IMF WORKING PAPER

WP/93/40

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Toward an Economic Theory of Multilateral Development Banking

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May 1993

Abstract

This paper addresses an apparent lack of economic theory in the analysis of multilateral development bank (MDB) behavior. A simple comparative statics model that is adapted from the credit union literature is used to predict potential areas of conflict, agreement, and indifference between MDB member countries, analyze lending policies against the background of distributional conflicts, and show how various institutional reforms may improve efficiency and overall member country benefits.

JEL Classification Numbers:

F33, F34.

1/ This paper, presented at the 1993 Allied Social Science Associations Conference in Anaheim, California, January 5-7, 1993, was largely completed before I joined the Fund. The views and opinions expressed in this paper are strictly personal and do not necessarily reflect those of the International Monetary Fund. I gratefully acknowledge comments by Dieter Bös, Bruce Dieffenbach, Terrence Kinal, Kajal Lahiri, Harry Richardson, Emil Sunley, and Shang-Jin Wei. All remaining errors and omissions are my own.

Contents

Summary

Multilateral development banks (MDBs), such as the World Bank and the various regional development banks, have been in existence for a number of decades now. Despite their obvious significance for both world capital markets and developing country borrowers, the provocative question whether MDBs are needed after all has usually been answered on either moral or political grounds, often with little economic foundation. This paper addresses the apparent lack of economic theory in the analysis of multilateral development banking by offering a simple comparative statics framework, adapted from the credit union literature, through which MDB lending behavior can be studied.

In the model, MDB members fall into two groups: "net contributors" (the industrialized countries) and "net borrowers" (the developing countries). The benefits derived by each group are nonhomogeneous. Within each group, member countries try to channel the MDB's financial resources into those uses that yield the highest expected benefit. The level of benefits member countries can expect to derive depends critically on a number of exogenous market parameters, institutional variables, and the preferences of other member countries. Although the MDB management has to trade off the interests of the two groups, once it has established its preferences, the preferred group of member countries usually has to absorb positive as well as negative exogenous shocks.

The model may be used to predict potential areas of conflict, agreement, and indifference between MDB member countries, analyze lending policy proposals against the background of distributional conflicts, and show how various institutional reforms may improve allocative efficiency and overall member benefits.

I. Introduction

Most Multilateral development banks, (MDBs), such as the World Bank and the various regional developments banks, have been in existence for a number of decades now. Despite their obvious significance for world capital markets and developing country borrowers, the provocative question whether MDBs are needed after all has usually been answered on either moral or political grounds, often with little economic foundation. Given a rich body of research on commercial banking, the lack of rigorous analytical models of multilateral development banking comes as a surprise. This paper tries to address this apparent gap in the existing literature by offering a simple analytical model through which MDB lending behavior can be studied.

The traditional line of research on MDBs, such as the pioneering studies by Dell (1972), Syz (1974), Kane (1975), DeWitt (1977), Hürni (1980), Payer (1982), Ayres (1983), Torrie (1983), and Please (1984), is largely based on descriptive analysis. More recently, researchers have either analyzed MDBs in a public choice framework, 1/ or concentrated on specific types of lending such as Mosley (1985) in his studies on concessional flows and Mosley, Harrigan, and Toye (1991) in their extensive study on the World Bank's policy-based adjustment lending. While this has led to new and interesting insights, little work has been done on trying to explain lending operations as a result of any type of optimizing behavior. The few exceptions, such as the pioneering studies by Fratianni and Pattison (1982) and Frey et al. (1985), have generated few testable hypotheses, or, as in Frey (1984), Frey and Schneider (1986), have relied largely on testing somewhat singular ad-hoc hypotheses that start with the assertion that one particular interest group, MDB managers, is dominant, and then relate observed loan allocations to stylized managerial behavior patterns.

This paper suggests that a more promising approach for analyzing MDB lending behavior may be based on the credit union literature, and particularly the work by Smith (1984, 1986), and Smith et al. (1981). In viewing MDBs as multilateral credit unions, the simple analytical framework proposed here integrates several ideas from the public choice literature, and generates various testable hypotheses. Using and explicit optimizing framework along the lines of Smith (1984), the model emphasizes heterogenous objectives of interest groups, and allows to study the impact of different exogenous shocks on the comparative statics properties of MDB lending. While this is a novel approach for analyzing MDBs, it can only be regarded as a very first step. Thorough empirical testing, further research on the behavioral assumptions, and, ultimately, a more flexible model framework will have to follow.

1/ See Frey (1984, 1985), Vaubel (1986), and Vaubel and Willet (1991), for examples of the public choice literature.

II. The Model

1. Objective function

Countries join MDBs for a variety of reasons, including, for example, financial interests, and benefits from international policy coordination and cooperation. The model presented here emphasizes one specific view among many, as it derives from the basic proposition that MDBs can be viewed as financial intermediation cooperatives that have two distinct groups of member countries: net borrowers (the developing countries, the "South"), and net contributors (the industrialized countries, the "North"). Considering, for the moment, only financial aspects, the fundamental purpose of MDBs is to provide benefits from indirect international capital market access to developing countries, and loan procurement benefits to industrialized countries. Under this view, a typical MDB can be assumed to maximize the sum of net financial benefits accruing to its member countries.

