Strategic Sovereign Defaults under International Sanctions

Carlo de Bassa Scheresberg*  Edoardo Grillo†
Francesco Passarelli‡

PRELIMINARY. COMMENTS WELCOME

January 27, 2017

Abstract

Sanctions induce political instability. We present a model where sanctioned regimes may decide to repudiate their public debts in order to keep internal support and avoid being overthrown. To be effective, this strategy requires the share of foreign debt to be sufficiently large. Combining datasets, we highlight that more than a third of all sovereign debt crises in the 1960-2005 period are connected to an international sanction episode. Results confirm a positive relation between sovereign defaults and sanctions’ destabilizing impact.

1 Introduction

Economic sanctions are a common tool to handle international disputes and conflicts without using military force. Dating back at least to ancient Greece,¹ sanctions have been an important tool in foreign policy throughout history and their use has increased steadily after WWII (see Figure 1).

*George Washington School of Business. 2201 G St NW, Washington, DC 20052, United States. email: carlo.debassa@gmail.com
†Collegio Carlo Alberto. Via Real Collegio 30, Moncalieri, 10024, Italy. email: edoardo.grillo@carloalberto.org
‡Corresponding author. Bocconi University and University of Teramo. Via Roentgen 1, 20136, Milan, Italy. email: francesco.passarelli@unibocconi.it

¹According to the Megarian decree, in 432 BC the Athenian statesman Pericles sponsored a decree against the city-state of Megara which banned its inhabitants from harbours and marketplaces located in Athens’ area.
As an intervention, sanctions are generally viewed as an alternative to military force—a lower-cost, lower-risk, middle course of action somewhere inbetween diplomacy and war. Sanctions are often a response to foreign crises in which military action is not feasible or where the national interest at stake is not vital. In other circumstances, sanctions are a fast response to buy time and evaluate more punitive actions, potentially preparing public opinions to such further measures.

From a practical point of view, economic sanctions cover a wide spectrum of interventions, ranging from trading restriction, to termination of capital flows, or full commercial embargoes. Similarly, although the goals behind the use of sanctions can be heterogeneous, a common goal of many economic sanctions is to weaken the government of an hostile regime by reducing its internal support.

Obviously, sanctions frequently entail important financial and monetary consequences for target countries. For instance, receiving a sanction in an open economy may undermine a country’s capacity to borrow externally, increasing the interest rate paid on public debt and impairing its ability to borrow long-term. Moreover, and related to the previous point, the financial constraints generated by sanctions can reduce the policy options of political leaders. Thus, understanding the public finance and monetary implications of economic sanctions for an office-motivated politician can be an important element to understand their effectiveness. Nonetheless the political economic literature has addressed this question only marginally.\(^2\)

In this paper, we take a first step to fill this gap by studying how sanctions impact the probability of sovereign debt default of a sanctioned country. Our analysis builds on a simple observation: combining data on sanctions and debt crises, we find that 38\% of all sovereign debt defaults recorded during the 1960-2005 period happened under sanctions. Thus, in the last 50 years, there has been a strong association between sanction episodes and financial crises. In our analysis, we also find that countries that default under sanctions have (on average) very high proportions of short-term external debt, but their economic indicators at the beginning of the debt crisis are significantly better than countries that entered in debt crisis not under sanctions. In other words, we find that countries that default under sanctions enter in default “earlier” and in better economic shapes than those that default without being under sanctions, suggesting that strategic mechanisms may be at play.

We rationalize these patterns in a model where sanctions affect the country both directly, by reducing its GDP, and indirectly, increasing the economic and public costs of debt service. The actual decision to default is taken by an office motivated official who

\(^2\)A noticeable exception is represented by Chang 2007.
faces a standard budget constraint incorporating the cost of debt service. If such cost becomes too high, the official may decide to default in order to save money and invest them to boost her survival probability. Since the cost of servicing the debt increases with the level of sanctions, our model generates a positive correlation between economic sanctions and defaults. This strategic response may substantially weaken the effectiveness of sanctions and, furthermore, it may have important consequence on the interest rate charged on the bond.

We test these predictions on a panel dataset with information on debt defaults and sanctions for 68 countries in the period 1960-2005. Debt defaults under sanctions are more frequent among autocratic regimes, and compared to other regimes under sanctions, regimes that default under sanctions have lower political turnover (21.5% vs. 24.6%). As described above, these countries also enter in default at better levels of economic performance compared to other countries, for example, higher GDP per capita, higher GDP growth, and more monetary reserves. Empirically, we find that sanctions are associated with a 4 to 12 percentage point increase in probability of sovereign debt default. Moreover, leaders who choose to default experience a 8 percentage point decrease in probability to lose office in the year after default. Our analysis also finds evidence that a strategic mechanism is at play: countries that default under sanctions tend to experience a statistically significant drop in internal political unrest, and while defaults or sanctions are negatively associated with national revenues, defaults under sanctions are associated with a 16% increase in national revenue.

Since the relationship between sanctions and defaults may be influenced by unobservable variables or selection in sanction imposition, we test the robustness of the estimates using an instrumental variable that proxies the probability that a country receives a sanction by linking it to the number of sanctions imposed on other similar countries in a given year. Once instrumented, the estimates show that the relationship between sanctions and debt defaults remain strong and significant.

These findings contribute to the literature in several ways. First, they contribute to the literature on international sanctions, which typically consists in cross-country economic analyses (Hufbauer, Schott and Elliott, 2009; Marinov, 2005a and 2005b; Escribà, Folch and Wright, 2010), case-studies (Hazelzet, 2001; Cooper and Cox, 2006; Cooper and Yitan, 2006; Bessler, Garfield and Mc Hugh, 2004), and legal or political analyses (Baldwin, 2000; Drezner, 2000). Our results suggest that sanction can be a costly tool of foreign policy and that the financial costs for the international community as whole can be substantial. Moreover, our findings suggest that sanctions can be quite ineffective in destabilizing political leaders when the target country has large external debt. On
the other hand, smart sanctions, which are becoming more and more popular, may be effective in creating financial crises in targeted countries, especially among countries that have relatively high dependency from borrowing from foreign markets.

Second, our paper contributes to the growing literature on sovereign debt defaults. This literature typically includes studies on determinants of debt crises and interest spreads (e.g. Manasse, Schimmelpfenning and Roubini, 2003; Manasse and Roubini, 2009; Balkan, 1992; Tomz and Wright, 2007; Reinhart and Rogoff, 2009 and 2010), theoretical works explaining the economics behind these events (Edwards, 1984; Calvo, 1988; Bulow and Rogoff, 1987) and studies on the political and economic costs of defaults (e.g. Martinez and Sandleris, 2008; Rose and Spiegel, 2002; and Borensztein and Panizza, 2009 and 2010). We contribute to this second strand of the literature by providing further evidence that political institutions, and especially political incentives, can play an important role in determining sovereign debt default risk (Reinhart and Rogoff, 2009). Our findings also provide further insights into the costs of sovereign defaults, showing that sanctions may not only be seen as a tool to punish defaults, but also as a determinant of debt crises.

The paper is organized as follows. In Section 2, we present the theoretical model. Section 3 analyzes the model and conveys its equilibrium prediction. The empirical analysis is carried out in Section 4. Section 5 concludes.

2 The Model

A country is ruled by an office-motivated head of state, Player \( H \), who enjoys a benefit \( v > 0 \) from keeping his position. The country has an outstanding amount of external public debt equal to \( B > 0 \). This debt is financed through a government bond, which must be repaid, together with interests, at the end of the game. Thus, the total cost of servicing the public debt is \((1 + r)B\), where \( r \) is the net interest rate paid on the bond.

The population of the country is homogeneous in terms of income. We normalize income level to 1. Citizens belong to one of two possible groups, \( A \) and \( Z \). Individuals in group \( A \) are activists. Each activist independently decides whether to revolt against Player \( H \) in the attempt to overthrow her or not. The actual interpretation of a revolt may vary with the specific context we are analyzing. Whereas in autocratic regimes, a revolt often entails violent riots against the leader (e.g., revolts during the Arab spring), in democratic regimes, revolts may range from violent protests against the current government (e.g., French May in 1968) to more peaceful demonstrations aimed at weakening the political support of the ruling government and thus at favoring a parliamentary confidence crises (e.g, public protests in Spain during the recent economic crisis). Individuals in group \( Z \),
instead, do not directly participate in the revolt. To simplify the analysis, we assume that group A represents a negligible fraction of the total population, while group Z has unit mass.

Citizens’ gross income (hence, the country’s GDP) is affected by sanctions imposed by the international community. A sanction equal to \( \sigma \in [1, \bar{\sigma}] \) reduces the income of citizens to \( y(\sigma) = 1/\sigma \). Thus, \( \sigma = 1 \) captures the decision not to impose any sanctions, while \( \bar{\sigma} > 1 \) is the maximum sanction that can be imposed. Therefore, \( 1/\bar{\sigma} \) can be interpreted as the per capita GDP if the country is totally banned from the international community. In particular, the level of sanctions levied against the targeted country can be determined by a set \( I = \{1, \ldots, n\} \) of countries. Each of these countries would benefit from overthrowing the leader, but would also suffer a cost in the event of a default. In line with our interpretation, we assume that such cost is proportional to the share of external debt owned by country \( i \in I \). Finally, we assume that the actual level of sanctions is determined by maximizing a weighted sum of the countries’ utility, in which the utility of each country is weighted by a political weight that captures factors such as its level of GDP, its degree of political interconnectedness, its likages (present or historical) with the targeted country and so on.

The utility of citizens in group Z depends on the decisions taken by Player H and by the level of sanctions:

\[
u_Z(\sigma, \tau, \delta) = \frac{1 - \tau}{\sigma} - \delta \ell, \tag{1}\]

where \( \delta \in \{0, 1\} \) is a binary choice variable describing whether the country defaults on the outstanding debt (\( \delta = 1 \)) or not (\( \delta = 0 \)), and \( \tau \in [0, 1] \) is the proportional tax rate chosen by Player H to finance public expenditures (see below). Both \( \delta \) and \( \tau \) are chosen by Player H.

Instead, \( \ell \) is the cost incurred by citizens if a default takes place. As such, \( \ell \) may capture capital losses in citizens’ portfolios, or, more in general, the utility losses associated with the socioeconomic turmoil a default may cause. We assume that \( \ell \) is uniformly distributed in the interval \([0, \ell_H]\). In particular, \( \ell \) is realized before Player H chooses whether to default or not (and it is observable to her), but after the level of sanctions, \( \sigma \), is determined.\(^3\)

Player H is overthrown if and only if the fraction of activists who revolt exceeds a threshold, which, in turn, depends on the utility of citizens in group Z, \( u_Z(\sigma, \tau, \delta) \).

