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SOVEREIGN DEBT AND THE TRIPLE R PROBLEM: REPUDIATION, RETALIATION AND REPUTATION

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ABSTRACT

The interaction between a creditor and a sovereign debtor is described as a 'one-shot' game with discrete actions—total or no debt-repudiation and seizure of asset holding abroad. Possible Nash equilibria where each player chooses an action as to maximise his expected payoff given his beliefs about the other player's action and the implications of those actions on the players' trustworthy reputation are identified. However, if reputation losses vary convexly with the players' relative hostility, partial repudiation and seizure might be the preferred strategies. The preferred repudiation and seizure rates are analysed under asymmetric and symmetric information about the state of the world.

1. INTRODUCTION

Despite the renewed growth of many developing countries in Asia and Latin America during the first half of the 1990s, the external debt crisis is far from being over. This crisis started in August 1982 when Mexico could not service its external liabilities. Twelve and a half years later, in January 1995, the foreign exchange reserves of the very same country were almost halved to a mere $3.5 billion. Mexico's default on short-term liabilities has been prevented by a US-led rescue plan that included $50 billion of loan guarantees. However, the crisis has destabilised the stock-exchange markets in other Latin American countries and raised the level of scepticism about the ability of those countries to overcome their severe and prolonged external-debt problems. During the 1990s, many of the former centrally planned economies in East Europe have joined the club of the highly indebted countries. By the mid 1990s, the developing countries as a group have become more indebted than they were at any time during the 1980s. The aggregate external debts of the developing countries as a proportion of their combined gross domestic product reached about 40 per cent and for many of these countries the debt-service ratio (i.e., total interest and principal payments as a share of exports of goods and services) was at a crippling level (e.g., 77 per cent for Algeria, 64 per cent for Peru, and 41 per cent for Hungary in 1993).

As suggested by the debt-overhang hypothesis, an indebted country's investment, and consequently economic growth, might be adversely affected by its debt-service payments through the depletion of financial resources available for investment and expected and actual increase in tax rates, which in the presence of capital mobility discourages capital formation and repatriation of flight capital (Krugman, 1989; Helpman, 1989; and Dooley

and Helpman, 1992). This crowding-out effect of actual debt service payments has been supported empirically by Boyce (1992) and Cohen (1993). In view of this adverse effect, internal pressures, and the fact that a country's public external debt is a sovereign one and as such is not subject to incentive to repudiate external liabilities, might be moderated by the level of its asset holding abroad as creditors, official ones in particular, can respond by seizing these assets. Yet, seizure is a two-edge sword as it is also possible for an indebted country to seize the creditors' assets holding on its soil. It has also been suggested by Eaton and Gersovitz (1981), Kletzer (1984), Grossman and Van Huyck (1988, 1993), and Dooley and Svensson (1994), with Bulow and Rogoff's (1989) reservation for small countries facing competitive foreign investors, and empirically supported by Lee (1993), that a country's incentive to repudiate external liabilities might also be moderated by a concern about the adverse effect of a default on its trustworthy reputation and subsequently on its access to foreign creditors.

The paper starts by analysing the strategic interaction between a creditor and a sovereign debtor within a game-theoretic framework whereby an indebted sovereign and a creditor decide on their repudiation and seizure strategies simultaneously, taking into account the implication of their actions on their trustworthy reputation. The novelty of the analysis is that trustworthy-reputation gains and losses are accruable to both players, and not only to the indebted country, and that these gains, or losses, vary in accordance with the nature of the interaction between the players. That is, the description of the players' payoffs takes into account the implications of being perceived as a villain when acting non-cooperatively and the benefits of being perceived righteous, or even as a victim, when playing cooperatively for future interactions of the creditor and the indebted sovereign with other players. For instance, in a case of repudiation, the losses for

the creditor from not seizing the indebted country's asset holding abroad when he could do so are moderated by the gain of trustworthy reputation from acting cooperatively and non-aggressively toward the indebted country. These reputation gains are likely to be larger in the event of repudiation than in the case of debt repayment, and may significantly improve the creditor's bargaining power in the international credit market. In such a case, the unprovoked defaulting debtor might suffer from a substantial loss of trustworthy reputation. Similarly, a seizure of an indebted country's asset holding abroad, especially when the indebted country repays its debt, can adversely affect the trustworthy reputation of a creditor while enhancing the trustworthy reputation of the cooperatively acting debtor.

