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# The Empirical Determinants of Lending to Sub-Saharan Africa

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**Abstract**

This paper looks at the empirical determinants of lending to sub-Saharan Africa during the 1982-89 period. A defensive lending model is presented in which an increase in the riskiness of a country promotes more lending to protect previous loans. This model differs considerably from previous models which predict an increase in lending from a decline in risk. The empirical results support the defensive lending model and imply that debt forgiveness may be more harmful than helpful.

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**Introduction**

While much of the discussion of the debt crisis has centered on the large debtors in Latin america, little attention has been paid to the fate of the smaller borrowers in sub-Saharan Africa. Only two African countries are included in the World Bank's group of highly indebted countries. However, the lending occurring in these countries is of utmost importance in determining their future economic viability, and while the dollar amounts may be small, relative to the size of the economies involved, the debt is quite substantial. This paper looks at the determinants of both commercial bank and official creditor lending to sub-Saharan Africa and its future prospects.

By global standards, Africa has not fared that badly in the current lending situation. Figure 1 shows global lending and decline in total loan disbursements after 1982. Lending exceeded debt service payments until 1985 after which the developing countries paid out more than they received. Figure 2 shows loan disbursements for sub-Saharan Africa separately. While lending dropped off in 1983, and they have received some new money since then.

However, the composition of the lending in Africa has changed dramatically. Figure 3 shows the distribution of loans and the dropoff in lending by private sources. In 1980, private lending comprised roughly 54% of total loans disbursed in Africa. By 1987 that number had fallen to about 21%, the dollar amount of loans from private sources fell from $6.2 billion in 1982 to $1.6 billion in 1987. Bilateral loans, those from creditor governments, also dropped from almost $3 billion in 1982 to $2 billion in 1987. While creditor governments may be willing to forgive past debt, the evidence suggests that they are unlikely to increase future lending substantially. This leaves the multilateral organizations as the only likely future creditors to sub-Saharan Africa. Figure 3 shows that the multilateral organizations have already substantially increased their disbursements to Africa. Whether they are able or willing to make further increases is unclear.

Official policy has finally begun to recognize the problems faced by the sub-Saharan countries. George Bush announced in early July 1989 that beginning October l, the U.S. government will forgive official development loans for the sub-Saharan countries which agree to IMF reform programs. This follows earlier announcements of debt forgiveness by Britain, France, West Germany, Canada, and the Netherlands. But the question remains as to whether this will have that much effect. If all government to government loans were forgiven, the African countries would see a 40% decline in their total debt outstanding.

However, because most of these loans are on concessional terms, even a 40% decline in debt would amount to only a 25% decline in debt servicing requirements. The crucial question is whether the creditor governments will continue to make future loans to Africa once the former loans have been forgiven. Based on 1987 data from the World Bank, over 30% of the net new money coming into Africa was coming from creditor governments. If the African countries are given debt forgiveness and then not lent any more money, the countries will end up worse off.

The prospects for further lending to sub-Saharan Africa, therefore, look somewhat bleak. However, there is a positive side. Some countries have experienced increases in lending by private creditors. Some have also experienced increases by official bilateral creditors. This paper will focus on the factors affecting these creditor decisions to determine what countries can do to increase the loans they receive and to determine the prospects for future lending. Section I describes the motivation for lending as discussed in the literature and presents a model specific to the current period. Sections II and III present an empirical model for lending with regression results, followed by the conclusion in Section IV.

**I. Determinants of Creditor Lending**

The commercial banks lent substantial sums of money to developing countries in the 1970's. An enormous body of literature discusses the reasons for the increase in lending as well as whether the lending was rational. Once the 1970's lending had occurred, however, the banks were stuck with a portfolio of loans with a high probability of default. The banks perceived a rise in the probability of default around 1982 and reduced lending to developing countries drastically. The lending which continued to occur was largely in the form of defensive lending, ending meant to enhance the value of past loans.

The early literature on LDC lending focused on the demand and supply for loans. Both Cline (1984) and Eaton and Gersovitz (1981) discuss lending as initially demand-determined. However, in both models there is a credit ceiling determined by creditors. Once that point has been reached, the lending becomes supply-determined with the availability of loans dependent on changes in this credit ceiling. Cline then determines the probability that the demand for loans will exceed the supply, forcing a rescheduling. A number of other articles, including McFadden et al. (1985), focus directly on the determinants of rescheduling, but implicitly use the same type of framework. This literature concludes that anything that makes the country riskier reduces lending. Demand variables

are included in that the higher a country's demand for loans, the less likely it is to risk losing access to international financial markets by defaulting.

A second body of literature, purely theoretical, focuses more directly on default risk. Cohen and Sachs (1986) develop a framework where lending occurs primarily to avoid default with countries being lent just enough to prevent default. The implications of this model are that once lending has occurred, an increase in the riskiness of the country will result in more lending to protect the value of the previous loans. The assumption is that banks will always lend to avoid default.[i] This framework differs from Krugman's defensive lending model (1989) in that Krugman allows banks to choose whether default is or is not in their best interest.[ii] The bank decision is based on the future value of the debt which depends heavily on the probability of default. While Krugman does not explicitly combine the earlier probability of default models with his model, a unified model which fully describes defensive lending behavior is presented below.

