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Trade Dependency, Bargaining and External Debt

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Abstract

This paper analyzes the factors determining the payment on outstanding debt in the presence of partial defaults, and the feasibility of renewed investment. We show that a higher relative size of sectors with lower substitutability between domestic and foreign products will increase the resource transfer ceiling. Even with a partial default, investment in highly trade dependent sectors with high productivity may be warranted. This investment can be implemented by a marginal relief of the present debt service, in exchange for investment in the proper sector. A way to partially overcome some of the monitoring problems associated with renewed investment is through direct investment.

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Contents

Summary

This paper analyzes factors determining the effective repayment on outstanding debt in the presence of partial defaults, as well as the feasibility of renewed investment. It considers a multi-sector, two-period model of the world economy comprising developing and industrial countries. The industrial nations are characterized by a relative abundance of capital and less dependency on international trade. The developing nations can produce their final output by using several technologies with different degrees of substitutability between foreign and domestic intermediate products.

A large initial debt overhang may motivate a partial default by the developing countries that will initiate negotiation between the two blocks of countries. The threat associated with such bargaining is the loss of international trade if no agreement is reached. This threat is applied to the model to derive the outcome of bargaining over the effective repayment. The larger the sector in which there is little substitutability between domestic and foreign products, the greater the trade dependency of the developing nations, weakening their bargaining power and therefore increasing the amount they must repay. A strategy of outward growth has the cost of increasing trade dependency, but also has the benefit of making external finance more available.

Under certain conditions it will be beneficial for both blocks of nations to renew marginal resource transfers, conditional on targeting the investment on projects that will increase the trade dependency of the developing countries. This may occur if the developing nations repay less in exchange for allowing investment in trade-dependent sectors. If the marginal productivity of capital in the developing nations is high, the beneficial effect associated with the increase in future repayment generated by the investment in the trade-dependent sector will justify a renewed resource transfer to those nations (subject to the appropriate conditionality). A way to alleviate the monitoring problems associated with the needed conditionality is to execute the renewed resource transfer through a direct investment. Such investment will be targeted on the more trade-dependent sectors. Consequently, the move to a bargaining regime brought about by a partial default emphasizes the importance of direct investment as one of the few remaining channels for external finance of new investments.

I. Introduction

The international credit market is presently characterized by the partial default of several Latin American nations and other developing countries. The partial default has triggered rounds of bargaining regarding the effective repayment called for. This bargaining has yielded refinancing packages that come with certain conditionalities attached to them. Recently much attention has been given to the viability of various 'smart' financing schemes to deal with these problems, as well as to the incentive problems generated by the partial default. Such literature has taken the view that the obstacle to complete default is the presence of default costs stemming from potential embargoes on temporal and inter-temporal trade (i.e., embargoes on trade in goods and trade in assets). 1/ Most of this literature assumes that the default costs are exogenous. While such an assumption is justified in the short run, in the intermediate run the costs of defaults are endogenously determined by a nation's trade dependency. This, in turn, is influenced by the investment policies of the country. The purpose of this paper is to focus on the linkages between trade dependency and investment policy. We wish to investigate the consequence of investment policy on the bargaining power of each party, and to study the role of conditionality attached to renewed credit. Specifically, we would like to identify conditions under which renewed marginal resource transfer would be beneficial for both parties, and to understand the role of conditionality and direct investment in generating more favorable growth prospects for the developing nations.

We consider an asymmetric world economy composed of two blocks of nations, the developing and the developed countries. The developed nations are characterized by a relative abundance of capital, implying that the return on capital in these developed countries tends to be lower than that in developing countries. Consequently, country risk considerations aside, developing countries offer more attractive investment opportunities. Another important characteristic of the developed nations is lower trade dependency (relative to that of the developing).

A minimal model that allows the derivation of endogenous trade dependency is a multi sector, two period model, in which the credit market behaves competitively in the absence of default. However, a large initial debt overhang may motivate a partial default by the developing countries. The partial default will then initiate negotiations between

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1/ For an analysis of country risk see Harberger (1976), Kharas (1981), Eaton and Gersovitz (1981), Sachs (1984), Kletzer (1984), Dornbusch (1984), Krugman (1985), Smith and Cuddington (1985), Edwards (1985), Folkerts-Landau (1985), Diwan and Donnenfeld (1986), Dooley (1986), Aizenman (1986), Bulow and Rogoff (1986), Calvo (1987), Helpman (1987), Aizenman and Borensztein (1987), Cole and English (1987), and Alesina and Tabelline (1987).

the two blocks of nations over the effective repayment. The threat associated with such bargaining is that in the absence of an agreement no international trade will occur. We apply this threat to derive the bargaining outcome by using the Nash fixed threat bargaining framework. Therefore, the bargaining outcome over the effective repayment is determined by the trade dependency of the nations involved. We investigate the factors determining the bargaining outcome, and identify conditions under which there exist opportunities for Pareto improving investment, whose return will be paid in the second period. In order to focus on the endogenous determination of the trade dependency of the developing nations, we assume that such nations can produce their final output using several technologies with different degrees of substitutability between foreign and domestic intermediate products. Thus, the trade dependency of developing nations is endogenously determined by the investment in the various sectors.

The bargaining outcome defines the resource transfer ceiling and therefore determines under which conditions we will switch from a competitive to a bargaining equilibrium. The resultant rule is simple: if the resource transfer due to initial debt exceeds the resource transfer supported by the bargaining outcome, the country will choose to default partially, switching from the competitive to the bargaining allocation.