The model emphasizes conflicts of interests between the two groups of MDB member countries; within each group individual member countries are assumed to possess homogenous objectives. The distribution of benefits between the two groups of member countries is also influenced by the MDB management. To become a member, a country buys MDB capital shares. MDBs are usually not leveraged, i.e., they are only allowed to lend out the capital that has been allocated to them by the governments of their member countries. Still, MDBs are among the biggest institutional borrowers. The contradiction is explained by considering that MDBs have two kinds of capital: paid-in capital and callable capital. Paid-in part capital represents money member country governments have actually given to the institution; callable capital represents a contingent liability, i.e., the maximum amount of funds member country governments promise to provide when the MDB is otherwise unable to service its capital market debt. Since they are not leveraged, MDBs need frequent increases in total capital, but not necessarily in paid-in capital, to increase their lending volume.

In this paper, I consider a MDB that is to receive a general capital replenishment (GCR). MDB member countries have to vote on the GCR. To vote in favor, a member country has to expect to derive positive net benefits. If all operations were completed within a single time period, and, again considering only the financial benefits of MDB membership, a favorable vote would require:

$$E(B^{s}) = E((r^{c}-r)L-S^{sp}) > 0, \qquad (1)$$

$$E(B^{n}) = E((\rho-1)S^{np}) > 0. \qquad (2)$$

Net financial benefits of the South, $E(B^{s})$, are modeled analogous to the "market rate comparison" concept in the credit union literature that was explored by Walker and Chandler (1977). This relies on the notion that the benefits of a credit union derive from providing savings and loan services at a price that is more attractive than the one available from alternative sources, and is consistent with Feinberg's (1987) argument that developing countries are primarily interested in obtaining positive net transfers from MDBs. Assuming that for the South the next best alternative to MDB lending is to give an equal amount of money to a national development agency that usually does not have access to international capital markets, expected net benefits consist of gross benefits, i.e. the interest rate differential between commercial bank (r^c) and MDB (r) interest rates times the flow of new lending received as a consequence of the GCR (L), minus gross "losses," i.e. the dollar value of the paid-in capital shares to be provided by the South under the GCR (S^{sp}).

$E(B^n)$ denotes the expected net financial benefits of the North. This is the procurement per paid-in dollar received from MDB financed projects ($\rho = P^n/S^{np}$) times the value of paid-in capital shares of the North (S^{np}) minus the total procurement that would have been received if the same amount of money would have been used for the next best alternative, which is bilateral lending with procurement tied to the donor country (in which case procurement per dollar equals 1). Calculations for the World Bank and the Inter-American Development Bank, presented in Appendix A, show that $\rho > 1$ holds for almost all industrialized countries.

Three further assumptions are made.

First, both the North and the South are assumed to have perfect foresight in the sense that $B^s = E(B^s)$, and $B^n = E(B^n)$.

Second, once a loan is authorized it is assumed to be disbursed within the present time period, i.e., the period covered by the GCR. As loan disbursements go hand in hand with procurement and project execution, all benefits to the North accrue in the current time period.

Third, loan maturities are assumed to extend beyond the current time period. Consequently, the South receives an extended benefit from an MDB loan compared to a commercial bank loan of the same maturity as long as the loan is not completely amortized. Parameter k with $0<k<1$ represents the portion of outstanding loans that is amortized in a given time period. Hence, for loans extended during the period covered by the GCR (the current time period), $(1-k)L$ will remain outstanding in period $t+1$, $(1-k)^2L$ will remain outstanding in period $t+2$, and so on. If the South would have to repay a commercial bank loan it would have to pay interest rate r^c rather than r for as long as parts of the loan remain outstanding. These future net benefits of the South have to be discounted by factor z to obtain an estimate of their present value:

$$B^s = \left(\left(\frac{1-k}{1+z}\right) + \left(\frac{1-k}{1+z}\right)^2 + \left(\frac{1-k}{1+z}\right)^3 \dots \right) (r^c - r)L - S^{sp},$$

which converges to:

$$B^s = ((1+z)/(z+k))(r^c - r)L - S^{sp}. \qquad (3)$$

Discount factor z reflects the opportunity cost of capital in the borrowing country, which might differ from either r^c or r.

As is the case for a credit union, the objective of a MDB is to maximize the sum of net financial benefits accruing to its members. The MDB management can express its own preferences by attaching weights to the objectives of its two member groups, trading off the interests of one group against the interests of the other group according to its own preferences. Hence, the MDB objective function may be expressed as:

$$\text{Maximize: } B = \alpha(B^s) + (1-\alpha)(B^n) \text{ subject to } \Gamma, \qquad (4)$$

where Γ denotes a set of constraints that is yet to be specified, and where α, with $0 \leq \alpha \leq 1$, reflects the management's relative preferences for the South, and $(1 - \alpha)$ reflects its relative preferences for the North.

So far, the model has only concentrated on financial benefits from MDB membership. It is clear that a whole range of not necessarily financial considerations influence MDBs. These are reflected in the supply of loans by the MDB, the supply of capital shares by the North (S^n), the supply of capital shares by the South (S^s), and the demand for loans by the South.

Given that financial benefits of MDB membership are derived from lending, it seems reasonable to assume that, after having set its current lending rate (r), the MDB will always supply the aggregate level of loans demanded at that rate, subject to some capacity constraint.

