MEASURING SOCIOECONOMIC DEVELOPMENT: INDICATORS, DEVELOPMENT PATHS, AND INTERNATIONAL COMPARISONS

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I. INTRODUCTION

SOME PEOPLE SEE development as a historical process, and others as a planned movement toward agreed goals. Whichever view one takes, it is necessary to try to measure the development which is being made. Interdisciplinary approaches should be taken for purposes of the measurement, as well as for policy and planning. This is true, first, because economic development cannot be treated separately from the interlocking links with cultural, social, ecological, and political factors. Historical development processes have been exceedingly multidimensional. Secondly, there is increasing criticism against the overemphasis on economic growth which has been present in past economic development policy and planning.

One cannot underestimate the role of economic factors among the most important explanatory variables of wider socioeconomic development. Nevertheless, economists themselves are aware that GNP alone cannot clarify various structural changes and distributional problems which constitute the central and essential issues of development. In an attempt to cope with contemporary problems confronting the developed nations, as well as the problems in the development efforts of underdeveloped nations, there has recently been a shift of emphasis from the studies in the economic domain alone to interdisciplinary approaches which overstep the present boundaries of the social sciences. Here, we need theoretical frameworks, indicators, and analytical tools for systematic studies of the problems.

The purpose of this study is to investigate indicators of socioeconomic development, including noneconomic factors, with the intention of providing better data for interdisciplinary approaches. We will present some empirical results of our study on the measurement of development process by available statistical data of social, economic, cultural, and other related variables. First, we shall briefly explain the framework of our study and the methods we used (Section II). Here, we have collected forty-five original data series concerning economic and consumption activities, standards of living, cultural levels, industrialization, urbanization, and others. Political and psychological factors for which conceptualization and quantification tend to be difficult or arbitrary have been excluded. We have used cross-national data covering seventy-nine countries for these series during

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or around the period 1968–70. The seventy-nine selected include both developed and underdeveloped countries. These data are explained in Section III in more detail.

For describing, estimating, and comparing the development of each country, first we have constructed six composite indicators (axes) with the aid of principal component and factor analysis, and calculated scores of the six indicators for each country. Using the scores, we have examined the path of socioeconomic development and compared the degree of development of each country (Section IV). We conclude that different indicators, or different combinations, should be chosen for different stages of development. This is in line with the multidimensional approach which attempts to make up for the limitations of the economic approach of GNP alone. After these examinations and international comparisons, we discuss the role of urbanization in the process of socioeconomic development (Section V). In the concluding remarks, we give some consideration to the limitations of this approach and indicate some directions for further study (Section VI).

II. FRAMEWORK AND METHOD

There are many empirical studies on social and political development and the progress of well-being based on multidimensional ideas. Sametz [17] claims that GNP should be adjusted upward for improvements in the quality of life, introduction of new products, and increase of leisure, on the one hand, and downward for pollution and the increase of costs caused by urbanization and industrialization, on the other. Recently, in Japan, an attempt [12] has been made to measure the net national welfare (NNW) along this line. For the purpose of considering the interactions between economic and noneconomic sectors, Walter Isard once tried to add ecological sectors to his input-output table. But these approaches still give priority to economic relations. So we may call them, for convenience, "economic welfare approaches."

Drewnowsky [5], on the other hand, states that development should be measured in terms of ultimate aims, i.e., the elevation of the standard of living or the promotion of social welfare. This position is a challenge to the national income approach or the modified economic welfare approach. We may call this a "social welfare approach." Although the idea is desirable, his method of three datum points raises many problems, such as arbitrariness, methods of weighting, methods of measuring transformation, and some statistical problems of handling these scores. Moreover, there is a lack of research into the interrelationships among social welfare indicators, which seem to be vital in the study of development process.

Political development and related fields have been studied by G. Almond and J. S. Coleman [2], F. W. Riggs [15], D. Easton [6] [7], K. W. Deutsch [4], A. S. Banks and R. Textor [3], B. M. Russett [16], and others. Important contributions have been made in the classical works of E. E. Hagen [8] and B. F. Hoselitz [9] [10], and the historical approach of R. A. Nisbet [13]. T. Parsons and E. A.

Shils's social system [14] and W. Isard's general theoretic approach [11] contain many suggestions for our framework. Also of interest are the factor analysis of Adelman and Morris [1], and the system model of the United Nations Research Institute for Social Development (UNRISD) [19].