We demonstrate that the bargaining outcome is determined by the relative size of the various sectors. A higher relative size of the sector with lower substitutability between foreign and domestic intermediate products will increase the trade dependency of the nation, reducing its bargaining power and thereby increasing the resource transfer ceiling. The resultant increase in the ceiling makes the nation less risky, increasing the willingness of creditors to lend. Thus, although a strategy of outward growth has the cost of increasing trade dependency, it has the benefit of increasing the availability of external finance.

With substantial initial debt overhang we will observe partial defaults and the elimination of voluntary resource transfers from the developed to the developing countries. We analyze the conditions under which renewed marginal resource transfer to the developing countries may occur. If there are no ways to commit the developing nations to follow a specified investment plan, no new marginal resource transfer will occur. The reason for this is that as long as we operate in the bargaining region, the repayment is dictated by the bargaining outcome. From the point of view of the developing nations it will be advantageous to apply any investment towards reducing their trade dependency. Such an investment will be beneficial for the developed countries for two reasons: first, the developing nations will reap the standard productivity gains; second, the drop in trade dependency will allow them to cut the resources transferred to the developed nations. Obviously, the interests of the developed nations will be served by minimizing investment in projects that reduce the trade dependency.

Under plausible conditions it may be beneficial for both blocks of nations to renew marginal resource transfers, under the condition of targeting the investment in projects that will increase the trade dependency of the developing countries. Such an investment will have the consequences of increasing the future resource transfer supported by the bargaining outcome, allowing higher repayment in the future.

We show that a strategy of reducing the resource transfer from the developing nations today, in exchange for an equivalent increase in investment in the sectors that are highly trade dependent, and the return in the future to the bargaining repayment, will benefit the developing countries. Nevertheless, this strategy is only the second best one the developing nations may choose, since their interests are best served by targeting the investment to sectors that are less trade dependent, and thereby reducing their trade dependency. Hence, the fact that the developing nations will benefit from investment in trade dependent sectors does not negate the need to impose conditionality to ensure the proper investment.

From the eyes of the developed nations, they are trading off the marginal drop of repayment today against the increase in repayment tomorrow. If the increase in future repayment is large enough, the developed nations will be better off. If the marginal productivity of capital in the developing nations is high enough, the beneficial effect associated with the increase in future repayment generated by the investment in the trade dependent sector will justify a renewed resource transfer (subject to the appropriate conditionality).

A way to alleviate the monitoring problems associated with the conditionality, is to execute the renewed resource transfer through a direct investment. Such an investment will be targeted to the proper sectors. Consequently, the move to a bargaining regime brought about by a partial default emphasizes the importance of direct investment as one of the few remaining channels for external finance of new investments. In this respect, it is interesting to trace the path of net direct private investment in recent years. Findings indicate that the volume of private direct investment in the seven major borrowers 1/ remains significant even in recent years, and the partial default of these countries did not deter marginal investment. 2/ Obviously, the relative importance of direct investment as a channel for external finance has increased drastically due to the reduction of all other channels. Thus, even in

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1/ Argentina, Brazil, Indonesia, Korea, Mexico, the Philippines and Venezuela.

2/ The net direct private investment in these countries during 1979-1986 (in billion dollar) was 3.5, 4.4, 6.2, 4.3, 2.3, 2.5, 3.3, and 2.5. This information draws on World Development Reports (1981-1988). For a useful discussion regarding the role and the experience with direct private investment in developing countries see Goldsbrough (1985).

the presence of partial defaults, selective direct investment may be advantageous for both parties.

This paper suggests that greater attention should be given to policies that encourage selective direct investment as a way to overcome the incentive problems generated by partial defaults. These incentive problems leave few options for the renewal of external finance for investment. The developing countries can choose either to accept detailed conditionality attached to the finance of new investments, or to tolerate direct private investment. In the first case, the conditionality provides the framework for monitoring. In the latter, the private investor does the monitoring himself, by choosing the investment projects. While none of these options may be enthusiastically endorsed by the developing nations, they represent the few remaining channels for external finance for renewed investment.

Before turning to the paper it is constructive to place it in its proper context in the existing literature. The incentive problems facing new investment in the presence of partial defaults have been analyzed by Krugman (1987), Froot (1988) and other. The bargaining process determining the repayment on external debt is the topic of the Bulow and Rogoff's 1987 contribution. The present paper addresses the strategic role of conditionality and the incentive problems facing new investment in a multi-goods economy, where the choice between inward versus outward growth strategies is relevant.

II. The Model

We describe the model by reviewing the production side, the preferences and the budget constraints.

1. Production

International trade is trade in intermediate products, whose assembly to the final good is location specific. Consequently, final goods are non-traded. 1/ The final good can be either consumed or invested domestically to increase the future capital stock. For example, consider the following production function of the final good:

$$(1) \quad Z_\varepsilon(X,Y;K) = h_\varepsilon[(X)^\varepsilon + (Y)^\varepsilon]^{\beta/\varepsilon}(K_\varepsilon)^{1-\beta}; \quad 0 < \beta < 1 \text{ and } \varepsilon \leq 1$$

where X and Y are the two types of intermediate products (domestic and foreign) and K_ε is the capital stock. Note that the elasticity of substitution between the intermediate products is given by $1/(1-\varepsilon)$. Our

1/ The supply side is using a framework similar to Ethier (1982). In Ethier's model the gains from trade stem from "international" returns to scale. These scale economics are the result of an increase division of labor (and other inputs) due to the rise in the market size.

analysis will demonstrate that this elasticity is a useful measure of trade dependency: a lower value will be shown to correspond with a greater trade dependency. The term h_ε is a technological coefficient. We assume that the developing countries are more trade dependent relative to the developed nations, and that they face a choice regarding their trade dependency. Henceforth we will refer to the sector producing Z_ε as sector ε.

