

# Malcolm Wiener Center for Social Policy

*Analysis of Loan Performance in the Bureau of Indian Affairs'  
Direct and Guaranteed Loan Programs*

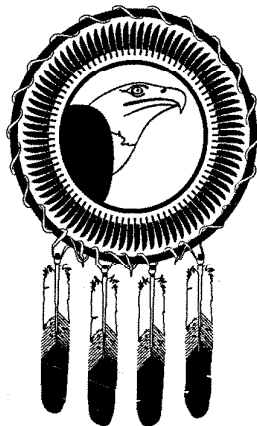
*A Report to the Bureau of Indian Affairs*

by

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## Executive Summary

I examined the direct loan and guaranteed loan program in the Bureau of Indian Affairs (BIA) to see if I could determine the factors influencing loan repayment. The BIA is the main Federal agency charged with providing for the general welfare of American Indians: among other programs, they provide loan funds for Indian tribes, organizations, and individuals for a variety of purposes but designed to contribute to economic development on reservations. Through looking at loan performance I hoped to look at some of factors involved in economic development on reservations. There have been few systematic analyses done of economic development on Indian reservations and there no existing models.

The BIA had collected loan summaries over the last ten years recording borrowers, purpose of loan, and the status of the loan, ranging from successful loans (repaid or current) to nonperforming loans (overdue, refinanced, or defaulted). I also collected information from a variety of other sources to see what non-loan specific factors might be important in explaining loan performance. The bulk of information came from the 1980 Census. After looking at several alternative models to explore different hypotheses I chose the below model as the best predictor of loan performance, where yes equals nonperforming:

$\text{Prob(Yes)} = 1/(1 - P(\text{Yes})) = -.42 C + .11 \text{ AGE}^* - .03 \text{ LENGTH}^* + .09 \text{ AMT} + 1.27 \text{ BORR}^* - 2.30 \text{ DG}^* + 1.16 \text{ ARO}^* - .32 \text{ AR1} + 1.43 \text{ AR3}^* + 1.21 \text{ AR4}^* + 1.38 \text{ AR5} + 2.15 \text{ AR6}^* + .26 \text{ AR7} + .003 \text{ RELUN}^* - .07 \text{ AGWOR}^* - .03 \text{ BIZ}^* - .013 \text{ SOV}$

The first twelve variables represent loan specific factors. They are the age of the loan, length of the loan, amount of the loan, whether the borrower was identified as a tribal government, and whether the loan was direct or guaranteed. the next seven variables identify loan purpose: respectively, they are land acquisition, agriculture, manufacturing and mining (including forestry), retail trade and tourism, construction ventures, housing and infrastructure, and unidentified. Relending loans were used as a base. The last four variables are more general and measure unemployment on the reservation relative to state unemployment, the percentage of all workers on the reservation working in agriculture, forestry, or fisheries, the percentage of all workers on the reservation working for a business (which can be either tribally or privately held), and finally, the percentage of all government workers who are working for the tribal government.

The model suggests that older loans tend to do worse than newer loans, which could reflect the poor economic conditions of the late 70's. The amount of the loan does not appear to be as significant as other factors in predicting loan repayment. The longer the loan, the likelier repayment. This reflects the fact that, controlling for amount, the longer the loan is the smaller the payments and the easier they are to meet. The highly

significant variable on borrower can not be easily explained without more information. I identified a borrower as non-tribal where I could identify the reservation but could not tell whether the business or venture was operated by the tribe. As of now, it suggests nontribal borrowers do a worse job of repaying loans. The negative coefficient for direct and guaranteed loans show that guaranteed loans show a significantly higher chance of being repaid. This could reflect the fact that borrowers must utilize the guaranteed loan program before the direct loan program, and that the borrowers in the direct loan program are a riskier set of borrowers.

I used relending loans as the basis for comparison. Relending loans are loans made to Indian institutions that turn around and reloan the money to tribal members. Relatively speaking, all other types of loans except for land acquisition loans showed less of a chance of repayment, significantly the loans made for agricultural, mining and manufacturing, retail trade and tourism, and housing purposes. The lower performance could be attributed to the slump in both the agricultural and natural resource industries, while the lower rate for retail trade and tourism could reflect lack of experience or expertise. The lower rates for housing and infrastructure might reflect the fact that these investments do not provide direct income.

