Heterogeneous Borrowers in Quantitative Models of Sovereign Default*

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Abstract

We study an economy in which policymakers of different types (patient vs. impatient) alternate in power. Our framework builds on the model used in recent quantitative studies of sovereign default. We show that a default episode may be triggered by a change in the type in office, from a patient to an impatient policymaker. We also show that for this mechanism to be observed in equilibrium, it is necessary that there is enough political stability and that patient policymakers encounter sufficiently poor economic conditions during their tenure. Under high political stability, the presence of political turnover enables the model to generate: (i) a higher and more volatile spread (even when we focus on samples where only the patient type is in office), (ii) lower borrowing levels after a default episode, and (iii) a weaker correlation between economic conditions and default decisions. These results narrow the gap between the predictions of the model and the data.

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1 Introduction

Business cycles in small emerging economies differ from those in developed economies. Emerging economies feature interest rates that are higher, more volatile and countercyclical (interest rates are usually acyclical in developed economies) and have higher output volatility, higher volatility of consumption relative to income, and more countercyclical net exports.[1] Due to the high volatility and countercyclicality of the interest rate, the state-dependent interest rate scheme plays an important role in any model designed to explain the cyclical behavior of quantities and prices in emerging economies. Some studies assume an exogenous interest rate scheme.[2] Others provide microfoundations for the interest rate scheme based on the risk of default.[3] This is the approach followed by recent quantitative models of sovereign default, based on the framework proposed by Eaton and Gersovitz (1981).[4] The present paper studies the role of political turnover in the second class of models.

In addition to pure economic variables, political factors are often considered to play a nontrivial role as determinants of defaults. For instance, Sturzenegger and Zettelmeyer (2006a) conclude that "a solvency crisis could be triggered by a shift in the parameters that govern the country's willingness to make sacrifices in order to repay, due to changes in the domestic political economy ...." Similarly, Van Rijckeghem and Weder (2004) argue that a country's willingness to pay is influenced by politics, i.e., by the distribution of interests and by the institutions and power structures. Santiso (2003) writes, "One basic rule of the confidence game [in international financial markets] is then to be very careful when nominating the official government voicer. For investors it is mainly the ministry of economics or finance or the governor of the central bank." In this vein, Moser (2006) finds a significant effect on country interest rate spreads when the minister of finance and/or economics changes. He argues that such events may reveal important signals about the government's future policy course. The signals may contain information that forms expectations about the future growth potential of a country and at the same time about its willingness to service its debt. Figure 1 illustrates the behavior of the sovereign spread in Brazil before and after the election of 2002. This is often mentioned as an example of the importance of political factors as determinants of default decisions. The concerns raised by the left-

[1]See Aguiar and Gopinath (2007), Neumeyer and Perri (2005), and Uribe and Yue (2006).

[2]See, for example, Aguiar and Gopinath (2007), Neumeyer and Perri (2005), Schmitt-Grohé and Uribe (2003), and Uribe and Yue (2006).

[3]Tomz and Wright (2007) document 250 sovereign defaults by 106 countries between 1820 and 2004. Some of the latest episodes are Russia in 1998, Ecuador in 1999, and Argentina in 2001.

[4]See Aguiar and Gopinath (2006), Arellano (2005), Arellano and Ramanarayanan (2006), Bai and Zhang (2006), Cuadra and Sapriza (2006a,b), Eyigungor (2006), Lizarazo (2005, 2006), and Yue (2005).

wing candidate Luiz Inacio “Lula” Da Silva due to his past declarations in favor of a debt repudiation is the most accepted explanation for the sharp increase in the country spread preceding the Brazilian election (see Goretti (2005)). More recently, the elected president of Ecuador—Rafael Correa—declared his intentions to restructure the country's debt, which was linked to a decline in sovereign bond prices (see, for example, Pimentel and Murphy (2006)). Finally, there is a body of empirical evidence that suggests that political factors may be important to understand the determinants of sovereign default (see Citron and Nickelsburg (1997), Balkan (1992), Kohlscheen (2003), Reinhart et al. (2003), and Meyersson (2006)). This paper contributes to the understanding of how political risk may affect borrowing and default decisions.

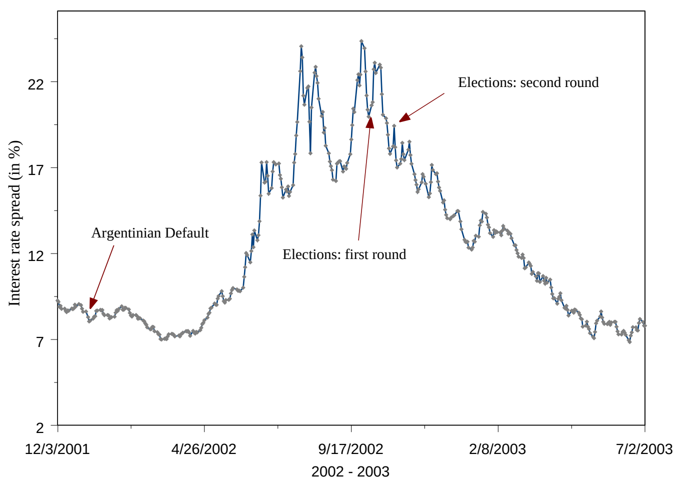

Figure 1: Elections and sovereign bond spread in Brazil. Source: JP Morgan (EMBI Global)

We introduce a stylized political process into the framework used by recent quantitative studies on sovereign default. We study a small open economy that receives a stochastic endowment stream of a single tradable good. The objective of the policymaker in power is to maximize the expected present value of future utility flows. As in Cole et al. (1995) and Alfaro and Kanczuk (2005), we assume that two types of policymakers who assign different weights to future utility flows alternate in power. One type is more patient than the other. The only financial assets available are one-period non-contingent bonds. These assets are priced in a competitive market inhabited by a large number of identical risk-neutral lenders. Lenders have perfect information regarding the economy's endowment and the type of policymaker in office. In each period, the policymaker in office makes two decisions. First, he decides whether to refuse to pay previously issued debt. Second, he decides how much to borrow or save. The cost of declaring a default is that the endowment is reduced in a fixed percentage in the following period.

Two types of defaults may be observed in equilibrium. First, a sufficiently low endowment realization may trigger a default during the spell of a "patient" or "impatient" type. The second type of default is a "political default". The latter is triggered by a change in the policymaker in power. In equilibrium, a political default may only occur when a patient policymaker is replaced by an impatient policymaker.

We show that a political default is likely to occur only when there is enough political stability. The intuition behind the role of political stability is the following. The price received by the government for the bonds issued today incorporates a discount that mirrors the probability of a default in the following period (recall that the government can only issue one-period bonds). If a patient type chooses borrowing levels that would lead an impatient type to default, it has to compensate lenders for this contingency, i.e., for the contingency that an impatient type becomes the decision maker in the following period. If the probability of this contingency is high enough (political stability is low), it is too expensive for the patient type to choose borrowing levels that would lead an impatient type to default. In this scenario, the patient type does not borrow so heavily and therefore, a change in the government's type does not trigger a default.

Our model displays a non-monotonic relationship between the default probability and political stability. For low levels of political stability (i.e., a high probability of change in the type in power), an increase in political stability increases the probability that a patient government chooses debt levels that would lead an impatient government to default and, therefore, it increases the default probability. On the other hand, for high levels of political stability, a patient government is already choosing debt levels that would lead an impatient government to default. In this case, the default risk premia charged on current bond issuances already incorporate the probability that the type in power may change tomorrow, so a decrease in that probability (more political stability) decreases the probability of default.

We also find that even in an economy with high political stability, a default does not occur every time a patient policymaker is replaced by an impatient policymaker. The reason is that a patient policymaker chooses high issuance volumes (that would lead an impatient policymaker to default) only after experiencing a stream of sufficiently low endowment realizations during his tenure.

