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Debt Relief and Adjustment Incentives:
A Theoretical Exploration *

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## Abstract

The purpose of this paper is to analyze the argument that debt relief would increase the incentive of a debtor country to make an adjustment effort (to invest) and that for this reason creditors may benefit by granting relief. It is shown that there are actually opposing incentive effects of debt relief and that the argument could be valid in particular circumstances. A distinction is made between exogenous and endogenous relief, the latter compelled by low capacity to pay caused by low investment earlier.

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## Summary

This paper analyzes the argument that creditors may benefit by granting debt relief since it increases the incentive of a debtor country to make an adjustment effort (to invest). The paper presents a model in which, when the debt service obligations become due, the country has a minimum consumption level and a level of output determined by the amount of investment in the past. "Capacity to pay" is the excess of output over the minimum consumption level. If capacity to pay is below the debt service obligations, endogenous debt relief will be granted. If investment in the earlier period had been higher, capacity to pay later would be higher and less endogenous relief would be needed.

In this model, the gains from extra output go wholly to paying debt service until endogenous relief becomes unnecessary. At this point, the gains go to the country itself. Thus, in certain circumstances, the country may have less incentive to adjust in the earlier period if there is no possibility of endogenous relief later.

It may thus be in the interest of creditors to grant some exogenous relief (i.e., reduce the contractual value of the debt) to give the country more incentive to adjust and so avoid further endogenous relief. For the creditors, half a loaf is better than none. This is the pro-incentive argument for debt relief. The paper shows in detail that the argument depends on various conditions and, above all, on the capacity to pay concept. It is also shown, however, that debt relief could have a disincentive effect, essentially because it reduces the need to generate resource transfers. Hence there are opposing incentive efforts at work.

# I. Introduction

It is sometimes argued that debt relief would reduce the incentive of a debtor country to adjust and, at the limit, if it obtained full relief it would not need to adjust at all as it would not need to generate resources to make the transfer of interest and principal. Against this there is a contrary argument that a high debt burden reduces the adjustment incentive since all or most of the benefits from increased output would go to foreign creditors. There are thus two quite opposing views and it is an interesting question how they can be reconciled and, indeed, whether there are not more than two aspects to this question. Thus, it has also been observed that the present and expected tax burdens implied by the government's debt service obligations are likely to have familiar disincentive effects. Finally, and most important, the question arises whether the possible incentive effects of debt relief provide some case for creditors to provide relief. 1/

# II. A Simple Intertemporal Model

"Adjustment effort" is presumably the effort which is varied in response to changing incentives. This concept can be given various meanings and writers in this field are not always clear as to what they mean, possibly having more than one idea in mind. A very specific meaning concerned with consumption and investment will be given to the concept here and all the main issues will be explored in terms of that meaning. A broader interpretation will be noted later.

There are four periods. In period 1--the past--the country acquired a debt to finance extra consumption and investment and it is now at the end of this period. Immediately ahead is period 2, when the country receives further loans and benefits from rescheduling so as to finance its inherited debt service obligations. Hence, it will not make any net transfers of resources on account of debt and on a net basis it is not really servicing the debt. Rather it is expected to invest appropriately so that it will be able to service the debt (including new debt incurred in period 2) in the following period 3. 2/

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1/ All these arguments are frequently put informally and the aim here is to give them some rigorous content. The argument that the incentive effect of debt relief (called the pro-incentive effect in this paper) provides a justification for creditors to provide relief has been put by Jeffrey Sachs in several papers. See, for example, Sachs and Huizinka (1987), pp. 594-95.

2/ It is simplest to assume that there is no private capital inflow or capital outflow (capital flight) during periods 2 or 3. This simplifying assumption, unrealistic for some countries, does not alter the main argument. It will be reconsidered at the end.