In the absence of well-defined models incorporating a wide range of socio-economic variables or reasonably clear hypotheses dealing with their interrelations, the current investigation is, basically, of exploratory nature in search of empirical evidence which may provide insight into the extent and structure of economic and noneconomic interdependences in the development process. We have used a technique of principal component and factor analysis similar to the one in the pioneering work of Adelman and Morris [1]. The main effort of our study, however, was directed toward constructing several composite indicators which reflect different dimensions of socioeconomic development, and assigning these indicator scores to each country, rather than inferring abstract hypothetical factors which the factor analysis is normally used for. Individual countries were mapped by these composite indicators to facilitate international comparison and to identify distinct patterns, if any, related to each stage of development.

Furthermore, we have based our analysis on a provisional view: that development is an overall process of social change bracketting together a number of more basic subprocesses of change, and that these constituent processes tend to proceed reinforcing each other in the same direction, but they proceed at different paces in different stages of development. This view has led us to look for those basic processes which are undergoing active change at each stage of development, and we made a specific attempt to identify a group of indicators which appear to be important aspects of such underlying processes. Once such a group of indicators was identified, the component analysis was applied to them and the resulting first principal component was adopted as the composite indicator representing the group. For the purpose of identifying the group of indicators that jointly undergo a rapid pace of change at a particular stage of development, a straightforward application of the principal component or factor analysis would be inappropriate. Hence, it was first necessary to classify the sampled countries into groups based on a crude judgment concerning their development levels. Then we examined each group separately.

Despite the usefulness of the principal component and factor analyses, some features do not conform to our aim mentioned above. One difficulty with the principal component analysis for our purpose is that the absorption of the total variabilities of the original data, after transformation, concentrates heavily on the first principal component, next on the second principal component, and so on in a decreasing manner. This often causes difficulty in interpreting the first or the second principal components, with an excessive number of original variables accounted for by them. One way to cope with this difficulty would be to rotate the reference axes to the positions appropriate for interpretation, which is the standard practice in factor analysis.

However, the factor analysis also has an aspect which is not consistent with our aim, that is, the assumed independence of individual factors. When the

factor scores have been estimated by factor analysis, the observed points are scattered in the factor-score space without correlation. Thus, in factor analysis the estimation of the factor scores is only of secondary concern. The main concern of the present investigation is to develop the composite indicators whose scores would meaningfully evaluate individual countries. The indicators developed are expected to be dependent or correlated to each other, so that any pattern revealed in the scatter diagram in the composite indicator space will suggest a relevant interdependence between the underlying basic processes. Therefore, we have used

TABLE I

INDICATORS AND THEIR CODES

Code	Indicators	Code	Indicators
GDPH	per capita GDP in US$		and parasitic deseases
CONS	per capita consumption	PRIC	rate of increase in price index
ENRG	per capita energy consumption	MAGR	per cent of economically active
COLR	per capita calory intake		males employed in agriculture
PROT	per capita protein intake	MELC	per cent of economically active male
BIRT	birth rate per 1,000		employed in electricity, gas, and water
DETH	crude death rate		industries
INFM	infant mortality rate per 1,000	AGRP	proportion of agriculture in GNP
PHYS	inhabitants per physician	MANP	proportion of manufacturing in GNP
LITE	literacy rate	WHLP	proportion of wholesale and retail in
FIRS	enrollment in first level education		GNP
NEWS	newspaper circulation per 1,000	TRAP	proportion of transportation and
RADO	radios per 1,000		GNP
ROOM	inhabitants per room	2URB	proportion of population living in
2ROM	per cent of households with two		localities of 20,000 or more
	persons or more per room	CAPF	fixed capital formation
WATR	per cent of households with piped	SAVE	proportion of saving in GNP
	water	WAGE	proportion of salary and wage
ELEC	per cent of households with electricity		earners among economically active
STEL	per capita steel consumption		males
POPU	population	EDUG	proportion of education expenditure
CINE	cinema attendance		in GNP
GDPI	growth rate of GDP	EDUP	proportion of expenditure in public
COEL	per capita consumption of electricity		outlay
ANPR	per capita animal protein intake	EXIM	proportion of export and import in
LIFE	life expectancy at birth		GNP
SECD	enrollment in second level education	DEFS	proportion of defense expenditure
PUBP	proportion of public expenditure in		in government budget
	GDP	PDAG	ratio of population dependent on
AGRI	rate of increase in agricultural		agriculture
	production	URBN	urban population ratio
INFE	per cent of deaths due to infectious		

Note: Data used for the present study are from the following United Nations publications:

Statistical Yearbook, 1970, New York, 1971; *World Economic Survey, 1969–1970*, New York, 1971; *Compedium of Social Statistics, 1967*, New York, 1968; and *Yearbook of National Accounts Statistics, 1970: Volumes I and II*, New York, 1972.

the technique of factor analysis only for the purpose of identifying groups of variables which appear to reflect some underlying basic processes. The procedures of the analysis is described in the following section in further detail.