In order to gauge the importance of political factors as determinants of recent default episodes, we study the behavior of political risk in these episodes.[5] We conclude that the Argentinean default in 2001 is the most likely to have been triggered by a change in political circumstances.[6] Only Argentina and Uruguay exhibit a relatively high degree of political stability that this paper suggests is necessary for the occurrence of political defaults. But while the average levels of political risk in Uruguay before and after its default are almost identical, Argentina exhibits the widest difference in the average levels for the same.[7]

The model is solved using numerical techniques and a calibration of the endowment process based on data from Argentina. We identify 1993-2001 as a period of low political risk in Argentina (in terms of the model, a period with patient governments). We simulate an economy with high political stability and study samples where only the patient type is in office, and in the first period after the end of the sample, the impatient type becomes the decision maker and declares a default. We compare the implications of the model with the Argentinean macroeconomic behavior during the 1993-2001 period. We show that introducing political turnover improves the ability of the model to reproduce the high spreads (margin of extra yield over U.S. Treasuries) paid by Argentina. The average spread observed during this period is 7.3%. The average spread obtained with our benchmark parameterization is 6.2%. This spread is substantially higher than that obtained when the role of political turnover is shut down. In an economy where all policymakers are patient, the average spread is 0.3%. In an economy where all policymakers are impatient, the average spread is 1.5%. Given that the mean spread in the model mirrors the default probability, this implies that an economy in which investor-friendly governments alternate in power with less investor-friendly governments has a higher default probability than an economy where governments are never friendly to investors. It is the alternation of the type in power that is crucial for generating a higher default probability.

We also find that when enough political stability is assumed, the presence of political turnover narrows the gap between the spread volatility obtained in the simulations and that observed in the

[5]Bilson et al. (2002) define political risk as "the risk that arises from the potential actions of governments and other influential domestic forces, which threaten expected returns on investment." In our environment, default is the government's action that affects the return obtained by lenders, and (for a given debt level) political risk is low (high) when a patient (impatient) policymaker is in power.

[6]We look at the composite index of political risk for investors constructed by the International Country Risk Guide for Argentina, Ecuador, Pakistan, Russia, and Uruguay. All of these countries declared a default within the last ten years. We identify higher (lower) values of the index (above the mean or the median) with a "good" ("bad") type being in power (the index is such that a higher value indicates less political risk).

[7]After Argentina's president De La Rua resigned on December 20, 2001, the Congress named Rodriguez Saa as the interim president on December 23, 2001. The next day, Argentina announces the suspension of all payments on debt instruments and the default is celebrated in Congress as a victory (see Sturzenegger and Zettelmeyer (2006a)).

data. In the model with alternation, in samples where only the patient type is in power, the standard deviation of the spread is 0.5%. Note that this measure of volatility is from samples without political turnover and, thus, is not driven by the alternation in power of policymakers of different type who are willing to pay different spread levels. The standard deviation obtained when the model is simulated without political turnover is less than 0.03%. Mechanically, the presence of political turnover smooths out the bond price scheme the government faces. This helps the model to generate a higher and more volatile spread. The shape of the bond price function plays a key role in the quantitative performance of models of sovereign default; it has been a challenge for the literature to generate a relatively smooth price function (see, for example, the discussions in Aguiar and Gopinath (2006) and Hatchondo et al. (2007b)). In addition to improving the performance of the spread, the model with political turnover is able to replicate other salient features of the macroeconomic performance of Argentina.

The occurrence of political defaults enable the model to partially disentangle default decisions from poor economic conditions. Tomz and Wright (2007) report that even though most default episodes occur in periods of low output (below the trend), the correlation between default decisions and economic conditions is much weaker than that implied by existing quantitative models of sovereign default (without political turnover). They conjecture that introducing "political shocks" to the model may help explain the moderate correlation between output and default decisions found in the data. The present paper presents a model that supports their conjecture.

The model implies that the economy faces a harsher treatment in capital markets after a political default. This implication is in line with the difficulties in market access that are regularly observed after a default episode (for example, Gelos et al. (2004) and IMF (2002) discuss evidence of a drainage in capital flows to countries that defaulted). In fact, the observation that countries face difficulties in market access after a default has been used by most of the recent work on sovereign default to motivate the assumption that countries are exogenously excluded from capital markets after a default. In contrast, in our model investors are still willing to lend to the impatient type—who is in office after a political default—but under more stringent conditions: the bond price scheme offered to the impatient type is below that offered to the patient type. We show that this induces impatient governments to borrow less and pay lower spreads compared to the pre-default levels. We argue that this is in line with what is observed in Argentina around the default in 2001. The external public debt and the spread observed in Argentina after the default in 2001 are below the values observed before the crisis; this is not the case in Uruguay, where as explained earlier, most likely the default was not triggered by political factors. Furthermore, and consistent with historical evidence, our model predicts that market access improves after the defaulting government loses power.[8]

1.1 Related literature

This paper is closely related to Cole et al. (1995) and Alfaro and Kanczuk (2005). They also study models of sovereign default with heterogeneous borrowers in which a default occurs if a "patient" policymaker is replaced by an "impatient" policymaker. In contrast to the present paper, they assume that there is asymmetric information about the borrower's type. They focus on equilibria in which patient policymakers always default and impatient policymakers never default. In order to simplify the analysis, Cole et al. (1995) assume that governments can only choose whether to accept the loans offered by lenders. In Alfaro and Kanczuk (2005) the borrowing level is exogenously given. Both modeling strategies enable the authors to simplify the learning process faced by the lenders and make their models tractable. The drawback of this approach is that it limits the ability to study the macroeconomic behavior over the business cycle. We consider political process similar to the one used by Cole et al. (1995) and Alfaro and Kanczuk (2005) but ours is embedded in the setup used in recent quantitative models of sovereign default. This means that the government does not face any restriction when choosing the optimal borrowing level. We show that a default is triggered by political turnover only if there is enough political stability and patient governments encounter poor economic conditions during their tenure. We also show that in politically stable economies, the presence of political turnover increases the volatility of the spread paid by patient governments.

Similarly, Chatterjee et al. (2005) study household bankruptcy in a setup with heterogenous borrowers and asymmetric information about the borrower's type. They assume that the discount factor follows a stochastic process, i.e., the borrower's type changes over time. Instead, we assume that borrowers of different types alternate in power. We consider this to be a better representation of political processes that feature the interaction of groups of politicians with different objectives. As Cole et al. (1995) and Alfaro and Kanczuk (2005), Chatterjee et al. (2005) restrict the set of savings levels available to borrowers. They also focus on equilibria where the impatient type always defaults.

[8]A clear example is discussed by Cole et al. (1995); they explain that "the ability of Reconstruction governments in Florida and Mississippi to borrow after the Civil War suggests that the old creditors could not block new loans once the states' reputations had been restored by an observable change in regime."

Amador (2003) and Cuadra and Sapriza (2006a) study sovereign default in a setup in which different types alternate in power. The types disagree on the optimal allocation of resources within each period but do not differ in their willingness to pay and, therefore, they receive the same treatment from lenders. In their environments, political stability affects the equilibrium spread mainly through its effect on the weight on future utility flows. In contrast, in our setup the two types differ in their willingness to pay, and political stability affects equilibrium spreads mainly through the direct effect it exerts on the shape of the bond price function.

The paper proceeds as follows. Section 2 introduces the model. Section 3 discusses the behavior of an index of political risk in countries that have declared a default in recent years. Section 4 presents the parameterization of the model. Section 5 discusses the results. Section 6 concludes and suggests possible extensions.

2 The model

The basic structure of the model studied in the paper is already present in Aguiar and Gopinath (2006), Arellano (2005), Arellano and Ramanarayanan (2006), Bai and Zhang (2006), Cuadra and Sapriza (2006a,b), Eyigungor (2006), Lizarazo (2005, 2006), and Yue (2005). They extend the basic framework presented by Eaton and Gersovitz (1981) to study the quantitative performance of the model. Among these studies, the closest reference to the present paper is Aguiar and Gopinath (2006). The advantage of their model is that its simplicity allows us to analyze the effects of political factors more transparently.

2.1 The environment

There is a single tradable good. The economy receives a stochastic endowment stream of y, where

$$\log(y_t) = (1-\rho)\,\mu + \rho\log(y_{t-1}) + \varepsilon_t,$$

where $|\rho| < 1$, and $\varepsilon_t \sim N\left(0, \sigma_\epsilon^2\right)$.

The government determines the consumption level in the economy, c. The per-period utility function is of the CRRA type, i.e.,

$$u\,(c) = \frac{c^{1-\sigma} - 1}{1-\sigma}.$$

The objective of the policymaker in power is to maximize the present discounted value of future utility flows. As in Cole et al. (1995) and Alfaro and Kanczuk (2005), we assume that two types of policymakers who assign different weights to future utility flows alternate in power. The patient policymaker discounts future utility flows at a rate β_h. The impatient policymaker discounts future utility flows at a rate β_l, where $\beta_h > \beta_l$. At the end of every period, the type of policymaker in power changes with probability π. The value of π is a constant. The simple political process assumed has the advantage of making the model a parsimonious generalization of the framework used in recent quantitative studies and, thus, helps gauge the role played by the new mechanism introduced in the paper.