\(^3\)From a technical point of view, the randomness in \( \ell \) smooths the binary decision to default into a probabilistic event. The assumption of uniform distribution is done to simplify the computations but none of our qualitative results hinges on it. In what follows, we further assume that \( \ell_H \) is sufficiently high to guarantee that a strategic default occurs with probability strictly between 0 and 1 for any level of sanction \( \sigma \in [1, \bar{\sigma}] \).
Intuitively, if the discontent among citizens is high, then Player $H$ is less stable and, consequently, fewer activists are needed to overthrow Player $H$.

If an activist revolts and the revolt succeeds, he enjoys a benefit equal to $g > 0$. Such benefit can be interpreted as the sum of a monetary component (possibly related with the value of office, $v$) and of an hedonic component associated with the participation in a successful revolt. On the contrary, if the activist revolts, but the revolt fails, he incurs a cost equal to the amount Player $H$ spends in revolt prevention, $\pi \geq 0$. The utility of an activist is thus given by:

$$u_A (\sigma, \tau, \delta) = \frac{1 - \tau}{\sigma} - \delta \ell + v 1_{\{success\}} - \pi 1_{\{failure\}},$$

where $1_{\{success\}}$ (resp., $1_{\{failure\}}$) is an indicator function that equals 1 if the revolt succeeds (resp., fails).

The investment in revolt prevention, $\pi$, is financed through a proportional tax rate, $\tau$, levied on citizens’ income. Besides financing $\pi$, tax revenues must also finance the service of public debt. Formally, the following government budget constraint must hold:

$$\frac{\tau}{\sigma} \geq \pi + B (1 + r) (1 - \delta).$$

Thus, Player $H$ chooses a triple $(\tau, \pi, \delta) \in [0, 1] \times [0, 1] \times \{0, 1\}$ under constraint (3) in order to maximize her survival probability given the level of sanctions $\sigma$ and the interest rate, $r$.

In particular, the interest rate $r$ is determined through a no-arbitrage condition against a risk-free interest rate, $\tilde{r}$. We say the debt is priced if there exists an interest rate on the government bond that compensates for the default probability. Formally, the debt is priced if we can find an interest rate $r \geq \tilde{r}$ such that:

$$(1 + r) (1 - F (\sigma | r)) = 1 + \tilde{r},$$

where $F (\sigma | r)$ is the probability with which Player $H$ defaults – namely, the probability with which Player $H$ chooses $\delta = 1$ — if the level of sanctions is equal to $\sigma$ and the interest rate is equal to $r$. Since the probability of a default depends on $\sigma$, the interest rate depends on the level of sanctions as well, $r = R (\sigma)$. If there is no $r$ satisfying (4), we say the debt is not priced and we assume that a default happens with certainty. Thus, in our model, defaults can happen either because Player $H$ decides so, or because the debt is not priced. We refer to the former type of defaults as to strategic defaults and to the latter as to automatic defaults.
The timing of the model is as follows. Sanctions are exogenously determined in period -1. In period 0, international markets form rational expectations on the probability with which the country defaults given the level of sanctions $\sigma$ and interest rate $r$ is determined. In period 1, if the debt is priced, Player $H$ chooses the policy vector $(\tau, \pi, \delta)$ as we specified above. Instead, if the debt is not priced, Player $H$ chooses a vector $(\tau, \pi)$ subject to $\frac{\tau}{\sigma} \geq \pi$. In period 2, activists decide whether to revolt or not and the outcome of the revolt is determined. Figure 1 summarizes the timing.

![Figure 1: Timing of the Model.](image)

3 The Analysis

In this section, we characterize the equilibrium of the model introduced in Section 2. To ease the presentation, we proceed backward. First, we describe the revolt subgame. Then, we derive the optimal policy vector $(\tau, \pi, \delta)$. Finally, we discuss the formation of the interest rates given the level of sanctions, $\sigma$.

As a result, we will be able to characterize the various channel through which sanctions affect the equilibrium of the game.

3.1 The Revolt Subgame

At the beginning of period 3, each activist in group $A$ must decide whether to revolt against Player $H$ or not. The revolt succeeds and Player $H$ is overthrown if and only if sufficiently many activists revolt. Thus, the subgame among activists exhibits strategic complementarities: if other activists participate in the revolt, each activist has an individually higher incentive to revolt.$^4$ To deal with the equilibrium multiplicity that

---

$^4$This happens because activists enjoy a specific benefit $g$ from participating in a successful revolt. If the benefit an activist enjoys by overthrowing Player $H$ were independent of his actual participation (for instance, if the only benefit of a successful revolt were the reduction of sanctions $\sigma$), the game would exhibit a free-riding problem and revolts could not arise in equilibrium. Moreover, one could reinforce strategic complementarities by assuming an inverse relationship between the punishment each activist expects to suffer and the mass of revolters. For the sake of simplicity, we do not introduce this second channel of strategic complementarities.
strategic complementarities may generate, we follow the literature on global games and we introduce information asymmetries concerning the stability of Player $H$’s regime (see Carlsson and van Damme, 1993, Atkenson, 2000, and Morris and Shin, 2002, 2003).

More specifically, we assume that the fraction of activists needed to overthrow Player $H$ depends on the utility of citizens in group $Z$, $u_Z(\sigma, \tau, \delta)$, and on the realization of a random variable $\tilde{\eta}$, which is uniformly distributed in the interval $[\eta, \bar{\eta}]$. Intuitively, a revolt succeeds more easily if it finds a larger support among citizens. This support, in turn, is inversely related to the satisfaction of citizens with the current government, which depends both on their utility, $u_Z(\sigma, \tau, \delta)$, and on a random shock to Player $H$’s popularity, $\eta$. As such, $\eta$ captures factors that are not affected by the policy vector chosen by Player $H$ but still affect the well-being of citizens — e.g., a shock to the price of a commodity the country exports or the empathy and rhetoric ability of Player $H$.

More formally, we assume that the fraction of activists needed to overthrow Player $H$ is equal to $u_Z(\sigma, \tau, \delta) + \eta$ and we refer to this quantity as to the stability of Player $H$. Let $\bar{u}$ and $u$ be respectively the highest and lowest utility that citizens in group $Z$ can experience in the game.$^5$ Assumption 1 below guarantees that if $\eta$ is sufficiently high (resp., sufficiently low), then an activist wants to revolt independently of what other activists do.$^6$

**Assumption 1** Revolting is dominant (resp., dominated) if the popularity shock is sufficiently low (resp., high): $\bar{u} + \eta < 0$ and $u + \bar{\eta} > 1$.

Although $\eta$ is determined at the beginning of period 3, activists are not perfectly informed about its realization. Indeed, activists may have some private information about the popularity of Player $H$, but such information may be biased, and it may fail to represent the actual support enjoyed by Player $H$ — e.g., an activist may know the popularity of Player $H$ in his town or within his social network, but not in other. Formally, we assume that each activist $i$ observes an independent signal $\varepsilon_i$ uniformly distributed in the interval $[\eta - \frac{1}{2\nu}, \eta + \frac{1}{2\nu}]$. $^7$

$^5$Formally, $\bar{u} := \max_{(\sigma, \tau, \pi, \delta)} u_Z(\sigma, \tau, \delta)$ s.t. (3) and $u := \min_{(\sigma, \tau, \pi, \delta)} u_Z(\sigma, \tau, \delta)$ s.t. (3).

$^6$This assumption is standard in the global game literature and yields equilibrium uniqueness. Formally, it identifies “dominant regions” from which the contagion argument typical of global games can start.

$^7$By construction, $\varepsilon_i$ can take values in the interval $[\eta - \frac{1}{2\nu}, \eta + \frac{1}{2\nu}]$. The posterior belief after signal $\varepsilon_i$ can thus be determined through Bayes rule as follows. If $\varepsilon_i \in \left[\eta + \frac{1}{2\nu}, \eta - \frac{1}{2\nu}\right]$, then $\eta \mid \varepsilon_i \sim U\left[\varepsilon_i - \frac{1}{2\nu}, \varepsilon_i + \frac{1}{2\nu}\right]$. Instead, if $\varepsilon_i > \eta - \frac{1}{2\nu}$ (resp., $\varepsilon_i < \eta + \frac{1}{2\nu}$), then $\eta \mid \varepsilon_i \sim U\left[\varepsilon_i - \frac{1}{2\nu}, \eta\right]$ (resp., $\eta \mid \varepsilon_i \sim U\left[\eta, \varepsilon_i + \frac{1}{2\nu}\right]$).
Proposition 1 states that the revolting subgame has an essentially unique equilibrium and characterizes the survival probability of Player \( H \). Its proof follows the same argument as in Morris and Shin, 2002 (see Appendix A for details).

**Proposition 1** Under Assumption 1, there are unique \( \varepsilon^* \) and \( \eta^* \) such that in any equilibrium of the revolt subgame, (i) an activist revolts if and only if \( \varepsilon_i \leq \varepsilon^* \), and (ii) Player \( H \) is overthrown if and only if \( \eta \leq \eta^* \).\(^8\) Therefore, Player \( H \)'s survival probability is given by

\[
S(\sigma, \tau, \pi, \delta) = \Pr \{ \eta \geq \eta^* \} = 1 - \frac{1}{\eta - \eta^*} \left( \frac{g}{g + \pi} - u_Z(\sigma, \tau, \delta) \right).
\]  

(5)

### 3.2 The Behavior of Player \( H \) and Strategic Defaults

In period 2, Player \( H \) takes the level of sanctions \( \sigma \) as given and chooses the policy vector \((\tau, \pi, \delta)\) to maximize her survival probability, \( S(\sigma, \tau, \pi, \delta) \), subject to the government budget constraint. Formally, she solves

\[
\max_{(\tau, \pi, \delta)} vS(\sigma, \tau, \pi, \delta) \quad \text{s.t.} \quad (i) \quad \frac{\tau}{\sigma} \geq \pi + B(1 + r)(1 - \delta) \quad \text{and} \quad (ii) \quad \tau \leq 1
\]  

(6)

if the debt is priced and

\[
\max_{(\tau, \pi)} vS(\sigma, \tau, \pi, 1) \quad \text{s.t.} \quad (i) \quad \frac{\tau}{\sigma} \geq \pi \quad \text{and} \quad (ii) \quad \tau \leq 1
\]  

(7)

if the debt is not priced.

First, suppose that the debt is priced and the interest rate is equal to \( r \). Then, the investment in revolt prevention, \( \pi \), has two effects on Player \( H \)'s survival probability as characterized in Proposition 1. On the one hand, it modifies the cost of revolting — \( g/(g + \pi) \) decreases with \( \pi \). On the other hand, it affects total government expenditures, hence the level of taxation — \( u_Z(\sigma, \tau, \delta) \) is decreasing in \( \tau \), which, in turn, increases with \( \pi \).

Similarly, the decision to default has a two-fold effect on the survival probability of Player \( H \). On the one hand, voters suffer a cost equal to \( \ell \) and their discontent toward the current government goes up — see (1). On the other hand, a default eliminates the cost of servicing the public debt, thus enabling a tax reduction and an increase in \( u_Z(\sigma, \tau, \delta) \), which boosts the leader’s survival probability.