III. PROCEDURES, SCORES, AND DATA

We have collected forty-five indicators for seventy-nine countries. The indicators we collected and their codes are shown in Table I. We had to exclude from our analysis such indicators as per cent of deaths due to infectious and

TABLE II

RANKING OF COUNTRIES IN TERMS OF PER CAPITA GDP, 1968

Country	Ranking by Per Capita GDP	Per Capita GDP in US$	Country	Ranking by Per Capita GDP	Per Capita GDP in US$
Malawi	1	66	Colombia	41	319
Nigeria	2	70	Malaysia	42	324
Burma	3	70	Turkey	43	352
India	4	81	Nicaragua	44	379
Nepal	5	83	Brazil	45	381
Haiti	6	90	Costa Rica	46	436
Uganda	7	98	Portugal	47	488
Sudan	8	109	Mexico	48	538
Kenya	9	122	Jamaica	49	557
Thailand	10	155	Surinam	50	567
Ceylon	11	159	Panama	51	602
South Korea	12	159	Chile	52	612
Mozambique	13	159	Uruguay	53	620
Sierra Leone	14	161	Singapore	54	638
Cameroon	15	163	Argentina	55	646
Bolivia	16	166	South Africa	56	727
United Arab Republic	17	187	Greece	57	792
Morocco	18	190	Trinidad and Tobago	58	826
Tunisia	19	210	Spain	59	829
Syria	20	211	Venezuela	60	986
Senegal	21	217	Israel	61	1,510
Algeria	22	225	Ireland	62	1,053
Paraguay	23	228	Japan	63	1,201
Southern Rhodesia	24	229	Italy	64	1,331
Ecuador	25	238	Austria	65	1,465
Ghana	26	253	Netherlands	66	1,805
Honduras	27	254	Finland	67	1,886
Mauritius	28	258	United Kingdom	68	1,976
Jordan	29	267	Belgium	69	2,019
Taiwan	30	272	New Zealand	70	2,039
Iraq	31	273	Luxemburg	71	2,131
Ivory Coast	32	279	West Germany	72	2,149
El Salvador	33	281	Norway	73	2,259
Dominican Republic	34	284	Australia	74	2,295
Peru	35	290	France	75	2,338
Liberia	36	297	Denmark	76	2,519
Iran	37	300	Switzerland	77	2,550
Philippines	38	305	Sweden	78	3,069
Guatemala	39	308	U.S.A.	79	4,038
Zambia	40	316			

TABLE
ROTATED FACTOR LOADING MATRIX:

	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6
GDPH	0.424	−0.177	−0.166	−0.015	−0.029	−0.025
CONS	0.392	−0.170	−0.204	−0.044	−0.086	−0.012
ENRG	0.482	−0.139	0.104	0.110	0.019	0.005
COLR	0.290	−0.114	−0.669*	0.235	−0.137	0.050
PROT	0.271	−0.132	−0.711*	0.001	−0.159	0.094
DETH	−0.765*	0.194	0.101	−0.072	0.021	0.023
INFM	−0.746*	−0.038	0.006	−0.250	0.059	0.209
PHYS	−0.722*	−0.194	0.118	0.321	−0.059	0.022
LITE	0.806*	0.095	−0.206	0.006	0.168	−0.046
FIRS	0.744*	0.078	−0.040	−0.080	−0.176	0.026
NEWS	0.548	−0.224	−0.532	−0.033	0.109	0.023
RADO	0.521	0.012	−0.354	−0.036	0.211	0.052
ROOM	−0.022	0.157	0.275	−0.196	0.239	−0.078
WATR	−0.253	−0.843*	0.000	−0.004	−0.042	0.058
ELEC	0.083	−0.841*	−0.217	−0.012	−0.038	0.061
STEL	0.231	−0.098	−0.124	0.024	−0.102	−0.038
CINE	0.481	−0.294	−0.131	0.124	−0.436	−0.032
GDPI	0.269	−0.088	0.139	0.112	−0.035	−0.158
COEL	0.387	−0.272	−0.148	−0.020	−0.150	0.039
ANPR	0.480	−0.187	−0.568	0.059	0.119	0.091
LIFE	0.806*	0.069	−0.188	−0.062	0.038	−0.107
SECD	0.568	−0.022	−0.214	0.438	−0.117	0.340
PUBP	−0.006	−0.055	0.039	−0.008	−0.838*	−0.125
AGRI	−0.060	0.074	−0.082	0.139	0.017	0.309
PRIC	0.191	0.006	−0.730*	0.006	0.017	0.009
MAGR	−0.539	0.160	0.218	−0.164	0.098	−0.470
MELC	−0.144	−0.151	0.045	−0.014	0.156	0.909*
AGRP	−0.460	0.029	0.098	−0.393	−0.014	−0.242
MANP	0.505	0.167	−0.342	−0.225	0.281	−0.134
WHLP	0.175	−0.231	0.163	0.109	0.357	−0.438
TRAP	0.005	−0.101	−0.118	0.012	−0.166	0.017
2URB	0.712*	−0.243	−0.187	0.127	−0.280	−0.020
CAPF	−0.122	0.054	−0.039	0.901*	0.013	−0.040
SAVE	0.179	−0.083	0.112	0.086	0.029	−0.039
WAGE	0.430	−0.449	0.190	−0.181	−0.105	0.076
EDUG	−0.052	−0.151	−0.018	−0.413	−0.421	0.083
EXIM	0.226	−0.248	0.563	0.091	−0.244	0.203
URBN	0.653	−0.123	−0.375	−0.078	−0.071	−0.127

