A Model for Predicting Expropriation in Latin America Applied to Jamaica

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IN SEPTEMBER 1974 the government of Jamaica announced the impending nationalization of controlling interest in the country's foreign-owned bauxite mining operations. This was a significant departure from past policy, for during the decade following independence in 1962, the ruling Jamaica Labor Party had actively sought to increase foreign investment, offering assurances of freedom from nationalization. The elections of 1972, however, brought to power the opposition People's National Party led by socialist Prime Minister Michael Manley, who in 1974 announced, first, a seven-fold increase in taxes on bauxite and, later, the government's plans for acquiring 51% interest in bauxite mining. The ensuing nationalization of bauxite mines was accompanied by similar action in other sectors.

Could statistical techniques have been used to predict this change in government policy toward nationalization? This article describes two versions of a model which apparently could have done so through the use of a procedure that classifies expropriating and nonexpropriating countries on the basis of selected indicators of their political systems.

A Model of Expropriation in Latin America

The subject of analysis in formulating the model was the expropriation activities of 21 Latin American countries during the period 1968-1971. These countries were divided into two groups: those that expropriated foreign investments during this period; and those that did not. For purposes of this classification, which is based upon that in Knudsen, an expropriating country is one in which there occurred "incidents of ownership or asset takeovers, or harassment of foreign enterprises (heavy 'domestication' policies)."[1] Nonexpropriating countries are those that did not exhibit these characteristics.

The 10 expropriating countries identified were Bolivia, Chile, Colombia, Ecuador, Guatemala, Guyana, Mexico, Panama, Peru, and Venezuela. The 11 nonexpropriating countries were Argentina, Brazil, Costa Rica, Dominican Republic, El Salvador, Haiti, Honduras, Jamaica, Nicaragua, Paraguay, and Uruguay.

Nineteen indicators of political phenomena within these countries, listed in Table 1, were chosen as independent variables. The data were examined using the statistical techniques of factor analysis and discriminant analysis.[2] Missing data on a variable were estimated by a stepwise regression of that variable on those remaining independent variables that significantly contributed to the regression.

Factor Analysis

First, the independent variables were factor analyzed. By thus determining common variance among them, it was possible to reduce the number of independent variables for the discriminant analyses and to select variables that were largely uncorrelated with one another. The principal components method of factor analysis was used. Factors were extracted that had eigenvalues of at least 1.0. The five factors that met this criterion were then orthogonally rotated using Kaiser's varimax procedure. These factors collectively accounted for 82.8% of the total variance in the matrix.

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Loadings of the 19 independent variables on the selected factors are reported in Table 2. As evident in the table, Factor 1 appears to reflect decentralization of political power. Countries highly associated with this factor are characterized by political systems in which power is less concentrated—more diffuse—than in other countries, which is apparent from loadings of the Gini index and party fractionalization. The political strength of the military is weaker, and new, mass-oriented

Table 1

Independent Variables

A. Sociopolitical Instability

V1. riots (total number for 1948 through 1967). Data were transformed to log (riots). Source: Charles Lewis Taylor and Michael C. Hudson, **World Handbook of Political and Social Indicators,** 2d ed., (New Haven: Yale University Press, 1972), pp. 94-101.

V2. protest demonstrations (total number for 1948 through 1967). The transformation log (demonstrations + 1) was used, the "one" added since the data include zero scores. Source: Taylor and Hudson, **World Handbook of Political and Social Indicators,** pp. 88-93.

V3. armed attacks (total number for 1948 through 1967). Data were transformed to log (attacks). Source: Taylor and Hudson, **World Handbook of Political and Social Indicators,** pp. 102-109.

B. Actions of Government to Cope with Instability

V4. repression index (average annual scores for 1960 through 1969). Source: Ernest A. Duff and John F. McCamant, **Violence and Repression in Latin America: A Quantitative and Historical Analysis** (New York: Free Press, 1976), p. 39.

C. Political Strength of Major Sectors of Society

V5. rural labor

V6. urban blue collar

V7. urban white collar

V8. landed oligarchy

V9. industrialists

V10. church

V11. military

Data for V5-V11 are as of December 1970. Source: James F. Torres, "Concentration of Political Power and Levels of Economic Development in Latin American Countries," **Journal of Developing Areas** 7 (April 1973): 400.

V12. foreign interests

Data are as of December 1970. Source: J. F. Torres, "A New (and Partial) Approach to Measurement of Political Power in Latin American Countries," **Western Political Quarterly** 26 (June 1973): 305.