The optimal policy vector, denoted with \((T(\sigma, \ell | r), P(\sigma, \ell | r), D(\sigma, \ell | r))\), is thus a function of the level of sanctions \( (\sigma) \), of the realization of the default cost \( (\ell) \), and of

\(^8\)If \( \varepsilon_i = \varepsilon^* \), activist \( i \) is indifferent between revolting or not. We break this indifference assuming that he revolts for sure.
the interest rate \( r \). However, as we clarify below, the interest rate is itself a function of the level of sanctions.

Importantly, the optimal policy vector depends on whether constraint \( \tau \leq 1 \) binds or not. Indeed, if \( \tau \leq 1 \) does not bind, Player \( H \) can choose \( \tau \) and \( \delta \) independently on the basis of the trade-offs highlighted above. Instead, if the constraint \( \tau \leq 1 \) binds, Player \( H \) faces an additional trade-off. If she services the debt \( (\delta = 0) \), she cannot choose the first-best level of revolt prevention and the amount of revolt prevention must be chosen residually after setting the highest possible level of taxation \( (\tau = 1) \). On the contrary, if she insists on choosing the first-best level of revolt prevention, she must renege on the public debt and default \( (\delta = 1) \). The first scenario — i.e., \( \tau \leq 1 \) not binding — arises when citizens’ income is high enough, while the second one — i.e., \( \tau \leq 1 \) binding — occurs when citizens are poor.

In what follows, we will assume that, independently of the level of sanctions, the GDP of the country is always high enough to finance either the first best level of revolt prevention, or the service of public debt in the absence of any default risk.\(^9\) Under this assumption the two cases described above are exhaustive for the equilibrium analysis.

To formalize this discussion, notice that the first-best level of investment in revolt prevention solves (6) relaxing constraint (ii) and it is given by \( \pi^{FB} = \max \{ \sqrt{g} - g, 0 \} \).

Thus, if the benefit that activists get from a successful revolt is not too high — i.e., \( g \leq 1 \) — the first-best investment is positive as it could help preventing the revolt. Instead, if the benefit from revolting is high — i.e., \( g \geq 1 \) — the investment in revolt prevention is so costly in terms of taxation that Player \( H \) is better off setting it equal to 0. In the remaining of the paper, we focus on the interesting case in which \( g < 1 \), so that \( \pi^{FB} = \sqrt{g} - g \).

**Assumption 2** The benefit of a successful revolt is not too high: \( g < 1 \).

Under Assumptions 1 and 2, we can characterize the optimal policy vector chosen by the leader. Moreover, exploiting the randomness in the cost of defaulting, we can compute (i) the probability of a strategic default from period 0’s perspective, \( F(\sigma \mid r) = \int_0^{\ell_H} D(\sigma, \ell \mid r) \), and (ii) the expected survival probability of the leader from period 0’s perspective, \( S(\sigma \mid r) = \int_0^{\ell_H} [S(\sigma, T(\sigma, \ell \mid r), P(\sigma, \ell \mid r), D(\sigma, \ell \mid r)) \mid \ell_H]d\ell \).

The next proposition, whose proof is contained in the appendix together with the characterization of the optimal policy vector chosen by Player \( H \), characterizes the probability of a strategic default in more details.

\(^9\)Formally, we assume \( 1/\sigma \geq \max \{ \sqrt{g} - g, B (1 + \hat{r}) \} \). Notice that, in line with the motivation of our paper, this assumption rules out the possibility that sanctions may cause an automatic default, absent any strategic behavior on Player \( H \)'s side.
Proposition 2 Suppose the debt is priced and Assumptions 1 and 2 hold. Then, the probability of a strategic default from the perspective of period 0, $F(\sigma | r)$, is increasing in both $\sigma$ and $r$.

To understand Proposition 2, we can observe that the net benefit from defaulting for Player $H$ is the sum of three separate forces. First, a default enables Player $H$ to reduce taxation, thus improving her survival probability. Second, a default enables Player $H$ to increase the investment in revolt prevention and this boosts her survival probability as well (importantly, this second channel is at play if and only if the constraint $\tau \leq 1$ is binding). Third, a default generates a disutility for the citizens equal to $\ell$ and this reduces Player $H$’s survival probability. An increase in the level of sanctions, $\sigma$, or an increase in the interest rate, $r$, both amplify the first two positive forces, without affecting the third negative force. As such, these changes in parameters boost the incentive of the leader to strategically default.

Now, suppose that the debt is not priced. In this case, the country automatically defaults. Thus, by Assumption 2, Player $H$ chooses an amount of revolt prevention equal to $\pi^{FB}$ and a level of taxation equal to $\sigma \pi^{FB}$.

3.3 Endogenous Interest Rates

In period 0, financial markets compute the probability of a strategic default, $F(\sigma | r)$, according to rational expectations and set the interest rate $r$ on the government bond accordingly. The absence of arbitrage opportunities implies that the expected gross return on the government bond must equal the safe gross return that an investor can get by investing in the risk-free asset. Formally:

$$(1 + r) (1 - F(\sigma | r)) = 1 + \tilde{r}. \tag{8}$$

By looking at equation (8), one can immediately verify that the interest rate on the government bond is greater than the risk-free interest rate, $r \geq \tilde{r}$ because investors require a premium to hedge themselves against the default risk. However, since the probability of a strategic default, $F(\sigma | r)$, is increasing in $r$ — see Proposition 2 — and financial markets have rational expectations, equation (8) may have no solutions. This happens when the amount of outstanding debt is so high that setting taxation in order to service this debt would generate too much discontent among the population. In this case, the government bond is not priced and there is an automatic default.

$^{10}$See (14) in the Appendix for a formal characterization of these channels.
Instead, when equation (8) has a solution, the debt is priced. In this case, for any given level of sanction, there could be more than one level of interest rate solving (8). Indeed, an increase in \( r \) increases both the yield on the government bond, \( 1 + r \), and the probability of a strategic default, \( F(\sigma \mid r) \). Since these two forces push in opposite directions, for every value of \( \sigma \), equation (8) may admit up to two solutions.\(^{11}\) When such multiplicity arises, we pick the lowest value of \( r \), which we denote with \( R(\sigma) \). Such selection is compatible with the idea that the interest rate is set by a (representative) investor, who, \textit{coeteris paribus}, prefers to avoid the financial turmoil that a default may cause.

**Proposition 3** The debt is priced only if its amount does not exceed a threshold, namely only if \( B \leq \bar{B} := \ell_H / [(1 + \bar{r}) 4] \). If the debt is priced, \( R(\sigma) \) is the lowest root of (8) and it is a continuous and differentiable function. In particular, there exists \( \hat{\sigma} \) such that if \( \sigma \leq \hat{\sigma} \), \( R(\sigma) \) is constant in \( \sigma \) and if \( \sigma > \hat{\sigma} \), \( R(\sigma) \) is increasing in \( \sigma \).

Since the return on the government bond in determined by (8), we can totally differentiate such equation and conclude that \( d((1 + R(\sigma))(1 - F(\sigma \mid R(\sigma)))) / d\sigma = 0 \). Thus, if the bond is priced and we marginally change the level of sanctions, the change in the yield on the government bond, \( R(\cdot) \), and in the default probability, \( F(\cdot) \), fully offset each other in order to preserve no-arbitrage.

### 3.4 The Effects of a Change in the Level of Sanctions

At the beginning of period 0, the international community sets the level of sanctions taking into account the effect that such sanctions will have on play of the game. The international community is made by a set of countries, \( C = \{1, \ldots, n\} \). Each country \( j \) would benefit from overthrowing the Player \( H \) from office, but, at the same time, suffers a cost if the country defaults. We assume that this cost is proportional to a parameter \( k_j \geq 0 \): the higher \( k_j \), the higher is the cost that country \( j \) suffers if the targeted country defaults. As such, we can interpret \( k_j \) as a proxy of how close from a commerical or financial point of view the targeted country and country \( j \). We refer to \( k_j \) as the country \( j \)’s exposure to default. Without loss of generality, we assume that countries are ranked based on \( k_j \): \( k_1 \leq k_2 \leq \ldots \leq k_n \). To summarize, if a sanction equal to \( \sigma \) is levied, country \( j \)’s utility is given by

\[
  v(\sigma \mid k_j) = \left(1 - \hat{S}(\sigma)\right) - k_j F(\sigma \mid R(\sigma))
\]

\(^{11}\)This follows from substituting the expression for \( F(\sigma \mid r) \) in (8) and noticing that the equation becomes quadratic in \( r \).
The level of sanctions is determined by the maximization of a weighted sum of individuals utility functions, in which the weights depend on the relative political power of countries. Then, the optimal level of sanctions solves:

$$\max_{\sigma \in [1, \sigma]} \sum_{j=1}^{n} \phi_j v (\sigma | k_j),$$

where \(\phi_j \geq 0\) represents the political power of country \(j\). Intuitively, weight \(\phi_j\) measures factors that affect the relevance of country \(j\) within the international community (e.g., its GDP, its level of military or economic contribution to international programs, the number of allied countries). We normalize weights so that \(\sum_{j=1}^{n} \phi_j = 1\). We denote the solutions of problem (10) when political weights are given by \((\phi_1, ..., \phi_n)\) with \(\sigma^* ((\phi_1, ..., \phi_n))\). In what follows, we assume that \(\hat{S} (\sigma)\) has a unique global maximizer and that (10) admits an internal solution for every profile of political weights.

First, consider the case in which all countries share the same political weight, \(\phi_j = \frac{1}{n}\). Then, the optimal level of sanctions equate the marginal benefit of an increase in sanctions (as measured by the decrease in the survival probability that such sanctions would induce) with its marginal cost (as measured by the marginal increase in the weighted sum of costs associated with a default). In this case, the optimal level of sanctions, \(\sigma^* (1/n, ..., 1/n)\), solves:

$$- \frac{\partial \hat{S} (\sigma^* (1/n, ..., 1/n))}{\partial \sigma} = \bar{k} \frac{\partial F (\sigma^* (1/n, ..., 1/n) | R (\sigma^* (1/n, ..., 1/n)))}{\partial \sigma},$$

where \(\bar{k} = \frac{1}{n} \sum_{j=1}^{n} k_j\) is the average exposure to default. Thus, if all countries share the same political weight, the level of sanctions would be the one that a country with an average exposure to default would choose.

Now assume that countries are not uniform in their political power. Let \((\phi_1, ..., \phi_n)\) be the profile of political powers and define \(K (\phi_1, ..., \phi_n) = \sum_{j=1}^{n} \phi_j k_j\). It is immediate to verify that \(K (\phi_1, ..., \phi_n) > \bar{k}\) (resp., \(K (\phi_1, ..., \phi_n) < \bar{k}\)) if the political power as measured by \((\phi_j)_{j=1}^{n}\) is shifted towards individuals with high (resp., low) exposure to default. The next proposition closes our model by stating that the equilibrium level of sanctions (and the resulting probability of a strategic default) depends on political-power weighted exposure to defaults, \(K (\phi_1, ..., \phi_n)\).

