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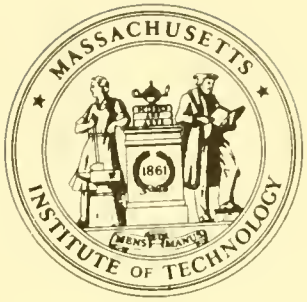


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# INDUSTRIALIZATION AND VARIATION IN SOCIAL STRUCTURE: AN EMPIRICAL TEST OF THE CONVERGENCE HYPOTHESIS

By Stephen J. Kobrin

WP 825-75 December, 1975

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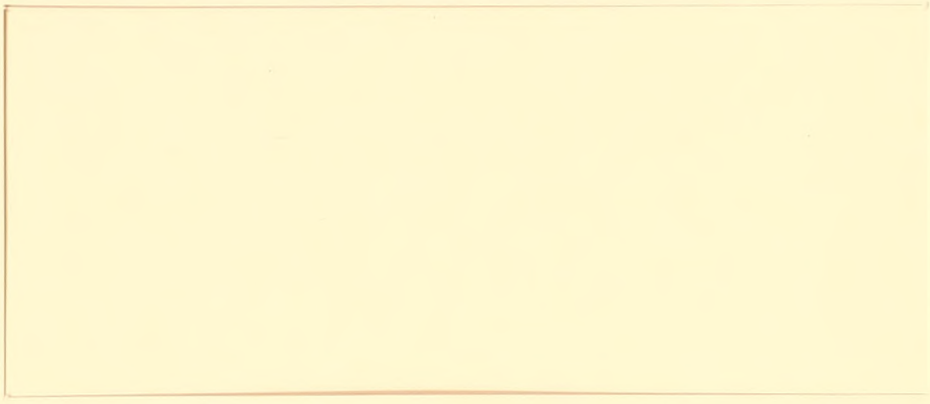

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# INDUSTRIALIZATION AND VARIATION IN SOCIAL STRUCTURE: AN EMPIRICAL TEST OF THE CONVERGENCE HYPOTHESIS

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## I. Introduction*

In Industrialism and Industrial Man, Kerr, Dunlop, Harbison, and Myers concluded that social systems become more uniform and societies in general become more alike as they industrialize.[1] While the convergence hypothesis has generated a good deal of discussion and controversy in the intervening fifteen years, reports of empirical tests of the concept have been limited. This paper summarizes such an attempt utilizing the techniques of cross-national research across a group of fifty-nine developing countries. The theoretical underpinnings of the hypothesis will first be discussed, the concept will then be restated in terms of testable hypotheses, the empirical findings will be reviewed, and, last, the conclusions will be presented.

## II. Industrialization and social change

Reduced to its essence, industrialization entails the use of inanimate sources of power--tools and machines--to multiply human effort in production.[2] As its raison d'être is an increase in output per unit of (human) input, broadscale industrialization results in an increased societal emphasis on efficiency which, given the nature of the machine, leads to larger scale productive units.[3] There is thus a central logic to industrialization,[4] a logic which leads to an increased emphasis on efficiency and scale.

As Moore has observed, it is not reasonable to expect industrialization to be neutral in its social consequences.[5] Rather, evidence from both the West and the developing countries indicates that industrialization tends to be a "universal social solvent."[6] The logic of the machine, the pressure it exerts for increases in efficiency and scale, is inconsistent with the

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* The author would like to thank Charles A. Myers and Clark Kerr for their comments and encouragement.

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basic structure of traditional society.[7]

Widespread mechanization of production is difficult ( if not impossible) to achieve within the bounds of a traditional society where roles are diffused and ascribed,[8] and the economic, social, and religious aspects of life are often interwoven as a whole cloth.[9] This conflict between mechanization and social structure results in what is perhaps the most important immediate effect of industrialization, the differentiation of roles or the division of labor.[10]

Development of a mechanized and occupationally differentiated system of production, in turn, results in pressures for increases in both horizontal and vertical mobility and for changes in the basic patterns of social organization. A relatively rigid and stable stratification system, with both status and roles ascriptively determined, directly conflicts with the "functional requisites of a society with expanding and progressing economic activities."[11] To the extent efficiency is important, positions must be filled on the basis of skills and abilities rather than status; if large scale productive organizations are to develop, workers must be free to change locale.

Similarly, industrialization has placed severe disintegrative pressure on extended families, tribes, and clans.[12] As Tumin has noted, industrialization violates the corporate nature of the clan;[13] its organization is inconsistent with the use of individuals as units of work or remuneration. The nuclear or conjugal family is much better suited to broadscale mechanization. It is geographically and socially mobile, allows for individual specialization, and importantly for individual remuneration and accumulation.[14]

Two points emerge from this brief summary of the relationship between industrialization and social change. First, industrialization results in pressures for change in the structure of traditional society, a process defined in this paper as social modernization. Second, there is a central logic to industrialization resulting from the emphasis on efficiency and scale which directs--within limits--the process of change. The social structures which evolve must be consistent with the requisites of industrialization. We would have to agree with Levy that: "(T)he emphasis associated with high levels of modernization on rationality, universalism, and functional specificity, for example, limit the possibilities of relationships in terms of which manufacturing can be carried out."[15] As one author has noted, there are many ways of skinning a cat, but very few ways of operating a zipper.[16]