The contractual debt obligation in period 3 consists of a stream of interest and principal repayments which is the equivalent of a stream of lump-sum taxes payable by the country to foreign creditors. In practice, the real value of this stream depends on world real interest rates, since most of the debt has been floating rate debt, but in the main analysis here it will be assumed that real interest rates are constant. (This assumption will be removed at the end.) The concern here is with sovereign debt so that the stream is equivalent to taxes levied by foreign creditors on the government of the debtor country. The taxes will be payable out of the country's output stream in period 3, which will have been increased by investment that took place both in the past period 1 and in period 2.

Finally, away in the future, there is a period 4 when all inherited debt will have been paid off but when the country may wish to borrow again, whether for consumption or investment, and for the sake of which it may wish to preserve its creditworthiness.

In Figure 1, the horizontal axis shows output, consumption and investment in period 2. Output is OA' and is influenced by how much investment took place in period 1. The central issue is how much will be consumed and how much invested in period 2. Consumption in period 2 is measured from the left-hand axis. The vertical axis shows expected output and consumption in period 3, the excess of output over consumption being debt service payments. The stream of expected output and debt service payments is collapsed into a single time period, so that the vertical axis shows the present value (as perceived at the beginning of period 2) of expected period 3 output, consumption and debt payments. Any investment in period 3—designed to benefit period 4—is ignored. It can be thought of as a fixed amount included in period 3 consumption.

If investment in period 2 were zero, output in period 3 would be A'A. The curve AB shows how output in period 3 is expected to increase as investment in period 2 increases. It is assumed that there is a minimum level of consumption in period 2 so that consumption cannot fall below OB'. The debt service payment due in period 3—equivalent to a lump-sum tax on the country—is BC and the curve CC' is vertically below BA by the distance BC at every level of period 3 output. CC' represents the debtor country's absorption possibilities in period 3.

The next step is to imagine an intertemporal utility function for the debtor country's government, the arguments being only national consumption in period 2 and national consumption in period 3. The utility function is well behaved, with both goods normal, and can be represented by an indifference curve map. Two indifference curves are shown in Figure 1, one at R, tangential to AB, and the other at S, tangential to CC'.

If there were no debt service to be paid, equilibrium would be at R, investment in period 2 being A'R'. But when there is a lump-sum

FIGURE 1



Output and
Consumption
in period 3

Output, Consumption, and Investment
in period 2
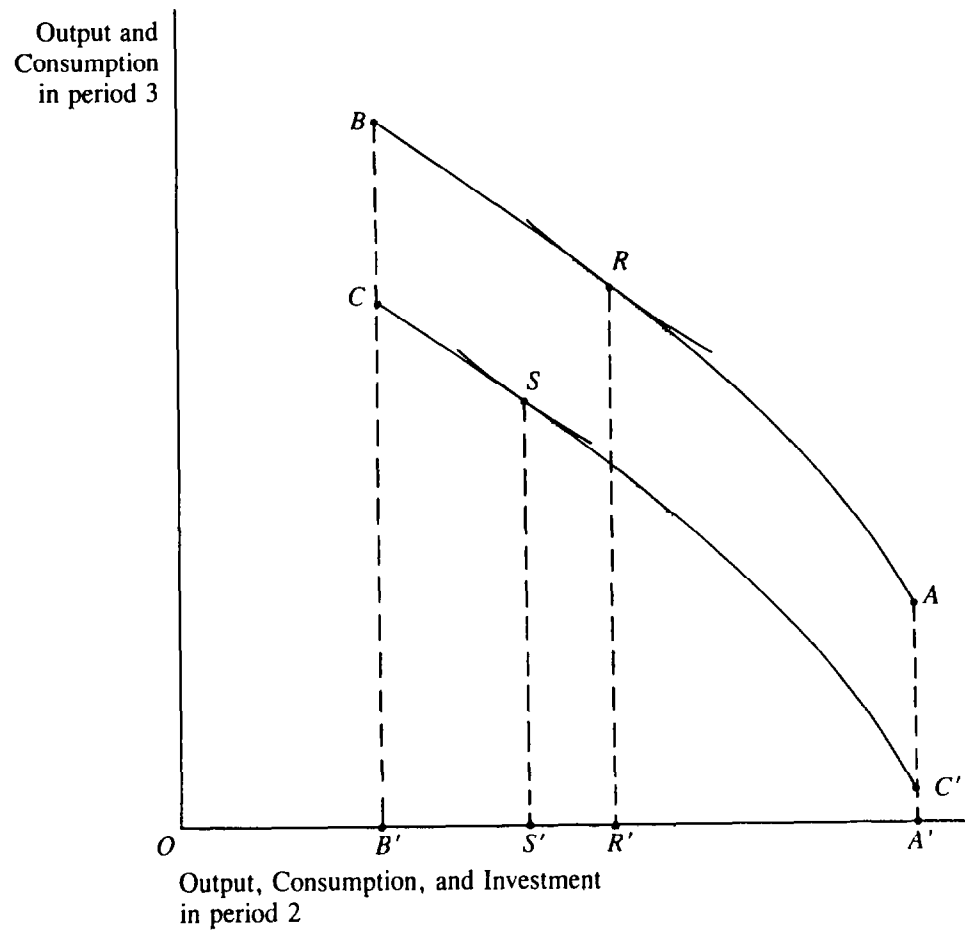
payment to foreign creditors to be made in period 3, investment in period 2 will be higher, namely at A'S'. Thus the simple conclusion follows that debt service obligations in the future would increase investment now, and this can be interpreted to mean that current "adjustment effort" is increased. The debt service obligations involve a sacrifice in period 3, and the commonsense proposition is that it will be optimal for some of this sacrifice to be shifted to period 2.