**Proposition 4** Let \((\phi_1, ..., \phi_n)\) be a profile of political powers. Then, if countries with high political power have also high exposure to default (i.e., \(K (\phi_1, ..., \phi_n) > \bar{k}\)), the level of sanctions is (weakly) lower than the benchmark level in which political power is evenly distributed across countries (i.e., \(\sigma^* ((\phi_1, ..., \phi_n)) \leq \sigma^* ((1/n, ..., 1/n))\)) and the probability
of a strategic default is thus lower. The opposite is true if countries with high political power have low exposure to default.

4 Empirical Analysis

4.1 Data

We test the implications of the theoretical model by analyzing data from four datasets which contain information on economic sanctions, sovereign debt defaults, macroeconomic performance, and political institutions. Each of these datasets are described below.

4.1.1 Threats and Imposition of Sanction Database (TISD)

The TISD is one of the most comprehensive databases on economic sanctions, and it provides information on sanctions levied globally in the period 1945 and 2005. Economic sanctions are defined as actions that one or more countries take to limit or end their economic relations with a target country in an effort to persuade that country to change one or more of its policies. Restrictions of economic relations for solely domestic reasons do not qualify as sanctions. In our data, we code the sanction variable as a dummy variable which is equal to one if a country is subject to sanction in any given year, zero otherwise.

4.1.2 Reinhart and Rogoff Database (RRD)

The TISD was merged with data from C. Reinhart and K. Rogoff (2009), who provide information on public debt and other financial crises for 70 countries over the period 1800-2010. The RRD gathers information on sovereign debt, banking, hyperinflation, and stock market crises. Since some countries are included in the TISD but are not available in the RRD, we drop these countries. Moreover, two countries (Angola and Korea) are available in the RRD database but not in the TISD data; we drop these countries as information on sanctions is not available. The resulting dataset can thus be representative of a population of countries that defaulted at least once in the period under consideration, but is not necessarily representative of the population of countries that were targeted by sanctions.

Sovereign debt defaults are defined in the RRD as the failure to meet principal or interest payment on the due date specified in the original terms of the debt issue. Sovereign defaults can occur on external debt, domestic debt, or both, and domestic defaults also include bank deposit freezes and forcible conversions to the local currency. In our data,
we code sovereign debt defaults as a binary indicator which is equal to one if (in any
given year) a country is defaulting on its external and/or domestic debt, zero otherwise.
Moreover, as countries can stay in default for multiple years, we create an additional
indicator for the first year of sovereign debt crisis, defining these episodes as “entry in
default”.

4.1.3 World Bank World Development Indicators (WDI)
We augment the information of the resulting dataset with macroeconomic indicators taken
from the World Bank World Development Indicators (WDI). These variables include
information on external debt stocks, short-term debt, inflation, reserves, and interest
payments, all variables that are important predictors of sovereign debt crises (Manasse
and Roubini, 2005; Rogoff, 2009). Unfortunately, information on these variables is missing
prior to 1960, and it is sometimes missing, for certain countries and years, also after 1960.
As a consequence, we limit our analysis to the period 1960-2005, and we run analyses of
public finance variables on specific subsamples to minimize missing information.

4.1.4 Cross-National Time-Series Data Archive (CNTSDA)
Finally, we include data on political unrest and political institutions from the Cross-
National Time-Series Data Archive (CNTSDA) developed by Databanks International.
This dataset contains information on several country-specific political indicators, such as
regime type, type of selection of the executive, legislative process, political instability, and
political unrest. Missing data are relatively few, and we are able to merge about 90% of
the observations to the main dataset.

4.2 Descriptive analysis
The resulting dataset contains information on 68 countries for the period 1960-2005, with
a total of 3,128 country-year observations. Countries received sanctions 840 times in the
1960-2005 period (which constitutes about 27% of the country-year observations in our
sample). Since a country can be under sanction for several years before the sanction is
removed, we also make a distinction for the first year of sanction imposition, indicating
when a country that was not under sanction in the previous year receives a new sanction
in the current year. According to this second definition of “entry into sanction”, there
were 556 new sanction episodes in the period under consideration, lasting on average 1.5
years each.
In comparison to sanctions, sovereign debt crises happen much more rarely. Countries defaulted on their debts a total of 505 times in the 1960-2005 period (which constitutes about 16% of our country-year observations), and if we exclude recurrent defaults, there were 101 “entries in default” in the period under consideration (Table 1). A sovereign debt crisis lasts on average 5 years.

What the data suggests, interestingly, is that there is a strong association between sanctions and sovereign debt crises. Over the total of 505 sovereign debt crises, 197 (39%) happened under sanction. Even if we consider only new entries in default, the percentage of defaults under sanctions remains very high (34%) (Table 1, Column 2). This correlation is interesting because, to our knowledge, no other study has addressed economic sanctions as a possible determinant of sovereign debt defaults. Economic sanctions have been described as a tool that countries can use to punish another country’s default on foreign debt, but while this certainly happened in the past (e.g. through the “gunboat diplomacy” described by Mitchener and Weidenmeir, 2010), no research has looked at the possible public finance effects of sanctions and their impact on the ability to repay public debt. Yet, even when we look at defaults under sanctions, most of the defaults are on external debt. Eighty percent of defaults under sanctions are external debt defaults (80% of the episodes). Less than one in six (14%) are both external and domestic defaults, and only 6% are domestic defaults. The percentages are similar if we consider only the first year of debt crisis; external debt defaults still account for nearly 70% of all defaults under sanctions (Column 2).

To understand more about the underlying characteristics of the countries under default and/or sanction, we turn to compare political and macroeconomic characteristics for countries under default, under sanction, or under default and sanction.

Table 2 provides summary statistics for regime type (civilian vs. military or other), selection of the executive (elective or not elective), a variable that records yearly changes of political executive, and a weighted index of internal conflict that provides a measure of the internal stability of a country.\textsuperscript{12} Information on these political variables is available only for a subsample of 2,128 observations. We report means for all variables and for all countries in Column 1, and in the other two columns we analyze information for the subsample of countries under sanction (Column 2) or under default and sanction (Column 3).

\textsuperscript{12}The index is used for weighted conflict measures, and the specific weights are variable. As of October 2007, CNTS weighted conflict measures in the following way: Assassinations (25), Strikes (20), Guerrilla Warfare (100), Government Crises (20), Purges (20), Riots (25), Revolutions (150), and Anti-Government Demonstrations (10). Multiply the value for each variable times the specific weights; multiply that sum of products by 100 and divide the result by 8 to obtain the value of the index.
The data show that countries under sanction tend to be more autocratic than other countries. For example, these countries are more likely to be ruled by a military or other non-civilian regime (16.6% vs. 14.9%) and they are more likely to be non-elective (18.4% vs. 14.5%). Moreover, the degree of internal political unrest is much higher (as shown by the internal conflict index) and changes of power are more frequent (24.6% vs. 21.1%), all factors that might be associated with the destabilizing action of sanctions.

In Column 3 we turn to analyze summary statistics for countries in sovereign debt crisis in t and under sanctions in the period t-1 and (or) t-2. With this definition we capture episodes where sanctions are imposed before the default, excluding episodes where sanctions and defaults happened in the same year and thus to ruling out the possibility of reverse causality.

Countries under default and sanction have peculiar political institutions. They are more likely to be ruled by a non-civilian regime (19.8% vs. 14.9%) and they have high degree of political unrest, but compared to other countries under sanction they are slightly more likely to have an elective selection of the executive (84.3% vs. 81.6%), a finding that suggests that these countries tend to experience a combination of populistic and autocratic regimes. Most importantly, we find that changes in power in countries that default under sanctions are less frequent: leader changes occur 21.5% of the times compared to 24.6% in countries under sanction and no default. This descriptive finding is in line with the implications of our theoretical model, which predicts that (under certain circumstances) leaders who enter in a debt crisis increase their political survival. And while at this stage we cannot say more about the factors that are associated to this different rate of political turnover, it is important to note that countries that default under sanctions seem to have different political institutions than countries under sanction that do not enter in default.

The analysis of the macro-economic variables shows that these differences are not only political, but also economic. In Table 3 we report similar summary statistics for a set of public finance variables and macroeconomic indicators taken from the WDI. Since these indicators have a lot of missing information, we are able to study them only on a subsample of 1,058 observations with data from 36 countries. We analyze information on short-term external debt per capita, external debt stocks as a percentage of GNI, per-capita interest payments on external debt, total reserves as a percentage of total external debt, inflation, GDP per capita, and GDP growth. We report means and standard deviations for the total sample (Column 1), and then we analyze subsample means for countries under default vs. not under default (Columns 2-3), countries under sanction vs. not under sanction (Columns 5-6), and countries under default and under sanction vs. countries under default only (Columns 8-9).
Countries under debt crisis have, on average, worse public finance indicators and worse economic performance than other countries. In our sample, they have higher rates of external debt as a percentage of GNI (81% vs. 45%), higher amounts of short term debt per capita ($120 vs. $88)$^{13}$, higher interest payments on external debt (both total and short-term), lower reserves, and they are more likely to experience hyperinflation. Additionally, average GDP per capita is about 16% lower than other countries, and GDP growth is nearly half than in other countries (2.4% vs. 4.7%).

Countries under sanction are different in a number of ways. Most importantly, they are much more likely to be indebted in the short-term. Short-term external debt per capita (at nearly $140) is very high with respect to countries not under sanction ($82), but even higher than countries under default ($120). This suggests that countries under sanction may find it difficult to borrow externally, and therefore have to use short-term borrowing much more often than other countries. Perhaps for the same reason, the quota of total external debt is quite low, at 46% of GNI. On the other hand, interest payments on external debt are very high both on short-term and total external debt, even higher than in countries under default. As a consequence, countries under sanction have a lot of the same problems experienced by countries that are having debt crises, but at lower external debt quotas.

Finally, in Column (9) we report means and standard deviation for countries under default in $t$ and under sanction in $t-1$ or $t-2$. The data suggest a number of interesting insights. First, as for countries under sanction, short-term external debt per capita is extremely high (at $182$), but external debt/GNI is relatively low (65%). Second, interest payments on short-term external debt per capita are double the interest paid by other countries under debt crisis ($8$ vs. $4$). Third, macro-economic variables that indicate ability to repay, such as the percentage of reserves on total external debt, GDP per capita, and GDP growth, are actually better among these countries than among other countries in default. The percentage of reserves on total external debt is higher (15% vs. 12%), as is GDP per capita (over 1.6 times higher), and GDP growth (0.5 percentage points higher, even if this difference in means is not statistically significant). In other words, countries under default and under sanction in $t-1$ or $t-2$ still have similar problems to other defaulting countries, such as high interest payments and high short-term external debt, but they tend to enter in default earlier than other countries, when macroeconomic indicators of performance have not yet reached the same thresholds of other defaulting countries. These preliminary findings are in line with the implications of our theoretical model that suggests that, in some cases, political leaders may decide to default on their

$^{13}$ Measured in current US dollars.
country’s external debts earlier than they would have in the event that no sanction was imposed. This view is also consistent with findings at Table 2, that show that countries that tend to default under sanction tend to have weaker political institutions and higher political instability. In the next section, we test these findings empirically.

