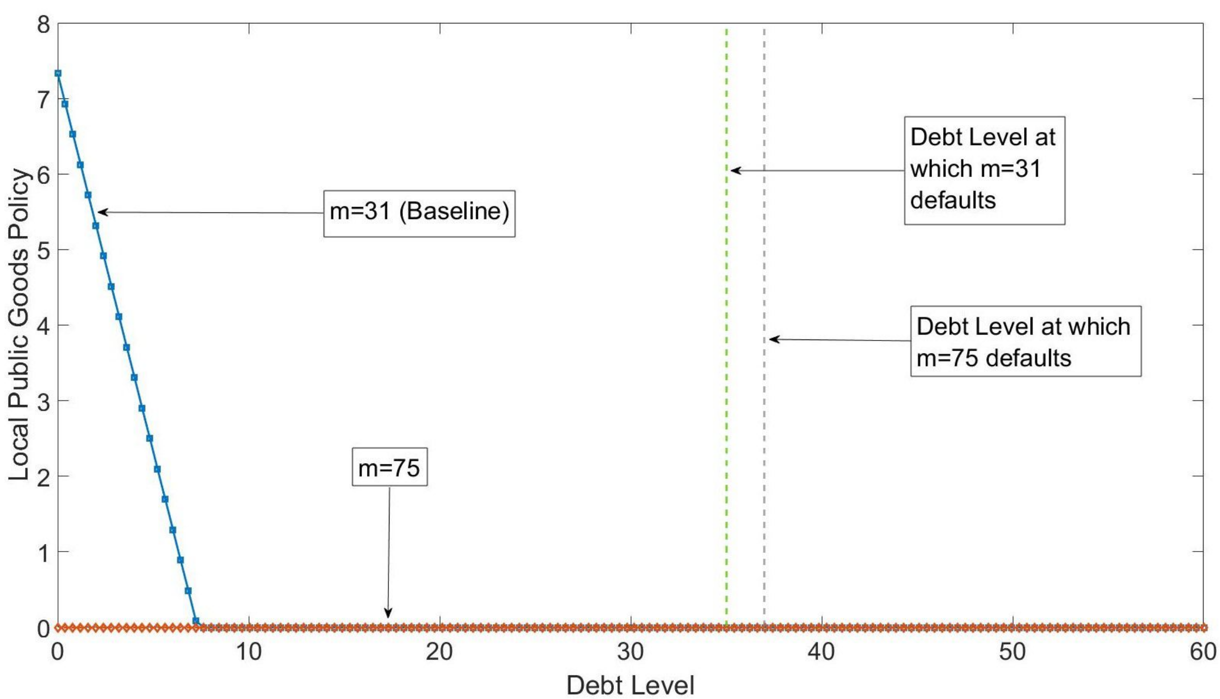


Figure 11: Local Public Goods Policy

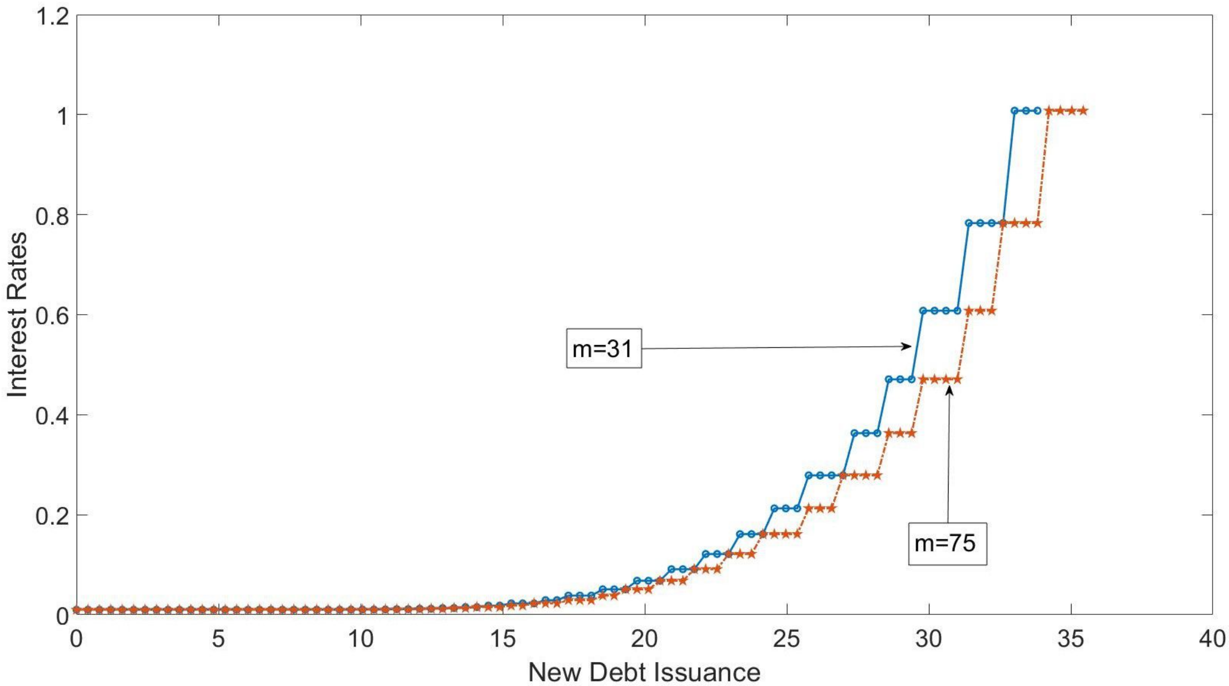


Figure 12: Interest Rate Schedules for Different Degrees of Political Constraints

Figure 12 shows the interest rate schedules for the above two governments, for the average the same shock. For low levels of debt, both governments can borrow risk-free. However, for higher levels of debt, the smaller sized coalition pays a higher interest on the newly issued debt, compared to the bigger one. Why is this the case if there is no *Overborrowing* or *static* incentive present?

In a one-period model, a constrained government budget with no local public good provision for both the ms would imply the same fiscal policies, given that the debt level is the same. But, in the infinite horizon model, the continuation values of the proposers in the two models are different. For the government with lower m, the chances of facing an unconstrained budget, accompanied by local public good spending are higher than the government with higher m. As explained in Section 5, this creates a higher incentive to default in the following period. The lenders anticipate this incentive and price in this additional risk. Lower prices on the newly issued debt in the current period makes the proposer in the $m = 31$ government default at a lower stock of debt.

In the following section, I use this model to conduct a counterfactual event study for the 2001 default event in Argentina.