As in any other game-theoretic analysis, the drawback of the above approach is that the strategies available to the players are of a discrete nature — either total repudiation of debt and seizure of asset-holding abroad, or no repudiation and seizure. From the players' perspectives, the optimality of such discrete actions is questionable if their reputation losses rise convexly with the relative hostility of their actions. Moreover, the players' reputation losses might be affected by the state of the world at the time the game takes place. A default of an indebted country is likely to be more excusable when that country suffers from harsh natural, social, political and economic conditions than when it enjoys favourable ones. Similarly, a hostile behaviour of a creditor toward a sovereign in distress is likely to be condemned by the international community. These elements are incorporated into the design of quadratic reputation loss functions which play a key role in the expected-return maximisation analysis of the repudiation and seizure rates under asymmetric information and, alternatively, under symmetric information.

The analysis is organised in the following manner. Section 2 describes the strategy combinations available to the indebted

sovereign and the creditor as zero or total repudiation and seizure and the payoffs associated with these strategies. It then identifies the possible Nash-equilibria in pure strategies under various assumptions about the constituents of the players' payoffs. Section 3 relaxes the assumption of zero-one repudiation and seizure rates and analyses the optimal repudiation and seizure rates associated with convex reputation loss functions, uncertainty about the well-being of the indebted sovereign and asymmetric information. Section 4 generates the indebted sovereign's and the creditor's choice of repudiation and seizure rates under the alternative assumption of symmetric information. This section also highlights the complex effect of the probability of a 'bad' state of world on the optimal repudiation and seizure rates. Section V concludes the paper.

2. REPUDIATION, SEIZURE AND REPUTATION IN A 'ONE-SHOT' GAME

The strategies available to the indebted sovereign in the game considered in this section are: (i) repayment of the debt, (ii) repudiation of the debt, or (iii) both repudiation of the debt and seizure of the creditor's asset holding in the indebted country. Similarly, the strategies available to the creditor are: (a) no seizure of the indebted country's asset holding in the creditor country, or (b) seizure of these assets.

Let,

D = the book value of the sovereign debt,

A_d = the indebted country's asset-holding in the creditor country,

A_c = the creditor's asset holding in the indebted country,

RG_d = the reputation gains for the indebted country from acting cooperatively (with $RG_d^h > RG_d^l$),

RG_c = the reputation gains for the creditor from acting cooperatively (with $RG_c^h > RG_c^m > RC_c^l$),

RL_d = the repudiation losses for the indebted country from not acting cooperatively (with $RL_d^{vh} > RL_d^h > RL_d^m > RL_d^l$), and

RL_c = the repudiation losses for the indebted country from not acting cooperatively (with $RL_c^h > RL_c^m > RL_c^l$).

Then the possible types of interaction between the indebted sovereign and the creditor and their associated payoffs can be formulated as displayed in the following payoff matrix where the entries on the left-hand side indicate the indebted country's payoffs and those on the right-hand side represent the creditor's payoffs.

		CREDITOR	
		(a) Not Seize	**(b) Seize**
DEBTOR	**(I) Repay**	$(A_d - D + RC_d^l),(A_c + D + RG_c^l)$	$(RG_d^h - D),(A_c + A_d + D - RL_c^h)$
	(II) Repudiate	$(A_d - RL_d^h),(A_c + RG_c^m)$	$(-RL_d^l),(A_c + A_d - RL_c^m)$
	(III) Repudiate & Seize	$(A_d + A_c - RL_d^{vh}),(RG_c^h)$	$(AA_c - RL_d^m),(A_d - RL_c^l)$

In view of the severe implications of strategies such as debt repudiation or asset seizure on the continuation of the relationship between the parties involved, it is reasonable to analyse the interaction between an indebted sovereign and a creditor (or a syndicate of creditors) within the framework of a 'one-shot' game rather than a repeated one. It is postulated that each player chooses an action that maximises his expected payoff given his beliefs about the other player's action and the implications of those actions on the players' trustworthy reputation. This payoff-maximising behaviour, as well as the strategies available to the players and their associated payoffs, are considered to be common knowledge. Since the players' constrained maximisation problems are linear in the action-probability vector, the players can be better off by choosing pure strategies rather than mixed ones.

The possible Nash equilibria in pure strategies can be found by analysing the best response of each player to what he believes would be the other player's strategy choice. The results of this analysis are summarised by the following propositions whose proofs are given in the Appendix.