4.3 Empirical Results

We study the implications of the theoretical model using a regression framework that tests the following hypotheses:

1. Sanctions and sovereign debt crises are statistically correlated.

2. In some cases, sovereign debt crises under sanction can improve leader survival in office.

3. Sovereign debt crises under sanction can help reduce internal political instability.

4. Sovereign debt crises under sanction can increase the resources that are available to the political leader.

In Table 4 we examine the relationship between sovereign debt defaults and sanctions in a multivariable setting. Our main regression model is a linear probability model with country and year fixed effects, where we regress the probability of sovereign default at time t on whether sanctions were levied in the previous two years. We also add, incrementally, three sets of controls: (1) controls on previous sovereign debt crises, such as the number of previous defaults in a given country and the number of defaults globally in t-1 and t-2; (2) a set of political indicators with information on regime type, type of election, and years since last executive changed; and (3) several economic indicators that appeared relevant in the descriptive analysis, including GDP growth and log GDP per capita, external debt stocks as a percentage of GNI, interests on short-term debt (per capita), and reserves as a percentage of total external debt. All these economic controls where lagged one year.

Since some observations are lacking, we run the regressions on three samples – the full sample (3,128 observations, Column 1), a sample where political information is not missing (2,999 observations, Columns 2 and 3), and a sample where both political and economic information is not missing (1,129 observations, Columns 4 and 5). We also run regressions with and without controls on all three samples to allow for a comparison of the results across the different specifications. Finally, in all regressions we dropped the categories “civilian regime” and “elective government”, thus the coefficients for military regime and non-elective government are calculated with respect to these baselines.
Columns 1, 2, and 3 show that sanctions are significantly associated with debt defaults, providing a 3 to 4 percentage point increase in default probability. The result is robust to country and year fixed effects, and does not change significantly when we include controls for political institutions (Column 3). However, when we run the regression on the smaller sample where public finance information is not missing, the correlation becomes not significant. Importantly, the coefficient is not significant even before adding the controls (Column 4), which suggests that the sample under consideration may be selected and too small for rare events such as sovereign debt defaults and sanctions.

The other results show that previous debt crises and political institutions can play a prominent role in influencing default probability. The number of previous defaults is positively correlated with default probability; an additional default in the past is associated with a 0.5-1.5 percentage point increase in probability of default. This confirms findings in the literature that show that the number of previous defaults is one of the best predictors of future debt crises (Rogoff, 2009). At the same time, the number of defaults globally within the previous two years is negatively correlated with current sovereign debt default probability. When controlling for other factors, military regimes are 6 to 15 percentage point less likely to enter in default, and information on whether the government is elective or not is not statistically significant in the regressions. Moreover, population size matters: countries with larger populations are more likely to default.

The results of the descriptive analysis are also confirmed for economic indicators. GDP per capita, GDP growth, and monetary reserves -indicators which represent capacity to pay back- are negatively and significantly associated to debt defaults. On the contrary, external debt and interest payments decrease capacity to pay back, and are positively associated with defaults.

These findings show that sanctions may play an important role in determining risk of default. In the next section, we look more closely at how sanctions may distort political incentives to enter in a debt crisis.

4.3.1 Debt Crisis under Sanction: A Political Choice?

We study sanctions’ distortive effect on political incentives by using a regression model similar to Table 4. Specifically, we look at changes in power, studying the combined effect of sanctions and defaults in determining whether the political leader has more (or less) chances to remain in office after default, sanction, or default under sanction. As in the previous Table, we use a linear probability model where the outcome variable is a binary indicator that is equal to one if, in a given year, the political leader of a country leaves
office, zero otherwise.\textsuperscript{14} As variables of interest we include:

- a dummy variable that is equal to one if the country received a sanction in t-1 or t-2;
- a dummy variable that is equal to one if the country entered in default in t-1 or t-2;
- an interaction term between the sanction variable and the default variable;
- the interaction is equal to one only if the country received a sanction and entered in default in t-1 or t-2, zero otherwise.\textsuperscript{15}

We also add, incrementally, controls for political institutions (similar controls as in Table 4), past defaults, and (lagged) indicators of capacity to repay (GDP per capita and GDP growth). We no longer include controls for public finance variables for two main reasons. First, the number of non-missing observations becomes very small when we use both data on political institutions and public finances, and the resulting sample appears to be selected. Second, as discussed in the descriptive analysis, sanctions are likely to have a direct impact on public finances, and therefore including public finance variables in the regression model may confound the effect of sanctions.

Table 5 reports the results. In the first three columns, we report the results of regressions where we study the separate effects of sanctions and defaults, controlling for political indicators. In column 4 we add controls for past defaults and capacity to repay. Finally, in Column 5 we report the results for the interaction term of sanction and default.

The results show that, when considered alone, sanctions negatively impact the probability of change in power (-4 percentage points), while sovereign debt defaults increase the probability the political leader will lose office (+4 percentage points). The coefficients are statistically significant at 10% level and remain significant across the different specifications; with or without the additional controls (only debt defaults lose significance in Column 4). It is perhaps surprising that the sign of sanctions is negative (which means that sanctions actually help political leaders remain in office). However, the literature on sanctions reports mixed results and there is not a clear indication that sanctions are effective in destabilizing political leaders (Marinov, 2005).

In Column 5 we look at the combined effect of defaults under sanction. As predicted by the theoretical model, defaults under sanction actually reduce (on average) the likelihood

\textsuperscript{14}The variable looks at whether, in a given year, effective control of executive power changes hands. Such a change requires that the new executive be independent of his predecessor. Since the binary indicator is constructed by year, we are unable to monitor multiple political crises in the same year.

\textsuperscript{15}We also recode the interaction term to zero in 4 cases where defaults happen in t-2 but sanctions happen only in t-1.
of change in power. The coefficient of the interaction term shows that defaults under sanction are associated with a -8.2 percentage point probability of leader change, and the result is statistically significant at 10% level. On the other hand, the coefficient for sanctions alone loses significance, while defaults alone are associated with a +6.6 percentage point increase in probability of leader change. This result is interesting because it shows that sanctions and defaults can have heterogeneous impacts on political leaders’ incentives and, under certain conditions, a risky political decision (such as deciding to repudiate a country’s external debt) can be seen as beneficial if it is able to solidify the position of the political leader, for example by freeing up resources to deal with internal political instability.

But how is this political instability reduced? In Table 6 we look at how sanctions and defaults impact the degree of internal conflict within a country. We use the same specifications as in the previous table, but this time we use as a dependent variable the weighted indicator from the CNTSDA that summarizes a country’s degree of political instability.

Our findings show that sanctions and defaults, alone, are not significantly correlated with internal conflicts, but the interaction term between the two suggest that, when controlling for regime type, macroeconomic performance, and previous debt crises, defaults under sanctions strongly decrease the degree of internal conflict within a country. Most of the other controls are not significant, however, GDP per capita, GDP growth, and years since last executive change are all associated with lower internal conflicts.

### 4.3.2 Impact on National Revenue and National Expenditure

Finally, we look at mechanisms through which debt repudiation may improve a political leader’s chances to remain in office. In our theoretical model, we show that –under certain conditions- sanctions can impair the political leader’s ability to keep political consensus and suppress domestic conflicts. Debt defaults, on the other hand, may offer a quick solution to free up resources that can allocated to political use.

To understand this mechanism, we look at the variation of national revenue per capita and national expenditure per capita under sanction, under, default, and under sanction and default. To make results comparable, we transform both dependent variables in log, and therefore the coefficient can be interpreted as relative percentage changes.

Tables 7 and Table 8 report the results, respectively, for log national revenue per capita and log national expenditure per capita. In line with the implications of the theoretical model, we find that -when alone- sanctions and defaults tend to have a negative impact on revenues and expenditure. Sanctions are negatively associated with national revenue.
and expenditure, but the coefficient is not significant. On the other hand, debt crises are associated with a 9% to 34% reduction in national revenue per capita, while the estimates are not significant for expenditure. However, when we include the interaction term between the two events (Column 5 in Table 7 and 8), we find that defaults under sanctions are associated with a 16% increase in national revenue per capita, while the correlation sign related to national expenditure is positive, but not significant.

This evidence seems to confirm the main conclusions of the theoretical model. Models of strategic default suggest the possibility that, under certain circumstances, the costs associated to repudiation are not enough to compensate the benefits, so that a strategic decision becomes possible or even desirable. For example, Eaton and Gersovitz (1981) theoretically demonstrate that sovereign default can free up resources for consumption. This analysis seem to suggest that these mechanisms may be at play: under certain conditions, political leaders may find it beneficial to enter in debt crisis under sanctions.

4.3.3 Robustness check: instrumental variable estimation

We test the robustness of the findings by looking more closely at the causal relationship between sanctions and debt default probability. Indeed, we may be concerned that the estimates do not reflect the causal effect of sanctions due to the action of unobservables that influence at the same time the probability that a country is targeted by sanctions and enters in a debt crisis. For example, countries with weak political institutions tend to experience more internal conflicts and warfare, thus being more likely to be targeted by sanctions. At the same time, weak institutions may be at the root of unstable financial systems that are more likely to trigger public debt crises. As a different example, political leaders targeted by sanctions may be naturally less likely to repay debts, independent on whether they actually receive sanctions or not. Even though we account for many of these determinants by including controls for economic and political variables and controls for country and time fixed effects, there might be other unobserved variables that influence at the same time the probability of receiving a sanction and entering in sovereign default. Moreover, there is the possibility that governments targeted by sanctions have private information on their ability to cope with international pressure (Marinov, 2005). This would generate a selection bias, and our estimates for the effect of sanctions would be biased downward.

We tackle this problem by adopting an instrumental variable approach that proxies a given country’s probability of being sanctioned by linking it to the number of sanctions imposed globally in a given year. We posit that the number of sanctions levied in the world in a certain year influences a country’s probability of receiving sanctions that
year, independent on the specific political or economic characteristics of the country under consideration. Indeed, the global number of sanctions can impact a country-specific sanction probability either positively or negatively. On one hand, when many sanctions are imposed at an international level, it may be that the probability that a country receives sanction increases, due to the fact that it is simpler for sender countries to impose sanctions (e.g., international coordination among sender countries is stronger, or political leaders of sender countries are in favor of an international policy that relies on frequent sanction use). On the other hand, the number of sanctions imposed globally may be negatively correlated to the probability of receiving a sanction. For example, if many countries around the world are already receiving sanctions, the focus of the international community, media, and public opinion is more dispersed, and hence similar international political threats—ceteris paribus—are less likely to be sanctioned. But whether the number of sanctions levied internationally is negatively or positively correlated to a given country’s probability of receiving sanctions, our key assumption is that the number of sanctions globally does not directly influence the probability of debt default in a country except by the influence on sanctions probability.