The policymaker in power makes two decisions every period. First, he decides whether to pay back previously issued debt. Defaults imply a total repudiation of government debt. Second, he chooses how much to borrow or save for the following period. The only financial assets available are one-period non-contingent bonds. Let b denote the bond position at the beginning of the period. A negative value of b denotes that the country was an issuer of bonds in the previous period. Each bond delivers one unit of the good in next period (provided a default is not declared). The cost of declaring a default is that the endowment in the following period is reduced by a fraction λ.

There is a continuum of risk-neutral lenders. Each lender can borrow or lend at the risk-free rate r. Lenders have perfect information regarding the economy's endowment and the government's type.[9]

The bond price is determined as follows. First, the government announces how many bonds it wants to issue. Second, lenders offer a price for the bonds. Finally, the government sells the bonds to one of the lenders who offered the highest price.

Competitive lenders offer a price $q_{jd}(b', y)$ for each bond when the government issues a total of $-b'$ bonds. The subindex j indicates the government's type, so $j \in \{h, l\}$. The subindex d is equal to 1 if the government has defaulted in the current period and is equal to 0 if the government has not defaulted in the current period.

The following equation summarizes the government's budget constraint in a given period.

$$c + q_{jd}\left(b', y\right) b' = (1 - h\lambda)\, y + (1 - d)\, b,$$

where h denotes the credit history. The variable h takes a value of 1 if a default was declared in the previous period and takes a value of 0, otherwise.

[9]Assuming that the borrower's type is not public information would significantly increase the difficulty of the analysis unless the set of borrowing levels is restricted. This is the strategy followed in Cole et al. (1995), Alfaro and Kanczuk (2005), and Chatterjee et al. (2005).

The timing of the model is summarized in Figure 2. At the beginning of the period, the type of policymaker in power is determined. Then, the endowment is realized. After observing the endowment realization, the government decides whether to pay back previously issued debt. If it decides to pay back, the government issues an amount $b'_{j0}(b_t, y_t, h_t)$ of bonds. If the government defaults, it issues an amount $b'_{j1}(y_t, h_t)$ of bonds. In the period after a default the economy suffers an output loss of λ percent. Before the beginning of period $t+1$, the type of policymaker in power changes with probability π and does not change with probability $1-\pi$.

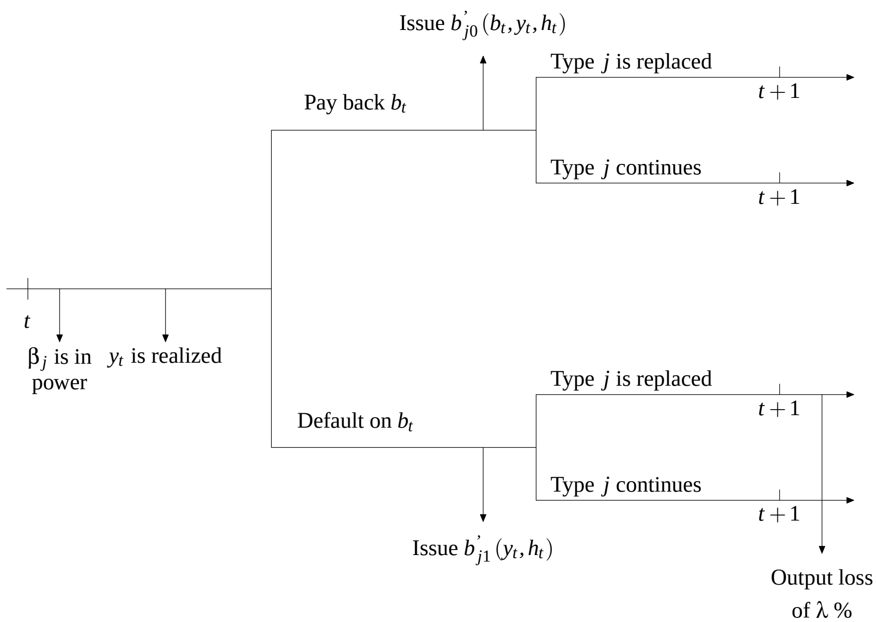

Figure 2: Order of events in period t

When deciding whether to default, the policymaker in power compares two continuation values, $V_{j1}(y, h)$ and $V_{j0}(b, y, h)$. The former denotes value function of a policymaker of type j if a default is declared in the current period, the current endowment realization is y, and the credit history is h. The second expression denotes the value function of a policymaker of type j if a default is not declared in the current period, the current endowment realization is y, and the credit history is h. In the second case, the government makes a payment of $-b$ at the beginning of the period.

Let $V_j(b, y, h)$ denote the value function of a policymaker of type j at the beginning of a period when he is in power. Let $W_j(b, y, h)$ denote the value function of a policymaker of type j at the beginning of a period when he is not in power. Since the behavior of the two types may differ, the value functions

V_j and W_j do not need to coincide. The optimal borrowing decision of a government that has defaulted in the current period solves the following dynamic programming problem:

$$V_{j1}(y,h) = \max_{b'} \left\{ \begin{array}{c} u\left(y\left(1-h\lambda\right) - q_{j1}\left(b',y\right)b'\right) + ... \\ \beta_j \left[\ \pi \int W_j(b',y',1)F\left(dy' \mid y\right) + \left(1-\pi\right)\int V_j(b',y',1)F\left(dy' \mid y\right) \ \right] \end{array} \right\}, \tag{1}$$

where $F(\cdot)$ denotes the cumulative distribution function for y'.

The value function of a policymaker of type j when he has decided to pay back the debt is obtained from the following Bellman equation:

$$V_{j0}(b,y,h) = \max_{b'} \left\{ \begin{array}{c} u\left(y\left(1-h\lambda\right) + b - q_{j0}\left(b',y\right)b'\right) + ... \\ \beta_j \left[\ \pi \int W_j(b',y',0)F\left(dy' \mid y\right) + \left(1-\pi\right)\int V_j(b',y',0)F\left(dy' \mid y\right) \ \right] \end{array} \right\}. \tag{2}$$

The function $V_j(b,y,h)$ is computed as follows:

$$V_j(b,y,h) = \max\{V_{j1}(y,h), V_{j0}(b,y,h)\}. \tag{3}$$

Let $d_j(b,y,h)$ denote the optimal default decision of a policymaker of type j, namely,

$$d_j(b,y,h) = \begin{cases} 1 & \text{if } V_{j1}(y,h) > V_{j0}(b,y,h) \\ 0 & \text{if } V_{j1}(y,h) \leq V_{j0}(b,y,h). \end{cases} \tag{4}$$

The value function of a policymaker of type j depends on the optimal behavior of the other type (denoted by $-j$). In the set of states where the type $-j$ finds it optimal to default ($d_{-j}(b,y,h) = 1$), the value function of a policymaker of type j is given by

$$W_j(b,y,h) = \begin{array}{c} u\left(y\left(1-h\lambda\right) - q_{-j1}\left(b'_{-j1}(y,h), y\right) b'_{-j1}(y,h)\right) + ... \\ \beta_j \left[\begin{array}{c} \pi \int V_j(b'_{-j1}(y,h), y', 1)F\left(dy' \mid y\right) ... \\ + \left(1-\pi\right)\int W_j(b'_{-j1}(y,h), y', 1)F\left(dy' \mid y\right) \end{array} \right], \end{array} \tag{5}$$

where $b'_{-j1}(y,h)$ denotes the optimal saving behavior of a policymaker of type $-j$ if a default has been declared in the current period. Similarly, in the set of states where the type $-j$ finds it optimal to pay back previously issued debt ($d_{-j}(b,y,h) = 0$), the value function of a policymaker of type j is given by

$$W_j(b,y,h) = \begin{array}{c} u\left(y\left(1-h\lambda\right) + b - q_{-j0}\left(b'_{-j0}(b,y,h), y\right) b'_{-j0}(b,y,h)\right) + ... \\ \beta_j \left[\begin{array}{c} \pi \int V_j(b'_{-j0}(b,y,h), y', 0)F\left(dy' \mid y\right) ... \\ + \left(1-\pi\right)\int W_j(b'_{-j0}(b,y,h), y', g', 0)F\left(dy' \mid y\right) \end{array} \right], \end{array} \tag{6}$$

where $b'_{-j0}(b, y, h)$ denotes the optimal savings of a policymaker of type j in a period where a default is not declared.

