NBER WORKING PAPER SERIES

ON WARS, SANCTIONS AND SOVEREIGN DEFAULT

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Working Paper 29989
http://www.nber.org/papers/w29989

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 2022

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NBER Working Paper No. 29989
April 2022
JEL No. F3,F34,F41,F42,F51

ABSTRACT

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This paper explores the role of restrictions on the use of international reserves as economic sanctions. We develop a simple model of the strategic game between a sanctioning (creditor) country and a sanctioned (debtor) country. We show how the sanctioning country should impose restrictions optimally, internalizing the geopolitical benefits and the financial costs of a potential default from the sanctioned country.

1 Introduction

Following the invasion of Ukraine, Russia faced a freezing of its international reserves, which amounted to close to 30% of its GDP. While the goal of the sanctions was to hinder the financing of the war, Russia was allowed to continue tapping reserves to make payments on its sovereign bonds. On April 4, 2002, however, the US Treasury blocked these payments, and Russia failed to meet its obligations. A few days later, Russia was declared in default.[1]

In this paper, we explore the role of restrictions on international reserves as economic sanctions and develop a simple model that can account for this set of events. The model has

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[1]See "U.S. stops Russian bond payments, raising risk of default," by Megan Davies and Alexandra Alper, Reuters, April 5, 2022 and Russia's First Default in a Century Looks All But Inevitable Now, Bloomberg News April 9, 2022. Figure 1 presents the evolution of reserves and bond yields and

two countries: a debtor country, Russia (the sanctioned country), and a creditor country, the US (the sanctioning country). The sanctioned country can default on its debt and choose external borrowing and international reserves. The sanctioning country can impose restrictions on the use of reserves by the sanctioned country, and its utility is decreasing in the utility of the sanctioned country. We refer to this latter feature as a "geopolitical externality." In this environment, we search for the Stackelberg Nash equilibrium in which the sanctioning country takes into account the strategic response of the sanctioned country when it chooses the restriction on the use of reserves.

The key results we obtain are as follows. Soft restrictions on the use of reserves by the sanctioned country are a free lunch for the sanctioning country. They impose some limits on war financing and come at no cost for the sanctioning country. Hard restrictions, however, can impose costs on the sanctioning country by precipitating a default by the sanctioned country. We show that for a low geopolitical externality, the optimal restriction involves squeezing the resources up to the point at which the sanctioned country is indifferent between repaying and defaulting. For a high geopolitical externality, the optimal restriction becomes a complete freezing of reserves. In this case, the gains from restricting funds to the sanctioning country outweigh the losses triggered by the default.