D. Concentration of Political Power

V13. Gini ratio (index of power concentration). High scores reflect high concentration of power. Source: Torres, "Concentration of Political Power and Levels of Economic Development in Latin American Countries," p. 401.

V14. party fractionalization: seats in legislature. High scores indicate low concentration of power. Source: Taylor and Hudson, **World Handbook of Political and Social Indicators,** pp. 48-50.

E. Foreign Policy

V15. voting record in United Nations General Assembly on self-determination issues (average scores for 1968-1971). Included are resolutions condemning white minority rule in South Africa, Namibia, and Rhodesia, as well as resolutions favoring independence for non-self-governing territories. Data were derived from the principal resolutions on these subjects on which Latin American countries did not vote unanimously, and covered the 23rd session (1968) through the 26th session (1971). Countries voting "no" were scored 1; "abstain," 2; "yes," 3. Thus high scores are associated with voting in favor of these resolutions. Source: United Nations, **Yearbook of the United Nations,** Vols. 22-25 (1968-1971), (New York: United Nations, 1971-1974).

F. Irregular Changes in Regime

V16. successful military coups (total for 1967-1970). Source: Richard P.Y. Li and William R. Thompson, "The Coup Contagion' Hypothesis," **Journal of Conflict Resolution** 19 (March 1975): 85-87.

G. Commitment of Regime to Modernization and Development

V17. extent of leadership commitment to economic development. Source: Irma Adelman and Cynthia Taft Morris, **Society, Politics, and Economic Development: A Quantitative Approach** (Baltimore: Johns Hopkins Press, 1967), pp. 78-81.

V18. public education expenditures as a percentage of gross national product (1968).

V19. public health expenditures as a percentage of gross national product (1968). Source for V18-V19: Calculated from 1968 data in U.S. Arms Control and Disarmament Agency, **World Military Expenditures, 1970,** Publication 58 (Washington: Government Printing Office, 1970), p. 11.

urban and rural labor groups have become stronger—groups likely to demand increased influence and redistribution of national wealth. Moreover, the negative repression loading suggests that in these countries these groups are relatively free from government interference with their political activities.

of more riots, armed attacks, and protest demonstrations than other countries. Interestingly, as Table 2 reveals, regimes in these countries are committed to economic development, a finding that tends to support the widely-held view that political instability is characteristic of modernizing societies.

Table 2

Rotated Factor Loadings

	Factor 1: power decentralization	Factor 2: traditional political groups	Factor 3: sociopolitical instability	Factor 4: coups	Factor 5: (undefined)
repression	-.918	-.053	.090	.020	-.031
urban white collar	.884	-.188	.001	-.202	-.270
urban blue collar	.836	-.372	.231	.042	-.180
education expenditures/GNP	.798	-.063	-.210	-.035	.473
military	-.575	.402	.171	.558	.018
Gini	-.823	.504	-.049	.175	-.014
party fractionalization	.685	.590	.102	-.016	.158
urban blue collar	.663	-.578	.115	.021	.146
landed oligarchy	-.295	.903	-.218	-.149	-.063
church	-.193	.777	.168	.092	.004
foreign interests	-.020	.765	.152	-.067	-.096
riots	.075	-.015	.928	.065	-.079
armed attacks	-.136	.094	.854	.021	.134
protest demonstrations	.015	.177	.809	.197	.013
commitment to development	.117	-.445	.574	-.292	-.216
coups	.131	-.171	.308	.875	.000
health expenditures/GNP	.407	-.004	.170	-.687	.330
UN voting	.145	.033	.085	-.301	.788
industrialists	.413	.350	.135	-.299	-.714
% variance explained by individual factors	28.50%	19.33%	15.69%	10.36%	8.95%

Total variance explained by 5 factors = 82.83%
(Brackets indicate loadings of .500 or greater.)

Factor 2 provides a sharp contrast with the first factor. It identifies those countries in which the traditionally dominant and usually conservative political groups—particularly the landed oligarchy and the church—have greater influence. Foreign interests are politically important; and, not surprisingly, labor groups are weaker here than elsewhere. Though loadings of the power concentration variables (Gini index and party fractionalization) are ambiguous, it is apparent that these are regimes reluctant to share power with groups that might challenge existing patterns of social and economic influence.

Factor 3 identifies a dimension that might be termed sociopolitical instability. Countries most strongly associated with this factor have a history

Factor 4 seems to reflect government change by coup d'etat. Frequency of coups best indexes this factor and is positively associated with it. Not surprisingly, the data suggest that countries experiencing frequent coups have politically strong military establishments. The low level of health expenditures by these regimes could be both a cause and effect of coups: a source of dissatisfaction with the government for not providing basic welfare services, and a consequence of the lack of continuity in political leadership which results from coups.

