

Sovereign Default, Political Instability and Political Fragmentation[†]

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December 16, 2015

JOB MARKET PAPER

Abstract

This paper studies sovereign borrowing and default in an economy in which self-interested political parties bargain over the budget. The bargaining mechanism generates an endogenous distribution of resources. The policymaker's share is the highest among parties. Policymakers become short-sighted because they will not enjoy this favorable distribution if they lose office. Three results arise in this setup. First, contracts available between the country and international investors provide distributional incentives that facilitate borrowing and repayment. The model generates a non-monotonic relationship between the policymaker's share and potential borrowing decisions, reflecting the tension between political incentives and market discipline. Second, in a model without political factors, the imposition of a low discount factor and the introduction of political instability operate through different channels. In equilibrium, allowing for political instability, or instability and fragmentation, provides a higher frequency of default and more debt—a result that cannot be achieved reducing the discount factor. Third, changes in both political factors are in line with the empirical record. Countries with a higher degree of instability and fragmentation are more prone to register default episodes.

Keywords: Sovereign Debt and Default, Small Open Economy, Legislative Bargaining
JEL: D72, E43, F34, H63, O11

[†] I am indebted to Roberto Chang for his guidance and advice. I have benefited from insightful comments by Todd Keister, Michael D. Bordo, Colin Campbell, Marina Azzimonti, Leonardo Martinez, Federico Mandelman and Cristina Fuentes-Albero. I also thank participants at Rutgers seminars, the 2015 Spring Midwest Macro Meetings, the Georgetown Center for Economic Research Biennial Conference 2015, the Federal Reserve Bank of Atlanta, and the XX Lacea Annual Meeting. Part of this work was completed at the research department of the Federal Reserve Bank of Atlanta; I gratefully acknowledge the hospitality and financial support they so generously provided.

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1 Introduction

What are the political motivations behind the repayment of sovereign obligations and the issuance of more debt? How do the characteristics of the political system affect debt levels and the frequency of default? This paper aims to give an answer to both questions, exploring how distributional incentives are linked to policymaker's short-sightedness, and how distributional incentives facilitate borrowing and repayment in a quantitative model of sovereign default. For this, the bargaining approach of [Battaglini and Coate \(2007, 2008\)](#) is embedded into a standard model of default ([Eaton and Gersovitz, 1981](#); [Aguiar and Gopinath, 2006](#); [Arellano, 2008](#)). The model incorporates two essential features of any political system: the degree of instability and fragmentation.

As emphasized by [Tirole \(2012\)](#), the bi-partisan nature of the political systems in Sweden, Germany, or Chile allowed these countries to benefit from the necessary political consensus related to budget discipline. However, political systems in most emerging economies are far from this scenario and are characterized by different degrees of instability and fragmentation. Political instability is understood as the frequent turnover of different parties in power (with more than two, the bi-partisan scenario is abandoned). Fragmentation is interpreted as a situation in which a high number of parties are excluded from the policymaking process (a higher number indicating less cohesion).

To explore these issues, the workhorse model of sovereign default is extended to allow for several political parties that stochastically alternate in power and bargain over the budget. The bargaining process implies that in each period a randomly selected party's representative (political instability) forms a coalition to approve policy decisions, leaving out of this coalition a given number of other parties (political fragmentation). First, an endogenous distribution of resources for the party in power, the members of the coalition, and those groups excluded is determined in a natural way. The distribution depends on the structure of the political system and on economic conditions. The second outcome of the model indicates that policymakers, unsure about tenure, become short-sighted; and the degree of short-sightedness is a function of the political structure. Given that assets markets are not complete and that policymakers cannot commit to repay, the party in power will choose debt and default, internalizing the distributive effects of its decision and discounting the future more heavily.

The model nests the benchmark model of default, which in this article is labeled as the central planner's case. In this setup, the benevolent central planner's scenario corresponds to a situation in which all the political parties belong to the government coalition. When this occurs, all political parties receive the same level of consumption, and policymakers' short-sightedness is eliminated.

In terms of the numerical results, the first simulation exercise contemplates [Arellano \(2008\)](#)'s calibration parameters. Under this scenario, the inclusion of political instability and political fragmentation increases default from 3.0% to 4.8% and debt from 5% to 19.6%. When the model is calibrated to target a default probability of 3.0%, a debt ratio of 23.2% is obtained if short-term bonds are used, as in [Arellano](#). While it is possible to achieve debt ratios that are

more consistent with the empirical evidence using short-term debt, doing so comes at the cost of less realistic business cycle statistics. For that reason, the introduction of long-term debt (Chatterjee and Eyigungor, 2012) in the model generates a debt ratio of 112.0%. This ratio is consistent with the range of public debt over quarterly GDP ratios observed in Argentina since the 1980s, which is between 86% and 172%.¹ More importantly, the paper complements previous efforts of the literature aimed at generating high and realistic debt ratios, which has proven to be hard in this class of models.²

Changes in the political factors are as indicated in Tirole (2012). More instability and fragmentation increase the probability of default and reduce debt levels in equilibrium, which reflect a lower degree of fiscal responsibility. The same is true when correlations are analyzed using a sample of 35 emerging countries between 1975 and 2012. These results can also be related to the *debt intolerance* phenomenon, described in Reinhart, Rogoff, and Savastano (2003). These authors conjectured that low debt-to-GNP thresholds for default in emerging markets can be explained by a combination of the procyclical nature of capital markets and short-sighted governments.

The intuition behind the model's distributional mechanism is as follows. When a party is selected to be the policy proposer, it can exploit (as in most bargaining games) the bargaining power derived from the possibility of making the first policy proposal. This will generate a distribution of resources that favors the proposer. This distribution can vary according to the state of nature and borrowing decisions, or the 'size of the pie'. When the party in power decides the country's level of borrowing, the political mechanism will provide the policymaker a better share of resources when it chooses more debt, hence the policymaker will also care about the 'share of the pie'. The reason is that self-interested policymakers will not have an incentive to provide anything to parties excluded from the coalition. Therefore, the resources associated with an additional bond issued in capital markets will be split between the proposer and the members of the coalition. This mechanism will work only up to a certain debt threshold. At this point, an increasing debt becomes counterproductive because the typical endogenous borrowing constraint of models of sovereign default becomes binding. In other words, market discipline will deter the issuance of more bonds via a decline in bond prices. Since debt has become too big and too risky, choosing debt above the threshold provides less resources for the country and a worse share of the pie for the proposer.

This mechanism explains the main features of the model. First, in the event of default,

¹ The actual quarterly debt ratio is 172% (equivalent to an annual ratio of 43%). However, assuming that some proportion of debt is secured, given that in reality there are positive recovery rates after a default episode and this rate is not 0% as in the model, the lower bound for the relevant estimated ratio may be closer to 86%.

² Quantitative models of sovereign default have presented difficulties in obtaining the default frequencies observed in the data and, at the same time, high or realistic levels of debt (Mendoza, 2015; Claessens and Kose, 2014; Aguiar and Amador, 2013; Tomz and Wright, 2013). There have been important improvements with respect to the initial debt predictions. In particular, the use of long-term bonds (Hatchondo and Martinez, 2009; Chatterjee and Eyigungor, 2012), convex costs of default (Mendoza and Yue, 2012; Chatterjee and Eyigungor, 2012) and positive recovery rates (Bi, 2009; Benjamin and Wright, 2009; Yue, 2010; D'Erasmus, 2011) allow these models to sustain more debt. Differently from these mechanisms, this paper looks at the motivations for borrowing.

the country loses access to capital markets and, consequently, the possibility of borrowing and improving the policymaker's share of resources. Then, distributional incentives are relevant under access to capital markets, which facilitate repayment in equilibrium and explain why the model can sustain more debt in the numerical exercises. This mechanism is novel in the literature of default.³ Second, distributional incentives are stronger in economic booms, when repayment obligations are low and when the coalition size is small. Third, distributional incentives explain the degree of policymakers' short-sightedness. Since today's proposer might not be in power in the next period, it will try to take the maximum advantage of its bargaining power today. A different situation would arise in the case of the central planner. In this scenario, even though there is political turnover, since all the policymakers receive the same share of resources, there are no distributional incentives that drive myopic policies.

Most calibrations of sovereign default models impose low discount factors, and justify this decision claiming the existence of political turnover or political instability (Aguiar and Amador, 2013). In this context, it is interesting to evaluate if a reduction in the discount factor, using the central planner's case, provides the same results and operates through the same channels as the introduction of political instability and fragmentation. The full-commitment-to-repay and no-commitment cases are considered in this analysis.

Under full commitment to repay, a lower discount factor and the introduction of political instability and fragmentation operate through the same mechanism; there is a reduction in the marginal cost of repaying debt obligations. When the possibility of default is introduced, a reduction in the discount factor does not affect the marginal cost anymore. Changes in impatience are completely absorbed by the equilibrium pricing condition, expanding the default region. When political instability and fragmentation are introduced, the marginal cost of repayment/default is reduced, as in the full-commitment case. Crucially, the default region is not expanded. The same holds if only political instability is introduced in a model without political factors (as in the central planner's case).

Why do political factors and impatience operate differently under the no-commitment case? For the scenario of an introduction of instability and fragmentation, international investors understand the motivations for repayment and borrowing. Importantly, they know that, in the next period, any political party chosen to be the policymaker will value more repayment because borrowing is a mechanism to improve his well-being and share of resources. Under these conditions, repayment is more probable and bond prices do not fall. By contrast, when there is more impatience, international investors know that the central planner will not have any particular motivation for repayment in the next period. For that reason, bond prices will fall as a consequence of the planner's desire to frontload consumption. In terms of the equilibrium results, more impatience yields more default and less debt, while political instability or both political factors yield more default and more debt.

³ Previously, Cuadra and Saprizza (2008) proposed a two-party model of sovereign default with an invariant distribution of resources. If the share of resources does not change with the borrowing decision, then there are no distributional benefits from borrowing more. Other similar models abstracted from redistribution.

The rest of the paper is organized as follows. Section 2 discusses the related literature. In Section 3 the model is introduced. A description of the calibration exercise and the quantitative results are presented in Section 4. The last section presents the conclusions.

2 Related Literature

This paper is at the intersection of the literature on the quantitative models of sovereign default (Eaton and Gersovitz, 1981; Aguiar and Gopinath, 2006; Arellano, 2008) and the literature on the political economy of debt. To be more specific, the paper is related to three strands of the literature.

QUANTITATIVE–POLITICAL ECONOMY MODELS OF SOVEREIGN DEFAULT.⁴ The previous models have considered the case of bi-partisan systems; in this paper the existence of more than two parties is allowed. Cuadra and Sapriza (2008) presents a model with two parties that alternate stochastically in power. In Cuadra and Sapriza’s paper the distribution of resources is fixed and depends on the parties’ preferences, while in this paper an endogenous outcome is generated. Other political economy papers abstract from the distribution of resources, with the exception of D’Erasmus and Mendoza (2014).⁵ This paper incorporates domestic debt, and redistribution of resources occurring among agents when the government defaults, affecting local bondholders. Hatchondo, Martinez, and Sapriza (2009) present two parties with different degrees of impatience or discount factors. Under this setup, default may not only be triggered by very low realizations of the endowment shock, but also by a change in the type of policymaker. The authors call this a ‘political default’.⁶

Using a similar framework as in Hatchondo, Martinez, and Sapriza (2009), D’Erasmus (2011) adds private information and the possibility of endogenous renegotiation. In D’Erasmus’s model, since international investors cannot observe if the government is a patient one or not, short-sighted governments tend to mimic patient ones to build reputation and be able to access more debt at lower interest rates. Andreasen, Sandleris, and Van Der Gote (2011) analyzes the political economy of taxation and default. In that model the government might not garner enough political support to raise taxes for repayment (the ‘inability to pay’ scenario). As in this paper, a political constraint will affect debt and default in equilibrium. The political constraint in that paper makes repayment more difficult, while in this paper repayment is more attractive.

MODELS OF FISCAL POLICY WITH DYNAMIC LEGISLATIVE BARGAINING. In Battaglini and Coate (2007) the authors develop a model in which a legislature decides the level of taxation and the allocation of resources between a productive public good, and district-specific transfers

⁴ An early review of this literature is found in Hatchondo and Martinez (2010).

⁵ The focus of that paper is not on political economy issues.

⁶ In particular, it occurs when a patient policymaker is replaced by an impatient one and the economy enjoys a relatively politically stable environment. On the contrary, if political stability is low (or there is high instability), then debt levels that could be sustained would be relatively low and changes in the government’s type would not generate a crisis.

(pork barrel spending). They characterize the conditions for a situation in which taxation is too high, the level of the public good is too low, and pork is over provided. [Battaglini and Coate \(2008\)](#) uses a similar framework to examine a richer set of fiscal policy variables, including government debt. Borrowing, as well as distortionary taxation, is used to provide pork and a public good with a stochastic value. Finally, [Battaglini and Barseghyan \(2013\)](#) investigates fiscal policy in the context of a model of endogenous growth, where public investment affects productivity.

Differently from this article, the papers cited above have studied fiscal policy models for closed economies under full commitment to repay.⁷ While the political motivations for borrowing are similar, in this paper, debt is limited by the endogenous borrowing constraint derived from the possibility of default; in Battaglini and Coate's models, other reasons play this role.⁸ Other dynamic legislative bargaining papers incorporate the possibility of an endogenous status quo, like in [Bowen, Chen, and Eraslan \(2014\)](#) and [Ma \(2014\)](#). The first paper studies the welfare properties of an economy in which the level of spending on mandatory programs is not easy to change, while the second studies the consequences of policy gridlock in terms of the tax rate. These articles abstract from borrowing and default.

PROCYCLICALITY OF FISCAL POLICY IN EMERGING MARKETS. [Gavin and Perotti \(1997\)](#) provides two initial hypotheses for this characteristic of emerging markets. The first is borrowing constraints, that can be relevant during downturns; and the second is political incentives, to spend more during times of plenty. [Talvi and Vegh \(2005\)](#) supports the view that political distortions explain fiscal procyclicality. The authors explain that if a government knows that it will be excluded from international markets, it must accumulate reserves during good times. Using a sample of 32 emerging economies during 1970-2006, [Panizza, Sturzenegger, and Zettelmeyer \(2009\)](#), featuring a survey of sovereign debt and default, shows that this is not the case. The authors conclude that the lack of access to capital markets cannot be the *only* reason for procyclical borrowing and that political factors matter. [Cuadra, Sanchez, and Saprizza \(2010\)](#) challenges this view and emphasizes that the discussion about borrowing constraints mainly has been focused on the scenario of a full exclusion from capital markets. In quantitative models of sovereign default, the option of no repayment is exercised only under extreme conditions. This article does not take a stand on this debate, and considers both potential explanations in the modeling approach.