It follows that debt relief would reduce investment and adjustment effort, this conclusion confirming one of the popular arguments referred to at the beginning of this paper. This is the disincentive effect of debt relief. In the diagram, complete debt relief would involve a movement from S to R and partial debt relief a movement to some point on SR between the two extreme cases.

The fuller macroeconomic implications of such debt relief might be noted. In period 2 investment falls and consumption rises but net resource transfers abroad remain zero. In period 3, output falls relative to the situation in the absence of relief (because investment was lower in period 2) but resource transfers abroad decline so much that consumption actually rises. Relative to the situation in period 2, one would expect the real exchange rate of period 3 to depreciate (to generate the appropriate switching of output toward tradables and demand away from them as required by the remaining resource transfer), but relative to the outcome without debt relief it would appreciate.

Various policies can bring about an increase in investment with an associated reduction in consumption--i.e., a movement to the left in the diagram--and investment could be public or private. For example, increased public investment might be financed by reduced transfers, lower public sector wages or higher taxes that reduce private consumption. Alternatively, increased bank credit might raise private investment, consumption being reduced at the same time through reduced government consumption spending, higher taxes, and so on. Of course, the form of investment will affect its productivity and hence the slope of the AB curve, a complication that is ignored here. 1/

In addition, the concept of investment might be defined more broadly if this analysis is to be relevant for current discussions. One might regard "economic reform" (for example, trade liberalization, an improvement in agricultural pricing policy, or a reform of parastatal organizations) as a form of investment that is expected to increase output and hence capacity to pay debt service in period 3. It imposes a

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1/ Investment might be defined as gross or net. If it were defined as net, output in period 3 resulting from zero investment in period 2 (A'A in Figure 1) would presumably be equal to or greater than period 2 output A'A.

current cost on the political system and on interest groups which can be equated with a loss of current consumption. Hence, both an increase in investment as usually defined and "economic reform" in the broader sense represent increases in "adjustment effort" in period 2, and are represented in the diagram as an increase in investment—a movement to the left on the horizontal axis.

### III. Capacity to Pay and Endogenous Debt Relief

The next step is to seek a formal basis for the argument that debt relief might increase adjustment effort—the pro-incentive effect. It will now be assumed that there is a minimum consumption level in period 3 and creditors will feel obliged to grant debt relief if it is needed for the country to attain this minimum level. This assumption is the crucial ingredient in the subsequent discussion. The alternative to debt relief is then default. The lower the debtor country's output in period 3, the more debt relief would have to be granted. Hence, a distinction must be made between exogenous debt relief that has been discussed so far, and which may be granted at the beginning of period 2, and endogenous debt relief which may have to be granted in period 3.