Since the number of sanctions levied globally in a given year varies by year but not by country, we also weigh each sanction episode by the Affinity of Nations Index, an index that measures the political affinity of pairs of states on the basis of voting patterns at the U.N. General Assembly (UNGA) (Gartzke, 2006). This metric ranges from -1 (minimum affinity) to +1 (maximum affinity) and reflects the similarity of country preferences (Gartzke and Dong-Joon, 2002). By weighing sanction episodes with the Affinity Index, we give more importance to sanctions levied among similar countries. The IV is constructed as a simple sum by year, varies by country and year, and proxies probability of receiving sanctions inductively, looking at whether sanctions are levied in similar countries.

Formally, the IV approximating country’s $j$ probability of being sanctioned in $t$ is given by

$$IV_{j,t} = \sum_{i=1,t}^{(k,t)} (sanctions_{i,t} \times Affinity_{i,t}^j) \quad \forall j \text{ and } \forall t$$

where $i = 1 \ldots k$ and $i \neq j$. Since the Affinity Index data is available only up to 2002, we restrict our instrumental variable analysis to the period 1960-2002. Table 9 summarizes the geographic variations of the instrument. Africa has the highest average probability of receiving sanctions, followed by the Middle East and Asia. In all geographic areas the instrument increases with time, reflecting a general tendency for increased use of sanctions in foreign policy.
In Table 10 we report the results of the instrumental variable estimation on the probability of sovereign debt default. First, we control only for country/year fixed effects and past defaults, as we did in Table 4, Column 1. Second, we add political controls, a specification similar to Columns 2 and 3 in Table 4. We report first-stage results in Columns 1 and 3.

The results show that the instrument has power: the IV is negatively and significantly correlated with the likelihood of receiving sanctions and the F-statistics are relatively large.\textsuperscript{16} Moreover, while the effect of sanctions is not significant in the first specification, it becomes significant when we add controls for political variables such as regime and election type and population size. Once instrumented, we find that sanctions are associated with a 12 percentage point increase in probability of sovereign default, an effect that is nearly four times larger in size than the coefficient estimated using the OLS regression only. Hence, the link between sanctions and sovereign defaults remains strong even after accounting for the effect of unobservables and selection bias, and once we account for these estimation problems, sanctions’ effect appears to be even larger in size.

5 Conclusion

In this study, we analyzed the relationship between economic sanctions and political leaders’ incentives to default strategically on public debt, and we find that this relationship is strong and significant. Our main theoretical argument suggests that, under certain conditions, political leaders of a sanctioned country may have incentives to repudiate their country’s external debt to quickly free up resources that can be used to suppress internal political conflicts and restore political stability. As shown in the analysis, strategic behavior might not be the only reason behind these debt crises and, in some cases, these behaviors may even be a desperate attempt to remain in power. Nonetheless, our empirical estimates tend to confirm the implications of the theoretical argument, and we show that the phenomenon is significant in size. Our findings suggest that sanctions can have substantial implications for the public finance and monetary decisions of the countries involved, but little research is available on this. Moreover, our analysis shows that, when a country is subject to external political pressure and/or when its macroeconomic performance is worsening, the political incentives of the ruling leader can significantly affect the country’s willingness to continue to repay its external obligations.

\textsuperscript{16}The values of the F-statistic are 13.5 in the first specification and 15.8 in the second one.
6 Appendix

6.1 Proof of Proposition 1.

Fix a level of sanctions $\sigma$ and a policy vector $(\tau, \pi, \delta)$ and let $v$ be the utility of Player $H$ in this case. Pick any equilibrium of the revolt subgame and let $\alpha(\varepsilon_i)$ be the fraction of activists in group $S$, who attack after they receive signal $\varepsilon_i$. Furthermore, define $S(\eta, \alpha) = \psi \frac{\eta + \frac{1}{2}}{2\pi} \alpha(\varepsilon_i) d\varepsilon_i$; thus, $S(\eta, \alpha)$ is the overall fraction of activists who revolt if the realization of the popularity shock is $\eta$. Finally, let $V(\eta) = \{\eta : S(\eta, \alpha) \geq v + \eta\}$ be the set of realizations for which the revolt is successful.

Thus, we can summarize the payoff of each activist in the following table

<table>
<thead>
<tr>
<th></th>
<th>$\eta \in V(\alpha)$</th>
<th>$\eta \notin V(\alpha)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revolt</td>
<td>$g$</td>
<td>$\pi$</td>
</tr>
<tr>
<td>Not Revolt</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

As a result, the expected payoff of an activist who observes signal $\varepsilon_i$ and decides to revolt is given by:

$$w(\varepsilon_i, \alpha) = \int_{\eta \in V(\alpha)} gdQ(\eta \mid \varepsilon_i) - \int_{\eta \notin V(\alpha)} \pi dQ(\eta \mid \varepsilon_i),$$

where $Q(\eta \mid \varepsilon_i)$ denotes the conditional cdf of $\eta$ given signal $\varepsilon_i$. On the contrary, if the activist does not participate in the revolt, he gets a safe payoff equal to 0.

Since activists are identical and they all have measure 0, in equilibrium:

$$\alpha(\varepsilon_i) = \begin{cases} 
0 & \text{if } w(\varepsilon_i, \alpha) < 0 \\
x \in [0, 1] & \text{if } w(\varepsilon_i, \alpha) = 0 \\
1 & \text{if } w(\varepsilon_i, \alpha) > 1 
\end{cases}.$$  

Let $\iota_k$ be a cutoff strategy that prescribe to revolt if $\varepsilon_i$ is below $k$ and not to revolt if $\varepsilon_i$ is above $k$. The next two lemmata proves some useful properties of $w(\varepsilon_i, \alpha)$.

Lemma 5 If $\alpha_1(\varepsilon_i) \geq \alpha_2(\varepsilon_i)$ for every $\varepsilon_i$, then $w(\varepsilon_i, \alpha_1) \geq w(\varepsilon_i, \alpha_2)$ for every $\varepsilon_i$.

Proof. If $\alpha_1(\varepsilon_i) \geq \alpha_2(\varepsilon_i)$ for every $\varepsilon_i$, we know that $S(\eta, \alpha_1) \geq S(\eta, \alpha_2)$ for every $\eta$. Thus, $V(\alpha_1) \supseteq V(\alpha_2)$. Intuitively, if for every signal $\varepsilon_i$ a higher fraction of people revolt under $\alpha_1(\cdot)$ than under $\alpha_2(\cdot)$, then Player $H$ is more likely to be overthrown if players follow $\alpha_1$ than if they play $\alpha_2$. The statement of the lemma follows from the definition of $w(\varepsilon_i, \alpha)$.

26
Lemma 6 $w(k, \iota_k)$ is continuous and strictly decreasing in $k$.

**Proof.** By definition of $\iota_k$ and $S(\eta, \iota_k)$, we have

\[
S(\eta, \iota_k) = \begin{cases} 
0 & \text{if } \eta > k + \frac{1}{2\psi} \\
\frac{1}{2} - \psi (\eta - k) & \text{if } \eta \in \left[k - \frac{1}{2\psi}, k + \frac{1}{2\psi}\right] \\
1 & \text{if } \eta < k - \frac{1}{2\psi} 
\end{cases}
\]

By Assumption 1, there is a unique value $\eta \in \left[k - \frac{1}{2\psi}, k + \frac{1}{2\psi}\right]$ such that $S(\eta, \iota_k) = v + \eta$. Define function $k \mapsto \varphi(k) \in \mathbb{R}$ as the mapping that associates to every $k$, the solution $f$ that solves $S(k + f, \iota_k) = v + k + f$. Intuitively, $\varphi(k)$ is the increase (or decrease) with respect to the threshold $k$ that guarantees that the fraction of revolters is exactly equal to the one needed to overthrow the regime. Then, if all activists follow cutoff strategy $\iota_k$, the revolt succeeds in overthrowing Player H if and only if $\eta \in \left[k, k + \varphi(k)\right]$. As a result, $w(k, \iota_k) = \int_{k-\frac{1}{2\psi}}^{k+\varphi(k)} gdx - \int_{k+\varphi(k)}^{k+\frac{1}{2\psi}} \pi dx$. By construction, $w(k, \iota_k)$ is a continuous function.

Since the solution to equation $S(\eta, \iota_k) = v + \eta$ lies in the interval $\left[k - \frac{1}{2\psi}, k + \frac{1}{2\psi}\right]$, we can write such equality as $\frac{1}{2} = v + k + (1 + \psi) \varphi(k)$. Totally differentiating the previous expression, we obtain $\varphi'(k) = -\frac{1}{1+\psi} < 0$. Thus $w(k, \alpha_k)$ is a continuous and strictly decreasing function of $k$. \(\blacksquare\)

Lemma 6 implies that the utility of the “marginal” revolter (namely, the revolter who receives the cutoff signal $k$) is decreasing in the level of the cutoff. Intuitively, if the cutoff is higher, less people do revolt and consequently the utility of revolting is lower.

**Lemma 7** There is a unique $\varepsilon^*$ such that in any equilibrium of the revolt subgame, an activist revolts if and only if $\varepsilon_i < \varepsilon^*$.

**Proof.** First, notice that there is a unique $\varepsilon^*$ such that $w(\varepsilon^*, \iota_{\varepsilon^*}) = 0$. Indeed, by the previous lemma, $w(k, \iota_k)$ is continuous and strictly decreasing in $k$. If $k < \frac{1}{2\psi}$, each activist knows that by revolting Player H will be overthrown. Thus, $w(k, \iota_k) = g > 0$. Instead, if $k > \frac{1}{2\psi}$, the activist knows that the revolt will fail even if all activists revolt. Thus $w(k, \iota_k) = -\pi < 0$. Hence, we can find a unique $\varepsilon^*$ such that $w(\varepsilon^*, \iota_{\varepsilon^*}) = 0$. Pick any equilibrium $\alpha(\cdot)$ of the revolt subgame. Define:

\[
\varepsilon = \inf \{ \varepsilon_i \mid \alpha(\varepsilon_i) < 1 \}, \\
\overline{\varepsilon} = \sup \{ \varepsilon_i \mid \alpha(\varepsilon_i) > 0 \},
\]

27
where $\alpha(\varepsilon_i)$ has been defined before. By definition

$$
\bar{\varepsilon} \geq \sup \{\varepsilon_i \mid \alpha(\varepsilon_i) \in (0, 1)\} \geq \inf \{\varepsilon_i \mid \alpha(\varepsilon_i) \in (0, 1)\} \geq \bar{\varepsilon}.
$$

Thus $\bar{\varepsilon} \geq \varepsilon$. If $\alpha(\varepsilon_i) < 1$, each activist must get the same utility by revolting than by not revolting. Thus, $w(\bar{\varepsilon}, \alpha) \leq 0$. Now, consider $w(\varepsilon, \tau_{\varepsilon})$. By definition of $\bar{\varepsilon}$, we know that $\tau_{\varepsilon} < \alpha$. Thus, Lemma 5 implies $w(\bar{\varepsilon}, \tau_{\varepsilon}) \leq w(\varepsilon, \alpha) \leq 0$. Since we know that $w(\varepsilon^*, \tau_{\varepsilon^*}) = 0$, Lemma 6 implies that $\bar{\varepsilon} \geq \varepsilon^*$. A symmetric argument implies that $\bar{\varepsilon} \leq \varepsilon^*$. Thus $\varepsilon^* \geq \bar{\varepsilon} \geq \varepsilon$. We conclude that $\bar{\varepsilon} = \varepsilon = \varepsilon^*$. Thus, the unique equilibrium is in cutoff strategies with cutoff $\varepsilon^*$.