## III. Convergence

In their final review of Industrialism and Industrial Man, Dunlop et al conclude that, "...the logic of industrialization results in advanced industrial societies becoming more alike, despite cultural and political differences, and certainly more alike than any one of them is like a less developed country."[17] However, they note that given political, social and cultural differences, there will never be total convergence; that convergence is towards a range of alternatives rather than a single point.[18]

There has been a good deal of support for the concept of convergence in the literature. Karsh and Cole note that the application of science and technology implies a level of standardization more universal than in pre-industrial society.[19] Haskins finds, "(F)undamentally convergent pressures

immanent in the nature and structure of science and technology."[20] Levy concludes that, "(F)or all of their important differences, all relatively modernized societies are in fact becoming more and more alike all the time and the range of possible variation among them decreases all the time."[21]

According to Moore and Feldman, "virtually no one rejects the notion that industrial societies share a core set of social structures that together provide an extended operational definition of industrialism itself."[22] However, Moore had earlier (in 1965) concluded that the weight of the evidence was against convergence. He felt that while structural interdependence and functional integration exert pressures for convergence, they are more than offset by differences in preindustrial society and differences in the routes and processes of change.[23] Upon closer examination, it is not clear that this position differs from that contained in Industrialism and Industrial Man and its various postscripts. It will be recalled that Dunlop et al noted that cultural, social and political differences prevent complete uniformity. Furthermore, they saw the process as so complex and "subject to such contrary internal pressures" that it is inherently pluralistic.[24]

In this research we are concerned with the direct impact of industrialization upon social structure. We are thus not interested in testing (nor entering the lists on) questions of convergence of political systems, ideologies, values and attitudes, or cultural orientations. We would agree that both preindustrial social structures and differences in the path of industrialization impinge on the process of social modernization. However, it appears obvious that once a society embarks on a course of broadscale industrialization, with its emphasis upon efficiency and scale, and pressures for role differentiation, mobility, and changes in social organization, the range and variation

of social structure becomes increasingly circumscribed.

## IV. Hypotheses

In operational terms the convergence hypothesis implies differences in the variation of an indicator (or indicators) of social structure at different levels of industrialization. One would expect decreases in the variation of an indicator of social structure (about a central measure) at higher levels of industrialization. Furthermore, assuming one could isolate and quantify various aspects of social structure (e.g. mobility or family organization) one would also expect less variation among the various aspects of social structure at higher levels of industrialization. Thus we would hypothesize that:

(1) The variation about the mean for a given indicator of social structure decreases as the level of industrialization increases.

(2) There is less variation between the indicators of various aspects of social structure at higher levels of industrialization.

(3) If countries are divided into relatively less and relatively more industrialized groups, there is less variation within than between groups.

## V. Methodology

The methodology is cross-national and cross sectional with most data collected between 1962-1965. All non-socialist bloc[25] developing countries that were sovereign states as of 1965 and met population and economic size minimums[26] were included in the analysis. The final country list (see Table 4) contains fifty-nine countries.[27]

Raw indicators of social structure that are directly affected by industrialization were obtained from published sources, such as the various yearbooks published by international organizations, university data banks, and collections

of qualitative indicators such as those compiled by Adelman and Morris or Banks and Textor.[28] The original list included twenty-two indicators; after redundant and apparently spurious indicators were deleted, seventeen were retained for further analysis.[29] The appendix contains a detailed description of the indicators and their sources.

The seventeen raw indicators of social structure consist of a relatively large number of variables which are to a large extent interdependent and correlated with one another.[30] Factor analysis was thus used to reduce the data to a smaller number of independent, and hopefully conceptually more meaningful, aspects of social structure.

Quantification of industrialization was straightforward. Its definition (the application of inanimate sources of power to production) suggests power consumption per capita as a basic indicator.[31] To provide a measure of the breadth of industrialization, the size of the manufacturing sector, as a percentage of GDP, was added. The index of industrialization thus consists of an unweighted linear average of the two variables.[32]

Given both the somewhat diffuse nature of the convergence hypothesis and the problems of accuracy and comparability of data[33] which arise when one works with statistical indicators across a relatively large number of developing countries, relatively simple and straightforward techniques are used to test the hypotheses. These can best be duscussed in the context of the findings.

## VI. Findings

As noted above, factor analysis (a principal axis solution and a varimax rotation) was used to reduce the seventeen raw indicators to a smaller number of aspects of social structure. The matrix of rotated factor loadings is

shown as Table 1. The loadings are a measure of the degree to which a given variable is associated with a given factor; they are analogous to correlation coefficients. The column headed by $h^2$ contains communalities or the percentage of the common variance of a given variable accounted for by the factors in total. As the factors were orthogonally rotated, the loadings define the major clusters of interrelationships among the variables and the factors are independent. While interpretation is necessarily subjective, the conceptual content of a factor is typically inferred from those variables loading most highly on it.[34]

The variables which load most highly on the first factor represent the movement from diffused and traditional agricultural roles into more differentiated roles in the mining and manufacturing industries and commercial agriculture, and the associated general societal changes. It is thus named role differentiation or roles. The second factor is clearly defined; it captures variables which are measures or requisites of vertical and horizontal mobility and it is so named.

The last factor can be interpreted as encompassing the transition from tribes and extended families to nuclear families, a corresponding lessening of the influence of non-associational groups, and increasing integration and homogeneity of society as cultural and linguistic differences break down. The third factor thus describes basic changes in the organization of society and is named social organization.