7 Event Study: Argentina 2001

Argentina defaulted on its external debt in the last quarter of 2001. The value of the defaulted debt was $88 billion and the country continued to stay in default status for the next four years. In this section, I compare the ten years leading up to the default episode in the data to that predicted by the calibrated model. I run a counterfactual experiment with a higher degree of political constraints to see if such an arrangement could have prevented the default. I also compare the other endogenous variables in the benchmark with those in the counterfactual model.

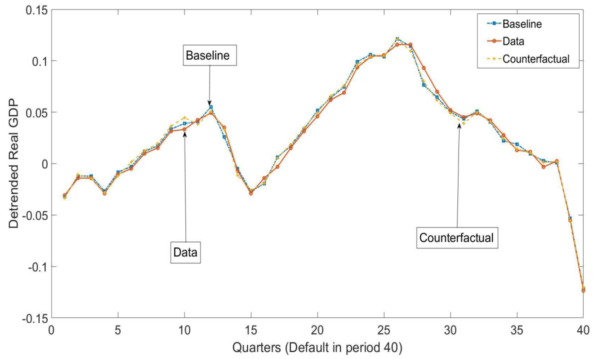
First I find the series of productivity shocks to match the model GDP and the detrended GDP in the data. Then, given the productivity shock in the initial period, I find the amount of outstanding debt such that spreads in the initial period in the model match that in the data. The remaining series for the debt level is generated endogenously, using the policy functions from the benchmark model. Using the series for productivity shocks and the level of debt for the entire period under consideration, other endogenous variables are determined using the corresponding policy functions.

Figure 13 plots the simulated time paths of all the endogenous variables for the period under consideration. In Panel (a), the solid (blue) line is the real GDP series generated by the model, the dashed (red) line is the data. During the default event in 2001, the cyclical component of GDP shows a sharp decline. Since the state variables of the model are matched to mirror the exact behavior, the model predicted GDP behaves exactly in the same way as the data. Panel (b) plots the model and data series for spreads. The solid (blue) line is the model prediction, while the dashed (red) line is the data. The model prediction matches the data reasonably well. Most importantly, the model economy defaults in exactly the same period where the data indicates a default. This is reflected by explosive spreads in the last period. The model economy does not default in any period other than the last one.

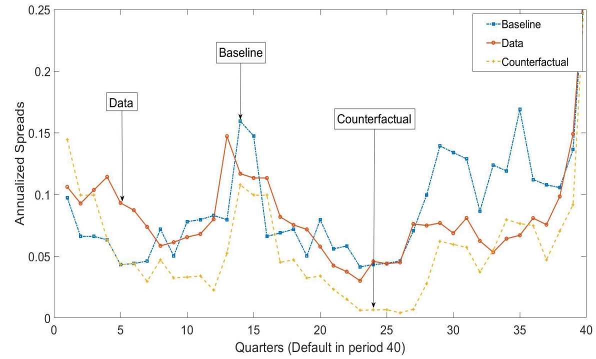
Panels (c) and (d) plot the simulated series for the pure and local public goods in the model economy respectively. Pure public good provision is pro-cyclical as is evident from the solid blue line in panel (c) and local public goods are not provided in any situation. This implies that the government budget is constrained. Panels (e) and (f) plot the tax rates and the simulated paths of labor supply respectively. Panels (g) and (h) plot the new borrowing and the level of consumption. Labor supply and consumption respond to the pro-cyclical government policies.

Had Argentina had a higher degree of political constraints, could it prevent the default in 2001? To answer this question, I use the same sequence of productivity shocks as in the benchmark event study and the same initial debt level. Keeping all the other parameters constant, I increase the political constraints parameter m to its maximum value in the calibration. The productivity shock sequence and the initial debt level are used to find out the remaining debt series. The state variables are then used to compute the counterfactual path for all other endogenous variables.

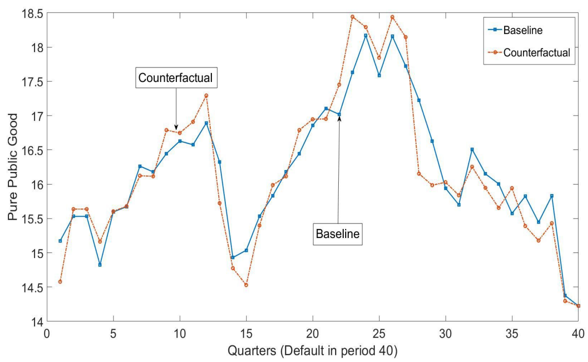
Counterfactual real GDP is represented by the dot-dashed (yellow) line in panel (a) of Figure 13. The spreads are also lower for the counterfactual model (yellow line in panel (b)). This result shows that for the benchmark calibration, a higher degree of political constraints is associated with lower country risk and hence, lower spreads. However, the counterfactual model also shows a default at the same time as the benchmark model, and the data shows a default. Thus, even though the default risk is lower in the counterfactual environment, a huge negative productivity shock in