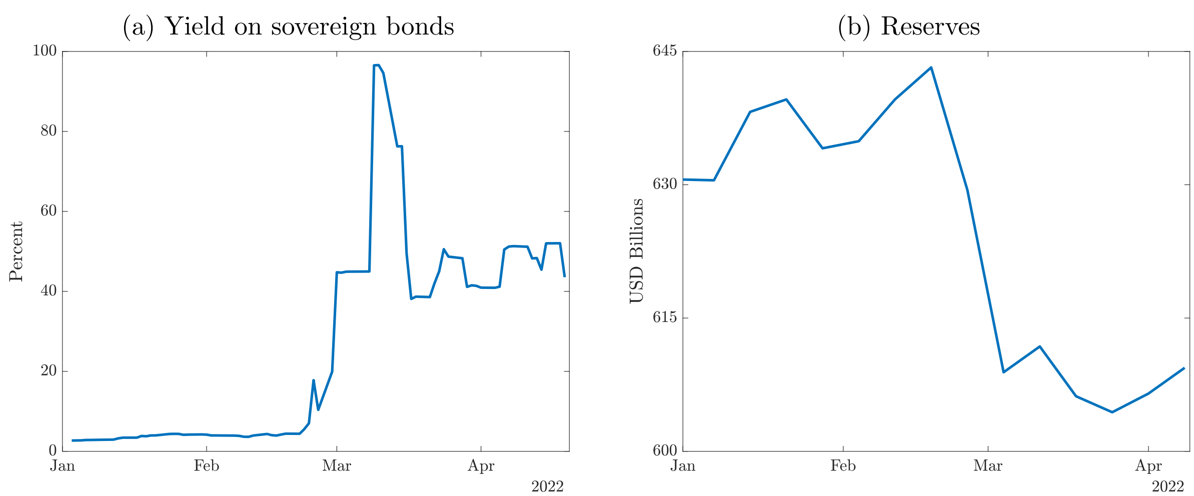

Figure 1: Reserves and government bond yields for Russia in 2022

The theory can therefore account for the dynamics of the sovereign debt crisis in Russia (see Figure 1). Following the invasion, yields on Russian government bonds spiked up (see panel [a]), largely as a result of the large scale of sanctions on Russia which lead investors to anticipate a default. However, Russia continued paying the coupons that were coming due using its international reserves (see panel [b]). On April 4, 2022, when the US Treasury blocked payments using reserves, we see another increase in bond yields. Shortly after, Russia missed dollar bond payments and S&P declared Russia in default.

Literature. Our paper is related to the burgeoning literature on the economics of sanctions.[2] Spurred by the Russian-Ukrainian war, several recent papers have shed light on the implications of trade sanctions (Sturm, 2022; Itskhoki and Mukhin, 2022; Lorenzoni and Werning, 2022; Bachmann et al., 2022). Our approach is more similar to Sturm (2022), who provides a rich characterization of how tariffs should be set optimally when there is a value from punishing a foreign country. Our paper instead studies financial sanctions, and focuses on the interaction between a sovereign default in Russia and the resulting losses for the West.

Our paper also draws on the literature on sovereign debt and international reserves (Alfaro and Kanczuk, 2009; Bianchi, Hatchondo and Martinez, 2018; Bianchi and Sosa-Padilla, 2020), which in turn builds on the workhorse sovereign default model (Eaton and Gersovitz, 1981; Aguiar and Gopinath, 2006; Arellano, 2008). We contribute to this literature by analyzing the role of restrictions on reserves as a sanction by the creditor country and the strategic interaction in the presence of a geopolitical externality.

2 A Model of Financial Sanctions and Sovereign Default

We present a two-country deterministic model with an infinite horizon. The war takes place in period 0. We assume that for $t \geq 1$, peace prevails and all incomes are constant. There are two countries, a foreign country, which we think of as Russia, and the home country, which we think about as the US. The economy is also populated by financial intermediaries that discount future payoffs at rate r.

2.1 Foreign Country

The foreign country starts with debt and reserves (a_0^*, b_0^*) and receives a constant income y^*. Reserves are one period non-negative, risk-free assets that may be subject to restrictions, given economic sanctions. Debt is long-term with a maturity parameter δ. In particular, a bond issued in period t promises to pay $\kappa(1-\delta)^{j-1}$ units of the tradable good in period $t+j$, for all $j \geq 1$.[3]

[2] Van Bergeijk (2021) provides a review of the literature at the intersection of political science and international economics.

[3] We normalize the coupon size to $\kappa = (\delta + r)/(1+r)$, which guarantees that a default-free bond with the same maturity and coupon structure trades at a price of $1/(1+r)$.

The government budget constraint is given by

$$c_t^* + g_t^* + \frac{a_{t+1}^*}{1+r} + \kappa b_t^* = a_t^* + y^* + q(a_{t+1}^*, b_{t+1}^*)[b_{t+1}^* - (1-\delta)b_t^*] \tag{1}$$

where g_t^* is fixed war expenditures. Given the assumption that the war last only one period, $g_t^* = 0$ for all $t > 0$.[4]

Relative to the standard repayment problem of the government in the sovereign debt literature, our model has two extra constraints. First, we have a constraint that restricts the use of reserves:

$$\frac{a_1^*}{1+r} \geq \underline{a}\,, \tag{2}$$

where $\underline{a} \leq a_0^*$. Constraint (2) encompasses the case $\underline{a} = a_0^* - \kappa b_0^*$, which restricts reserves for purposes other than debt repayments, as established at the onset of the Russian-Ukrainian war. The harshest punishment is when $\underline{a} = a_0^*$, which implies that reserves cannot be used at all and interest payments cannot be repatriated.

Second, there is a constraint on new issuances of bonds,

$$b_1^* \leq b_0^*(1-\delta); \tag{3}$$

that is, the country cannot issue new bonds. To focus on optimal the determination of (2), we take (3) as given (i.e., as part of the existing sanctions imposed by the rest of the world).

