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Modernization and Childlessness in the States of Mexico*

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The relationship between socioeconomic development and fertility be-
havior has received extensive treatment in the demographic literature
in recent decades. This particular association provides one of the basic
premises for demographic transition theory, so the attention it has
received is understandable. However, studies relating modernization
to a particular fertility outcome, childlessness, have been less numer-
ous. The lack of analyses may have resulted from the assumption that
since most married women desire and have children, few will be child-
less, and that to the extent that childlessness exists among populations,
it should be characterized by little if any variability.

   This paper examines the relationship between modernization and
childlessness in the states of Mexico in 1970. Mexico has experienced
strong and substantial economic growth from World War II through
most of the 1970s.[1] In the course of this development, regional differ-
ences, always a prominent characteristic of the country, have wid-
ened.[2]

   In this paper, we demonstrate rather considerable variation in
childlessness among the Mexican states. A theoretical framework
based on theories of modernization and socioeconomic development is
then shown to provide a satisfactory interpretation of this variability.
Among the Mexican states, the higher the levels of modernization, the
lower the childlessness. In the next section, we review the empirical
studies conducted on childlessness relevant to this particular inquiry.
The theoretical model focusing on modernization is presented next.
Later sections deal with the data, methods, and findings of our re-
search.

Empirical Antecedents

One of the earliest census-based studies of childlessness was Grabill and Glick's examination of 1950 U.S. census data; other studies using 1970 U.S. data followed, along with Canadian studies.[3] None of these analyses employed cross-national data, nor did they focus on developing countries. Some research, however, has been conducted on international patterns in childlessness in both developed and developing countries, the most recent of which measures and discusses variability among 65 countries.[4] In a more analytic paper focusing solely on developing countries, Poston and Trent investigated the degree of relationship between childlessness and modernization in 36 developing countries of the world circa 1970.[5] Modernization was conceptualized in terms of structural economic development, health conditions, and female status. The authors hypothesized negative relationships between the three modernization components and childlessness. Their results supported their expectations, with health conditions showing the highest correlation with childlessness. This theoretically grounded analysis of childlessness represents, in some ways, an advance over earlier brief and mainly descriptive international studies.[6]

Other studies, although not specifically dealing with childlessness, have indicated, nonetheless, the direction of the relationship between childlessness and modernization at the subnational level. Romaniuk observed among the James Bay Indians an increase in fertility during their early stages of modernization.[7] The rise in fertility was attributed to several factors, one of which was the reduction of pregnancy wastage due to improvements in medical care. Later, Romaniuk examined the early stages of modernization and its impact on childlessness from the mid-1950s to the mid-1970s in the country of Zaire and its regions.[8] During this 20-year period, which was characterized by improvements in the provision of health services and reductions in malnutrition, "populations in which formerly infertility was high experienced a dramatic reduction in childlessness."[9]

Ericksen et al. examined childlessness rates among ever-married Amish women of the pre-1899 birth cohort and four later birth cohorts through the 1929–38 period; they too found that the incidence of childlessness had fallen dramatically over time. They observed that such a result "is not surprising, given the Amish willingness to use modern medical technology. As medicine has improved, infecundity has declined."[10] Tabutin examined data for Western Zaire over 20 years and reported that, in areas where fertility formerly was low, population has been increasing at a fast rate.[11] These population gains have been occurring in the context of increasing socioeconomic development. One of the causes of this change was the reduction of endemic sterility, the diminishing occurrence of infertility.

The above-mentioned studies, and others like them, are not incon-

sistent with the theoretical reasoning to be developed later in this paper and set forth as an explanation of the variation in childlessness among the states of Mexico in 1970.[12] Modernization levels among the states should be related to levels of subfecundity and childlessness, to the extent that it is involuntary. The next section of this paper develops more fully the theoretical model employed in the analysis.

Theoretical Model
In this paper we not only describe the variability in childlessness in the states of Mexico in 1970 but also attempt to account for this variability with a theoretical model dealing with modernization. Before outlining the model, we will discuss briefly the immediate causes of childlessness.

