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Sensible Debt Buybacks for Highly Indebted Countries

Enrica Detragiache

Concerted agreements in which debt repurchases are linked to reduced interest rates or new-money requirements can make buybacks at a fair price viable, while preventing a free-rider problem among lenders.

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Previous studies indicate that debt buybacks at market prices benefit lenders the most — because the lack of a seniority structure in sovereign lending distorts secondary market prices upward.

Detragiache examines whether welfare-improving buybacks would arise at the "fair" price. If so, policy intervention is needed to remove the distortion. In a model of intertemporal consumption smoothing, buybacks at the fair price are desirable if the country experiences unusually heavy export earnings and if large reserve holdings tend to increase transfers to creditors in default states.

Concerted agreements in which debt repurchases are linked to cuts in interest rates or new money requirements can make buybacks at the fair price viable, while preventing the free-rider problem among lenders.

Sensible Debt Buybacks for Highly Indebted Countries

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1. Introduction.

In recent years, as well as in previous international debt crises, highly indebted countries (HICs) have devoted considerable resources to repurchasing some of their outstanding debt at a discount on the secondary market. Recent buybacks have been of various nature, sometimes financed by donors' funds, sometimes through the country's own reserves. In some instances they have been part of larger agreements with creditors, while other times they have been carried out on the country's own initiative and through intermediaries. In some cases they have been carried out as debt for equity swaps, or as swaps for exit bonds. In any case, economists and policy advisors have been debating on the rationale for such buybacks and about their desirability. One of the central questions is whether it is appropriate for international institutions or potential donors to commit considerable amounts of funds to promote debt repurchases, as they are currently doing, or whether HICs would profit more from aid earmarked for investment or consumption.

A lot of the early debate focused on the beneficial effects of debt reduction on investment in the indebted country[1]. The presence of a large debt overhang, acting as a distortionary tax, reduces the expected marginal return from investing in the indebted country. A buyback, by reducing the volume of debt outstanding reduces the distortion, and makes the world pattern of production more efficient [see for instance Froot (1989)]. Bulow and Rogoff (1989), however, criticized the very foundations of this argument. First of all, they correctly pointed out that buybacks should be regarded as a use of funds alternative to investment, and that the larger the overhang the less beneficial are buybacks

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[1]For a survey, see S.Claessens and I. Diwan (1988).

compared to investment. Bulow and Rogoff also argued that debt buybacks at market prices make creditors better off, because debt is repurchased at its average price rather than at the (lower) marginal price, and that this anomaly has such a strong effect that countries are likely to be better off if they do not buyback any debt at all, unless additional concessions are obtained from the creditors. This result also implies that donors who want to help a highly indebted country would do better giving aid to finance consumption or investment, rather than to finance debt buybacks at the market price.

Debt buybacks are an investment in a particular type of asset, and their attractiveness can be evaluated in terms of their rate of return and of their covariance with the country's consumption, as models of intertemporal asset pricing indicate. The divergence between the marginal and average price of debt, stressed by Bulow and Rogoff, arises because each creditor expects to share in default proceeds in proportion to his claims, no matter how much debt the country had contracted at the time of the loan. If a seniority structure could be established in international sovereign lending, the divergence would disappear, and debt buybacks would occur at a "fair price", that is a price that yields an expected rate of return equal to the risk–free interest rate. Since lenders are modeled as risk–neutral, in a competitive equilibrium they should purchase assets at that rate. Hence, the fact that countries are forced to repurchase debt at the average price is a distortion, and in equilibrium rational and optimizing countries retire too little debt. This same distortion generates a bias in favor of too much borrowing.

This paper is concerned with trying to determine if and under what circumstances debt buybacks at the fair price can be welfare–improving. If such buybacks exist, there is a scope for trying to remove the distortion, and possible policies to achieve that result need to be discussed.

The analysis of debt buybacks is carried out in a model of intertemporal optimization, in which a risk-averse planner maximizes future expected utility. Introducing risk-aversion also allows to discuss issues of intertemporal consumption smoothing, which are neglected in models with linear utility functions. Debt buybacks are treated as an asset, and if for some parameter values the asset is in positive demand when it is sold at the fair price welfare-improving buybacks exist.

When interested in smoothing consumption, a country may want to buyback debt if it experiences a particularly favorable state of nature, such as exceptionally high export revenues, so as to transfer some of the revenues into the future. Investing in debt repurchases, however, yields a positive rate of return only in states of the world in which debt is expected to be serviced, since only in those states a reduced face value of debt induces smaller transfers to creditors. But future repayment states tend to be high income states, and intra-temporal consumption smoothing would require transferring more consumption to the low-income states. If the country has access to an alternative asset that pays a rate of return comparable to buybacks, and that allows to transfer consumption to default states, such asset would dominate debt repurchases. In particular, foreign exchange reserves always dominate buybacks, even if the latter take place at the fair price, if reserves do not increase the transfer to creditors in default states. In principle, official reserves cannot be attached by creditors, but empirical evidence on secondary market prices suggests that the stock of reserves has a significant and positive impact on expected repayment. When this is the case, debt buybacks at the fair price can be welfare improving.

Investment in physical capital is also analyzed. Here the results depend not only on how much of the returns lenders can seize in default states, but also on the covariance of

the marginal product of capital with consumption. If investment is in a production that is positively correlated with aggregate output, it tends to increase the volatility of aggregate consumption. In this case, even if the marginal product of capital is equal to the expected return on buybacks, buybacks may be welfare–improving.