A way of characterizing this situation is by assuming that the developing countries have access to two technologies with different ε, denoted by $\varepsilon = \gamma, \delta$; where $\gamma < \delta \leq 1$. The discussion is greatly simplified by assuming that the developed nations have access to a production technology that allows perfect substitutability between the various intermediate products, with $\varepsilon = 1$. We normalize productivity such that the productivity coefficient for the developing country is unity (hence $h_{\varepsilon=1} = 1$). To focus on the role of substitution flexibility in determining the trade dependency, we suppose that all technologies share the same capital intensity (thus all have the same β). 1/

2. Preferences and the Budget Constraints

The utility is given by the discounted value of consumption of the final good. The preferences of the two blocks of nations are summarized by the following functions:

$$(2) \quad U = C_1 + \rho\, C_2; \qquad U^* = C_1^* + \rho^*\, C_2^*$$

where C_t is the consumption at time t.

We assume that the intermediate products are produced using a Ricardian process and that there is a fixed supply of labor in each country and no labor mobility. We normalize units such that the supply of intermediate products is equal to one in both blocks of nations. Thus, $X^S = 1$, and $Y^S = 1$ where X^S and Y^S denotes the intermediate products produced by the developed and the developing block. The use of X and Y by developing countries at time t is denoted by X_t^* and Y_t^*, and the investment level in the developing and the developed countries is denoted by I_1^* and I_1, respectively. Thus, the developed countries are using $1 - X^*$ and $1 - Y^*$ of the two intermediate products. The use of the two intermediate products by industry ε in the developing countries ($\varepsilon = \delta$ or γ), is denoted by $X_{\varepsilon,t}$ and $Y_{\varepsilon,t}$. The periodic budget constraints are given by:

1/ While the key insight of the paper carries to more general systems, the characteristics of the solution are modified if we alter the above assumption. The concluding remarks to the paper (Section V) discuss how altering the above assumption will affect the solution.

$$(3)\quad C_t^* + I_t^* = Z_t^*; \quad C_t + I_t = Z_t$$

$$(4)\quad X_t^* = X_{\gamma,t} + X_{\delta,t};\ Y_t^* = Y_{\gamma,t} + Y_{\delta,t};\ X_t^* + X_t = 1;\ Y_t^* + Y_t = 1$$

where

$$(5)\quad Z_t^* = h_\gamma[(X_{\gamma,t})^\gamma + (Y_{\gamma,t})^\gamma]^{\beta/\gamma}(K_{\gamma,t})^{1-\beta} + h_\delta[(X_{\delta,t})^\delta + (Y_{\delta,t})^\delta]^{\beta/\delta}(K_{\delta,t})^{1-\beta}$$

$$(6)\quad Z_t = [1 - X_t^* + 1 - Y_t^*]^\beta (K_t)^{1-\beta}$$

We now focus our attention on the characterization of the global equilibrium.

III. The Equilibrium

We study the global equilibrium by first analyzing the characteristics of the bargaining equilibrium. This equilibrium will occur if the level of initial debt is large enough. An understanding of the bargaining equilibrium allows us to precisely define the threshold level of debt that will trigger both a partial default and will move us to the bargaining outcome. And by understanding the bargaining outcome we can easily characterize the properties of the competitive equilibrium.

1. The Bargaining Regime

Suppose that we start period one with a large initial debt due to be paid to the developed nations, whose value is large enough to motivate a partial default. A partial default will initiate a renegotiations between the two blocks of nations. The threat associated with such bargaining is that in the absence of an agreement no international trade will occur. The bargaining outcome over the effective repayment is derived by the Nash fixed threat bargaining framework. 1/ We review the bargaining solution in two steps. First, we identify the allocations that are Pareto efficient (the contract curve). Next, we identify the bargaining solution by finding the trading point on the contract curve that maximizes the

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1/ For a discussion regarding the Nash fixed threat bargaining framework see Nash (1950) and Roth (1979). The solution of this bargaining problem is obtained by the allocation that maximizes the products of the trade gains for each party (relative to the fixed threat allocation). A useful characteristic of the solution is that it is a Pareto efficient allocation (see Roth (1979)).

product of the gains from trade for both blocks of nations. The technical derivations of the solution are described in the Appendix. Here we review the key results, starting with the consideration of the case in which there is no new investment. 1/

a. The Pareto efficient allocations

Pareto efficiency is characterized by an allocation where all use equal quantities of both intermediate goods (i.e., $X = Y$ and $X^* = Y^*$). 2/

For a given X the Appendix shows that the efficient allocation is given by:

$$(7) \quad X_\gamma = (1 - X)s_\gamma; \quad X_\delta = (1 - X)(1 - s_\gamma)$$

$$\text{where } s_\gamma = \frac{\tilde{h}_\gamma K_\gamma 2^{\bar{\beta}/\gamma}}{\tilde{h}_\gamma K_\gamma 2^{\bar{\beta}/\gamma} + \tilde{h}_\delta K_\delta 2^{\bar{\beta}/\delta}}$$

$$\text{for } \bar{\beta} = \beta/(1 - \beta), \quad \tilde{h}_\varepsilon = (h_\varepsilon)^{1/(1-\beta)} \quad (\text{for } \varepsilon = \gamma,\delta); \quad \text{and}$$

$$(8) \quad X_\gamma = Y_\gamma; \; X_\delta = Y_\delta; \; X = Y = 1 - Y^*; \; X^* = Y^* = X_\delta + X_\gamma = Y_\delta + Y_\gamma.$$

Note that (7) implies that the division of intermediate inputs between sectors δ and γ is determined by the relative share of the "effective capital" (s_ε), obtained by weighting the capital stock by $h_\gamma 2^{\bar{\beta}/\varepsilon}$,

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1/ This assumption is justified as the benchmark case, in which we assume that the two blocks of nations have reached their desired closed economy capital stock. Such a level is determined by the rates of time preference, as given by (ρ,ρ^*). In order for further investment to equate the marginal product across the two blocks of nations, capital mobility will be required. Our analysis in Section IV will more closely examine the potential role of investment in the presence of partial default.