Childlessness may be voluntary or involuntary; that is, a woman may decide not to have children or may be unable to do so. Although childlessness in a specific geographical area may be due to both voluntary and involuntary factors, recent data from World Fertility Surveys for 14 developing nations suggest that little, if any, of the childlessness in these nations is voluntary. And in Mexico as a whole, it was shown that well over 90% of the permanent childlessness is involuntary.[13]

Involuntary childlessness is due primarily to subfecundity, that is, "the diminished capacity to reproduce."[14] Although subfecundity has various causes, including genetic factors, psychopathology, disease, nutritional deficiencies, and environmental factors, principal causes in the developing world today include disease and nutritional deficiencies. "This situation is compounded (and perpetuated) by the relative absence of quality health care and facilities."[15]

We suggest that various aspects of modernization, such as increases in labor force participation, urbanization, development of transportation systems, educational levels, health care facilities, and reductions in disease and nutritional deficiencies, should be associated with decreased subfecundity, that is, increased fertility. Increases in modernization should lead to decreases in the diseases and nutritional deficiencies related to subfecundity, and thus, childlessness. Although scholars disagree on the degree to which malnutrition affects fecundity, no one, to our knowledge, has ruled it out completely.[16] Let us turn to a more detailed consideration of the influence of modernization and development on childlessness.

Goldscheider has suggested that "the key to understanding modernization begins with the process of structural differentiation . . . of major social structures, roles, and organization . . . including specialization and separation of economic, family, religious, political, and stratification systems."[17] The common view held among social scientists appears to be that, while the household or kinship group is relatively self-sufficient in primitive and tribal societies, and to a certain

degree in peasant societies, the family unit is no longer the principal economic unit for production when modernization occurs. "In modernization, economic activities, following increases in the division of labor, move from kinship to more specialized organizations; economic roles shift from the local family setting to large nonfamilial institutions."[18] This is accompanied by the relegation of political control, education, and health services, among other factors, to wider institutional structures.

We have chosen a number of different variables to indicate many of the various theoretical dimensions of modernization. Variables have been selected to reflect urbanization, health, economic activity, structural development, and other aspects of modernization. Generally we would anticipate that the health variables should have stronger relationships with childlessness because of their closer proximity to subfecundity, and ultimately to childlessness, than the variables tapping the other modernization dimensions.

Data and Methods
The data for this study on the number of children ever born were obtained from the 1970 Mexican census.[19] The data on which we base the indicators of modernization and development were obtained from the 1970 Mexican census, the Mexican Statistical Yearbook of 1970–71, and the 1975 *Atlas of Mexico*.[20]

The Mexican States as Units of Analysis
A word is necessary about the use of the 32 Mexican states (actually 30 states and two territories) as units of analysis. They vary considerably in area and population, and internally some are quite heterogeneous. Some investigators have tried to overcome the later problem by using groupings of municipios (roughly equivalent to counties in the United States) as was done by Stern with his 111 geographic-economic zones.[21] Unfortunately, because more information is available at the state level than at the municipio level, the former is used more frequently as the unit of analysis.

The Measurement of Childlessness
The denominator for the childlessness rate used in this study refers to ever-married women. This denominator is defined broadly by including as ever-married not only the married, widowed, divorced, and separated but also those living in consensual unions; the latter is recorded as a distinct category in the Mexican census. The numerator refers to ever-married women or those living in consensual unions who report zero children ever born to them.