The only empirical work to date on defensive lending is by Schwarz (1989) and Nunnenkamp (1989). Schwarz examines lending in Latin America alone which differs in many respects from lending in Africa. Nunnenkamp looks at a large group of indebted countries and examines defensive lending as one hypothesis to explain lending. He finds defensive lending more plausible than the other types he considers, but his framework is not theoretically based and his choice of variables is different from that described below.

The model presented here begins with Krugman's defensive lending model. Letting represent the probability of default at time t and $D_t$ the amount of debt outstanding, a bank's expected losses can be represented as $\lambda_t D_t$. If further lending $L_t$ occurs, default this period may be avoided, but the total debt outstanding will now be $(D_t + L_t)$. The expected losses to bank next period will be $\lambda_{t+1}(D_{t+1})$, where $D_{t+1}$ is the sum of the debt outstanding at time t and the new loans made at time t. As long as this is less than the original expected loss, the bank should continue to offer new loans.

(1) $\lambda_{t+1}(D_t + L_t) \leq \lambda_t D_t$

Assuming for a moment that $\lambda_{t+1}$ is independent of $L_t$, the maximum amount that the banks would be willing to lend debtors would be where the expected losses with the new lending equal the original expected losses. Solving for that $L_t$, we get:

(2) $L_t = \frac{(\lambda_t - \lambda_{t-1})D_t}{\lambda_{t+1}}$

Taking the first derivatives of $L_t$, with respect to $\lambda_t\lambda_{t+1}$ and $D_t$ , we find that as the probability of current default $\lambda_t$ rises, new lending rises. As the probability of future default $\lambda_t$ rises, new lending falls, and as the amount of debt outstanding $D_t$ rises, new lending rises as long as the current probability of default $\lambda_t$ is higher than the future probability $\lambda_{t+1}$. New ending is thus a function of current and future default probabilities and the amount of debt outstanding:

(3) $L_t = f(D_t,\ \lambda_t,\ \lambda_{t+1})$

The amount of debt accumulated in the 1970's, $D_t$, is exogenous in the 1980's. However, the probabilities of default $\lambda_t$ and $\lambda_{t+1}$ are endogenous decisions made by the debtor government. Each period the debtor government chooses between default and repayment. The government derives utility from two goods: net income and the level of satisfaction of the population. Income adds to the government utility in that the government has more to tax and consume. The satisfaction of the population also affects the utility of the government in that dissatisfaction will lead to a loss of power through and electoral defeat or a coup. The utility function is assumed to be multiplicative so that a minimum satisfaction level is required to keep the government in power. For a single period, the welfare W of the government can be
represented as:

(4) $W = U(N_t, G_t)$ ,

where: $N_t$ = net income in period t and
$G_t$ = level of satisfaction with the government in period t.

The net income of the country in period t depends on its repayment decision. Each period the country receives some income $Y_t$. In the simplest case this income is not a function of past investment decisions. If the government chooses repayment, debt service must be paid out of current income, but the country may receive some new loans to help with debt service payments. If the new loans received exceed the debt service payments, the country will achieve a higher net income this period through a positive net transfer from its creditors. For a period the net income of the country choosing to repay can be represented as:

(5) $N_t = Y_t + (L_t - S_t)$ ,

Where: $Y_t$ = income in period t,
$L_t - S_t$ = net transfer in period t, and
$S_t$ = debt service in period t, and
$L_t$ = Loans in period t.

The government choosing to default would pay no debt service, but would also receive no loans and would face penalties imposed by its creditors which would have to be paid out of its current income. The defaulting net income can be represented as:

(6) $N_t = Y_t - P_t$

where: $P_t$ = penalties imposed on defaulting nations.

The other component of the government's utility function, popular satisfaction, is clearly a function of net income, but is also a function of other attributes of the government. Politically repressive regimes, for example, may be secure enough that they can behave as if they have popular satisfaction whether they actually do or not. Governments can also engage in satisfaction increasing actions. Default is generally popular, and a government which chooses to default will gain domestic credibility[iii] which may balance the loss in income. The popular satisfaction can thus be expressed as:

7) $G_t = G(N_t, X_t, d_t)$

where: $N_t$ = net income ($G_n>0$).
$X_t$ = government-specific attributes ($G_n>0$) and
$d_t$ = positive effect of default.

The default probability $\lambda_t$ is the probability that the government's welfare under default $W^D$ is greater than its welfare under repayment $W^R$[iv]

(8) $\lambda_t = \Pr\left[W^D - W^R \geq 0\right]$

Anything that raises $W^D$, such as a reduction of the penalties to be imposed under a default or a rise in the pressure on a government to default raises $\lambda_t$. Anything that raises $W^R$, such as a rise in current lending or a drop in debt service lowers $\lambda_t$. Thus,

(9) $\lambda_t = \lambda_t(P_t,\ G_t,\ S_t,\ L_y,\ Y_t)$

In a multiperiod framework, the defaulting country expects to get no further loans and expects penalties to be imposed forever[v]. Its multiperiod utility, therefore, can be expressed as:

10) $W^D = U\left[(Y_t - P_t),\ G_t\right] + \sum_{t=1}^{\infty} \beta^t U\left[(Y_{t+1} - P_{t+1}),\ G_{t+1}\right]$

The repaying country repays this period, receives some new loans, but incurs an obligation to repay additional debt next period.