2/ The Appendix shows that, because both intermediate goods are perfect substitutes in the production process of the developed nations, in a Pareto allocation the marginal product of both X and Y should be equal for all activities. This result, coupled with the assumption that the global supply of each intermediate product is equal to one, implies that $X = Y$ and $X^* = Y^*$.

(for $\varepsilon = \delta, \gamma$). The properties of the Pareto allocation imply that for a given X we can completely characterize the solution by equations (7) and (8). Consequently, we can view the bargaining as a process determining X.

b. The default decision

It is noteworthy that since X and Y are perfect substitutes in the production process of the developed nations, a free trade, competitive equilibrium is characterized by a unitary terms of trade. Let us denote by R the resources to be transferred to the developed nations due to existing debt (a negative value of R will correspond to a resource transfer to the developing countries). In the absence of default, the exports of the developing nations finance the imports and the transfer to the developed nations:

$$(9) \quad 1 - Y^* = 1 - X + R,$$

Applying the property of the Pareto allocation, where $X = 1 - Y^*$, we derive that

$$(9') \quad R = 2X - 1$$

A default will move us to the bargaining regime, yielding an allocation that is characterized by a level of X denoted by X_b. The equal proportions of X and Y in all the activities imply that X_b is fully characterizing the system and the developing nations use $[X_b^*, Y_b^*] = [1 - X_b, 1 - X_b]$. The bargaining allocation is obtained by the exchange of $1 - X_b$ units of the developed countries' intermediate product with X_b units of the developing countries' intermediate product. Thus, the bargaining allocation is equivalent to a competitive allocation in which the resource transfer is given by $R_b = 2X_b - 1$. The term R_b defines the effective ceiling on repayment: if the repayment due exceeds R_b the developing nations will prefer to default partially, and will transfer only R_b. Consequently, one can view X_b as the key variable in determining the smooth functioning of the international credit market. A larger X_b is associated with a world system that will allow greater capital flows from the developing to the developed countries.

We can summarize this insight with the help of an Edgeworth Box diagram (see Figure 1), whose dimensions are given by the global endowment of X and Y, where 0 and 0^* denotes the origin of the developed and the developing countries, respectively. The diagonal 00^* describes the Pareto allocations. 1/ The line T0* corresponds to the repayment schedule, defined by (9'). A competitive allocation A_c corresponds to a repayment of R_c (measured by the vertical bold line). Suppose that the bargaining allocation is given by the point A_b, corresponding to $X = X_b$. The

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1/ Curves ZZ (Z^*Z^*) describe allocations that yield a constant output in the developed (developing) countries, respectively.

resource transfer ceiling is R_b, and the feasible range of competitive free trade equilibria with full integration of capital markets is given by those X_c to the left of X_b, in which the repayment due is R_c, with $R_c < R_b$. The precise location of the free trade equilibrium is characterized by the desirable level of resource transfer. In the absence of resource transfer, the equilibrium will occur at the point A_0, where $X = .5$, $Y = .5$. A resource transfer to the developing nations will imply an equilibrium to the left of A_0.

Note that in a two periods world with no uncertainty, the maximum level of credit to the developing nations that could be allocated equals the discounted value of the second period transfer resource ceiling (i.e., $R_{b,2}/(1 + r)$, where r is the lenders' interest rate, and $R_{b,2}$ is the second period resource transfer ceiling). The purpose of the next section is to characterize X_b, and to demonstrate that it is directly tied to the trade dependency of the developing countries.

c. The bargaining equilibrium

We now turn to the characterization of the bargaining equilibrium. We adapt the framework of the fixed threat Nash equilibrium. The bargaining allocation is characterized by the X value that maximizes the products of the gain from trade. Let us denote by $Z(X)$ and $Z(X^*)$ the production level of the developed and the developing nations that is generated with an allocation of (X, X^*). Note that the autarky production level of the developed and the developing nations is given by $Z(1)$ and $Z^*(0)$, respectively. The bargaining allocation X_b is found by solving:

$$(10) \qquad \underset{X}{MAX} \quad [Z(X) - Z(1)]\,[Z^*(1 - X) - Z^*(0)]$$

We start by considering the case where $\gamma < 0 < \delta \leq 1$. The Appendix demonstrates that:

$$(11) \quad Z(1) = K^{1-\beta}; \qquad Z(X) = (2X)^{\beta} K^{1-\beta}$$

$$(12) \quad Z^*(0) = h_\delta K_\delta^{1-\beta}; \quad Z^*(1 - X) = (1 - X)^{\beta} \tau^{1-\beta};$$

where

$$(13) \quad \tau = \tilde{h}_\gamma K_\gamma \, 2^{\bar{\beta}/\gamma} + \tilde{h}_\delta K_\delta \, 2^{\bar{\beta}/\delta}.$$