Lemma 7 implies that the fraction of activists who revolt after realization $\eta$ is given by:

$$
S(\eta, \tau_{\varepsilon^*}) = \begin{cases}
0 & \text{if } \eta > \varepsilon^* + \frac{1}{2\psi} \\
\frac{1}{2} - \psi(\eta - \varepsilon^*) & \text{if } \eta \in \left[\varepsilon^* - \frac{1}{2\psi}, \varepsilon^* + \frac{1}{2\psi}\right] \\
1 & \text{if } \eta < \varepsilon^* - \frac{1}{2\psi}
\end{cases}
$$

Obviously $S(\eta, \tau_{\varepsilon^*})$ is decreasing in $\eta$ and strictly decreasing in the interval $\left[\varepsilon^* - \frac{1}{2\psi}, \varepsilon^* + \frac{1}{2\psi}\right]$. Instead, $\nu + \eta$ is strictly increasing in $\eta$. Thus, the two curves cross only once. Let $\eta^*$ be the realization of $\eta$ at which this happens.

By definition, in equilibrium if an activist receives signal $\varepsilon^*$, he is indifferent between revolting or not. Thus, the following equation must hold:

$$
\int_{\varepsilon^* - \frac{1}{2\psi}}^{\eta^*} \psi g d\eta - \int_{\eta^*}^{\varepsilon^* + \frac{1}{2\psi}} \psi \pi d\eta = 0. \tag{12}
$$

Moreover, Player $H$ survives if and only if the realization of $\eta$ is below the value $\eta^*$ that satisfies the following equation:

$$
\int_{\eta^* - \frac{1}{2\psi}}^{\varepsilon^*} \psi dz = \nu(\sigma) + \eta^*. \tag{13}
$$

Intuitively, equation 12 says that an opinion leader who receives signal $\varepsilon^*$ is indifferent between revolting (in which case, he enjoys a benefit $g$ if the revolt succeeds or suffering a cost $\pi$ if the revolt fails) or not (in which case the utility is 0). Equation 13 instead says that when the realization of $\eta$ is $\eta^*$, the fraction of individuals who revolt (i.e., the fraction of individuals who observe a signal below $\varepsilon^*$) is exactly equal to the fraction needed to overthrow the regime.

Equations (12) and (13) define a system of two equations in two unknowns ($\varepsilon^*$ and...
The solution of such system is

\[
\eta^* = \frac{g}{g + \pi} - \nu, \\
\varepsilon^* = \frac{g - \pi}{2\psi (g + \pi)} + \frac{g + \pi}{g + \pi} - \nu.
\]

This concludes the proof. □

6.2 Proof of Proposition 8 and the Optimal Policy Vector.

Define \( \bar{y} (r) := FB + B (1 + r) \). In words, \( \bar{y} (r) \) is the cutoff level on citizens’ income that determines whether the constraint \( \tau \leq 1 \) binds or not. Let \( \pi^*_{\delta=1} \) and \( \tau^*_{\delta=1} \) (resp., \( \pi^*_{\delta=0} \) and \( \tau^*_{\delta=0} \)) be the optimal level of revolt prevention and taxation conditional on Player \( H \) choosing to default (resp., not to default). Formally, these values solve (6) if we set \( \delta = 1 \) (resp., \( \delta = 0 \)). In line with the discussion in the main text, \( \pi^*_{\delta=1} \geq \pi^*_{\delta=0} \) and \( \tau^*_{\delta=0} > \tau^*_{\delta=1} \), namely a default leads to a (potentially weak) increase in the amount invested in revolt prevention and to a decrease in the level of taxation.

Let \( \Delta (\sigma, \ell \mid r) \) be Player \( H \)’s benefit from defaulting when the level of sanctions is \( \sigma \), the cost of defaulting is \( \ell \) and the level of interest rate is equal to \( r \). Formally, \( \Delta (\sigma, \ell \mid r) = v \left[ S \left( \sigma, \tau^*_{\delta=1}, \pi^*_{\delta=1}, 1 \right) - S \left( \sigma, \tau^*_{\delta=0}, \pi^*_{\delta=0}, 0 \right) \right] \) and exploiting the results in Proposition 1, we get:

\[
\Delta (\sigma, \ell \mid r) = \frac{v}{\eta - \bar{y}} \cdot \left[ \frac{\tau^*_{\delta=0} - \tau^*_{\delta=1}}{\sigma} + \frac{g \cdot \left( \pi^*_{\delta=1} - \pi^*_{\delta=0} \right)}{(g + \pi^*_{\delta=1}) (g + \pi^*_{\delta=0})} - \ell \right]. \quad (14)
\]

By looking at the squared bracket in (14), we can identify the three separate effects of defaulting that we discuss in the main text. First, a default enables Player \( H \) to reduce taxation. Second, a default enables Player \( H \) to increase the investment in revolt prevention (however, this second channel is at play only if \( \pi^*_{\delta=1} > \pi^*_{\delta=0} \), namely only if \( \tau \leq 1 \) is binding). Third, a default generates a disutility for the citizens equal to \( \ell \).

Substituting for \( \left( \pi^*_{\delta=1}, \pi^*_{\delta=0}, \tau^*_{\delta=1}, \tau^*_{\delta=0} \right) \) in (14), we can further conclude that

\[
\Delta (\sigma, \ell \mid r) = \begin{cases} 
\frac{v}{\eta - \bar{y}} \cdot [B (1 + r) - \ell] & \text{if } \frac{1}{\sigma} \geq \bar{y} (r) \\
\frac{v}{\eta - \bar{y}} \cdot \left[ \frac{g}{g + \frac{1}{\sigma} - B (1 + r)} - 2 \sqrt{\bar{y} + \frac{1}{\sigma} + g - \ell} \right] & \text{if } \frac{1}{\sigma} < \bar{y} (r)
\end{cases}
\]

Obviously, \( \Delta (\sigma, \ell \mid r) \) is decreasing in \( \ell \). Moreover, observe that (i) \( \Delta (\sigma, \ell \mid r) \) is piecewise
increasing in \( r \), (ii) \( \bar{y}(r) \) is increasing in \( r \), and (iii) \( \Delta(\sigma, \ell | r) \) is higher if \( \frac{1}{\sigma} < \bar{y}(r) \) than if \( \frac{1}{\sigma} \geq \bar{y}(r) \). Then, \( \Delta(\sigma, \ell | r) \) is increasing in \( r \).

The optimal policy vector for Player \( H \) is described in the following proposition

**Lemma 8** Suppose the debt is priced and Assumptions 1 and 2 hold. Then, the optimal policy vector \((T(\sigma, \ell | r), P(\sigma, \ell | r), D(\sigma, \ell | r))\) is given by:

\[
\begin{align*}
P(\sigma, \ell | r) &= \begin{cases} 
\max \left\{ 0, \frac{1}{\sigma} - B(1 + r) \right\} & \text{if } \frac{1}{\sigma} < \bar{y}(r) \text{ and } \Delta(\sigma, \ell | r) \leq 0; \\
\sqrt{g} - g & \text{otherwise.} 
\end{cases} \\
D(\sigma, \ell | r) &= \begin{cases} 
0 & \text{if } \Delta(\sigma, \ell | r) \leq 0; \\
1 & \text{if } \Delta(\sigma, \ell | r) > 0. 
\end{cases} \\
T(\sigma, \ell | r) &= \sigma [P(\sigma, \ell | r) + B(1 + r)(1 - D(\sigma, \ell | r))] 
\end{align*}
\]

**Proof.** Recall that Player \( H \) faces program \((6)\). Substituting for \( S(\sigma, \pi, \delta, \tau) \) in the objective function and exploiting the budget constraint, we can immediately conclude that the objective function is strictly concave in \( \pi \). Indeed, the first order condition is given by

\[
\frac{\partial}{\partial \pi}
\left(\frac{\pi}{\left(\frac{\sigma}{\pi} + \tau\right)} - 1\right)
\]

while the second order condition is equal to \( -\frac{2}{\frac{1}{\pi} - \frac{1}{\pi + \tau}} < 0 \). As a result, if we ignore the second constraint in problem \((6)\), and we solve this relaxed problem, we obtain

\[
\pi^{FB} = \sqrt{g} - g.
\]

If Player \( H \) defaults \((\delta = 1)\), \( \pi^{FB} \) can always be attained. Moreover, since taxation does not entail any benefit per se, it will be set equal to the lowest value that finances \( \pi^{FB} \). As a result, \( \pi^{*}_{|\delta=1} = \pi^{FB} \) and \( \tau^{*}_{|\delta=1} = \sigma \pi^{FB} \). Now, suppose that Player \( H \) does not default \((\delta = 0)\). Then \( \pi^{FB} \) can be attained if and only if \( y \geq \bar{y}(r) \). In this case, \( \pi^{*}_{|\delta=0} = \pi^{FB} \) and the tax rate will be set residually in order to finance both \( \pi^{FB} \) and the service of public debt, \( \tau^{*}_{|\delta=0} = \sigma \left[ \pi^{FB} + B(1 + r) \right] \). Instead, if \( y < \bar{y}(r) \), the first-best investment in revolt prevention cannot be attained. Thus, \((6)\) is solved by choosing the highest possible tax rate and by setting the investment in revolt prevention residually. Formally, \( \tau^{*}_{|\delta=0} = 1 \) and \( \pi^{*}_{|\delta=0} = \frac{1}{\sigma} - (1 + r)B \). Obviously, Player \( H \) defaults if and only if the benefit from doing so, \( \Delta(\sigma, \ell | r) \), is positive. Furthermore, the optimal level of revolt prevention can be derived noticing that the first-best level is attainable if either Player \( H \) defaults or she does not default, but the income level of voters is sufficiently high to finance \( \pi^{FB} \). Finally, the optimal tax rate is obtained by \((3)\).

---

\(^{17}\)To see this last result, observe that if \( \frac{1}{\sigma} \leq \bar{y}(r) \), the differences \( \tau^{*}_{|\delta=0} - \tau^{*}_{|\delta=1} \) and \( \pi^{*}_{|\delta=1} - \pi^{*}_{|\delta=0} \) are both larger than in the case in which \( \frac{1}{\sigma} > \bar{y}(r) \).