However, each period the country can make the decision to default or to repay. So while the repaying country does incur the additional debt, it can choose to default on it next period. Its multiperiod welfare can be represented as:

(11) $W^R = U\left[\left(Y_t + (L_t - S_t)\right),\ G_t\right] + \sum_{t=1}^{\infty} \beta^t \max\left[W^R\left(Y_{t+1},\ S_{t+1},\ G_{t+1}\right), W^D\left(Y_{t+1},\ P_{t+1},\ G_{t+1}\right)\right]$

Thus, the probability of future default $\lambda_{t+1}$ can be expressed as:

(12) $\lambda_{t+1} = \lambda_{t+1}\left(P_{t+1},\ G_{t+1},\ S_{t+1},\ L_{t+1},\ Y_{t+1}\right)$

Lending today affects at least one variable in equation 12. The debt service in the future is a function of both the old debt and the new lending which occurs today. As today's loans rise, tomorrow's debt service rises as well, making future default more likely. The future income level $Y_{t+1}$ could also be modeled as a function of $L_t$ if some of the loan money is used for investment (see Cohen and Sachs, 1986). However, in the interest of simplicity the investment component is ignored in this model.

Substituting equations 9 and 12 into equation 3, we get a complete expression for the amount of new loans $L_t$:

$$(13)\quad L_t = f\left[D_t,\ \lambda_t(P_t,\ G_t,\ S_t,\ L_t,\ Y_t),\ \lambda_{t+1}(P_{t+1},\ G_{t+1},\ S_{t+1},\ L_{t+1},\ Y_{t+1})\right]$$

Completely differentiating equation 13, and solving for $dL_t$ we can determine how $L_t$ responds to changes in the debt outstanding, in the penalties which may be imposed on defaulting nations, in the political pressure to default, and in the debt servicing requirements.[vi] Equation 13 is the basis for the empirical work which follows.

**II. Empirical Model**

This section describes the variables to be used in estimating equation 13. The first variable in equation 13 is $D_t$, the amount of debt outstanding to private creditors. Since the financial markets are lending to defend previous lending, the more they have lent previously, the more likely they are to defend those loans with current lending.

The probabilities of default are functions of the penalties imposed on defaulting nations, the political pressure placed on a government to default, the debt service needed to be paid to avoid default, and the income level. Two types of penalties may be imposed on defaulting debtor nations (Eaton, Gersovitz, and Stiglitz, 1986). The first is a cutoff of trade with creditors. The proportion of a country's GNP which is subject to trade with its creditor nations is some measure of the severity of such a trade penalty. Countries dependent on trade will face more welfare losses from such a penalty when defaulting. In equation 10 as $P_t$ rises, $W^D$ falls. If the default welfare is low, the probability of default falls, lowering the amount of lending necessary to avoid default.[vii]

The other penalty likely to be imposed on a defaulting nation is a cutoff in future lending. The severity of this penalty will depend on how much a given country depends on such lending. The premise is that countries which face greater fluctuations in their income streams are likely to borrow for the purpose of consumption smoothing and will thus suffer the most when they are unable to borrow. As above, a rise in variability raises $P_t$ and lowers the default probability $\lambda_t$ and therefore the necessary amount of defensive lending. The actual variable used in the regressions is the variability of a country's reserves which reflects fluctuations in a country's net export earnings.

The debt service to be paid and its interpretation is straightforward. As the amount of debt service rises, the repayment welfare falls, making default more likely in the absence of new loans. This variable is related to the total debt outstanding and may be redundant, but differs in two important respects. First, the debt variable $D_t$ includes only debt to private creditors which is what affects creditor decisions. The government of the country, however, is concerned with its overall debt service payments, regardless of the creditor involved. Total debt service therefore affects the probability of default from the country's perspective while the private debt outstanding affects the need for defensive lending from the creditor's perspective. Secondly, the total debt outstanding involves debt of varying maturities, varying interest rates, and varying grace periods. The debt service owed in any given year thus is only loosely connected to the debt outstanding.

A related variable is the interest rate. Most developing county loans are on an adjustable rate basis with a spread above a specific internationally recognized rate, such as the London Interbank Offer Rate (LIBOR). As current interest rates rise, debt servicing requirements also rise. One interpretation of this variable involves ex post risk sharing. World interest rates are assumed to be exogenous for a particular country. The optimal contract literature distinguishes between excusable default and outright repudiation (Grossman and Van Huyck, 1987). In this context an optimal contract would allow the actual payments made by debtors to be contingent on the state of the world. Since it is costly and difficult to design a contract which is fully state-contingent, creditors may design rigid nominal contracts, but be willing to excuse default or accept lower payments when they can observe that the inability to make the originally specified payments comes from a particularly bad state of the world, essentially sharing the external risk ex post. A rise in world interest rates would be a bad state of the world for a debtor and thus banks may be willing to accept lower net payments by making more loan money available.[viii]

The remaining variables all deal with the government's feeling of security arising from the satisfaction level of the population. The first of these is real per capita GDP. Real per capita GDP affects net income which enters the government's utility function directly and indirectly through the government satisfaction variable. If the satisfaction level were unaffected by default, then a drop in income would affect both the default and repayment welfare levels equally. Since the default probability is related to the difference between the two welfare levels, it would be unchanged. However, the satisfaction level is positively affected by default. If the government were concerned with maintaining a minimum level

of satisfaction to remain in power, a drop in income would lower net income, lowering $G_t$ to below the threshold point. If default would raise $G_t$ above the threshold, this government would likely choose default to remain in power. Thus, a low level of income would tend to increase the probability of default and increase lending.