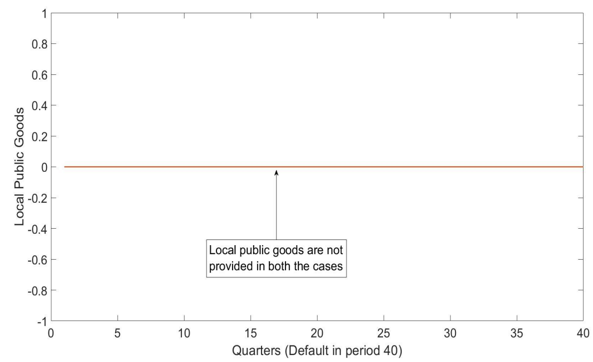
(a) GDP



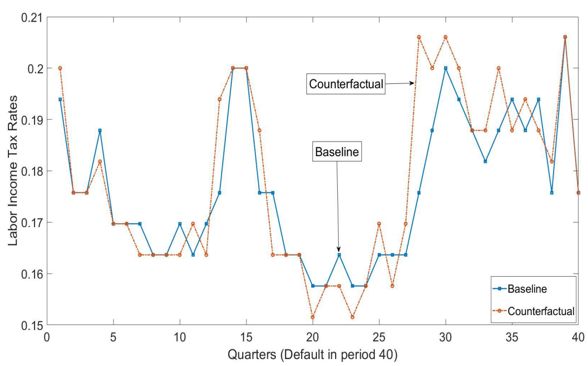
(b) Spreads



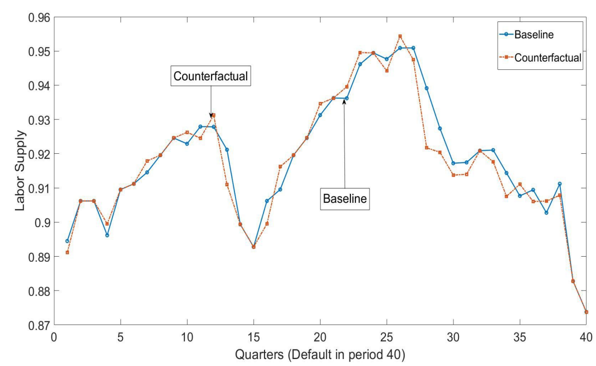
(c) Pure Public Good



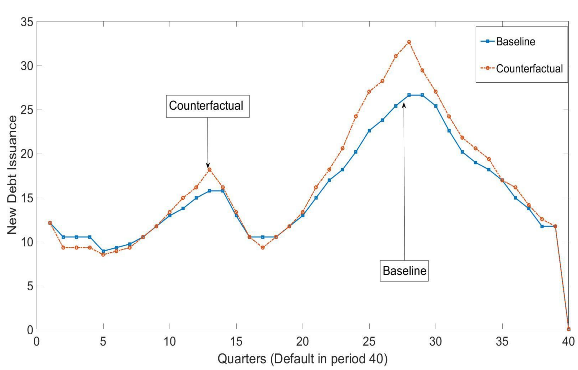
(d) Local Public Good



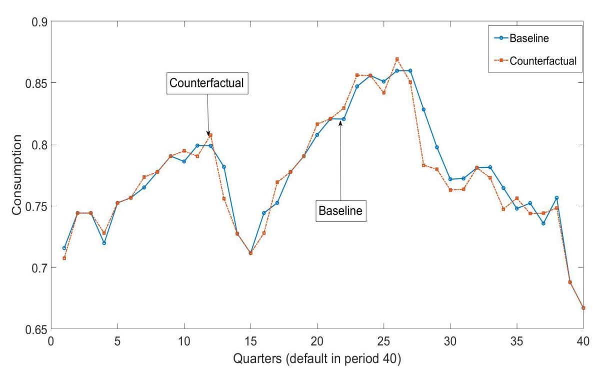
(e) Tax Rates



(f) Labor Supply



(g) Debt Level



(h) Consumption

Figure 13: Endogenous Variables prior to 2001 Argentina Default

the last period forces the government to default. This shows that higher political constraints in Argentina could not have prevented the default.

The dot-dashed (red) lines in panels (c) to (h) show the series for all other endogenous variables in the counterfactual environment. Except for new borrowing and spreads all other variables behave in a similar way as the baseline. In the counterfactual model borrowing is lower in periods of high productivity shock. This shows that the *overborrowing* channel is partially responsible for higher spreads in the baseline.

The event study is also an example of the effect of the *dynamic* channel. Observe that, in the period before default (period 39), both the benchmark and the counterfactual governments' budgets are constrained, as evident from no local public good provision, and the new debt issuance is also the same (as seen in panel(g)). In a one-period world, the fiscal policies of both governments will be exactly similar. In the full model, the more constrained government is less exposed to default risk. International investors pay a higher price for their sovereign bonds.

8 Empirical Evidence

This section summarizes the evidence on the relationship between political constraints and the probability of sovereign default conditional on the output costs associated with default. First I describe the data and summarize the variables used. Then I describe the econometric model based on the above theory and summarize the results.

8.1 Data

I construct a dataset comprising ten South American countries, the Dominican Republic, Mexico, Argentina, Brazil, Peru, Ecuador, Venezuela, Chile, Colombia, and Panama. The sample time period for the panel is 1995 to 2016. The panel is unbalanced with time period ranging from 10 to 22 years. I use the dataset used by Trebesch and Zabel (2017) to obtain the periods of default and the associated output cost for this set of countries. Since their dataset ranges from 1980-2010, it provides a longer window with more default and debt crisis episodes[17]. I focus on South America for my empirical analysis mainly because many of these countries defaulted on their sovereign debt in the past few decades, and hence their spreads and fiscal policy behavior reflect significant default risk. I use only those variables in the regression analysis which are relevant to the above theory. Of course, there can me many more factors that impact default risk. Please refer to Eichler (2014) for a discussion. The variables I use in this empirical study are as follows.

Spreads$_{it}$: Country spreads reflect among other things the probability of a country defaulting on its external sovereign debt. A high spread means higher premium on the interest rate on foreign debt of a country over the benchmark U.S. Treasury bond, considered risk free. According to the

[17]However, I drop Colombia from our data because their last default episode was in 1935

main result in the theoretical part of the paper, higher political constraints are be associated with lower spreads for countries with low output cost of default.

POLCONv_{it}: As an empirical measure for political constraints, I use POLCONv_{it} by Henisz (2000). A higher POLCONv_{it} score means a more constrained government. This variable ranges drom 0 to 1 with 1 meaning the highest degree of executive constraints. According to the calibrated model, a high POLCONv_{it} implies lower Spreads for countries with low cost of default.

XCONST_{it}: This is used as an alternative to POLCONv_{it}. It comes from the POLITY IV database and also captures the degree of executive constraints. This variable ranges from 1 to 7 with 1 meaning unlimited executive authority. Similarly, the theory predicts a negative relationship between Spreads_{it} and XCONST_{it} for countries with low cost of sovereign default.

Low Cost_i: This is an indicator variable that takes a value 1 if the country has low cost of default and 0 otherwise. It is assumed to be fixed for a country, and captures the resilience of a country to recover from episodes of debt crisis. The cost associated with default for a country is determined by the drop in growth rates of per-capita output from the pre-default/debt crisis period to the period when the default or debt crisis starts[18]. I compute the median of all such episodes for each country from 1980 to 2010. All the countries with *median* drop in growth rates above the cross-country median are considered to have low cost of default. Others are considered to be ones with high cost[19].

$(\frac{\text{Debt}}{\text{GDP}})_{it-1}$: It is well established in the literature on sovereign default that a higher existing debt to GDP ratio can increase the probability of default. This is because a high $(\frac{\text{Debt}}{\text{GDP}})_{it-1}$ means a higher payment burden on the government and stress on the government budget. This implies higher spreads.

Growth Rate_{it}: A higher growth rate of nominal GDP implies a higher productivity shock. In these periods, the revenue received by the government is expected to increase. Higher receipts reduce budgetary stress and create an incentive to repay. This is equivalent to the productivity shock in the theory. A higher growth rate should be associated with lower spreads, implying lower probability of default.

[18] I use default and debt crisis interchangeably even though they may be different in a narrower sense of term.

[19] The results are also consistent with other classifications of the output cost of default. Other methods considered are (a) median growth rates for all the default/debt crisis episodes for each country. (b) average difference in growth rates from that of two periods prior to default and three consecutive periods into the default. Note that, as opposed to the measure used in the main text, both these measures additionally capture the growth rates during a protracted default episode as well.