The three factors represent major components of the changes in social structure which result from industrialization; increased differentiation of roles, increased mobility, and a shift to a more homogeneous society composed

of nuclear family units. Scores for each of the factors were obtained by utilizing the loadings as weights and summing for the (suitably rescaled) variables which load highest on each factor.[35]

The first hypothesis posits less variation in each of the indicators of social structure at higher levels of industrialization. This suggests a comparison of their dispersion at several levels of industrialization. While the standard deviation provides an absolute measure of dispersion, a relative measure is required for comparison. To this end, the coefficient of variation, which is the standard deviation expressed as a percentage of the arithmetic mean, was computed for each aspect at four levels of industrialization.[36] The results are presented in Table 2.

In each instance there is less dispersion (relative to the mean) in a given indicator at higher than at lower levels of industrialization. Considering each indicator in turn, countries are more alike at higher than at lower levels of industrialization. It is interesting to note that both the absolute and relative measure of dispersion for social organization is larger, at each level of industrialization, than for either roles or mobility. This is consistent with what the theory would predict as: 1) there tends to be a greater variation in this aspect of social structure in preindustrial societies than for roles or mobility and 2) changes in social organization are a function of changes in the other two factors which are more immediately affected by industrialization.[37]

The second hypothesis states that there will be less variation between the various aspects of social modernization as nations industrialize. If the process of social modernization is a coherent phenomenon, and if the three

factors are actual aspects of modernization, then a country which is more modernized than another should score higher on each of the three aspects of modernization than the other. The three aspects or factors would then constitute what is known as a unidimensional scale.[38]

In actual practice we would expect deviations from a unidimensional scale. We would expect to find errors or a less than perfect correspondence between an ideal or predicted scale and the actual scale. In terms of the problem at hand, we would expect this correspondence to vary at different levels of industrialization; we would expect a better fit between ideal and actual scales at higher levels of industrialization.

This correspondence, or the degree of reproducibility of the ideal scale, may be computed by a technique known as scaleogram analysis.[39] Guttman scales are utilized to determine if responses of subjects to given items form a scale;[40] if they can be ordered along an underlying dimension.[41] In a perfect Guttman scale, responses of a subject to all items can be reproduced from the knowledge of its rank order alone.[42] The technique thus involves construction of an ideal scale, comparing the actual and ideal scale (counting errors), and then determining if the degree of reproducibility is satisfactory.

In the case at hand, we thus want to determine if country scores on roles, mobility, and social organization form a scale and if the degree of reproducibility varies at different levels of industrialization. The three aspects of modernization were converted to ordinal scales (quartiles) by reference to their distributions.[43] The ideal or predicted scale was constructed by utilizing the bar chart method[44] and is shown as Table 3. The lowest value for a given aspect is zero and the highest is three; the total scale score is simply

the row sum. The ideal scale appears to be consistent with theory; where deviations from a homogeneous pattern (eg 3,3,3) occur, roles always has a value equal to or greater than the other two indicators. This is to be expected if role differentiation is the first order effect of industrialiation.

The actual scale is presented as table 4. The countries are grouped by four levels of industrialization based upon a division of the ordinal scale for that variable into four equal parts. The errors are simply the deviations from the closest ideal pattern.[45] The coefficient of reproduceability (CR) which is one less the number of errors as a percentage of the number of responses of all subject to all items,[46] is then used to judge whether the actual responses constitute a scale. Originally Guttman selected a CR of 0.85 as the dividing line separating scales from non-scales, but more recently the standard has been tightened to 0.90.[47]

Table 5 summarizes the degree of reproduceability (CR) for the overall scale and each of the four levels of industrialization.[48] The overall CR of 0.92 is clearly acceptable; the categorized country scores on the three aspects of modernization constitute a unidimensional scale. The pattern of reproduceability over the sub-groups is consistent with the second hypothesis. The correspondence between the ideal and actual scales is best at the lowest and at the highest levels of industrialization. The fit, while still acceptable, is poorer at interim levels.

While we would certainly not claim that the fifteen least industrialized countries represent "ideal" traditional societies, they are reasonable approximations of preindustrial states. Thus, one would expect a good deal of homogeneity. In fact, six of the fifteen countries in the group (all of which rank among the eight least industrialized of the countries studied) have a scale score of zero.[49]

At interim levels of development, one would expect a poorer correspondence between the predicted and the actual scale patterns; greater variation in the relationship between the various aspects of social structure. The immediate effects of the introduction of industrialization are disintegrative[50] and a breakup of the structures of traditional society results. While, in general, pressures for social change are exerted through the increased differentiation of roles, there is no reason to expect either the path of industrialization or the process of social modernization to follow the same course in each country.

If the convergence hypothesis is correct, one would expect that as industrialization proceedes, its requisites would limit the variation between aspects of social structure. Thus, the improvement in reproduceability of the predicted scale pattern in the fourth quartile is consistent with the hypothesis. It should also be noted that thirty-eight percent of the errors in the fourth quartile are attributable to South Africa, which is certainly a very singular case. If South Africa is dropped from the analysis, the CR for the fourth quartile becomes 0.96.[51]

The third hypothesis was tested through cluster analysis which is a technique used to identify groups of similar individuals within a given population. Cluster analysis is performed on cases (countries) rather than variables and essentially groups individuals based upon their profile over a given set of variables.[52] In this instance, the fifty-nine countries were clustered on the basis of their profiles over the seventeen raw indicators of social structure.