The second part of the paper looks at how the distortion due to the lack of seniority can be eliminated if buybacks are accompanied by concessions such as a reduction in interest rates or new money requirements. Schemes can be devised so that no lender has an incentive to deviate from the agreement. For this to be the case, concessions must be large enough to drive the secondary market price to what would be the post–buyback fair price if no concessions were made. Since bargaining between the parties is not likely to remove the distortion completely, there seems to be a rationale for policy measures that enhance the attractiveness of buybacks. Recent episodes of debt reduction agreements are discussed from this perspective.

Finally, other potential aspects (besides the lack of seniority) that may distort banks' valuation of HIC debt are briefly discussed. The presence of mispriced federal deposit insurance, and the asymmetry of the corporate–tax system are likely to affect secondary market prices of HIC debt. The conclusions summarize results and open questions.

2. The Model.

The highly indebted country is a small open economy, that receives an endowment of a traded good y_t every period. y_t is the realization of an independently and identically distributed random process $\mathbf{Y}$, with support Y. Let prob $\{\mathbf{Y} \geq y\} = G(y)$ and $G'(y) =$

$g(y)$. The country has inherited from the past a stock of debt, in the form of a sequence of one–period pure discount bonds with face value d_t. For simplicity, let $d_t = d \; \forall \, t$. D is the present discounted value of inherited debt at any date. The country can also issue new one–period discount bonds b_t. Let $p(b_t)$ be the price at which these new bonds are sold. A negative value for b_t will be interpreted as a debt buyback. For the moment no other asset is assumed to be available to the indebted country. At every period the country can choose to default on her debt, at the cost of being forced into financial autarky and of losing an amount $\lambda(y_t)$. As usual, it is assumed that the loss is increasing with income, and that it accrues to the creditors. Under these assumptions, the maximum utility that the country can achieve if it defaults at t is

$$V^d(y_t) = u(y_t - \lambda(y_t)) + \frac{\delta}{(1 - \delta)} E\,[u(Y - \lambda(Y))] \qquad (2)$$

where $u(\cdot)$ is a concave utility index, δ is the rate at which the country discounts the future, and E is the expectations operator[2]. Notice that if default occurs, payments to creditors become state–contingent, and with $\lambda'(\cdot) > 0$ consumption is less variable than output. So debt with default risk offers some risk–shifting opportunities for countries, but

[2]The model can also be interpreted as one in which in default states bargaining between the country and her creditors takes place. In this case $\lambda(y_t)$ is the solution to the bargaining game that takes place in every period. In general, it could be the case that at least for some histories of the shock the transfer $\lambda(y_t)$ depends on the face value of accumulated debt, if the country can return to solvency with some probability. To keep the problem tractable, this possibility is neglected here.

is far from allowing the country to fully insure against output fluctuations[3].

The price at which new bond issues are purchased by competitive, risk–neutral investors depends on how the proceeds in case of default are shared among the creditors. This, in turn, depends on whether seniority rules are enforceable. Bulow and Rogoff (1988) argue that in sovereign lending all lenders are treated pari passu, hence the default proceeds are shared in proportion to claims. This stance seems to be supported by the empirical observation that recent debt reschedulings have treated all lenders in the same way. The price at which b_t units of a new bond could be issued if seniority existed, which will often be referred to as the fair price for reasons that will become clear later, is

$$p(b_t) = \beta [1 - G(y^*_{t+1})] \tag{2}$$

where $\beta = (1 + r)^{-1}$ and r is the lenders' opportunity cost of funds. y^*_{t+1} is the level of income at which in period t+1 borrowers are exactly indifferent between repayment and default. This value is in general a function of b_t. With seniority, and assuming that the outstanding debt is large enough not to be fully serviced with certainty, junior lenders do not expect to receive any of the default proceeds. On the other hand, as shown by Bulow and Rogoff (1988), without seniority the country is able to issue at price

$$p(b_t) = \beta \{[1 - G(y^*_{t+1})] + \varphi(y^*_{t+1}) (D_t + b_t)^{-1}\} \tag{2'}$$

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[3]Some authors, such as H. Grossman and J. Van Huyck (1988), T. Worrall (1990), and recently K. Kletzer and B. Wright (1990), hold the view that banks and sovereign borrowers write an implicit contract that (except for default states) mimicks a fully state–contingent contract. This view seems at odds with the fact that countries default when they are hit by bad shocks, rather than the other way around.

where

$$\varphi(y^*_{t+1}) = \int_{Y^d_{t+1}} \left[\lambda(y) + \frac{E\ \lambda(Y)}{r} \right] g(y)\, dy$$

is the expected value of the default proceeds at t. $Y^d_{t+1} \subset Y$ is the set of default states at t+1. The difference between the two prices, of course, depends on the size of λ, on the likelihood of a default, and on the value of debt outstanding. If the country is buying back debt, the presence of junior creditors allows to repurchase at a lower price. Without seniority rules, by increasing the level of debt the country reduces the value of old creditors' claims, while debt buybacks have the opposite effect.