The price of the bonds is determined by the lenders' zero profit condition. This means that the market price for an issuance volume $|b'|$ when a policymaker of type j is in power satisfies the following equation:

$$q_{jd}(b', y) = \frac{1}{1+r}\left[1 - \pi E\left[d'_{-j} \mid b', y, h'\right] - (1-\pi) E\left[d'_j \mid b', y, h'\right]\right], \tag{7}$$

where the expression

$$E\left[d'_i \mid b', y, h'\right] = \int d_i(b', y', h') F(dy' \mid y)$$

denotes the probability that a policymaker of type i declares a default at the beginning of the following period when he inherits a bond position of b', with $i \in \{l, h\}$. This probability also depends on the current endowment realization (y) and the credit history that the future government will inherit (h'). The latter is determined by the default decision in the current period. The equilibrium price depends on the type of policymaker in power because the latter conveys information about the probability distribution of future types and, therefore, it affects the probability distribution of next-period default decisions. The equilibrium price depends on the current default decision (d) because a default decreases future output and affects future default decisions.

2.2 Equilibrium Concept

We focus on differentiable Markov-perfect equilibria. Krusell and Smith (2003) show that there is typically a problem of indeterminacy of Markov-perfect equilibria in an infinite-horizon economy: there is a continuum of savings rules that satisfy the Markov-perfect equilibrium definition. In order to avoid this problem, we analyze the equilibrium that arises as the limit of the finite-horizon economy.

Definition 1 *A recursive competitive equilibrium is characterized by*

1. a set of value functions $V_j(b, y, h)$, $V_{j1}(y, h)$, $V_{j0}(b, y, h)$, and $W_j(b, y, h)$ for $j = l, h$
2. a set of savings rule $b'_{j0}(b, y, h)$ and $b'_{j1}(y, h)$, and a default decision rule $d_j(b, y, h)$ for $j = l, h$,
3. and a bond price function $q_{jd}(b', y)$ for $j = l, h$,

such that

(a) $V_j(b,y,h)$, $V_{j1}(y,h)$, $V_{j0}(b,y,h)$, and $W_j(b,y,h)$ satisfy the system of functional equations (1)-(6);

(b) the default policy $d_j(b,y,h)$ and the savings rules $b'_{j0}(b,y,h)$ and $b'_{j1}(y,h)$ solve the dynamic programming problem specified by equations (1)-(3);

(c) the bond price functions $q_{jd}(b',y,h)$ satisfy the lenders' zero profit condition implicit in equation (7).

2.3 Comparison with the existing literature

The environment laid down before departs from the baseline model of sovereign default used in recent quantitative studies in three dimensions. First, we do not assume that countries can be exogenously excluded from capital markets after a default episode.[10] The exogenous exclusion assumption is controversial on several grounds. First, it appears to be at odds with the existence of competitive international capital markets (an assumption present in this type of models). Wright (2005) discusses how in the past three decades, the sovereign debt market has become more competitive and explains how an increase in competition (number of creditors) may diminish the creditors' ability to coordinate (see also Wright (2002)).[11] The assumption that countries are excluded from international capital markets after a default episode is motivated by evidence of a drainage in capital flows into countries that defaulted (see, for example, Gelos et al. (2004) and IMF (2002)). Nonetheless, empirical studies suggest that once variables such as the quality of policies and institutions are used as controls, market access is not significantly influenced by previous default decisions (see, for example, Eichengreen and Portes (2000), Gelos et al. (2004), and Meyersson (2006)).[12] This suggests that it may very well be that the difficulties in market access observed after a default episode respond to the same factors that triggered the default

[10] Hatchondo et al. (2007b) show that the model delivers a slightly higher equilibrium default probability without exclusion.

[11] A similar point has been raised by Cole et al. (1995) and Athreya and Janicki (2006).

[12] Sturzenegger and Zettelmeyer (2006b) discuss how holders of defaulted bonds succeeded in interfering with cross-border payments to other creditors who had previously agreed to a debt restructuring. From this, they infer that holders of defaulted bonds may have been able to exclude defaulting economies from international capital markets. On the other hand, they conclude that "legal tactics are updated all the time, and new ways are discovered both to extract payment from a defaulting sovereign as well as to avoid attachments." In particular, they expect that "the threat of exclusion may be less relevant for some countries or to all countries in the future." For example, they explain that after Argentina defaulted in 2001, "attempts to actually attach assets have so far turned out to be fruitless." In any case, other forms of financing are always available to defaulting economies (issuing bonds at home, aid, official credit, multilateral or bilateral financing, etc.). Thus, the discussion in Sturzenegger and Zettelmeyer (2006b) suggests that defaulting economies might face at most a higher borrowing cost, though it is not clear how important this cost differential may be.

decision itself. In this paper, both a default and the difficulties in market access after the default may be triggered by political turnover.

The second difference from the existing literature is that here the output loss is realized in the period after the default, and in previous studies the output loss occur for a stochastic number of periods. Our assumption is motivated by tractability reasons. Hatchondo et al. (2007b) explain that assuming that the output loss occurs in one period enables the model to abandon the exclusion assumption without increasing the dimensionality of the problem. In addition, Hatchondo et al. (2007b) show that in the model with exclusion, whether the output loss occurs in the period after the default or for a stochastic number of periods does not affect the results. The output-loss assumption intends to capture the disruptions in economic activity caused by a default decision. It has been argued that a government default decreases private financing and, thus, it reduces output. Using micro-level data, Arteta and Hale (2006) find that sovereign debt crises are systematically accompanied by a large decline in foreign credit to domestic private firms. This may be the case because a sovereign default signals to investors a higher risk of expropriation or bad economic conditions and, therefore, it reduces firms' net worth and their ability to borrow (see Sandleris (2006) and the references therein). IMF (2002), Kumhof (2004), and Kumhof and Tanner (2005) discuss how financial crises that lead to severe recessions follow a sovereign default. Similarly, Kaminsky and Reinhart (1999) shows that debt devaluations in developing countries tend to cause banking problems. Kobayashi (2006) presents a model in which a shock that disturbs the payments system causes a decrease in aggregate productivity.

Finally, and more importantly, we allow for the possibility that the composition of the government or the distribution of power among government officials change over time. This is embedded in the assumption that policymakers with different preferences alternate in power. It should be stressed that the change of the type in power does not need to be caused by an election.

3 A measure of political risk for investors

The International Country Risk Guide aggregate index of political risk for investors is commonly used in recent empirical studies (see, for example, Reinhart et al. (2003) and Meyersson (2006)). The index evaluates the political risk faced by businesses in different countries. It is computed based on the subjective analysis of experts in the area. The index ranges from zero to 100. A higher value indicates less political risk.

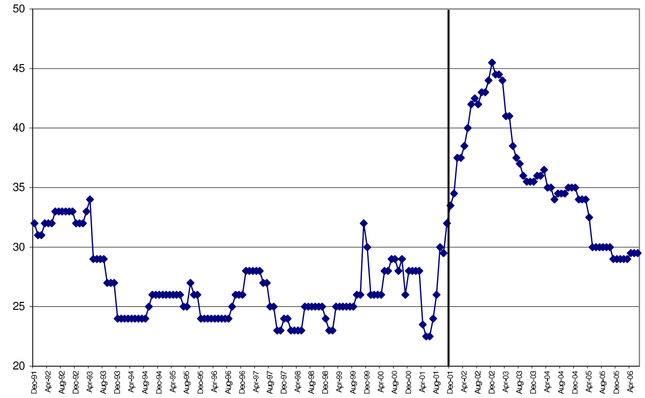

Figure 3: Political risk for investors in Argentina (100 minus the International Country Risk Guide's index of political risk for investors). The vertical line marks the month when Argentina defaulted.

Figure 3 shows the value of this measure before and after the Argentine default of December 2001. The graph shows that the default in Argentina was preceded by an increase in the level of political risk. Moreover, the level of political risk was consistently lower in the 1990s than after the default.

Figure 4 shows that the behavior of political risk in Argentina is not shared by other recent default episodes: Ecuador, Pakistan, Russia, and Uruguay. In these countries, the level of political risk is not significantly higher after the default episode and, with the exception of Uruguay, they seem to exhibit more political instability (i.e., more frequent changes between periods of relatively low risk and periods of relatively high risk).

The differences in the behavior of political risk across recent default episodes are also apparent from the statistics presented in Table 1. The table shows that Argentina exhibits the largest difference between the average levels of political risk before and after the default. It also shows that among the five countries considered, Argentina is the only one where the level of political risk was consistently low before the default and consistently high after the default. For these reasons, we shall compare the behavior of the macroeconomic variables during the pre-default period in Argentina with what our model predicts for periods when a patient policymaker is in office before a political default.

Figure 4: Political risk for investors in Uruguay, Russia, Ecuador, and Pakistan (100 minus the International Country Risk Guide's index of political risk for investors). The vertical line marks the month of default.