While the clustering procedure is hierarchical, building from the most similar pair of countries, the two penultimate clusters contained all of the countries analyzed. Table 6 shows the cluster each country is contained in with the countries grouped by level of industrialization.

If the match was perfect, all countries in quartiles III and IV would be contained in cluster I and all of the countries in quartiles I and II in cluster II. On this basis nine or fifteen percent of the countries are misplaced. However, if one considers only the most and least industrialized quartiles only one country (Ceylon) is contained in the "wrong" cluster.

## VII Conclusions

The findings must be considered tentative for several reasons. First, one must have substantial concerns about the accuracy and comparability of indicators of social structure collected across a large number of developing countries.[53] Second, attempting to investigate a longitudinal phenomena through a cross-sectional methodology requires assumptions about the nature of the process which may lead to conceptual difficulties.[54] Third, the tests did not involve rigorous statistical tests of significance.

Thus, one certainly can not state the convergence hypothesis is proven. However, it is reasonable to conclude that it is consistent with the data and the findings of this research. The variance of both a given aspect of social structure and among the three aspects considered together was found to be smaller at higher levels of industrialization. Furthermore, the findings of all the tests were consistent lending additional confidence to the conclusions.

It is important to note that convergence is narrowly defined in this research. Both conceptually and empirically, we are considering convergence in those social structures which are directly affected by industrialization. The findings of this research can not be generalized to draw conclusions about a tendency towards convergence of political systems, cultures or individual values. We can only conclude that this research supports the notion that

as societies industrialize, the nature of the process places limits on the permissable variation in social structure.

This research represents only a preliminary effort at a test of the convergence hypothesis. We would hope that advances in both the availability of data and in the methodology of cross-national research will allow a longitudinal investigation of the topic in the near future. If one could trace the process of industrialization and social modernization in a number of countries, a good deal more could be learned about the process as well as the end result. Additionally it would be interesting to extend this research to include the most industrialized capitalist countries as well as the socialist countries.[55]

TABLE I

Factor Analysis of Social Modernization

| Variables | Rotated Factors | | | |
|---|---|---|---|---|
| | $S_1$ | $S_2$ | $S_3$ | $h^2$ |
| 1. % Agriculture | -.69 | -.48 | -.38 | .85 |
| 2. % Min. and Mfg. | .59 | .51 | .32 | .71 |
| 3. Agric. Org. | .69 | .32 | .24 | .64 |
| 4. Middle Class | .55 | .47 | .27 | .59 |
| 5. Dualism | .78 | .47 | .14 | .85 |
| 6. Mod. Out. | .85 | .15 | .28 | .83 |
| 7. Bureaucracy | .55 | .29 | .22 | .42 |
| 8. Assoc. Groups | .62 | .36 | .37 | .64 |
| 9. Literacy | .48 | .50 | .48 | .72 |
| 10. Enrol. 1 and 2 | .41 | .63 | .22 | .61 |
| 11. Enrol. 3 | .35 | .74 | .31 | .81 |
| 12. Human Res. | .33 | .84 | .31 | .91 |
| 13. Urbanization | .44 | .63 | .38 | .72 |
| 14. Transportation | .37 | .65 | .36 | .70 |
| 15. Family | .43 | .30 | .69 | .74 |
| 16. Non Assoc. Groups | -.37 | -.21 | -.71 | .68 |
| 17. Fractionalization | -.09 | -.40 | -.65 | .58 |
| Percent of Total Variance | 29 | 25 | 17 | |
| Cumulative Percent of Variance | 29 | 54 | 71 | |

TABLE 2

Measures of Dispersion

| Industrialization | Roles | Mobility | Social Organization |
|---|---|---|---|
| I. Lowest | | | |
| $\sigma$ | 27.0 | 32.3 | 22.6 |
| coeff of var. | .56 | .52 | .69 |
| (N=15) | | | |
| II. Lower | | | |
| $\sigma$ | 20.6 | 20.2 | 33.8 |
| coeff of var. | .29 | .22 | .65 |
| (N=14) | | | |
| III. Higher | | | |
| $\sigma$ | 27.3 | 24.6 | 35.3 |
| coeff of var. | .27 | .19 | .45 |
| (N=15) | | | |
| IV. Highest | | | |
| $\sigma$ | 22.5 | 24.9 | 35.8 |
| coeff of var. | .16 | .16 | .33 |
| (N=15) | | | |

TABLE 3

Ideal Scale Patterns

| Roles | Mobility | Social Organization | Scale Score |
|---|---|---|---|
| 3 | 3 | 3 | 9 |
| 3 | 2 | 3 | 8 |
| 2 | 2 | 2 | 6 |
| 2 | 2 | 1 | 5 |
| 1 | 1 | 1 | 3 |
| 1 | 1 | 0 | 2 |
| 0 | 0 | 0 | 0 |