8.2 Model and Results

8.2.1 Econometric Model

I estimate the following models using standard fixed effects regression.

$$\text{Spreads}_{it} = \beta_0 + \beta_1 * \text{Constraints}_{it} * \text{Low Cost}_i + B.X_{it} + C.\text{Year}_t + \alpha_i + u_{it} \tag{24}$$

Equation (24) is the econometric model used to test the relationship between political constraints and the probability of sovereign default. Constraints_{it} represents both XCONST_{it} and POLCONv_{it} and are used in two different specifications. X_{it} represents the control variables relevant to the model. $Year_t$ is a dummy variable that takes the value 1 for a particular year and 0 otherwise. α_i and u_{it} represent the random error terms. α_i is the country-specific unobserved fixed effects. The coefficient of interest is β_1. It is a difference-in-differences estimator and measures the difference in the effect of political constraints on country risk between low and high default cost countries. Since I use a fixed effects specification, the variability of Constraints_{it} is used to identify β_1.

8.2.2 Results

Table 5 presents the regression results associated with equation (24). Column (1) and (2) report the difference-in-differences estimates using POLCONv_{it} as a measure of political constraints. In column (1) the coefficient of interest is -15.352. The value is significant at 1% level. One standard deviation increase in POLCONv_{it} reduces the spreads by 3.37 percentage points, compared to that in high default cost countries. In column (2) I control for the current GDP growth rate, outstanding debt to GDP ratio, and the crisis dummy variable. In years of a debt crisis, country spreads are 6.7 percentage points higher. One standard deviation increase in the lagged debt to GDP ratio increases country spreads by 0.87 percentage points and, a one percentage point increase in the GDP growth rate reduces country spreads by 1.05 percentage points. All these results are consistent with the literature. The coefficient of interest in column (2) does not change much compared to that in (1). A one standard deviation increase in POLCONv_{it} reduces spreads by 2.9 percentage points.

Columns (3) and (4) reports the results of a similar exercise with XCONST_{it} as the measure of political constraints. The coefficient of interest is not significantly different from 0 in column (3). However, in column (4), after controlling for the relevant variables, it is significant at 5 percent level. A one standard deviation increase in XCONST_{it} decreases country spreads by 2.64 percentage points compared to countries with high cost of default. The magnitude is similar to that obtained in columns (1) and (2). Furthermore, the magnitude and signs associated with the other control variables also match those in columns (1) and(2).

Table 5: Fixed effects regressions with time effects, heteroskedasticity robust

	Dependent variable:				
	spreads				
	(1)	(2)	(3)	(4)	(5)
POLCONv	1.955	0.283			
	(1.525)	(1.398)			
Low Cost*POLCONv	-15.352^{***}	-13.182^{***}			
	(5.220)	(4.623)			
XCONST			-0.527^{*}	-0.503^{**}	
			(0.316)	(0.249)	
Low Cost*XCONST			-1.179	-2.819^{**}	
			(1.362)	(1.201)	
$\widehat{\text{POLCON}}$v					-8.645^{**}
					(4.295)
Low Cost*$\widehat{\text{POLCON}}$v					-48.456^{**}
					(20.654)
Crisis		6.768^{***}		7.852^{***}	7.852^{***}
		(1.357)		(1.345)	(1.345)
$\left(\frac{\text{Debt}}{\text{GDP}}\right)_{-1}$		2.824^{**}		3.511^{***}	3.511^{***}
		(1.185)		(1.287)	(1.287)
Growth Rate		-0.261^{**}		-0.277^{**}	-0.277^{**}
		(0.116)		(0.111)	(0.111)
Observations	207	194	207	194	194
R^2	0.259	0.457	0.204	0.458	0.458
Adjusted R^2	0.112	0.333	0.047	0.334	0.334
Country FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓

Note: Data on Spreads and executive constraints are winsorized to remove outliers. *** implies statistical significance at 1% percent level. ** and * implies statistical significance at 5% and 10% level respectively. Heteroskedasticity robust standard errors are reported in the parenthesis.

Column (5) reports the results of an instrumental variables regression where XCONST_{it} is used as an instrument for POLCONv_{it}. $\widehat{\text{POLCON}}\text{v}_{it}$[20] is the predicted value of POLCONv_{it} from the first stage of the 2-SLS regression. Since the two measures of political constraints are computed in two different ways[21], this process eliminates measurement errors associated with each of them. The difference-in-differences estimate is -48.456 and it is significant at a 5% level. One standard deviation increase in the predicted value of POLCONv_{it} reduces spreads by 2.03 percentage points compared to that in countries with high cost of default. The effect of other control variables are similar in magnitude and sign as in columns (2) and (4).

9 Conclusion

This paper studies the relationship between political constraints and the probability of external sovereign debt default. Political constraints affect the default decision through the provision of a region-specific, excludable local public goods. Defaulting on the currently maturing debt is more beneficial for the less constrained government, as it releases resources to be distributed among fewer *mwc* members as local public goods, compared to the more constrained government. This is the static channel of default. Even if local public goods cannot be provided in the current period, less constrained governments are more likely to provide for local public goods in the future. The risk-neutral lenders anticipate this risk and charge higher interest rates on newly issued debt. This is the dynamic channel influencing default in the current period. Finally, the less constrained government finds it more beneficial to borrow more, simply because the resources are distributed among fewer legislators. Higher borrowing implies lower prices on the debt. This is the Overborrowing channel. The Overborrowing channel is responsible for movement along the bond price schedule, whereas, the static and the dynamic channels cause the bond price schedule to shift inwards for the less constrained government.

Finally, I also find that if the marginal value of the defaulted resources is very high, the less constrained government can sustain higher debt levels. This is the case if the productivity cost of default is too high. In this case, static and dynamic channel results overturn, while overborrowing still makes the more constrained government to default less frequently. The model is calibrated to Argentina and generates a negative relationship between political constraints and spreads. I also find the same relationship in a sample of South American countries. The business cycle statistics generated from the benchmark model are in line with the existing default literature. A counterfactual experiment on the Argentine default event of 2001 is conducted using higher political constraints. Results show that even the maximum degree of political constraints could not have prevented the default.

[20]Subscripts *it* are suppressed in Table 5 for convenience.

[21]Refer to Henisz (2000) and the POLITY IV database for details.