The variables that load most highly on Factor 5 are largely dissimilar and appear to reflect no common underlying dimension.

Discriminant Analysis

To determine the extent to which the independent variables could correctly classify expropriating and nonexpropriating countries, two discriminant functions were computed. The first was derived from data on all 21 Latin American countries. The second function omitted countries misclassified in the first.

The independent variables selected for the discriminant analyses were those that had the highest loadings, respectively, on each of the five factors: repression, political strength of the landed oligarchy, riots, successful coups, and UN voting on self-determination issues.[3] The BMDP stepwise discriminant program then scanned these variables, selecting those that best explained the variance between the means of the two groups, given the other variables previously included.

As Table 3 indicates, in the discriminant analysis using data from all 21 countries three of the five independent variables were entered into the function: riots, UN voting on self-determination issues, and repression. The F-to-enter significance levels for these variables were .01, .05, and .05, respectively.[4] The standardized 21 country function in Table 4 shows that the riots variable was the best discriminator, followed by UN voting and then repression. The signs preceding the variables indicate the direction of their influence. Thus expropriation is more likely to occur in those countries in which there is a 20-year history of numerous riots, a current tendency of the government to vote in favor of self-determination resolutions in the UN, and a record of little repression over the preceding decade. Since the riots variable indexes a sociopolitical instability factor and repression indexes a power decentralization factor, expropriation is also associated with countries having those more general characteristics.

Table 5 reveals that 18 of the 21 countries were correctly classified. For 14 countries the probability of correct classification was greater than 90%, and exceeded 95% in 10 of these cases. The three misclassified countries were the Dominican Republic and Uruguay (which were predicted to expropriate but did not) and Guatemala (which expropriated but was predicted not to).

The second discriminant function was computed from data in which the three misclassified countries were omitted. As seen in Table 3, riots, UN voting, and repression were again selected and had higher F-to-enter significance levels than

Table 3

	F Ratios (to Enter or to Remove) for 21 countries	for 18 countries (omitting misclassified cases)
Variables included in discriminant function		
riots	13.186**	23.442***
UN voting	6.568*	12.143**
repression	5.842*	11.395**
F for function	9.760***	19.161***
Variables omitted from discriminant function		
coups	.685	.454
landed oligarchy	.137	.004

*** sig. .001
** sig. .01
* sig. .05

in the 21 country function (.001, .01, and .01, respectively). Table 4 shows that in the standardized 18 country function, as previously, the greatest contribution was made by riots, followed by UN voting and repression. The direction of the variables was also the same. Table 5 reveals that, as expected, all countries were correctly classified. With one exception, the probability of correct classification increased for each country, exceeding 99% in 15 of the 18 cases.

Application of the Expropriation Model to Jamaica

Could either version of the discriminant model have predicted the policy change of the Jamaican

Table 4

Linear Discriminant Functions

For 21 Latin American countries

nonstandardized:

$$Z_i = -14.733 + 2.115A_i + 4.390B_i - .194C_i$$

standardized:

$$Z_i = .922^*A_i + .701^*B_i - .675^*C_i$$

For 18 Latin American countries (omitting misclassified cases)

nonstandardized:

$$Z_i = -18.256 + 2.632A_i + 5.488B_i - .256C_i$$

standardized:

$$Z_i = 1.123^*A_i + .898^*B_i - .868^*C_i$$

A = log (riots)
B = UN voting
C = repression

Table 5

Posterior Probabilities of Classification in Correct Group

	for 21 countries	for 18 countries (omitting misclassified cases)
Expropriating countries:		
Bolivia	94.0%	99.8%
Chile	99.1	100.0
Colombia	99.1	100.0
Ecuador	93.4	99.7
Guatemala	43.5 *	—
Guyana	91.8	99.6
Mexico	93.8	99.8
Panama	96.6	99.9
Peru	89.8	99.3
Venezuela	99.3	100.0
Nonexpropriating countries:		
Argentina	76.3%	83.2%
Brazil	99.8	100.0
Costa Rica	97.7	99.8
Dominican Republic	18.2 **	—
El Salvador	99.9	100.0
Haiti	98.1	99.9
Honduras	99.3	100.0
Jamaica	88.1	95.9
Nicaragua	63.1	56.7
Paraguay	99.9	100.0
Uruguay	37.6 **	—