3 The Model

The benchmark quantitative model of sovereign default ([Eaton and Gersovitz, 1981](#); [Aguiar and Gopinath, 2006](#); [Arellano, 2008](#)) is extended to incorporate long term bonds ([Chatterjee and Eyigungor, 2012](#)) and the political process developed in [Battaglini and Coate \(2007, 2008\)](#) and those author's subsequent papers, in particular [Battaglini and Barseghyan \(2013\)](#).

⁷ For example, they include taxes, debt, public goods, and transfers.

⁸ For example, in [Battaglini and Coate \(2008\)](#) distortionary taxation provides a self-insurance motive that pushes debt down.

3.1 The Economic Environment

A small open economy receives each period a stochastic endowment. Also, it trades a single good and a single asset with the rest of the world. Different from the benchmark model, there are n types of domestic agents, each represented by a political party, indexed by $i = 1, \dots, n$. There is a continuum of infinitely lived citizens in each of the n parties. The size of the population in each party is normalized to one.⁹

All the individuals in the economy have the same preferences, given by $u(c_t^i)$. Consumption for party i at period t is c_t^i and $u(\cdot)$ is increasing and strictly concave. The stochastic endowment y_t follows the typical autoregressive process, described later in section (4.1).

At the beginning of each period and for a country that has access to capital markets, the policymaker will make a decision regarding paying back the bond or defaulting. A detailed description of who is the policymaker will be discussed in the following section. Depending on this decision, the budget constraint faced by the policymaker will differ. In the event of repayment, the budget constraint is the following

$$\sum_{i=1}^n c_t^i = y_t + [\eta + (1 - \eta) \zeta] a_t - q_t [a_{t+1} - (1 - \eta) a_t] \quad (1)$$

The above specification corresponds to the random-maturity bond specification of [Chatterjee and Eyigungor \(2012\)](#). Let a_t be the net foreign assets held by the small open economy. Each unit of outstanding net foreign assets matures next period with probability η , paying out one unit of consumption. When the bond does not mature, in this case with probability $1 - \eta$, then it pays a coupon equal to ζ units of consumption. Because bonds are assumed to be infinitesimally small, current obligations for the country are given by $[\eta + (1 - \eta) \zeta] a_t$. Also, the bonds issued this period are indistinguishable from the bonds that did not mature and all are traded at the price q_t per unit. For this reason, the new resources available for consumption are given by the market value of the difference between the new level of net assets and the number of bonds previously issued that did not mature, or $q_t [a_{t+1} - (1 - \eta) a_t]$. If $\eta = 1$, the bond structure becomes the one-period specification used in [Aguiar and Gopinath](#), or [Arellano](#). The introduction of long maturity bonds is a crucial ingredient for calibrations that generate high ratios of debt over output.

In the event of default or if the country did not repay in the past and is still in financial autarky, the budget constraint is given by

⁹ This setup is similar to those presented in [Battaglini and Coate \(2007, 2008\)](#) or [Barseghyan and Guerdjikova \(2011\)](#). Battaglini and Coate do not identify each type as a party, but as a geographical district that can receive transfers from the government and whose representatives bargain over the budget. Barseghyan and Guerdjikova modified the Battaglini and Coate setup to have two types of citizens. They are the elite and the workers, and the elite are divided into subgroups that bargain over policy. In this paper the types or groups are identified as parties, as, for example, [Cuadra and Sapriza \(2008\)](#) did in a previous article about the political economy of sovereign default.

$$\sum_{i=1}^n c_t^i = \varphi(y_t) \quad (2)$$

This budget constraint reflects that the economy has no access to capital markets, which constitutes the first cost of default. The second cost is a loss in terms of output represented by the function $\varphi(y_t)$, which is discussed later. The description of the two budget constraints is similar to the one in [Cuadra and Saprizo \(2008\)](#), but these authors restrict their attention to the case of two political parties and one-period debt. This highly stylized setup is useful to illustrate the distributional incentives related to a bargaining mechanism in the context of a sovereign debt problem, but it completely abstracts of many important fiscal policy issues, among other relevant aspects of reality. This point is highlighted because it would be very difficult to argue that the resulting distribution of resources is a good proxy of income inequality.

Define the net resources available in the economy as the right hand side of the equation (1) in the event of repayment, and $\varphi(y_t)$ in the event of default (2). Finally, define λ as the probability that after default, or in a situation without access to capital markets, the country regains access to credit for the beginning of the next period. If this is the case, the economy starts with zero net assets.

3.2 The Political Process

The main features of the political process are as follows. For the n parties, one citizen from each party is selected to be a representative. Since all citizens have the same preferences, the selection process can be ignored.

At the beginning of the period and under access to capital markets, one policy proposer is randomly selected and there is an initial proposer's decision to default or not, as in the standard model of sovereign default. The decision will be taken after the proposer observes the realization of the endowment. The value function for the policy proposer or the party in power of an economy with access to capital markets is $v^p(a_t, y_t)$. The superscript p denotes the policy proposer. If the country defaults, the value function of the proposer is $v^{p,B}(y_t)$, and if it repays, the value function is $v^{p,G}(a_t, y_t)$. The credit status decision is given by $h \in \{G, B\}$. B denotes a bad credit history (default) and G denotes a good credit history (repayment). Considering the previous description, an economy with good credit standing will default if $v^{p,B}(y_t) > v^{p,G}(a_t, y_t)$.

This specification assumes that the default decision does not need to be approved by the legislature. However, the value of default or repayment will depend on the distribution of resources. The approval and implementation of this distribution needs to receive the support of a given number of parties. In particular, the budgetary process is modeled as a non-cooperative bargaining process between self-interested parties.

Previously, it was mentioned that at the beginning of the period and under access to capital markets, one policy proposer is randomly selected. This also occurs if the country is in autarky,

because resources should be distributed among parties in any case. The random process at the beginning of the period will also contemplate the selection of $\gamma - 1$ representatives. In the scenario of access to capital markets ($h = G$) or without ($h = B$), the proposer will choose a policy platform that could be approved or not. It is assumed that $\gamma \leq n$ votes are necessary to approve policy. The proposer and the $\gamma - 1$ representatives are considered the minimal winning coalition (MWC). The size of the MWC (γ) is not restricted to be half of the representatives.¹⁰ Denote by $j \in \{p, c, e\}$ the representative's role, where p stands for the proposer, c refers to the other MWC members and e the representatives excluded from the MWC.

The bargaining process takes place each period. As usual, there can be different rounds for each process and representatives meet at the beginning of each round. Each meeting takes an infinitesimal amount of time, or there is no discounting between rounds. There will be one bargaining process if the proposer defaults, considering the budget constraint (2); and a different one if the proposer repays, using the constraint (1). In the first case, representatives will bargain over the distribution of the endowment; in the second case, they will approve the distribution of resources and the new level of net assets (a_{t+1}). Let the first proposed distribution of resources be $(c_t^{p,h}, c_t^{c,h}, c_t^{e,h})$. For $h \in \{G, B\}$ and period t , under this platform the policy proposer receives $c_t^{p,h}$, the other MWC members get $c_t^{c,h}$, and the representatives excluded from the MWC receive $c_t^{e,h}$.¹¹

If the first proposal or policy platform is accepted by γ members, then it is implemented and the bargaining process ends. If it is not, nature chooses again a randomly selected proposer and the rest of the representatives of the coalition for the bargaining-process second round. This new proposer can choose an alternative policy platform. The process continues until a proposal is approved for this period. If after $T \geq 2$ rounds no proposal has been accepted, then a default policy is implemented. The default policy should be feasible ((1) and (2)) and it involves a uniform distribution of resources.

Finally, it is assumed that $c_t^{e,h} = c^e$, the consumption of the excluded is exogenous and constant for t and h , as in Battaglini and Barseghyan (2013). The level of consumption c^e is the minimum level of consumption that any party should get, and it is associated with a minimum level of utility. For this to be true, it is assumed that $y_t > nc^e$. Importantly, it captures the idea that those who are not in power typically do not benefit from the government's

¹⁰ This assumption reflects the fact that the process for the budget's approval is quite different in the U.S. and in emerging markets. In the U.S. the Congress has great influence over the budget. The literature has captured this fact modeling pork barrel spending (Weingast et al., 1981). As was mentioned before, Battaglini and Coate (2007) studied why pork might be overprovided. Drazen and Ilzetzki (2011) presents the case in which pork is useful because it *greases the legislative wheels*. Hence, in the numerical simulations of Battaglini and Coate's models, γ is set to 0.5. Different from this situation, in Latin America (the region that experienced more default episodes), Congress does not play a crucial role in terms of budgetary decisions (Hallerberg et al., 2009). For example, in most cases there are formal restrictions to change the executive's budget proposal. Legislators are not allowed to increase expenditures (just to reallocate them) or they are required to 'identify' additional sources of funding. In the case of Chile, legislators are allowed only to reduce expenditures. Congressional influence also can be limited by allowing only a short time to analyze the executive's proposal.

¹¹ For this policy platform and in the following sections, the notation that corresponds to the bargaining round is not included. As discussed in the following section, in equilibrium the first proposal will be accepted.

decisions. In other words, if political parties are self-interested, then policymakers do not have any incentive to give more resources to parties that are out of the coalition, simply because their votes are not needed.

3.3 The Political Equilibrium

The analysis presents four stages. First, as an outcome of the bargaining process the distribution of resources is characterized as a function of the degree of political instability and fragmentation. Second, the optimal plan for a policy proposer that today is in power but might lose office next period is studied. Third, the country's default policy and the behavior of international investors are discussed. Finally, the definition of the equilibrium is given.

3.3.1 Bargaining Over the Budget

One important implication of the bargaining process is that the selected proposer will always try to provide enough consumption to the $\gamma - 1$ representatives to guarantee their vote. If this is not the case and the bargaining process moves to the next stage, the proposer will lose the bargaining power associated with the possibility of making the proposal.

To characterize the political equilibrium, it is assumed that representatives vote for a policy platform if they prefer it (weakly) to continuing into the next proposal round (weakly stage undominated strategies). This is a standard assumption in the theory of legislative voting.

In each of the two potential scenarios, default or repayment, the proposer will choose a policy platform to maximize his utility subject to the resource constraint and to an incentive compatibility constraint (IC). The IC constraint guarantees that the proposal is approved by γ votes (by the other MWC members). For $h \in \{G, B\}$, the constraint is given by

$$u(c_t^{c,h}) + \beta v_{cont}^h \geq v_{out}^h \quad (3)$$

In this case, v_{cont}^h denotes the continuation value for the MWC members, while β is the discount factor. Importantly, v_{out}^h is the expected utility of an MWC member of voting "no" and therefore moving to the next round of the bargaining game, in which a new proposer is randomly selected. The constraint will bind in equilibrium, because the proposer will minimize the cost of obtaining a MWC. Hence, in equilibrium, there will be only one round or the first proposal will be accepted. The next result is derived in Appendix 1.

Lemma 1. *In equilibrium the incentive compatibility constraint (3) is satisfied if and only if $c_t^{c,h} = u^{-1} \left(\Gamma \left[u(c_t^{p,h}) + (n - \gamma) u(c^e) \right] \right)$; where $h \in \{G, B\}$ and $\Gamma = 1/(n - \gamma + 1) \in (0, 1]$. Also, $c_t^{c,h} \in (c^e, c_t^{p,h}]$*

The first lemma reflects that the proposer should provide enough consumption to the MWC members to be indifferent between voting "yes" and "no". For this reason, $u(c_t^{c,h})$ is equal to the expected utility of moving to the next round, where the uncertainty is related to the

future role of the current MWC members. In other words, $u\left(c_t^{c,h}\right) = \mathbb{E}_j u\left(c_t^{j,h}\right)$. As a result, the condition in Lemma (1) indicates that the MWC members will get a weighted average of the consumption for the proposer and the consumption of those excluded.

The conditions derived in Lemma (1), the budget constraints (1)-(2) and c^e , implicitly define the functions $c_t^{p,h}\left(\mathcal{R}_t^h\right)$ and $c_t^{c,h}\left(\mathcal{R}_t^h\right) \in \left(c^e, c_t^{p,h}\left(\mathcal{R}_t^h\right)\right]$; where \mathcal{R} denotes net resources available in the economy, $\mathcal{R}_t^G = y_t + [\eta + (1 - \eta)\zeta]a_t - q_t[a_{t+1} - (1 - \eta)a_t]$ if $h = G$, and $\mathcal{R}_t^B = \varphi\left(y_t\right)$ if $h = B$.¹² These consumption levels, and the number of parties and the coalition size, determine the distribution of resources in the economy. The previous formulation allows to define two scenarios, one in which the distribution of resources is equal among parties and another in which it is not.

Definition 1. *The central planner's case is a situation where $\gamma = n$, or there are no parties excluded from the MWC*

Note that in the central planner's case $\Gamma = 1$ and $c_t^{c,h}\left(\mathcal{R}_t^h\right) = c_t^{p,h}\left(\mathcal{R}_t^h\right)$. In this scenario all the parties are equally important and receive the same level of consumption. A different situation occurs when a positive number of parties has been excluded from the MWC. When the number of parties excluded is very high, then $c_t^{c,h}\left(\mathcal{R}_t^h\right) \approx c^e$.

Definition 2. *Political fragmentation is a situation in which $\gamma < n$ or $\Gamma < 1$. The degree of political fragmentation is given by the number of parties excluded from the MWC, or $n - \gamma$. Political instability is a situation in which $n > 1$. The degree of political instability is given by the inverse of the probability of being elected as a proposer, or n*

An important aspect to understand is how the levels of consumption are affected by different degrees of political instability or fragmentation. The following lemma provides an incomplete and static analysis on how the consumption of the MWC members is affected by changes in n and γ . The result is derived in Appendix 1.

Lemma 2. *For a given level of net resources, the consumption of the members of the MWC is decreasing in $(n - \gamma)$*

This result can be explained as follows. The higher $(n - \gamma)$ or the possibility of being left out of the coalition in the scenario of voting "no", the lower is the level of consumption that the MWC members can request to the proposer today. This rationalizes why the consumption of the MWC members is decreasing in $(n - \gamma)$. The interpretation is that the proposer will be able to exploit the bargaining power derived from the possibility of making the policy proposal, as in most bargaining games, if there is fragmentation.

The analysis of Lemma 2 assumes that the level of net resources available in the economy is given. However, different levels of political instability and fragmentation will affect the level

¹² Note that $c_t^{p,h}\left(\mathcal{R}_t^h\right)$ is given by $c_t^{p,h} + (\gamma - 1)u^{-1}\left(\Gamma\left[u\left(c_t^{p,h}\right) + (n - \gamma)u\left(c^e\right)\right]\right) + (n - \gamma)c^e = \mathcal{R}_t^h$. Given the consumption for the proposer, $c_t^{c,h}\left(\mathcal{R}_t^h\right)$ is derived using the condition from Lemma (1).

of debt that can be sustained through changes in bond prices, and consequently the levels of consumption that the parties can achieve. Section 4.8 discusses the general equilibrium effects of changes in political factors over debt and default probabilities.