4 Parameterization

The model is solved numerically using value function iteration and interpolation.[13] Table 2 presents the parameter values of our benchmark parameterization. We assume a coefficient of relative risk aversion of 2. A period in the model refers to a quarter. The risk free interest rate is set equal to 1%. The parameter values that govern the endowment process are chosen so as to mimic the behavior of GDP in Argentina from the third quarter of 1993 to the third quarter of 2001. We chose this period because it corresponds to a period of "low political risk" (see Figure 3). The parameterization of the output process does not change much if a longer period is considered (see, for example, Aguiar and Gopinath (2006)).

The value of λ is taken from Hatchondo et al. (2007b). When $\lambda = 8.3\%$, the present value of the

[13]Value functions are approximated using Chebychev polynomials. Fifteen polynomials on the asset space and ten on the endowment shock are used. Results are unchanged when more polynomials are used.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Argentina	12-01	29.3	25.6	35.7	0	0	124	N/A
Ecuador	07-99	41.0	39.3	43.0	11.5	0	28	N/A
Pakistan	11-99	54.4	48.6	52.7	42.7	3.8	4	18
Russia	08-98	41.1	43.3	39.3	72.4	70.2	22	23
Uruguay	05-03	27.8	27.9	27.6	36.4	59.5	1	13

Table 1: Political risk for investors in recent default episodes (100 minus the International Country Risk Guide's index of political risk for investors). (1) Country. (2) Month of default. (3) Average risk in the sample. We consider data starting eight years before the default. The exception is Russia. The data for Russia starts in April 1992. We consider data until June 2006. (4) Average risk before the default. (5) Average risk after the default. (6) Percentage of months before the default with risk above the after-default average. (7) Percentage of months after the default with risk below the before-default average. (8) Number of consecutive months before the default with political risk below the after-default average. (9) Number of consecutive months after the default with political risk above the before-default average. N/A indicates that political risk after the default is always above the before-default average.

cost of defaulting is of similar magnitude as the cost implied by the process of output loss assumed in Aguiar and Gopinath (2006) (a loss of 2% per period for an average duration of 10 periods).

As in previous studies, high impatience is necessary to generate default in equilibrium. For instance, Aguiar and Gopinath (2006) choose a discount factor of 0.8. Here, we choose a higher discount factor for the patient policymaker and a lower discount factor for the impatient policymaker.[14]

5 Results

We show that political defaults may occur in equilibrium. We also show that political defaults are likely to occur only if there is enough political stability and if patient policymakers encounter poor economic conditions during their tenure. When the degree of political stability is high, the presence of political turnover helps the model to explain (i) the high and volatile spreads paid by investor-friendly governments in Argentina during the 1990s, (ii) the relatively low spread and borrowing level

[14] The difference between the two discount factors could be calibrated to match differences in the actions of different types of government. For instance, as explained in Section 5, the differences between the average borrowing level chosen by patient and impatient governments in the model is a direct consequence of the assumed difference between discount factors. However, the presence of other factors that affect the debt level makes it difficult to identify the extent to which differences in debt levels result from differences in political circumstances. For example, differences in the debt level chosen by Argentina before and after its default are not only explained by differences in political factors but also by the large devaluation that occurred in Argentina, as well as by changes in other economic conditions. Footnote 16 explains how our results depend on the assumed difference between the two discount factors.

Risk aversion	σ	2
Interest rate	r	1%
Output autocorrelation coefficient	ρ	0.9
Standard deviation of innovations	σ_ϵ	2.7%
Mean (log) output	μ	$(-1/2)\sigma_\epsilon^2$
Output loss	λ	8.3%
High discount factor	β_h	0.9
Low discount factor	β_l	0.6

Table 2: Parameter values

observed after the Argentinean default, and (iii) the moderate correlation between economic conditions and default decisions documented by Tomz and Wright (2007).

5.1 Political risk, default risk, and political stability

Do changes in political circumstances trigger a default? Cole et al. (1995) and Alfaro and Kanczuk (2005) present models in which this is the case. We add to their insight by showing that a sovereign default is likely to be triggered by political turnover only if there is enough political stability in the economy. Furthermore, even in an economy with high political stability, a political default occurs only when patient policymakers encounter sufficiently poor economic conditions during their tenure.

We solve the model using the parameterization in Table 2. The degree of political stability is left as a free parameter. We consider two economies that are identical in everything except for the degree of political stability. In the "stable" economy, the probability that the current government type is replaced (π) is set equal to 1.5%. This implies an average tenure in office of 16 years independently of the type. In the "unstable" economy the value of π is set equal to 2.5%. The latter implies an average tenure in office of 10 years.

In what follows, Figures 5-7 illustrate the link between the degree of political stability and the frequency with which political defaults occur in equilibrium. First, Figure 5 shows the optimal default rules of patient and impatient types. Second, Figure 6 shows how the differences in the default rules of the two types and the presence of political turnover affect the bond price menu faced by patient policymakers. The figure shows the bond price menus faced by patient policymakers in a stable and in an unstable economy. Third, Figure 7 shows how the shape of the objective function of the patient policymaker depends on the bond price menu. The figure describes how the degree of political stability affects the optimal borrowing decision of a patient type. Finally, Figure 8 plots the optimal borrowing decision of a patient type in a stable economy. The figure shows that for the patient type to choose a borrowing level that would lead an impatient type to default, the endowment realization has to be sufficiently low.

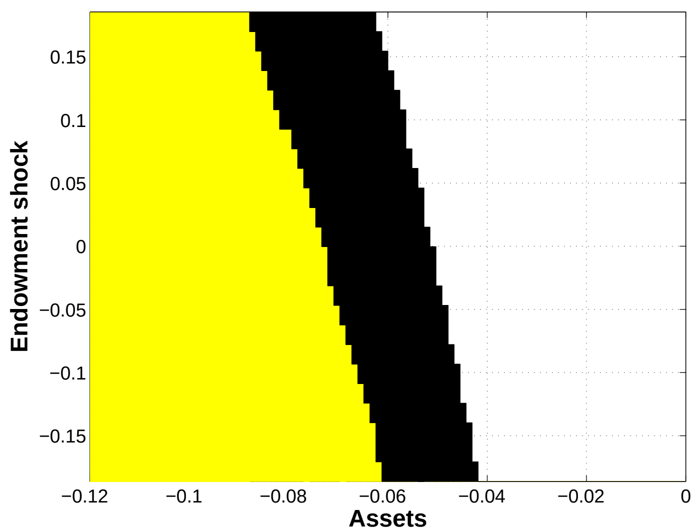

Figure 5: Default regions in a stable economy. The graph corresponds to the case where the government inherits a good credit history ($h = 0$). The dark area shows combinations of bond positions and endowment realizations at which an impatient type defaults and a patient type does not default. The gray area shows combinations of bond positions and endowment realizations at which both types default. The white area shows combinations of bond positions and endowment realizations at which neither the patient nor the impatient type defaults.

Figure 5 describes the optimal default decision of each type in the stable economy when the type in power inherits a good credit history ($h = 0$) (the picture is not much different when either a politically unstable economy or a bad credit history is considered). The grey area shows combinations of initial bond positions and endowment realizations at which both types find it optimal to default. The black area shows combinations of initial bond positions and endowment realizations at which only an impatient government defaults. The graph shows that, for combinations of debt levels and endowment realizations such that a patient government chooses to default, an impatient government also chooses to default. The fact that there are combinations of debt and endowment realizations at which only an impatient policymaker defaults affects the shape of the price function faced by patient and impatient governments.

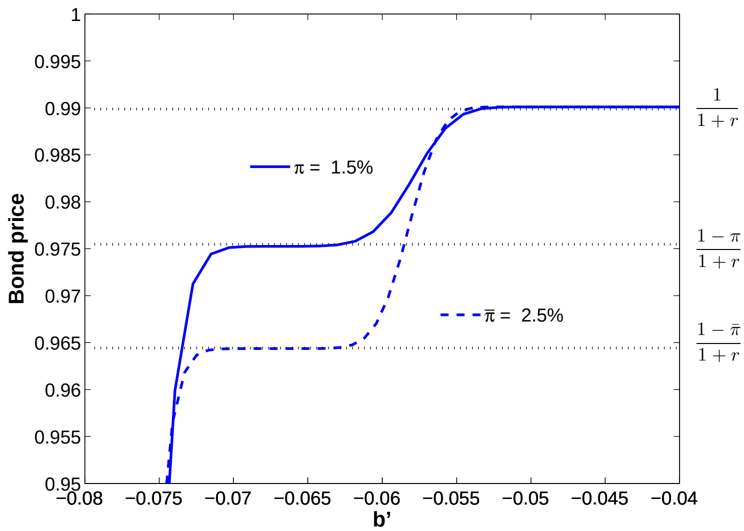

Figure 6: Bond price faced by a patient policymaker in the economies with high and low political stability. The graph considers the case where the endowment realization coincides with the unconditional mean of the distribution and the government has not defaulted today.