The last four variables illustrate reservation economic activity. Briefly, this model suggests that the more economic

activity on the reservation and the larger the business sector, the more likely loans will be rapid. A natural resource base also makes important contributions to the reservation economy, perhaps through providing opportunities and a historical basis. Tribal capabilities also appear to be a factor, suggesting that tribes that have developed the ability to provide more services to their members also show a better chance of repaying their loans.

There are several caveats to keep in mind about this model. First, much of the information is cross sectional, drawn at one point in time over the last ten years, and does not reflect dynamic changes taking place over time. In addition, there are variables that could be relevant that I omitted when I built the model. Most importantly, this model predicts past probabilities based on past performance; the parameters could have changed so that they are no longer important.

However, the model does provide a way of systematically analyzing loan performance where no model exists. Although further information would be necessary before issuing any recommendations, this model does suggest several areas for closer examination. What about natural resource economies is different than other types of reservation economies? What factors appear to lead to a larger business sector? Do relending programs do a better job of evaluating loan proposals? Are higher percentages of tribal governmental workers correlated with tribal contracting for Federal governmental programs?

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## **Introduction**

My Policy Analysis Exercise (PAE) will predict the performance of loans made by the Division of Financial Assistance in the Bureau of Indian Affairs (BIA) using records of loans issued over the last ten years. Using an econometric model, I plan to identify the factors that affect loan repayment and see how they influence the probability of repayment. Finally, I will look at the factors to see how they might influence economic development more generally on Indian reservations. The paper is organized in four parts: a background section, a description of the loan program, formulation of analysis and results, and discussion of the results.

## **Background**

The 1980 Census counted 1.4 million self-identified American Indians in the United States, 300,000 living on reservations scattered throughout the country. The Census also showed that the Indians living on reservations lagged behind every other group in the United States in terms of socio-economic indicators.

## **History**

Poverty on reservations has been a chronic problem since the first was established in the early 1800's. As settlers moved westwards, the Federal government entered into treaties with different tribes, offering payments and protection and usually an exchange of land for then tribal lands. Most of the reservations

were established west of the Mississippi; however, as the tide of settlement rolled up to and around the reservations Federal Indian policy changed from separation. The Dawes Allotment Act of 1887 provided land titles for individual Indians with the hope that land ownership would lead to economic integration and eventual assimilation. The Indian land base shrunk over 60% over the time of the Act; much land ended up in nonIndian hands or in fragmented holdings. The Indian Reorganization Act of 1934, recognizing that allotment had created new obstacles to bettering economic conditions on reservations, declared allotment a failure and repealed the act.

The Indian Reorganization Act also marked a swing away from assimilation as Federal policy. Then Commissioner of Indian Affairs John Collier saw the answer to Indian poverty in the strengthening of the community:"...the tribal Indian remains the self-reliant and self-supporting Indian" (see Sorkin). The IRA provided support for tribal governments including mechanisms for establishing tribal constitutions as well as the first funds for economic development.

The next great swing in Indian policy was the short-lived termination movement of the 1950's, which proposed to eliminate the special status of reservations and end Federal recognition of tribes--assimilation as the answer. Several tribes were terminated, most noticeably the Menominee of Wisconsin and Klamath of Oregon, but public outcry halted the program and led

to the reinstatement of the tribes. The final great movement in Indian policy was the war on poverty of the 1960's. Indian reservations looked like an appropriate battlefield to wage that war with unemployment rates over 80% on certain reservations; Federal funds poured into a variety of programs ranging from road-building to job-training with over \$3 billion in annual expenditures by the mid 70's. Funding has since leveled off and declined over the last few years, with little improvement in living standards on most reservations.

#### Recent Developments

Two developments in the last ten years, the Self-Determination Act of 1975 and recent Supreme Court Decisions, have opened up new opportunities to tribes. The Self-Determination Act (PL 93-638) allows tribes to enter into contracts to administer federal programs previously provided by federal agencies, providing tribes with the opportunity to develop decision making capabilities. Recent Supreme Court decisions have led to an expansion of tribal economic capabilities, establishing tribes' rights to manage land use and tax economic activity within the reservation, providing tribes with the real substantive authority over economic activity for the first time. Charles Wilkinson calls these changes the renewed promise of measured separatism: Indian tribes as a recognized and distinct type of government, different from states but in many ways analagous.