If the country defaults, it faces an income cost ϕ^D in the period in which default takes place, and it cannot borrow.[5] We assume there is re-entry to financial markets the period after default. This assumption is without loss of generality, because the economy is stationary the period following default. The budget constraint under default is therefore

$$c_0^* + g^* = y^* - \phi^D.$$

Notice that in the budget constraint above, we already assume the US would impose the stringent feasible constraint (i.e., $\underline{a} = a_0^*$) in case of a default. Therefore, the value for

[4]What will be important for our analysis is $y_0^* - g_0^*$ is lower in the initial period. This could result from lower initial output or higher expenditures.

[5]A direct cost from defaulting, either in output or utility, is standard in the sovereign default literature to support positive levels of debt in equilibrium. This cost could be time varying. For example, in the context of the Russian default, the economy was already subject to sanctions, which likely reduced the cost of defaulting. What is crucial for our analysis is that there are non-negative costs from defaulting.

defaulting is

$$V_D^*\left(a_0^*\right) = u(y^* - \phi^D - g^*) + \frac{\beta}{1-\beta} u(y^* + r a_0^*), \tag{4}$$

where the utility function satisfies standard properties $u' > 0$ and $u'' < 0$ and Inada conditions.

In deriving the continuation utility in (4), we used that the country starts period 1 with $a_0^*(1+r)$ assets and given that $\beta(1+r) = 1$, it consumes the income plus the annuity value for $t \geq 1$.

We now present the value under repayment. Notice first that without any financial constraint on reserves (which amounts to $\underline{a} = 0$) or debt issuances the government would increase debt, to equalize the consumption over time, reduce reserves, or both.[6] We assume that these constraints bind (i.e., at the optimum $\frac{a'}{1+r} = \underline{a}$ and $b' = (1-\delta)b$). This can be guaranteed by the following assumption:

Assumption 1 (Binding reserve constraint)**.** *The foreign country's initial gross positions and government spending satisfy*

$$g^* + \kappa b_0^* - a_0^* > (1-\beta)(1-\delta) b_0^*.$$

If the government uses all reserves today and pays the coupons, it is able to consume $y^* + a_0^* - g^* - \kappa b_0^*$. In turn, tomorrow the debt is $(1-\delta)b_0^*$, and this allows for a stationary consumption level of $y^* - (1-\beta)(1-\delta)b_0^*$. In other words, Assumption 1 says that if the government uses all reserves to pay coupon payments and war expenses, this leaves fewer resources for consumption today relative to tomorrow. The implication is then that the government is liquidity constrained.

Notice that since all variables are constant from $t \geq 1$, we have that

$$c_t = y^* + (a_t^* - b_t^*)(1-\beta)$$

for $t \geq 1$. If we use that $a_1 \geq 0$ and (3) bind in the absence of a restriction by the US, per Assumption 1, it follows that (2) and (3) also bind when the constraint is in place. We then

[6] This implies a $c_t^* = y^* + (1-\beta)(a_0^* - b_0^* - g_0^*)$ and therefore a net foreign asset position for next period of $a_1^* - b_1^* = (1+r)\left[a_0^* - b_0 - (1-\beta)(a_0^* - b_0^* - g_0^*)\right]$.

have that if the country chooses to repay, the value is

$$V_R^*(a^*, b^*; \underline{a}) = \max_{c^*} \left\{ u(c^*) + \frac{\beta}{1-\beta} u(y^* + (1-\beta)(\underline{a}(1+r) - (1-\delta)b^*)) \right\} \tag{5}$$

subject to

$$c^* + g^* + \underline{a} + \kappa b^* = a^* + y^*$$

We have used in writing the continuation value that the country repays for $t \geq 1$, a result that follows because compared with its state in period 0, the government in period 1 has lower debt, lower expenditures and no reserve restrictions. Notice that the constraint set in (5) becomes empty if $g^* < y^* + a^* - \underline{a} - \kappa b^*$ and the government is forced to default.

Default decision. The decision to default at time 0 is as follows

$$d^*(a^*, b^*; \underline{a}) = \begin{cases} 0 & \text{if } V_R^*(a^*, b^*; \underline{a}) \geq V_D^*(a) \\ 1 & \text{if } V_R^*(a^*, b^*; \underline{a}) < V_D^*(a) \end{cases}$$

We make the following parametric assumptions that imply that the government finds it optimal to repay when there are no restrictions on the use of reserves other than non-negativitity (i.e., when $\underline{a} = 0$), and finds it optimal to default when the harshest possible restriction is imposed on the use of its reserves (i.e., when $\underline{a} = a_0^*$).

