Coordinating Creditors

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Abstract

The market for developing country sovereign debt has become increasingly competitive. Is this necessarily good for welfare? Or, is there scope for beneficial government intervention to reduce competition, and promote coordination, among creditors? This paper reviews recent theoretical work on the market for developing country sovereign debt that shows that competition can reduce welfare. Further, it argues that while private sector creditor organizations have been successful at coordinating existing creditors in history, government intervention to discourage entry by new creditors may be welfare improving today.

In the past three decades, the market for developing economy sovereign lending has grown increasingly competitive. Advances in telecommunications and the removal of capital market regulations have reduced the costs of doing business. At the same

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time, the shift away from syndicated bank loans towards bonds, illustrated in Figure One, has opened up the market to larger numbers of investors.

In any ordinary market, these developments would be seen as an unquestionably good thing for ordinarily competition promotes the efficient allocation of resources in the economy by forcing firms to price at marginal cost. However, sovereign debt is not traded in an ordinary market as there is no supra-national legal system that can guarantee the enforcement of a contract. And when contracts must be enforced by informal means – such as through a threatened denial of future credit – efficiency *ex ante* is limited to the extent that creditors can coordinate in imposing punishments *ex post*[1]. This begs the question: Is there a role for government policy to encourage cooperation, and discourage competition, in the market for developing country sovereign debt?

Towards an answer to this question, Section I outlines a simple economy in which an developing country borrows internationally to invest in productive domestic projects. I begin by assuming that contracts can be enforced, but are limited in their complexity, and demonstrate that competition in such a world increases efficiency. The intuition is familiar: when contracts are limited, non-competitive firms extract profits at the cost of an inefficient allocation of resources. As a result, an increase in competition limits the ability of firms to extract profits and promotes efficiency. However, when contracts are sufficiently flexible, non-competitive firms can extract profits through price discrimination without any loss of efficiency. And given that international financial markets are increasingly sophisticated, this suggests that the efficiency benefits from increased competition may be small. Section II alters the environment to limit the enforceability of contracts and shows that increased competition may decrease the

efficiency of resource allocation. Section III then concludes by extracting lessons for policy from both the theory, and from the history of efforts to coordinate international creditors in practice.

I. ENFORCEABLE DEBT

Consider the problem of a small open economy represented by an agent with linear utility. Time lasts forever and in every even numbered year the country has access to a production opportunity which requires foreign capital k, and produces output of

$$f(k) = ak - \frac{b}{2}k^2$$

the following (odd numbered) year. This particular form for the production function ensures that the marginal product of capital (the country's demand curve) is linear.

The country borrows capital from a group of N profit maximizing international creditors, where N is our index of market competitiveness below. The creditors discount the future at the rate r, while the country discounts at rate $\rho \geq r$. Potential gains from trade are maximized when the country invests the first-best amount

$$k^{FB} = \frac{a - (1+r)}{b}$$

in each even numbered year. To begin, I assume that $\rho = r$ so that the only motive for trade in capital is for production; as a result, in a first-best world the distribution of odd period surplus

$$S^{FB} = \frac{[a - (1+r)]^2}{2b}$$

is indeterminate both across creditors and the country, as well as through time.

To understand the effects of competition on efficiency in the market for emerging market debt, I begin by assuming that all contracts can be costlessly enforced, but

are limited in their complexity. In particular, suppose that in each period creditors offer simple loan contracts at interest rate r^B with the size of the loan determined by the country. I assume that creditors can make offers anonymously (this rules out strategies for the country in which it induces a price war by always breaking ties in favor of one creditor). This game has been designed to mimic a repeated Bertrand oligopoly game: faced with a price, the country chooses quantities off its demand curve, while anonymity ensures symmetric tie-breaking (in expected value).