Finally, the Reagan Administration has showed a renewed interest in poverty on reservations, issuing the President's Commission on Reservation Economies as well as a report put out by the Department of Interior, The Report on the Task Force on Indian Economic Development, both listing recommendations on how to develop self-sufficient reservation economies as a means of ending poverty. The Presidential Commission looked at the individual Indian entrepreneur as the vehicle for economic development, while the Interior Report concentrated on regulatory relief (including tax breaks) and organizational changes within the Bureau as the mechanism for development and both saw capital as a crucial factor.

#### **Loan Programs**

The Presidential Commission's report and the Interior report pointed out a need for economic development on Indian reservations as have most reports issued over the last thirty years. The reports have also pointed out that tribes need capital to fund projects and provide employment opportunities. While some tribes have successfully entered private capital markets, usually selling revenue bonds backed by natural resources (such as the Jicarilla Apache's issuance of notes backed by oil and gas revenues), most tribes have found it difficult to secure outside capital due to lender's uncertainty about the legal consequences of tribal immunity, in many cases coupled with the generally depressed economic conditions on most

reservations. Consequently, many tribes have looked towards the Bureau of Indian Affairs (BIA), which is the Federal agency charged with providing for the welfare of American Indians. Among other duties, it provides the main source of funds for economic development on Indian reservations: other sources of funds in the Federal government include the Farmers Home Administration, the Small Business Administration, and the Administration for Native Americans. In 1974 Congress passed the Indian Financing Act of 1974 (PL 93-262) revamping the credit program in the BIA, directing that:

It is hereby declared to be the policy of Congress to provide capital on a reimbursable basis to help develop and utilize Indian resources, both physical and human, to a point where the Indians will fully exercise responsibility for the utilization and management of their own resources and where they will enjoy a standard of living from their own productive efforts comparable to that enjoyed by non-Indians in neighboring communities.

The Indian Financing Act consolidated several direct loan programs and established several new ones, including a loan guaranty program and a matching grants program as well as increasing the funds available for development. Recent developments such as the Supreme Court decisions, coupled with a renewed interest in economic development on reservations, has led to increased demands for funds from the BIA.

#### Direct Loan Program

The direct loan program is the oldest of the three programs. Initially established as three separate funds by the IRA, the Act

combined the three funds into one and authorized an additional \$50 million for a total authorization of \$76.5 million. The fund recycles payments from earlier loans to provide new loans; the program currently has outstanding loans of \$105.3 million. The purpose of the loan program is to provide funds to Indian tribes, individuals, and organizations who might not be otherwise able to find funding from other sources. Approval criteria states that the borrower must not be able to obtain funds from any other source, including other federal agencies, and must utilize the loan guaranty program before the direct loan program. The Federal Code (Title 25, Part 101.2) states that loans " ...shall be made for purposes which will improve and promote the economic development on Indian reservations." Purposes can range from relending programs (credit programs run by tribes who issue loans to individual members) to attracting industry and developing business ventures. From 1975 to 1985 \$115.6 million has been loaned out.

#### Guaranteed Loan Program

The Act also established a program to provide guarantees for private loans and funds for interest subsidies and management and technical assistance to Indian tribes, organizations, and individuals. The purpose of this program is to provide access to private funds that might not otherwise be available. The Federal Code (Title 25, Part 103.2) authorizes loans that will "...contribute beneficially to the economy of an Indian

reservation..." As of September 30, 1985, there were 233 outstanding loans guaranteed for \$178.1 million.

#### Grant Program

In addition to the loan programs, the Act also established a matching grants program. The purpose of this program is to provide funds for economic development as well as attract private investment. In 1985 the Bureau funded 16 projects for \$4.7 million in grants and an overall investment of \$56 million.

#### **Analysis**

##### Data

In May 1986 the Division of Financial Assistance summarized all the direct and guaranteed loans made between 1975 and 1985 in a report titled "Status of Financial Commitments in BIA's Credit Program". There was no comparable information for the grants program. The original report showed 408 direct loans and 233 guaranteed loans for a total of 641 loans which after netting out incomplete records led to 450 loans in all since I only looked at loans going to identifiable reservations (see Appendix 1). Data limitations led to 358 loans used in the study, as information for certain variables was unavailable. The performance of the loans was roughly split with one nonperforming loan for every two performing loans, with the bulk of the loans going to tribal governments.