Another interpretation for the use of real per capita income is that the penalties imposed on a defaulting country could be a function of income (Sachs, 1984). In this case as income falls, the severity of the penalty falls, making default more likely. In a low income case, defaulters have less to lose. Also from the demand perspective, the literature maintains that higher income countries have less need for loans. Their volume of domestic savings may be sufficient for investment and consumption smoothing, reducing the need for lending to these countries.[ix]

A more direct measure of political pressure is the number of deaths from political violence. While closely correlated to per capita GDP, the deaths variable represents the ability of the people to express their dissatisfaction. Extremely repressive countries may suffer income losses and yet face no internal violence, or at least reported violence. If the regime is firmly in control, the government has no need to respond to populist dissatisfaction by defaulting, and the banks consequently have no reason to lend. Therefore, higher deaths are a measure of the dissatisfaction expressed by a society, and it is to this that the government will respond by defaulting. In terms of equation 7, as deaths rise, $X_t$ falls, lowering $G_t$ .

Another variable is the length of present political system. New Systems, regardless of type, are generally less stable than older established ones. People tend to be less satisfied with newer regimes making default more likely. As a result, banks should be willing to lend to new regimes to help them stabilize. A new regime is defined in this context as one where power was obtained through non-constitutional means. Occasionally when a government radically changed policies, it was coded as a new regime. Complete documentation is available from the author on request.

The last political type of variable also relates to income. This is the ratio of current to average export earnings. If this ratio is high, the country has less need for loans to service its debt, and thus less pressure is put on the government to default. Banks would also see that if the current export earnings are high, net income will tend to be high, and the

government would not need to resort to default to maintain the threshold level of satisfaction, and thus does not need more loans on that ground. Another interpretation of this variable is that since the current export earnings are partially exogenous due to fluctuations in world prices and weather conditions, the banks are willing to again engage in ex post risk sharing by loaning countries more when their current export earnings are low.

The final variable is the inflation rate and is meant to be an indicator of the soundness of domestic policy. The higher the inflation rate, the more risky the government is perceived to be and the more dissatisfied people will be, so that $\lambda_t$ rises.

**III. Results**

The appendix contains a complete description of the variables used and their sources. The regression results are shown in Table 1. The first column shows the results for all loans to sub-Saharan Africa; the other columns divide the lending by creditor type, private, bilateral, and multilateral. While the theory presented in the previous section strictly applies to private lenders alone, the bilateral and multilateral lending regressions were run to determine whether official creditors also respond to the same variables. The total loan regressions show the extent to which a country's total loans, which are important from the country's perspectives, depend on the private market variables. The higher $R^2$ on the total loan regression suggests some correlation or causation between the different types of loans. Casuality tests confirm that official lending responds to private lending, increasing the importance of the private sector model. The sign of the coefficient on $D_t$ the total debt to private lenders, in the bilateral regression also confirms this result.

The dependent variable in each case is the value of the loans disbursed to each country in each year. All variables used have been logged, and the regression parameters have been corrected for autocorrelation.[x] The t-statistics appear in parentheses under each coefficient. The data include 160 observations from sub-Saharan Africa, pooling cross section data for 32 countries with time series for the period 1982-86. The countries omitted from the sample are only those for which many of the variables are missing. A complete listing appears in the Appendix. Some of the previous literature differentiated lending that was credit-constrained from that which was demand-determined. (Eaton and Gersovitz, 1981, and Hajivassiliou, 1987). The regression results which follow assume that all countries are credit-constrained. Figure 1 provides support for the view that virtually all countries have been credit-constrained since 1982. Figure 1 would show even more of a

decline in lending if loans disbursed by private creditors alone were used. To the extent that non-constrained observations are included in the sample, the explanatory power of the regression and the significance of the coefficients will be reduced.

The results provide strong support for the model described in Section I. Lending is strongly correlated with the amount of debt outstanding to private creditors, more so for commercial banks than for official creditors. On the literature related to lending in the 1970's, as debt started to mount, the probability of rescheduling rose, reducing the amount of current lending (Cline, 1984). In the 1980's as the model in Section I predicts, defensive lending promotes higher lending to already large debtors from commercial banks, but the results also show that bilateral official creditors respond to commercial debt. This may stem from governmental anxiety to protect one's own banking system. Multilateral creditors respond far less to private creditor debt. The size of the debt was not normalized by GNP or exports, as has often been done, because the creditors are concerned with defending the value of the debt outstanding, the debt they hold in their portfolios, and not its relationship to the debtor's GNP or the debtor's exports.