We can apply (11)-(12) to (10), taking a logarithmic transformation, obtaining that X_b is the solution of 1/

$$(14) \quad \underset{X}{MAX} \quad \ln[(2X)^{\beta} - 1] + \ln[\frac{(1-X)^{\beta}}{h_{\delta}} \left\{\frac{\tau}{K_{\delta}}\right\}^{1-\beta} - 1]$$

The two terms measure the percentage increase in the production (relative to autarky) of the developed and developing countries, respectively. Note that the gains from trade for the developing nations depend positively on τ/K_{δ}. Inspection of (13) reveals that τ/K_{δ} depends positively on the capital ratio in the sector with the low substitutability relative to the high substitutability (i.e., on K_{γ}/K_{δ}). The rational for this outcome is that in autarky only sector δ is producing. Sector γ is ideal, because it can not produce without imports of X. Consequently, the gains from trade are greater for sector γ than for sector δ, and these gains are tied to the relative size of sector γ, as measured by the K_{γ}/K_{δ} ratio.

Direct optimization of (14) yields the following first order condition:

$$(15) \quad \frac{\beta 2^{\beta}}{X2^{\beta} - X^{1-\beta}} = \frac{\beta\left\{\frac{\tau}{K_{\delta}}\right\}^{1-\beta}}{(1-X)\left\{\frac{\tau}{K_{\delta}}\right\}^{1-\beta} - (1-X)^{1-\beta}h_{\delta}}$$

The left side measures the percentage increase in the developed nations' gain from trade that is associated with a marginal increase of X, and is described by curve DD (Figure 2). The right side measures the percentage loss in the developing nations' gains from trade associated

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1/ Henceforth we restrict our attention to the bargaining region in which there are gains from trade for both nations. In terms of (14) we assume that

$.5 < X < 1 - \left\{\frac{\tilde{h}_{\delta}K_{\delta}}{\tau}\right\}^{(1-\beta)/\beta}$. Note that from the definition of τ it follows that $.5 < 1 - \left\{\frac{\tilde{h}_{\delta}K_{\delta}}{\tau}\right\}^{(1-\beta)/\beta}$.

with a marginal increase in X, and is described by schedule GG. The feasible bargaining range is given by the shaded values of X (Figure 2), and the intersection of both schedules gives the bargaining outcome (X_b). At this allocation a marginal transfer of X will cause percentage losses of the gains from trade to one party that equal the percentage gains to the other party.

The relative size of the two sectors plays a key role in determining both the bargaining outcome and the riskiness of the developing countries (as measured by the feasible region of no default). A greater trade dependency is associated with a higher relative size of the sector with lower elasticity of substitution. Basically, higher K_γ/K_δ ratios are associated with a raise in $\frac{\tau}{K_\delta}$, and an increase in the gains from trade of the developing nations. In terms of Figure 2, a higher K_γ/K_δ ratio will shift GG downwards and rightwards, to G'G', increasing the bargaining solution from X_b to X_b'. In terms of Figure 1, the resultant increase in X_b will raise the range of no default, increasing the resource transfer ceiling from R_b to R_b'. 1/

The insight behind these results is clear: a higher relative size of the sector that is more trade dependent increases the bargaining power of the developed nations, thereby increasing their willingness to supply credit, and reducing the tendency of the developing countries to default. Thus, while a strategy of outward growth has the cost of increasing the trade dependency, it has the benefit of increasing the resource transfer ceiling as well as the availability of external finance. 2/

Our analysis has demonstrated that a useful measure of trade dependency is the elasticity of substitution between the foreign and the domestic intermediate products, where lower substitutability is associated with a greater trade dependency. While here we have considered the case

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1/ A formal proof that $\frac{\partial X_b}{\partial K_\gamma} > 0$ is given in Appendix A.2.

2/ A potential cost of trade dependency is the increase of the vulnerability of the economy to external commercial policy and foreign productivity shocks. In terms of our model, we focus on the case where the move to the bargaining equilibrium is determined by the will of the developing nations. In a more symmetric environment, the move to the bargaining equilibrium may be also determined by the developed nations. A higher trade dependency of the developing nations may increase their vulnerability to such policies. In analyzing the consequences of external productivity shocks the addition of explicit uncertainty is required. Section V review such an extension.

in which the elasticity of substitution is above unity in one sector (sector δ) and below unity in the second sector (sector γ), the appendix demonstrates that the same result holds true for the case in which the elasticity of substitution in both sectors exceeds unity. 1/

IV. Partial Defaults, Conditionality and Direct Investment

Suppose that we start period one with substantial debt overhang, implying that we are in the partial default region, in which the effective repayment is given by the bargaining outcome, R_b. This situation is characterized by the elimination of any voluntary resource transfers from the developed to the developing countries. We now examine the conditions under which renewed investment in the developing countries may occur.

If there are no ways to commit the developing nations to follow a specified investment plan, no new marginal resource transfer will occur. The reason for this is that as long as we operate in the bargaining region, the repayment is dictated by the bargaining outcome. From the point of view of the developing nations it will be advantageous to apply any investment towards reducing their trade dependency. Such an investment will be beneficial for the developed countries for two reasons. First, they will receive the standard productivity gains; second, the drop in trade dependency will allow the developing nations to cut the resources transferred to the developed nations. Obviously, the interests of the developed nations will be best served by minimizing investment in projects that reduce the trade dependency.