In Figure 2, the minimum consumption level in period 3 is OL. If investment in period 2 had only been A'K', output in period 3 would have been just equal to this minimum level—at K. The creditors would then feel obliged to grant 100 percent endogenous debt relief (or the country would completely default).

If investment in period 2 increased from that level, and hence output in period 3 increased, some endogenous relief would still need to be granted until M were reached when output would be sufficient for the full contractual debt service to be paid while the debtor country's period 3 consumption is at its minimum level. In other words, "capacity to pay"— a popular term in this field—is sufficient at M to meet the whole debt service. Capacity to pay is represented for each level of period 3 output (and hence investment in period 2) by the vertical distance between BK and LK.

If there were no debt relief of any kind, whether exogenous or endogenous, the debtor country's intertemporal consumption possibility frontier would be CC'. Assuming no exogenous relief but introducing endogenous relief based on the capacity to pay concept just described, the frontier becomes CNKA. Along CN there is full debt service. At N, the country is just able to make full payment given the need to sustain the minimum consumption level. Along NK, consumption stays constant at the minimum level and reductions in output are reflected in increasing endogenous relief until at K there has to be 100 percent endogenous relief. Output below K is insufficient to yield the minimum consumption level.

FIGURE 2



Output and Consumption in period 3

Output, Consumption, and Investment in period 2
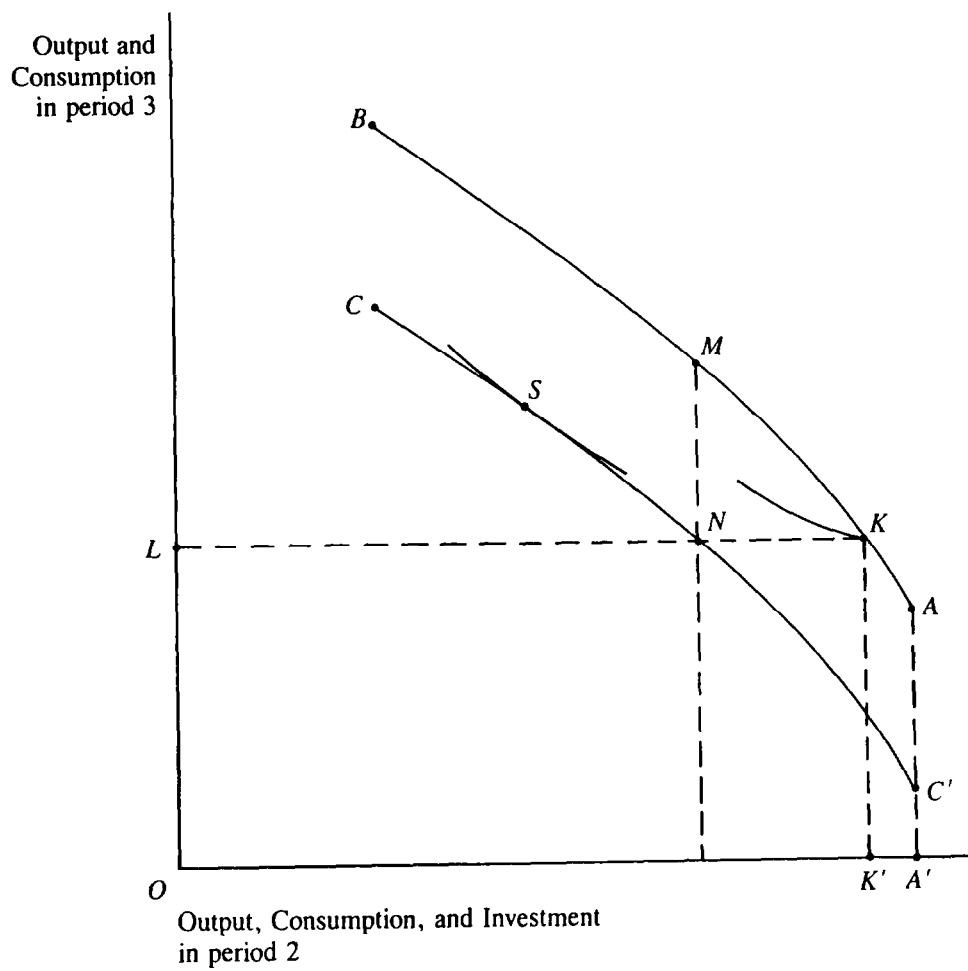
Given this new frontier, the country will presumably again choose to be on the highest indifference curve. This might, as before, be the curve at S (tangential to CN) but now there is also the possibility that it is the curve at K. If S is chosen, there will not be any endogenous debt relief. But if K is chosen, endogenous relief will be 100 percent.1/ The pro-incentive argument could be interpreted as saying that the country may choose in period 2 to invest so little (engage in so little adjustment effort) that 100 percent endogenous relief becomes inevitable and, indeed, implicitly, the country plans on that.