Concentrating on the total loan regression, the coefficients of the two penalty variables provide further evidence of lending for defensive purposes. Countries which trade heavily with industrial countries are lent less since the fear of trade penalties is sufficient to prevent default. Additional lending is unnecessary.[xi] Similarly, countries subject to more fluctuations in their reserve levels depend on future lending enough that they are unlikely to default despite reduced lending today. These findings also contradict 1970's findings that import to GNP ratios and variability of export earnings increase lending (Eaton and Gersovitz, 1981).

The debt service measure also supports defensive lending. As the size of the debt service payment rises, lending rises. Again, this contradicts precious results from lending in the 1970's (McFadden et al.m, 1985).

The political pressure variables tend to be less significant than the other variables and partly reflect the fact that most of these variables affect both current and future default probabilities. The coefficient for the interest rate variable is positive as expected for official creditors, suggesting that some ex post risk sharing is occurring, but only by official creditors. However, the per capita real income variable is also positive, particularly for the private creditors. This may reflect the fact that financial infrastructure is positively

correlated with income, and that some sub-Saharan countries may not have the minimum infrastructure necessary for commercial bank lending. It may also reflect the fact that higher income countries are better future credit risks as found in previous studies (Eaton and Gersovitz, 1981). Finally, it could be the case that the higher income countries who can better afford default are being encouraged not to do so by increased lending.

The ratio of current to average export earnings also affects the amount of lending. Both the defensive lending and the ex post risk sharing hypotheses suggest that as current export earnings rise, less lending is required. Official creditor lending behaves as expected, but financial market lending is quite the opposite. Three possible explanations exist for the market lending behavior. First, banks may interpret a rise in exports as an indication that future exports will also rise. Second, banks may view a rise in exports as evidence of structural reform. Third, banks are unwilling to engage in any form of risk sharing, even when the risk is external. Finally, the inflation rate appears significant in only the bilateral regression, but does have the expected sign.

## IV. Conclusion

The regression results provide conclusive evidence that the defensive lending described and modeled in Section I is a useful way of interpreting lending to sub-Saharan Africa since 1982. Regression results from analyzing previous lending suggest that in the 1970's as various indicators of riskiness rose, creditors reduce lending or that credit ceilings were imposed. Since the onset of the debt "crisis," however, defensive lending has taken place to prevent default on past loans. As the likelihood of default or riskiness rises, more loans rather than less are made available. The empirical results thus support the hypothesis of defensive lending.

The presence of defensive lending leads to important policy implications for debt management. The Brady Plan as originally presented strongly favored debt reduction. The results of Section III show that as the debt outstanding falls, lending by all parties will fall, particularly by private and bilateral official lenders. Debt reduction, therefore, can make countries worse off. A drop in servicing requirements also causes a drop in lending. However, the drop in lending is smaller than the drop in servicing, resulting in an increase in net lending. Charging lower interest rates of loans or lengthening the term of the loan, which are alternative components of the Brady Plan, lower servicing requirements and may be more efficient means of true debt relief.

The results also show that private creditors are much more willing to lend to middle income countries than to low income countries. The official creditors are willing to make some loans to low income countries, but not that many. Three disturbing implications arise from these results. First, while middle income countries are receiving loans, the poorest countries are being excluded from the opportunity to borrow, invest, and grow. Second, the situation will worsen in the future. Since governments tend to lend most heavily where private creditors lend, then the absence of private lending to low income countries will also curtail government lending. Third, as debt burdens continue to lower real income levels, more countries will be excluded from both private and bilateral lending.

Finally, the results show the lack of consistent ex post risk sharing across all lenders. Official lenders have responded to a rise in world interest rate levels by increasing lending. Commercial banks have not. Neither group has responded to export market risk. Designing contracts to incorporate external risk sharing may be a way of granting debt relief without resorting to debt forgiveness which carries negative implications for future lending.

## Appendix

The data set consists of 256 observations, eight annual observations per country from 1982-89 for 32 countries. The countries included are listed below:

| | | | |
|---|---|---|---|
| Botswana | Gabon | Mauritania | Sudan |
| Burkina Faso | The Gambia | Mauritius | Swaziland |
| Burundi | Ghana | Niger | Tanzania |
| Cameroon | Kenya | Nigeria | Togo |
| Ctl.Af.Republic | Lesotho | Rwanda | Uganda |
| Congo | Liberia | Senegal | Zaire |
| Côte d'Ivoire | Madagascar | Sierra Leone | Zambia |
| Ethiopia | Malawi | Somalia | |
| Zimbabwe | | | |

The variables used are listed below in the order that they appear in the regressions, beginning with the dependent variables. Total Loans Disbursed is the sum of public and publicly guaranteed long term loans disbursed by all creditors as published in the *World Debt Tables*, 1989-90 Edition. Private, Bilateral, and Multilateral refer to the sub-categories under total loan disbursements. The sum of the three categories equals the total.

Total debt to private lenders refers to the public and publicly guaranteed long term debt outstanding and disbursed by private creditors as published in the *World Debt Tables*, 1989-90 Edition.

The percent of trade with developed countries is the sum of exports and imports of goods to and from industrial countries divided by the GNP of the country. The numbers for exports to and imports from the industrial countries are taken from the *Direction of Trade Statistics Yearbook*, published by the IMF. Three countries, Botswana, Lesotho, and Swaziland do not publish export statistics. However, imports from these countries are recorded in the industrial country statistics and were used in their place. The same procedure was used for imports from these countries. The GNP numbers are in nominal dollar terms as are the trade statistics and come from the *World Debt Tables*.