Proposition 1

If (i) $RG_d^l - D > - RL_d^h$, (ii) $RG_d^l - D > A_c - RL_d^{vh}$, and (iii) $RG_c^l > A_d - RL_c^h$, then the co-operative combination of repayment and non-seizure (I,a) is a Nash equilibrium in pure strategies.

Proposition 2

If (i) $- RL_d^h > RG_d^l - D$, (ii) $- RL_d^h > A_c - RL_d^{vh}$, and

(iii) $RG^{m}_{c} > A_d - RL^{m}_{c}$, then the combination of repudiation and non-seizure (II,a) is a Nash equilibrium in pure strategies.

Proposition 3

If (i) $A_c - RL^{vh}_{d} > - RL^{h}_{d}$, (ii) $A_c - RL^{vh}_{d} > RG^{l}_{d} - D$ and (iii) $RG^{h}_{c} > A_d - RL^{l}_{c}$, then the combination (III,a) in which the indebted sovereign repudiates his debt and seizes the creditor's asset holding in his territory, while the creditor is refrained from seizing the indebted sovereign asset holding abroad, is a Nash equilibrium in pure strategies.

Proposition 4

If (i) $RG^{h}_{d} - D > - RL^{l}_{d}$, (ii) $RG^{h}_{d} - D > A_c - RL^{m}_{d}$, and (iii) $A_d - RL^{h}_{c} > RG^{l}_{c}$, then the combination (I,b) in which the indebted sovereign repays his debt and the creditor seizes the indebted country's asset holding abroad is a Nash equilibrium in pure strategies.

Proposition 5

If (i) $- RL^{l}_{d} > RG^{h}_{d} - D$, (ii) $- RL^{l}_{d} > A_c - RL^{m}_{d}$, and (iii) $A_d - RL^{m}_{c} > RG^{m}_{c}$, then the combination (II,b) in which the indebted country repudiates its debt and the creditor seizes the indebted country's asset holding abroad is a Nash equilibrium in pure strategies.

Proposition 6

If (i) $A_c - RL_d^m > RG_d^h - D$, (ii) $A_c - RL_d^h > - RL_d^l$, and (iii) $A_d - RL_c^l > RG_c^h$, then the combination (III,b) in which the indebted country repudiates its debt and also seizes the creditor's assets held on its territory, while the creditor is seizing the indebted country's asset holding abroad, is a Nash equilibrium in pure strategies.

3. CONVEX REPUTATION LOSS FUNCTIONS, ASYMMETRIC INFORMATION AND THE OPTIMAL REPUDIATION AND SEIZURE RATES

The above game-theoretic analysis was based on extreme modes of response (i.e., either complete seizure and repudiation or no seizure and repudiation) and their associated fixed losses, or gains, of trustworthy reputation. However, if reputation losses vary with the relative intensity of the players' responses in a convex way, partial repudiation and seizure can be the preferred responses. The present section analyses the implications of such convex reputation-loss functions where both players have already set up their mind to play non-cooperatively. Moreover, a state-of-world's effect is incorporated into the reputation-loss functions in order to distinguish between a 'good' state of world and a 'bad' one. A 'good' state of world is characterised by favourable natural, social, political and economic conditions for the indebted sovereign, whereas a 'bad' state of world is an alignment of unfavourable conditions lowering the indebted sovereign's ability to service external liabilities. Therefore, in a 'bad' state of world repudiation of some of the external liabilities might be more excusable and hence generating lower reputation loss than in a

'good' state of world. Similarly, official creditors might suffer from relatively high reputation loss from seizing the asset holding abroad of a sovereign in distress.

To simplify matters, the analysis considers the case where the creditor's asset holding in the indebted country is negligible and where the creditor's repudiation loss (CRL) is quadratic in the ratio of the assets seized to the repudiated liabilities. In this setting the creditor's reputation loss from seizing the indebted sovereign asset holding abroad in a 'good' state of world is given by

$$CRL_g = C_g^c \left(\frac{sA_d}{rD}\right)^2 \qquad (1)$$

and in a 'bad' state of world by

$$CRL_b = C_b^c \left(\frac{sA_d}{rD}\right)^2 \qquad (2)$$

where s is the seizure rate ($0 \leq s \leq 1$), r is the repudiation rate of external liabilities ($0 \leq r \leq 1$), $C_b^c > C_g^c > 0$ are the coefficients of the quadratic loss function in a 'good' and a 'bad' states of world, respectively, and the ratio inside the parentheses indicates the extent of the creditor's hostility relatively to that of the indebted sovereign.