Note: The asterisks after the figures show significant indicators.

parasitic deseases, the ratio of educational expenditure to public outlay, and the ratio of defense expenditure to government budget because of excessive data deficiencies. We excluded those underdeveloped countries with missing data exceeding fifteen out of the forty-five indicators, and those advanced countries with data deficiency exceeding ten of forty-five. As a result, we selected the remaining seventy-nine countries as our subject countries.

Our study is based on cross-national data, mostly for the period of 1968–70.

III

UNDERDEVELOPED COUNTRY GROUP

Z_7	Z_8	Z_9	Z_{10}	Communality
0.855*	−0.031	−0.003	0.008	0.974
0.846*	−0.060	−0.040	0.028	0.955
0.687*	0.165	0.070	−0.022	0.780
0.296	−0.097	0.150	0.162	0.768
0.320	−0.163	−0.095	0.128	0.786
−0.236	0.077	−0.266	0.061	0.776
−0.271	0.224	−0.103	−0.122	0.817
−0.157	0.090	−0.018	0.048	0.715
0.280	0.003	0.030	−0.000	0.811
0.308	0.143	0.069	0.103	0.729
0.335	0.021	−0.100	0.199	0.809
0.431	0.283	−0.046	0.133	0.732
−0.279	−0.455	−0.358	0.094	0.624
0.207	−0.014	0.074	0.081	0.836
0.242	0.038	0.087	0.003	0.834
0.879*	−0.150	0.012	−0.061	0.891
−0.077	−0.231	0.073	−0.372	0.744
−0.034	−0.613*	0.059	−0.064	0.523
0.781*	0.034	−0.014	−0.075	0.887
0.373	0.165	−0.039	0.112	0.794
0.306	−0.073	0.202	−0.073	0.857
0.006	−0.289	−0.077	0.127	0.796
0.204	0.040	−0.061	0.212	0.815
0.248	−0.739*	0.199	−0.044	0.779
−0.018	0.326	−0.017	−0.037	0.678
−0.418	0.077	0.197	−0.138	0.859
0.005	−0.047	−0.038	0.016	0.900
−0.492	0.058	0.034	−0.170	0.710
0.301	−0.136	0.030	−0.198	0.697
0.298	−0.209	−0.174	0.026	0.606
−0.070	0.042	−0.023	0.813*	0.721
0.282	−0.072	−0.144	−0.208	0.844
0.047	−0.147	0.144	−0.020	0.878
−0.065	−0.138	0.818*	−0.016	0.754
0.176	−0.034	−0.124	0.219	0.568
0.414	−0.171	0.288	0.296	0.751
0.291	0.040	0.211	0.280	0.747
0.454	−0.008	−0.197	0.009	0.855

However, since the data for literacy, urban population ratio, population ratio dependent upon agriculture, and others, are not available for this period, we were obliged to use the data for the first half of 1960s. Deficient data of the selected countries are substituted by estimated values. As for the estimated values, we used the average for each of the following four groups: African group excluding South Africa, underdeveloped countries, intermediate countries, and developed countries. In estimating values for missing data of an indicator variable, we did not employ

the regression method of the variable on, for example, GNP, since it would create artificially higher correlation between the two variables.