Variability of reserve takes the dollar level of reserves from the *World Debt Tables* and calculates both a mean and a standard deviation for the 1970-89 period. The standard error is then divided by the mean to get a variability measure.

Total debt service paid is the sum of the debt service paid on public and publicly guaranteed long term debt to all creditors as published in the *World Debt Tables*. Six month LIBOR rate comes from the *International Financial Statistics*. Real per capita GDP comes from the United Nations International Comparison Project figures as produced and documented by Summers and Heston (1990). Ratio of current to average exports takes the export numbers from the *World Debt Tables* which are in nominal dollar terms and deflates them by the yearly US GNP deflator to put them in real dollar terms. An average is then taken from 1970-80. The 1982-89 numbers are then divided by this average to provide a ratio of current to average export earnings.

The Length of present system refers to the political system of the country. For each year the variable is computed as the number of years since the last non-constitutional change of power. Complete documentation is available from the author. Deaths from political violence are tabulated from the *New YorkTimes* index. The definitions and methodology used are consistent with Taylor (1985). The inflation rate is calculated as the percentage change in the CPI as published in the *International FinancialStatistics*.

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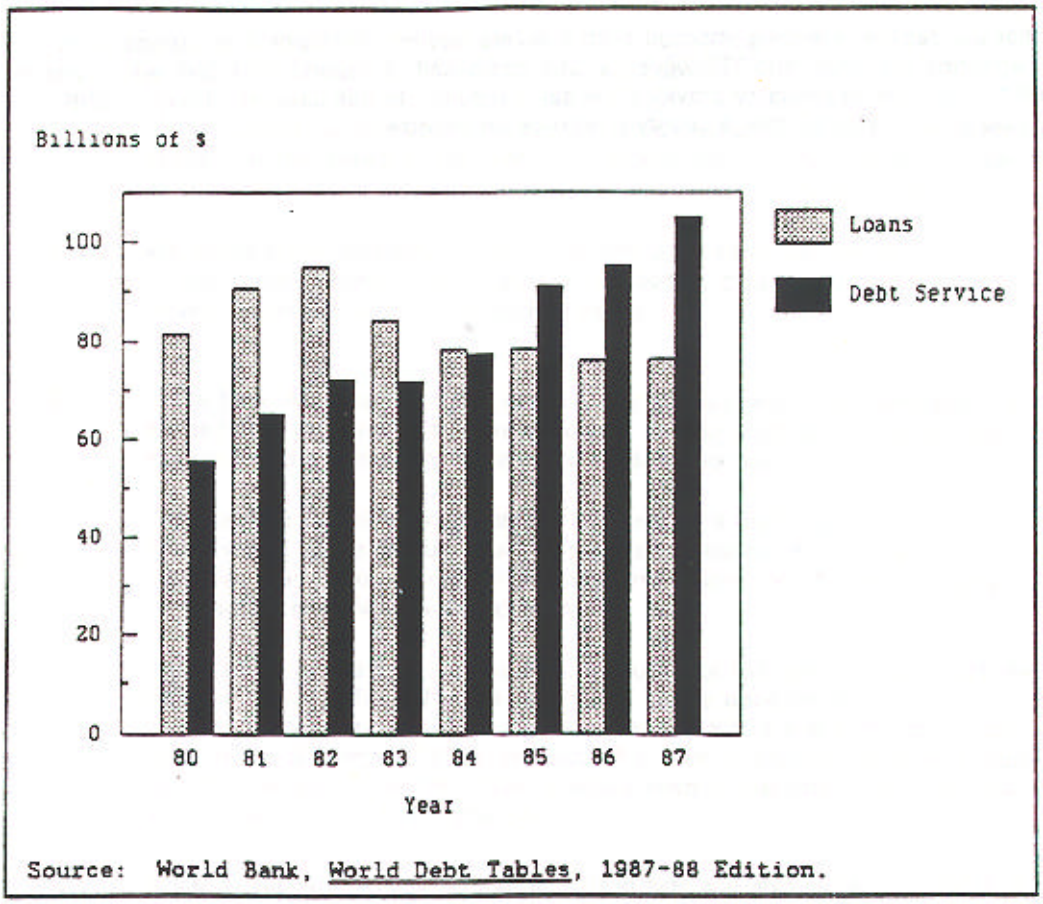
**Table 1**
**Determinants of Lending to Sub-Saharan Africa**