### Analytic Framework

As stated earlier, I proposed to examine successful loan performance and the factors influencing it. For the purposes of this model, success has a very narrow meaning--that is, loans are either repaid or current. It does not take into account effects outside of a loan--such as the possibility that even a defaulted loan might have provided people with employable and transferable skills. I divided loan performance into two groups--successful and nonperforming. Nonperforming loans are loans that are either overdue, have been refinanced or modified, or have defaulted. Successful loans are either current or have been repaid. Although there are current loans that could become delinquent, and overdue loans that could be paid up, this distinction is valid where the loan has not closed yet. Many of the overdue loans show outstanding amounts over 50% of the original loan.

It is my belief that looking at the factors that influence loan repayment will point out some of the factors affecting economic development. Successful loan repayments suggest the borrower has identified an area of opportunity, entered the market, obtained the resources necessary to carry out the venture, and followed through with implementation. Successful repayment of a loan requires everything to work; failure in one area can lead to the failure of the project and inability to repay the loan. Aggregating all loans takes into account the particular circumstances of each loan, and provides a way to look

at the factors influencing loan repayment and more generally successful economic development.

There are several factors that can influence loan repayments, ranging from the generic factors affecting any loan (such as size of the loan and repayment terms) to the more specific factors affecting economic development on Indian reservations. Commonly mentioned factors include lack of expertise (both managerial and professional), few resources, and a usually small business base. Some writers have argued that reliance on Federal assistance payments lessens people's willingness to work and therefore inhibits economic development, while others have argued that cultural inhibitions and the historic lack of a market economy have contributed to underdevelopment. Many of these supposed impediments have taken on the strength of popular wisdom with little evidence in support. Trospen, in his study of ranching on the Northern Cheyenne reservation, pointed out that the Indian ranchers were profit-maximizing and making efficient use of their inputs, and that the lower productivity reflected the higher transaction costs involving fragmented land holdings for the ranchers, not cultural constraints or lack of management expertise suggested by other researchers. The loan summaries provide a means to systematically approach some of these issues and see which factors do appear important in an area where no models exist.

## Results

I used a logit model to examine loan performance, where the model took the standard form:

$$\log \text{Prob}(\text{yes})/(1-\text{Prob}(\text{yes})) = B + B_1 * Z_1 + B_2 * Z_2 \dots$$

where Z represents a factor that influences loan performance and Prob(yes) represents the probability that the loan will be nonperforming. Since the observations were individual and not grouped I estimated the logit model with a nonlinear maximum-likelihood procedure. The econometric model that best predicts successful loan performance is:

$$\begin{aligned} \text{PROB (Y)} = \text{LOGIT} & (-0.420 + 0.113 \text{ AGE}^* - 0.303 \text{ LENGTH}^* \\ & + 0.089 \text{ AMT} + 1.268 \text{ BORR}^* - 2.298 \text{ DG}^* + 1.162 \text{ ARO}^* \\ & - 0.315 \text{ AR1} + 1.425 \text{ AR3}^* + 1.207 \text{ AR4}^* + 1.379 \text{ AR5} \\ & + 2.152 \text{ AR6}^* + 0.260 \text{ AR7} + 0.003 \text{ RELUN}^* - 0.067 \text{ AGWOR}^* \\ & - 0.026 \text{ BIZ}^* - 0.013 \text{ SOV}) \end{aligned}$$

Where Y = 1 for the probability of a nonperforming loan (\* = significant at the 5 percent level, standard errors included in Appendix 2).

## **Discussion**

### Analysis of Results

The explanatory variables were drawn from a variety of sources. Table I provides a brief description of each variable, while Appendix 3 gives a fuller description as well as the source of information.

The positive coefficient for age reflects the fact that older loans tend to be nonperforming relative to newer loans. This could reflect several things. The earlier loans were issued under different economic conditions (the earliest loan was