Similarly, it is assumed that the indebted sovereign reputation loss (ISRL) rises with the ratio of the repudiated debt to the seized assets as displayed by the following quadratic forms:

$$ISRL_g = C_g^d \left(\frac{rD}{sA_d}\right)^2 \qquad (3)$$

in a 'good' state of world, and

$$ISRL_b = C_b^d \left(\frac{rD}{sA_d}\right)^2 \qquad (4)$$

in a 'bad' state of world. Here, $C_g^d > C_b^d > 0$ are the coefficients of the debtor's quadratic reputation-loss functions in 'good' and 'bad' states of world, respectively, reflecting that repudiation in a 'good' state of world is less excusable than in a 'bad' state of world. The ratio inside the parentheses displays the extent of the indebted sovereign's hostility relatively to that of the creditor.

It is also assumed that the creditor and the indebted sovereign perceive the probability of a 'bad' state of world as a positive scalar within the open unit interval π_c and π_d, respectively, and that both maximise expected net returns. It is likely that $\pi_c \neq \pi_d$ as it is natural that the creditor is less informed about the indebted country's affairs. In this case, one can argue that it is in the interest of both the creditor and the indebted sovereign to act immediately rather than waiting for the realisation of the state of world. The underlying rationale is that by delaying action to the realisation of the state of world the creditor, who is less informed, is running the risk of losing a collateral if a 'bad' state of world is realised, as such a delay might give the indebted sovereign, who has the information edge, an opportunity to liquidate and repatriate his asset holding abroad. Similarly, a rational indebted sovereign is aware of the creditor's reluctance to delay an action, and hence will not delay his action too. By delaying repudiation the indebted sovereign is running the risk of fully servicing his debt while the creditor is seizing some of his asset holding abroad.

In view of the above arguments, the net return for the creditor

is distributed as

$$y = \begin{cases} (1\text{-}r)\,D + sA_d - CRL_g^e & 1 - \pi_c \\ (1\text{-}r)\,D + sA_d - CRL_b^e & \pi_c \end{cases} \tag{5}$$

and the distribution of the indebted sovereign's net return is

$$x = \begin{cases} (1\text{-}s)\,A_d - (1 - r)\,D - ISRL_g^e & 1 - \pi_d \\ (1\text{-}s)\,A_d - (1\text{-}r)\,D - ISRL_b^e & \pi_d \end{cases} \tag{6}$$

where the superscript e associated with the reputation loss terms indicates the creditor's and the indebted sovereign's assessments of their reputation loss given their expectations about the intensity of each other's actions $\mathbf{r^e}$ and $\mathbf{s^e}$, respectively. Assuming that they both believe that reputation losses are generated in accordance with the above-mentioned quadratic forms, then

$$CRL_g^e = C_g^c \left(\frac{sA_d}{r^e D}\right)^2 \tag{7}$$

$$CRL_b^e = C_b^c \left(\frac{sA_d}{r^e D}\right)^2 \tag{8}$$

$$ISRL_g^e = C_g^d \left(\frac{rD}{s^e A_d}\right)^2 \tag{9}$$

and

$$ISRL_b^e = C_b^d \left(\frac{rD}{s^e A_d} \right)^2 . \qquad (10)$$

The maximisation of E(y) and the convexity of the creditor's reputation-loss function imply that the creditor's optimal seizure rate is

$$s^o = \frac{(r^e D)^2}{2[(1-\pi_c)C_g^c + \pi_c C_b^c]A_d} . \qquad (11)$$

This indicates that the optimal seizure rate:

i. rises with the repudiation rate perceived by the creditor,

ii. rises with the sovereign's external liabilities,

iii. declines with the indebted sovereign's asset holding abroad, and

iv. declines with the probability of a 'bad' state of world (since $C_b^c > C_g^c > 0$).

Similarly, the maximisation of E(x) and the convexity of the reputation loss functions imply that the indebted sovereign's best choice of rate of repudiation is

$$r^o = \frac{(s^e A_d)^2}{2[(1-\pi_d)C_g^d + \pi_d C_b^d]D} . \qquad (12)$$

That is, the indebted sovereign's optimal repudiation rate of external liabilities:

i. rises with the perceived seizure rate of his asset holding abroad and the size of these assets,
ii. declines with the sovereign's external debt, and
iii. rises with the perceived probability of a 'bad' state of world (since $C_g^d > C_b^d > 0$).