Figure 6 illustrates the bond price menu faced by a patient government if it has decided to pay back the debt and the current endowment equals the unconditional mean of the distribution. The graph describes how the bond price menu differs across the two economies studied in this section: the stable and the unstable economies. The price received by the government for the bonds issued today incorporates a discount that mirrors the probability of a default in the following period. This explains why the price functions display three steps. The first step corresponds to “low” issuance volumes. For these volumes, investors realize that the debt taken today is so low that the government will almost surely pay it back in the following period, regardless of the type in power. When the issuance level is within this range of values, investors charge the risk free rate (bond prices are high). The second step corresponds to “intermediate” issuance levels. In this range of issuance values, the debt taken today is such that an impatient policymaker would default in the next period if he becomes the decision maker, while a patient policymaker would pay the debt back if he remains in office. For these issuance volumes, the default premia (spread) charged by the lenders coincides with the probability of a change in the government type. Finally, the third step corresponds to “high” issuance volumes. For these values of borrowing levels, investors realize that the government will almost surely default tomorrow, regardless of the type in power. Therefore, they offer a price of zero for the bonds issued today (this cannot be seen in Figure 6 because of the scale of the vertical axis).

As explained above, when a patient type chooses "intermediate" borrowing levels, he compensates lenders for the contingency that an impatient type becomes the decision maker in the following period. As the probability of this contingency increases (π is higher, or political stability is lower), it becomes more expensive to choose "intermediate" borrowing levels. Figure 6 shows how this translates into a higher discount in the bond price at intermediate issuance levels.

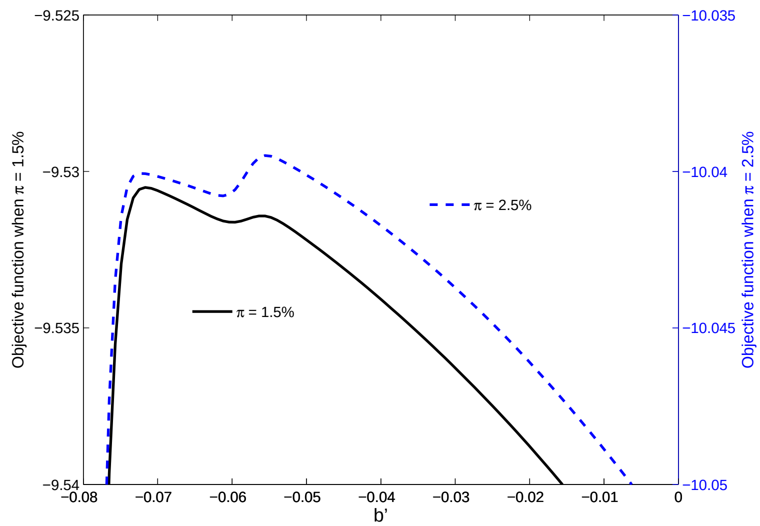

Figure 7: Objective function of a patient policymaker in a stable and in an unstable economy. The graph considers the case where the government has decided not to default, the initial endowment realization coincides with the unconditional mean of the endowment process, the government inherits a good credit history, and the initial bond position takes a value of -0.0715, which is within the range of values observed in the simulations of a stable economy.

Figure 7 shows the objective function of a patient policymaker as a function of the size of the current issuance volume. The graph considers the case where the patient policymaker inherits a good credit history, the current endowment realization coincides with the unconditional mean of the distribution, and the initial bond position takes a value of -0.0715. The latter is within the range observed in the simulations of a stable economy.

The shape of the objective function is closely related with the shape of the bond price function. Typically, the objective function is not globally concave.[15] For "low" borrowing levels, the objective function is increasing with respect to the issuance volume ($-b'$). For issuance values in the transition from the first to the second step of the bond price function, the objective function decreases with the

[15] We use a global search procedure to find an initial guess for the optimal borrowing level. The latter is used as a starting point in a nonlinear optimization routine.

issuance level. This accounts for the first local maximum. Once the second step of the bond price is reached, the objective function becomes increasing again. Finally, as the government moves from the second to the third step of the bond price, the objective function declines. This explains the second local maximum. The objective function remains low after the third step has been reached, so the optimal issuance volume coincides with one of the two local maxima. The increasing portions of the objective function are explained by the difference between the rate at which future utility flows are discounted and the interest rate paid on the debt. The decreasing portions of the objective function are explained by the decline in the bond price implied by an increase in the issuance volume. Since the mean bond price received by the government is equal to the marginal bond price, a higher borrowing level decreases the price of the entire issuance volume.

Figure 7 shows that the optimal issuance volume is at "intermediate" borrowing levels (left local maximum) in the politically stable economy and at "low" borrowing levels (right local maximum) in the politically unstable economy. As the degree of political instability decreases (π is lower), the patient type pays a lower spread at intermediate borrowing levels, which makes these points more attractive.[16] This is the main mechanism by which a politically stable economy induces patient policymakers to be willing to choose intermediate borrowing levels. At these borrowing levels, a political default occurs in the next period if there is a change of the type in power.

Finally, we show that even in the politically stable economy, a political default occurs only when patient policymakers encounter poor economic conditions. In effect, Figure 8 shows that patient policymakers do not choose intermediate borrowing levels in the stable economy as long as the current endowment realization is sufficiently high. The figure describes the optimal issuance level of a patient type as a function of the initial bond position and the endowment realization. The graph describes that there are three regions of issuance levels. The region on the left corresponds to initial bond positions that are so high or endowment realizations that are so low that even a patient type defaults. In these cases, the government does not need to put away resources to pay back previously issued debt and, therefore, it does not need to borrow as much. In the middle region, the optimal issuance volume is at intermediate levels. Finally, the region on the right illustrates that, with the exception of very high initial debt, when the current endowment realization is sufficiently high, the optimal issuance volume

[16] Similarly, if β_l is far enough from β_h, the patient government prefers intermediate issuance levels over low levels even in the unstable economy. The reason is that the extra borrowing that could be obtained by paying the intermediate spread level is large, and the government is better off if it pays the intermediate spread level in order to increase the borrowing level by a large amount.

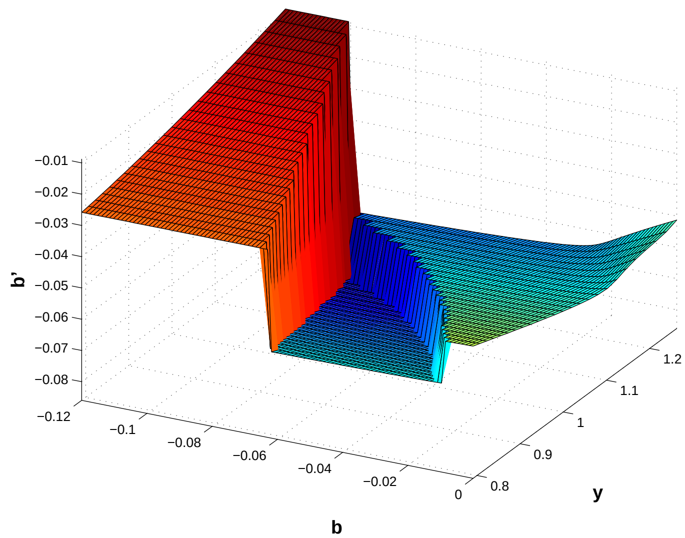

Figure 8: Optimal bond issuance decision of a patient type that inherits a good credit history in an economy with $\pi = 1.5\%$. The issuance decision is computed after the government has chosen the optimal default decision. When the endowment is sufficiently high or the initial debt level is sufficiently low, the chosen issuance level is low. For intermediate combinations of low endowment or relatively high initial debt, the patient type chooses an intermediate issuance level. When the endowment is sufficiently low or the initial debt level is sufficiently high, the patient type defaults and chooses an even lower issuance volume (it does not need to borrow to roll over previously issued debt).

is at low levels. When the current endowment is sufficiently high, there is less need to bring resources to the present to finance current consumption and, thus, the patient type decides to borrow less.