There are many subgame perfect equilibria of this game, and so I focus on the symmetric one that maximizes cooperation (collusion) by creditors. If creditors cooperate, the best they can achieve for themselves is an equal split of the monopoly level of profits

$$\pi^M = \frac{(a-(1+r))^2}{4b},$$

which is attained with a quantity of loans half as large as the first best. This produces a level of world welfare three-quarters of the efficient level. But this can be achieved only if the number of creditors is sufficiently small. If a member of the group of creditors were to deviate from this cooperative arrangement, they could capture the entire profits in one period for themselves by slightly undercutting the monopoly price. The worst punishment that can be levied against such a creditor is the threat of reversion of the competitive price r with consequently zero profits. As a result, collusion can be sustained as long as the number of creditors is not too large, or

$$N \leq N^* \equiv \frac{(1+r)^2}{(1+r)^2-1}.$$

In this case, the ability of creditors to contract with the country is limited exogenously, and so creditors extract surplus from the country through inefficiently low levels of capital flows. As competition increases, the ability of creditors to act non-

competitively is limited and consequently the deviation from the efficient allocation is reduced.

Results like this one lead to the common presumption that competition is good for efficiency. However, the restriction on contract form seems less appealing when applied to international financial markets (which are increasingly sophisticated) and to loans with sovereign governments (where price discrimination seems reasonably easy to sustain).

Instead, suppose that creditors are able to offer contracts that specify pairs of loan amounts and repayments, and as above assume that these offers can be made anonymously. From the perspective of the creditors, the worst subgame perfect equilibrium of this repeated game involves all creditors offering the first best loan amount at interest rate r. Given this, it can also be established that, as long as the number of creditors is less than N^*, the creditors are able to collude and extract the entire surplus S^{FB} from the country. As before, when $N \leq N^*$, a share of the total surplus in every period is worth more to a creditor than one period of the surplus to itself. For larger N, only the competitive outcome is an equilibrium.

The implications for world welfare are very different from the simple loan contract case. Here, independently of the number of creditors, investment is *efficient*. This result is important for policy: if international financial markets are sufficiently complex so as to allow price discrimination, the welfare gains from greater competition are likely to be small even if enforcement is perfect. It is true that in both models, competition shifts the allocation of welfare in favor of the developing country. But the redistributive consequences of greater competition can also be duplicated by other policies. This may be particularly important when enforcement is imperfect

for, as I show in the next section, in such a world increased competition can decrease efficiency.

II. UNENFORCEABLE DEBT

When contracts are unenforceable, the set of contracts that can be sustained in equilibrium is limited by the necessity that each contract be self-enforcing. I begin by characterizing the set of allocations that can be sustained when contracts are unenforceable, and then demonstrate how they can be implemented as an equilibrium of a game between the country and a single creditor. I then show how the ability to implement this outcome varies as I change the number of creditors, and how results can vary as I change assumptions on the ability of both country and creditor to commit.

To begin, assume that the amount of resources that can be transferred from the developing country to the creditor in any period T_t is constrained by the fact that neither the creditor nor the country can commit to honor a contract. Under this assumption of *two-sided limited commitment*, the best allocations that can be achieved solve the problem of maximizing the level of welfare provided to the country

$$\left(\frac{\rho}{1+\rho}\right)\sum_{s=0}^{\infty}\left(\frac{1}{1+\rho}\right)^{2s+1}\left(f\left(-T_s\right)-T_{s+1}\right),$$

subject to a constraint on creditor profits and sequences of continuing participation constraints for both the creditor and the country.

Inspection of the objective function for the country reveals that by defining the following time-dependent period utility function

$$u_s\left(T\right)=\begin{cases} f\left(T\right)/\left(1+\rho\right) & \text{if } s \text{ is even} \\ T & \text{if } s \text{ is odd} \end{cases},$$

and ignoring non-negativity constraints, the problem can be rewritten as one of maximizing

$$\left(\frac{\rho}{1+\rho}\right)\sum_{t=0}^{\infty}\left(\frac{1}{1+\rho}\right)^{t}u_t\left(-T_t\right),$$

subject to sequences (one for each t) of participation constraints for the creditor and the developing country

$$\begin{aligned}\left(\frac{\rho}{1+\rho}\right)\sum_{s=t}^{\infty}\left(\frac{1}{1+\rho}\right)^{s-t}u_s\left(-T_s\right) &\geq 0,\\ \left(\frac{r}{1+r}\right)\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}T_s &\geq 0,\end{aligned}$$