Sanford (1972) has argued that membership in MDBs allows industrialized countries to pursue three objectives: economic self interest, economic development goals, and political and/or security goals. This view is generally supported in recent publications by the US Treasury Department (1982), and DeWitt (1987). However, these views appear somewhat narrow as they fail to explicitly acknowledge general benefits from international policy coordination and cooperation. Reducing self-interest to financial self-interest, namely loan procurement per paid-in capital share (ρ), and assuming that all other general policy objectives can be represented by parameter h, the supply of capital shares by the North can be modeled as:

$$S^n = S^n(\rho, h). \qquad (5)$$

S^n is assumed to be continuously twice differentiable, and an increasing function of both ρ and h, i.e., $(\partial S^n/\partial \rho) > 0$, $(\partial S^n/\partial h) > 0$. However, as the North has alternative channels to pursue both development and/or security as well as loan procurement objectives, shares are assumed to be increasing at a decreasing rate, i.e., $(\partial^2 S^n/\partial \rho^2) < 0$, $(\partial^2 S^n/\partial h^2) < 0$. 1/

The supply of capital shares by the North is a supply of total shares. Of all shares, $(1-\beta)$, with $0 \leq \beta \leq 1$, is the callable part, and β the paid-in part, such that:

$$S^n = S^{nc} + S^{np} = (1 - \beta)S^n(\rho,h) + \beta S^n(\rho,h).$$

Note, that while the supply of capital shares is a supply of total shares, the net benefits of the North (B^n) are only related to paid-in capital shares (S^{np}) as callable capital shares do not represent actual expenditures.

The supply of capital shares by the South (S^s) during the period covered by the GCR is assumed to be exogenously fixed: whatever amount of paid-in capital shares the South has to buy under the GCR it will buy, as long as it can expect $E(B^s) > 0$ to hold. Hence,

$$S^s = S^{sc} + S^{sp} = (1 - \theta)S^s + \theta S^s,$$

where θ, with $0 \leq \theta \leq 1$, represents the proportion of capital shares to be paid in by the South in the GCR. 2/

The demand for MDB loans by the South depends on the MDB's lending rate (r) and the commercial bank lending rate (r^c). It is also dependent on the amount of new paid-in capital shares the South has to contribute in the GCR (S^{sp}): the more the South is required to pay in, the more it will want to get back. Consequently we get:

$$L = L(r, r^c, S^{sp}). \tag{6}$$

This function is assumed to be continuously twice differentiable with $(\partial L/\partial r) < 0$, $(\partial L/\partial r^c) > 0$, and $(\partial L/\partial S^{sp}) > 0$. Since, in general, there exist proportionately fewer high return than low return investment projects in developing countries, and using the fact that the demand for loanable funds

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1/ For the discussion that follows it will not be necessary to make assumptions on second-order cross-partials.

2/ Note, that the paid-in portion of capital shares provided by the North and the South may differ. Developed countries always contribute funds in convertible currencies; developing countries are allowed to make some of their MDB capital share purchases in their domestic (non-convertible) currencies. Domestic currency contributions of developing countries frequently are lent back directly to the contributing country where the money is used for domestic procurement of MDB financed projects. These non-convertible currency contributions can be regarded as carrying zero opportunity costs. Hence, they should be excluded from the analysis, so that only the MDB's convertible currency operations, i.e. only funds that can be used for international procurement, are considered.

is generated by investment demand, we may assume that $(\partial^2 L/\partial r^2) > 0$. 1/

Hence, to sum up, equation (4) can be expressed as:

$$Maximize\text{:}\;\; B = \alpha\left\{\left(\frac{1+z}{z+k}\right)(r^c - r)L - \theta S^s\right\} + (1-\alpha)(\rho-1)\beta S^n \;\; subject\ to \;\; \Gamma. \qquad (7)$$

2. Constraints

In any given time period, a MDB faces three constraints. First, it is constrained by an income statement requirement that it must not make operating losses if it is to maintain a favorable bond rating. Second, it is constrained by a balance sheet requirement that its net worth cannot be negative. Third, it can only issue new capital market debt in accordance with its charter limit. These constraints are independent, at least during the period covered by the GCR (the short run). This implies, for example, that, in the short run, it would be possible that a MDB has operating losses while maintaining a positive net worth, and vice versa.

Not being permitted to incur operating losses, a MDB cannot have a negative current period net income. 2/ Net income is derived from gross income (loan and investment income) and gross expenditures (resulting from capital market debt, fixed operating costs, and variable operating costs). Any difference between current income and current expenditures, i.e., all gross operating profits (π) are zero. Assuming, for simplicity, that all financial transactions occur at the same time either at the beginning or at the end of the current period, the net profit constraint of a MDB can be expressed as follows:

$$\pi = rL_0 + r^c I_0 - r^d D_0 - \phi(L, S^n) - F - R = 0, \qquad (8)$$

where rL_0 denotes interest income received on outstanding loans, and $r^c I_0$ denotes interest income received from non-lent-out (=invested) balances. It is assumed that a MDB incurs capital market debt only in the form of bonds (D), for which it has to pay interest rate r^d, such that $r^d D_0$ denotes interest expenses on outstanding capital market debt. The term $\phi(L, S^n)$ denotes the MDB's variable costs as measured by the volume of its current period lending program (L), and current period share contributions by the North (S^n). Only new, current period operations result in variable costs; all operations carried over from the last period only result in fixed administrative expenses. This assumption can be justified by considering

1/ This amounts to the standard textbook assumption about investment demand. For the discussion that follows, assumptions about the signs of other second-order partial and cross-partial derivatives are not needed.