We have computed for each of the 32 states of Mexico a general marital childlessness rate (GMCR) which may be defined as $GMCR =$

1. Aguascalientes
2. Baja California
3. Baja California, T.
4. Campeche
5. Coahuila
6. Colima
7. Chiapas
8. Chihuahua
9. Distrito Federal
10. Durango
11. Guanajuato
12. Guerrero
13. Hidalgo
14. Jalisco
15. México
16. Michoacán
17. Morelos
18. Nayarit
19. Nuevo León
20. Oaxaca
21. Puebla

22. Querétaro
23. Quintana Roo, T.
24. San Luis Potosí
25. Sinaloa
26. Sonora
27. Tabasco
28. Tamaulipas
29. Tlaxcala
30. Veracruz
31. Yucatán
32. Zacatecas

FIG. 1—United States of Mexico: political divisions. (Source: Dirección general de estadística, *IX Censo general de población, 1970, Resumen general* [Mexico, D.F.: Secretaría de industria y comercio].)

L/P, where L represents the number of ever-married women between the ages of 15 and 49 with no children ever born to them and P represents the total population of ever-married women between the ages of 15 and 49. A map of Mexico, divided into the 32 states, is provided in figure 1, and the values of the general marital childlessness rates are reported for the states in table 1. The rates vary from a low of .099 in Tlaxcala and .104 in both the Distrito Federal and Nuevo León, to a high of .151 in the Yucatán and .144 in Oaxaca. For every 100 ever-married women in the 15–49 age group in the Distrito Federal, 10 were childless in 1970, whereas in the Yucatán for every 100, 15 were childless. The general marital childlessness rate for all of Mexico was .120.

The general distribution of these marital childlessness values is congruent with many studies of regional differences in Mexico. Generally, the lowest childlessness rates are found in the Distrito Federal, and in some of the northern Mexican states such as Nuevo León and Chihuahua, regions noted as having high standards of living and well-

TABLE 1

GENERAL MARITAL CHILDLESSNESS RATES
FOR THE 32 MEXICAN STATES, 1970

State	Rate
High (.125–.151):	
Yucatán	.151
Oaxaca	.144
Guerrero	.139
Chiapas	.132
Michoacán	.132
Hidalgo	.129
Guanajuato	.125
Intermediate (.116–.121):	
Baja California	.121
Campeche	.120
Veracruz	.120
Zacatecas	.119
Tamaulipas	.119
Sonora	.118
San Luis Potosí	.118
Durango	.118
Coahuila	.118
Aguascalientes	.118
Puebla	.117
Morelos	.117
México	.116
Low (.099–.113):	
Tabasco	.113
Sinaloa	.113
Jalisco	.113
Colima	.113
Quintana Roo, T.	.109
Nayarit	.109
Baja California, T.	.109
Chihuahua	.108
Querétaro	.105
Distrito Federal	.104
Nuevo León	.104
Tlaxcala	.099

being.[22] The highest rates are found in many of the states noted by other scholars as characterized by low levels of well-being, such as Oaxaca, Chiapas, Guerrero, and others, many of them in southern Mexico.

There are two important exceptions, however. Tlaxcala and Querétaro are among the four Mexican states with the lowest childlessness rates (in fact, Tlaxcala has the lowest rate of all 32 states), but they typically are ranked quite low on indexes of levels of living and well-being.[23] Deviations of this type may be real in part, but we are of the opinion that these low childlessness values more probably result from inadequate data collection and similar kinds of methodological problems in those states. Although there are no careful evaluative studies, it

is widely recognized in Mexico that the quality of the information-gathering agencies in the Mexican states varies somewhat, particularly among the smaller states. And these two states, with populations in 1970 of less than 500,000, are among the six states with the smallest populations. To the extent that small population size results in a less stable rate, this may be an important factor contributing to their lower than expected childlessness values.