3.3.2 The Policymaker's Optimal Plan

Every period a proposer is randomly selected to choose policy. Even though the proposer can change over time, since all party representatives are identical, the problem for the policymaker elected at period t , from the point of view of period t , will be the same as the problem that corresponds to the proposer at $t + 1$, from the point of view of $t + 1$.

The same is not true for a particular representative elected at t , which needs to choose an optimal plan (for periods t , $t + 1$, $t + 2$...). If today a representative is selected to be the incumbent, there is a non-negligible chance that this representative will have a different role next period. This will affect the optimal plan. What follows presents a discussion about the problem of a particular representative that has been selected today as policymaker.

For a country with access to capital markets, once a proposer is selected he faces the following problem, denoted by (P.0)

$$v^p(a_t, y_t) = \max_{d_t \in \{0,1\}} \langle v^{p,G}(a_t, y_t), v^{p,B}(y_t) \rangle \quad (\mathcal{P}.0)$$

The value of default is given by

$$v^{p,B}(y_t) = u(c_t^{p,B}(\mathcal{R}_t^B)) + \beta \mathbb{E}_{y_{t+1}|y_t} [\lambda \mathcal{V}^p(0, y_{t+1}) + (1 - \lambda) \mathcal{V}^{p,B}(y_{t+1})] \quad (4)$$

$$\text{s.t. } \mathcal{R}_t^B = \varphi(y_t)$$

Note that $c_t^{p,B}(\mathcal{R}_t^B)$ is implicitly defined by the budget constraint (2) and the IC constraint (3), as indicated before.

The value of repayment is given by

$$v^{p,G}(a_t, y_t) = \max_{a_{t+1}} \left\langle u(c_t^{p,G}(\mathcal{R}_t^G)) + \beta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^p(a_{t+1}, y_{t+1}) \right\rangle \quad (5)$$

$$\text{s.t. } \mathcal{R}_t^G = y_t + [\eta + (1 - \eta) \zeta] a_t - q_t [a_{t+1} - (1 - \eta) a_t]$$

As in the case of default, $c_t^{p,G}(\mathcal{R}_t^G)$ is implicitly defined by the budget constraint (1) and the IC constraint (3).

The problem above follows closely the standard model of sovereign default. After default, there is an exogenous probability (λ) of regain access to the capital markets (with zero net assets for the next period) and resources are limited to the endowment in default ($\varphi(y_t)$). A first difference with the benchmark model is that the proposer will choose how to distribute

the resources, following the IC constraint (3) to approve the budget. Under the scenario of repayment, a distribution of resources and the level of net assets are chosen by the proposer and accepted by the MWC. The second difference is that today's value function for the current proposer is not equal to the continuation value of the problem ($v^p(a_t, y_t) \neq \mathcal{V}^p(a_t, y_t)$), as equations (4) and (5) indicate.

In particular, the continuation value for today's proposer (for period $t + 1$ and the subsequent ones, but expressed in terms of t) is a problem (P.1) defined as follows

$$\mathcal{V}^p(a_t, y_t) = (1 - d_t(a_t, y_t)) \mathcal{V}^{p,G}(a_t, y_t) + d_t(a_t, y_t) \mathcal{V}^{p,B}(y_t) \quad (\text{P.1})$$

The value function under default, $\mathcal{V}^{p,B}(y_t)$, is given by

$$\mathcal{V}^{p,B}(y_t) = \Gamma u\left(c_t^{p,B}(\mathcal{R}_t^B)\right) + \mathcal{K} + \beta \mathbb{E}_{y_{t+1}|y_t} [\lambda \mathcal{V}^p(0, y_{t+1}) + (1 - \lambda) \mathcal{V}^{p,B}(y_{t+1})] \quad (6)$$

Subject to the same constraint as in (P.0). The same is true for the value function under repayment, $\mathcal{V}^{p,G}(a_t, y_t)$, which is given by

$$\mathcal{V}^{p,G}(a_t, y_t) = \Gamma u\left(c_t^{p,G}(\mathcal{R}_t^G)\right) + \mathcal{K} + \beta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^p(a_{t+1}(a_t, y_t), y_{t+1}) \quad (7)$$

Note that (P.1) is expressed in terms of the policy functions.¹³ This is the case because the policy functions that solve (P.0) given (P.1), should also satisfy (P.1). In other words, the equilibrium is given by a fixed point that satisfies (P.0) and (P.1). For the last two value functions given in (6) and (7), \mathcal{K} is a constant given by $\mathcal{K} = \Gamma(n - \gamma)u(c^e)$. This completes the description of the problem. The derivation is given in Appendix 1.

From the previous description, at period t the selected policy proposer will face a problem (P.0) that is not equal to the problem represented by the continuation value (P.1). The difference is explained by the possibility of losing office. From the point of view of the representative that has been selected to be the proposer today, next period this representative could be the proposer again (p), be part of the MWC (c), or excluded from the MWC (e). From Lemma 1, this future uncertainty can be eliminated because the IC constraint will equate the expected utility of the group's role (p , c or e) with the utility of the MWC members (c), as discussed before. This will change the continuation value under default and repayment, introducing the wedge Γ before the utility of the proposer and adding the constant \mathcal{K} in the objective function.

The implications of the differences introduced in the continuation value are straightforward. When there is political fragmentation ($\Gamma < 1$), today's proposer will discount more his future

¹³ The default decision corresponds to $d_t(a_t, y_t)$, the borrowing decision is given by $a_{t+1}(a_t, y_t)$. The equilibrium condition for international capital markets, described in the next section, is given by $q_t(a_{t+1}(a_t, y_t), y_t)$.

utility when deciding its optimal plan.¹⁴ This implies that the proposer will not fully internalize the future repayment/default costs, or policymakers will become short-sighted. The presence of short-sighted policymakers and an unequal distribution of resources will affect the endogenous borrowing limit generated by this type of models, as well as the incentives to default, as will be discussed later.

On the contrary, in the central planner's case all the parties receive the same level of consumption. Because $\Gamma = 1$ and $\mathcal{K} = 0$ in this case, the value functions of (P.0) and (P.1) are the same. This implies that the policymakers' short-sightedness is driven by the political structure of the system, in particular the existence of political fragmentation, which implies the possibility of obtaining a more favorable distribution of resources. Also, the model with instability and fragmentation nests the benchmark model of default as a special case when $n = \gamma = 1$ (or when $\Gamma = 1$ and $\mathcal{K} = 0$).

3.3.3 Default Policy and International Investors

The policymaker's default policy can be characterized by default sets (D) and repayment sets (A). Define

$$A(a_t) = \{y_t \in Y : v^{p,G}(a_t, y_t) \geq v^{p,B}(y_t)\}$$

$$D(a_t) = \{y_t \in Y : v^{p,G}(a_t, y_t) < v^{p,B}(y_t)\}$$

Given the default policy and a competitive international capital market with risk neutral investors, the market equilibrium implies that bonds are priced according to the zero profit condition

$$q(a_{t+1}, y_t) = \mathbb{E}_{y_{t+1}|y_t} \left(\frac{[1 - d_{t+1}(a_{t+1}, y_{t+1})] [\eta + (1 - \eta)(\zeta + q(a_{t+2}(a_{t+1}, y_{t+1}), y_{t+1}))]}{1 + r} \right) \quad (8)$$

Where d_{t+1} is an indicator function. It takes the value of one if the proposer defaults, or $d_t = 1$ if $y_t \in D(a_t)$. In the event of repayment, there is a chance η that the bond will mature, and in the event the bond does not mature, with probability $1 - \eta$, it will pay a coupon payment ζ and will be priced at q . The future cash flows are discounted at the international interest rate, which is given by r . As usual, today's price of the bond is linked to tomorrow's default decision (d_{t+1}). While there is a chance that today's proposer will not be in power tomorrow, whoever is the newly elected proposer will behave exactly as today's given the corresponding state of nature, since all the individuals and representatives are ex-ante identical.

¹⁴ In other words, the proposer will choose an optimal plan assuming that in the following periods he will be an MWC member. As indicated in Lemma 1, $c_t^{e,h}(\mathcal{R}_t^h) \in (c_t^e, c_t^{p,h}(\mathcal{R}_t^h)]$ and if $\Gamma < 1$ then $c_t^{c,h}(\mathcal{R}_t^h) < c_t^{p,h}(\mathcal{R}_t^h)$.

3.3.4 Definition of Equilibrium

In a symmetric Markov perfect equilibrium, any representative selected to be the proposer will make the same decisions depending on the state of the economy. Focusing on the bargaining game, at any round of the bargaining process any representative makes the same proposal and this proposal depends only on the level of net assets, the endowment shock, and the economy's credit standing. The focus is on equilibria in which at each round, proposals are immediately accepted by the MWC. Then, the first proposal in the first bargaining round is accepted and implemented.

For the following definition, any variable x_t or x_{t+1} is denoted by x and x' respectively, as it is the standard practice.

Definition 3. *The model's symmetric Markov perfect equilibrium is given by a set of value functions and policy functions. The value functions are $\tilde{v}^p \equiv \{v^p(a, y), v^{p,G}(a, y), v^{p,B}(y)\}$ for $(\mathcal{P}.0)$ and $\tilde{\mathcal{V}}^p \equiv \{\mathcal{V}^p(a, y), \mathcal{V}^{p,G}(a, y), \mathcal{V}^{p,B}(y)\}$ for $(\mathcal{P}.1)$. The policy functions correspond to: (i) consumption of the proposer ($c^{p,B}(y), c^{p,G}(a, y)$), (ii) a level of net assets ($a'(a, y)$), (iii) default sets ($D(a)$) and default probabilities, and (iv) the price function for sovereign bonds ($q(a', y)$). In equilibrium:*

1. *Taken as given the bond price function ($q(a', y)$) and $\tilde{\mathcal{V}}^p$, the proposer's policy functions $a'(a, y)$ and $D(a)$ solves $(\mathcal{P}.0)$.*
2. *Taken as given $a'(a, y)$ and $D(a)$, then $c^{p,B}(y)$ and $c^{p,G}(a, y)$ satisfy the budget constraints and the incentive compatibility constraints for $(\mathcal{P}.0)$.*
3. *The bond price function ($q(a', y)$) reflects the default probabilities for $(\mathcal{P}.0)$ given $\tilde{\mathcal{V}}^p$, and are consistent with the zero profit condition in international markets.*
4. *Taken as given the bond price function ($q(a', y)$) and the policy functions $a'(a, y)$ and $D(a)$, then $\tilde{\mathcal{V}}^p$ satisfies $(\mathcal{P}.1)$.*

As mentioned before, the equilibrium is characterized by a set of policy functions that correspond to a fixed-point implied by $(\mathcal{P}.0)$ and $(\mathcal{P}.1)$.

4 Quantitative Analysis

The model is calibrated and solved numerically. The three following subsections complete the model specification, comment on the computational algorithm, and describe the calibration exercise, respectively. The simulations results, the nature of the mechanism, and the effects of the political parameters changes are presented in the last subsections.

4.1 Model Specification

As is typical in models of default, the utility function is assumed to be CRRA.

$$u(c_t^i) = \frac{(c_t^i)^{1-\sigma}}{1-\sigma} \quad (9)$$

Where σ is the coefficient of relative risk aversion. The endowment follows an autoregressive process. Let $y_t = \exp(z_t)$, where $z_t = \tilde{\rho}z_{t-1} + \epsilon_t$ and $\epsilon_t \sim N(0, \sigma_z^2)$.

The endowment process is truncated if the policymaker defaults. In particular, the functional form presented in [Chatterjee and Eyigungor \(2012\)](#) is used. The value of the endowment under default ($\varphi(y_t)$) is defined as follows

$$\varphi(y_t) = y_t - \max\{0, \phi_0 + \phi_1 y_t + \phi_2 y_t^2\} \quad (10)$$

This functional form is flexible enough to capture two different specifications of the cost of default. As in [Chatterjee and Eyigungor \(2012\)](#), setting $\phi_0 = 0$, $\phi_1 < 0$, $\phi_2 > 0$ gives rise to an increasing and convex cost of default, in the spirit of [Mendoza and Yue \(2012\)](#). Setting $\phi_0 = \tilde{\phi}\mathbb{E}(y_t)$, $\phi_1 = 1$, $\phi_2 = 0$ provides the [Arellano \(2008\)](#) specification cost, which is linearly increasing in the endowment realization. The simulations of the model will consider both cases, because the Arellano's case was typically used in the earlier papers of default that focused on the one period bond scenario, while the Chatterjee and Eyigungor specification is commonly used in more recent papers of default, that also incorporate long maturity bonds.

4.2 Computational Algorithm

The details of the computational algorithm are presented in Appendix 2. There are two main departures from the standard value function iteration solution of models of sovereign default. First, the combination of the budget constraint ((1) or (2)) and the IC constraint (3) yields a nonlinear equation that has to be solved numerically. To reduce the computational burden, the optimal consumption for the proposer is solved outside of the iterative cycle, as in, for example, [Maliar and Maliar \(2005\)](#). Based on this solution, interpolation methods are used in each iteration.

Second, the computational algorithm should look for a fixed-point that solves (P.0) and (P.1). The straightforward application of value function iteration fails to converge, because an initial candidate solution for (P.0) is not a solution for (P.1). This is a feature that characterizes the models with quasi-geometric discounting. Following [Chatterjee and Eyigungor \(2014\)](#), the value function under access to capital markets should be updated in each iteration using

$$\mathcal{V}^{p,G}(a_t, y_t)_{k+1} = (1 - \varsigma) \mathcal{V}^{p,G}(a_t, y_t)_k + \varsigma \mathcal{V}^{p,G}(a_t, y_t)_{k+1}$$

Where $\varsigma \in (0, 1)$ and is a very small number, $k + 1$ is the current iteration, and k corresponds to the previous iteration. The value under default receives exactly the same treatment.

4.3 Calibration

Three calibration exercises have been carried out. The first one replicates the [Arellano \(2008\)](#) exercise, in order to see what are the effects of the introduction of political instability and fragmentation in the benchmark case. Given that the introduction of political factors using Arellano’s parameters does not yield the typical calibration targets, the second exercise changes these parameters maintaining the Arellano’s cost of default specification and considers the case of short-term bonds. The third exercise uses a convex cost of default and long term bonds, as in [Chatterjee and Eyigungor \(2012\)](#), but in a way different from these authors, the calibration targets the probability of default and not debt levels.