Assumption 2 (Default costs). *We assume that*

$$u(y^* - \phi^D - g^*) + \frac{\beta}{1-\beta} u(y^* + ra_0^*) < \\ u(y^* + a_0^* - g^* + \kappa b_0^*) + \frac{\beta}{1-\beta} u(y^* - (1-\beta)(1-\delta)b_0^*)$$

and that

$$u(y^* - \phi^D - g^*) + \frac{\beta}{1-\beta} u(y^* + ra_0^*) > \\ u(y^* - g^* + \kappa b_0^*) + \frac{\beta}{1-\beta} u(y^* - (1-\beta)(a_0^*(1+r) + (1-\delta)b_0^*).$$

With these assumptions in hand, we can now state the following lemma.

Lemma 1. *Suppose Assumption 2 holds. Let (a^*, b^*) be the initial financial position, then there exists a restriction on the use of reserves $\hat{a} \leq a_0^*$ such that $V^R(a^*, b^*; \underline{a}) \geq V^D(a^*)$ if and only if $\underline{a} \leq \hat{a}$.*

Proof. See Appendix A.2. □

2.2 Home Country

The home country values the utility of the stream of consumption and puts a negative weight on the utility of the foreign country. We refer to this second channel as a "geopolitical externality." The home country's preferences are therefore given by

$$W = \sum_{t=0}^{\infty} \beta^t u(c_t) - \eta u(c_0^*)$$

where $\eta > 0$ measures the intensity with which the home country wishes to punish the foreign country during the war. A higher η can be interpreted as capturing how a reduction in utility for the foreign country can decrease the probability that it would win the war, either because it has fewer resources available or because of the popularity of the political regime declines.[7]

The home country owns αb_0^* units of the foreign country's debt and other portfolio of assets and liabilities with net position k_0. With a constant income over time, and with a return on the portfolio equal to $1 + r$, optimal consumption is then given by

$$c_t = y + (1 - \beta)(\alpha b_0^*(1 - d^*) + k_0)$$

for all $t \geq 0$.

We can write the home country's welfare as

$$W(\underline{a}; d^*) = \frac{1}{1-\beta} u\left(y + (1 - \beta)(\alpha b_0^*(1 - d^*) + k_0)\right) - \eta u(c_0^*(\underline{a}, d^*)), \tag{6}$$

where with some abuse of notation we denote by $c_0^*(\underline{a}, d^*)$ the resources available for the foreign country as a function of $\underline{a}$ and its default decision d^*.

The home country's welfare is therefore determined entirely by the initial default decision by the foreign country and by c_0^*. The home country can affect these two outcomes by controlling the restrictions on the use of foreign country's reserves. The trade-off is that imposing restrictions reduces the geopolitical externality, but it may trigger a default, which implies fewer resources for the home country. Next, we analyze how this decision is made and solve for the equilibrium.

[7] We abstract from the primitives of the geopolitical externality as well as the ethical foundations for it. Notice that, from a modelling perspective, our formulation of the geopolitical externality is akin to negative altruism à la Becker and Barro (1988).

2.3 Nash Equilibrium

We assume the home country moves first by setting restrictions, followed by the foreign country's decision to repay or not. Our equilibrium concept is a Stackelberg equilibrium, defined below and illustrated in Figure A.1.

Definition 1 (Stackelberg Nash equilibrium)**.** *A Stackelberg Nash equilibrium is a policy for the home country $\underline{\mathbb{A}}$ and a best response for the foreign country $\mathbb{D}^*(\underline{a})$ such that*

$$\underline{\mathbb{A}} = \operatorname*{argmax}_{\underline{a}} W(\underline{a}; \mathbb{D}^*(\underline{a})),$$

where

$$\mathbb{D}^*(\underline{a}) = \begin{cases} 0 & \text{if } V_R(a^*, b^*; \underline{a}) \geq V_D(a^*) \\ 1 & \text{if } V_R(a^*, b^*; \underline{a}) < V_D(a^*), \end{cases}$$

where V_R, V_D and W were defined in (4), (5), and (6), respectively.