Any increase in output above K involves the payment of a 100 percent marginal tax rate to foreign creditors until M is reached, when the marginal tax rate becomes zero. Thus, it will pay the debtor country either to engage in no effort to get beyond K or so much as to reach S. The creditors will either get nothing or they get all they are owed. The point K is the interesting point. If the country chooses this point, it is choosing an equilibrium with endogenous relief where the creditors get nothing. This point will only be chosen if the indifference curve at K is higher than that through S. In other words, it is by no means inevitable that there is endogenous debt relief since the indifference curve through S could be higher.

## IV. The Possible Case for Exogenous Debt Relief

The final step in the argument is to show that it may be in the interests of the creditors to grant exogenous debt relief so as to avoid endogenous relief. Thus it may pay them to reduce the contractual value of the debt at the beginning of period 2 so as to avoid being forced to do so in period 3, in effect facing the alternative of default.

The key condition required is that, in the absence of exogenous relief, the point K would be chosen, where the creditors get nothing. As just noted, this is not inevitable, since S is also a possibility. This condition--that the creditors would get nothing unless there is exogenous relief--will now be assumed.

In Figure 3, exogenous relief can be represented by the CC' curve moving upward until it coincides with BA when there is 100 percent relief. If it does go that far, the debt service obligation has disappeared. Partial debt relief is represented by an upward movement of CC', but not so far as to make CC' coincide with BA. It might just go to the extent where the indifference curve through K becomes tangential to CC'. The point of tangency is then S*. In that case, the debtor

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1/ One is tempted to draw an indifference curve through K (rather than at K) but, since there is a minimum consumption level, it should probably not go on below K or should become horizontal.

country would be indifferent between engaging in a big adjustment (investment) effort to get to S* and engaging in a low adjustment effort and so reaching K with 100 percent endogenous relief. At S* it would be paying the full but reduced value of the contractual debt service but its increased effort would nevertheless yield it more consumption.

Slightly greater exogenous relief (moving CC' further up) would persuade the country to engage in extra investment. It might then get to the new tangency point S" where the indifference curve is slightly above that through K and S*. It would be marginally better off at S" while the creditors would be much better off.

Thus, exogenous debt relief, if it is sufficient, yields a Pareto improvement. Further relief would increase the gains for the debtor but would be at the expense of the creditors. Once endogenous relief is not chosen, further exogenous relief is not in the interests of the creditors. If full relief were granted (so that R were reached), all the gains would go to the debtor.