Another methodological question deals with the possibility that the higher childlessness rates in the less developed states may be due in part to women whose children had died misreporting themselves as childless. Although this is a plausible hypothesis, we are inclined to argue against it from two vantage points. In the first place, we have shown general rates of childlessness for all ever-married women in the 15–49 age group; the rates vary from about 9% to 15% among the 32 states. Now if some of the women in the less developed states were misreporting themselves as childless, an examination of a schedule of age-specific marital childlessness rates should show this deviation. That is, less variation in childlessness rates would be expected among older women than among younger women. We have computed age-specific rates of marital childlessness for age groups 15–19, 20–24, 25–29, . . . , 45–49 for each of the 32 Mexican states. There is about as much variation, from 5 to 6 percentage points, in the rates for women in the 45–49 age group as there is for women in the 25–29 age group. Among the very oldest women, the rates vary from 5% to 11%, while among those in their late 20s, the rates vary from 7% to 12%. Indeed, among all but the very youngest women, the rates vary by about 5–6 percentage points. (Schedules of age-specific marital childlessness rates for the 32 states will be provided to the interested reader on request.)

Second, we are of the opinion that few women misreport themselves as childless because of a failure to remember children who had died some years earlier. To the extent that this may occur, we would expect it more frequently in the urban-industrial states of Mexico than in the less developed ones. In the less developed areas, kinship networks are stronger, and ceremonial rites are more likely to be observed in cases of birth and death than in the urban-industrial areas. Regarding other possible cultural reasons, we know of none that would lead a Mexican woman to hide the fact of a dead child and declare herself childless. In Mexico, infant and child mortality has been common until relatively recently, and seldom has it been considered a source of shame. Indeed, in a predominantly Catholic country such as Mexico, most believe that at death the babies immediately and directly ascend to heaven as "angelitos," an event to remember, not forget. Thus we think it unlikely that childlessness rates in the less developed states are upwardly biased.

The Independent Variables
In considering the relationship between modernization and childless-
ness, various development components were chosen, some of which
have been discussed earlier. Following the guidance of Goldscheider
and others, we selected 20 variables to reflect modernization compo-
nents of economic activity, education, urbanization, health conditions,
and overall structural development. These indicators are listed,
defined, and their sources provided in the Appendix.

Results
The major question of this paper concerns the relationship between
modernization and childlessness among the 32 states of Mexico. Table
2 presents the zero-order correlation coefficients between the general
marital childlessness rate and 20 modernization variables. In all the
tests, the hypothesized correlations are obtained. The effects of the
various modernization indicators on childlessness vary somewhat,
however. The percentage of the population economically active has the
highest correlation with the dependent variable ($r = -.58$). This par-
ticular relationship is illustrated graphically in figure 2. This scatter-
gram shows that among the Mexican states, the higher the percentage

TABLE 2

ZERO-ORDER CORRELATION COEFFICIENTS BETWEEN THE GENERAL MARITAL CHILDLESSNESS
RATE AND MODERNIZATION VARIABLES: THIRTY-TWO STATES OF MEXICO, 1970