Table 1. Calibration: Short-Term Bonds and Long-Term Bonds cases

Parameter		Value		Comment
		ST Debt	LT Debt	
STANDARD PARAMETERS				
Risk aversion	σ		2.0	Standard
World interest rate	r		0.01	Standard
Probability of redemption	λ		0.0385	Argentina’s data
Autocorrelation of shocks	$\tilde{\rho}$		0.916	Argentina’s data
Standard dev. of shocks	σ_z		0.031	Argentina’s data
Probability that the bond matures	η		1 / 0.05	Argentina’s data
Coupon payments	ζ		0 / 0.03	Argentina’s data
Discount factor	β		0.98	Calibrated / Calibrated
Output cost specification	ϕ_0		$1.04E(y_t) / 0$	Calibrated / -
Output cost specification	ϕ_1		1 / -0.35	- / Calibrated
Output cost specification	ϕ_2		0 / 0.44	- / Calibrated
POLITICAL PARAMETERS				
Consumption for the excluded	c^e		0.079	Calibrated / Calibrated
Total ENPP	n		1.75	Argentina’s data
ENPP in gov. coalition	γ		1.27	Argentina’s data
TARGETS				
Annual probability of default			3.0 / 3.0	Argentina’s data
$\sigma(c)/\sigma(y)$			1.09 / 1.09	Argentina’s data
$\sigma(TB/y)/\sigma(y)$			- / 0.34	Argentina’s data
Income share for the highest 6 deciles			0.89 / 0.89	Argentina’s data

Note: ST denotes short-term and LT denotes long-term. ENNP is effective number of political parties.

Following the standard practice for the quantitative models of sovereign default, the model is set to a quarterly frequency. All the parameters are standard in the literature and are presented in Table 1. For example, the coefficient of risk aversion was set to 2.0 and the world interest rate is 1.0%, as in almost all the models of default. The autocorrelation of shocks is 0.916 and the standard deviation of shocks is 3.1, and the information corresponds to the

GDP of Argentina from 1980:1-2001:4.¹⁵ The probability of reentry after default is the same as in Chatterjee and Eyigungor (2012) and is equal to 0.0385. Considering this value, for a country it takes, on average, six and a half years to reenter capital markets. This length of exclusion corresponds to the default episodes of Argentina for 1982 and 2001, and the details of this estimation are discussed in Uribe and Schmitt-Grohé (2015). The characteristics of the long-term debt also come from Chatterjee and Eyigungor.

The first two political parameters correspond to Argentina’s information on the number of political parties; the source is the World Bank’s Database of Political Institutions (Beck et al., 2001). First, the total number of political parties, n in the model, plays a dual role in reality. It can be interpreted as the parties in power (executive), as well as the total number of parties in Congress. Since in the model n reflects the potential number of policymakers, and Latin America is characterized by presidential regimes (the role of Congress is not crucial in the budget approval, as indicated in Hallerberg, Scartascini, and Stein (2009)), then the total number of parties in the executive was used.¹⁶

Importantly, for the calibration exercise, n and γ are interpreted as a *measure* of the number of parties, rather than the actual number of parties, where the proposer has size one. This is done following the empirical literature about the relation between fiscal policy outcomes and the number of parties. This literature uses the effective number of political parties (ENPP) for the estimations, and not the actual number of parties.¹⁷ The same is done in Appendix 3, where an empirical analysis using a sample of emerging countries is carried out to test the predictions of the model. During the period 1984-2012, three major political parties have held executive branch positions in Argentina.¹⁸ Based on the years in power, the ENPP is set to 1.75. In order to calculate the number of parties that belong to the government coalition, the percentage of votes of all the parties that at some point belong to the coalition was calculated. Besides the three parties in the executive, a fourth party was considered.¹⁹ On average, these four parties represent 0.73% of the votes in Congress between 1984 and 2012. Based on this number, γ was set to 1.27.

For the second calibration exercise, that considers Arellano’s cost of default and short-term bonds, the three remaining parameters β , ϕ_0 and c^e are selected to match (i) an annual probability of default of 3%; (ii) the relative volatility of consumption and output ($\sigma(c)/\sigma(y)$) of 1.09; and (iii) a measure of the distribution of resources, in this case the income share for the highest 6 deciles²⁰ in Argentina, which is equal to 0.89 for the period 1998-2003 in the

¹⁵ The source of the data is the Ministerio de Economía and Finanzas Públicas of Argentina. The same is true for the estimations of the business cycle characteristics of other macro variables. Data on historical yields from Neumeyer and Perri (2005) is used. As in Arellano (2008) and Chatterjee and Eyigungor (2012), a linear trend is used to obtain these estimates. The simulations use subsamples of 88 periods.

¹⁶ See footnote 10 for a discussion about the role of Congress in presidential regimes and in Latin America.

¹⁷ See Appendix 3 for a formal definition of the ENPP.

¹⁸ UCR from 1984-1989, UCR/Frepaso from 2000-2001, and PJ from 1990-1999 and from 2002-2012.

¹⁹ The party was UdCD, that formed part of the government coalition between 1991 and 1995.

²⁰ The share for the proposer in terms of the number of political parties is $1/1.75=0.57$. In terms of the target income share is 0.89.

main 28 cities in the country.²¹ The discount factor is set to 0.98. This value is above the 0.954 of Chatterjee and Eyigungor (2012), 0.953 used in Arellano (2008), 0.88 of Mendoza and Yue (2012), and 0.80 used by Aguiar and Gopinath (2006). In the case of the cost of default, $\phi_0 = 1.04\mathbb{E}(y_t)$.²² Finally, c^e is set equal to 0.079. Under this value, each group excluded receives 10% of the lowest realization of the endowment (y_{min}) and gives a distribution of income similar to the target. It should be noted that it is evident that the model is too stylized to explain the differences in income within a country, but a measure was necessary to impose discipline to the calibration. In practice, a high share of resources in favor of the policymaker aims to represent the political benefits of being in power. More importantly, as is discussed in the following sections, the focus will be on how this share can change under different states of nature.

The third calibration exercise incorporates long-term bonds and a convex cost of default. In this case, β , ϕ_1 , ϕ_2 and c^e are selected to match (i) an annual probability of default; (ii) the relative volatility of consumption and output ($\sigma(c)/\sigma(y)$); (iii) a measure of the distribution of resources; and (iv) the relative volatility of the trade and output ($\sigma(TB/y)/\sigma(y)$) of 0.34. For this case, $\phi_1 = -0.35$ and $\phi_2 = 0.4403$, which corresponds to the values selected by Uribe and Schmitt-Grohé (2015) to achieve similar targets. In this case, the values chosen by Chatterjee and Eyigungor were not used, because they target debt levels and as a consequence they obtained a default frequency of 6.8%.

4.4 Results

Simulation results are reported in Table 2. The most important result is that the model with political instability and fragmentation ($\mathcal{I}\&\mathcal{F}$) is able to generate higher ratios of debt/output and, at the same time, increases the probability of default. The valid comparison for the model with political factors is the central planner's scenario (\mathcal{CP}). In this model, this would be the case of a representative that gives equal consumption to each of the parties, since none of these is excluded from the coalition, as noted after Lemma 1. The mechanism behind this main result is discussed later.

The logic of the three calibration exercises is as follows. In the first case, all the parameters of Arellano (2008) are used, in order to make the most transparent comparison with this model. While Arellano achieved a default probability of 3% and a debt/output ratio above 5%, the introduction of political factors increases the chances of default up to 4.82% and the debt ratio rises almost four times (19.63%). While there are small changes in the business cycle statistics, the most notorious one is the correlation between output and the spread ($\rho(y, spread)$), which varies from a negative value (like in the data), to a positive one. This result can be interpreted through the lens of the findings of Tomz and Wright (2007), which found that there is a weak

²¹ The source is SEDLAC (CEDLAS and The World Bank).

²² This value is higher than the one used by Arellano ($0.969\mathbb{E}(y_t)$). A higher value reduces the cost of default, facilitating default. However, this is done because the other cost of default (time of the country in autarky) was increased with respect to Arellano's calibration. This is because Arellano considered an extremely short period of time (less than a year) in autarky.

Table 2. Results: with Instability and Fragmentation ($\mathcal{I}\&\mathcal{F}$) and the Central Planner (\mathcal{CP})

	DATA	[1] ARELLANO'S PARAMETERS		[2] ST-DEBT, ARELLANO'S COST		[3] LT-DEBT CONVEX COST	
	Argentina	\mathcal{CP}	$\mathcal{I}\&\mathcal{F}$	\mathcal{CP}	$\mathcal{I}\&\mathcal{F}$	\mathcal{CP}	$\mathcal{I}\&\mathcal{F}$
$\sigma(y)$	7.87	5.69	5.90	6.89	6.66	6.18	5.67
$\sigma(c)$	8.60	6.21	6.82	6.88	7.39	8.09	7.27
$\sigma(TB/y)$	2.66	1.39	2.66	0.66	2.32	5.07	3.46
$\sigma(spread)$	5.61	5.98	10.81	0.24	2.63	1.29	4.26
$\rho(y, TB)$	-0.89	-0.24	-0.12	0.04	-0.15	-0.07	-0.31
$\rho(y, spread)$	-0.83	-0.22	0.15	-0.50	0.61	-0.38	-0.53
$\rho(y, c)$	0.97	0.97	0.91	1.00	0.94	0.79	0.87
$\rho(TB, spread)$	0.78	0.28	0.10	0.16	0.20	0.82	0.82
Average Spread	11.64	6.24	6.86	0.12	3.65	5.52	7.32
$\sigma(c)/\sigma(y)$	1.09	1.16	1.09	1.00	1.11	1.31	1.28
$\sigma(TB/y)/\sigma(y)$	0.34	0.24	0.45	0.09	0.35	0.82	0.61
Proposer's Share	0.89	1.00	0.91	0.57	0.91	0.57	0.91
Default Probability	3.00	3.07	4.82	0.12	2.79	0.86	3.21
Mean Debt/ $y_{quarterly}$	[86.2 - 172.4]	5.19	19.63	6.78	23.24	92.83	112.02

correlation between default decisions and economic conditions. Tomz and Wright conjectured that the inclusion of political turnover in the benchmark model of default might weaken this correlation.

The second calibration exercise [2] maintains the Arellano's specification of the cost of default and the one-period bonds setup, while achieving a probability of default of 2.8% and a debt ratio of 23%. The third calibration exercise [3], with a convex cost of default and long-term debt, yields the desired probability of default and provides a realistic debt over output ratio of 112%. At the same time, this exercise presents the correct sign for the correlation between the spread and output, although the ratio of the volatility of consumption over output is slightly above the target.²³ The actual range for debt of [86.2-172.4] was calculated following [Uribe and Schmitt-Grohé \(2015\)](#). The average ratio of public debt over annual GDP in Argentina for the period 1980-2001 was 43.1% (with an average for the exclusion period of 2002-2005 of 129.64%).²⁴ Also, considering an average haircut of 50% for the default episodes of 1982 and 2001 and the fact that the model assumes that the country defaults on 100% of its debt, then it can be assumed that at least half of the annual debt/output ratio (21.55%) is unsecured debt. This value translated into a quarterly frequency represents the lower bound for the debt to output ratio (86.2%). The upper bound assumes that the haircut was zero.

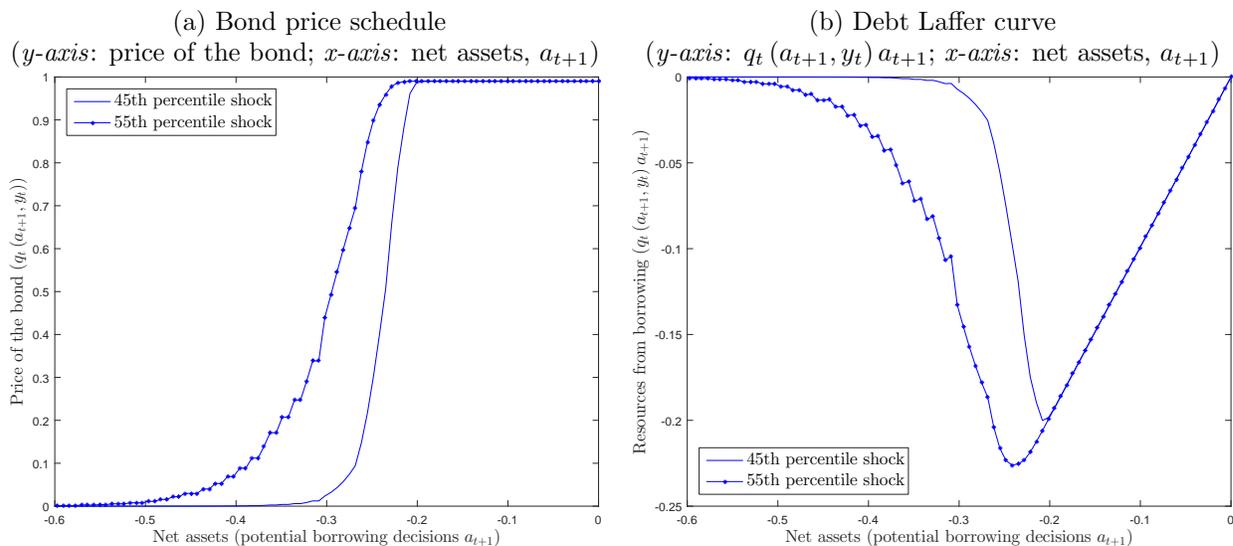
²³ In fact, it is possible to achieve high ratios of debt to output using the framework of the second calibration. However, the ratio of the volatility of consumption over output explodes, as indicated in [Chatterjee and Eyigungor \(2012\)](#).

²⁴ [Uribe and Schmitt-Grohé \(2015\)](#) considers the net external debt in Argentina for the period 1994-2001, which was around 30% of GDP.

4.5 Borrowing Contracts and the Policymaker's Share

This section analyzes the distributional incentives for the proposer in terms of borrowing decisions. In order to make the exposition simpler, transparent, and closer to the benchmark model, the second calibration exercise [2] is used for the discussion. The same is true for the following sections.

Figure 1. Borrowing contracts - Bond price schedule & debt Laffer curve



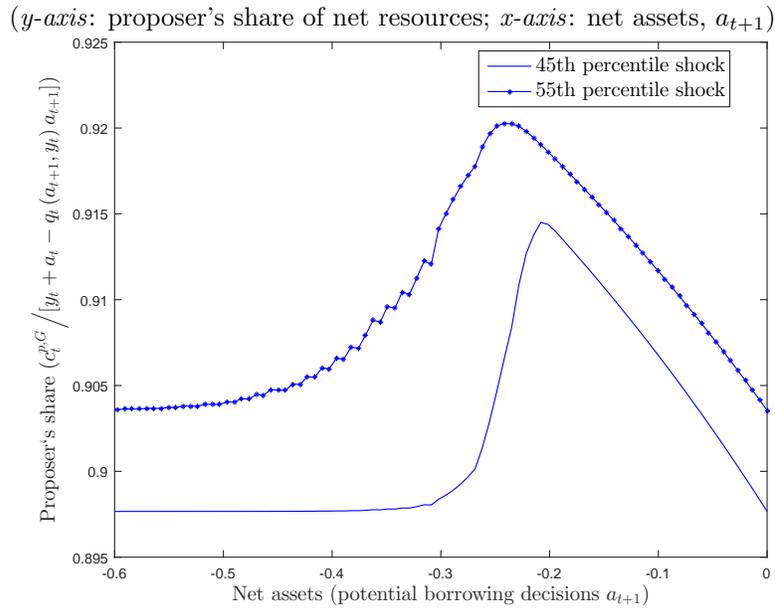
Note: The figures in panel (a) and (b) correspond to the case of an initial level of net assets $a_t = -0.0604$. The model corresponds to the one-period bond case.