2/ MDBs rise and fall with their ability to raise money cheaply. Being concerned about their *AAA* bond rating, MDB financial policies are fairly conservative.

that projects need to be evaluated and appraised before new loans are extended, while old loans that remain outstanding do not result in any costs beyond fixed administrative costs. F represents the MDB's fixed costs, and includes the fixed administrative budget. R denotes additions to reserves, and is determined as a residual. For the short run, i.e., the time period that is covered by the GCR and during which membership and thereby the scale of operations is constant, it seems reasonable to assume that the relevant part of the MDB's cost-function has marginal costs that are increasing in their own arguments for both L and S^n, while cross-effects are absent. Hence, we get $(\partial\phi/\partial L) > 0$, $(\partial\phi/\partial S^n) > 0$, $(\partial^2\phi/\partial L^2) > 0$, $(\partial^2\phi/\partial (S^n)^2) > 0$, and $(\partial^2\phi/\partial S^n \partial L) = 0$.

The balance sheet constraint is based on the MDB's annual balance sheet, which, at the end of each time period, shows the structure of assets and liabilities. Assets are the stock of outstanding loans and the stock of financial investments; liabilities consist of the value of the stock of outstanding capital market debt and the stock of all paid-in member country shares. The difference between assets and liabilities is the stock of reserves. Hence, at the end of the previous time period the MDB's balance sheet had the following structure:

$$L_o + I_o = S^p_o + D_o + R_o. \qquad (9)$$

These stocks of assets and liabilities will change in the current time period. It will be assumed that in the current period the MDB will amortize a portion γ, with $0 \leq \gamma \leq 1$, of last period debt, such that:

$$D_1 = (1-\gamma)D_o + D.$$

As mentioned above, k, with $0 \leq k \leq 1$, represents the amount of outstanding loans that is amortized in each given time period, such that:

$$L_1 = (1-k)L_o + L.$$

Similarly, investment (I) is assumed to evolve as follows:

$$I_1 = (1-\eta)I_o + I,$$

with $0 \leq \eta \leq 1$. The model treats the level of current investment as a residual, i.e., investment is simply non-lending.

The evolution over time of the stock of total paid-in capital shares, S^p_1, may be expressed as follows:

$$S^p_1 = S^p_o + S^p = \beta(S^n_o + S^n) + \theta(S^s_o + S^s),$$

with $S^p \geq 0$, while the additions to MDB reserves are simply:

$$R = R_1 - R_o.$$

As already pointed out, R is necessarily non-negative since current period operating profits are required to be non-negative. Using these assumptions, the MDB's balance sheet at the end of the current period can be expressed as:

$$(1-k)L_o + L + (1-\eta)I_o + I = (1-\gamma)D_o + D + \theta(S_o^s+S^s) + \beta(S_o^n+S^n) + R_o + R. \qquad (10)$$

The maximum amount of new capital market debt (D) the MDB is allowed to issue in the current period is limited by its charter. The charter limit for the stock of outstanding capital market debt is provided by the sum of unimpaired callable capital, i.e., the callable capital of its non-borrowing member countries, and accumulated reserves. Hence, the upper limit of new MDB bond issues is given by:

$$D \leq S^{nc} + \gamma D_o + R + (S_o^{nc} + R_o - D_o). \qquad (11)$$

The MDB can issue new capital market debt (D) up to a point where D equals the sum of new callable capital shares of the North (S^{nc}), plus replacement bond issues for bonds that fall due during the current time period (γD_o), plus current additions to its stock of reserves (R), plus the shortfall relative to the charter limit of the level of outstanding capital market debt in the last period (D_o), i.e., the sum of the stock of callable capital shares of the North in the last period (S_o^{nc}) and the MDB's stock of reserve assets (R_o) in the last period. Equation (11) can be rewritten as:

$$D \leq (1-\beta)(S_o^n + S^n) - (1-\gamma)D_o + R_o + R. \qquad (12)$$

Given that the interest rate on capital market bond issues (r^d) will not exceed the MDB lending rate (r), which in turn will not exceed the commercial bank lending rate (r^c), i.e., $r^d \leq r \leq r^c$, the MDB will always want to issue new capital market debt up to its charter limit, regardless of the demand for its loans: the portion of money raised by issuing bonds that is demanded for new lending will earn interest rate r, while the portion that is not needed for new lending will simply earn the going market rate (r^c) as it is invested by the MDB. Hence, equation (12) is assumed to hold with equality, and it can be substituted into the MDB's balance sheet constraint, giving:

$$(1-k)L_o + L + (1-\eta)I_o + I = S^n{}_o + S^n + \theta(S_o^n+S^s) + 2(R_o+R). \qquad (13)$$

After solving equation (13) for R, it can be substituted back into the MDB's income constraint (equation 8), which then becomes:

$$\pi = \left(r + \frac{k-1}{2}\right)L_O + \left(r + \frac{\eta-1}{2}\right)I_O - r^d D_O - F + R_O - \phi\left(L, S^n\right) + \frac{1}{2}\left[S_O^n + S^n + \theta\left(S_O^s + S^s\right) - L - I\right] = 0, \qquad (14)$$

where $L = L(r^c, r, \theta S^s)$, and $S^n = S^n(\rho, h)$. Hence, we have obtained a single constraint for the MDB's optimization problem.

3. <u>The optimization problem</u>

The MDB adjusts its lending operations to exogenous shocks through two endogenously determined lending policy parameters, r and ρ. It supplies all the loans that are demanded up to its lending limit, and accepts all the capital shares it is offered by its members. While it can neither influence aggregate lending or capital share subscriptions directly, it has indirect control over both variables by setting its lending rate r, and by controlling ρ within reasonable limits. The MDB controls its lending rate (r) within the limit set by the difference between the market interest rate (r^c) and its bond rate (r^d), i.e., $r^d \leq r \leq r^c$. It controls ρ since it influences the sectoral loan allocation pattern via its policy advisory function and via its ability to set eligibility standards and criteria for certain types of lending operations. The larger the share of projects with a high import component (e.g. energy, industry, communications, etc.), the higher will be the value of ρ.