We can solve the equilibrium by backward induction. For any $\underline{a}$, we use V_R, V_D,and W to spell out the payoffs when the foreign country defaults and when the foreign country repays.

Payoffs under foreign country default. Suppose the foreign country defaults, then the values for the foreign and home countries are, respectively,

$$V_D(a^*) = u(y^* - \phi^D - g^*) + \frac{\beta}{1-\beta} u(y^* + ra^*) \tag{7}$$

and

$$W(\underline{a}, 1) = \frac{1}{1-\beta} u(y + (1-\beta)k_0) - \eta u\left(y^* - g^* - \phi^D\right) \tag{8}$$

Payoffs under repayment. When the foreign country repays, the value for the foreign and home country are given by

$$V_R(a^*, b^*; \underline{a}) = u\left(y^* - g^* + a_0^* - \underline{a} - \kappa b_0^*\right) + \frac{\beta}{1-\beta} u\Big(y^* + (1-\beta)\left(\underline{a}(1+r) - (1-\delta) b_0^*\right)\Big) \tag{9}$$

and

$$W(\underline{a}, 0) = \frac{1}{1-\beta} u(y + (1-\beta)(\alpha b_0^* + k_0)) - \eta u\left(y^* - g^* + a_0 - \underline{a} - \kappa b_0^*\right) \tag{10}$$

Home Country optimal policy. When the potential response to the sanctions is internalized, the problem solved by the home country is given by

$$\max_{\underline{a}} W\left(\underline{a}; d^{*}(a, b; \underline{a})\right)$$

where $d^{*}(a^{*}, b^{*}; \underline{a})$ is the foreign country default decision. How this decision varies with $\underline{a}$ is characterized in Lemma 1.

Let us define $\tilde{W}(\underline{a})$=$W\left(\underline{a}; d^{*}(\ a, b; \underline{a})\right)$. We have

$$\tilde{W}(\underline{a}) = \begin{cases} \frac{1}{1-\beta}u(y + (1-\beta)(\alpha b_0^{*} + k_0)) - \eta u\left(y^{*} - g^{*} + a_0 - \underline{a} - \kappa b_0^{*}\right) & \text{if } \underline{a} \leq \hat{a}. \\ \frac{1}{1-\beta}u(y + (1-\beta)k_0) - \eta u\left(y^{*} - g^{*} - \phi^{D}\right) & \text{if } \underline{a} > \hat{a}. \end{cases} \tag{11}$$

Notice that in general, $\tilde{W}(\underline{a})$ features a discontinuity. In addition, $\tilde{W}(\underline{a})$ is strictly increasing in $\underline{a}$ if $\underline{a} \leq \hat{a}$ while it is independent of $\underline{a}$ if $\underline{a} > \hat{a}$.

It therefore follows that the solution for the home policy satisfies $\underline{a} \geq \hat{a}$. In particular, the solution features either $\underline{a} = \hat{a}$ or any $\underline{a} > \hat{a}$. In other words, conditional on inducing repayment in equilibrium, the home country squeezes the foreign country's resources up to the point at which it becomes indifferent between repaying and defaulting. When the geopolitical externality η is low, the outcome would be that the home country induces repayment. However, if η is large, the solution would induce a default by the foreign country. We summarize this result in the next proposition.

Proposition 1. *Define* $\hat{\eta} = \frac{u(y+(1-\beta)(\alpha b_0^{*}+k_0)) - u(y+(1-\beta)k_0)}{(1-\beta)\left[u\left(y^{*}-g^{*}+a_0^{*}-\hat{a}-\kappa b_0^{*}\right)\right] - u(y^{*}-g^{*}-\phi^{D})}$. *We have that* $\hat{\eta} > 0$. *Moreover, if* $\eta \leq \hat{\eta}$, *the home country chooses* $\underline{a} = \hat{a}$ *and the foreign country repays. Otherwise,* $\underline{a} > \hat{a}$ *and the foreign country defaults.*

Proof. See Appendix A.3 □

The result of this proposition can account for the evolution of the economic sanctions on Russia during the war. Following the invasion, the West prevented Russia from using its international reserves for purposes other than debt repayments. As the war escalated and the catastrophe continued, the US Treasury decided to completely freeze Russian reserves, and the default followed.