The discussion above is reflected in our simulations. We find that in the economy with high political stability ($\pi = 1.5\%$), 95% of the changes from a patient to an impatient government trigger a default. The remaining 5% correspond to situations in which the patient government does not encounter poor economic conditions during its tenure and, therefore, it does not choose "intermediate" issuance levels that would lead an impatient government to default. The result is different in the unstable economy. When $\pi = 2.5\%$, a change in type from β_h to β_l triggers a default only 3% of the time.

5.2 Business cycles

This section shows that when there is enough political stability, the presence of political turnover improves the quantitative performance of the model. We contrast the performance of the model with the behavior of macroeconomic variables in Argentina before the default in 2001. To that end, the model is simulated for 750,000 periods (500 samples of 1,500 observations each). We take from the simulations the first 500 samples that satisfy the following criteria: (i) each sample has 32 periods, (ii) the beginning of the sample is determined by a change in the policymaker in power, from an impatient type to a patient type, (iii) the patient type remains in office for 32 consecutive periods, and (iv) in the first period after the end of the sample, an impatient policymaker gains power and declares a default. The rationale behind these restrictions is that we want to compare the performance of the model with data based on a period of 8 years (32 quarters) of a government of low political risk (patient type).

Table 3 reports business cycle moments observed in the data and in the simulations.[17] The third column reports the average business cycle moments in an economy inhabited by patient policymakers only. The fourth column reports the average business cycle moments in an economy inhabited by impatient policymakers only.[18] The fifth and sixth columns report the average business cycle moments in an economy with political turnover when $\pi = 1.5\%$ and $\pi = 2.5\%$, respectively. The moments are chosen so as to evaluate the ability of the model to replicate the distinctive business cycle properties of emerging economies. Relative to developed economies, emerging economies feature interest rates that are high, volatile, and countercyclical; high volatility of consumption relative to income; and more countercyclical net exports. The trade balance (TB) is expressed as a fraction of output (Y) and the interest rate spread (R_s) is expressed in annual terms. The logarithm of income and consumption are denoted by y and c, respectively. All series are HP filtered with a smoothing parameter of $1,600$. Standard deviations are denoted by σ and are reported in percentage terms; correlations are denoted by ρ. It should be said that the sample moments reported in the second column of Table 3 display the same qualitative features that are observed using a longer sample period or in other emerging markets (see, for example, Aguiar and Gopinath (2007), Neumeyer and Perri (2005), and Uribe and Yue (2006)). The exception is that the reported volatility of consumption is slightly lower than the volatility of income.

Table 3 shows that the presence of political turnover improves the ability of the model to account for the high spreads paid by Argentina during this period, only when there is enough political stability. The average spread observed in the politically stable economy is 6.2%, compared to 0.3% in the unstable economy. As explained above, in the unstable economy patient governments do not choose debt levels high enough that lead an impatient governments to default and, therefore, lenders ask for a small spread

[17]The output, consumption, and trade balance data are obtained from the finance ministry of Argentina. The spread series is taken from Neumeyer and Perri (2005).

[18]For the economies where all policymakers are of the same type, the average moments are computed using 500 samples of 32 periods before a default episode.

	Data	β_h only	β_l only	$\pi = 1.5$	$\pi = 2.5$
$\sigma(y)$	3.11	3.14	3.09	3.11	3.21
$\sigma(c)$	3.00	3.21	3.15	3.18	3.28
$\sigma(TB/Y)$	1.35	0.16	0.14	0.33	0.14
$\sigma(R_s)$	2.80	0.03	0.02	0.46	0.03
$\rho(c, y)$	0.98	1.00	1.00	0.99	1.00
$\rho(TB/Y, y)$	-0.63	-0.45	-0.45	-0.20	-0.46
$\rho(R_s, y)$	-0.69	-0.94	-0.95	-0.67	-0.95
$\rho(R_s, TB/Y)$	0.55	0.71	0.70	0.48	0.70
Mean spread (annual rate %)	7.3	0.27	1.54	6.2	0.33

Table 3: Business cycle statistics. The second column is computed using data from Argentina from 1993 to 2001. The remaining columns summarize the results of the simulations: each cell reports the mean value of the moment using 500 samples of 32 periods.

when they purchase the bonds.

The average spread delivered by the model in the stable economy is substantially higher than what is obtained when political turnover is shut down. In the economy where all policymakers are patient, the average spread is 0.3%. In the economy where all policymakers are impatient, the average spread is 1.5%. Given that the mean spread in the model mirrors the default probability, this implies that an economy in which investor-friendly governments alternate in power with less investor-friendly governments has a higher default probability than an economy where governments are never friendly to investors. It is the presence of political turnover—and not the low discount factor of the impatient type—that is crucial for generating a higher default probability.

Mechanically, the presence of political turnover enables the model to generate a higher average spread because it makes the bond price function smoother, i.e., the bond price becomes less sensitive to the issuance volume. With a smoother price function, a given decrease in the bond price allows for a larger increase in the issuance level. This makes the choice of lower bond prices more attractive, which induces patient governments to pay higher spreads. In the economy with low political stability, a smoother price function alone does not increase the mean spread because intermediate debt levels are almost never optimal.

Table 3 illustrates the non-monotonic relationship between the mean spread and the degree of political stability. The third column can be interpreted as an extreme case where $\pi = 0$ and the patient policymaker is in power in the first period. Starting from this point, a decrease in the level of political stability to $\pi = 1.5\%$ increases the mean spread from 0.3% to 6.2%. A further decrease in the level of political stability to $\pi = 2.5\%$ decreases the mean spread from 6.2% to 0.3%. There are two forces through which changes in π affect the mean spread. First, an increase in π increases the spread paid at intermediate borrowing levels. Second, an increase in π makes intermediate borrowing levels less attractive and, therefore, less frequent in equilibrium. The first effect is dominant when π is sufficiently low, i.e., when the discount in the bond price at intermediate borrowing levels is sufficiently low. For a low π, the government chooses intermediate borrowing levels often and, therefore, the effect on the price paid for these borrowing levels is dominant. The second effect is dominant when π is sufficiently high and, therefore, intermediate borrowing levels are chosen less frequently. The previous discussion illustrates that in our model, the degree of political stability affects spreads mainly by changing the shape of the bond price. This is not the case in the environments studied by Amador (2003) and Cuadra and Sapriza (2006a). In their models, political stability affects spreads by changing the weights on future utility flows.

In the economy with high political stability, the presence of political turnover enables the model to generate a higher spread volatility. The standard deviation of the spread is 0.46% compared to the value of 0.03% that is observed when there is no political turnover. The higher spread volatility is another consequence of having a smoother bond price function. At the same time, it should be stressed that the higher spread volatility is not mechanically driven by the turnover of policymakers of different types—and willing to pay different spread levels (recall that we study samples in which only patient policymakers are in power).

The presence of political turnover does not have significant effects on the spread volatility when the degree of political stability is low. The spread volatility in the economy with low political stability is close to the value observed in economies without heterogeneity. Finally, Table 3 shows that the introduction of political turnover does not significantly affect the other business cycle moments.[19]

[19] As in the benchmark case without heterogeneity, the debt levels generated by the model are low (between 5% and 7% of quarterly output). In part, this is because we do not assume that a defaulting economy is excluded from capital markets (see Hatchondo et al. (2007b)). There are other simplifying assumptions that limit the ability of the model to generate higher debt levels. For instance, it is assumed that governments cannot save and borrow at the same time and that all the debt is held by foreigners. Furthermore, there are costs of defaulting that are not present in the model (see Hatchondo et al. (2007a) for a discussion of the costs of defaulting). Since our model builds on the baseline framework that has been used in recent quantitative studies and also shares the same parameterization, it tends to generate low debt levels.

5.3 The correlation between default and output

Using a historical data set with 169 sovereign defaults, Tomz and Wright (2007) report a weak correlation between economic conditions and default decisions. Only 62% of the default episodes in their sample occurred in years when the output level in the defaulting country was below the trend value. They argue that the baseline model of sovereign default (without political turnover) is ill-suited to replicate this weak correlation. In order to illustrate this, we shut down political turnover and simulate the economy with patient governments only. We find that 3% of default episodes occur in periods where the output level is below its long run mean. The fraction increases to 7% in an economy with only impatient governments.

Tomz and Wright (2007) suggest that the inability of quantitative models to generate the weak correlation observed in the data may result from the lack of heterogenous borrowers. Our model suggests that their conjecture is plausible. If there is enough political stability, the presence of political turnover reduces the link between economic conditions (endowment realizations) and default decisions. In the economy with high political stability, output is below the long run mean in 63% of the default episodes.[20]

5.4 The behavior of the spread and the debt level after a default

The model also has predictions about the behavior of the spread and debt levels before and after a default. In particular, the model has different implications depending on whether the default is triggered by political circumstances.