The bond price schedule and the usual debt Laffer curve associated with models of sovereign default, explained in [Arellano \(2008\)](#), are shown in Figure 1. For the one-period debt model [2], the price schedule reveals the set of contracts $\{q_t(a_{t+1}, y_t), a_{t+1}\}$ between the country and international investors that the proposer can choose every period, given an initial level of net assets.²⁵ The two typical characteristics of these contracts are that the bond price is an increasing function of net assets (or a decreasing function of debt), and that more favorable contracts are associated with higher endowment shocks. Because the model is able to sustain higher levels of debt, bond prices start declining only for levels above 15% of GDP, for the standard analysis of shocks 5% above and below the trend. Another important characteristic of these contracts is the countercyclical borrowing constraints, which are reflected in panel (b) of Figure 1. The debt Laffer curve associated with these contracts shows that resources available from borrowing, $q_t(a_{t+1}, y_t) a_{t+1}$, are first increasing and then decreasing in net assets. The second effect is driven by falling bond prices associated with increasing levels of borrowing. As the figure indicates, this effect is more important in the bad states of nature.

²⁵ The initial level of net assets was set to $a_t = -0.0604$, similar to the final debt level sustained in [Arellano \(2008\)](#), of $a_t = -0.0596$.

In the benchmark model, the endogenous debt Laffer curve reveals the relevant set of potential choices for borrowing.²⁶ In this model, it is the interplay of the debt Laffer curve and the distribution of resources associated with the set of contracts $\{q_t(a_{t+1}, y_t), a_{t+1}\}$ that matters in terms of borrowing decisions. In other words, in the benchmark case only the ‘size of the pie’ is relevant, while in this model it is the ‘size and the proposer’s share of the pie’. Hence, in the benchmark model, debt is used only for smoothing consumption purposes, while in the model with political instability and fragmentation, distributional considerations also play a role. Figure 2 shows the proposer’s share of net resources for different levels of net assets, where the share for the one-period bond model is defined by: $c_t^{p,G} / [y_t + a_t - q_t(a_{t+1}, y_t) a_{t+1}]$. Since the discussion corresponds to the same set of contracts presented before, Figure 3 also presents the proposer’s share for shocks 5% above and below the trend.

Figure 2. Borrowing contracts - Distribution of net resources by net assets



Note: The figure correspond to the case of an initial level of net assets $a_t = -0.0604$. The model corresponds to the one-period bond case.

The proposer’s share of net resources is a non-monotonic function of net assets, first increasing and then decreasing.²⁷ The share is increasing due to the bargaining mechanism and the fact that the parties excluded from the coalition do not receive any additional benefit when net assets are higher, leaving more resources available for the proposer and the MWC members. When the endogenous borrowing constraint comes into play, benefits in terms of distribution of resources are diluted. Clearly, the proposer’s share inherits the debt Laffer curve shape for

²⁶ In particular, the policymaker will never choose borrowing above the level associated with the maximum value of the debt Laffer curve. This level represent an endogenous borrowing constraint. For that reason, the relevant borrowing region goes from zero borrowing up to this endogenous constraint.

²⁷ The proposer’s share in Figure 2 fluctuates between 0.89% and 0.92%. These numbers should be understood as an illustration of the mechanism presented in the paper. As it was mentioned before, such a highly stylized model is not well suited to account for real measures of income inequality.

the decreasing part, because it is the reduction in net resources that worsens the proposer’s situation. Hence, the model presents an additional incentive to front load consumption—higher levels of borrowing improves the distribution of resources for the proposer, particularly in the good states of nature.

This result resembles the modeling of political rents in [Alesina, Campante, and Tabellini \(2008\)](#). In a model that explains the procyclicality of fiscal policy in emerging economies, corrupt politicians can appropriate part of the tax revenues for their own benefit. Their argument is simple as in this model. The higher the endowment, the bigger the opportunities to grab rents. Differently, when there is a high level of debt, the room for stealing is limited. A similar interpretation of these ideas applies in the context of this paper, where the focus is not on rents but on the distribution of resources. Closer to the modeling approach of this paper is the view of [Aguiar and Amador \(2011\)](#) that indicates that political economy frictions might emerge as a consequence of a disproportionate share of consumption in the hands of the incumbent. More generally, the opposite forces behind this nonlinear relation have been discussed a long time ago in the literature of fiscal procyclicality in emerging markets. Even though the model abstracts from taxes, public goods, and transfers, this framework captures two of the initial hypothesis of this literature ([Gavin and Perotti, 1997](#)): borrowing constraints that can be relevant during downturns; and political incentives, to spend more during times of plenty.

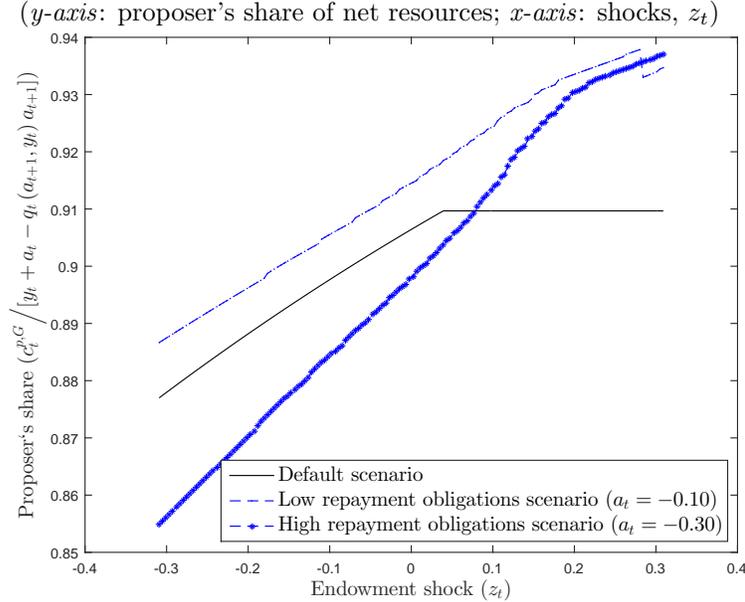
4.6 Policymaker’s Share in Equilibrium

Figure 3 shows the relation between shocks and the proposer’s share of net resources derived from the policy functions, which ultimately determine the default decision and the value for the proposer in $(\mathcal{P}.0)$. The figure depicts three scenarios: the case of autarky; a situation in which debt carried from the previous period (a_t) is relatively low ($a_t = -0.1$); and the case in which obligations are relatively high ($a_t = -0.3$). Recall from Table 3 that the average level of net assets sustained in the second simulation [2] is 0.23. For all the cases, the higher the shock the better the distribution of resources for the proposer, as was discussed previously.

Under autarky, the distribution reaches a maximum because the shock is truncated for medium and high values, due to the nature of Arellano’s cost specification (10). This is an important part of the mechanism, because the distributional incentives vanish in the event of default because of this truncation and also because the country is not able to borrow. In the case of access to capital markets and low debt acquired the previous period (a_t), the distribution of resources is slightly better in relative terms. On the contrary, when the economy issues high levels of debt in the previous period, the repayment of this obligation will represent a bigger proportion of net resources in the bad states of nature. Also, net resources will be diminished by the effect of a low price of bonds. The outcome is that a bigger proportion of the scarce net resources is devoted to the fixed payments for the consumption of the excluded, leaving the proposer with a share that is around 3-4 percentage points smaller than the case of low debt, for most of the negative realizations of the endowment. Hence, the proposer’s share will be

unfavorable for low realizations of the endowment and high levels of debt acquired the previous period. Differently, the proposer’s share will be favorable, and in particular much higher than the share for the default scenario, for positive realizations of the endowment.

Figure 3. Distribution of net resources in equilibrium, by endowment shocks



Note: Estimated using the policy functions. The model corresponds to the one-period bond case.

4.7 Disentangling the Political Effects

What is the value-added of the bargaining mechanism? How to disentangle the numerical effects of political fragmentation and instability? The model cannot give a direct answer to these questions, but analyzing different counterfactual scenarios can provide insight.²⁸

Five models are considered in Table 3, taking as a reference the calibration exercise [2], that considers short-term bonds as well as the Arellano’s cost specification for default. Model ($\mathcal{M}0$) is the baseline scenario and assumes $n = \gamma = 1.75$, or corresponds to the central planner’s case. As mentioned, the inclusion of fragmentation and instability increases the probability of default and debt levels that can be sustained. This complete model ($\mathcal{M}4$) is reported in the last column of Table 5. The central planner’s case ($\mathcal{M}0$), as do most of the scenarios, uses a discount factor of 0.98, while model ($\mathcal{M}1$) looks again at the central planner’s case, but with a lower discount factor of 0.905. Models ($\mathcal{M}2$) and ($\mathcal{M}3$) correspond to the case in which there is only political fragmentation and only political instability, respectively. Model ($\mathcal{M}2$) simply imposes $\Gamma = 1$ and $\mathcal{K} = 0$, maintaining an unequal distribution of total resources (fragmentation). In other

²⁸ Recall that fragmentation was defined as $n - \gamma$. Even though instability depends on the probability of being selected as a proposer ($1/n$), the degree of short-sightedness depends on Γ . This last term depends negatively on $n - \gamma$.

words, model ($\mathcal{M}2$) eliminates short-sightedness. On the contrary, model ($\mathcal{M}3$) imposes an equal distribution, but allows for short-sightedness, or $\Gamma < 1$. It should be noted that models ($\mathcal{M}2$) and ($\mathcal{M}3$) are presented for illustrative purposes and are not strictly correct, because in this paper both political characteristics are linked.

Table 3. Individual effects of a lower discount factor, Instability (\mathcal{I}) and Fragmentation (\mathcal{F})

	DATA Argentina	($\mathcal{M}0$) \mathcal{CP}	($\mathcal{M}1$) \mathcal{CP}	($\mathcal{M}2$) Only \mathcal{F}	($\mathcal{M}3$) Only \mathcal{I}	($\mathcal{M}4$) With $\mathcal{I}\&\mathcal{F}$
		Lower β				
Default Probability	3.00	0.12	2.60	0.11	3.93	2.79
Mean Debt/ $y_{quarterly}$	[86.2 - 172.4]	6.78	5.00	6.70	15.88	23.24
$\sigma(c)/\sigma(y)$	1.09	1.00	1.06	1.00	1.12	1.11
$\sigma(TB/y)/\sigma(y)$	0.34	0.09	0.20	0.09	0.37	0.35
Proposer's Share	0.89	0.57	0.57	0.91	0.57	0.91

For ($\mathcal{M}0$): $\beta = 0.98$, $n = \gamma = 1.75$, $\Gamma = 1$, $\mathcal{K} = 0$
For ($\mathcal{M}1$): $\beta = 0.905$, $n = \gamma = 1.75$, $\Gamma = 1$, $\mathcal{K} = 0$
For ($\mathcal{M}2$): $\beta = 0.98$, $n = 1.75$, $\gamma = 1.27$, $\Gamma = 1$, $\mathcal{K} = 0$
For ($\mathcal{M}3$): $\beta = 0.98$, $n = \gamma = 1.75$, $\Gamma < 1$, $\mathcal{K} \neq 0$
For ($\mathcal{M}4$): $\beta = 0.98$, $n = 1.75$, $\gamma = 1.27$, $\Gamma < 1$, $\mathcal{K} \neq 0$

When models ($\mathcal{M}0$) and ($\mathcal{M}1$) are compared, a lower discount factor yields a higher probability of default and a lower level of debt. This was reported in [Aguiar and Gopinath \(2006\)](#) and it is discussed in [Uribe and Schmitt-Grohé \(2015\)](#). The following paragraphs go back to this point. When only political fragmentation ($\mathcal{M}2$) is introduced in the model, changes in the default frequency and debt levels are minor. The introduction of only political instability ($\mathcal{M}3$) increases both outcomes. Interestingly, this result differs from the reduction of the discount factor, which has opposite effects over debt levels. While the introduction of only fragmentation did not yield significant changes, its introduction in a model with political instability reduces the probability of default in one percentage point and increases debt levels in more than seven percentage points. Hence, fragmentation also plays a significant role in terms of the numerical results. Also, political fragmentation is at the core of the mechanism and gives the reason to the policymaker for being short-sighted.

While the effects of a reduction in the discount factor have been reported before, there is a generalized use of very low discount factors in the literature of sovereign default. In fact, as explained in [Aguiar and Amador \(2013\)](#), *a motivation for this assumption is that the governmental decision maker is relatively impatient due to political turnover*. Does using low discount factors have the same effects as political instability (turnover)? Do they operate through the same channels? The following paragraphs address these questions.

Before exploring the differences between a reduction in the discount factor and the introduction of political instability and fragmentation, it is helpful to look at the scenario in which the policymaker has full commitment to repay his obligations. This is relevant because a reduction in the discount factor operates through different mechanisms under full and no commitment to repay. Under full commitment, the problem for the proposer today is given by

$$v^{p,COM}(a_t, y_t) = \max_{a_{t+1}} \langle u(c_t^p(\mathcal{R}_t)) + \beta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^{p,COM}(a_{t+1}, y_{t+1}) \rangle \quad (11)$$

s.t.

$$\mathcal{R}_t = y_t + [\eta + (1 - \eta)\zeta] a_t - q_t [a_{t+1} - (1 - \eta) a_t]$$

$$\mathcal{V}^{p,COM}(a_t, y_t) = \Gamma u(c_t^p(\mathcal{R}_t)) + \mathcal{K} + \beta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^{p,COM}(a_{t+1}(a_t, y_t), y_{t+1})$$

In order to make the model comparable to the exercises in Table 3, attention is restricted to the case of one-period bonds ($\eta = 1$). Also, table 3 indicates that a reduction in the discount factor and also the introduction of political instability increases the probability of default. However, the effects over debt levels are the opposite. What lies behind these different results?