2.4 A Simple Linear Example

We now provide a simple example to obtain further insights into the threshold value of the geopolitical externality, $\hat{\eta}$, at which point the sanctioning country finds it optimal to face the losses from the sanctioned country defaulting. In particular, suppose the restriction is such that the foreign country can only use reserves to pay coupon payments, then we obtain $\Delta \equiv c_0^{*R} - c_0^{*D} = \phi^D$, the difference in the sanctioned country's consumption under repayment under default. Assume also that the utility function for both countries is linear. In this case, the sanctioning country chooses to default if $b_0^* > \phi^D$. In addition, the condition that makes the sanctioning country indifferent between inducing default or not is given by

$$\hat{\eta}\Delta = \alpha b_0^*$$

where the left-hand side represents the benefits from the reduction in the sanctioned country's consumption and the right-hand side are the losses from the default. Using $\Delta = \phi^D$, we then obtain

$$\hat{\eta} = \frac{\alpha b_0^*}{\phi^D} > \alpha \, , \tag{12}$$

where the inequality follows from the default decision under linear utility. Notice that this means that if $\alpha = 1$, we must have $\eta > 1$ to justify that the sanctioning country absorbs the default losses. The intuition is that if $\alpha = 1$, what the sanctioned country saves from defaulting is a loss for the sanctioning country. Because the default decision is optimal for the sanctioned country, this implies that the debt is higher than the penalty suffered from default. Thus, justifying a penalty that induces default implies that it is more valuable for the sanctioning country to deplete consumption of the sanctioned country by one unit than to have one more unit of consumption for itself.

2.5 A Simple Calibration

We now conduct a simple calibration exercise to gauge the quantitative effects of the geopolitical externality. We parameterize the Foreign country using Russian data and the Home country using US data. Table A.1 reports the parameter values we use.

We assume log utility for both countries. We normalize the income in the Home country to unity ($y = 1$) and set the income in the Foreign country to match the GDP of Russia relative to the US as observed in the data ($y^* = y/14$). The world interest rate is $r = 0.01$ and $\beta = 1/(1 + r)$. The initial financial position of the Foreign country is given by $a_0^* = 0.3y^*$ and $b_0^* = 0.2y^*$, the ratios observed in Russian data. We set the coupon decay rate δ so that the debt duration is 6.8 years, this amounts to $\delta = 0.14$.[8] The net foreign assets of the Home country are $k_0 = -0.6y$, which is the magnitude for the US net foreign assets as of

[8] Bai et al. (2017) find that the debt duration for Russia is 6.83 years (using data for the period January 1993 – June 2009). The risk-free Macaulay duration, given our coupon structure, is given by $(1 + r)/(\delta + r)$.

2020, as reported in Atkeson et al., 2022. We set $\alpha = 0.5$, capturing that roughly 50% of Russian bonds are held by foreign investors (see March 15's New York Times article). Given all these parameters, g^* is set to $0.28y^*$ (which is the lowest value consistent with Assumption 1) and $\phi^D = 0.13y^*$ which guarantees that $\hat{a} = a_0^* - \kappa b_0^*$ (i.e. restricting reserves for any purposes other than debt coupon payments). Finally, we present results for two values of the geopolitical externality: $\eta^{Low} = 0.03$ and $\eta^{High} = 0.05$.

Based on these calibrated parameters, we find that consumption falls by 18% in the foreign country at $t = 0$ when the home country imposes the harshest punishment relative to the case where $\underline{a} = \hat{a}$. Meanwhile, the home country suffers a permanent consumption drop of 0.007% (again relative to the case where $\underline{a} = \hat{a}$). We obtain that the critical value for the intensity of the externality is $\hat{\eta} = 0.04$. This implies that the home country is willing to cut the utility from its own consumption stream by 0.04 units to reduce the foreign country's current utility by 1 unit. The key takeaway is that it is optimal for the home country to induce default in the foreign country for a plausible range of values of the geopolitical externality.

Figure 2 provides an illustration of the workings of the model. In panel (a) of this figure we present the value for the Foreign country both under repayment and under default, V_R and V_D. As implied by the Lemma 1, the value under repayment and default become equal at the threshold $\hat{a}$.