TABLE 4

Actual Scale Scores

| Country | Scale Score | Roles | Mobility | Social Organization | Errors |
|---|---|---|---|---|---|
| Industrialization IV* | | | | | |
| Argentina | 9 | 3 | 3 | 3 | 0 |
| Chile | 9 | 3 | 3 | 3 | 0 |
| Greece | 9 | 3 | 3 | 3 | 0 |
| Venezuela | 9 | 3 | 3 | 3 | 0 |
| Uruguay | 9 | 3 | 3 | 3 | 0 |
| Brazil | 8 | 3 | 2 | 3 | 0 |
| Jamacia | 8 | 3 | 2 | 3 | 0 |
| Panama | 8 | 2 | 3 | 3 | 1 |
| Portugal | 8 | 3 | 2 | 3 | 0 |
| Spain | 8 | 3 | 3 | 2 | 1 |
| Taiwain | 8 | 3 | 3 | 2 | 1 |
| Colombia | 7 | 2 | 2 | 2 | 1 |
| Mexico | 7 | 3 | 2 | 2 | 1 |
| Peru | 6 | 2 | 2 | 2 | 0 |
| S. Africa | 5 | 3 | 2 | 0 | 3 |
| Industrialization III | | | | | |
| Costa Rica | 9 | 3 | 3 | 3 | 0 |
| Lebanon | 8 | 3 | 3 | 2 | 1 |
| Turkey | 8 | 3 | 2 | 3 | 0 |
| Dominican R. | 7 | 2 | 2 | 3 | 1 |
| El Salvador | 7 | 2 | 2 | 3 | 1 |
| Ecuador | 6 | 2 | 2 | 2 | 0 |
| Philippines | 6 | 3 | 3 | 0 | 3 |
| S. Korea | 6 | 1 | 3 | 2 | 3 |
| UAR | 6 | 2 | 2 | 2 | 0 |
| Iraq | 5 | 1 | 2 | 2 | 1 |
| Syria | 5 | 2 | 2 | 1 | 0 |
| Bolivia | 4 | 1 | 1 | 2 | 1 |
| India | 3 | 2 | 1 | 0 | 1 |

TABLE 4 (cont.)

| | | | | | |
|---|---|---|---|---|---|
| Tunesia | 3 | 1 | 1 | 1 | 0 |
| Iran | 2 | 1 | 1 | 0 | 0 |
| Industrialization II | | | | | |
| Nicaragua | 6 | 2 | 1 | 3 | 2 |
| Guatemala | 5 | 2 | 1 | 2 | 1 |
| Honduras | 5 | 1 | 1 | 3 | 2 |
| Jordan | 4 | 1 | 2 | 1 | 1 |
| Ghana | 3 | 2 | 1 | 0 | 1 |
| Morocco | 3 | 1 | 1 | 1 | 0 |
| Vietnam | 3 | 0 | 2 | 1 | 2 |
| Algeria | 2 | 1 | 0 | 1 | 1 |
| Malaysia | 2 | 1 | 1 | 0 | 0 |
| Congo | 1 | 0 | 1 | 0 | 1 |
| Kenya | 1 | 1 | 0 | 0 | 1 |
| Thailand | 1 | 0 | 1 | 0 | 1 |
| Zambia | 1 | 1 | 0 | 0 | 1 |
| Senegal | 0 | 0 | 0 | 0 | 0 |
| Industrialization I | | | | | |
| Ceylon | 5 | 2 | 2 | 1 | 0 |
| Burma | 2 | 0 | 1 | 1 | 1 |
| Cambodia | 2 | 0 | 1 | 1 | 1 |
| Lybia | 2 | 0 | 1 | 1 | 1 |
| Pakistan | 2 | 1 | 1 | 0 | 0 |
| Indonesia | 1 | 1 | 0 | 0 | 1 |
| Ivory Coast | 1 | 1 | 0 | 0 | 1 |
| Malagasay R. | 1 | 0 | 0 | 1 | 1 |
| Nigeria | 1 | 1 | 0 | 0 | 1 |
| Cameroon | 0 | 0 | 0 | 0 | 0 |
| Ethiopia | 0 | 0 | 0 | 0 | 0 |
| Nepal | 0 | 0 | 0 | 0 | 0 |
| Sudan | 0 | 0 | 0 | 0 | 0 |
| Tanzania | 0 | 0 | 0 | 0 | 0 |
| Uganda | 0 | 0 | 0 | 0 | 0 |

*IV is the highest level of industrialization

TABLE 5

Comparison of Errors

| Level of Industrialization | N | Errors | Coeff. of Reproducibility |
|---|---|---|---|
| I Lowest | 15 | 7 | .95 |
| II Lower | 14 | 14 | .89 |
| III Higher | 15 | 12 | .91 |
| IV Highest | 15 | 8 | .94 |
| Total Sample | 59 | 41 | .92 |

TABLE 6

Cluster of Counries versus Level of Industrialization

| Country | Cluster | Country | Cluster |
|---|---|---|---|
| Quartile IV | | Quartile II | |
| Argentina | I | Algeria | II |
| Brazil | I | Congo | II |
| Chile | I | Ghana | II |
| Colombia | I | Guatemala | I |
| Greece | I | Honduras | II |
| Jamaica | I | Jordan | I |
| Mexico | I | Kenya | II |
| Panama | I | Morocco | II |
| Peru | I | Malaysia | I |
| Portugal | I | Nicaragra | I |
| Spain | I | Senegal | II |
| S. Africa | I | Thailand | II |
| Taiwan | I | Vietnam | II |
| Uruguay | I | Zambia | II |
| Venezuela | I | Quartile I | |
| Quartile III | | Burma | II |
| Bolivia | II | Cambodia | II |
| Costa Rica | I | Cameroon | II |
| Dominican Rep. | I | Ceylon | I |
| Ecuador | I | Ethiopia | II |
| El Salvador | I | Indonesia | II |
| India | II | Ivory Coast | II |
| Iran | II | Libya | II |
| Iraq | II | Malagasay Rep. | II |
| Lebanon | I | Nepal | II |
| Philippines | I | Nigeria | II |
| S. Korea | I | Pakastan | II |
| Syria | I | Sudan | II |
| Tunesia | I | Tanzania | II |
| Turkey | I | Uganda | II |
| UAR | I | | |

## Appendix

### Sources and Measurement of Social Variables

1. Percentage of the economically active population in traditional agriculture. (Adelman and Morris, cross-checked against U.N. and I.L.O. data.)