Using this information, and taking possible corner-solutions into account, the MDB's optimization problem can be expressed as:

$$Max\ (r,\rho):\ \alpha\left[\left(\frac{1+z}{z+k}\right)(r^c-r)L-\theta S^s\right]+(1-\alpha)(\rho-1)\beta S^n \tag{15}$$

subject to

$$\pi = 0,$$

$$r^c \geq r \geq r^d \geq 0,$$

$$L(\beta S^n)^{-1} \geq \rho \geq 1,$$

where π is defined as in equation (14).

Using a Kuhn-Tucker framework, the MDB's optimization problem (15) can be expressed as:

$$\mathcal{L}(r,\rho) = B + \lambda_1(\pi) + \lambda_2(r-r^d) + \lambda_3(r^c-r) + \lambda_4(\rho-1) + \lambda_5(L-\rho\beta S^n), \tag{16}$$

where B denotes the weighted net-benefit function, i.e.

$$B = \alpha B^s + (1-\alpha)B^n$$

$$= \alpha\left[\left(\frac{1+z}{z+k}\right)(r^c-r)L-\theta S^s\right]+(1-\alpha)(\rho-1)\beta S^n.$$

Concentrating on interior solutions to the MDB's optimization problem (15), i.e. $\lambda_1 \geq 0$ and $\lambda_2=\lambda_3=\lambda_4=\lambda_5=0$, the Lagrangian of equation (15) can be written as:

$$\mathcal{L}(r,\rho) = B + \lambda\ ((1/2)(S^n + S^n_o + \theta(S^s+S^s_o) - L - I) + R^o - r^d D_o$$

$$- \phi(L,S^n) - F + L_o(r+(k-1)/2) + I_o(r^c+(\eta-1)/2)) \tag{17}$$

where $S^n = S^n(\rho,h)$, and $L = L(r^c,r,\theta S^s)$, and all other variables are denoted as before. The first order conditions generated by this function are:

$$\Delta_r = \alpha \left(\frac{1+z}{z+k}\right)\left[(r^c - r)\frac{\partial L}{\partial r} - L\right] + \lambda\ \frac{\partial \pi}{\partial r} = 0, \tag{18}$$

$$\Delta_\rho = (1-\alpha)\beta \left[(\rho-1)\frac{\partial S^n}{\partial \rho} + S^n\right] + \lambda\ \frac{\partial \pi}{\partial \rho} = 0, \tag{19}$$

$$\Delta_\lambda = \pi = 0, \tag{20}$$

where

$$\frac{\partial \pi}{\partial r} = L_o - \left(\frac{1}{2} + \frac{\partial \phi}{\partial L}\right)\frac{\partial L}{\partial r},$$

and

$$\frac{\partial \pi}{\partial \rho} = \left(\frac{1}{2} - \frac{\partial \phi}{\partial S^n}\right)\frac{\partial S^n}{\partial \rho}.$$

The second-order condition that has to be satisfied for a maximum is that the bordered Hessian matrix is negative definite, which implies

$$H = \begin{vmatrix} \Delta_{rr} & \Delta_{\rho r} & \pi_r \\ \Delta_{\rho r} & \Delta_{\rho\rho} & \pi_\rho \\ \pi_r & \pi_\rho & 0 \end{vmatrix} > 0.$$

Since in our case $\Delta_{r\rho} = \Delta_{\rho r} = 0$, the second order condition reduces to:

$$H = -(\pi_\rho)^2\Delta_{rr} - (\pi_r)^2\Delta_{\rho\rho} > 0. \tag{21}$$

In general, a sufficient condition for this to hold would be $\Delta_{rr} < 0$. However, in order for the model to yield an interior solution, it can easily be shown that $\Delta_{rr} < 0$ and $\Delta_{\rho\rho} < 0$ is not only sufficient but also necessary. Thus:

$$\Delta_{rr} = \alpha \frac{1+z}{z+k} \left[(r^c - r) \frac{\partial^2 L}{\partial r^2} - 2 \frac{\partial L}{\partial r} \right] + \lambda \frac{\partial^2 \pi}{\partial r^2} < 0, \tag{22}$$

$$\Delta_{\rho\rho} = (1-\alpha)\beta \left[2 \frac{\partial S^n}{\partial \rho} + (\rho - 1) \frac{\partial^2 S^n}{\partial \rho^2} \right] + \lambda \frac{\partial^2 \pi}{\partial \rho^2} < 0, \tag{23}$$

with

$$\frac{\partial^2 \pi}{\partial r^2} = - \left(\frac{1}{2} + \frac{\partial \phi}{\partial L} \right) \frac{\partial^2 L}{\partial r^2} - \frac{\partial^2 \phi}{\partial L^2} \left(\frac{\partial L}{\partial r} \right)^2$$

and

$$\frac{\partial^2 \pi}{\partial \rho^2} = \left(\frac{1}{2} - \frac{\partial \phi}{\partial S^n} \right) \frac{\partial^2 S^n}{\partial \rho^2} - \frac{\partial^2 \phi}{\partial (S^n)^2} \left(\frac{\partial S^n}{\partial \rho} \right)^2$$

Assuming that $\lambda > 0$, implying that net benefits to the South (B^s) and to the North (B^n) are non-negative at an optimum, 1/ there exist three general cases:

a. The MDB management has complete preferences for developing countries (α=1), which would normally imply:

$$\left(\frac{\partial \pi}{\partial r} \right) > 0$$

$$\left(\frac{\partial \pi}{\partial \rho} \right) = 0 \quad \Rightarrow \quad \frac{1}{2} = \left(\frac{\partial \phi}{\partial S^n} \right)$$

b. The MDB management has complete preferences for industrialized countries (α=0). In this case, a corner solution for which the total procurement of the South (P^s) equals zero is likely.

c. Intermediate cases ($0<\alpha<1$), that normally imply: but where corner solutions for which procurement of the South (P^s) equals zero are nevertheless possible.