To summarize, until S" is reached, exogenous debt relief has no effects. It is insufficient to induce the debtor country to forego equilibrium at K--i.e., a low investment or adjustment effort outcome in which there is endogenous relief. At S", there is a gain to the creditors with only a marginal gain to the debtor. The creditors now obtain full payment of a reduced contractual debt service. This degree of relief maximizes the gains to the creditors. Further relief reduces the gain to the creditors and redistributes it to the debtor until at R, where the contractual debt has been reduced to zero owing to exogenous debt relief, all the gain goes to the debtor. The diagram shows that exogenous debt relief increases investment or adjustment effort if it is sufficient to bring equilibrium to S", but further relief reduces investment at the margin (as indicated by the positive slope of S"R), though investment will still be greater with 100 percent relief than with no relief at all.

The practical message preached by advocates of exogenous relief based on the pro-incentive effect is that such relief may be in the interests of the creditors, since half a loaf is better than none. But there are judgments required. First, the starting point may not be K, so that there is no pro-incentive effect. Secondly, even if it is at K, relief could be too much from the point of view of creditors relative to the optimal extent of relief (to get to S").

## V. The Crucial Role of Expectations

The whole analysis really refers to expectations and not necessarily to actual events. In particular, the creditors have to make their decisions at the beginning of period 2 on the basis of expectations.

FIGURE 3



Output and
Consumption
in period 3

Output, Consumption, and Investment
in period 2
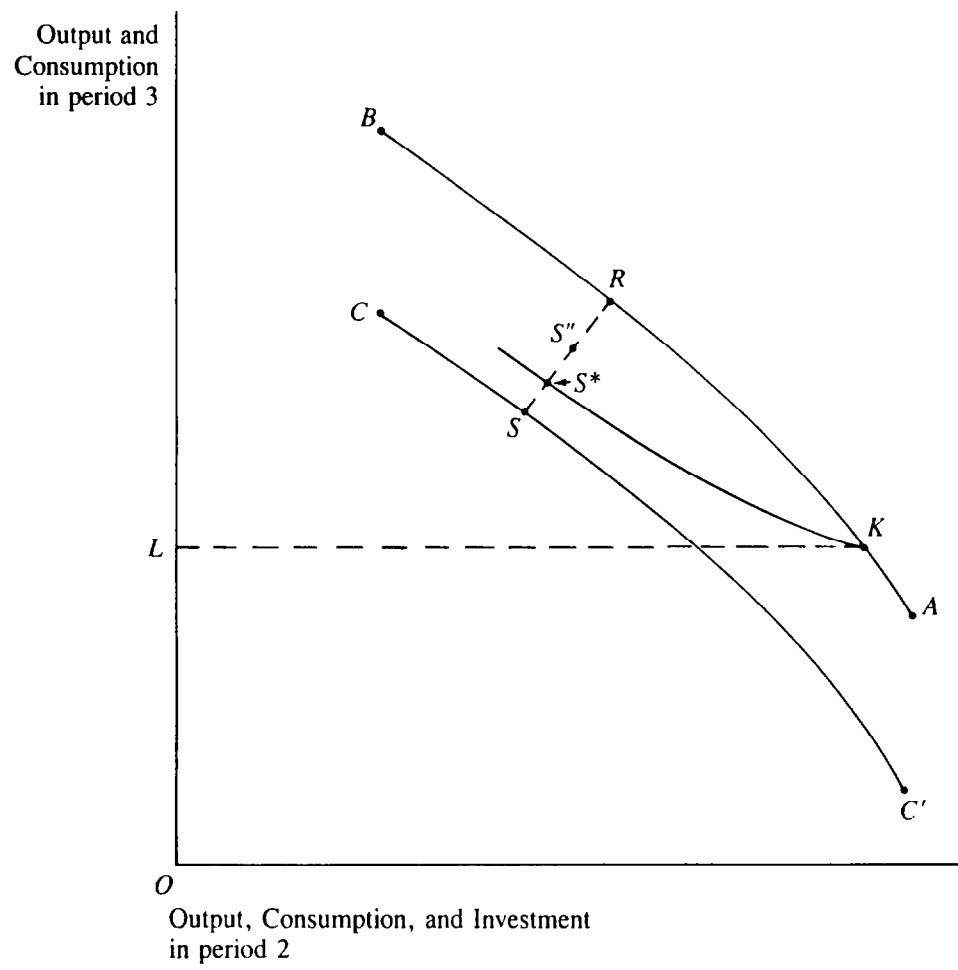
The debtor country makes its investment decision during period 2 on the basis of expectations about the marginal productivity of capital in period 3--in effect the slope of the BA curve--and other developments in period 3, which affect the position of that curve, as well as of the intertemporal utility function. An expected terms-of-trade improvement would shift the BA curve upward. The creditors make their decisions about whether to grant exogenous debt relief, and how much, at the beginning of period 2 and should base these on expectations of debtor behavior as well as exogenous developments, such as terms of trade changes, in both period 2 and period 3.