The lack of seniority has a startling side-effect, when borrowing behavior is examined. Notice that if debt is large enough that $G(y^*_{t+1}) = 1$, the issue price is zero with seniority, meaning that no new borrowing is possible, as it should be. Inspection of (2'), on the other hand, reveals that this price is positive for any bounded amount of debt. But this means that the country can raise any bounded amount of money without increasing future payments, as long as it offers a high enough interest rate. The new loans are effectively paid off by reducing payments to existing creditors. In such a framework, no lending would arise in equilibrium. Either banks expect to be able to enforce their seniority rights, or they tacitly collude, and refuse to extend new loans at high interest rate beyond a certain threshold. In practice, most HICs are unable to increase their long-term borrowing even though they are paying low interest rates on it. Short-term credit, which typically carries larger spreads, has not increased but rather diminished since the early

'80s. At least at first inspection, the tacit collusion hypothesis seems the most likely. A more detailed analysis of this issue is left to future extensions[4]. For the purposes of this model, it will be assumed that lenders collectively impose a ceiling $\bar{b}$ on the total amount of indebtedness of the country. The exact value of $\bar{b}$ has no bearing on the analysis.

Let $\epsilon_t = -\frac{b_t}{p_t}\frac{\partial p_t}{\partial b_t}$ be the inverse of the elasticity of the demand for new bonds. Then using (2')

$$(3) \qquad \epsilon_t = \frac{b_t}{p(b_t)}\varphi(y^*_{t+1})(D_t + b_t)^{-2} + \frac{b_t}{(b_t + D_t)}\{p(b_t) - [1 - G(\cdot)]\beta\}$$

For small buybacks ϵ_t is close to zero, and it is always less than one.

Let's now turn to the decision problem of a planner within the indebted country. Define the indicator function ϕ_t that takes the value 1 if the country repays and zero if it defaults. The problem is to choose values of c_t, ϕ_t, and b_t that solve

$$\max E_0 \sum_{t=1}^{\infty} \delta^t u(c_t)$$

$$\text{s.to } c_t \geq 0,\ b_0 = 0,\ \phi_t \in \{0, 1\},\ b_t \leq \bar{b}$$

$$c_t = y_t - \phi_t [b_{t-1} + d - p_t(b_t) b_t] + (1 - \phi_t)\lambda(y_t)$$

$$\phi_t = 0 \ \forall t > \tau \text{ if } \phi_\tau = 0$$

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[4]Accidentaly, along this line it could be explained w. : loans at very high interest rates are not observed in sovereign lending, while they exist in domestic credit markets (junk-bonds and credit cards, for instance). Without seniority and with substantial default proceeds to be appropriated, high-interest rate debt is a way of "ripping off" existing lenders, and the financial community would sanction it. This is not the case when seniority works and default proceeds are small, as in domestic lending.

This problem can be rewritten in a recursive way. Let's drop the subscript t and denote by a prime variables pertaining to the next period. The solution to the planner's problem is a value function

$$V(b, y) = \max [V^r(b, y), V^d(y)]$$

where V^d is as defined in (1) and V^r is the value function under repayment, defined as

$$V^r(b, y) = \max_{b'} u(c_r) + \delta E_t \{\max [V^r(b', y'), V^d(y')]\}$$

$$\text{s.to } b' \leq \bar{b}$$

where $c_r = y - d - b + p(b') b'$. At every period the default level of income is implicitly defined by

$$V^r(b, y^*) = V^d(y^*)$$

Let μ_t be the multiplier associated with the constraint on the volume of borrowing. The first order and envelope conditions for this problem yield

$$u_1(c_r)\, p(b')[1 - \epsilon] - \mu + \int_{Y_r'} V_1^r(b', Y)\, g(y)\, dy = 0 \tag{4}$$

$$V_1^r(b, y) = -u_1(c_r) \quad \forall\, y \in Y_r \tag{5}$$

where ϵ is defined in (3) above. The complementary slackness conditions associated with the credit constraint are

$$\mu(b - \bar{b}) = 0, \quad \mu = 0 \tag{6}$$

Notice that default is more attractive when income is low, for two reasons: The loss $\lambda(y)$ is smaller when y is low, and the future expected value of repayment is likely to be smaller, since b' is larger for low y and V^r is a decreasing function of b.

If the credit constraint is not binding, manipulating (4) and (5) yields

$$u_1(c_r) = \left[\frac{\delta}{p(b')\ [1 - \epsilon]} \right] \int_{Y_r'} u_1(c_r')\, g(y)\, dy \tag{7}$$

Define expected marginal utility conditional on repayment

$$E\,[u_1(c_r') \mid Y_r'] = \left[\int_{Y_r'} u_1(c_r')\, g(y)\, dy \right] [1 - G(y^{*\prime})]^{-1}$$

Hence (7) becomes

$$E\left[\frac{\delta\ u_1(c_r')}{u_1(c_r)} \mid Y_r' \right] = \frac{[1 - G(y^{*\prime})]}{p(b')\ [1 - \epsilon]} \tag{8}$$

If default occurs with zero probability and the country behaves like a small agent ($\epsilon = 0$), at an optimum the expected marginal rate of substitution across periods is equal to the

risk–free interest rate $(1 + r)$, since when $G(y^{*l}) = 0$ $p(b^l) = \beta = (1 + r)^{-1}$. In this case, there is perfect consumption smoothing over time, although no consumption smoothing across states of nature: With no asset paying a state–contingent return the country cannot obtain any insurance. When the current value of y is large, the country wants to reduce the stock of debt through buybacks.