Figures 4 and 5 analyze the borrowing decision for the full commitment case and for the case with sovereign default respectively. The analysis of both figures focus on the change in utility ($\Delta v^p(a_t, y_t)$) for different potential choices of net assets against the utility associated with the no-borrowing decision. In particular, the variation in utility derived from a particular borrowing decision $a_{t+1} = a$ can be analyzed using

$$\Delta v^p(a_t, y_t) \equiv v_{a_{t+1}=a}^p(a_t, y_t) - v_{a_{t+1}=0}^p(a_t, y_t) \quad (12)$$

$$\Delta u(c_t^p) \equiv u_{a_{t+1}=a}(c_t^p) - u_{a_{t+1}=0}(c_t^p) \quad (13)$$

$$\begin{aligned} \Delta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^p(a_{t+1}, y_{t+1}) &\equiv \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}_{a_{t+1}=a}^p(a_{t+1}, y_{t+1}) \\ &\quad - \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}_{a_{t+1}=0}^p(a_{t+1}, y_{t+1}) \end{aligned} \quad (14)$$

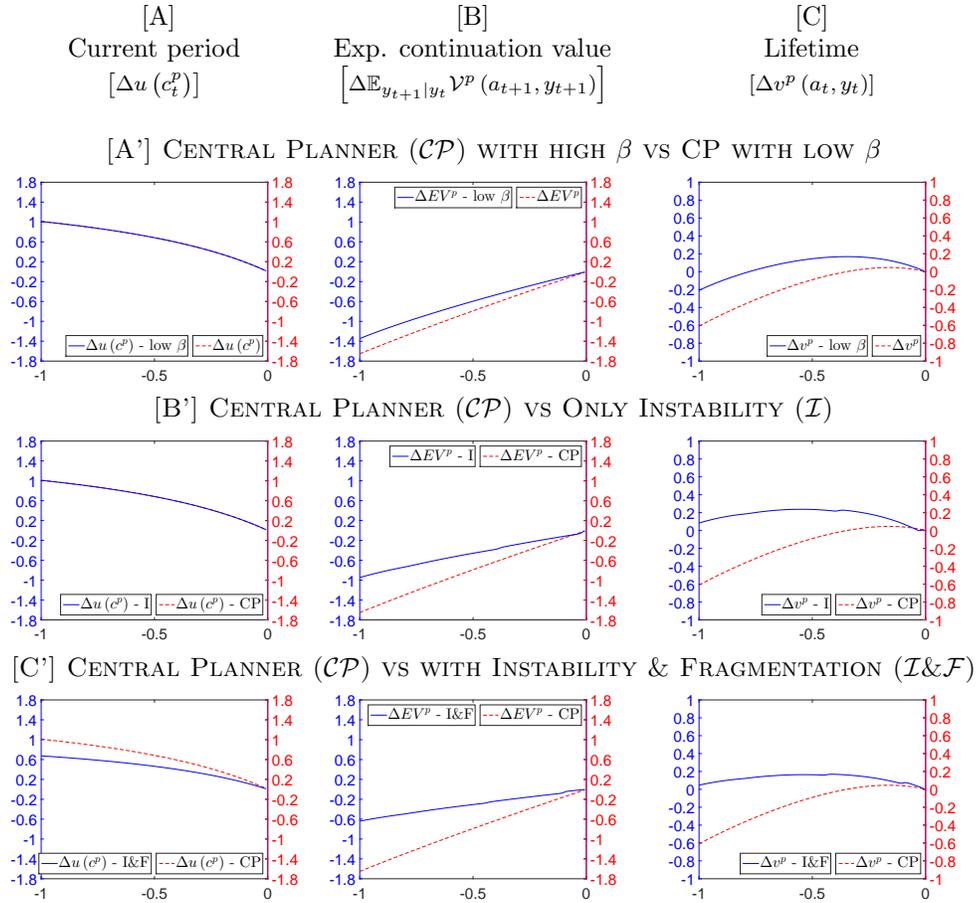
Because $v^p(a_t, y_t) = u(c_t^p) + \beta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^p(a_{t+1}, y_{t+1})$, the total change in utility is broken up into its two components. First, the current utility gain is $\Delta u(c_t^p) \equiv u_{a_{t+1}=a}(c_t^p) - u_{a_{t+1}=0}(c_t^p)$. Second, the future cost associated with more borrowing today is given by the following expression: $\Delta \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}^p(a_{t+1}, y_{t+1}) \equiv \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}_{a_{t+1}=a}^p(a_{t+1}, y_{t+1}) - \mathbb{E}_{y_{t+1}|y_t} \mathcal{V}_{a_{t+1}=0}^p(a_{t+1}, y_{t+1})$. Column [A] of Figures 4 and 5 present the marginal gain from borrowing, the second column [B] presents the future marginal cost of repayment/default, and the third column [C] reports net marginal gain. Only for Figure 5, in which the policymaker can choose to default, does a last column [D] indicate the bond price.

Four different scenarios are considered in Figures 4 and 5. The first row [A'] looks at a reduction in the discount factor for the central planner's case. Row [B'] compares the central planner with a model with only political instability, as in ($\mathcal{M}3$). Case [C'] focuses on the case of the central planner and the model with instability and fragmentation. To complete the

description, all the graphs in Figures 4 and 5 correspond to a negative shock that is on the 45% percentile, in the same way as in previous figures.

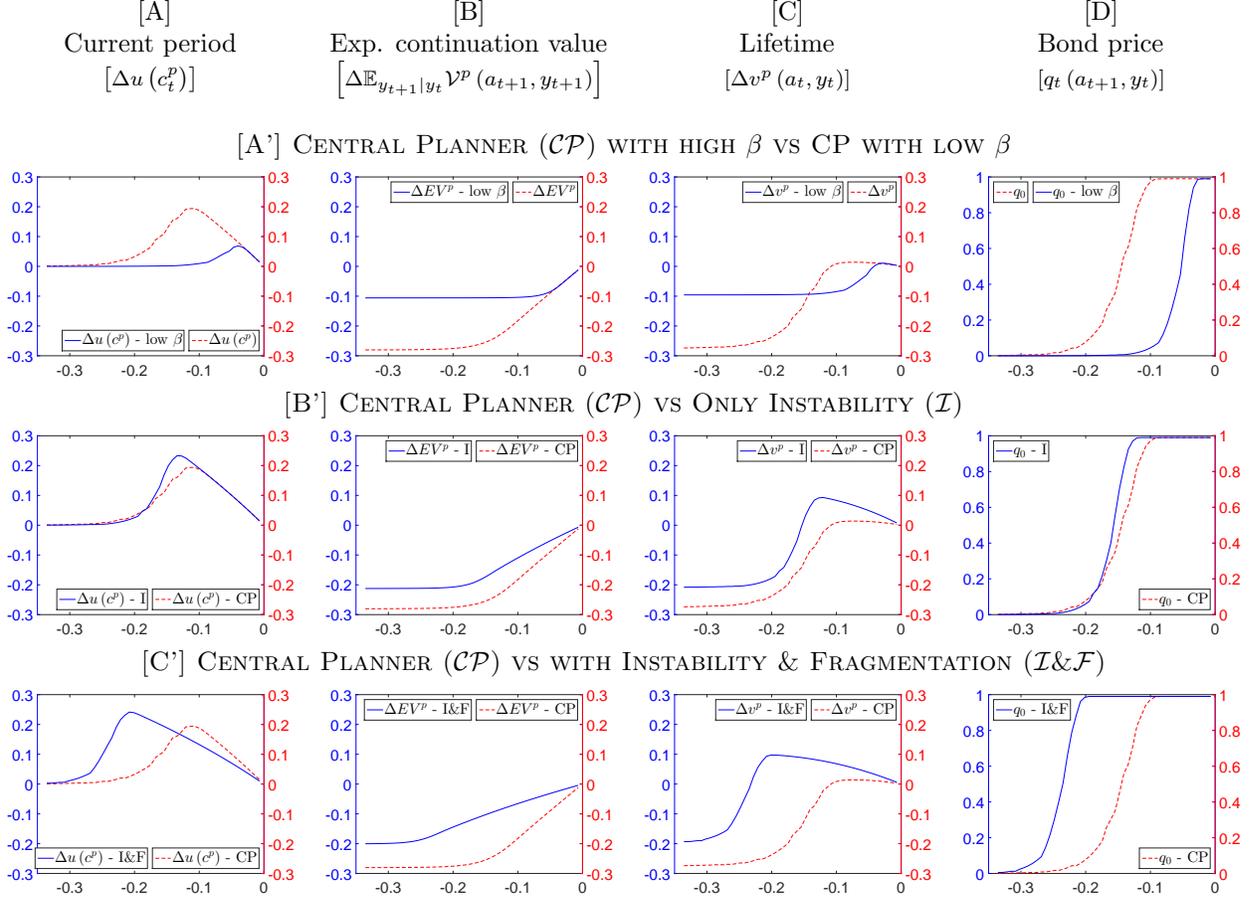
Under full commitment to repay, a reduction in the discount factor and the introduction of political instability operate through the same mechanism. In both cases there is a reduction in the marginal cost of repayment and no changes in the current marginal gain from borrowing. Also, the total change in utility shows that in both cases more borrowing is chosen (column [C]). To complete the description, the last row [C'] contemplates the case with instability and fragmentation. In this scenario, there is a reduction in the current marginal benefit of borrowing. This is because fragmentation allows for a bigger share for the proposer, such that the marginal change in utility for a higher level of consumption is smaller. Despite this reduction in the current marginal benefit, the policymaker choose more borrowing than in the central planner's case.

Figure 4. Full Commitment to Repay: Variation in the level of utility for different borrowing levels in comparison to the utility of the no-borrowing case (*y-axis*: change in utility; *x-axis*: net assets or borrowing decision, a_{t+1})



Note: Estimated for a 45th percentile shock. The model corresponds to the one-period bond case.

Figure 5. Model with Default: Variation in the level of utility for different borrowing levels in comparison to the utility of the no-borrowing case (*y-axis*: change in utility; *x-axis*: net assets or borrowing decision, a_{t+1})



Note: Estimated for a 45th percentile shock. The model corresponds to the one-period bond case.

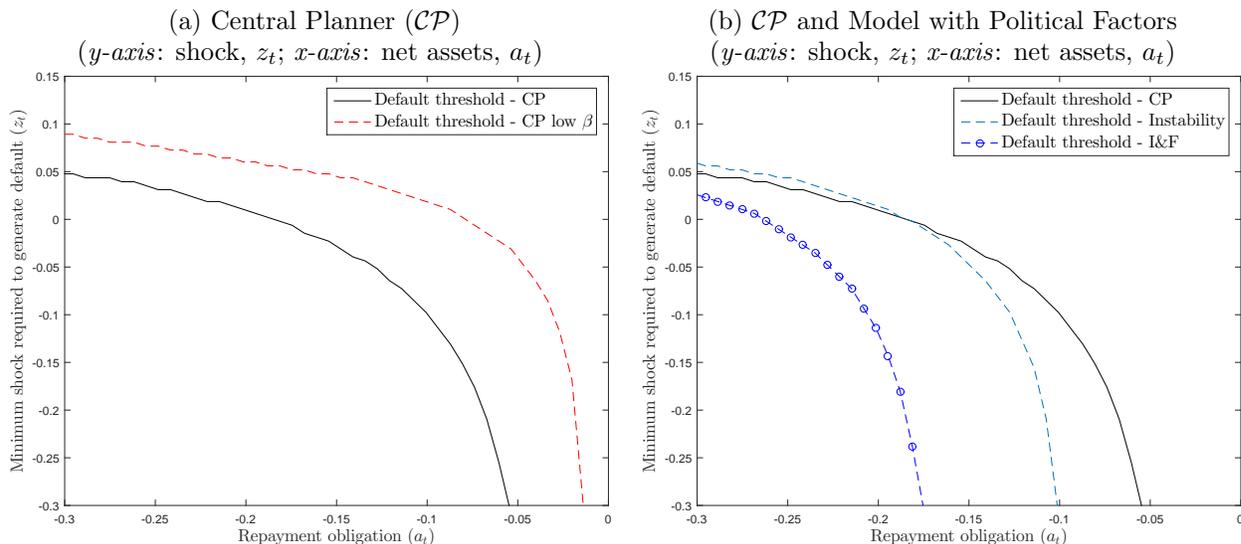
Figure 5 considers the case with default. Now the current benefits from borrowing ($[\Delta u(c_t^p)]$) replicate the debt Laffer curve presented in Figure 1, simply because consumption depends on the resources obtained from issuing risky bonds ($q_t(a_{t+1}, y_t) a_{t+1}$ for short term bonds). Differently from the full commitment case, for the relevant part of the debt Laffer curve, a reduction in the discount factor does not change the marginal benefit of borrowing today, nor the marginal cost of repayment/default in the future. A reduction of the discount factor in a model with sovereign default is reflected in a contraction in the bond price schedule and, consequently, on a smaller relevant borrowing region.²⁹ This can also be observed in panel (a) of Figure 6, where a reduction in β implies a smaller default threshold (smaller repayment

²⁹ The relevant borrowing region goes from the zero borrowing decision up to the borrowing level associated with the highest level of resources that the country can get issuing bonds, or the maximum point of the debt Laffer curve. See the discussion associated with Figure 1.

region or bigger default region). Note that more impatience implies that the planner cares less about the consequences of default that mainly arise in the future. Because of the higher risk of default and interest rates, the planner finds it optimal to choose a lower level of net assets.

The key difference between a reduction in the discount factor and the introduction in political instability is observed in case [B'] of Figure 5. While the reduction in the discount factor does not affect the marginal cost of borrowing, political instability reduces this marginal cost as in the full commitment case. Because the proposer today does not expect to be in power tomorrow, he is not fully internalizing the costs of the borrowing decision. With a lower discount factor, even though there is a higher need to consume more today, the planner is fully internalizing the costs of repayment or default. The bond price schedule will not change in the same way as in the reduction of the discount factor; in fact changes are small. Why do bond prices are not affected in the same way as in the more impatient scenario? Because international investors understand that in every period a potential new policymaker will care much more about his term in office (current period), and the only way to improve his current utility is by repaying previous obligations and borrowing more. Consequently, the default region shrinks with political instability for low levels of repayment obligations. Panel (b) of Figure 6 demonstrates this.

Figure 6. Default thresholds as a function of the shock (z_t) and repayment obligations (a_t)



Note: Estimated for a 45th percentile shock. The model corresponds to the one-period bond case.

The introduction of political fragmentation in a model that already considers instability is left for the last case [C'] in Figure 5. There will be an important expansion of the relevant repayment region (Figure 6 panel (b)); an increase in the current marginal benefit from borrowing; and a bigger reduction in the marginal costs of repayment/default in the future. Recall that having a model with only instability ($\mathcal{M}3$) is not strictly correct, because there must be a reason for the existence of short-sightedness. Now the model with both political factors gives

the complete picture of why the default region shrinks. Since international investors fully understand the problem, they know that tomorrow’s policymaker will be more willing to repay because he will need the access to capital markets to benefit from a much better distribution of resources. For that reason, repayment will be more probable and higher levels of debt can be sustained in equilibrium.

It should be noted that the shifts in the default region from the central planner towards a more impatient one (Figure 5 panel (a)) and towards a model with instability and fragmentation (Figure 5 panel (b)) are also different. In the first case, there is a parallel expansion of the default region. In the second case, the reduction in the default region is relatively small for high repayment obligations (for example $a_t = -0.3$) and relatively large for medium levels of repayment obligations ($a_t = -0.2$). As shown in the previous section, the proposer’s share is highly unfavorable for negative shocks and high levels of repayment obligations (Figure 4). This will not favor the value of repayment under these conditions, determining a small shrink of the default region under high repayment obligations.