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A Figures

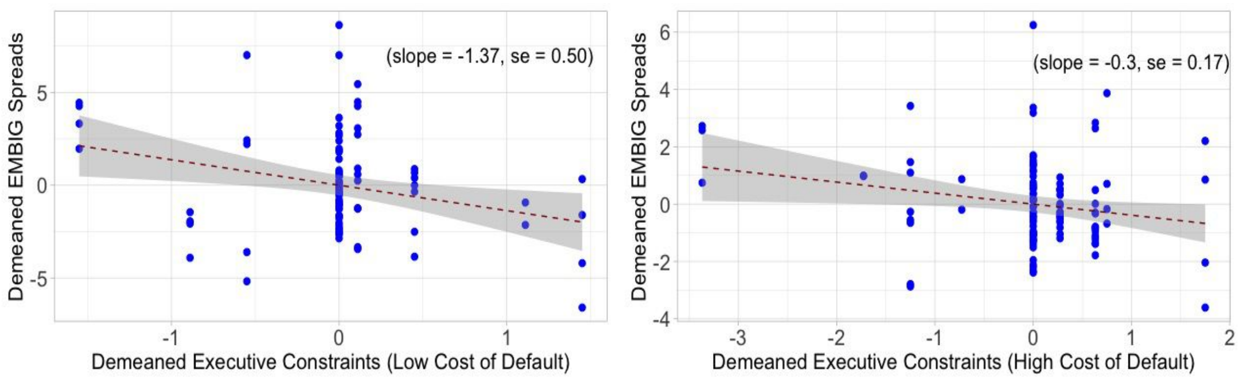

Figure 14: Relationship between Executive Constraints (XCONST) and country spreads

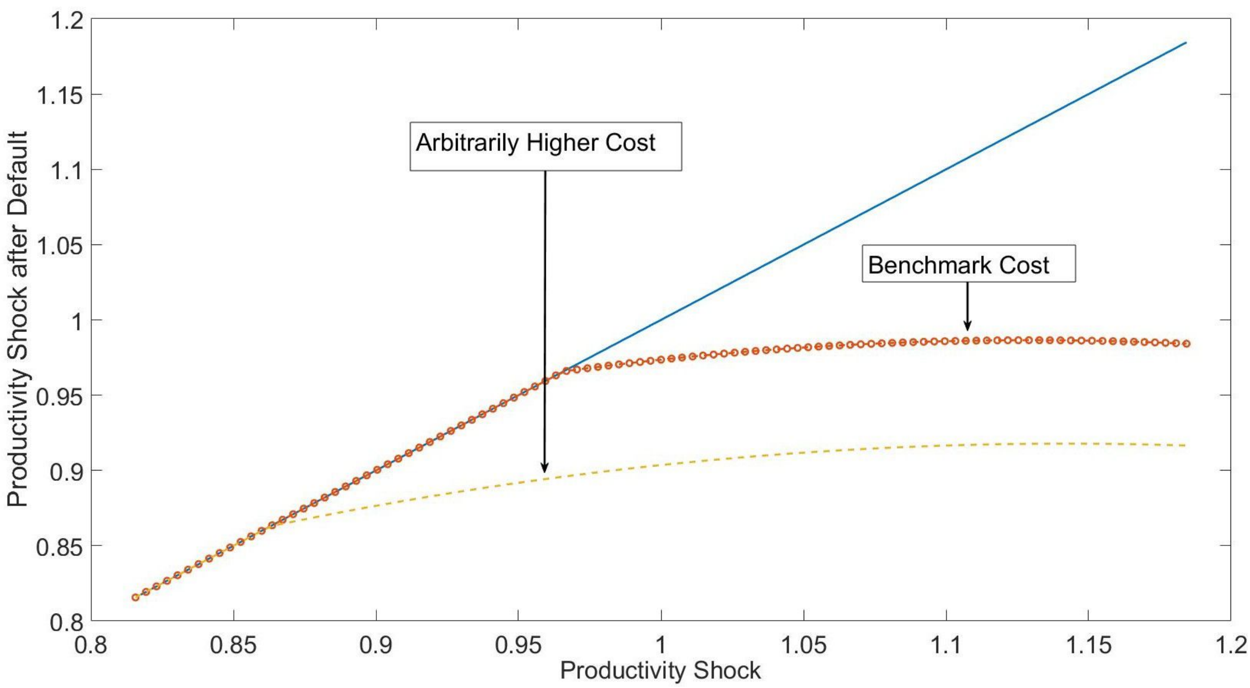

Figure 15: Productivity Costs of Default

B Proof of Proposition 1

The proof is similar to Battaglini and Coate (2008). I show that the proposer effectively maximizes the joint utility of m coalition members who vote in favour of his policies. The main assumption behind this result is that utility is transferable across legislators in the form of local public goods. In what follows, I provide the proof for the problem of the proposer if he decides to repay in a given period. The one where he decides to default, or enters a period already in default are similar.

Proof. Let us start with proposal round T. The proposer's problem if he repays in a period with state Π is given as

$$\begin{aligned} V_c^T(\Pi) = \quad & \max_{\{\tau,g,s,b'\}} U(c,l^*,g) + B(\tau,g,b';\Pi) - (m-1)s + \beta E_{z'} J_0(\Pi') \\ \text{s.t.} \quad & c = (1-\tau)zl^* \\ & U(c,l^*,g) + s + \beta E_{z'} J_0(\Pi') \geq J_0^{T+1}(\Pi) \\ & B(\tau,l^*,g) \geq (m-1)s \\ & s \geq 0 \end{aligned} \tag{B.1}$$

If $\{\tau_T, g_T, b'_T, s_T\}$ solves the above proposer's problem, then I prove that $\{\tau_T, g_T, b'_T\}$ solves the equivalent problem as mentioned in the main text.

$$\begin{aligned} H_c^T(\Pi) = \quad & \max_{\{\tau,g,b'\}} U(c,l^*,g) + \frac{B(\tau,g,b';\Pi)}{m} + \beta E_{z'} J_0(\Pi') \\ \text{s.t.} \quad & c = (1-\tau)zl^* \\ & B(\tau,l^*,g) \geq 0 \end{aligned} \tag{B.2}$$

Furthermore, the local public good provision to the coalition members is given as $s_T = J_0^{T+1}(\Pi) - U(c,l^*,g) - \beta E_{z'} J_0(\Pi')$.

Given the state Π, the equivalent problem can be multiplied throughout by m to obtain the following problem.

$$\begin{aligned} & \max_{\{\tau,g,b'\}} m[U(c,l^*,g) + +\beta E_{z'} J_0(\Pi')] + B(\tau,g,b';\Pi) \\ \text{s.t.} \quad & c = (1-\tau)zl^* \\ & B(\tau,l^*,g) \geq 0 \end{aligned} \tag{B.3}$$

First, it is easy to verify from the proposer's problem that $s_T = J_0^{T+1}(\Pi) - U(c,l^*,g) - \beta E_{z'} J_0(\Pi')$. Otherwise, from the definition of J_0^{T+1} it must be the case that $s_T > 0$. In this case the proposer can easily find a better allocation by optimally reducing s_T. Eliminating s from the proposer's problem, the proposer's payoff can be written as

$$m[U(c,l^*,g) + \beta E_{z'} J_0(\Pi')] + B(\tau,g,b';\Pi) - (m-1)J_0^{T+1}(\Pi) \tag{B.4}$$

It is important to note that since the proposer cannot control the policies in the next proposal round, he takes $J_0^{T+1}(\Pi)$ as given. Hence the optimal choice of the tuple $\{\tau, g, b'\}$ are independent of the proposal round $\{1, 2, ..., T\}$. Only the local public good provision to the coalition members, s depends on the proposal round.