As in Smith's (1984) analysis of credit union behavior, it is useful to assume for the moment the hypothetical case of a profit maximizing MDB. In this case the profit function (equation 14) becomes the objective function

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1/ Assuming $\lambda>0$ actually implies that net benefits are not exhausted, i.e. relaxing the income constraint would allow net benefits to increase, at least in the short run.

$$\left(\frac{\partial \pi}{\partial r}\right) > 0$$

$$\left(\frac{\partial \pi}{\partial \rho}\right) < 0 \quad \Rightarrow \quad \frac{1}{2} < \left(\frac{\partial \phi}{\partial S^n}\right)$$

rather than the constraint, and the first order conditions yield: $(\partial\pi/\partial r)=0$ and $(\partial\pi/\partial\rho)=0$. This implies that with complete preferences for developing countries the MDB would treat industrialized countries as if it were to maximize profits, and then and use these "profits" to "subsidize" the lowest possible lending rate for developing countries. Similarly, profit maximization with complete preferences for industrialized countries would imply that the MDB sets its lending rate for developing countries to "maximize profits" and then spend the profits by subsidizing the procurement interests of the industrialized country members. In practice, it is unlikely that MDBs can afford completely to neglect the interests of any one of its two member groups.

4. Comparative statics behavior

Comparative statics properties of the model can be explored via total differentiation of the first order conditions. This shows the likely reaction of the MDB to various exogenous shocks, showing potential areas of conflict, agreement, and indifference between the MDB's developing country members and its industrialized country members, taking the interests of the MDB's management into account.

Table 1 shows the results of the comparative statics exercises that were carried out for an intermediate range of the managerial preference parameter ($0<\alpha<1$). The results can be categorized into four general cases according to how they affect the interests of the two groups of member countries: (i) exogenous shocks that affect the interests of both groups in the same direction ("agreement shocks"); (ii) exogenous shocks that affect the interests of both groups in opposite directions ("conflict shocks"); (iii) exogenous shocks that have a definite effect on only one group but, a priori, an unclear effect on the other; and (iv) exogenous shocks that have an unclear effect on both groups. For curiosity, the results for the extreme case of an MDB that operates with complete preferences for its developing country members ($\alpha=1$) are reported in parentheses.

Exogenous variables that generate agreement shocks constitute the largest group of variables, indicating that, notwithstanding the very different nature of developing and industrialized country interests, the two groups can be expected to speak with one voice when reacting to these shocks. The variables include changes in the MDB bond rate (dr^d), changes in the maturity structure of the MDB's financial investment portfolio ($d\eta$), changes in the levels of current investment (dI), and changes in fixed operating costs (dF). According to these results, MDBs can be expected to

Table 1. Results of Comparative Statics Exercises

		dr		$d\rho$	
Category (i):	[1]	$(dr/dr^d)>0$	(>0)	$(d\rho/dr^d)<0$	$(=0)$
	[2]	$(dr/d\eta)<0$	(<0)	$(d\rho/d\eta)>0$	$(=0)$
	[3]	$(dr/dI)>0$	(>0)	$(d\rho/dI)<0$	$(=0)$
	[4]	$(dr/dF)>0$	(>0)	$(d\rho/dF)<0$	$(=0)$
	[5]	$(dr/dS_o^s)<0$	(<0)	$(d\rho/dS_o^s)>0$	$(=0)$
	[6]	$(dr/dS_o^n)<0$	(<0)	$(d\rho/dS_o^n)>0$	$(=0)$
	[7]	$(dr/dD_o)>0$	(>0)	$(d\rho/dD_o)<0$	$(=0)$
	[8]	$(dr/dR_o)<0$	(<0)	$(d\rho/dR_o)>0$	$(=0)$
	[9]	$(dr/dI_o)>0$	(>0)	$(d\rho/dI_o)<0$	$(=0)$
Category (ii):	[10]	$(dr/d\alpha)<0$	$(=0)$	$(d\rho/d\alpha)<0$	(<0)
	[11]	$(dr/dz)>0$	$(=0)$	$(d\rho/dz)>0$	$(=0)$
	[12]	$(dr/d\beta)>0$	$(=0)$	$(d\rho/d\beta)>0$	(>0)
Category (iii):	[13]	$(dr/dk)=?$	(<0)	$(d\rho/dk)>0$	$(=0)$
	[14]	$(dr/dL_o)>0$	(>0)	$(d\rho/dL_o)=?$	$(=0)$
Category (iv):	[15]	$(dr/dr^c)=?$	$(=?)$	$(d\rho/dr^c)=?$	$(=0)$
	[16]	$(dr/dh)=?$	$(=?)$	$(d\rho/dh)=?$	$(=?)$
	[17]	$(dr/d\theta)=?$	$(=?)$	$(d\rho/d\theta)=?$	$(=0)$
	[18]	$(dr/dS^s)=?$	$(=?)$	$(d\rho/dS^s)=?$	$(=0)$

be very protective of their bond rating, have investment portfolios with a high share of short-term assets, and, as the model treats investment simply as non-lending, be more interested in lending than investing. Also, since increases in fixed operating costs adversely affect the benefit structure of MDB members, the model would predict that bureaucratic waste is hard to tolerate. Assuming that member countries are able to influence the MDB decision process, for example via the board of directors, the result would indicate that the often alleged inefficiency of MDBs is unlikely to be the result of an overly high level of fixed operational expenses. Hence, the public choice argument that MDBs can be characterized by an administrative overhead would be rejected within the present framework.