If there are credible ways to commit the developing countries to follow a specified investment policy, then it may be beneficial for both blocks of nations to renew marginal resource transfers, with the condition of targeting the investment in projects that will increase the trade dependency of the developing countries. This may occur if the developed nations agree to cut the resource transferred today below R_b, in exchange for an investment in the sector that is highly trade dependent. Such an investment will have the consequences of increasing the future resource transfer from R_b to R_b', allowing higher repayment in the future. The modified budget constraint is now

$$(9'') \quad Y = 1 - X + R_b - I_\gamma^*$$

1/ The case in which the elasticity of substitution is below unity for both sectors corresponds to the case in which in the absence of trade, output is zero in the developing nations. It can be shown that in this case the bargaining outcome is independent of the relative size of both sectors. Because this case corresponds to the implausible outcome (that output is zero in the absence of international trade) our analysis ignores this possibility.

where the developed nations agree to reduce the effective present resource transfer below the bargaining solution, to $\tilde{R} = R_b - I^*_\gamma$. In exchange, the developing nations are investing the marginal product of I^*_γ in the trade dependent sector (γ) today, and returning to the (new) bargaining solution, with a resource transfer of R_b', in the future. Note that in the new equilibrium we still observe Y = X, implying that

$$(16) \quad X_1 = (1 + R_b - I^*_\gamma)/2; \quad X_2 = (1 + R_b')/2$$

Let us evaluate the conditions under which such a transaction will increase the welfare of both parties. Note that from the point of view of the developing countries Z^*_1 stays intact in the present, while Z^*_2 is affected by two factors. First, the present investment increases the capital stock in sector γ, raising the effective capital stock (τ) and thereby raising future output. Second, the increase in R_b, resulting from the investment in the trade dependent sector, will increase the resource transfer in the future, thereby reducing the future X^* and the future output. Applying (12) we can summarize these two factors by:

$$(17) \quad \frac{\partial Z^*_2}{\partial I^*_\gamma} = Z^*_2\left[\frac{1-\beta}{\tau}\frac{\partial \tau}{\partial I^*_\gamma} - \frac{\beta}{1-X_b}\frac{\partial X_b}{\partial I^*_\gamma}\right]$$

The first term on the left side of (17) is positive, and measures the enhanced productivity effect due to the accumulation of capital. The second term is negative, and reflects the increase in trade dependency, with the result of reducing future consumption due to the increase in the resource transfer ceiling (R_b). Appendix A.2 demonstrates that the first positive effect dominates, and the developing nations are better off with the renewed investment. Therefore, a strategy of reducing the present resource transfer from the developing nations, in exchange for an equivalent increase in investment in sector γ (the sector that is more trade dependent), and the return in period two to the bargaining repayment (with repayment R_b') will benefit the developing countries.

While the outcome for the developing nations is clearly favorable, the outcome for the developed nations is ambiguous. First period consumption goes down by $MP_X I^*_\gamma$ (where MP_X is the marginal product of X), whereas second period consumption goes up by $MP_X \frac{\partial X_b}{\partial I^*_\gamma} I^*_\gamma$. Thus, the gross

return attributed to this policy is given by the marginal consequence of the investment on the resource ceiling:

$$(18) \quad \frac{\partial Z_2}{\partial Z_1} = - \frac{\partial X_b}{\partial I^*_\gamma}$$

The Appendix demonstrates that $\frac{\partial X_b}{\partial I^*_\gamma}$ is positive and proportional to $1/\tau$. 1/ Recalling (13), τ is a measure of the developing countries' capital stock. It follows that $1/\tau$ is a measure of capital scarcity in the developing countries.

As seen by the developed nations, they trade off the marginal drop of repayment today against the increase in repayment tomorrow. If the increase in future repayment is large enough, the developed nations will be better off, as will be the case with countries where capital is scarce.

It is worth noting that the strategy of investing in a highly trade dependent sector is only the second best for the developing nations. Their interests are best served by targeting the investment in activity δ (the sector that is less trade dependent), thereby reducing their trade dependency. 2/ Obviously, with such a strategy the developed nations are always worse off. 3/ Hence, the fact that the developing nations will

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1/ See Appendix A.2, equation (A18).

2/ In terms of equation (17) the second term is positive if the investment is targeted toward sector δ. Consequently,

$$\frac{\partial Z_2^*}{\partial I^*_\gamma} < \frac{\partial Z_2^*}{\partial I^*_\delta} .$$

3/ In terms of (18), $\frac{\partial X_b}{\partial I^*_\delta} < 0$ and therefore the developed nations are worse off if investment is targeted toward a reduction in trade dependency of the developing nations. Thus, such a type of investment must be domestically financed. If there are no strategic restrictions on inward investment, the debtor will invest in sector δ until the marginal gain in future output equals the domestic real interest rate. The first order condition for optimal investment in sector δ is that $\Delta Z_2^*/\Delta Z_1^* = 1 + r^*$, where r^* is the debtor real interest rate. The scarcity of capital and high real interest rates in the developing countries limit the feasibility of inward investment. Conditionality, coupled with external financing of investment in the trade dependent sectors may impose another obstacle to inward investment.

benefit from investment in trade dependent sectors, does not negate the need to impose conditionality to ensure proper investment in the more trade dependent sector.

A way to alleviate some of the problems associated with setting the conditionality for the proper use of funds, is to execute the renewed resource transfer through direct investment. Such investment will be targeted to the proper sector, and may avoid some of the monitoring issues. Therefore, we may conclude that the move to a bargaining regime due to a partial default put greater weight on the importance of direct investment as one of the few remaining channels for external finance of investment in the developing nations. The incentive problems that characterize the bargaining regime in the presence of partial defaults leave few options for the renewal of external finance for investment. The developing countries can choose either to accept detailed conditionality attached to the finance of new investments, or to tolerate direct private investment. In the first case, the conditionality provides the framework for monitoring. In the latter, the private investor does the monitoring himself, by choosing the investment projects. While none of these options may be enthusiastically endorsed by the developing nations, they represent the few remaining channels for external finance for renewed investment.