One might ask why creditors would have agreed to certain levels of contractual debt in period 1 when, at the beginning of period 2, they perceive it to be optimal to grant some degree of exogenous relief. The answer is that expectations must have changed. On the basis of expectations in period 1 about debtor behavior in periods 2 and 3, it may have been rational to make loans involving particular contractual debt service obligations. But by the beginning of period 2 such contracts may no longer appear optimal.

In terms of Figure 3, the original expectation will have been that the indifference curve at K is lower than that through S, so that the debtor would not choose an equilibrium requiring endogenous debt relief in period 3. But by the beginning of period 2, a different configuration is expected by the creditors or by those who seek to advise them: the curve at K is expected to be higher. This may be because the minimum consumption level, OL, is now believed to be higher, because the marginal product of capital is expected to be less (possibly because of worse terms of trade) so that the BA curve is now steeper, or because the debtor is expected to discount the future more (the indifference curve at K is steeper). Of course, it is also possible that the creditors have not changed their expectations but that their expectations just happen to differ from those of the debt relief advocates who advance the pro-incentive argument.

One might also ask why debtors are not always expected to default in period 3. The standard answer is that there are two kinds of penalties.

The first kind of penalty would be imposed in period 3 and later: deprivation of trade credit, seizure of assets, and so on. Threats of such penalties may, of course, not be credible because they also impose costs on creditors. But leaving this aside, the interesting aspect of our analysis is that when a country maintains a low level of investment in period 2 so that it fails to increase its capacity to pay in period 3 and thus compels endogenous debt relief, it is really doing much the same thing as when it is defaulting in circumstances when it does have capacity to pay. Capacity to pay in this model results from the debtor's own decisions. In effect, by investing less than is required to ensure

adequate capacity to pay in period 3, the country is evading the penalties it would incur if it did have capacity to pay but did not actually pay.  For the creditors, there is an information and enforcement problem.

The second kind of penalty concerns the effect of default on credit-worthiness or reputation in period 4 when the country may again wish to borrow.  Of course, it is possible that its borrowing capacity in period 4 would not depend on reputation--there always being a risk of default in any case--but if it does, then the analysis here has an important implication.  When period 4 comes, the debtor country's reputation will surely depend not just on whether it defaulted or not but also on whether it engaged in behavior in period 2 that made endogenous debt relief unavoidable in period 3.  Hence, the "reputation penalty" should provide a deterrent not only to default in period 3 but also to low investment or inadequate adjustment behavior in period 2 that leads to endogenous debt relief.


## VI.  Extension and Variations

### 1.  Real interest rate changes

In period 1, a particular (average) real interest rate was expected to prevail later--i.e., in period 2, when more debt will be incurred to pay for debt service obligations falling due in that period, and in period 3 when interest payments and principal repayments must be made. Let us now suppose, realistically, that at the beginning of period 2 expectations change and the average real interest rate payable is expected to rise.

This means that the debt service obligation payable to creditors in period 3 is expected to increase:  in terms of Figures 2 and 3, BC increases--i.e., CC' shifts down.  Hence S shifts down and (with the position of K unchanged) it becomes more likely that the indifference curve at K is above that through S and that, in the absence of exogenous debt relief, there would have to be endogenous relief.  There is then more likelihood that the pro-incentive argument for debt relief from the point of view of the creditors would apply.  Thus a rise or expected rise in the real interest rate, like a deterioration in the terms of trade, may create a situation where it would be optimal for creditors to grant exogenous relief.