The group of agreement shocks also includes level changes in a number of variables that refer to the period covered by the previous GCR such as past capital shares of developing countries (dS_0^s), past capital shares of industrialized countries (dS_0^n), past outstanding capital market debt (dD_0), past reserves (dR_0), and past investments (dI_0). While these past period variables cannot be changed in the current period, forward looking MDB's would tend to adjust these variables to optimally suit their member countries. Given the results of the comparative statics exercises, we would expect, for example, that MDBs that operate with higher levels of capital shares during previous GCRs have lower lending rates and generate higher procurement levels per industrialized country capital share. Similarly, MDBs that operate with higher levels of outstanding capital market debt during previous GCRs would be expected to have higher lending rates and generate lower procurement levels per industrialized country capital share.

Conflict shocks are more problematic than agreement shocks because they reveal the different interests and objectives existing among the MDB membership, and show the potential for conflict within the institution. There are three conflict shock variables in the model. These are the management preference parameter (α), the time rate of discount of developing countries (z), and the paid-in part of industrialized country capital shares (β). The fact that changes in the management preference parameter always cause benefits for the two member groups to go in opposite directions, implies conflicts over the distribution of benefits. Hence, the MDB management always has to trade off procurement interests of the North against borrowing interests of the South. Based on the model we would, for example, expect that MDBs with strong preferences for their industrialized country members will charge comparatively high interest rates on loans and promote projects with a high import component.

Increases in the time rate of discount of developing countries cause future benefits to be discounted more, implying that developing countries increase their preference for current borrowing. According to the model, this will be beneficial to the North and harmful to the South. If it can be argued that the international debt crisis of 1980s caused the time discount rate of developing countries to increase, leading to an intertemporal substitution of loanable funds in favor of current demand, the model would indicate that this resulted in both higher MDB lending rates, and higher loan procurement levels per capital share than would have prevailed otherwise. Therefore an increased urgency of MDB lending could be expected to largely benefit industrialized country members.

Interestingly, the model suggests that decreases in the paid-in part of capital shares of industrialized countries reduce both the procurement parameter and the MDB lending rate. This would imply that the drop in paid-in capital shares that has been observed for all MDBs largely benefitted developing country members. The result also implies that MDBs with comparatively low levels of paid-in capital shares of industrialized countries are likely to have both projects with a lower import component and a lower lending rate. In addition, the result would predict that proposals to lower the level of paid-in capital shares are likely to originate from developing country members.

Exogenous shocks that have a definite effect on only one group but a priori an unclear effect on the other may be problematic for MDBs. There are two variables in the model that have such an effect: the level of loans outstanding during the period covered by the previous GCR (dL_0), and the loan amortization parameter (dk) that determines the loan maturity profile. This result is interesting, as it suggests that developing countries with a time horizon that extends beyond the current time period are likely to object to any type of "loan pushing," and thereby counterbalance what part of the literature has sometimes assumed to be the typical management objective, at least in the case of commercial banks (Darity and Horn, 1988). The model also suggests that decreases in the loan amortization parameter, reflecting longer loan maturities, have an uncertain effect on the MDB lending rate, while decreasing loan procurement. This result may help to explain the observed preference of developing countries for long-term funds: as borrowing long-term does not necessarily carry negative implications for the cost of borrowing, it becomes the preferred choice of developing country borrowers. Still, as longer loan maturities adversely affect procurement interests, the model predicts conflicts over the maturity structure of the MDB's loan portfolio. Nevertheless, with complete preferences for developing countries, loan maturity structure changes do not have a favorable impact on the loan procurement interests of industrialized countries, but do have a favorable impact on the borrowing interests of developing country members, as MDB lending rates are reduced.

Finally, there is the group of exogenous variables that has an unclear effect on the benefits derived by either of the two groups of member countries. These are the market interest rate (dr^c), other general policy objectives of industrialized countries, including, for example, benefits from international policy coordination and cooperation (dh), the level of <u>paid-in</u> capital shares of developing countries ($d\theta$), and the overall, i.e., both paid-in and callable, capital shares of developing countries (dS^s).

The result that changes in market interest rates have an uncertain impact on the model's optimality conditions, may just be interpreted as reflecting the importance of demand elasticities in the determination of MDB lending rates. More interesting is the fact that increases in development and/or security objectives of industrialized countries have an uncertain impact on both the procurement interests of industrialized countries, and on the borrowing interests of developing countries. In an extreme case, i.e., for MDB with complete preference for developing countries, the pursuit of other general policy objectives by the North could even raise the MDB's lending rate 1/ and lower the North's procurement rate ($d\rho < 0$). In general, however, the pursuit of non-monetary development objectives by the

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1/ In order for $dr/dh>0$, $\Delta_{\rho h}>0$ is a sufficient but not a necessary condition. Conversely, in order for $dr/dh<0$, $\Delta_{\rho h}<0$ is a necessary but not a sufficient condition.