| Indicators	r
Economic activity:	
Economically active (%)	− .583
Females economically active (%)	− .511
In agricultural activity (%)	.499
In professional occupations (%)	− .400
Structural development:	
Literate (%)	− .518
Kilometers of railroad per 1,000 square kilometers of land	− .311
Kilometers of road per 1,000 square kilometers of land	− .186
Urbanization:	
Population in places of 2,500 + (%)	− .307
Population in places of 10,000 + (%)	− .313
Population in places of 100,000 + (%)	− .154
Health:	
General mortality rate	.211
Mortality rate of infectious and parasitic diseases	.391
Doctors per 10,000 population	− .293
Medical units per capita	− .225
Medical beds per capita	− .219
Percent of dwellings without sewerage	.314
Percent of dwellings with piped water	− .294
Other modernization:	
Per capita gasoline consumption	− .306
Per capita sugar consumption	− .157
Percent nonnative to their state	− .450
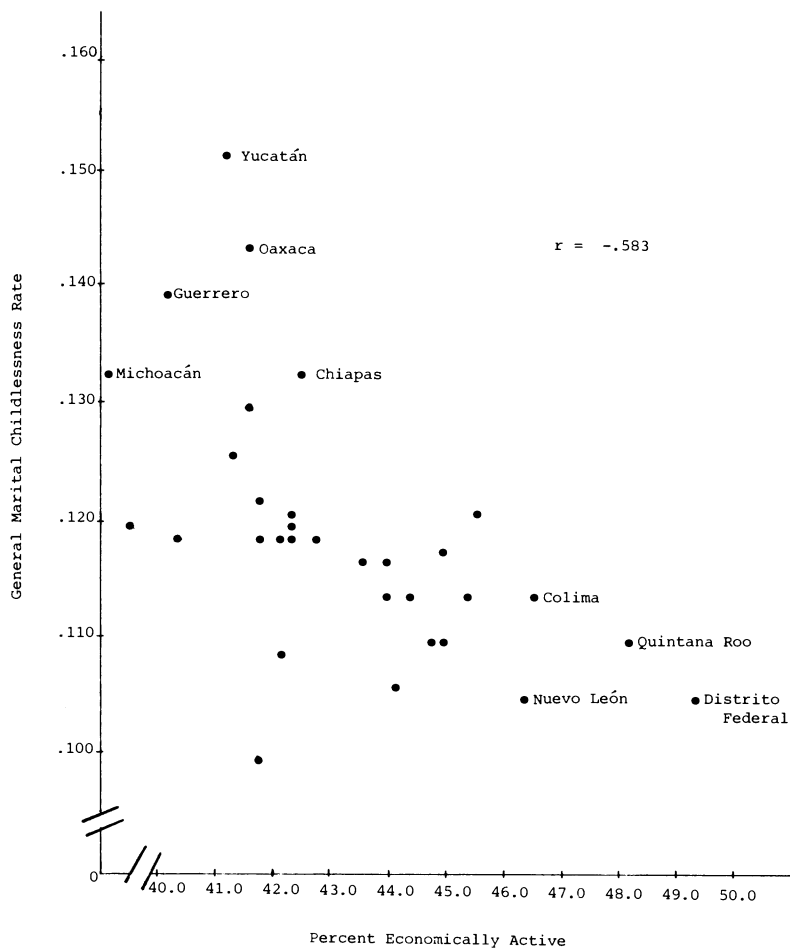
Fig. 2.—Scatter diagram of the relationship between the general marital childlessness rate and the percentage of the population economically active: states of Mexico, 1970.

economically active, the lower the childlessness. Generally, those states with the lowest percentages of their populations economically active have the highest childlessness rates. See, for instance, the positions of the Yucatán, Oaxaca, Guerrero, and Michocán on figure 2; these same four states are also among those that are the least modernized according to the other indicators of socioeconomic development. Conversely, states with the highest percentages of their population economically active (Nuevo León and Distrito Federal are good examples) are among those reporting the lowest childlessness rates. This scattergram is representative of the form of the associations of the other correlations reported in table 2.

The lowest correlations with childlessness occur for per capita

sugar consumption and the percentage of the population living in
places of 100,000 or more inhabitants ($r = -.157$ and $r = -.154$,
respectively), but even they are of reasonable magnitude and in the
direction expected. Among the 32 states, the higher the indicators of
economic activity, urbanization, and other structural development in-
dicators, the lower the levels of childlessness. This relationship is sub-
stantiated further by the positive correlation between the percentage of
the labor force in agricultural activity and the GMCR ($r = .499$).

   We next examine the relationships between the GMCR and indi-
cators of health conditions. The mortality rate of infectious and
parasitic diseases, as well as the general mortality rate, are positively
related to childlessness (r's $= .391$ and $.211$, respectively). Therefore,
in the cross-section, decreases in the rates of mortality are associated
with decreases in childlessness. Medical care, indicated by doctors per
10,000 population, medical units per capita, and medical beds per
capita, are all negatively related to childlessness. As expected, im-
provements in medical care are associated with decreases in childless-
ness. Finally, the general health environment, such as the percentage
of dwellings without sewerage, is positively related to childlessness;
and the percentage of dwellings with piped water is negatively associ-
ated with childlessness. The hypothesized relationships between
health conditions and childlessness also have been sustained at the
bivariate level by the data in table 2.