2. Percentage of the economically active population in mining and manufacturing. (Yearbook of Labor Statistics.)

3. Character of agricultural organization reflecting the range from peasant farming to modern commercial agriculture. Countries were divided into groups based upon area studies and the classifications were then validated through interviews with experts. (Adelman and Morris.)

4. Importance of the indigenous middle class. An estimate based upon (1) the percentage of the population engaged in middle class occupations and (2) a qualitative assessment of the importance of expatriates. (Adelman and Morris.)

5. The extent of dualism. A qualitative estimate of the degree of separation of the traditional and modern sectors. Countries are divided into groups (as described under three above) ranging from an overwhelmingly traditional economy to the relatively complete integration of traditional and modern sectors. (Adelman and Morris.)

6. Modernization of outlook. A qualitative estimate (perhaps the most subjective used in this study) of the modernization (in terms of lifestyle) of educated urban groups and the degree of acceptance of programs of social and political modernization among both urban and rural populations. (Adelman and Morris.)

7. The efficiency and modernization of the bureaucracy. An estimate (countries were divided into four groups) of the efficiency and ascriptive versus achievement orientation of the civil service. Efficiency is judged in terms of functionally specific relationships and rational decision making. (Banks and Textor.)

8. The extent of interest articulation by associational groups. This reflects the influence of voluntary groups, such as trade unions and civic associations. (Banks and Textor.)

9. Literacy. The percentage of the adult population (generally over fifteen years of age) that meets a given country's standard of literacy. (Taylor and Hudson.)

10. First and second level school enrollment ratio. The percentage of appropriate age groups enrolled in primary and secondary schools. (Taylor and Hudson.)

11. Third level enrollment ratio. The percentage of appropriate age groups enrolled in university. (U.N.E.S.C.O. Statistical Yearbook.)

12. An index of human resource utilization. A linear combination of variables ten and eleven with the latter weighted by a factor of five. The index is suggested in Harbison, Frederick and Myers, C.A. Education, Manpower and Economic Development. New York: McGraw-Hill, 1964.

13. Urbanization. The percentage of the population living in cities of 100,000 or more. (Taylor and Hudson, and Banks.)

14. Transportation. An index, original to this research, intended as a measure of the potential for horizontal mobility and economic independence. The index is composed of a measure of road and rail length per unit of area multipled by an index of the concentration of the population. The latter is scored so that the more concentrated the population (a greater proportion living in a few large cities rather than in many smaller ones) the higher the index. It is assumed that, ceteris paribus, countries with more diffused populations will tend to have larger transportation networks relative to area. (The Statesman's Yearbook. London: MacMillan, 1967 and 1972; Ginsburg, Norton. Atlas of Economic Development. Chicago: University of Chicago Press, 1961; and Taylor and Hudson.)

15. Basic family structure. Countries were grouped into three classes: those in which tribal allegiances are widespread, those in which the extended family is the norm and those in which the nuclear family predominates. (Adelman and Morris.)

16. The extent of interest articulation by non-associational groups. This reflects the importance of ascriptive groups such as clans and tribes in a society. The index is qualitative; countries were divided into groups based upon country studies. (Banks and Textor.)

17. Cultural and linquistic fractionalization. Countries are scored on a scale ranging from .00 (extremely homogeneous) to .99 (extremely fractionalized). (Atlas Narodov Mira, Academy of Sciences, Moscow, reported in Taylor and Hudson.)

Sources

Irma Adelman and Cynthia Taft Morris, Society, Politics and Economic Development. (Baltimore: Johns Hopkins University Press, 1967).

Arthur S. Banks, Cross-Polity Time-Series Data. (Cambridge: MIT Press, 1971).

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Charles Lewis Taylor and Michael C. Hudson, World Handbook of Political and Social Indicators: Second Edition. (New Haven: Yale University Press, 1972).

NOTES

[1]Clark Kerr, John T. Dunlop, Frederick H. Harbison, and Charles A. Myers, Industrialism and Industrial Man, (Cambridge: Harvard University Press, 1960; New York, Oxford University Press, 1964), p. 238.

[2]Marion J. Levy, Jr., Modernization and the Structure of Societies: A Setting for International Affairs, (Princeton: Princeton University Press, 1966; Princeton; Princeton Paperback, 1969), p.11; Wilbert E. Moore, Social Change, (Englewood Cliffs: Prentice Hall, 1963), p. 91; James Sidney Slotkin, From Field to Factory: New Industrial Employees, (Glencoe: The Free Press, 1960), p. 13.

[3]Kerr et al, Industrialism and Industrial Man, p. 21.

[4]Ibid, p. 15.