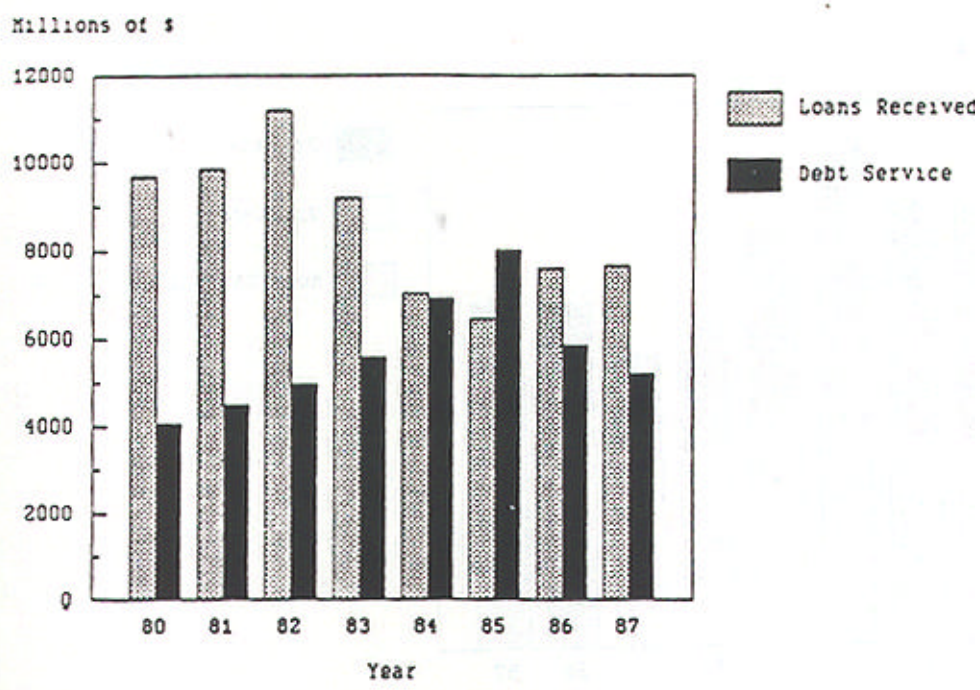
| Independent Variables | Total Loans Disbursed | Private | Bilateral | Multilateral |
|---|---|---|---|---|
| Total debt to private lenders | | | | |
| | 0.334 | 0.590 | 0.411 | 0.122 |
| | (5.062) | (3.605) | (3.968) | (1.580) |
| Percent of trade with developed countries | | | | |
| | -0.238 | -0.257 | -0.155 | -0.265 |
| | (-2.877) | (-1.286) | (-1.209) | (-2.705) |
| Variability of reserves | | | | |
| | -0.230 | -0.279 | -0.649 | -0.271 |
| | (-1.287) | (-0.663) | (-2.420) | (-1.260) |
| Total debt service paid | | | | |
| | 0.340 | 0.450 | 0.201 | 0.291 |
| | (4.390) | (2.321) | (1.637) | (3.232) |
| Six month LIBOR rate | | | | |
| | 0.244 | -0.671 | 0.536 | 0.433 |
| | (1.418) | (-1.580) | (1.991) | (2.152) |
| Real per capita GDP | | | | |
| | 0.125 | 0.547 | -0.106 | -0.100 |
| | (1.337) | (2.272) | (-0.701) | (-0.930) |
| Ratio of current to average exports | | | | |
| | 0.075 | 0.719 | -0.116 | -0.171 |
| | (0.469) | (1.823) | (-0.464) | (-0.911) |
| Length of present system | | | | |
| | -0.018 | -0.014 | 0.002 | 0.007 |
| | (-0.209) | (-0.068) | (0.015) | (0.070) |
| Deaths from political violence | | | | |
| | 0.015 | 0.053 | -0.026 | -0.007 |
| | (0.738) | (0.984) | (-0.766) | (-0.302) |
| Inflation rate | | | | |
| | 0.00006 | 0.0006 | -0.006 | 0.00004 |
| | (0.036) | (0.134) | (-2.359) | (-0.020) |
| Adjusted $R^2$ | 0.8095 | 0.5461 | 0.5573 | 0.5485 |