On the other hand, with a positive probability of default and [illegible] as the only asset available, income can be transferred only across repayment states. The expected bond yield is equalized to the marginal rate of substitution conditional on repayment occurring in the next period. With seniority, $p(b^l) = \beta [1 - G(y^{*l})]$, and the bonds are expected to yield the risk–free interest rate, as it should be since lenders are competitive and risk–neutral. In this sense, the price of debt with seniority is fair, while under the pari passu rule new borrowing is too cheap and debt buybacks too expensive. At the fair price,

$$E [u_l(c_r^l) \mid Y_r^l] = u_l(c_l)$$

Buybacks are welfare improving if the current income is so favorable that it exceeds expected future income in repayment states. If the probability of default is large, Y_r^l contains only the upper tail of the distribution of Y, and the probability that a state of the world in which buybacks are needed is small. Hence, it is less likely that countries whose debt is sold at very large discounts could benefit from a repurchase. Note, however, that Y_r^l is the set of repayment states after the buyback.

A second distortion comes from the fact that the country is likely to behave as a large agent, an take into account the effects of increased volumes on the price. With $\epsilon \neq 0$, both buybacks and new borrowing take place in smaller quantities.

Finally, if the credit constraint is binding no new borrowing is possible even if there is an unfavorable realization, and the extent of intertemporal consumption smoothing that can be achieved is very small.

3. Reserve Accumulation.

The set–up proposed in the preceding section, although it highlights the role of bank debt in intertemporal consumption smoothing, is too restrictive to realistically describe the menu of assets available to a highly indebted economy. Countries can accumulate reserves or physical capital as an alternative to debt buybacks when they want to transfer consumption to the future. Moreover, asset accumulation allows to transfer consumption also to default states, which is impossible if only debt buybacks are permitted. This option is very valuable if states of the world in which default occurs tend to be low–consumption states. On the other hand, if more reserves or more physical capital increase the transfer to creditors in default states (because for instance they can be partially seized), there is an incentive not to accumulate them.

Let's assume that the debtor country can accumulate foreign exchange reserves s_t that yield a (gross) rate of return equal to γ. Suppose for the moment that the transfer to creditors if default occurs does not depend on the level of reserves. Under these assumption the utility from defaulting at t is defined recursively as

$$V^d(s, y) = \max_{s} u(c_d) + \delta E V^d(s', y')]$$

$$\text{s.to} \quad s \geq 0$$

where $c_d = y - \lambda(y) + \gamma s - s'$. At an interior optimum the following condition holds

$$V_1^d(s, y) = \gamma u_1(c_d)$$

The default level of output $y^{*'}$can be obtained as in section 2. Since reserves do not affect proceeds in case of default. the expressions for p(b) derived in section 2 still hold. To keep things simple, throughout this section it will be assumed that the country takes the price of bonds as parametric. so $\epsilon = 0$. The value function in repayment states is now

$$V^r(s, b, y) = \max_{s', b} u(c_r) + \delta E \max [V^r(s', b', y'), V^d(s', y')]$$
$$\text{s.to } b' \leq \bar{b}, \; s' \geq 0$$

where $c_r = y - (d + b) + p(b') b' + \gamma s - s'$. Let η be the multiplier associated to the constraint on reserves. If the credit ceiling is not binding, the first order and envelope conditions yield

$$u_1(c_r') = \delta \gamma \left[\int_{Y_r'} u_1(c_r') g(y) dy + \int_{Y_d'} u_1(c_d') g(y) dy \right] + \eta \tag{9}$$

$$u_1(c_r') = \frac{\delta}{p(b')} \int_{Y_r'} u_1(c_r') g(y) dy \tag{10}$$

while the complementary slackness conditions are

$$\eta s = 0, \quad \eta \geq 0$$

The first equation is the derivative of the objective function with respect to reserves. Since reserves increase future utility in both repayment and default states, the marginal utility of current consumption must be equal to expected future marginal utility over all possible states. Combining (9) and (10) and rearranging

$$(11) \qquad E\,[u_1(c_d^1) \mid Y_d^1] = E\,[u_1(c_r^1) \mid Y_r^1] \left[\frac{1 - G(y^{*1})}{G(y^{*1})}\right] \left[\frac{1 - p(b^1)\ \gamma}{p(b^1)\ \gamma}\right]$$

The meaning of this equation becomes clear once we notice that if $p(b^1)$ is the fair price and if reserves pay the risk–free rate ($\gamma = \frac{1}{\beta}$) (11) becomes

$$E\,[u_1(c_r^1) \mid Y_r^1] = E\,[u_1(c_d^1) \mid Y_d^1]$$

At an optimum, the marginal rate of substitution between default and repayment states must be equal to one: With two assets, one that pays a negative return in repayment states and nothing in default states, while the other pays a fixed return in every state, the country can obtain some insurance. If there is seniority and $\gamma = \frac{1}{\beta}$, the insurance is offered at fair terms, and expected marginal utilities are equalized across states.

Since default states tend to be low–income states, expected marginal utilities can be equalized only through accumulating new debt, which is the only way to lower consumption in repayment states without reducing consumption in default states as well.

In this case debt buybacks never occur: If the country experiences a favorable shock at t she will in general increase both reserves holdings and debt[5]: Reserves increase future consumption in both states and debt reduces consumption in repayment states. On the other hand, if an adverse shock is experienced the country will want to run down its stock of reserves (reducing future consumption), but at the same time increase debt to smooth consumption across states in the next period. To sum up, if the country is risk-averse, if default states are low-income states, and if reserves can be accumulated at the risk-free rate without increasing the transfer to creditors in case of default, buybacks are always suboptimal, even if they take place at the fair price.

These results are rather paradoxical: To optimally smooth consumption over time a country perpetually increases her stock of debt. Since the level of reserves fluctuates depending on the state of nature, the net stock of foreign assets in the country fluctuates as well. This strange outcome stems from the general lack of financial instruments to insure against future aggregate shocks. If there was an asset paying a return in default states alone, debt would be run down when current income is large.