### 2.  Substitution effect

It has been assumed here that the intertemporal utility function is that of the debtor government.  The debt service payment represents, in effect, a lump-sum tax obligation incurred by the government to foreign creditors.  The obligation could be met by a reduction of government expenditure.  Insofar as it is met by an increase in taxes on households or firms, further implications need to be allowed for.

It will now be assumed that the utility function is not that of the government but the representative function of households, and that the debt service obligation of the government to external creditors is passed on to the domestic private sector through an increase in the tax rate on households, whether direct or indirect. Such tax increases will have familiar income and substitution effects since lump-sum taxes on households are not possible. The income effect is essentially the same as the effect of a lump-sum tax. It is the substitution effect which needs to be introduced because it could have effects on the incentive to invest in period 2 and on output and work incentives in period 3.

The substitution effect represents various distortions, of which the distortion of the work-leisure choice is one. Of course, there are many sources of tax-induced distortions, all of which would reduce the productivity of the country and so shift down the BA curve. One set of distortions is produced by tax avoidance and evasion (which might be achieved by capital flight). Here one should note particularly the distortion of the work-leisure choice. The implication for the analysis of debt relief is that debt relief reduces the actual and expected tax burden on households. Hence, there would be a substitution from leisure to work: debt relief would thus have a pro-incentive effect additional to the one which has been so named in this paper.

Furthermore, there is an incentive effect on investment which relates to the simple model of the paper. Expectations in period 2 of relief of the period 3 tax burden would (on account of the substitution effect in isolation) lead to more investment in period 2 and hence to more output in period 3. If output in period 3 is expected to be taxed less, there is more of an incentive to invest in period 2 in order to raise period 3 output rather than consuming now. In Figures 1 and 3, this means that the SR curve might be negatively sloped over a range.

3.  Capital Flight

The assumption so far has been that there are no private capital imports or exports in periods 2 and 3. The question arises whether one could allow for private capital exports (so-called capital flight) in period 2 within the context of this model.

Capital flight might be given two alternative interpretations. One would be to treat it as a way in which the country (though not the government) pays off part of its foreign debt in period 2 rather than period 3. But since the debt we are considering is sovereign debt, one can hardly say that private investments abroad that are not within the reach of the debtor country's government pay off the government's debt.

Hence an alternative approach seems preferable. Capital flight is one way in which the private sector allocates its savings and possibly seeks to evade taxes. Instead of investing all savings at home, some

of them are invested abroad. The vertical axis in our diagrams could
then be reinterpreted to refer, not to national output in period 3, but
rather to taxable income, whether resulting from investment at home in
period 2 or from private investment abroad. 1/ Anything that reduces
the ability to collect taxes on the private sector, such as capital
flight, will tend to shift the AB curve down and such a downward move-
ment in the AB curve (and hence the CC' curve) would have the variety
of implications that follow from the analysis in this paper.


VII. Conclusion

The purpose of this paper has been to analyze the pro-incentive
argument for debt relief. It has been shown that it depends on the
possibility of endogenous relief or default, which in turn depends on
there being some minimum consumption level and hence meaningful concept
of "capacity to pay." If that is granted, one can conclude that in
certain circumstances it may be advantageous for creditors to grant
exogenous relief. Thus the paper has indeed provided a rigorous con-
firmation for the possible validity of the argument. But the conditions
required for it to be applicable have also been brought out and it can-
not be automatically assumed that it is valid in particular cases, such
as the current situation. There is also a disincentive effect of debt
relief and, in addition, a substitution effect which provides an addi-
tional pro-incentive effect, though not a basis for a debt relief
argument.

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1/ It would also include direct income of the government, out of
which debt service payments could be financed. The horizontal axis
would show consumption and domestic savings, and the latter could be
invested at home or abroad. By contrast, in the main analysis, domestic
savings and domestic investment were always equal.

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