Assume that $\{\tau_T, g_T, b'_T\}$ does not solve the equivalent problem. Let the allocations $\{\tau_x, g_x, b'_x\}$ maximize the equivalent problem. Further assume that $s_x = J_0^{T+1}(\Pi) - U(c_x, l_x^*, g_x) - \beta E_{z'} J_0(\Pi')$. Here $c_x = c(\tau_x, z)$, and $l_x^* = l^*(z, \tau_x)$. By construction, the incentive compatibility constraint of the coalition members is satisfied. From the definition of J_0^{T+1}, $s_x \geq 0$. Finally, we need to verify if $B(\tau_x, g_x, b'_x; \Pi) - (m-1)s_x \geq 0$. Eliminating s_x from this expression yields

$$
\begin{aligned}
B(\tau_x, g_x, b'_x; \Pi) - (m-1)s_x &= (m-1)[U(c_x, l_x^*, g_x) + \beta E_{z'} J_0(\Pi')] \\
&\quad + B(\tau_x, g_x, b'_x; \Pi) - (m-1)J_0^{T+1}(\Pi) \\
&= m[U(c_x, l_x^*, g_x) + \beta E_{z'} J_0(\Pi')] + B(\tau_x, g_x, b'_x; \Pi) \\
&\quad - (m-1)J_0^{T+1}(\Pi) - J_0^{T+1}(\Pi) + s_x \geq 0 \qquad \text{(B.5)}
\end{aligned}
$$

The last inequality follows from the fact that $\{\tau_x, g_x, b'_x\}$ maximizes the equivalent problem summarized by the first two terms on the left hand size of the inequality, the definition of J_0^{T+1} and $s_x \geq 0$. Thus the policy tuple $\{\tau_x, g_x, b'_x, s_x\}$ is feasible and provides a better payoff to the proposer. This is a contradiction.

Consider proposal round $T-1$. The proposer's problem in this round when he decides to repay is

$$
\begin{aligned}
V_c^{T-1}(\Pi) = \quad & \max_{\{\tau, g, s, b'\}} U(c, l^*, g) + B(\tau, g, b'; \Pi) - (m-1)s + \beta E_{z'} J_0(\Pi') \\
\text{s.t.} \quad & c = (1-\tau)zl^* \\
& U(c, l^*, g) + s + \beta E_{z'} J_0(\Pi') \geq J_0^T(\Pi) \\
& B(\tau, l^*, g) \geq (m-1)s \\
& s \geq 0
\end{aligned}
\qquad \text{(B.6)}
$$

The main difference between round T and round $T-1$ is the expected value of the coalition member in case the round $T-1$ negotiations fail. Notice that the value J_0^{T+1} is determined by maximizing the unanimous joint utility of the legislators. I need to show that if $\{\tau_{T-1}, g_{T-1}, b'_{T-1}, s_{T-1}\}$ solve the proposer's problem in round $T-1$, then $\{\tau_{T-1}, g_{T-1}, b'_{T-1}\}$ solves the equivalent problem and $s_{T-1} = J_0^T - U(c, l^*, g) - \beta E_{z'} J_0(\Pi')$.

If I can show that $s_{T-1} = J_0^T - U(c, l^*, g) - \beta E_{z'} J_0(\Pi')$, then the proof for the rest of the rounds $\{1, 2, ..., T-1\}$ follows easily from the previous argument. To prove by contradiction, let us assume that $s_{T-1} > J_0^T - U(c, l^*, g) - \beta E_{z'} J_0(\Pi')$. Therefore, it must be the case that $s_{T-1} = 0$. Otherwise, if $s_{T-1} \geq 0$, the proposer can obtain a better allocation by reducing the transfer of local public goods s_{T-1}. This implies

$$J_0^T(\Pi) < U(c_{T-1}, l_{T-1}^*, g_{T-1}) - \beta E_{z'} J_0(\Pi') \tag{B.7}$$

where $c_T = c(\tau_{T-1}, z)$ and $l_{T-1}^* = l^*(\tau_{T-1}, z)$. Thus, we can rewrite the proposer's original problem to include $s_{T-1} = 0$. $\{\tau_{T-1}, g_{T-1}, b'_{T-1}\}$ must solve

$$\begin{aligned} &\max_{\{\tau, g, b'\}} U(c, l^*, g) + B(\tau, g, b'; \Pi) + \beta E_{z'} J_0(\Pi') \\ &B(\tau, g, b'; \Pi) \geq 0 \end{aligned} \tag{B.8}$$

Consider a proposal $\{\tau_T, g_T, b'_T, \frac{B(\tau_T, g_T, b'_T); \Pi}{n}\}$. This proposal satisfies all the constraints of the proposer's problem in round $T-1$. The incentive compatibility constraint holds with equality. The payoff of the proposer with these policies is

$$m[U(c_T, l_T^*, g_T) + \beta E_{z'} J_0(\Pi')] + B(\tau_T, g_T, b'_T; \Pi) - (m-1) J_0^T(\Pi) \tag{B.9}$$

where $c_T = c(\tau_T, z)$ and $l_T^* = l^*(\tau_T, z)$. This policy is strictly larger than

$$\begin{aligned} m[U(c_T, l_T^*, g_T) + \beta E_{z'} J_0(\Pi')] + B(\tau_T, g_T, b'_T; \Pi) \\ - (m-1)[U(c_{T-1}, l_{T-1}^*, g_{T-1}) - \beta E_{z'} J_0(\Pi')] \end{aligned} \tag{B.10}$$

On the other hand, the optimal payoff of the proposer in proposal round $T-1$ is

$$U(c_{T-1}, l_{T-1}^*, g_{T-1}) + B(\tau_{T-1}, g_{T-1}, b'_{T-1}; \Pi) + \beta E_{z'} J_0(\Pi') \tag{B.11}$$

Therefore, the following inequality must hold.

$$\begin{aligned} U(c_{T-1}, l_{T-1}^*, g_{T-1}) + B(\tau_{T-1}, g_{T-1}, b'_{T-1}; \Pi) + \beta E_{z'} J_0(\Pi') \geq \\ m[U(c_T, l_T^*, g_T) + \beta E_{z'} J_0(\Pi')] + B(\tau_T, g_T, b'_T; \Pi) \\ - (m-1)[U(c_{T-1}, l_{T-1}^*, g_{T-1}) - \beta E_{z'} J_0(\Pi')] \end{aligned} \tag{B.12}$$

This further implies that

$$\begin{aligned} m[U(c_{T-1}, l_{T-1}^*, g_{T-1}) + \beta E_{z'} J_0(\Pi')] + B(\tau_{T-1}, g_{T-1}, b'_{T-1}; \Pi) \geq \\ m[U(c_T, l_T^*, g_T) + \beta E_{z'} J_0(\Pi')] + B(\tau_T, g_T, b'_T; \Pi) \end{aligned}$$

But this is impossible since $\{\tau_T, g_T, b'_T\}$ maximizes the equivalent problem given the value expected by the coalition members in the following period.