The assumption that countries can hold reserves without increasing default payments at all seems extreme. Empirical evidence suggests that reserves do affect expected repayment: Both Acharya and Diwan (1989) and Ozler and Huizinga (1990) find a positive and significant coefficient for the reserve-to-GNP ratio in regressions explaining the secondary market price of debt. This is puzzling, since in principle official reserves cannot be attached by creditors according to international law (see D. Folkerts-Landau

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[5]As S. O'Connell (1988) puts it, the country borrows to finance the accumulation of reserves.

(1985)[6]. In practice, there may be doubts as to whether this aspect of sovereign immunity will be enforced in the case of an outright repudiation (all of Iran's assets in the U.S. were frozen in 1979, for instance). Such rules always depend on the willingness of the lending country's government to cooperate, which is guided by political considerations that are hard to foresee.

Another, perhaps more appealing, argument to explain why reserves increase payments to creditors has to do with the interpretation of the default transfer[7]. In section 2 it was suggested that $\lambda(\cdot)$ reflects the ability of creditors to punish a default. But this need not always be the case: To service foreign debt, HIC governments not only have to be willing to do so, but they must be able to generate a sufficiently large budget surplus to finance the payments. This internal transfer may often be problematic in countries in which the tax-base is eroded by tax-evasion, capital flight, and political constraints. The government can try to increase domestic borrowing, or use the inflation tax, but both these remedies can only raise a limited amount of funds. If this domestic-finance constraint is tighter than the no-default constraint for some values of y, there is a region in which the transfer to creditor depends on the size of the government's budget surplus. In this region, foreign exchange reserves (which are owned by the Central Bank, a part of the government) increase the transfer to creditors one-for-one.

A third reason why HICs may be reluctant to keep a large volume of reserves is if they expect foreign aid (or concessional lending) to come to their rescue when they are hit by a bad shock. Countries that have large foreign exchange reserve holdings are not likely

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[6]This empirical evidence also contradicts O'Connell's bargaining model, in which reserves increase the debtor's bargaining power in default states, and hence should reduce the transfer.

[7]I thank Eduardo Fernandez-Arias for suggesting me this line of reasoning.

to receive much aid, so the value of the expected subsidy from this implicit insurance scheme falls with the size of reserves. This hypothesis can be empirically tested by checking whether the inflow of concessional lending and foreign aid is negatively related to the level of reserves[8].

As one may expect, if reserves increase default transfers and this effect is strong enough, investment in debt buybacks emerges again as a possibly attractive asset. Let default proceeds be now $\lambda(y, s)$, with $\lambda_2 > 0$. Solving for the optimal post–default path under this set–up will yield the optimal sequence of reserve holdings s, which in turn determines the equilibrium value of the secondary market price. Going back to the necessary conditions for optimality, equation (11) now becomes

$$(12) \qquad E\,[u_1(c_d^1)\,(1-\lambda_2)\,|\;Y_d^1] = E\,[u_1(c_r^1)\;|\;Y_r^1]\left[\frac{1\;-\;G(y^{*1})}{G(y^{*1})}\right]\left[\frac{1\;-p(b^1)\;\;\gamma}{p(b^1)\;\gamma}\right]$$

Now some of the returns from reserves are taxed away in default states. So the beneficial insurance effects of reserves are watered down, while their overall expected return falls below the risk–free interest rate. For a sufficiently large λ_2, the country may benefit from buybacks at the fair price, if a favorable realization of y occurs: The country wants to transfer consumption to the next period, but this is possible only to the extent that asset accumulation does not result in an increase of payment to creditors. In repayment states, payments are limited by the size of the obligation, so both a debt buyback and reserve accumulation are effective in transferring consumption to those states. Transferring consumption to default states is more problematic, because payments are determined

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[8]In this case, the first best policy would be for international institutions not to make aid a function of the level of reserves. A precommitment problem obviously arises here.

through bargaining, and creditors are likely to appropriate some of the value of the assets. If creditors could pre-commit themselves not to extract larger transfers if the country's income is larger, HIC's would save more and they would use reserves for investment in physical capital rather than buybacks. Such a precommitment would require making debt explicitly state-contingent.

Note that if the country has a linear utility function, buybacks at the fair price always dominate reserves, as long as $\lambda_2 > 0$. With risk-aversion, on the other hand, the size of λ_2 matters, and it is therefore crucial to evaluate empirically the degree by which reserves are taxed away by creditors. Unfortunately, the two empirical studies mentioned above suggest very different sizes for λ_2. Ozler and Huizinga obtain an extremely small coefficient, while Acharya and Diwan a very large one. Assuming that λ is homogeneous of degree one in reserves, with a debt to GNP ratio of 0.72, an interest rate of 8% and a 50% secondary market discount, Acharya and Diwan's result imply an expected value of λ_2 over default states of 0.74. This means that if the probability of default is less than 74 %, λ_1 is on average greater than one. On the other hand, this parameter would be close to zero if Ozler and Huizinga's values are correct. Obviously, more empirical work is needed to solve the issue.