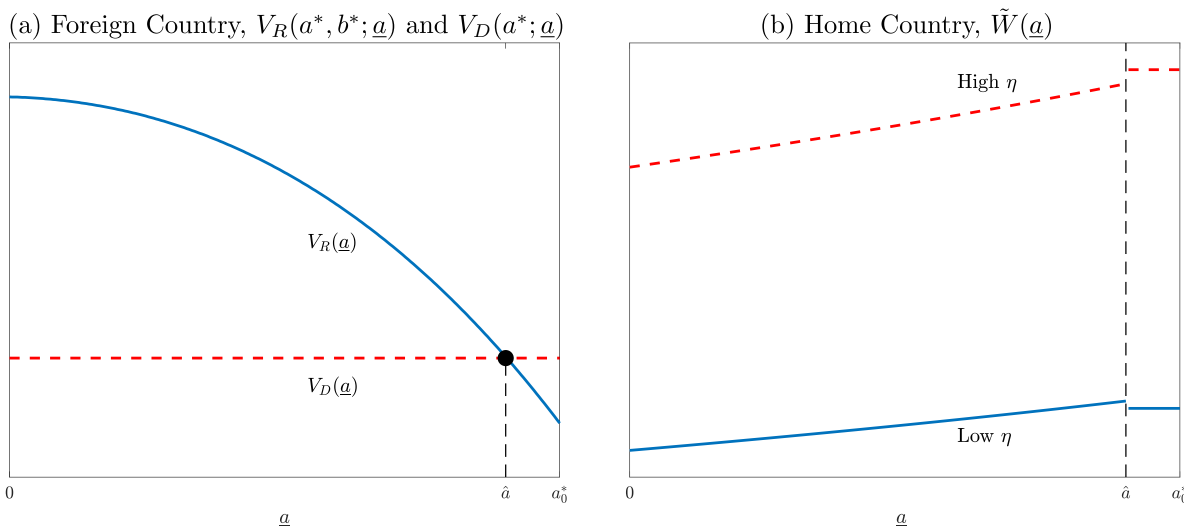

Figure 2: Value functions for Home and Foreign Countries

Note: The left panel shows the value for the Foreign country as function of the sanctions ($\underline{a}$) for both default and repayment. The right panel shows the value for the Home country for two levels of the geopolitical externality, low (blue solid lines) and high (red dashed lines).

Panel (b) of Figure 2 illustrates the workings of Proposition 1 by plotting the value for the Home country, $\tilde{W}(\underline{a})$ for two different values of η. As shown in (11), the value for the

Home country is discontinuous at $\hat{a}$. Below $\hat{a}$ it is strictly increasing in the strength of the sanctions. Above $\hat{a}$, the value is independent of $\underline{a}$. This figure illustrates how for η^{Low} it is in the home country's best interest to choose the highest possible constraint without triggering a default in the foreign country. However, for (η^{High}), the Home country finds it optimal to introduce a restriction that is larger than $\hat{a}$ and that triggers a default and, therefore, losses for the home country.

3 Conclusion

We present a simple model to think about the implications of restrictions on the use of international reserves as economic sanctions, a measure recently adopted to punish Russia following the invasion of Ukraine. We find that soft restrictions come at no cost for the sanctioning country—they restrict resources available to the sanctioned country without negative consequences for the sanctioning country. However, a complete freezing of reserves can trigger a default by the sanctioned country and generate losses for the sanctioning country. Our model provides a characterization of the size of the geopolitical externality that makes this policy optimal.

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A Appendix

A.1 Additional Tables and Figures

Table A.1: Parameter values

Income in H	y	1
Income in F	$y*$	$y/14$
World interest rate	r	0.01
Discount factor	β	$1/(1+r)$
Initial Reserves in F	a_0^*	$0.3\,y^*$
Initial Debt in F	b_0^*	$0.2\,y^*$
Coupon decay rate	δ	0.138
Other net-foreign-assets in H	k_0	$-0.6\,y$
H's exposure to F's debt	α	0.50
Default cost	ϕ^D	$0.13\,y^*$
War spending	g^*	$0.28\,y^*$
Geopolitical externality	$\{\eta^{Low}, \eta^{High}\}$	{0.03, 0.05}