   In the preceding paragraphs we have examined bivariate relation-
ships between the 20 modernization indicators and childlessness
among the 32 states of Mexico. Many of these independent variables,
however, are highly related to each other, so much so that multiple
regression analysis with the full set of predictors is not appropriate. At
the same time, it would be most beneficial to examine the degree to
which basic dimensions or features of modernization such as structural
economic development and health conditions are associated in the
broadest sense with childlessness. These two themes, along with cer-
tain other dimensions of modernization, are implied in the 20 indepen-
dent variables.

   Thus, we decided to factor analyze the predictor variables and
then to employ the emerging factors as individual predictors in a re-
gression equation with childlessness. Since the factors will be indepen-
dent of one another, the multicollinearity issue just mentioned with
regard to the full set of 20 independent variables would no longer be a
problem.

   Employing the 20 variables in table 2, a principal-components fac-
tor analysis, with iteration, was performed. And, following our con-
cern for identifying independent dimensions of modernization, the ini-
tial factors (that is, the dimensions of variance underlying the 20
variables), were rotated to different locations in the factor space so that

TABLE 3

MODERNIZATION FACTORS AMONG 32 STATES OF MEXICO, 1970: PRINCIPAL COMPONENTS
SOLUTION (with Iteration), ORTHOGONAL (Varimax) ROTATION

Factor and Variable	Loading
1. Structural economic development (% variance, 54.0; cumulative variance, 54.0)	
Literate (%)	.66
Population in places of 2,500+ (%)	.85
Population in places of 10,000+ (%)	.90
Population in places of 100,000+ (%)	.91
Professional occupations (%)	.71
Agricultural activities* (%)	.83
Females economically active (%)	.74
Dwellings without sewerage* (%)	.89
Dwellings with piped water (%)	.85
Per capita gasoline consumption	.56
Per capita sugar consumption	.72
2. Health conditions (% variance, 14.4; cumulative variance, 68.4)	
General mortality rate*	.79
Mortality rate of infectious and parasitic diseases*	.68
Medical units per capita	.76
Percent population nonnative to their state	.67
3. Health facilities/economic activity/railroads (% variance, 8.5; cumulative variance, 76.9)	
Doctors per 10,000 population	.76
Medical beds per capita	.55
Population economically active (%)	.63
Kilometers of railroads per 1,000 km² of land	.77
4. Transportation (% variance, 5.8; cumulative variance, 82.7)	
Kilometers of paved roads per 1,000 km² of land	.83

* Transformed variable.

90 degree positions between each set of factors were maintained. The form of rotation chosen was varimax.

In the factor structure of the modernization variables to be reported below, we selected factors with eigenvalues greater than 1.0, a common practice in the factor analytic literature.[24] However, when we comment later on the "percentage of variance accounted for," the referent is the original variance accounted for before narrowing the focus to those modernization dimensions with eigenvalues greater than 1.0. We define primary variables in the description of the factor structure as those with a factor loading of .30 or greater and with no higher loading on any other factor.[25] Finally, so that all 20 variables would be associated with childlessness in the same (negative) direction, we transformed four of the variables: by subtracting 1,000 from the general mortality rate, 10,000 from the mortality rate of infectious and parasitic diseases, 100 from the percentage of the labor force in agricultural activity, and 100 from the percentage of dwellings without sewerage.

The principal loadings on four factors or dimensions of modernization are reported in table 3. All factors have eigenvalues greater than

1.0, and collectively they account for nearly 83% of the original variance in the 20 input variables. As noted above, the variables specified under each factor, and thus the variables with which we defined the factors, are restricted to primary variables. The first modernization factor may be defined as structural economic development, and it accounts for 54% of the original variance (see table 3). This factor is defined mainly by variables dealing with urbanization and with the quality of dwelling units. Literacy, gasoline, and sugar consumption also have a role in the definition of this factor. The second most important dimension of modernization according to the factor analysis refers to health conditions. Variables reflecting general mortality, infectious mortality, and medical units are among the main defining variables. This factor accounts for more than 14% of the original variance in the 20 input variables. The next modernization factor is a composite one defined in terms of health facilities, economic activity, and railroads. Individual variables representing each of these concepts have primary loadings on this factor. The factor accounts for nearly 9% of the original variance. The final modernization factor is defined by a single variable and reflects a transportation dimension. An additional 5.8% of the original variance is explained by this factor.