* expropriating countries classified as nonexpropriating
** nonexpropriating countries classified as expropriating

government toward nationalization? It was possible to make this determination by inserting data on riots, repression, and UN voting for later years into the two discriminant equations. But first, it was necessary to collect more recent data than that used in deriving the equations.[5]

In generating new data an effort was made to duplicate as closely as possible the scoring criteria and tabulation procedures employed in compiling the original data. Information on political events and repression was obtained from the *New York Times Index*, Taylor and Hudson's primary source, as well as from relevant articles indexed therein and entries in *Deadline Data on World Affairs* and the *Facts on File Yearbook*. Related articles listed in the *Washington Post Index* and *The Times [of London] Index* were also checked, but in most cases either provided no useful data or duplicated information in other sources. UN voting data again were taken from annual volumes of the *Yearbook of the United Nations*.

In computing the discriminant scores for each year, 1968 through 1975, time periods for the independent variables corresponded to those used earlier. The riots data covered the 20 years prior to the year under study, and repression data included that year and the nine preceding. As previously, UN voting data were contemporaneous, in this case taken from the General Assembly sessions occurring in the fall of both the preceding and current years.[6]

These data for each year were entered first into the nonstandardized discriminant equation for the 21 Latin American countries in Table 4. The resultant annual discriminant scores, the predicted classification of Jamaica as an expropriator or nonexpropriator, and the probabilities of correct classification each year are reported in Table 6.

Table 6

Annual Expropriation Predictions for Jamaica: Using 21 Country Discriminant Function

	discriminant scores	predicted classification	posterior probability of predicted classification
1968	-.96	not expropriate	93.3%
1969	-.19	not expropriate	67.2
1970	.46	expropriate	71.0
1971	.63	expropriate	79.1
1972	.77	expropriate	84.3
1973	.38	expropriate	67.0
1974	.13	expropriate	52.3
1975	.07	not expropriate *	52.0

* The positive discriminant score for 1975 (.07) would suggest a predicted classification of expropriation. However, 11 of the 21 countries included in the discriminant function are nonexpropriators, which results in a prior probability of nonexpropriation of .524. When this prior probability is entered into the computations, 1975 is classified as a nonexpropriating year.

These results show that the model was successful in predicting expropriation before it occurred. Expropriation was forecast beginning in 1970, and its probability became greatest in 1972, two years before the government announced its intention of nationalizing foreign-owned bauxite mining operations.

The decline in the probability of expropriation after 1972 is less encouraging. Though expropriation was predicted in 1974, the year of the government's nationalization announcement, its probability had dropped to 52.3%. The following year, when the government still was clearly committed to nationalization, the model incorrectly—though weakly—predicted a policy of nonexpropriation.

Table 7

Annual Expropriation Predictions for Jamaica: Using 18 Country Discriminant Function

	discriminant scores	predicted classification	posterior probability of predicted classification
1968	-1.07	not expropriate	98.4%
1969	-.11	not expropriate	60.1
1970	.70	expropriate	93.6
1971	.92	expropriate	97.2
1972	1.10	expropriate	98.5
1973	.62	expropriate	91.4
1974	.31	expropriate	76.3
1975	.22	expropriate	69.8

Next, the data on Jamaica were entered into the nonstandardized discriminant equation for the 18 correctly classified countries in Table 4. The results are reported in Table 7. This function, as did the function derived from data on all 21 countries, began predicting expropriation in 1970, four years prior to the government's nationalization announcement. However, in this function the probabilities of expropriation reached higher levels, as evident in a comparison of Tables 6 and 7. The peak year was again 1972, two years before the government's nationalization announcement, but the probability of expropriation for that year was an impressive 98.5%, compared to 84.3% in the 21 country function. This 98.5% probability of expropriation in 1972 was a dramatic change from only four years earlier, when in 1968 there was a 98.4% probability that expropriation would *not* occur. In 1974, the year of the government's nationalization announcement, expropriation was predicted with 76.3% probability, and with 69.8% probability the following year. Both scores were more accurate predictions than those derived from the 21 country function.