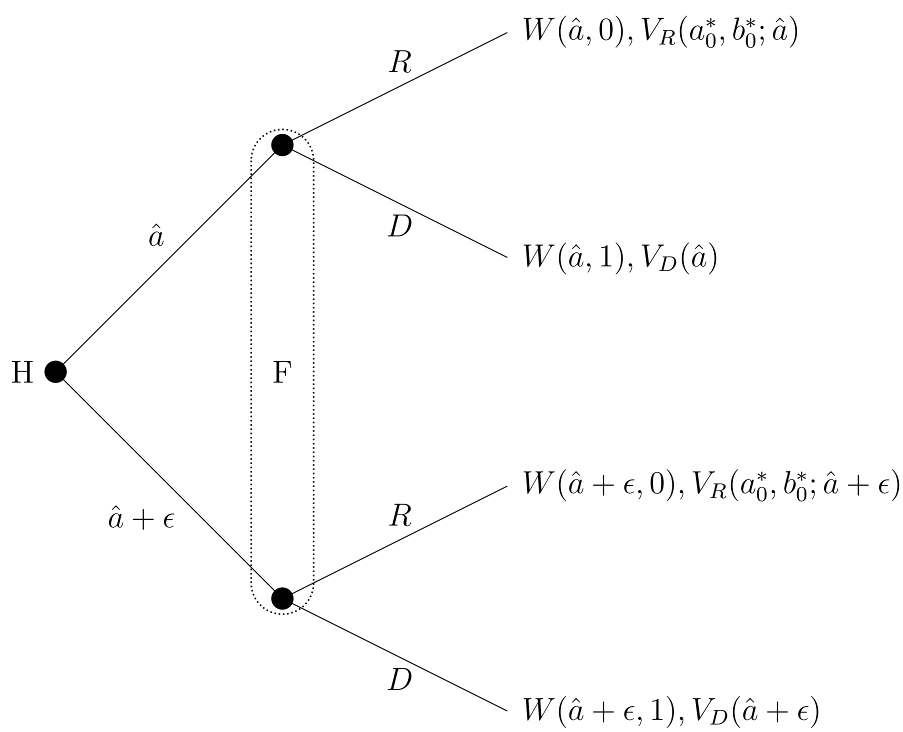

Figure A.1: Extensive-form representation of the game between the Home and Foreign countries.

A.2 Proof of Lemma 1

Proof. By Assumption 2, $V^R(a^*, b^*; a^*) < V^D(a^*)$ and $V^R(a^*, b^*; 0) > V^D(a^*)$. The result then follows by the fact that $V^R(a^*, b^*; \underline{a})$ is continuous and strictly decreasing in $\underline{a}$ while V^D is independent of $\underline{a}$. $\square$

A.3 Proof of Proposition 1

We first prove the following lemma.

Lemma A.2. *Consider $\underline{a} = \hat{a}$ and let $c^*_{0,D}$ and $c^*_{0,R}(\underline{a})$ be the consumption policies under default and repayment in period 0 when the home policy is $\underline{a}$. Then, we have that consumption evaluated a the home policy $\hat{a}$ is higher under repayment: $c^*_{0,D} < c^*_{0,R}(\hat{a})$.*

Proof. By Lemma 1, we know that $V_R(a^*, b^*, \hat{a}) = V_D(a^*)$. It is straightforward that the continuation value is higher under default, which implies that $c^*_{0,D} < c^*_{0,R}(\hat{a})$. $\square$

We now proceed to prove the proposition.

Proof. We first argue that $\hat{\eta} = \frac{u(y+(1-\beta)(\alpha b^*_0+k_0))-u(y+(1-\beta)k_0)}{(1-\beta)\left[u\left(y^*-g^*+a^*_0-\hat{a}-\kappa b^*_0\right)\right]-u(y^*-g^*-\phi^D)}$ is positive, a result that is immediate from Lemma A.2 and the budget constraints under repayment under default. Next, let us define Γ as the difference in value between setting $\hat{a}$ and setting a strictly higher restriction $\hat{a} + \epsilon$

$$\Gamma(\tilde{a}; \eta) = \hat{W}(\tilde{a}; \eta) - \hat{W}(\tilde{a} + \epsilon; \eta) \tag{13}$$

We have that $\frac{\partial \Gamma}{\partial \eta} = \eta[u(c^*_{0,D}) - u(c^*_{0,R}(\hat{a}))] < 0$, where the inequality follows from Lemma A.2. The result that $\underline{a} = \hat{a}$ if $\eta \leq \hat{\eta}$ and that $\underline{a} > \hat{a}$ if $\eta > \hat{\eta}$ follows then immediately. $\square$