[5]Wilbert E. Moore, The Impact of Industry, (Englewood Cliffs: Prentice Hall, 1965), p. 45.

[6]Levy, Modernization and the Structure of Societies, p. 744.

[7]A traditional society is typically structured on the basis of small, agarian, often ascriptive, independent and self sufficient, production-consumption units. This structure (which is obviously idealized, in Weber's sense) is not compatible with the requisites of broadscale industrialization.

[8]In an ideal traditional society, we would envision a rural production unit which grew their own food, built their own house, and made their own clothes. Any differentiation of roles which exists would be ascribed on the basis of age and sex.

[9]Again, the aspects of life as well as occupational roles are diffused. It is difficult to separate social and economic, or occupational and recreational activities. The idea of a distinct economic sector is a relatively modern concept.

[10]Kahl called the occupational division of labor the "...economically determined skeleton on which the flesh of modern social organization develops." Joseph A. Kahl, "Some Social Concomitants of Industrialization and Urbanization", Human Organization 18 (Summer, 1959), p. 58; Also see, Gayle D. Ness, ed. The Sociology of Economic Development: A Reader, (New York: Harper and Row, 1970), p. 11.

[11]Bert F. Hoselitz, "Stratification and Mobility in Industrial Society", International Social Science Journal 16 (1964), reprinted in, William A Faunce and William H. Form, eds., Comparative Perspectives on Industrial Society, (Boston: Little Brown, 1969), p. 173.

[12]If one idea emerges from the literature, it is that industrialization and the extended family or clan are not compatible. Levy summarized the issue in absolute terms; "(E)very society regardless of the basis from which change took place, which has changed in the direction of relatively high levels of modernization has been marked by a change in the ideal structures for family types toward multilineal conjugal family units." Modernization and the Structure of Societies, p. 417.

[13]Melvin M. Tumin, "Competing Status Systems", in Labor Commitment and Social Change in Developing Areas, ed. Wilbert E. Moore and Arnold Feldman, (New York: Social Science Research Council, 1960), p. 315.

[14]William J. Goode, "Industrialization and Family Change", in North American Conference on the Social Implications of Technological Change, eds. Bert F. Hoselitz and Wilbert E. Moore, (Paris: Mouton, 1963), p. 242.

[15]Levy, Modernization and the Structure of Societies, p. 240.

[16]Bruce F. Ryan, Social and Cultural Change, (New York: Ronald Press Company, 1969), p. 252.

[17]John T. Dunlop, Frederick H. Harbison, Clark Kerr, and Charles A. Myers, Industrialism and Industrial Man Reconsidered, (Princeton: The Inter-University Study of Human Resources in National Development, 1975), p. 37.

[18]Ibid, pp. 36 and 37.

[19]Bernard Karsh and Robert E. Cole, "Industrialization and the Convergence Hypothesis: Some Aspects of Contemporary Japan", Journal of Social Issues 24 (October 1968), p. 46.

[20]Caryl P. Haskins, "Science and Policy for a New Decade", Foreign Affairs 49 (January 1971), p. 239.

[21]Levy, Modernization and the Structure of Societies, p. 103.

[22]Moore and Feldman, Labor Commitment and Social Change, p. 59 and 60.

[23]Wilbert E. Moore, Industrialization and Labor: Social Aspects of Economic Development, (New York: Russell and Russell, 1965), p. 13.

[24]Kerr et al, Industrialism and Industrial Man, p. 233.

[25]Socialist bloc nations have been excluded from many studies of comparative socio-economic development due to problems of comparability and the lack of data. See Irma Adelman and Cynthia Taft Morris, Society, Politics and Economic Development, (Baltimore: John Hopkins University Press, 1967),

p.106; and Simon Kuznets, Modern Economic Growth, (New Haven: Yale University Press, 1966), p. 508.

[26]Nations which did not have a population of at least one million and a GNP of at least $500 million in 1965 were excluded from the analysis to insure comparability of national units.

[27]One country which met the size minimums, Saudi Arabia, had to be dropped due to a lack of data. For more detailed information see; Stephen J. Kobrin, "Foreign Direct Investment, Industrialization and Social Change: Acculturation and Modernization in Developing countries," (Ph.D. dissertation, The University of Michigan, 1975).

[28]Examples of university data banks are; Charles Lewis Taylor and Michael C. Hudson, World Handbook of Political and Social Indicators: Second Edition, (New Haven: Yale University Press, 1972) and Arthur S. Banks, Cross-Polity Timeseries Data, (Cambridge: MIT Press, 1971). Qualitative Indicators are found in Adelman and Morris, Society, Politics and Economic Development and Arthur S. Banks and Robert B. Textor, A Cross-Polity Survey, (Cambridge: MIT Press, 1963).

[29]Missing data was estimated by; 1) reference to other comparable indicators or, 2) regression on other correlated variables. When a distribution was highly skewed the variable was transformed logarithmically. Variables were judged spurious -- not in fact measuring what they purported to measure -- if they loaded randomly in factor analysis.

[30]The raw indicators were all selected as measures of the elements of social structure that are likely change with industrialization. Thus, they all are components of, and should be correlated with, some generalized notion of social development.

[31]The source for this indicator is the United Nations Statistical Yearbook, (New York: United Nations, various years).