Figure 9 shows the bond price faced by an impatient government when the current endowment realization coincides with the unconditional mean of the distribution and it has decided to default in the present period. As seen in the price functions plotted in Figure 6, the bond price schemes faced by impatient policymakers also display three steps. The intermediate step in Figure 9 is close to zero because it is highly likely that incumbent policymakers remain in power and the impatient types default on intermediate borrowing levels. The sharp decrease in the bond price induces impatient governments to choose “low” issuance levels and pay low spreads. That is, even though impatient governments assign more weight to current utility flows, they may decide to borrow less than patient governments. The

[20] We find that 77% of the default episodes occur when a patient policymaker is replaced by an impatient policymaker. Out of the default episodes that are not triggered by political turnover, 83% occur with impatient governments and the remaining 17% with patient governments.

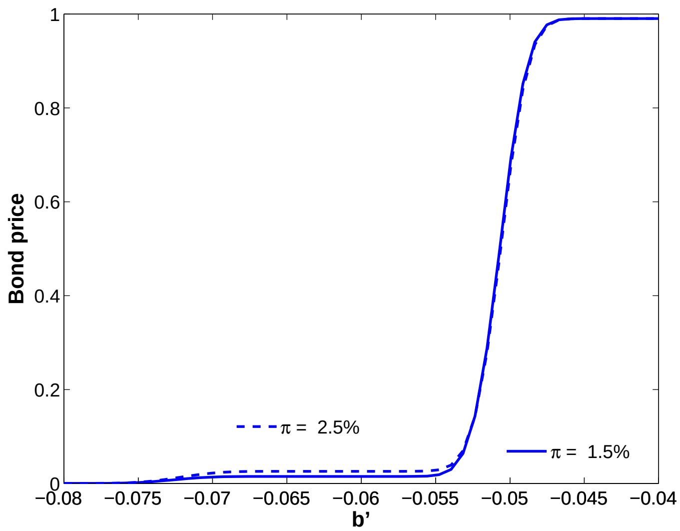

Figure 9: Bond price faced by an impatient policymaker in the economies with high and low political stability. The graph considers the case where the endowment realization coincides with the unconditional mean of the distribution and the government has defaulted today.

reason is that since impatient governments are more likely to default, they face higher borrowing costs. This means that the model predicts that if a default is triggered by a patient policymaker being replaced by an impatient policymaker, we should observe a decrease in the spread and debt levels in the periods following the default.

In section 3 we showed that the level of political risk in Argentina after the default in 2001 was higher than the level of political risk observed before the default episode. Figure 10 shows that more politically risky governments in Argentina have paid lower spreads after the default episode than less risky governments before the default.[21]

Figure 10 shows that the behavior of the spread in Argentina is roughly in line with the predictions of the model. The Uruguayan default in 2003 offers a nice case study in order to isolate the role of other factors that may be affecting the behavior of the spread. The business cycle in Uruguay is highly correlated with the business cycle in Argentina but, unlike the default in Argentina, it is unlikely that the default episode in Uruguay was triggered by a change in political circumstances (see Section 3). Figure 11 shows that the spread in Uruguay after the default episode is not lower than before the crisis (as it is in Argentina).

[21]The spread is very high between the default episode in 2001 and the debt exchange in 2005 because it is computed using the price of defaulted bonds.

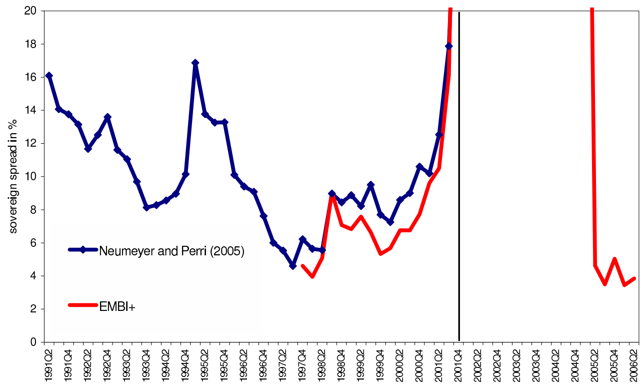

Figure 10: Argentina sovereign spread. The vertical line marks the month of default.

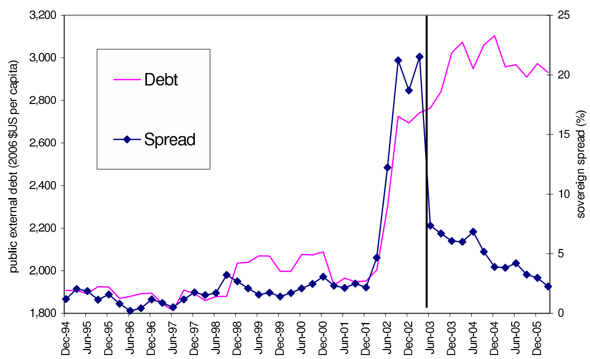

Figure 11: Uruguay's public external debt and sovereign spread (UBI). The vertical line marks the month of default.

Figure 12 shows that risky governments in Argentina have chosen relatively low debt levels after the default—the debt level decreases sharply in 2005 when the defaulted debt is exchanged. This is consistent with the decrease in the debt level after a political default predicted by our model. It is also consistent with the difficulties in market access observed after a default episode.[22] In contrast, Figure 11 shows that the debt level in Uruguay is not lower after the default.[23]

Summing up, the evolution of spread, the evolution of the debt level, the evolution of political risk,

[22]Recall that the nature of the difficulties in market access in this paper is different from the one in previous studies where defaulting countries are exogenously excluded from capital markets. In our environment, the decrease in the debt level after a default is explained by the change in the type of policymaker in power that triggers the default, and not by the default episode itself. Thus, difficulties in market access are not a cost of defaulting in this paper. Furthermore, consistently with historical evidence, market access in our model improves after the defaulting government loses power (see the discussion in Cole et al. (1995)).

[23]The evolution of the debt level in Argentina is also affected, for example, by the large devaluation of its exchange rate in 2001 and by changes in the international debt market. Uruguay also experienced a large devaluation but, of course, the comparison of Argentina and Uruguay is not perfect—for example, the debt recovery rate was higher in the Uruguayan default.

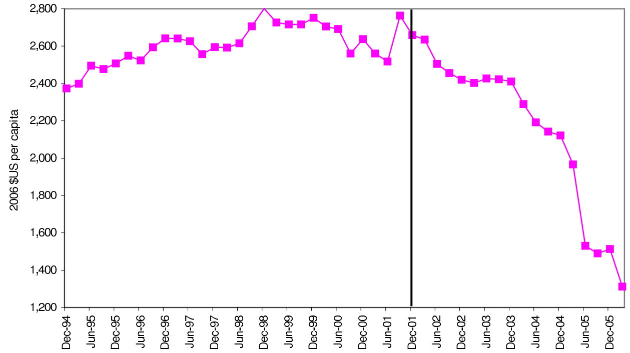

Figure 12: Argentina's public external debt without arrears. The vertical line marks the month of default.

and the timing of the default in Argentina are in line with the implications of our model.

6 Conclusions and extensions

This paper introduces a stylized political process into the framework used in recent quantitative studies of sovereign default. We show that a default episode is likely to be triggered by political turnover only if there is enough political stability in the economy and "investor-friendly" governments encounter sufficiently poor economic conditions during their tenure. The presence of political turnover may help to explain (i) the high and volatile spreads paid by investor-friendly governments in Argentina during the 1990s, (ii) the relatively low spread and borrowing level observed after the Argentinean default in 2001, and (iii) the moderate correlation between economic conditions and default decisions documented by Tomz and Wright (2007). We compare the predictions of our model with data from Argentina because we conclude that among the most recent default episodes, the Argentinean one appears to be the most likely to have been triggered by a change in political circumstances. We also find that the evolution of the debt level, the evolution of the political risk, the evolution of spreads, and the timing of the default in Argentina are in line with the predictions of the stylized model studied in this paper.

The stylized political process presented here has the advantage that it simplifies the analysis and enables us to provide a transparent description of the mechanism behind our results. Allowing for a richer political process could help to improve the performance of the model. For example, the probability with which the two types alternate in power could be a function of the output level or the consumption level. This may help the model to generate higher spread volatility.

Another extension is to allow for the existence of asymmetric information about the government's type. This would introduce a signaling cost of defaulting. This extension is technically challenging. Previous studies that assume the presence of asymmetric information place restrictions on the borrowing set available to the agents (see Cole et al. (1995), Chatterjee et al. (2005) and Alfaro and Kanczuk (2005)).

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