MDB's industrialized country members has an uncertain impact on the optimality conditions for MDB behavior under any assumption on the managerial preference parameter. This result is a rather strong one as it implies that industrialized countries may not have an incentive to pursue political or other non-monetary objectives through their MDB membership.

Increases in either the percentage of paid-in capital shares and the level of total capital shares of developing countries have uncertain effects on the MDB lending rate and on procurement. Hence, the model predicts that developing countries are unlikely to be enthusiastic about increasing their own capital share in GCRs. Casual observation would suggest that, while developing countries have been very interested in increasing their voting power, they have often lobbied for more base votes, i.e., votes that are not linked to the level of capital shares. Also, since procurement effects are unclear, or, as in the case of an institution with complete preferences for developing countries, non-existent, the model predicts that industrialized country members are also unlikely to object to the general reluctance of developing countries to increase their shares. Still, on the whole, these results provide some rationale for the intense lending policy discussions that have tended to accompany GCR negotiations 1/ in MDBs. The model shows that the level of benefits generated by a GCR for both industrialized and developing country members is uncertain, except for an increase in the paid-in capital shares of industrialized countries, which, while beneficial for industrialized country shareholders, has an adverse impact on the benefits derived by the MDB's developing country members. It could be argued that the observed problems of negotiating GCRs in practice constitute a systematic result of the way the interests of member country blocks are transmitted through the organizational structure of MDBs.

III. Summary and Conclusions

Adapted from the literature of credit unions, the model presented in this paper presents an alternative to the existing literature on multilateral development banking, and particularly the public choice literature, which usually explains MDB lending behavior as the outcome of management utility maximization. Using a simple comparative statics framework, the model views MDBs as consisting of two groups of member countries that pursue heterogenous objectives and derive heterogenous benefits, which are, however, influenced by the MDB management.

MDB policy parameters are shown to depend critically on the value of various exogenous market- and country-determined variables, as well as on a range of institutional parameters. By expressing preferences for one or the other group of members, the MDB management has to trade off the borrowing interests of its developing country members against the procurement

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1/ For reviews on some of these discussions, see, for example, Fleming (1988), Klutznik (1988), Greenhouse (1988), Farnsworth (1988), McNamee (1988), Bandow and Fauntroy (1988), and, more recently, Mallet (1993).

interests of its industrialized country members. However, having set its preferences, it is shown that the preferred group of members usually has to absorb both positive and negative effects of exogenous shocks.

The simple model framework, points out possible areas of conflict, agreement, and indifference between MDB member countries, interprets policy proposals against the background of distributional conflicts, and derives various testable hypotheses. While it is argued that modelling MDBs as international credit unions provides a promising new approach for the analysis of MDBs, more research is needed. Future research should concentrate on providing a more sophisticated objective function, analyzing MDB behavior in a dynamic setting, and subjecting the various hypotheses generated by the model to empirical tests.

Procurement of MDB Loans

This appendix provides procurement data for the World Bank and the Inter-American Development Bank, and indicates that the assumption of a procurement parameter greater than one ($\rho>1$) generally holds. For the two institutions, the tables that follow show cumulative procurement of net contributors, i.e., the cumulative disbursements on MDB project contracts awarded to the North (P^n), the paid-in capital shares of the North ($S^{np}=\beta S^n$), and the value of $\rho=P^n/S^{np}$. P^n and S^{np} are measured in millions of US dollars. World Bank data are derived from the World Bank's Annual Report for 1988; Inter-American Development Bank data are taken from Bruggmann (1988).

Table A1. The World Bank: Cumulative Foreign Procurement and Paid-In Capital Shares to June 30, 1988

Country	P^n	βS^n	ρ
Australia	556.8	141.03	3.9
Austria	642.6	63.16	10.2
Belgium	941.6	169.76	5.5
Canada	1449.2	263.80	5.5
Denmark	331.0	58.33	5.7
Finland	210.4	48.28	4.4
France	4444.1	410.16	10.8
Germany	7675.9	427.95	17.9
Iceland	3.1	4.83	0.6
Ireland	49.6	28.71	1.7
Italy	3972.9	207.78	19.1
Japan	10073.2	554.55	18.2
Kuwait	130.1	76.34	1.7
Luxembourg	43.6	7.18	6.1
Netherlands	1133.3	181.57	6.2
New Zealand	100.9	40.41	2.5
Norway	162.1	56.73	2.9
South Africa	261.7	77.44	3.4
Sweden	1138.1	86.42	13.2
United Arab Emirates	346.5	22.64	15.3
United Kingdom	5121.4	429.33	11.9
United States	13994.3	1577.62	8.9
Total	55392.0	4934.02	11.23

Table A2. The Inter-American Development Bank: Cumulative Foreign Procurement and Paid-In Capital Shares to December 31, 1987

Country	P^n	βS^n	ρ
Austria	39.505	9.953	3.96
Belgium	41.462	34.611	1.20
Canada	169.499	287.183	0.59
Denmark	20.463	12.308	1.66
Finland	17.046	9.828	1.73
France	618.706	121.551	5.09
Germany	535.321	141.053	3.80
Italy	699.979	124.183	5.64
Japan	8.993	9.672	0.92
Netherlands	106.554	19.098	5.58
Norway	3.282	10.708	0.31
Sweden	118.252	22.072	5.38
Switzerland	283.262	33.458	8.46
United Kingdom	183.235	133.175	1.38
United States	4474.784	4931.443	0.91
Total	7320.343	5900.296	1.24

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