In 1970, when both versions of the discriminant model first predicted expropriation, the government of Prime Minister Hugh Shearer was actively seeking foreign investment, reassuring businessmen that nationalization was not planned. In July 1970 Trade Minister Robert Lightbourne, in a speech before the Jamaican-American Chamber of Commerce in New York, underscored the government's position by disassociating Jamaica from other Caribbean countries that were then recommending nationalization.[7]

The Jamaican government's actions indicating opposition to nationalization may have belied its intentions. The U.S. ambassador in Kingston reported that conversations with local officials during this period revealed an apparent gravitation of government policy toward nationalization.[8] Moreover, Prime Minister Shearer later stated that during his last months in office—early 1972—he was publicly discussing the possibility of nationalization.[9] These reports suggest that nationalization might well have occurred even had there been no change of government in 1972. Thus this action may have been the result of forces in the political system that were so fundamental as to be expressed by whatever government was in power. Furthermore, it was in 1972—the year of the election—that the discriminant functions predicted the probability of expropriation to be highest. Perhaps it was then that forces leading

toward nationalization coalesced. If so, the nationalization announcement in 1974 may have been only the expression of a fundamental change that had occurred previously.

Conclusion

In this study it has been determined that quantitative indicators of political characteristics of Latin American countries can be used to distinguish those countries that expropriated foreign investments from those that did not. Factor analysis identified five factors existing among the political variables. Of the variables that best indexed these factors, riots, UN voting on self-determination issues, and repression were best able to classify expropriating governments in discriminant analyses. In tests of two versions of the discriminant model, the nationalization of foreign-owned bauxite mining operations by Jamaica was successfully predicted. The best prediction was obtained in using the discriminant function based on data in which three countries originally misclassified were omitted.

This study has demonstrated the usefulness of statistical techniques for predicting expropriation of foreign investment.[10] Though this effort represents only an early stage in the development of quantitative models for forecasting political risks, it is clear that they have considerable potential for real world application.

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NOTES

1. Harald Knudsen, "Explaining the National Propensity to Expropriate: An Ecological Approach," *Journal of International Business Studies* 5 (Spring 1974): 65. In the analysis that follows, as in some of the literature, a distinction is made between expropriation and nationalization. Any act in which a foreign enterprise is compelled to transfer ownership of its local assets to the government is an expropriation, regardless of whether compensation is provided. Nationalization is an act of expropriation in which a dispossessed foreign enterprise is compensated for assets taken. Thus nationalization is subsumed under the more inclusive category of expropriation. The model developed here is concerned with expropriation, while the actions of the Jamaican government with which the model is tested fit the narrower definition of nationalization.

2. The computer programs used are from the BMDP-77 series developed by the Health Sciences Computing Facility, Department of Biomathematics, School of Medicine, University of California, Los Angeles. See W. J. Dixon and M. B. Brown, *BMPD-77: Biomedical Computer Programs, P-Series* (Berkeley: University of California Press, 1977).

3. There were several reasons for using as inputs for the discriminant analyses the variables that best indexed the factors, rather than the factor scores. First, Factor 5 seems to have no intrinsic meaning, since the variables loading on it are apparently dissimilar. Moreover, variables loading on Factor 4—indexed by coups—appear to explain the occurrence of coups more than reflect a dimension to which each contributes. Therefore, these factors, as distinct entities, would be less useful in providing an explanation of expropriation than would actual variables. In addition, a major objective of this analysis is to simplify the task of predicting expropriation. Concrete variables would seem more useful for this purpose than factors that are artificial constructs without an independent existence apart from their constituent variables, and which would thus require numerous variables for prediction.

4. Strictly speaking, significance tests are, of course, applicable only to data that constitute a sample. However, following common practice, they are used in this analysis of nonsample data as an indicator of the extent to which the magnitude of the relationships is due to chance. See Robert F. Winch and Donald T. Campbell, "Proof? No. Evidence? Yes: The Significance of Tests of Significance," *American Sociologist* 4 (May 1969): 140-143.

5. See citations listed for variables 1, 4, and 15 in Table 1 for sources of the original data. The Taylor and Hudson study provided data on riots and other forms of political instability only as late as 1967. UN voting scores generated previously did not extend beyond 1971. Repression data from the Duff and McCamant study did not include Jamaica. (A regression estimate was inserted for Jamaica's repression score in the original data.)

6. Data from the preceding year were included since the fall session of that year was closer in time to early months of the current year than was the current year's session. Typically, sessions begin during the third week of September and end during the third week of December.

7. *New York Times*, 14 July 1970, p. 48; *Wall Street Journal*, 14 July 1970, p. 14.

8. U.S. Congress, Senate, Committee on Foreign Relations, *Multinational Corporations and United States Foreign Policy, Hearings before the Subcommittee on Multinational Corporations on Overseas Private Investment Corporation (OPIC)*. 93d Cong., 1st sess., 1973, pt. 3, p. 111.

9. *New York Times*, 21 July 1973, p. 8.

10. A forthcoming companion study from this project will analyze reasons why some of the political phenomena identified here may be causes of expropriation.