The same logic can be applied for the other proposal rounds as well as for the proposer's problem in default. □

C Proof of Lemma 1

Lemma 1 characterizes the behavior of the one-period model when the government decides to default or enters the period already in default. According to the timing of events in the model, in both these situations, b=b'=0 in the event of default.

Proof. Incorporating the equilibrium form of labor supply into the objective function, the period utility function can be simplified in the following way.

$$U(\tau, g) = \frac{1}{1-\sigma}[\frac{\gamma}{1-\gamma}(1-\tau)z^{\frac{1+\gamma}{\gamma}}]^{1-\sigma} + \frac{1}{1-\sigma}g^{1-\sigma} \tag{C.1}$$

In default, the government maximizes the above period utility function. Since this is a one-period problem, there is no continuation value for the government. Therefore, the government solves the following problem.

$$\begin{aligned} &\max_{\{\tau,g\}} U(\tau, g) + \frac{B(\tau, g; \Pi)}{m} \\ &\text{s.t.} \quad B(\tau, g; \Pi) \geq 0 \end{aligned} \tag{C.2}$$

$B(.) \geq 0$ is the government's resource constraint. It says that the total pure public good provided by the government in the current period cannot exceed tax revenues.

If the constraint is slack, first order conditions with respect to g yields

$$g^{-\sigma} = \frac{1}{m} \tag{C.3}$$

The left hand side is the marginal benefit from an additional unit of pure public good spending. The corresponding cost is one less unit of local public goods spent out of the budget surplus. Notice that I use the equivalent problem proved in Proposition 1 as the government's problem. Clearly, when the resource constraint is slack, the government provides $g^* = m^{-\frac{1}{\sigma}}$ pure public goods. Any additional unit provided after g^* is costlier for the government. Additional surplus is transferred to the regions as local public goods.

When the government budget binds, that is the proposer's problem can be written as

$$\max_{\{\tau,g\}} \frac{1}{1-\sigma}[\frac{\gamma}{1-\gamma}(1-\tau)z^{\frac{1+\gamma}{\gamma}}]^{1-\sigma} + \frac{1}{1-\sigma}[n\tau z[(1-\tau)z]^{\frac{1}{\gamma}}]^{1-\sigma} \tag{C.4}$$

This is the same period utility function as before, except g is replaced by $n\tau z[(1-\tau)z]^{\frac{1}{\gamma}}$, indicating that the resource constraint binds. First order conditions with respect to τ yields

$$[\frac{\gamma}{1+\gamma}[(1-\tau)z]^{\frac{1+\gamma}{\gamma}}]^{-\sigma}[(1-\tau)z]^{\frac{1}{\gamma}}(-z)+$$
$$[n\tau z[(1-\tau)]^{\frac{1}{\gamma}}]^{-\sigma}[nz[(1-\tau)z]^{\frac{1}{\gamma}}+\frac{n\tau z}{\gamma}[(1-\tau)z]^{\frac{1}{\gamma}-1}(-z)]=0 \quad \text{(C.5)}$$

The first term of the above expression is the cost of increasing labor income taxes by 1 unit, assuming that the resource constraint binds. The second and the third terms are the benefit from providing pure public goods. In the margin, the cost and benefit from raising taxes must be equal. Also note that the entire additional tax revenue is use to provide pure public goods in this case. The benefit from providing pure public goods g is bigger than $\frac{1}{m}$, the benefit from providing local public goods.

Collecting z s from the above expression I get

$$z^{-\sigma[\frac{1+\gamma}{\gamma}]}z^{\frac{1+\gamma}{\gamma}}[...]+z^{-\sigma[\frac{1+\gamma}{\gamma}]}[...][z^{\frac{1}{\gamma}+1}[...]+z^{\frac{1}{\gamma}+1}[...]]=0 \quad \text{(C.6)}$$

The z's cancel out. This proves that $\tau=\tau^*$ if the resource constraint binds. Intuitively,when the government is in default and the constraint binds, a higher z impacts the cost and benefit of taxation equally. More specifically, a higher z implies a lower cost of taxation and a lower benefit from using the entire tax revenue as pure public goods.

Thus, when the government's budget is constrained,

$$\begin{aligned} g &= n\tau^* z[(1-\tau^*)z]^{\frac{1}{\gamma}} \\ &= n\tau^* z^{\frac{1+\gamma}{\gamma}}[(1-\tau^*)] \end{aligned} \quad \text{(C.7)}$$

Clearly, $\frac{\partial g}{\partial z}>0$. g continues to rise with z until $g=g^*$.

The first order condition for the proposer's problem with respect to τ, assuming that the resource constraint does not bind is given by the following equation.

$$[\frac{\gamma}{1+\gamma}]^{-\sigma}(1-\tau)^{-\sigma(\frac{1+\gamma}{\gamma})}z^{-\frac{1+\gamma}{\gamma}\sigma}=\frac{1}{m}[n-\frac{1}{1-\tau}] \quad \text{(C.8)}$$

Totally differentiating the above expression with respect to z, I get

$$\frac{\partial\tau}{\partial z}=\frac{[\frac{\gamma}{1+\gamma}]^{-\sigma}(1-\tau)^{-\sigma(\frac{1+\gamma}{\gamma})}[\frac{1+\gamma}{\gamma}\sigma]z^{-(\frac{1+\gamma}{\gamma})\sigma-1}}{\frac{1}{m(1-\tau)^2}+[\frac{\gamma}{1+\gamma}]^{-\sigma}[\sigma(\frac{1+\gamma}{\gamma})](1-\tau)^{-\sigma(\frac{1+\gamma}{\gamma})-1}z^{-\frac{1+\gamma}{\gamma}\sigma}} \quad \text{(C.9)}$$

It can be easily verified that the above expression has a positive sign. Also, note that $\frac{\partial \tau}{\partial z}$ increases with m.

For the behavior of the government surplus, $B(.)$, in default, if the government's budget is unconstrained, pure public good provision $g = g^*$. However, tax rates and tax revenues are both increasing in z, as $\frac{\partial \tau}{\partial z} \geq 0$ and the government operates on the positively sloped part of the Laffer curve. Therefore, in this situation, the surplus is used to provide local public goods, and the provision is increasing in z. This implies that

$$\frac{\partial B}{\partial z} > 0 \tag{C.10}$$

If the government's budget is not constrained, the marginal benefit from providing pure public goods, g is higher then $\frac{1}{m}$. Hence local public good provision is 0.