4. Investment in Physical Capital.

The main difference between investing in foreign exchange reserves and in the production of output (aside from differences in expected rates of return) is that the latter yields random returns. For a risk-averse country, the attractiveness of investment will then generally depend on the covariance between the marginal product of capital and

marginal utility. This section examines the case in which investment is in the production of more of the only good in the economy (output), and its marginal product is positively correlated with current consumption. This would be the case of an HIC investing in the production of her export staple, for instance. Since the country is generally unable to obtain insurance against aggregate shocks, this type of investment has undesirable properties from the point of view of consumption smoothing. Hence, even if the expected marginal product of capital is above the risk–free rate and returns from investment do not increase default transfers, a buyback at the fair price can be welfare improving.

Suppose that output y is now produced by means of capital, and let $w\,f(k)$ be the production function. w is the realization of an i.i.d. productivity shock W that takes values in some set W. $G(\cdot)$ and $g(\cdot)$ are now the c.d.f. and p.d.f. of the productivity shock. For future reference, define $\bar{w}$ to be the unconditional mean of W, $\bar{w}_r = E[W \mid W_r']$ the mean conditional on repayment in the next period, and $\bar{w}_d = E[W \mid W_d']$ the mean conditional on default in the next period. Let q be the rate of depreciation of the capital stock, and i_t be new investment. The value function under default is now

$$V^d(k, w) = \max_{i} u[w\,f(k) - i - \lambda(w, k)] + \delta\, E[V^d(k', w')]$$

$$\text{s.to} \quad k' = k(1-q) + i$$

(now the loss in case of default is a function of the capital stock as well). The value function in case of repayment is

$$V^r(k, b, w) = \max_{i} u(c_r) + \delta E \max [V^r(k', b', w'), V^d(k', w')]$$

$$\text{s.to} \quad k' = k(1-q) + i, \; b' \leq \bar{b}$$

where $c_r = w f(k) - i - (d + b) + p(b) b$. Let $f_1(k) = \frac{\partial f}{\partial k}$, and suppose $q = 0$ for simplicity. Also, take the case less favorable to buybacks, in which increased investment does not affect the loss in case of default. By combining first order and envelope conditions as in the previous sections, and if the credit ceiling does not bind, one gets

$$p(b) u'(c_r) = \delta \int_{W_r'} u'(c_r') g(W) dW$$

$$u'(c_r) = \delta \left[\int_{W_r'} [w f_1(k') + 1] u'(c_r') g(W) dW + \int_{W_d'} [w f_1(k') + 1] u'(c_d') g(W) dW \right]$$

Let $cov_r[w, u'(c_r')]$ denote the covariance between productivity and the marginal utility of consumption conditional on repayment, and analogously for $cov_d[w, u'(c_d')]$. Under the assumptions, these covariances are negative, since w is positively correlated with consumption, and marginal utility is a decreasing function of c. Let $w^{*'}$ denote the default level of the shock. Combining the two equations above and using the definitions

$$(13) \quad E[u'(c_d') | W_d'] = E[u'(c_r') | W_r'] \left[\frac{1 - G(w^{*'})}{G(w^{*'})} \right] \left[\frac{1 - p [\bar{w}_r f'(k') + 1]}{p [\bar{w}_d f'(k') + 1]} \right] + K$$

where

$$K = -\{[1 - G(W_r^1)]\,\mathrm{cov}_r[w,\, u'(c_r^1)] + G(W_d^1)\,\mathrm{cov}_d[w, u'(c_d^1)]\}\{G(w^{*1})[w_d f'(k^1)+1]\}^{-1} > 0$$

Except for the term K, equation (13) is just a modified version of (11), the corresponding optimal insurance condition under reserve accumulation. After some manipulations it can be shown that if p is the fair price, and if the expected marginal product of capital $\bar{w}\, f'(k^1) = r$, The product of the two terms in brackets on the RHS of (13) is equal to 1. So if K = 0 expected conditional marginal utilities would be equalized. But if w is positively correlated with consumption, K > 0 and when buybacks and investment yield the same rate of return the country wants to skew consumption towards repayment states. For K sufficiently large, this may require debt buybacks.

As in the case of reserves, it is likely that in default states some of the returns from new investment are captured by the creditors, which in turn makes transferring consumption to default states even costlier.

5. Negotiated Debt Buybacks.

The lack of an enforceable seniority structure in international sovereign lending makes it impossible for a country to repurchase her debt at a price corresponding to an expected return equal to the risk–free rate, even if lenders are risk–neutral. Lenders are willing to sell their loans only if they can get more than their opportunity cost of funds. These observations suggest that there is a case for subsidizing debt buybacks (and taxing new borrowing), or for promoting concerted agreements that make buybacks more attractive to debtors. In practice, most large debt buybacks have taken place within a

broader concerted agreement, if nothing else because lenders must unanimously waive sharing clauses for buybacks to go through [see K. Froot (1989)]. Since buybacks at the market price make creditors strictly better off as a group, if countries bargain over a buyback deal they should be able to extract some additional concessions, even if international institutions do not intervene in the process.

The simplest way to remove the distortion in the buyback price would be to try to force creditors to sell at the fair price. Obviously, however, each individual lender has an incentive to free–ride on such an agreement, since they make a capital gain if they hold on to their claims. Fortunately, it is possible to design slightly more complicated agreements such that each lender is indifferent between selling and not selling, and such that the price is the fair price. Two examples of such schemes are discussed here. The first one is a permission to buyback debt accompanied by a reduction in the interest rate on outstanding obligations. For an appropriate choice of interest rate reduction, the country can end up purchasing the debt at exactly the fair price, while no lender has an incentive to free–ride.