and a constraint on initial creditor profits

$$\left(\frac{r}{1+r}\right)\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^{t}T_t \geq S,$$

where the parameter S indexes the distribution of initial surplus. This is an entirely standard limited commitment problem. The constraint set is convex, and the first order conditions for an interior maximum can be rearranged to yield

$$\left(\frac{1+r}{1+\rho}\right)^{t}u_t'\left(-T_t\right)=\frac{\lambda+\sum_{s=0}^{t}\mu_s^C}{1+\sum_{s=0}^{t}\mu_s^D},$$

where the μ_t^i are current value multipliers on the continuing participation constraints of the Developing country ($i=D$) and Creditor ($i=C$) respectively, and λ is the multiplier on the creditor's profit constraint.

This problem nests a number of interesting cases. For example, if both the country and the creditor can commit to honoring their contracts (so that neither sequence of participation constraints ever binds) and $r=\rho$ (so that the economy is at an interior solution with respect to consumption) the first-order conditions can be rearranged to give the first best level of investment in every even period, or $f'\left(-T_t\right)=1+r$.

Next, suppose that the country cannot commit to honoring its contracts, but that creditors are able to use the legal systems of the developed economies in which they are based to commit themselves. This case of *one-sided limited commitment* corresponds to ignoring the creditor's continuing participation constraint in the above programming problem, or setting $\mu_t^C = 0$ for all t. Now the first order condition gives

$$\left(\frac{1+r}{1+\rho}\right)^t u_t'\left(-T_t\right) = \frac{\lambda}{1+\sum_{s=0}^{t}\mu_s^D}.$$

If $\rho = r$, the marginal utility of consumption for the country is non-increasing, eventually converging to a constant where the participation constraint of the country never binds. The reason is intuitive: as the creditor can commit to repaying contracts, the country responds by accumulating a buffer-stock of savings with the creditor which it is uses to finance its investments over time. That is, the country becomes a net-saver in international markets.

In order to studying borrowing, assume that $\rho > r$. If t is odd, this gives

$$\left(\frac{1+r}{1+\rho}\right)^t = \frac{\lambda}{1+\sum_{s=0}^{t}\mu_s^D},$$

so that in period $t+1$ (even) we have

$$\left(\frac{1+r}{1+\rho}\right)^{t+1}\left(\frac{1}{1+\rho}\right) f'\left(-T_{t+1}\right) = \frac{\lambda}{1+\sum_{s=0}^{t}\mu_s^D}\frac{1+\sum_{s=0}^{t}\mu_s^D}{1+\sum_{s=0}^{t+1}\mu_s^D}$$

and hence

$$\frac{1+r}{(1+\rho)^2} f'\left(-T_{t+1}\right) = 1,$$

because $\mu_{t+1}^D = 0$. That is, the country invests less than the first best investment level. Together with the participation constraints of the country, this equation pins down the constrained efficient allocation for this economy. All efficient allocations have a similar form: after an initial loan that varies in size according to the distribution of

surplus, the economy converges to a stationary equilibrium in which the constrained efficient amount is invested.

In Wright (2004a), I show how to implement this allocation as the equilibrium of a game in which a creditor makes contract offers to a country so that the creditor has all the bargaining power. The creditor is assumed to have access to a commitment technology for delivering on promises next period. This technology allows the creditor to both take deposits, and to make loan commitments, where the latter serve to bind the creditor not to extract too much surplus in the future. Given an initial loan commitment, this game has a unique subgame perfect equilibrium which is constrained efficient.

When the number of creditors in the market increases, the potential for multiple equilibria arises. The worst equilibrium involves creditors making zero profits by offering deposit contracts at interest rate r. As long as the number of creditors is not too large, the threat of reversion to this competitive deposit-taking equilibrium can support the constrained efficient level of capital flows. To see this, note that a deviating creditor can offer a range of contracts that include both deposit and loan components. If this creditor offers a loan, the country will default on the loan next period and deposit the proceeds with the other creditors (by an argument familiar from Bulow and Rogoff 1989b). But if this creditor offers a deposit contract, it can induce the country to default on its other loans and make a profit. When an individual creditor's share of the profits from lending is small, and they are not too impatient, this becomes more profitable than lending, and hence no lending can be sustained in equilibrium.