\(^{18}\)In Lemma 8, we assume that, whenever indifferent between defaulting or not, Player \( H \) does not default. None of our results hinges on this tie-breaking rule.
Then, a strategic default occurs if \( \Delta(\sigma, \ell \mid r) \geq 0 \). As a result, the probability of a strategic default is equal to \( F(\sigma \mid r) = \Pr \{ \Delta(\sigma, \ell \mid r) \geq 0 \} \). Since \( \Delta(\sigma, \ell \mid r) \) is decreasing in \( \ell \), we can have two cases (it is immediate to verify that \( \Delta(\sigma, 0 \mid r) > 0 \)). If \( \Delta(\sigma, \ell_H \mid r) \geq 0 \), then defaulting is always profitable and, consequently, a strategic default happens with probability 1. As discussed in Footnote XXX, we rule out this case assuming that \( H \) is sufficiently high. Instead, if \( \Delta(\sigma, \ell_H \mid r) < 0 \), a strategic default takes place (resp., does not take place) if \( \ell \) is sufficiently low (resp., high). In this last case, exploiting the distributional assumption on \( \ell \), we can conclude that \( F(\sigma \mid r) = \ell^* \), where \( \ell^* \) is the unique solution \( \ell \) of \( \Delta(\sigma, \ell \mid r) = 0 \). As a result,

\[
F(\sigma \mid r) = \begin{cases} 
B(1 + r) & \text{if } \frac{1}{\sigma} \geq \bar{y}(r) \\
\frac{1}{\sigma} + g \left( \frac{1}{g + \frac{1}{\sigma} - B(1 + r)} + 1 \right) - 2\sqrt{g} & \text{if } \frac{1}{\sigma} < \bar{y}(r)
\end{cases}
\]

By applying the implicit function theorem on \( \Delta(\sigma, \ell^* \mid r) = 0 \), we can immediately conclude that \( \partial F(\sigma \mid r) / \partial r = \partial \ell^* / \partial r > 0 \). Similarly, applying the implicit function theorem,

\[
\partial F(\sigma \mid r) / \partial \sigma = \partial \ell^* / \partial \sigma \geq 0
\]

To see why, observe that if \( \frac{1}{\sigma} \geq \bar{y}(r) \), then \( F(\sigma \mid r) \) is constant in \( r \), while if \( \frac{1}{\sigma} < \bar{y}(r) \), then the sign of \( \partial F(\sigma \mid r) / \partial \sigma \) is equal to the sign of \( \partial \Delta(\sigma, \ell \mid r) / \partial \sigma \). In particular,

\[
\frac{\partial \Delta(\sigma, \ell \mid r)}{\partial \sigma} = -\frac{1}{\sigma^2} + g \left( \frac{\frac{1}{\sigma^2}}{(g + \frac{1}{\sigma} - B(1 + r))^2} \right) > -\frac{1}{\sigma^2} + \frac{1}{\sigma^2} = 0,
\]

where the inequality follows from observing that, since \( \frac{1}{\sigma} < \bar{y}(r) \), \( 0 < g + \frac{1}{\sigma} - B(1 + r) < \sqrt{g} \).

6.3 Proof of Proposition 3.

By definition, \( R(\sigma) \) is the lowest root \( r \) of equation \( 1 + \bar{r} = (1 + r)(1 - F(\sigma \mid r)) \).

Suppose first that \( \frac{1}{\sigma} \geq \pi^{FB} + B(1 + R(\sigma)) \). In this case, \( F(\sigma \mid R(\sigma)) = \frac{B(1 + R(\sigma))}{\ell_H} \).

Thus, the no-arbitrage condition yields a solution if and only if \( 1 \geq 4B(1 + \bar{r})/\ell_H \), in which case

\[
R(\sigma) = \ell_H \left( \frac{1 + \sqrt{1 - \frac{4B(1 + \bar{r})}{\ell_H}}}{2B} \right) - 1.
\]

Substituting for the interest rate in (18), inequality \( \frac{1}{\sigma} \geq \pi^{FB} + B(1 + R(\sigma)) \) becomes

\[\text{The first inequality follows as we are assuming that the debt is priced, thus } \frac{1}{\sigma} \geq B(1 + r). \text{ If this inequality were not satisfied, the country would have no possibility to repay the outstanding debt and an automatic default would occur.}\]
\[ \sigma \leq 2/[2(\sqrt{g} - g)] + \ell_H \left(1 + \sqrt{(1 - 4B(1 + \tilde{r}))/\ell_H}\right) := \hat{\sigma}. \] Thus, if \( \sigma \leq \hat{\sigma} \) and \( 1 \geq 4B(1 + \tilde{r})/\ell_H \), the debt is priced and the interest rate is constant and equal to (18). Instead, if \( \sigma \leq \hat{\sigma} \) and \( \tilde{r} > \frac{1}{4B} - 1 \), the debt is not priced.

Now suppose that \( \frac{1}{\sigma} < \pi^{FB} + B(1 + R(\sigma)) \). Then, the equilibrium interest rate is given by the lowest value of \( \sigma \) that solves

\[
(1 + r) \left(1 - \frac{\frac{1}{\sigma} + \frac{g}{g + \frac{1}{\sigma} - B(1 + r)} + g - 2\sqrt{g}}{\ell_H}\right) - (1 + \tilde{r}) = 0. \tag{19}
\]

It is easy to show that if \( \sigma \to \hat{\sigma} \), the interest rate coincides with (18). Let \( Q(\sigma, r) \) be the left-hand side of (19). By the implicit function theorem, (19) defines \( r \) as a function of \( \sigma, R(\sigma) \). Moreover, \( R'(\sigma) = -\frac{\partial Q(\sigma, r)}{\partial \sigma} / \frac{\partial Q(\sigma, r)}{\partial r} \). Since we are considering the case in which \( \frac{1}{\sigma} < \sqrt{g} - g + B(1 + R(\sigma)) \), we can conclude that \( \frac{\partial Q(\sigma, r)}{\partial \sigma} < 0 \). Thus, \( R'(\sigma) \) is positive if and only if \( \frac{\partial Q(\sigma, r)}{\partial r} > 0 \), which holds for the lowest root of (19) as (19) has two roots and \( Q(\sigma, \tilde{r}) < 0 \).

6.4 Proof of Proposition 4.

We start by showing that the probability of a strategic default, \( F(\sigma \mid R(\sigma)) \), is weakly increasing in \( \sigma \). If \( \sigma \leq \hat{\sigma} \) (recall that \( \hat{\sigma} \) is the threshold level we identified in Proposition 3), then \( \frac{1}{\sigma} \geq \pi^{FB} + B(1 + R(\sigma)) \) and Proposition 3 implies that \( R(\sigma) \) is constant in \( \sigma \). Furthermore, as we have shown in the proof of Proposition 2, \( F(\sigma \mid R(\sigma)) = B(1 + R(\sigma)) \). Then it is immediate to see that, in this case, \( F(\sigma \mid R(\sigma)) \) is constant in \( \sigma \). Now suppose that \( \sigma > \hat{\sigma} \) (so that, \( \frac{1}{\sigma} \geq \pi^{FB} + B(1 + R(\sigma)) \)). Then, reasoning as before, we can conclude that \( R(\sigma) \) is increasing in \( \sigma \) and that

\[
F(\sigma \mid R(\sigma)) = \frac{1}{\sigma} + g \left(\frac{1}{g + \frac{1}{\sigma} - B(1 + R(\sigma)) + 1}\right) - 2\sqrt{g}
\]

As a result,

\[
\frac{\partial F(\sigma \mid R(\sigma))}{\partial \sigma} = -\frac{1}{\sigma^2} + g \left(\frac{\frac{1}{\sigma^2} + BR'(\sigma)}{(g + \frac{1}{\sigma} - B(1 + R(\sigma)))^2}\right)
\]

Since \( BR'(\sigma) \geq 0 \), we can reason as in the proof of Proposition 2 and conclude that \( F(\sigma \mid R(\sigma)) \) is positive. Moreover, as shown in the proof of proposition 3, \( \lim_{\sigma \to \hat{\sigma}^+} R(\sigma) \) is equal to the one identified in (18). We conclude that \( F(\sigma \mid R(\sigma)) \) is increasing in \( \sigma \).
For any profile of political weight \((\phi_1, \ldots, \phi_n)\), problem (10) becomes:

\[
\max_{\sigma \in [1, \theta]} \left( 1 - \hat{S}(\sigma) \right) - K(\phi_1, \ldots, \phi_n) F(\sigma | R(\sigma))
\]

In particular, the solution of this problem is identical to the one faced by a single decision maker who has to decide on the level of sanctions keeping into account that his exposure to default is given by \(K(\phi_1, \ldots, \phi_n)\). The statement of the proposition, then, would then follows if we show that the optimal level of sanctions for a country with exposure to default equal to \(k\) is decreasing in \(k\). Suppose not, than we can find two levels of exposure to default \(k'\) and \(k''\) with \(k' < k''\) and two levels of sanctions \(\sigma'\) and \(\sigma''\) with \(\sigma' < \sigma''\) such that:

\[
\sigma' \in \arg \max_{\sigma \in [1, \theta]} \left( 1 - \hat{S}(\sigma) \right) - k' F(\sigma | R(\sigma))
\]

\[
\sigma'' \in \arg \max_{\sigma \in [1, \theta]} \left( 1 - \hat{S}(\sigma) \right) - k'' F(\sigma | R(\sigma))
\]

In particular, \(1 - \hat{S}(\sigma') - k' F(\sigma' | R(\sigma')) \geq 1 - \hat{S}(\sigma'') - k' F(\sigma'' | R(\sigma''))\) or equivalently \(\hat{S}(\sigma'') - \hat{S}(\sigma') - k' [F(\sigma' | R(\sigma')) - F(\sigma'' | R(\sigma''))] \geq 0\). Since \(F(\sigma | R(\sigma))\) is weakly increasing in \(\sigma\) and \(k'' > k'\), we can have one of two possible cases: (i) \(F(\sigma' | R(\sigma')) = F(\sigma'' | R(\sigma''))\), and (ii) \(F(\sigma' | R(\sigma')) < F(\sigma'' | R(\sigma''))\). In the first case, as \(\hat{S}(\sigma)\) has a unique global minimizer, \(\sigma' = \arg \max_{\sigma \in [1, \theta]} \left( 1 - \hat{S}(\sigma) \right) - k'' F(\sigma | R(\sigma))\), contradicting (21). In the latter case, \(F(\sigma' | R(\sigma')) < F(\sigma'' | R(\sigma''))\) and then \(\hat{S}(\sigma'') - \hat{S}(\sigma') - k'' [F(\sigma' | R(\sigma')) - F(\sigma'' | R(\sigma''))] > 0\). Adding 1 on both sides of the inequality and rearranging terms, we get \(1 - \hat{S}(\sigma') - k'' F(\sigma' | R(\sigma')) > 1 - \hat{S}(\sigma'') - k'' F(\sigma'' | R(\sigma''))\), contradicting again (21).

**References**