4.8 Changes in Political Factors

This section looks at the effects of changes in political factors over debt and default. Table 4 show the effects of changes in n , γ and c^e . The degree of instability was defined as the inverse of the probability of being elected as a proposer, or n . Fragmentation was defined as $n - \gamma$. Then, any change in n will affect both political factors. Similarly, a problem of identification arises when γ is modified. The degree of short-sightedness is a function of Γ , and this parameter depends negatively on $n - \gamma$.³⁰ Then, an increase in γ will reduce fragmentation and the degree of short-sightedness. Finally, variations in the consumption for the excluded (c^e) are analyzed. Differently from n and γ , changes in c^e are not directly related to the degree of short-sightedness.³¹

Table 4 indicates that a higher number of parties (n) for a given size of the government coalition, or more political instability and fragmentation, is linked to a higher probability of default and lower debt ratios. The same results arise with a lower γ . Changes in c^e are more interesting because they represent the core of the mechanism. An increase in c^e reduces the bargaining power of the proposer, leaving him with a lower share of resources. For the policymaker it is less attractive to access the capital markets, because the distributional benefits of repayment are weaker. This will shrink the repayment region and expand the default region, facilitating more default in equilibrium.

Despite the fact that the model is too stylized to explain patterns in inequality, Table 4 indicates that the relation between debt, default, and the proposer’s share of resources is not

³⁰ Recall that $\Gamma = 1/(n - \gamma + 1)$.

³¹ The degree of short-sightedness depends on Γ and the term $\mathcal{K} = \Gamma(n - \gamma)u(c^e)$, which is a constant that depends on c^e . Simulations of the model with and without \mathcal{K} yield the same numerical results. Changes in c^e will affect the continuation value of the problem, or (P.1), because they will affect the consumption for the members of the coalition. Recall that the proposer expects to be part of the MWC in the future.

Table 4. Changes in n , γ and c^e and its effects over Debt & Default

		CHANGES IN n		
	DATA	$n = 1.5$	$n = 1.75$	$n = 2.0$
	Argentina	$\gamma = 1.27$ $c^e = 0.079$	$\gamma = 1.27$ $c^e = 0.079$	$\gamma = 1.27$ $c^e = 0.079$
Default Probability	3.00	0.99	2.79	3.76
Mean Debt/ $y_{quarterly}$	[86.2 - 172.4]	34.66	23.24	19.89
$\sigma(c)/\sigma(y)$	1.09	1.09	1.11	1.10
$\sigma(TB/y)/\sigma(y)$	0.34	0.27	0.35	0.35
Proposer's Share	0.89	0.90	0.91	0.90

		CHANGES IN γ		
	DATA	$n = 1.75$	$n = 1.75$	$n = 1.75$
	Argentina	$\gamma = 1.15$ $c^e = 0.079$	$\gamma = 1.27$ $c^e = 0.079$	$\gamma = 1.55$ $c^e = 0.079$
Default Probability	3.00	3.14	2.79	1.03
Mean Debt/ $y_{quarterly}$	[86.2 - 172.4]	22.73	23.24	30.52
$\sigma(c)/\sigma(y)$	1.09	1.10	1.11	1.09
$\sigma(TB/y)/\sigma(y)$	0.34	0.35	0.35	0.26
Proposer's Share	0.89	0.92	0.91	0.81

		CHANGES IN c^e		
	DATA	$n = 1.75$	$n = 1.75$	$n = 1.75$
	Argentina	$\gamma = 1.27$ $c^e = 0.010$	$\gamma = 1.27$ $c^e = 0.079$	$\gamma = 1.27$ $c^e = 0.150$
Default Probability	3.00	2.19	2.79	3.22
Mean Debt/ $y_{quarterly}$	[86.2 - 172.4]	29.93	23.24	18.93
$\sigma(c)/\sigma(y)$	1.09	1.11	1.11	1.11
$\sigma(TB/y)/\sigma(y)$	0.34	0.36	0.35	0.35
Proposer's Share	0.89	0.99	0.91	0.84

unique. For a very high value of γ , or a very low number of parties excluded, the model registers a low probability of default, high debt ratios, and a lower share for the proposer. Differently, for a high value of c^e , a low share for the proposer also is obtained, but in this case coupled with high default and low debt. These inconclusive predictions are in line with different empirical relations recently reported in the literature. Recognizing that it is not possible to make a strict comparison³², [Azzimonti, de Francisco, and Quadrini \(2014\)](#) reported a positive correlation between debt and inequality, [D'Erasmus and Mendoza \(2014\)](#) found a nonlinear relation between the two, and [Ferriere \(2014\)](#) found a negative correlation.

In terms of the empirical literature of debt and default, political instability can be linked to *debt intolerance* phenomenon. [Reinhart, Rogoff, and Savastano \(2003\)](#) conjectured that historical low default thresholds and higher probabilities of default can be explained by a combination of the procyclical nature of capital markets and short-sighted governments. Also, as indicated by [Tirole \(2012\)](#), more fiscal discipline is associated to high stability and cohesion of the political system. In this case, more instability and fragmentation (less cohesion), are

³² Is not possible due to the different time frameworks, countries used, and controls among these studies.

linked to higher chances of default. In terms of Table 4, default will be more frequent if the country has a higher number of parties or the size of the government coalition is smaller.

Finally, Appendix 3 gathers data on the number of political parties, public debt, and default episodes for a sample of 35 emerging economies between 1975 and 2012. The effective number of political parties in power, or in the executive leadership, was considered to proxy instability (n). The percentage of votes of the political parties that at some point in time belong to the government coalition was considered to proxy the size of the coalition (γ). The purpose of this exercise is not to establish causality or to provide an extensive econometric analysis, but to shed light on simple correlations. The panel estimations are in line with the results of Table 4, a higher n is associated with a higher probability of default and less debt, while an increase in γ is associated with a lower chance of default and higher levels of borrowing.

5 Conclusions

This paper studies how distributional incentives and policymaker short-sightedness affect default and borrowing decisions in a quantitative model of sovereign default. The country can borrow from international capital markets and bond prices are an endogenous outcome that depends on the probability of repayment/default. A bargaining mechanism is introduced in the workhorse model of default in order to generate an endogenous distribution of resources among political parties. The policymaker forms a coalition with a given number of parties to approve policy. Not all parties belong to this coalition. As in most bargaining games, the distribution favors the policymaker or proposer. Policymakers become endogenously short-sighted, because in the future they can lose office and this favorable distribution of resources.

A non-monotonic relationship between borrowing decisions and the policymaker's share of resources arises. First, the more the country borrows, the higher the share for the policymaker. This is because any resources the policymaker brings from abroad are shared among him and the members of the coalition. In this setup the policymaker does not need the vote of those excluded from the coalition, and for that reason the policymaker's share increases. This positive relation is true as long as more borrowing brings more resources to the country. However, in models of sovereign default, high levels of borrowing imply a higher probability of default in the future, lowering bond prices and the resources that the country can get in international capital markets. For this reason, there is a borrowing threshold that determines that the proposer's share starts declining if the policymaker wants to issue debt levels above the threshold.

This mechanism is novel in the literature of sovereign default, since previous political economy models assumed a fixed distribution of resources for any borrowing decision or state of nature. Importantly, because the distribution of resources depends on borrowing decisions, policymakers will value more repayment. If the policymaker defaults, he loses access to capital markets and to the possibility of improving his share of total resources through more borrowing. This explains why the introduction of these political factors in a model of sovereign default facilitates repayment and borrowing. In equilibrium, it allows to sustain higher debt ratios and a higher frequency of default.

This paper also sheds light on the differences between having a low discount factor and political instability and fragmentation. In a model without political factors, more impatience implies that the country wants to frontload consumption. However, international investors know that more impatience also implies that the planner cares less about the consequences of default, which arise mainly in the future. For this reason, the chances of default are higher and will be translated in lower bond prices. In equilibrium, more default and less debt are sustained in equilibrium. In a model with political factors, there will not be a decrease in bond prices and more debt and default will be observed. Political instability also will generate incentives to frontload consumption. Differently, international investors will not punish bond prices because they know that in the next period the new policymaker will value more repayment. This is because the new policymaker, as well as the current one, wants to repay obligations in order to borrow more and enjoy a higher share of resources.

Appendix 1

[A] Lemma 1

The IC constraint implies that $u\left(c_t^{c,h}\right) + \beta v_{cont}^h = v_{out}^h = \mathbb{E}_j u\left(c_t^{j,h}\right) + \beta v_{cont}^h$, where $j \in \{p, c, e\}$ and $h \in \{G, B\}$.³³

In other words, the members of the MWC should receive a level of consumption and an associated utility equal to the expected utility of the scenario in which they vote "no" and the game moves to the next round. In this case, each of the members of the MWC can (i) become proposers, (ii) still belong to the MWC or (iii) do not belong to the next round's MWC. Then, it is true that

$$u\left(c_t^{c,h}\right) = \mathbb{E}_j u\left(c_t^{j,h}\right)$$

$$u\left(c_t^{c,h}\right) = \frac{1}{n} u\left(c_t^{p,h}\right) + \frac{\gamma - 1}{n} u\left(c_t^{c,h}\right) + \frac{n - \gamma}{n} u\left(c^e\right) \quad (15)$$

Solving for the consumption of the MWC yields the expression in Lemma 1.

Also, from equation (15), if $n - \gamma = 0$, then $c_t^{c,h} = c_t^{p,h}$. If $n - \gamma \rightarrow \infty$, then $c_t^{c,h} \rightarrow c^e$.

[C] Lemma 2

The budget constraint is given by: $Q\left(c_t^{p,h}, c_t^{c,h}, c^e, n, \gamma\right) \equiv c_t^{p,h} + (\gamma - 1)c_t^{c,h} + (n - \gamma)c^e - \mathcal{R}_t^h$. As in the previous Lemma, \mathcal{R}_t^h is defined as net resources.

From the expression obtained in Lemma 1, it can be shown that

$$\frac{\partial c_t^{c,h}}{\partial (n - \gamma)} = -u^{-1'}(\cdot) \Gamma^2 \left[u\left(c_t^{p,h}\right) - u\left(c^e\right) \right] < 0$$

Since $y_t > nc^e$, then $u\left(c_t^{p,h}\right) > u\left(c^e\right)$. Note the first term of the derivative is positive since $u(\cdot)$ is increasing and strictly concave.

[C] The Proposer's Problem

At any point in time, the state of the economy is given by net assets a_t , a credit standing $h \in \{G, B\}$ and an endowment process that depends on the random variable ϵ . To maintain the notation of [Aguiar and Gopinath \(2006\)](#), θ refers to the shock ϵ . There are two more random variables in the system. The first one is the role of the representative, denoted by $j \in \{p, c, e\}$. The second is the random variable λ , which is the probability of regaining access to the capital markets if the proposer default in the current period or the credit condition is B .

³³ v_{cont}^h corresponds to the second expression of equation (C1p), defined later in section [C] of this Appendix.

In the same way as Aguiar and Gopinath, the credit standing variable h is split into its random and nonrandom components. Define \tilde{h}_t as the credit status at the end of period $t - 1$, which was decided by the default/repayment decision in $t - 1$ (the nonrandom part). Then, $h_t = G$ has a probability one if $\tilde{h}_t = G$ and with probability λ if $\tilde{h}_t = B$. Finally, denote as $\rho_t \in \{0, 1\}$ the random variable with a value of one if redemption in the previous period. Denote the state of the economy by $s_t = (a_t, \tilde{h}_t, \rho_t, \theta_t)$

Define $\Phi(s_t)$ as the budget correspondance that maps the state s into the range of possible consumption level for the proposer (c_t^p) (the consumption of the members of the MWC (c_t^c) is given by the IC constraint), credit standings \tilde{h}_{t+1} and assets a_{t+1} .

- If $\tilde{h}_t = B$ and $\rho_t = 0$; and $j = p$

$$\Phi(s_t) = \left(\left(\begin{array}{l} c_t^{p,B} + (\gamma - 1) c_t^{c,B} + (n - \gamma) c^e = \varphi(y_t) \\ c_t^{c,B} = u^{-1} \left(\Gamma \left[u \left(c_t^{p,B} \right) + (n - \gamma) u \left(c^e \right) \right] \right) \end{array} \right) ; \left(\tilde{h}_{t+1} = B \right) ; \left(a_{t+1} = 0 \right) \right)$$

- If $\tilde{h}_t = G$ or $\rho_t = 1$; and $j = p$

If the proposer default

$$\Phi(s_t) = \left(\left(\begin{array}{l} c_t^{p,B} + (\gamma - 1) c_t^{c,B} + (n - \gamma) c^e = \varphi(y_t) \\ c_t^{c,B} = u^{-1} \left(\Gamma \left[u \left(c_t^{p,B} \right) + (n - \gamma) u \left(c^e \right) \right] \right) \end{array} \right) ; \left(\tilde{h}_{t+1} = B \right) ; \left(a_{t+1} = 0 \right) \right)$$

If the proposer repay

$$\Phi(s_t) = \left(\left(\begin{array}{l} c_t^{p,G} + (\gamma - 1) c_t^{c,G} + (n - \gamma) c^e = \\ y_t + [\eta + (1 - \eta) \zeta] a_t - q_t [a_{t+1} - (1 - \eta) a_t] \\ c_t^{c,G} = u^{-1} \left(\Gamma \left[u \left(c_t^{p,G} \right) + (n - \gamma) u \left(c^e \right) \right] \right) \end{array} \right) ; \left(\tilde{h}_{t+1} = G \right) ; \left(a_{t+1} \right) \right)$$

Before presenting the problem, it is important to highlight the role of the representative, because only the proposer will choose policy. Denote the combination of the state and the role of the representative as $\hat{s}_t = (s_t, j_t)$. Using this last notation, the problem for a proposer initially for $\hat{s}_0 = (s_0, p)$ is

$$v^p(s_0, p) = \sup_{\{c_t^p, a_{t+1}, \tilde{h}_{t+1}\}_{t=0}^{\infty}} \left\{ u(c_0^p) + \mathbb{E}_0 \sum_{t=1}^{\infty} \beta^t u(c_t^j) \right\} \quad (\text{C1})$$

subject to

$$\left(c_t^p, a_{t+1}, \tilde{h}_{t+1} \right) \in \Phi(s_0, p), \Phi(s_t, j_t) \quad t = 1, 2, \dots \quad (\text{C2})$$

The problem represented by (C1) and (C2) can be reformulated. In particular, the future uncertainty with respect to the role of the representative can be eliminated using the IC

constraint, where $\mathbb{E}_j u(c_t^{j,h}) = u(c_t^{c,h})$ given the corresponding state h_t , which can be decomposed in its random and non-random components, as before. Using this condition

$$\mathbb{E}_j u(c_t^{j,h}) = \Gamma u(c_t^{p,h}) + \Gamma(n - \gamma) u(c^e)$$

Then, the problem can be expressed as

$$v^p(s_0, p) = \sup_{\{c_t^p, a_{t+1}, \tilde{h}_{t+1}\}_{t=0}^{\infty}} \left\{ u(c_0^p) + \mathbb{E}_0 \sum_{t=1}^{\infty} \beta^t [\Gamma u(c_t^p) + \mathcal{K}] \right\} \quad (\text{C1p})$$

subject to

$$(c_t^p, a_{t+1}, \tilde{h}_{t+1}) \in \Phi(s_t, p) \quad t = 0, 1, 2, \dots \quad (\text{C2p})$$

Where $\mathcal{K} = \Gamma(n - \gamma) u(c^e)$ and c^e is assumed exogenous and fixed. From (C1p) and (C2p) the problem can be reformulated in its recursive form, as in equations (6) and (7).