[32]Power consumption per capita alone may be misleading as very resource-intensive countries may consume relatively large amounts of power in an isolated economic (or geographic) sector. The source for national accounts data is the United Nations Yearbook of National Accounts Statistics, (New York: The United Nations, various years).

[33]Problems of accuracy and comparability are both practical and conceptual. Developing countries, almost by definition, face a shortage of administrators and technicians. It is not reasonable to expect that collection procedures are standardized within countries, much less between countries. However, the major problem may be conceptual. While international organizations such as the United Nations are making progress, at this point there is no reason to expect that each of the indicators of social structure is defined the same way in each of the countries studied.

[34]The three factors captured seventy-one percent of the variance the original seventeen indicators had in common. Thus the use of factor analysis for purposes of data reduction was relatively efficient as there was a considerable gain in simplicity at a relatively low cost.

[35]It is perhaps more common to obtain factor scores by a more complex technique which maintains their statistical independence. However, maintaining the independence of factors would have resulted in problems in this case. As the first factor (roles) is very highly correlated with industrialization ( a simple R of .88), maintaining factor independence would have resulted in the second and third factors being orthogonal to industrialization. As this is the result of a statistical artifact and would have interferred with further analysis, the alternative method of deriving factor scores was used. The simple correlation coefficients of mobility and roles with industrialization are .85 and .70 respectively.

[36]The countries were simply rank ordered on industrialization and the resulting scale was divided into four equal parts.

[37]Patterns of preindustrial social organization vary considerably. For example, while the extended family was the norm in India, nuclear families formed the basis of society in many preindustrial Indian communities in the Central American highlands. Similarly some areas which are now defined as nations in the political sense have been relatively homogeneous culturally since antiquity, while others have been highly factionalized for centuries.

[38]Allen L. Edwards, Techniques of Attitude Scale Construction, (New York: Appleton-Century-Crofts, 1957), p. 172.

[39]A very interesting application of scaleogram analysis to a cross-national research problem can be found in; Lee Sigelman, "Lerner's Model of Modernization: A Reanalysis", The Journal of Developing Areas 8 (July 1974) 525-536.

[40]Warren S. Torgerson, Theory and Methods of Scaling, (New York: John Wiley and Sons, 1967), p. 307.

[41]Sigelman, "Lerner's Model of Modernization", p. 526.

[42]Torgerson, Theory and Methods of Scaling, p. 318.

[43]To avoid small classes due to the influence of extreme values the two outlying observations, at each end of the scale, were discounted in determining quartile cut-off points. They were, of course, included in all calculations.

[44]Edwards, Techniques of Attitude Scale Construction, p. 186.

[45]Thus the actual scale values for a given country are compared to the ideal scale pattern which will minimize the number of errors. For example if there are two ideal patterns , 121 and 222, an actual pattern of 111 would contain one error. See, Torgerson, Theory and Methods of Scaling, p. 319.

[46]Ibid, p. 323. However, as Sigelman notes, the CR is typically defined for a dichotomous response pattern. If there are more than two possible responses, the coefficient must be adjusted to take the greater number of possible observations into account. Thus, the general formula is

$$CR = 1 - \frac{\text{errors}}{kr(n-1)}$$

where k is the number of columns, r the number of rows and n is the number of categories ( or possible answers) for each entry. In the case at hand there are three columns, fifty-nine rows and four categories for each entry. Sigelman, "Lerner's Model of Modernization", p. 531.

[47]Torgerson, Theory and Methods of Scaling, p. 323.

[48]See note 46.

[49]One of the major advantages of a scaleogram, as compared to a more sophisticated statistical methodology, is that the case by case comparison allows for identification and analysis of deviants.

[50]In the West the processes of industrialization and social change were intertwined; they developed in tandem over the course of several centuries. In the current less developed countries, however, the situation is quite different. The institutions of industrialization are transmitted from the West and are often superimposed upon an existing traditional society. In the context of the developing countries, industrialization can thus be regarded as an exogenous variable, with its immediate effects more easily isolated than was possible in the West.

[51]It is difficult to justify excluding any case on an a posteriori basis, especially if doing so improves the results. However, South Africa is a very singular case and it is not unreasonable to argue that its Government's policies force it out of the pale of observed relationships linking industrialization and social change.

[52]The clustering strategy is hierarchical, building from a single pair which is the most homogeneous in terms of the selection criterion to a final step in which one large cluster includes all of the cases. The variables are converted to T scores and the selection criterion is then the average of absolute differences in T scores. The iterative procedure works on a pairwise basis, treating each cluster formed as a single individual by averaging T scores. The algorithm was developed by Professor M.C. Johnson of the School of Education of The University of Michigan.

[53]See note 33.

[54]Investigating historical phenomena cross-sectionally requires an assumption that individual observations represent points on the longitudinal path. This obviously does not present a very accurate conception of reality, and while not destroying the usefullness of the analysis, it limits how far one can take the results. See, Bruce M. Russett, "The Yale Political Data Program: Experience and Prospects", in Comparing Nations: The Use of Quantitative Data in Cross-National Research, eds. Richard L. Merritt and Stein Rokkan (New Haven: Yale University Press, 1966), p. 104.

[55]While there a major problems in terms of the availability of data in extending the research to include the socialist countries, it would not be difficult to include the advanced capitalist countries. Although some of the indicators utilized in this study are not available for the industrialized countries (particularly those developed by Adelman and Morris), sufficient data exists to permit quantification of the aspects of social structure and industrialization.

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