The preceding suggests that there are at least four statistically independent sources of modernization variability characterizing the 32 states of Mexico in 1970. One of the factors pertains to structural economic development, another to health conditions, a third to the three concepts of health facilities, economic activity, and railroads, and a fourth involves transportation. The results of the above factor analysis make apparent the multidimensionality of modernization. Among the dimensions specified, we hypothesized earlier that variables reflecting health conditions should be more highly correlated with childlessness than structural development indicators. We suggested that this would obtain because of the closer proximity of the effects of the health variables to decreases in subfecundity and hence childlessness.

This hypothesis may be tested directly by regressing the marital childlessness rate on the four modernization factors. Table 4 presents the results of the multiple regression analysis. When entered into the same equation, all four modernization factors are associated with childlessness in the negative direction hypothesized. And of the four modernization dimensions, the health conditions factor has the highest negative association with childlessness. Its standardized partial regression coefficient (beta) is .41. The betas for the other three factors, which are defined mainly in terms of dimensions of structural economic development, are lower. The regression results suggest the superiority of the health factor over the other three.

Finally, we may inquire about the overall relationship between the

TABLE 4

MULTIPLE REGRESSION ANALYSIS OF MODERNIZATION FACTORS ON CHILDLESSNESS:
32 STATES OF MEXICO, 1970

Modernization Factor		Standardized Partial Regression Coefficient
Structural economic development		− .233
Health conditions		− .411
Health facilities/economic activity/railroads		− .253
Transportation		− .260
Multiple coefficient of correlation (R)	= .572	
Multiple coefficient of determination (R^2 adjusted)	= .228	

modernization dimensions and childlessness among the 32 states of
Mexico. The multiple correlation coefficient (R) is .57 (see the base of
table 4). The relationship between modernization and childlessness is
sizable and very significant. Given the consistently negative signs of
the relationships of the modernization factors on childlessness (see
table 4), we know that the relationship is inverse. Among the 32 states
of Mexico in 1970, the higher the levels of modernization, the lower
their rates of childlessness.

Discussion and Conclusion
We began this analysis by hypothesizing that, among the 32 states of
Mexico in 1970, levels of modernization should be negatively related to
childlessness. Since childlessness is mainly involuntary in developing
countries such as Mexico, increasing modernization should directly
and indirectly affect subfecundity, which is the more proximate cause
of involuntary childlessness because of its influence in reducing disease
and nutritional deficiencies. We set forth a number of modernization
variables reflecting structural economic development and health condi-
tions, and we hypothesized that the health variables should be more
highly associated with childlessness in the expected direction at the
bivariate level.
      We then factor analyzed the input variables, obtained four factors,
one of which clearly reflected health conditions; the other three were
identified as various dimensions of structural economic development.
When childlessness was regressed on these four modernization factors,
the health conditions dimension was shown to have the highest stan-
dardized regression coefficient. Our analyses support both the general
hypothesis that modernization is related inversely to childlessness
among the states of Mexico and the more specific hypothesis that the
health conditions dimension of modernization is more influential than
factors dealing mainly with structural economic development.
      Our findings may also be examined in light of the subnational

investigations of modernization and childlessness in other countries.[26] In the last paragraphs of this paper, we will compare our findings with those from the two Zaire investigations and attempt to draw inferences about the future course of fertility in the Mexican states, particularly those states characterized by low levels of development. The important point emerging from the two investigations of Zaire was that childlessness rates decline and fertility rates increase during the incipient stages of modernization and industrialization. To a limited extent our findings reinforce the conclusions of those investigations, particularly those dealing with development and childlessness. Although our analysis was conducted in the cross-section, the results do show that increases in levels of development in the states of Mexico result in lower levels of childlessness. Childlessness is, by and large, involuntary and thus can respond both to advances in health and nutrition and to some of the other, more structural aspects of economic development not necessarily related to health conditions.