Unlike the simple loan case studied above, the "competitive" outcome in this case

is not constrained efficient: investment in the country is in general too low, at least in the initial period. That is, when enforcement is limited, competition in the market for developing country sovereign debt reduces efficiency. Importantly, competition is defined by the number of creditors and not by the profitability of those creditors. In fact, and also unlike the simple loan contract model studied above, cooperation can be sustained even when creditors make zero-profits (so that the market may appear very competitive on the surface). The reason lies in the inherently inter-temporal nature of the loan contract: even if expected repayments leave all creditors indifferent to making the loan, threats of disrupting future repayments support cooperation in equilibrium.

Perhaps a little surprisingly, when neither country nor creditor can commit (so that in general both sequences of participation constraints may bind) capital flows may be more efficient as the ability of creditors to coordinate in imposing punishments on the country is improved: deviations that involve deposit contracts are no longer feasible. Narayana Kocherlakota (1996) has shown how the constrained efficient allocation with two-sided limited commitment can be implemented as one of the subgame perfect equilibria of a game between a country and a creditor in which each party makes simultaneous transfers to each other at the start of every period. This result carries over to the present environment.

To see the effect of increases in competition in this game, imagine that the number of creditors playing this game is increased. If the original equilibrium strategy profile is modified to include zero transfers to these new creditors, which are reciprocated by zero transfers in turn, it is easy to see that this adjusted strategy profile implements the same allocation. That is, when both the country and creditors cannot commit to honoring contracts, changes in the number of competing creditors have no effect

on the efficiency of the market for developing country sovereign debt. Nor is the result solely an artifact of the multiplicity of equilibria of this simultaneous move game; Kenneth M. Kletzer and Brian D. Wright (2000) drastically refine the set of equilibria by insisting on coalition proofness for their economy and show that the set of coalition proof equilibria is also invariant to the number of competing creditors.

III. POLICY LESSONS

Is there room for beneficial intervention by creditor country governments in the market for developing country sovereign debt? If so, what form should intervention take? Perhaps counter-intuitively, the theory warns against direct attempts to improve contract enforcement. This is because national sovereignty inevitably limits the ability to enforce contracts with developing country governments, so that enforcement mechanisms have their largest effect on creditors. And when enforcement is asymmetric, improvements in enforcement that expand potential gains from trade *ex ante* may be offset by reductions in the ability to cooperate *ex post* (this assumes that enforcement cannot be tailored to prevent fraudulent conveyancing as in Philip Bond and Arvind Krishnamurthy 2004).

The theory also demonstrates that *if* barriers to entry limit the number of creditors and *if* these creditors cooperate effectively, the constrained efficient allocation of resources is attainable without government intervention. Consequently, if these conditions are absent there may be room for beneficial government intervention. History gives us reason to be optimistic about the latter condition: private sector efforts to coordinate market participants appear to have been successful in practice. In Wright (2004b), I trace the formation of one of these institutions – the British Council of

Foreign Bondholders – to an 1860's violation of a creditor embargo of Spain, and argue that the Council and its successor Corporation were effective in deterring further embargo violations (see Paulo Mauro and Yishay Yafeh 2003 for an alternate interpretation). However, efficiency also requires that existing creditors coordinate with potential new entrants and, over time, barriers to entry into the market for developing country sovereign debt have fallen. This suggests that government intervention in the form of restrictions on entry may be necessary for efficient outcomes.

REFERENCES

Bond, Philip and Krishnamurthy, Arvind. "Regulating Exclusion from Financial Markets." Review of Economic Studies, July 2004, 71(3), pp. 681-707.

Bulow, Jeremy and Rogoff, Kenneth. "A Constant Recontracting Model of Sovereign Debt." Journal of Political Economy, February 1989a, 97(1), pp. 155-178.