V. Concluding Remarks

A key result derived in this paper is that the trade dependency determines the bargaining outcome regarding the repayment associated with a partial default. Even with a partial default, investment in highly trade dependent sectors with high productivity may be warranted. This investment may be implemented by a marginal relief of the debt service today in exchange for the investment in the proper sector. Following such a scheme may require detailed conditionality and close monitoring. A way to partially overcome some of the monitoring problems is through direct investment. We close the paper with remarks concerning extensions and qualifications.

While we assumed there was no uncertainty, it could be added without difficulties. For example, stochastic productivity of intermediate products will make the dimensions of the Edgeworth Box in Figure 1 random, but the logic of our analysis will stay intact. 1/ An interesting result obtained in the paper is that the bargaining solution depends only on the capital ratio among the various activities, and not on the absolute level of capital. This result is related to the functional specification, which assumes a unitary elasticity of substitution between the 'aggregate' intermediate product and capital, and does not hold for a

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1/ The contract curve is the 45 ray starting from 0^*. It can be shown that productivity shocks affecting Y^S and X^S will make the corresponding repayment ceiling R_b random.

general elasticity of substitution. Another simplifying assumption applied throughout the analysis, is that the developed nations have access to a production technology that allows perfect substitutability between the various intermediate products. This assumption generated a simple solution where the contract curve is a straight line. Abandoning this assumption will generate a non-linear contract curve. Such modification may be important in the presence of systematic uncertainty, because different levels of trade dependency will affect the trade off (and the relative price) of foreign and domestic products.

APPENDIX

The purpose of this Appendix is to derive some of the key results reported in the text. Appendix A.1 reviews the derivations of the bargaining outcome, and Appendix A.2 analyzes the role of marginal investment and conditionality.

A.1. The Bargaining Outcome

A useful characteristic of the bargaining outcome in the Nash fixed threat framework is that it is Pareto efficient. We start the analysis by deriving the characteristics of the contract curve, defined by the Pareto efficient points. Thus, a point on the contract curve is defined by an allocation of X and Y among the various activities that maximize the global weighted average of output. Therefore, for a given ω, $0 < \omega < 1$ we maximize:

$$(A1) \quad \omega Z_t + (1 - \omega) Z_t^*$$

Equivalently maximizing

$$(A2) \quad \omega[1 - X_t^* + 1 - Y_t^*]^{\beta}(K_t)^{1-\beta} + (1 - \omega)\{h_\gamma[(X_{\gamma,t})^\gamma + (Y_{\gamma,t})^\gamma]^{\beta/\gamma}(K_{\gamma,t})^{1-\beta} + h_\delta[(X_t^* - X_{\gamma,t})^\delta + (Y_t^* - Y_{\gamma,t})^\delta]^{\beta/\delta}(K_{\delta,t})^{1-\beta}\}.$$

The weight ω corresponds to the relative importance attached to the developed nations, and varying it will move us along the contract curve. Direct optimization (with respect to X_t^*; Y_t^*; $X_{\gamma,t}$; and $Y_{\gamma,t}$) gives us the following first order conditions:

$$(A3) \quad \omega[1 - X_t^* + 1 - Y_t^*]^{\beta-1}(K_t)^{1-\beta} = (1 - \omega)\{h_\delta[\Omega_\delta]^{(\beta/\delta)-1}(X_t^* - X_{\gamma,t})^{\delta-1}(K_{\delta,t})^{1-\beta}\}$$

$$(A4) \quad \omega[1 - X_t^* + 1 - Y_t^*]^{\beta-1}(K_t)^{1-\beta} = (1 - \omega)\{h_\delta[\Omega_\delta]^{(\beta/\delta)-1}(Y_t^* - Y_{\gamma,t})^{\delta-1}(K_{\delta,t})^{1-\beta}\}$$

$$(A5) \quad h_\gamma[\Omega_\gamma]^{(\beta/\gamma)-1}(K_{\gamma,t})^{1-\beta}(X_{\gamma,t})^{\gamma-1} = h_\delta[\Omega_\delta]^{(\beta/\delta)-1}(K_{\delta,t})^{1-\beta}(X_t^* - X_{\gamma,t})^{\delta-1}$$

$$(A6) \quad h_\gamma[\Omega_\gamma]^{(\beta/\gamma)-1}(K_{\gamma,t})^{1-\beta}\,(Y_{\gamma,t})^{\gamma-1} = h_\delta[\Omega_\delta]^{(\beta/\delta)-1}(K_{\delta,t})^{1-\beta}\,(Y_t^* - Y_{\gamma,t})^{\delta-1}$$

where $\Omega_\varepsilon = (X_{\varepsilon,t})^\varepsilon + (Y_{\varepsilon,t})^\varepsilon$ for $\varepsilon = \gamma,\delta$.

Taking the ratio of (A3) and (A4) yields that

$$(A7) \quad X_t^* - X_{\gamma,t} = Y_t^* - Y_{\gamma,t}.$$

Taking the ratio of (A5) and (A6) yields that

$$(A8) \quad (X_{\gamma,t}/Y_{\gamma,t})^{\gamma-1} = [(X_t^* - X_{\gamma,t})/(Y_t^* - Y_{\gamma,t})]^{\delta-1}.$$

Applying (A7) and (4) to (A8) yields that

$$(A9) \quad X_{\gamma,t} = Y_{\gamma,t};\quad X_{\delta,t} = Y_{\delta,t};\quad X_t^* = Y_t^*;\quad X_t = Y_t$$

We can apply (A7) and (A9) to (A5), replacing the terms involving Y with the terms involving X. Solving the resulting equation for $X_{\gamma,t}$ yields (7) in the text.