4. Optimal Repudiation and Seizure Rates when Information is Symmetric

While the previous section's analysis of the creditor's and the indebted sovereign's optimal actions considered the case of asymmetric information about the state of the world, the following analysis considers the less likely case where the perceptions of both the creditor and debtor about the probability of the state of world are identical, i.e., $\pi_c = \pi_d = p$, and where the creditor and the indebted sovereign know each other's reputation loss functions and objectives. In this case, the expectations of the creditor and the indebted sovereign about each other's actions are correct (i.e., $r^e = r^o$ and $s^e = s^o$). Although not suffering from information disadvantage about the state of the world, the creditor still faces the risk of losing a collateral by delaying seizure and hence can be expected to act immediately. Being aware of the creditor's concerns and consideration, the indebted sovereign can also be expected to act immediately and repudiate some of the external liabilities.

The substitution of p for π_c and π_d and the optimal seizure rate (11) into the optimal repudiation rate equation (12) implies that the optimal rate of repudiation when information is

symmetric is given by

$$r^{o}_{sym} = \frac{2[(1-p)C^{d}_{g} + pC^{d}_{b}]^{1/3}\,[(1-p)C^{c}_{g} + pC^{c}_{b}]^{2/3}}{D} \quad . \qquad (13)$$

Similarly, the substitution of p for π_c and π_d and the optimal repudiation rate into the optimal seizure rate equation implies that the optimal seizure rate in the case of symmetric information is

$$s^{o}_{sym} = \frac{2[(1-p)C^{c}_{g} + pC^{c}_{b}]^{1/3}\,[(1-p)C^{d}_{g} + pC^{d}_{b}]^{2/3}}{A_{d}} \quad . \qquad (14)$$

The above results indicate that under symmetric information the optimal repudiation rate declines with the size of the sovereign's external debt and that the optimal seizure rate declines with the size of the indebted sovereign's asset holding abroad. The total differentiation of the above equalities indicates further that the effect of the probability of a 'bad' state of world on the optimal repudiation and seizure rates is not clear *a priori* and depends upon the relative size of the coefficients of the reputation loss functions. The underlying rationale for this ambiguity is as follows. Recalling that the optimal seizure rate rises with the repudiation rate perceived by the creditor, which in the present setting is equal to the optimal one, and recalling that the effect of the probability of a 'bad' state of world perceived by the indebted sovereign on his optimal seizure rate is positive, then the indirect effect (i.e., through r^{e}) of the probability of a 'bad' state of world on the creditor's optimal seizure rate is positive. However, the direct effect of the probability of a 'bad' state of

world (i.e., the effect of the creditor's own expectations about this probability) on the creditor's optimal seizure rate is negative. Thus, the full (direct plus indirect) effect of the probability of a 'bad' state of world on the optimal seizure rate can be positive, negative or nil depending on the relative size of the coefficients of the quadratic reputation-loss functions specified earlier. Similarly, recall that the optimal repudiation rate rises with the seizure rate perceived by the indebted sovereign and that when information is symmetric the latter factor is equal to the optimal seizure rate which was shown to be declining with the creditor's perceived probability of a 'bad' state of world. Therefore, the indirect effect (i.e., the effect through s^e) of the probability of a 'bad' state of world on the optimal repudiation rate is negative. In contrast, the direct effect of the probability of a 'bad' state of world (i.e., the effect of the indebted sovereign's own assessment of this probability) on the optimal repudiation rate is positive. Thus, the full effect of p on r^o is not clear as well.

Note that when the coefficients of the creditor's and the indebted sovereign's reputation loss function are similar in magnitudes (i.e., both are treated similarly for non-cooperative behaviour), the opposite direct and indirect effects stemming from a change in the probability of a 'bad' state of world are of a similar magnitude and hence the changes in the optimal repudiation and seizure rates are relatively small. This point, as well as the possibility of counter intuitive changes, is illustrated by Table 1 which allows the probability of the 'bad' state of world to vary from 0.1 to 0.9 while holding D = 12 billion dollars, A_d = 2.4 billion dollars, $C_g^d = 0.8 = C_b^c$ and $C_b^d = 0.4 = C_g^c$. In this example, the optimal repudiation rate rises by only 1.76 percentage point and the optimal seizure rate declines by only 8.79 percentage points as the probability of a 'bad' state of world hikes from 0.1 to 0.9.