Appendix 2

An asset grid of 150 points and a shock grid of 150 points are used. The model is simulated 300 times. Each simulation had a length of 10,000 quarters. Only the last 1000 were considered to rule out any effect of initial conditions.

The algorithm to solve the model is the following:

1. Discretized the state space.
2. Define \mathcal{R}^h as net resources. $\mathcal{R}^G = y_t + [\eta + (1 - \eta)\zeta] a_t - q_t [a_{t+1} - (1 - \eta) a_t]$ if $h = G$, or $\mathcal{R}^B = \varphi(y_t)$ if $h = B$. Construct a grid of values for \mathcal{R}^h , $\{\mathcal{R}_1, \dots, \mathcal{R}_m\}$. The grid should include all the potential values for \mathcal{R}^h under repayment and under default. Define the grid function:

$$G(\mathcal{R}_m) = \{c_m^p : c_m^p + (\gamma - 1) u^{-1}(\Gamma[u(c_m^p) + (n - \gamma) u(c^e)]) + (n - \gamma) c^e = \mathcal{R}_m\}$$

For $m = 1, \dots, M$.

3. Start with a guess for the bond price schedule $q^0(a_{t+1}, y_t)$.
4. Given the bond price schedule and for an initial guess of the value function:
 - (a) Use interpolation methods to calculate $c^{p,h}(a_t, y_t)$ based on $G(\mathcal{R}_m)$.
 - (b) Given the previous iteration value functions for (P.1), solve for the policy functions in (P.0). Suppose that for the current iteration $k + 1$ the optimal level of assets is a_{t+1}^{k+1} and the default decision is d_{t+1}^{k+1} .
 - (c) Calculate the set:

$$\mathcal{S} = \{\mathcal{V}_{a_{t+1}}^p(a_t, y_t), \mathcal{V}^{p,B}(y_t)\}_{a_{t+1}=a_{\min}}^{a_{\max}}$$

There will be a value function for each potential choice of $a_{t+1} \in \mathcal{A} = [a_{\min}, a_{\max}]$ in (P.1).

- (d) Use the policy functions of ($\mathcal{P}.0$) to find the optimal continuation values over the set \mathcal{S} . Then, the optimal choice a_{t+1}^{k+1} and the default decision is d_{t+1}^{k+1} will be the same for ($\mathcal{P}.0$) & ($\mathcal{P}.1$).
- (e) Considering (b) and (c), iterate the value functions in \mathcal{S} until convergence for a given q^0 . Suppose that \mathcal{S}_{k+1} are the functions delivered in the current iteration. The first element of \mathcal{S} is updated as a weighted average of the previous and current iteration values

$$\mathcal{V}^p(a_t, y_t)_{k+1} = (1 - \varsigma) \mathcal{V}^p(a_t, y_t)_k + \varsigma \mathcal{V}^p(a_t, y_t)_{k+1}$$

Where $\varsigma \in (0, 1)$ and is a very small number. The same for $\mathcal{V}^{p,B}(y_t)_{k+1}$. The algorithm loops until $\max \left| \max | \mathcal{V}^{p,G}(a_t, y_t)_{k+1} - \mathcal{V}^{p,G}(a_t, y_t)_k |, \max | \mathcal{V}^{p,B}(y_t)_{k+1} - \mathcal{V}^{p,B}(y_t)_k | \right|$ has dropped below 10^{-5} .

5. Given the new value function for ($\mathcal{P}.0$), update the bond price function q^1 .
6. Use the update price function q^1 to repeat 2. to 4. until the convergence criterion is met.

Appendix 3

This section gathers information about the number of political parties, debt levels and default episodes. Simple correlations among these variables are studied. A panel for 35 emerging countries between 1975 and 2012 was used in the analysis.

Information on political parties in the executive as in Congress comes from the World Bank's Database of Political Institutions, originally formulated in Beck, Clarke, Groff, Keefer, and Walsh (2001). Data on crises comes from Manasse and Roubini (2009).³⁴ Information on total public debt comes from Abbas, Belhocine, ElGanainy, and Horton (2010). Public debt was collected by the authors at the general government level.³⁵

A group of 35 countries were considered in the estimations. Initially a sample of 47 emerging market countries used in Manasse and Roubini (2009) was analyzed. To test the hypothesis that fragmentation and instability played a role in terms of debt and default, countries in the sample must present some degree of variability of these political factors. From the 47 countries, the ones that never showed a change or registered only one political party in the executive were not considered.³⁶ The final sample include: Argentina, Bolivia, Brazil,

³⁴ Manasse and Roubini (2009) defined a crisis following the classification of Standard and Poor's and also if the country receives a large non-concessional IMF loan, or above the 100 per cent of the country's IMF quota.

³⁵ The authors define that the general government *consists of all government units and all nonmarket nonprofit institutions that are controlled and mainly financed by government units, comprising the central, state, and local governments. The general government sector does not include public corporations or quasi-corporations.*

³⁶ These are the cases of Algeria, China, Kazakhstan, Malaysia, Morocco, Pakistan, Oman and Jordan. Also, countries that were classified as military during the whole or a very long period were also excluded from the final sample. In this group there are three countries, Indonesia (31 years under military rule), Egypt (always military) and Tunisia (with a military government between 1988 and 2011). One last country was not considered, Slovak Republic, due to the lack of information on political variables.

Chile, Colombia, Costa Rica, Cyprus, Czech Rep., Dom. Rep., Ecuador, Estonia, Guatemala, Hungary, India, Israel, Jamaica, Korea, Lithuania, Latvia, Mexico, Panama, Peru, Philippines, Poland, Paraguay, Romania, Russia, El Salvador, Thailand, Trinidad-Tobago, Turkey, Ukraine, Uruguay, Venezuela, S. Africa.

As in the empirical literature of the relation between fiscal policy and political characteristics, the effective number of political parties - ENPP (Laakso and Taagepera, 1979) was used in the calculations. This measure is calculated as follows:

$$ENPP = 1 / \left(\sum_i^n s_i^2 \right)$$

Where s_i is the share of time in the executive of the i th party and n is the actual number of parties in power. For example, for the first case if in an election there is only two political parties and they obtain the same number of votes, 50% for the first and 50% for the second, the ENPP is 2. Meanwhile, if the results of the election are 75% for the first party and 25% for the second, the ENPP is 1.6. Hence, this measure penalize the nominal number of parties by the distribution of votes in the election.

Table A.1 studies the relation between public debt and political factors. The sample is restricted to non-military regimes or democracies. Public debt is measured as a percentage of GDP and as percentage of exports. This last ratio is used following C atao and Kapur (2006).³⁷ The ENPP in the executive was used as a proxy of the total number of parties, as in the model. This variable is called ‘ n ’ in Table A.1, as in the model. In terms of the coalition size, all the parties that at some point belong to the government coalition were considered, instead of the parties that every year effectively belong to the coalition. The model is too stylized to capture changes in the coalition size, but what it intends to capture is that there is a group of parties that benefits from the policymaking process. For that reason, the votes of all the parties that at least in one year belong to the coalition were considered. The percentage of votes in Congress for this group is denoted by ‘ γ ’ in Table A.1.

Other political characteristics are included as controls, like the regime type (presidential regime is equal to one and zero otherwise), if there is a proportional rule (taking a value of one if it is the case), a dummy for the year of elections and the number of seats in Congress. Focusing on the fiscal policy outcomes of constitutional rules, Persson and Tabellini (2004) showed that presidential regimes induce smaller governments than parliamentary regimes, while majoritarian elections lead to smaller governments than proportional elections. In the case of proportional elections, legislators are elected in large districts, which gives incentives to form coalitions and spend more. On the other hand, in the case of majority rule, the size of the minimal winning coalition (and consequently government expenditures) is smaller than under proportional representation.³⁸ Finally, a set of economic variables is included as controls. The

³⁷ They mentioned that *once debt is scaled by exports (D/X), rather than GDP, the correlation between default events and debt burdens tightens considerably, although some important outliers remain.*

³⁸ In the case of the majority rule, a party can win with 25 per cent of the votes; 50 per cent in 50 per cent of the districts. Under full proportional representation, a 50 per cent of the national vote is required.

three variables are GDP growth, the real exchange rate (RER) growth and the terms of trade (ToT) growth.

Table A.1. Relation between public debt and political factors, 1975-2012 for 35 countries

	Dependent variable:			Dependent variable:		
	PUBLIC DEBT / GDP			PUBLIC DEBT / EXPORTS		
	[1]	[2]	[3]	[1']	[2']	[3']
n	-0.0524** [0.025]	-0.034 [0.024]	-0.0314 [0.024]	-0.3460* [0.178]	-0.281 [0.172]	-0.243 [0.164]
$n\gamma$	0.0006*** [0.000]	0.0002 [0.000]	0.0002 [0.000]	0.0038*** [0.001]	0.0029** [0.001]	0.0023* [0.001]
Presidential		-0.139 [0.099]	-0.1544 [0.097]		-0.077 [0.512]	-0.056 [0.534]
Proportional		0.0149 [0.065]	0.0737 [0.058]		0.0202 [0.712]	0.2166 [0.711]
Elections		0.0041 [0.010]	0.0003 [0.009]		0.0281 [0.082]	0.0142 [0.084]
Congress size		0.0199 [0.022]	-0.0128 [0.025]		-0.1 [0.233]	-0.033 [0.275]
GDP growth			-0.0037 [0.002]			-0.0417* [0.024]
RER growth			0.0657* [0.034]			0.1788 [0.234]
ToT growth			-0.0158 [0.019]			-0.152 [0.238]
Observations	1,022	1,022	973	1,022	1,022	973
Countries	35	35	35	35	35	35
R -squared	0.0209	0.133	0.169	0.0118	0.102	0.146
Time effects	No	Yes	Yes	No	Yes	Yes

Notes: The constant is not reported, but it is significant in all the cases. RER denotes Real Exchange Rate and ToT denotes Terms of Trade. Robust standard errors are reported in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Results of Table A.1 corroborate the predictions of the model at the level of correlations. In particular, in Table 4 the model predict that an increase in n is associated with less debt, while an increase in γ is related to an increase in debt. The simple correlations of column [1] and [1'] indicate this for the ratio of debt over GDP and the ratio of debt over exports. Including time effects and controlling for other political characteristics maintain all the signs of the coefficients, but only for the ratio of debt over exports, $n\gamma$ is still significant. The same is true when the set of economic controls is introduced, in columns [3] and [3'].

Table A.2 reports the results of a logit specification. A dummy variable taking the value of one for the years in which the country was in default is explained by the same set of regressors and debt levels. All the explanatory variables were included with a lag of one year. Also, including independently n and γ in the estimations yield non significant results. When the political variables were interacted with debt levels, it is found that the number of political parties is relevant. The first three columns repeat the same exercise as in Table A.1. First simple correlations are analyzed, then time fixed effects and political controls are introduced, and the third column includes the economic controls. In all these cases, an increase in n is associated with a higher chance of default, as in Table 4.

Table A.2. Relation between default and political factors, 1975-2012 for 35 countries

	Dependent variable: DEFAULT [Public Debt (D) as % of GDP]				Dependent variable: DEFAULT [Public Debt (D) as % of Exports]			
	[1]	[2]	[3]	[4]	[1']	[2']	[3']	[4']
D_{t-1}	1.3723** [0.690]	0.7398 [0.937]	0.4997 [0.963]	0.3312 [0.765]	0.2098*** [0.076]	0.1131 [0.097]	0.0958 [0.105]	0.0459 [0.096]
$D_{t-1}\gamma_{t-1}$	-0.005 [0.007]	-0.008 [0.009]	-0.005 [0.009]	0.0167* [0.009]	-0.001 [0.001]	-0.0003 [0.001]	0.0003 [0.001]	0.0027** [0.001]
$D_{t-1}\gamma_{t-1}n_{t-1}$	0.0043*** [0.001]	0.0037** [0.001]	0.0032** [0.001]	0.0000 [0.002]	0.0007*** [0.000]	0.0006*** [0.000]	0.0005** [0.000]	0.0001 [0.000]
Proportional $_{t-1}$		0.1679 [0.254]	0.1756 [0.260]	-0.6542** [0.315]		0.0125 [0.236]	0.0634 [0.252]	-0.8363*** [0.313]
Elections $_{t-1}$		-0.004 [0.250]	0.0314 [0.257]	0.2031 [0.286]		0.0016 [0.249]	0.0415 [0.261]	0.2247 [0.286]
Congress size $_{t-1}$		-0.031 [0.063]	-0.014 [0.067]	0.2578*** [0.080]		-0.1432** [0.069]	-0.1393* [0.077]	0.0788 [0.079]
GDP growth $_{t-1}$			-0.0674*** [0.025]	-0.0755*** [0.028]			-0.0809*** [0.025]	-0.0898*** [0.028]
RER growth $_{t-1}$			0.9914** [0.400]	1.2418*** [0.398]			1.0412*** [0.396]	1.3554*** [0.399]
ToT growth $_{t-1}$			0.3621 [0.281]	0.4333 [0.337]			0.4154 [0.323]	0.5006 [0.452]
Presidential $_{t-1}$				2.6170*** [0.363]				2.3776*** [0.346]
Observations	958	730	698	698	958	730	698	698
R-squared	0.0804	0.266	0.291	0.386	0.106	0.288	0.318	0.4
Time effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Notes: The dependent variable is dummy that takes the value of one for the years in which a country is in default. The model corresponds to a logit specification. The constant is not reported, but it is significant in all the cases. D denotes debt, RER denotes Real Exchange Rate and ToT denote Terms of Trade. Robust standard errors are reported in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

The last two columns, [4] and [4'], incorporates the Presidential indicator. When this is done, the number of parties turns non significant. Default episodes mainly occur in Presidential regimes. Also, the indicator of the size of the coalition turn significant but the incorrect sign. In way to interpret these results is that n and γ are capturing the same deep structural characteristics that make presidential systems more prone to default. For the purposes of this paper, the relation between n and the probabilities of being in default holds for the simple correlation case.

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