Table I.  
Definition of Variables

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- AGE = When the loan was issued, using January 1, 1986 as the endpoint measured in decimal months (July 1, 1980 = 5.5).
- LENGTH = The repayment schedule for the loan measured in decimal months.
- AMT = Amount of the loan divided by \$1 million to scale for size.
- BORR = Dummy variable where BORR = 1 when borrower could not be definitively identified as a tribe and 0 when identified as a tribe.
- DG = Dummy variable where DG = 1 when loan was guaranteed and 0 when loan was direct.
- ARO = Dummy variable for loan purpose where ARO = 1 for agricultural loans and 0 for all others.
- AR1 = Dummy variable for loan purpose where AR1 = 1 for land acquisition and 0 for all others.
- AR3 = Dummy variable for loan purpose where AR3 = 1 for manufacturing and mining (including forestry and fishery operations) and 0 for all others.
- AR4 = Dummy variable for loan purpose where AR4 = 1 for retail trade and tourism enterprises and 0 for all others.
- AR5 = Dummy variables for loan purpose where AR5 = 1 for construction enterprises and 0 for all others.
- AR6 = Dummy variable for loan purpose where AR6 = 1 for housing and infrastructure (sewers, water, etc.) and 0 for all others.
- AR7 = Dummy variable where loan purpose could not be identified.
- RELUN = Unemployment on the reservation as a percentage of state unemployment.
- AGWOR = The percentage of workers of all workers on the reservation working in forestry, fisheries, or agriculture.
- BIZ = The percentage of workers of all workers on the reservation working for a tribal, Indian-owned, or private business.
- SOV = The percentage of employees working for the tribal government as a percentage of all people working for either the tribal, federal, or state governments on the reservation.

recorded for 1974), and could have been influenced by the effects of a slumping economy in the late 70's. On the other hand, the relatively better performance of newer loans could reflect an improving ability to pay back loans or an improvement in the loan selection process or in projects submitted. Further information would be needed to explore the different possibilities.

The negative coefficient for length shows that, controlling for the size of the loan, the longer the repayment schedule the more likely the loan will be repaid. This makes logical sense: the longer the loan, the smaller the loan payments and the easier they are for the borrower to meet.

The coefficient is positive but not significant at the 5% level for amount. This suggests that, although larger loans might be harder to repay, the effect is minor and other factors have more of an influence.

The coefficient for borrower is positive which suggests that loans to tribes do better than loans to nontribal businesses. However, this could be due to the identification process, which considered any borrower not clearly identified as a tribe to be a nontribal borrower. This variable needs further information for a closer examination before any conclusions can be drawn.

The coefficient for direct and guaranteed loans is negative. This is not surprising, as it suggests that guaranteed loans tended to perform better than direct loans. As borrowers in the direct loan program must first show that they cannot qualify for

the guaranteed program, it is not surprising that the pool of direct loans should be riskier and hence show a lower repayment rate. However, since some of the borrowers participate in both programs, it also suggests that either the guaranteed programs might benefit from screening by private lenders or that loan servicing by the lender could be an important factor.

I identified seven major loan purposes: agricultural, land acquisition, relending, manufacturing and mining, retail and tourism, construction, housing and infrastructure, and unidentified. The dummy variables for loan purposes reflect the improvement (or worsening) of the probability of repayment using relending loans as a base. Consequently, agricultural, manufacturing, retail, and housing loans show a significantly higher probability of getting into trouble, while construction loans also show a tendency (but not significant) to do worse than relending loans. Land acquisition loans tend to perform better than all other types of loans, although again the difference appears to be small. Unidentified loans show a tendency to do worse but it is not significant.

Relending programs, by inserting extra layers between the borrower and the source of funds, would appear to worsen the chances of repayment by decreasing accountability. However, it is possible that tribal loan programs do a relatively good job of evaluating loans and consequently the relending loans as a pool perform better than other loans. It should be noted that

relending loans are probably used for many of the purposes identified above. The other results are suggestive as well. The relatively successful performance of land acquisition loans suggest that tribes may invest special effort in repaying these loans, while the lower probability of performance for agricultural and manufacturing loans might reflect the recession that struck particularly hard at those sectors. The lower repayment probabilities for retail trade and tourism could reflect the need for management or technical assistance, controlling for level of business activity. The lower repayment probabilities for housing and infrastructure suggest that borrowers find these loans harder to repay, perhaps because they do not provide direct income. The unidentified loans probably include loans of all categories; it is likely that the bulk of loans if identified would not be relending or land acquisition loans.

The positive coefficient for relative unemployment suggests that the worse unemployment on the reservation is relative to the state, the lower the chances of repayment. This is hardly surprising--unemployment rates generally reflect the economic conditions, and the harder times are on the reservation the harder it will be to pay back loans. In addition, the relative unemployment rate also points to the pace of economic activity on the reservation--the higher the rate, the less activity leading to precarious business conditions.