But since our study also examined the associations between childlessness and four conceptually distinct dimensions of modernization, we may go beyond the results of the Zaire investigations and comment on the relative impact of changes in the modernization dimensions on childlessness. It is recalled that when we regressed childlessness on the four dimensions of modernization, the health conditions factor provided the highest standardized partial regression coefficient with childlessness. The remaining three modernization components, each reflecting, for the most part, a particular aspect of structural economic development, were significantly associated with childlessness but at levels considerably less than the dimensions dealing with health conditions. These cross-sectional regression results allow us to suggest that, as development increases in the Mexican states, those programs directed toward the enhancement of health, such as disease reduction and general nutritional improvements, should affect childlessness more than some of the more structurally oriented aspects of economic development. Such results should be most apparent in some of the least developed Mexican states such as Oaxaca, Chiapas, the Yucatán, Guerrero, and others, many of them in southern Mexico. These states have the lowest levels of modernization of all the states of Mexico, as measured by our 20 development indicators; following Romaniuk, these states may be placed in the incipient stages of modernization, and as development increases in these kinds of states childlessness should decline.[27]

Another important part of the Zaire investigations of Romaniuk and Tabutin, as noted above, was that not only does childlessness decline during the early stages of modernization, but, more important, fertility increases. "The breakdown of fertility-inhibiting customs, and emergence of modern infant feeding practices, as well as the im-

provement of reproductive conditions through advances in medical care and nutrition, are among the more important aspects of modernization, which are expected to bring about a rise in fertility."[28] Since these aspects of modernization occur sooner than the more structurally based dimensions pertaining to socioeconomic transformations with their associated motivations for smaller family size, fertility levels will rise before they decline.

Though our data do not directly address the fertility rates of the Mexican states, we should be able to draw inferences about the development-childlessness-fertility nexus. We know already about the modernization-childlessness relationship, and we know also that the effects of the health conditions dimension of modernization on childlessness are more significant than the effects of the other modernization components. If the results pertaining to modernization, childlessness, and fertility reported by Romaniuk and by Tabutin in Zaire obtain in the case of Mexico, then advances in modernization in some of the less developed Mexican states should have as their immediate result an increase, not a decline, in fertility. However, whether fertility will first actually increase in these states as a result of the reductions in infecundity will depend also on the incidence of modernization-triggered birth control practices and the timing of their occurrence. Also, only after the other, more structurally oriented aspects of development take hold (and this should occur after the advances in health conditions have been implemented) should the fertility decline normally associated with economic development occur.

Again, the above inferences depend largely on the degree to which the findings among the states of Zaire apply to the states of Mexico. But to the extent that they are generalizable, these inferences deserve the serious attention of policy practitioners and analysts in Mexico generally, and particularly in the less developed states where the health and economic development programs would be implemented. Romaniuk's observations about Zaire are equally applicable to Mexico: "Actual or potential increases in natural fertility should be taken into account in the formulation of family planning programs and in the post factum evaluation of their effectiveness."[29]

Notes
    1. See the surveys of Clark W. Reynolds, *The Mexican Economy: Twentieth Century Structure and Growth* (New Haven, Conn.: Yale University Press, 1970); and M. Leopoldo Solis, *La Realidad Económica Mexicana: Re-*

trovisión y Perspectivas (México: Siglo XXI Editores, 1970). See also the recent annotated bibliography of Elizabeth R. Forsyth and Gilberto Ramírez, *Development and Equity in Mexico: An Annotated Bibliography* (Austin: Mexico–United States Border Research Program, 1981).

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