This far, I have characterized the behavior of the government is two situations, if the government's budget constraint is satisfied with a slack or binds. This is an endogenous outcome. Now I find the condition which determine when the constraint binds.

Define $z^*(m)$ such that

$$n\tau^* z^*(m)^{\frac{1+\gamma}{\gamma}}[(1-\tau^*)] = g^*(m) \tag{C.11}$$

If follows from above that if $z > z^*(m)$, the constraint binds, else it is satisfied at the optimum with a slack. Furthermore, since $g^*(m) = m^{-\frac{1}{\sigma}}$, $g^*(m)$ is increasing in m. This implies that $z^*(m)$ is increasing in m.

□

D Proof of Lemma 2

Lemma 2 summarizes the behavior of the one-period model when the government decides to repay its existing debt, $-b$. We continue with our assumption of of equal utility weights on pure public good spending and the consumption-leisure part of the utility function. Since this is a one-period model, the government cannot borrow or save. Hence, $b' = 0$.

Proof. Similar to the proof of Lemma 1, we incorporate the equilibrium labor supply into the objective function. The simplified period utility function is:

$$U(\tau, g) = \frac{1}{1-\sigma}[\frac{\gamma}{1+\gamma}[(1-\tau)z]^{\frac{1+\gamma}{\gamma}}]^{1-\sigma} + \frac{1}{1-\sigma}g^{1-\sigma} \tag{D.1}$$

The government maximizes

$$\max_{\{\tau,g\}} U(\tau, g) + \frac{B(\tau, g; \Pi)}{m} \tag{D.2}$$

subject to the constraint $B(\tau, g; \Pi) \geq 0$, where $B(\tau, g; \Pi) = n\tau z[(1-\tau)z]^{\frac{1}{\gamma}} - g + b$.

Start with the pure public spending. If the government's resource constraint is slack, then the first order condition yields $g^{-\sigma} = \frac{1}{m}$. Thus, when the resource constraint is slack, the amount of pure public good provision is $g^* = m^{-\frac{1}{\sigma}}$. Beyond this point, it is optimal for the government to provide local public goods instead of pure public goods. Hence, higher assets (b) keeps g^* unchanged.

When the government's resource constraint is slack, then first order conditions with respect to taxes, τ is same as that in Lemma 1. This equation is independent of b. Therefore, $\frac{\partial \tau}{\partial b} = 0$ and, $\tau = \tau^{**}$.

When the government's budget constraint binds, then we can write pure public good spending as $g = n\tau z[(1-\tau)z]^{\frac{1}{\gamma}} + b$, that is, the entire tax revenue net of debt payment is used to provide for pure public good spending. In this case, the government's maximization problem is

$$\max_{\tau} \frac{1}{1-\sigma}[\frac{\gamma}{1+\gamma}[(1-\tau)z]^{\frac{1+\gamma}{\gamma}}]^{1-\sigma} + \frac{1}{1-\sigma}[n\tau z[(1-\tau)z]^{\frac{1}{\gamma}} + b]^{1-\sigma} \tag{D.3}$$

First order conditions with respect to τ yields

$$\underbrace{[\frac{\gamma}{1+\gamma}]^{-\sigma}[(1-\tau)z]^{\frac{-\sigma(1+\gamma)}{\gamma}}}_{\text{Marginal Cost of Taxation}} - \underbrace{[n\tau z[(1-\tau)z]^{\frac{1}{\gamma}} + b]^{-\sigma}}_{\text{Marginal Utility of Pure Public Goods}} \underbrace{n[1 - \frac{\tau}{\gamma(1-\tau)}]}_{\text{Marginal Revenue from Taxation}} = 0 \tag{D.4}$$

The first term on the left hand side is the cost of raising the tax rate by 1 unit while, the second term is the benefit. Since the government's budget is constrained, the entire tax revenue is used to pay for the pay for the maturing debt stock and pure public goods. The benefit from taxation accrues only to additional pure public good provision. Totally differentiating the above expression with respect to b, and using the first order condition of taxation (positive marginal revenue from taxation), I can show that $\frac{\partial \tau}{\partial b} \leq 0$. Intuitively, higher assets reduce the marginal value of pure public good provision. It is then optimal for the government to reduce distortionary taxes in the margin.

When the government's budget is constrained, provision of pure public goods equal $g = n\tau z[(1-\tau)z]^{\frac{1}{\gamma}} + b$. Re-writing the objective function above at the optimum, with given z, and taxes τ expressed as a function of b, we have

$$\frac{1}{1-\sigma}[\frac{\gamma}{1+\gamma}[(1-\tau(b))z]^{\frac{1+\gamma}{\gamma}}]^{1-\sigma} + \frac{1}{1-\sigma}[n\tau(b)z[(1-\tau(b))z]^{\frac{1}{\gamma}} + b]^{1-\sigma} \tag{D.5}$$

Using envelope theorem, with respect to b, we get

$$\frac{\partial \tau}{\partial b}[\text{Marginal Gain from Reduced Taxes}- \\ \text{Marginal Gain from Pure Public Goods}] = 0 \quad \text{(D.6)}$$

Since we already know that $\frac{\partial \tau}{\partial b} \leq 0$, it must be the case that the gain from reduced taxes equals the gain from pure public goods provision at the maximum. It follows from this argument that $\frac{\partial g}{\partial b} \geq 0$.

Finally, when the government's budget constraint binds, B(.)=0, by definition. In this situation, when b increases for a given z, the tax rate is reduced and pure public good provision increases (as already proved). The marginal gain from providing pure public goods is higher than local public goods ($\frac{1}{m}$). Thus, $\frac{\partial B}{\partial b} = 0$. However, if the government's budget constraint is slack, then taxes and pure public good provision are fixed (as already proved). The entire increase in assets is used to provide local public goods. Thus, $\frac{\partial B}{\partial b} \geq 0$.

Define a $b^*(z,m)$ such that $n\tau^{**}z[(1-\tau^{**})z]^{\frac{1}{\gamma}} + b^*(z,m) = g^*(m)$[22], where $b^*(z,m)$ is the threshold value of government assets for which the government's budget constraint binds. Since $g^*(m)$ is increasing in m, it is easy to follow that for a given value of z, $b^*(z,m)$ is also increasing in m. Keeping m constant, if z increases, tax revenue increases. For the above equation to hold, $b^*(z,m)$ must fall. Therefore, the asset threshold $b^*(z,m)$ is decreasing in z.

□

[22] Assuming continuity