The variable for agricultural, fisheries, and forestry workers as a percentage of all workers is a proxy for the natural resource base of a reservation. The greater the number of workers, the more significant the resource base. The negative coefficient suggests that the larger the resource base the more likely a loan will be successfully repaid. This could reflect several things: the first is that the natural resources provide a more robust economy (even given the vagaries of resource markets over the last few years), controlling for level of business activity. Traditionally, many of the jobs on the reservation have been in natural resources, and "natural resource" economies could be more mature, implying greater stability and the accumulation of expertise. It is also noticeable that Supreme Court decisions have particularly affirmed tribes' management of natural resources, and the larger the resource base, the greater the possibilities for tribal economic activities.

The variable BIZ measures the percentage of all people on the reservation who are working for either a tribal, Indian owned, or privately run business of all people working. The other classes of industry tend to be either working in agriculture or for the tribal, Federal, or state government. This is a proxy for the level of business activity on Indian reservations, and the negative coefficient suggests that as the percentage of business employees goes up so do the chances of repayment. The importance of this variable is that it is

significant--I would expect the chances of repayment to go up where as business becomes a larger part of the reservation economy. The higher percentage of business workers could reflect anything from integration with the surrounding regional economy to a larger economic base. The higher the percentage of nonbusiness jobs, the more likely the economic base is very small and many of the jobs are delivering government services. Expanding the business sector relative to the government sector provides more opportunities and the chance to acquire experience, and is probably more conducive to new ventures.

Neither the BIZ, AGWOR, or RELUN variables were correlated, suggesting that each of these have a different effect on repayment. Each of these variables addresses the economic structure of the reservation, but from different angles. The percentage of business workers addresses the importance of a significant business sector on the economy, while the percentage of natural resource workers suggest the importance (perhaps historical) of a natural resource base to the reservation economy (it should be noted that about 15% of all Indians living on reservations receive significant amounts of income from natural resources). Finally, economic conditions on the reservation as measured by the relative unemployment rate suggests that lack of economic activity is an important factor in explaining loan performance.

The variable SOV tries to measure the influence of the tribe

on the economic structure of the reservation. Although the coefficient is not significant, the negative sign shows that as the percentage of tribal employees of all government employees goes up so do the chances of repayment. This is very suggestive, and is probably an indirect measure of tribal capabilities. That is, tribes that administer their own programs can also do a better job of repaying their loans. It is likely that this variable reflects the effects of contracting under the Self-Determination Act through allowing tribal administration of Federal programs.

#### Alternative Models

I examined several other models to see what model would best predict loan performance. Appendix 4 shows two alternative models, the first of which includes the variables BEN and MIST which are the percentage of people on the reservation 15 and older receiving benefits from the Federal government and the median income on the reservation as a percentage of the state median income. This alternative model looked to see whether Federal assistance payments had any influence on loan repayments. The resulting model shows that as the percentage of people on the reservation goes up the likelihood of repayment goes down slightly; the coefficient is insignificant suggesting that many other factors have a much greater effect.

Appendix 4 also shows another alternative model that includes the variables BEN, MIST, COLL, and ALWAYS. The first

two variables are as described above: the latter two represent the percentage of people 25 and older on the reservation who have gone to college and the percentage of people who have always lived on the reservation. The inclusion of college was an attempt to look at the amount of expertise, using college graduates as a proxy through levels of education. Although the variable was insignificant, it showed a counterintuitive sign: as the percentage of college graduates went up, the likelihood of repayment went down. A possible explanation for this could be the presence of tribal colleges, most of which lie in the Northern plains where there are not many economic opportunities but a higher percentage of people are likely to hold a college degree. In addition, many of these people are likely to go into education or tribal government and not into business. Therefore, using this coefficient without further study could draw a spurious relationship between loan performance and levels of education. Further information and examination are necessary to unravel the effects of this variable.

The variable for permanent residence on the reservation does show the expected sign: as the percentage of people who have always lived on the reservation goes up so do the chances of repayment. This could reflect two factors: because there are job opportunities more people stay on the reservation to begin with, or the lower turnover rate is conducive to economic stability.

The latter model does appear promising, and more information

and time would warrant a further exploration of the additional variables. However, as with the above model, the inclusion of these variables dropped the significance of the other coefficients and predictive power of the model. None of the omitted variables were correlated with the included variables, so the estimates were not biased by their omission. Therefore, I chose to use the present model as the best predictive model given the available information.