**Figure 1**
**Total Loans Disbursed Globally and Total Debt Service Paid**



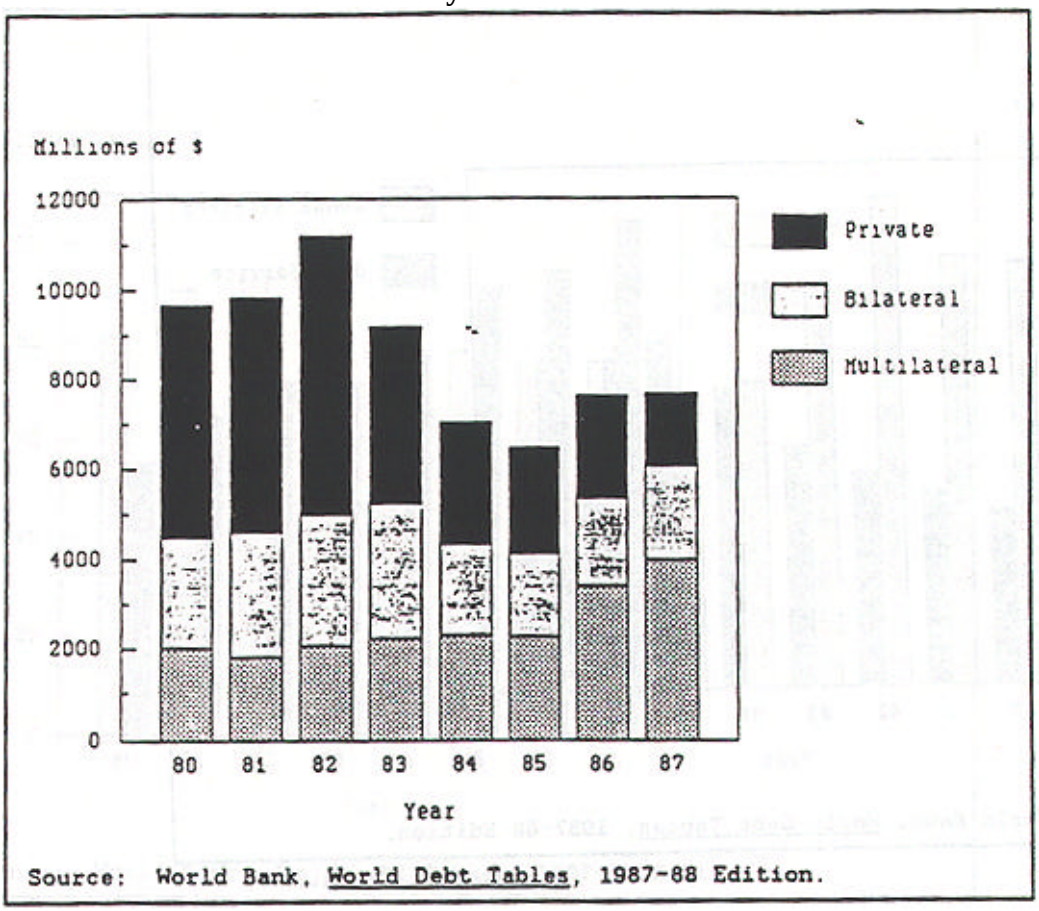

Source: World Bank, World Debt Tables, 1987-88 Edition.

**Figure 2**
**Loans Received and Debt Service Paid by Sub-Saharan Africa**




Source: World Bank, World Debt Tables, 1987-88 Edition.

**Figure 3**
**Distribution of Loans by Creditors in Sub-Saharan Africa**




Source: World Bank, World Debt Tables, 1987-88 Edition.

## End Notes

[i].. Some support for this view comes from Guttentag and Herring (1985) who suggest that the incentive systems within banks stress short term performance so that default this period should be avoided at all costs because by next period it will be somebody else's problem.

[ii].. We might argue that since banks up to this point have not chosen default, we cannot be certain that default is their choice. However, debt buybacks, debt-equity swaps, and even rescheduling can be viewed as partial defaults allowed by banks.

[iii].. In the Latin American context, every newly elected head of government in the last few years has been elected on a platform of toughness toward foreign creditors. Domestic political uncertainty has almost always led to a temporary moratorium on debt payments.

[iv].. If the precise functional form for the government's utility function were known, then the level of loans which would cause default could be precisely determined. However, governments in different countries may have different utility functions which may change over time. Therefore, the likelihood of default is not known with certainty.

[v].. These are fairly realistic assumptions. In Cuba, for example, Castro repudiated foreign debt and received no loans from the U.S. and faced severe trade penalties from the U.S. and its trading partners. Other Latin countries defaulted in the 1930's and suffered no borrowing penalties according to Lindert and Morton (1989), although this point is disputed by Ozler (1988). However, neither the lack of new lending nor the trade penalties need to last forever for the model to work, and these assumptions can be freely changed.

[vi].. Since $L_t$ appears directly on the right hand side and also indirectly affects $S_t$ on the right hand side, complete differentiation of equation 13 results in each coefficient of the remaining right hand side variables being divided by the denominator $\left[1-\left(\partial f/\partial\lambda_t\right)\left(\partial\lambda_t/\partial\lambda_t\right)-\left(\partial f/\partial\lambda_{t+1}\right)\left(\partial\lambda_{t+1}/\partial S_{t+1}\right)\left(\partial S_{t+1}/\partial L_t\right)\right]$. However, since this denominator is positive, the signs of the remaining coefficients are unaffected.

[vii].. It is possible that in the case of default, creditors lose only $\left(\lambda_t D_t - P_t\right)$ since they can attach the assets of the country or seize goods. However, realistically, the transfer of the penalty from borrower to creditor is unlikely. Kaletsky (1985) notes the legal obstacles to the seizure of goods. Recently, Citicorp attempted to use deposits held in the account of the Central Bank of Ecuador to repay trade loans, but ended up returning the money (*Wall Street Journal*, July 19, 1989, B10). A more realistic line of action would be the denial of trade credits or even a trade embargo, neither of which would benefit the creditor and in fact may impose further losses.

[viii].. The interest rate used here is the nominal rate since a nominal loan value is disbursed each period in response to a rise in nominal debt service payments which are affected by nominal interest rates.

[ix].. However, the penalty framework suggests that a high income country which can generate its own savings can afford to default and be excluded from international financial markets. Enders and Mattione (1984) thus suggest that Argentina is the most capable of surviving default in Latin America. In this case, creditors would want to increase lending to such countries.

[x].. The model was estimated using the full GLS transform (Harvey, 1981). The coefficient of autocorrelation was assumed to be identical across countries. Tests showed little variance across countries.

[xi].. It is possible that the decline in lending imposed such a severe budget constraint that imports were cut drastically affecting the trade ratio. However, a ratio composed of exports over GNP which would not be

affected by this reverse causality provided the same results. In this case, the trade to GNP ration is preferable since it incorporates a county's reliance on imports.