Applying equation (7) to (5) yields the result reported in (12) regarding $Z^*(1 - X)$. The autarky output for the case where $\gamma < 0 < \delta \leq 1$, is obtained by noting that for the γ process both inputs must be used in order to produce anything. Thus, in autarky only the δ process is employed, yielding the $Z^*(0)$ in (12).

We now turn to an overview of the bargaining problem for the case where the elasticity of substitution excess one for both processes. If the elasticity of substitution exceeds one in both activities (i.e., if $0 < \gamma < \delta \leq 1$) then the autarky output is obtained by choosing $Y_{\gamma,t}$ that maximize the aggregate autarky output

$$(A10) \quad h_\gamma(Y_{\gamma,t})^\beta(K_{\gamma,t})^{1-\beta} + h_\delta(1 - Y_{\gamma,t})^\beta\,(K_{\delta,t})^{1-\beta}$$

yielding that the level of $Y_{\delta,t}$ and the corresponding output are

$$(A11) \quad Y_{\delta,t} = \tilde{h}_\delta K_\delta / (\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta)$$

$$(A12) \quad Z^*(0) = (\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta)^{1-\beta}$$

In solving the bargaining outcome for the case where $0 < \gamma < \delta \leq 1$, we follow the steps described in (14)-(15), adjusting for the new value of $Z^*(0)$, and obtaining that the modified equations are

$$(14') \quad \underset{X}{MAX} \; \ln[(2X)^\beta - 1] + \ln[(1 - X)^\beta \left\{\frac{\tau}{(\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta)}\right\}^{1-\beta} - 1]$$

$$(15') \quad \frac{\beta 2^\beta}{X2^\beta - X^{1-\beta}} = \frac{\beta \left\{\frac{\tau}{\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta}\right\}^{1-\beta}}{(1-X)\left\{\frac{\tau}{\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta}\right\}^{1-\beta} - (1-X)^{1-\beta}}$$

Note that (14') and (15') can be obtained from (14) and (15) by

replacing $\frac{1}{h_\delta}\left\{\frac{\tau}{K_\delta}\right\}^{1-\beta}$ with $\left\{\frac{\tau}{\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta}\right\}^{1-\beta}$. Consequently, it follows

that the discussion regarding the determination of X_b and Figures 1-2 continue to hold true for this case. Direct derivation reveals that:

$$(A13) \quad \text{sign } \partial \frac{\tau}{(\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta)} / \partial K_\gamma = \text{sign } \{\delta - \gamma\} > 0.$$

Thus, investment in the sector that is more trade dependent will increase

$\frac{\tau}{(\tilde{h}_\gamma K_\gamma + \tilde{h}_\delta K_\delta)}$, implying that X_b will go up.

A.2. Marginal Investment and Conditionality

We now turn to the derivations of the results reported in section 3. Let us denote by H the term $\left\{\frac{\tilde{h}_\delta K_\delta}{\tau}\right\}^{1-\beta}$. Applying this notation we can rewrite the condition defining X_b (equation 15) by $X_b - (X_b)^{1-\beta} 2^{-\beta} = 1 - X_b - (1 - X_b)^{1-\beta} H$. From which we derive that

$$(A14) \qquad \frac{\partial X_b}{\partial \tau} = \frac{1}{\tau} \frac{(1-\beta)(1-X)^{1-\beta} H}{2-(1-\beta)(1-X)^{-\beta} H-(1-\beta)X^{-\beta} 2^{-\beta}}$$

Notice that the bargaining equilibrium must involve gains from trade for both parties, therefore X_b must satisfy the following:

$$(A15) \qquad .5 < X_b < 1 - H^{1/\beta}.$$

Applying this information to (A14) we find that $\frac{\partial X_b}{\partial \tau} > 0$. Observe that from definitions it follow that:

$$(A16) \qquad \frac{\partial \tau}{\partial I^*_\gamma} = \tilde{h}_\gamma 2^{\bar{\beta}/\gamma} \text{ and } \frac{\partial X_b}{\partial I^*_\gamma} = \frac{\partial X_b}{\partial \tau} \frac{\partial \tau}{\partial I^*_\gamma}.$$

Applying (A16) and (A14) to (17) we obtain that:

$$(A17) \quad \frac{\partial Z_2^*}{\partial I_\gamma^*} = \tilde{h}_\gamma 2^{\bar{\beta}/\gamma} \frac{(1-\beta)Z_2^*}{\tau} \frac{2-(1-X)^{\bar{\beta}}\, H-(1-\beta)(X2)^{\bar{\beta}}}{2-(1-\beta)(1-X)^{\bar{\beta}}\, H-(1-\beta)(X2)^{\bar{\beta}}}$$

Inspection of (A17) reveals that the conditions given in (A15) ensure that $\frac{\partial Z_2^*}{\partial I_\gamma^*} > 0$. Finally, note that by combining (A14) and (A16) we conclude that

$$(A18) \quad \frac{\partial X_b}{\partial I_\gamma^*} = \frac{1}{\tau} f(K_\gamma/K_\delta)$$

where f is a proportionality factor that is a function only of the capital ratio (and not of the absolute level of capital). Note that from the definition of τ (see (13)) it follows that τ is a measure of the capital level in the developing countries. Consequently, (A18) implies that the larger the scarcity of capital in the developing economies, the greater the marginal effect of investment on the X_b and the transfer ceiling.

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