#### Caveats

There are several caveats to keep in mind when examining the above econometric model. The first is that the model predicts past probabilities, based on past performance. Conditions could have changed such that the factors mentioned above might not be significant in explaining loan performance today. This caveat is worth restating: the model predicts past probabilities based on past conditions. Before using this model to look at current performance, each variable should be carefully examined to see whether the parameters are still the same.

In addition, because most of the explanatory variables were drawn from the midpoint of the loan period and are hence cross-sectional, the model does not reflect changes taking place over time. There is also the possibility that I omitted relevant variables that might be significant in explaining loan performance or misspecified variables and dismissed them as irrelevant when they truly were significant (as could be the case

for the college variable included in one of the alternative models). There are also the problems of data. It is possible that the loan summaries do not capture all the information--for example, there are guaranteed loans that are overdue, or loans could have been repaid with funds obtained from other federal agencies and not from the success of the venture.

Finally, it should be mentioned that many of the variables are indirect measures of more subtle influences. Positive loan performance associated with greater tribal administration does not mean that simply increasing the number of tribal employees will lead to more successful loan performance; rather, it reflects tribal capabilities, which in turn might be drawn from other sources that cannot be quantitatively measured.

#### Predictive Power

Given the above caveats, however, the model still provides a way to predict past performance. Using the actual data, the model correctly predicted loan performance 72.6% of the time (260 out of 358 cases). The model also provides a chance to measure the influence of different factors; Table II shows the change in probability brought about by changing one of the parameters when all the others are held at their means.

The variations in probabilities for each estimate suggest that the most significant variable (holding all others equal) was whether the loan was direct or guaranteed, followed in order of

Table II.  
Range of Predicted Probabilities for Nonperforming Loans

Value of Variable	AGE	LENGTH	AMT	BORR	RELUN	AGWOR	BIZ	SOV
Maximum	0.3873	0.3691	0.3786	0.3864	0.3923	0.3635	0.3718	0.3769
Minimum	0.3721	0.3923	0.3768	0.3727	0.3690	0.4012	0.3878	0.3795
	P(Y = 1, all other variables held at their means)							
Value of Variables	DG	ARO	AR1	AR3	AR4	AR5	AR6	AR7
Maximum	0.3480	0.3875	0.3753	0.4110	0.3720	0.3804	0.3968	0.3760
Minimum	0.4270	0.3714	0.3820	0.3573	0.3813	0.3763	0.3664	0.3791
	P(Y = 1, all other variables held at their means)							
	P(Y = 1, <u>all</u> variables held at their means ) = 0.3779							

size of influence by manufacturing and mining loans, the percentage of natural resource workers, and the length of the loan.

It is interesting to note that when the model missed predictions, many of the times they were tribe-specific--that is, the model would incorrectly predict performance for a set of loans for an individual tribe. This suggests, as mentioned above, that there are other effects that enter into loan performance that I was unable to incorporate into the model. The model only drew comparison within the program, as in comparing across loan purpose, and did not look at other loan performance (such as SBA loans.)

#### Conclusions

The econometric model calculated above suggests several factors that influence loan performance as measured by repayment. Some of these variables can be controlled by the Bureau, such as loan terms and loan purpose; others are reflective of more general constraints facing loans on Indian reservations. The above factors examined in the best predictive model suggest areas where the Federal government may want to target its efforts: continuing to develop tribal capabilities, examining relending programs to see how they evaluate loan programs, and looking at the the different loan purposes to see whether technical and management assistance is needed in certain areas

(such as retail trade and tourism) and the extent to which external economic conditions may affect borrowers (as in the agricultural and natural resource loans).

The model points out what reservation economic structures appear to be important and suggest that the Bureau might want to look even more carefully at "natural resource" based economies. Are there lessons that can be drawn from them for successful development on other reservations? Other questions might be what factors appear important in determining the size of the business sector. Are there institutional arrangements or do they reflect factors not specified in the model, such as the availability of other markets? Are the factors that determine tribal contracting for Federal programs correlated with loan repayments?

Because of the caveats discussed above, the model cannot bear the full weight of recommendations yet. However, in the absence of other models this provides a starting place from which to systematically examine some of the constraints affecting economic development on Indian reservations. Given the importance of economic development on Indian reservations, this model provides a way to test some of the assumptions about what constraint are important and some suggestions about where the Bureau could target its efforts.

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