Let B be the amount of debt that the country wants to retire and g be the interest rate carried by debt maturing in the next period. The fair price for the buyback is then (all the rest of the notation is like in section 2)

$$p = \beta [1 - G(y^{*1})] (1 + g)$$

If the country offers to repurchase at this price, and no interest rate reduction is granted, no lender would sell. The price at which lenders are willing to sell, if the interest rate on the outstanding debt is reduced by k is

$$p^* = \beta [1 - G(y^{*l})] (1 + g - k) + \beta \varphi(y^{*l})(D - B)^{-1}$$

If no lender should profit from free –riding it must be $p = p^*$. hence

$$k = \varphi(y^{*l}) \{[1 - G(y^{*l})] (D - B)\}^{-1}$$

The value of ` is iess than r if

$$g [1 - G(y^{*l})] (D - B) > \varphi(y^{*l})$$

Hence. if expected future interest payments exceed expected default proceeds. for any amount of debt that the country wishes to retire, there is a level of interest rate reduction such that the creditors are willing to sell at the fair price. After the deal. creditors are exactly as well off as they were before. If the country can credibly threaten not to buyback any debt unless enough interest rate reduction is granted, she can extract all the surplus and pay exactly the fair price. A more realistic bargaining outcome will leave some gains to the creditors. and the price at which the concerted buyback occurs would be somewhere between p and p^*. This means that the distortion is not completely removed. In this case there is an efficiency argument to subsidize debt buybacks. and the funds committed by international institutions to this purpose are not a pure transfer to the parties involved, but generate welfare gains.

An agreement of the type just described resembles the Chilean buyback of 1988. In that year Chile had an unusually large trade surplus thanks to favorable copper prices, and creditors agreed to allow the country to use US$ 500 million of reserves for debt buybacks

either on the secondary market or in private negotiations to be carried out in the next three years. In the same year, Chile obtained that the spread paid on outstanding loans be reduced to 13/16 percent. In November, $299 million of debt was retired at an average discount of 44 cents on the dollar, which was the secondary market discount [World Debt Tables (1988–89)]. This episode seem to correspond well to the concerted agreement just described.

In the second type of concerted buyback a "new money" requirement is imposed on banks that do not sell their debt at the buyback price. This scheme is discussed by Diwan and Kletzer (1990) in reference to the Mexican debt reduction agreement of 1989. This agreement was not a buyback, but a swap of debt for exit bonds. Since the exit bonds (a discount bond or a par bond with a lower interest rate) implied lower expected debt service, debt reduction was achieved. To induce banks to agree to the swap, the exit bonds were enhanced in various ways through collateral and partial guarantees. So the operation was similar to a buyback, in which the value of the enhancements corresponds to the cash spent for direct repurchases. Banks were required to commit new funds in proportion of the exposure that was not swapped. This requirement is just a way to force creditors who do not exit to finance part of the buyback. Let x be the amount of new money (as a fraction of exposure) that lenders who do not sell their claims must extend. Notice that to achieve the desired level of debt reduction now the country has to retire more debt, since the new money increases total indebtedness. In particular, $B + x(D - B)$ will have to be repurchased. The price at which lenders are willing to sell, given that they have to relend a fraction x of residual exposure is

$$p^{*'} = \{\beta[1 - G(y^{*'})](1 + g) + (D - B)^{-1}\beta\varphi(y^{*'})\}(1 + x) - x$$

For every unit of debt not sold a creditor must invest x of new money which will yield an expected repayment equal to the expression in brackets. The value of x such that $p = p^{*1}$ is

$$x = \frac{1}{d}\left[\frac{\beta\ \phi(\hat{y}^{*1})}{(D - B)}\right]$$

where $d = 1 - \beta[1 - G(y^{*1})](1 + g) + (D - B)^{-1}\ \beta\ \phi(y^{*1})$ is the discount at which the debt would be sold after the buyback, in the absence of a new money requirement. Such a requirement is a transfer to the debtor because lenders are forced to issue at par loans that are traded at less than face value. Another way of interpreting the formula above is that what lenders gain on each unit of buyback $(\beta\ \phi(y^{*1})\ (D - B)^{-1})$ must be exactly equal to what they lose (d x).

A debt buyback accompanied by a new money requirement has recently been carried out by the Philippines. US$ 1.3 billion of debt was retired at a 50% discount. At the same time, US $ 714 million in new money was extended, so that the buyback was more than fully financed by the creditors. Banks could still have been better off, if the market value of debt after the deal had increased sufficiently. In practice, the market value of debt fell from US $ 5.19 billion to US $ 4.96 billion, and banks lost from the Philippine buyback[9]. When countries can strike such good deals (or when creditors are so generous), it is not hard to buybacks can increase their welfare aside from intertemporal consumption smoothing considerations.

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[9]It is possible to show that buybacks financed by creditors make the creditors better off if and only if the country is on the wrong side of the debt–Laffer curve, that is if the elasticity of the secondary market price to the face value of debt is greater than one

Finally, attempts to repurchase debt at above the market price, such as the Mexican swap in 1988 [see R. Lambdany (1988)], and Chile's second buyback in 1989, resulted in very little debt being tendered, showing that more complex deals are necessary to deal with free–riding.

5. More on the Lender Side of the Market.

Aside from the lack of seniority, other elements may put a wedge between the secondary market price of debt and the fair price. One of these elements is the presence of (mispriced) Federal Deposit Insurance (FDI) in the United States. Since deposits are fully insured, and insurance premia do not depend on the riskiness of a bank's portfolio, the secondary market price is equal to expected payments conditional on the bank not going bankrupt in the next period: Repayments occurring in bankruptcy states go to depositors, as part of the bankruptcy proceeds. If the deposit were not insured, these payments would lower the interest rate on deposits. With insurance, they simply accrue to the FDI, and since insurance premia are flat they do not affect banks' profits. If the probability of bankruptcy is not zero, the conditional expectation is smaller than the unconditional one, and the secondary market value of debt is lower than the present value of expected repayments. This distortion tends to offset the distortion due to lack of seniority.