Table 1 Simulated effect of the probability of a 'bad' state of the world with identical reputation loss' coefficients and under symmetric information

Probability of 'bad' state of world	Optimal repudiation rate	Optimal seizure rate
0.1000	0.0880	0.5278
0.3000	0.0948	0.5182
0.5000	0.1000	0.5000
0.7000	0.1036	0.4739
0.9000	0.1056	0.4399

Finally, let the creditor's reservation price (P_c) be defined as the ratio of E(y) to D, then by virtue of equations 5 and 11 the creditor's reservation price of a dollar of debt associated with s^o is

$$P_c = r - r^e \qquad (15)$$

which in the case of symmetric information implies

$$P_c = \frac{1 - 2[(1-p)C_g^d + pC_b^d]^{1/3}\,[(1-p)C_g^c + pC_b^c]^{2/3}}{D} . \qquad (16)$$

In contrast to simple intuition, this result indicates that the creditor's reservation price of a sovereign debt rises with the size of the debt. Again, and as explained earlier, the full effect of the probability of a 'bad' state of world on the creditor's reservation price is not clear *a priori*.

5. CONCLUSION

This paper analysed the interaction between the creditor and the indebted sovereign and identified the possible Nash equilibria in pure strategies within the framework of a 'one-shot' game. The payoffs of the game included reputation gains and losses for the players as their current behaviour, in conjunction with their opponent's behaviour, might affect their future payoffs from dealing with other lenders or borrowers in the international credit market. It was shown that the possibility of any strategy combination to be Nash equilibrium in pure strategies depends on these trustworthy reputations gains and losses, the size of the debt and the asset holding of each of the players in the other player's country.

The introduction of convex reputation loss functions suggested that partial repudiation and seizure of asset holding abroad might be preferred to the total or no repudiation and seizure strategies considered by the game. These partial repudiation and seizure were analysed under the alternative assumptions of asymmetric and symmetric information about the state of world. The analysis indicated that in the case of asymmetric information optimal seizure rate rises with the repudiation rate perceived by the creditor and the sovereign's external liabilities and declines with the indebted sovereign's asset holding abroad and the probability of a 'bad' state of world. It was also found that in the case of asymmetric information, the indebted sovereign's optimal repudiation rate declines with the sovereign's external debt but rises with the perceived seizure rate of his asset holding abroad, the size of these assets and the perceived probability of a 'bad' state of world. In the case of symmetric information, it was found that the direct and indirect effects of the probability of a 'bad' state of world are of opposite signs and hence their combined effect on the repudiation and seizure rates is not clear *a priori*.

APPENDIX

Proof of Proposition 1: If the inequalities (i) and (ii) hold and the indebted sovereign thinks that the creditor will not seize his asset holding abroad, the indebted sovereign's best response is to repay his debt. When the indebted sovereign repays his debt, it is optimal for the creditor not to seize the indebted country's asset holding abroad as long as inequality (iii) holds.

Proof of Proposition 2: If the inequalities (i) and (ii) hold and if the indebted sovereign thinks that the creditor will not seize his asset holding abroad, the indebted sovereign's best response is to repudiate. Note further that when the indebted sovereign repudiates, it is optimal for the creditor not to seize the indebted country's liabilities as long as inequality (iii) holds.

Proof of Proposition 3: If the inequalities (i) and (ii) hold and if the indebted sovereign thinks that the creditor will not seize his asset holding abroad, the indebted sovereign's best response is to repudiate the debt and to seize the creditor's asset held in his territory. When the indebted sovereign repudiates and seizes, it is optimal for the creditor not to seize the indebted country's liabilities as long as inequality (iii) holds.

Proof of Proposition 4: If the inequalities (i) and (ii) hold and if the indebted sovereign thinks that the creditor will seize his asset holding abroad, the indebted sovereign's best response is to repay its debt. When the indebted sovereign repays his debt, it is optimal for the creditor to seize the indebted country's liabilities as long as inequality (iii) holds.

Proof of Proposition 5: If the inequalities (i) and (ii) hold and if the indebted sovereign thinks that the creditor will seize his asset

holding abroad, the indebted sovereign's best response is to repudiate its debt. When the indebted sovereign defaults, it is optimal for the creditor to seize the indebted country's liabilities as long as inequality (iii) holds.

Proof of Proposition 6: If the inequalities (i) and (ii) hold and if the indebted sovereign thinks that the creditor will seize his asset holding abroad, the indebted sovereign's best response is to repudiate its debt and to seize the creditor's assets held in its territory. When the indebted sovereign does so, it is optimal for the creditor to seize the indebted country's liabilities as long as inequality (iii) holds.

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