Bulow, Jeremy and Rogoff, Kenneth. "Sovereign Debt: Is to Forgive to Forget?" American Economic Review, March 1989b, 79(1), pp. 43-50.

Kletzer, Kenneth M. and Wright, Brian D. "Sovereign Debt as Intertemporal Barter." American Economic Review, June 2000, 90(3), pp. 621-639.

Kocherlakota, Narayana. "Implications of Efficient Risk Sharing without Commitment." Review of Economic Studies, October 1996, 63(4), pp. 595-609

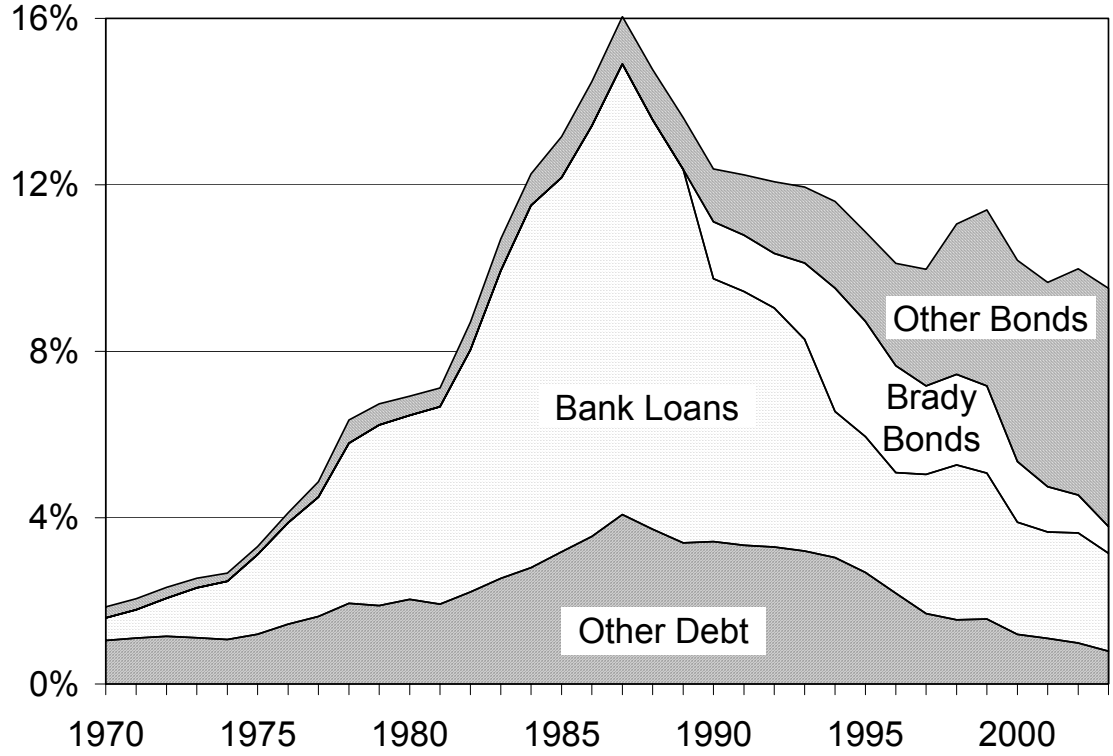
Mauro, Paolo and Yafeh, Yishay. "The Corporation of Foreign Bondholders." International Monetary Fund Working Paper No. 03/107, 2003.

Wright, Mark L. J. "Reputations and Sovereign Debt." Working Paper, Stanford University, 2004a.

Wright, Mark L. J. "Creditor Coordination and Sovereign Risk." Working Paper, Stanford University, 2004b.

Figure 1: Developing Country Sovereign Debt

From Private Sector Creditors (Percentage of Gross National Income)



Notes

[1]Related concerns apply to other informal mechanisms for contract enforcement. For example, if default is deterred by the threat of trade sanctions, as in Jeremy Bulow and Kenneth Rogoff (1989a), cooperation among *trading partners* is necessary to sustain lending by *creditors*.