S. Ozler and H. Huizinga (1990) raise the issue of the effects of federal deposit insurance on secondary market prices. They find that the debt of countries to which banks are more exposed trades at a higher price. This is explained through a model in which, because of FDI, banks do not care about expected repayments in bankruptcy states: If banks are very exposed to country A and country A repays, the bank is unlikely to go

bankrupt. Conversely, repayment by a small debtor do not affect the probability of bankruptcy. Since it is the returns in those bankruptcy states in which countries repay that are missing from banks' valuation. ceteris paribus banks value more debt of countries to which they are highly exposed. Consistent with the FDI hypothesis, Ozler and Huizinga also find that strengthening capital requirements would increase the market price of debt. Curiously, however, they conclude that their findings "strengthen the arguments that buybacks may be harmful to countries". In fact. debt buybacks allow countries to take advantage of the presence of subsidized FDI.

In a recent paper. A. Demirguc–Kunt and I. Diwan (1990) study the consequences of book–value regulations on banks behavior. Loans that are valued at a discount on the secondary market can be carried on the books at face value, according to U.S. regulatory practices. If some of the debt is sold, however, the entire portfolio must be written down. Since a larger book value of asset allows to increase leverage, which in turn increases the implicit subsidy from the FDIC, selling debt at a discount generates an extra–cost to commercial banks. This effect tends to bias secondary market prices upward. A study of the 1989 Brazilian rescheduling confirms that banks' financial strength is positively correlated with their willingness to exit at a discount.

Another aspect of banks' environment that potentially distorts secondary market prices is the asymmetry of the tax system. In the U.S., the tax system is not neutral with respect to the time pattern of profits and losses reported by corporations: Losses generate tax–credits that can be carried back up to three years into the past (meaning that banks can obtain a refund of taxes paid in the previous three years up to the amount of the credit). If the tax–credit exceeds taxes paid in the previous three years. losses can be carried forward for fifteen years, but no interest accrues on them. This amounts to lending

to the government at zero interest rate. After a few years of low profitability, the tax cost of posting losses can be very significant, and banks have an incentive to keep assets such as HIC loans at face value in their books until a period of profitability occurs. Banks who have not recently been and are not very profitable would demand a higher price for selling their loans on the secondary market. Hence, the asymmetry in the tax system tends to bias secondary market prices upwards. The size of the bias is going to be more significant in periods in which commercial banks are not very profitable and interest rates are high.

6. Conclusions.

Whether a rational and optimizing government would ever repurchase debt on the secondary market if it could do so at a fair price is a rather complex issue. Debt buybacks are best viewed as the purchase of an asset. In the context of intertemporal consumption smoothing, countries are more likely to benefit from such a purchase when they experience unusually favorable levels of income (or foreign exchange earnings). The attractiveness of debt buybacks also depends on whether they pay larger expected rates of return than other assets, and on how the returns are distributed across states of nature. Debt buybacks should yield an expected return equal to the risk–free interest rate, if the distortion due to the lack of seniority rights in sovereign lending was removed. Returns, however, are concentrated exclusively in non–default states, which tend to be high consumption states. So debt buybacks appear to be a rather unattractive asset from the point of view of insurance. Nonetheless, highly indebted countries may not have much better alternatives to carry consumption into the future: Accumulation of foreign exchange reserves could provide an expected rate of return equal to the risk–free rate in all states of nature, but for

a number of reasons (that need more careful theoretical and empirical investigation) it is likely to increase payments to creditors in default states. Large reserves are also likely to reduce the amount of concessional lending that the country can receive. When these effects are taken into account, reserves yield less than the risk–free rate in expected value, and the returns are skewed towards high income states.

As to investment in physical capital, if projects that yield large rates of return tend to be positively correlated with output also this alternative is not very attractive from an insurance point of view. Moreover, investment does not provide an "efficient" way of transferring consumption to default states if the returns are partially appropriated by creditors. On the other hand, if the country has investment projects that tend to be negatively correlated with output and yield a rate of return not too far from the risk–free rate, these projects should be preferred to debt repurchases.

From this perspective, attempts at eliminating the bias against buybacks due to the absence of seniority should yield welfare improvements, at least under some circumstances. Buybacks that are accompanied by an appropriate reduction of the spread at which outstanding debt is rescheduled or by new money requirements can reduce the distortion, while requiring a minimum amount of coordination among banks. Both schemes have been utilized successfully. Of course, if it was possible to create an enforceable seniority structure in sovereign lending, the distortion would be directly eliminated.

Finally, the rate of return on buybacks is also likely to depend on the characteristics of the creditors. There are indication that the presence of (mispriced) federal deposit insurance tends to distort downwards the secondary market price of debt, thereby increasing the rate of return on buybacks. On the other hand, the requirement that forces

banks to write down to market value the entire portfolio of debt. if some of it is sold at a discount, tends to have the opposite effect. Also, the asymmetry of the tax system is likely to bias upwards secondary market prices. in periods of low bank profitability. These considerations suggest that more sophisticated modelling of the lenders' side of the market is needed to interpret observed secondary market prices correctly.

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