As has already been stated, we divided the seventy-nine countries into two

TABLE
ROTATED FACTOR LOADING MATRIX:

	Z_1	Z_2	Z_3	Z_4	Z_5
GDPH	0.383	0.366	0.023	−0.028	0.087
CONS	0.371	0.353	−0.004	−0.037	0.058
ENRG	0.238	0.147	−0.047	−0.021	0.026
COLR	−0.090	0.847*	−0.180	0.021	−0.077
PROT	0.049	0.811*	−0.203	0.088	−0.165
BIRT	−0.725*	−0.074	0.006	0.135	−0.099
DETH	−0.666*	−0.186	0.352	0.306	−0.162
INFM	−0.674*	−0.210	0.251	0.127	−0.275
PHYS	−0.209	−0.274	0.129	0.860*	0.023
LITE	0.307	0.722*	−0.050	−0.264	0.104
NEWS	0.479	0.537	0.062	−0.066	−0.049
RADO	0.162	0.207	−0.010	−0.106	−0.123
ROOM	−0.754*	−0.094	−0.062	0.027	0.117
2ROM	−0.742*	−0.157	−0.101	−0.061	0.074
WATR	0.338	0.538	0.019	0.203	0.151
ELEC	0.438	0.659	−0.146	0.034	0.082
STEL	0.375	0.342	0.033	0.016	0.096
CINE	0.075	0.122	−0.820*	−0.008	0.061
GDPI	−0.132	0.180	−0.350	0.043	0.470
COEL	0.420	0.375	0.046	−0.006	0.114
ANPR	0.441	0.639	−0.009	−0.040	−0.164
LIFE	0.032	0.846*	−0.181	−0.160	0.193
SECD	0.393	0.452	−0.072	0.174	0.086
PUBP	−0.069	0.170	−0.349	0.116	−0.064
AGRI	−0.157	0.147	−0.396	0.186	0.245
INFE	−0.681	−0.094	−0.154	−0.255	0.013
PRIC	0.036	0.363	−0.039	−0.075	−0.716*
MAGR	−0.819*	−0.101	0.043	0.146	0.101
MELC	0.080	0.002	0.168	−0.044	−0.016
AGRP	−0.777*	−0.113	0.006	−0.144	0.043
MANP	0.121	0.656	0.026	−0.182	0.011
WHLP	−0.111	0.149	−0.004	0.037	0.111
TRAP	−0.068	0.534	0.139	0.180	−0.089
2URB	0.379	0.434	−0.548	−0.139	−0.074
CAPF	0.074	0.190	−0.089	0.891*	0.132
SAVE	0.037	0.512	−0.112	0.182	0.504
WAGE	0.295	0.577	0.034	−0.102	0.200
EDUG	−0.023	0.344	−0.113	−0.172	0.206
EDUP	−0.459	0.133	0.109	−0.191	0.099
EXIM	0.181	0.157	0.010	0.056	0.602*
PDAG	−0.727*	−0.103	0.122	0.207	0.017
URBN	0.286	0.637	−0.227	−0.219	−0.193

Note: See Table III.

groups: developed and underdeveloped countries. In Table II the selected seventy-nine countries are ranked by per capita GDP from No. 1 Malawi ($66) to No. 79 U.S.A. ($4,038). Sixty-one countries from No. 1 to No. 61 (Israel)

IV

DEVELOPED COUNTRY GROUP

Z_6	Z_7	Z_8	Z_9	Communality
0.081	−0.006	0.008	0.822*	0.9710
0.100	0.008	−0.004	0.832*	0.9699
0.083	−0.012	−0.057	0.896*	0.8944
0.229	0.088	−0.060	0.180	0.9071
0.229	0.112	0.017	0.236	0.8581
0.197	0.099	−0.367	−0.266	0.8126
0.222	0.120	0.031	0.004	0.7872
0.052	0.247	0.109	−0.200	0.7695
0.042	0.087	−0.029	−0.125	0.9016
−0.010	−0.161	−0.153	0.253	0.8129
0.102	−0.010	0.048	0.517	0.8076
0.080	−0.048	−0.057	0.836*	0.8069
0.181	0.094	−0.287	−0.357	0.8471
0.088	0.030	−0.226	−0.434	0.8425
0.070	0.266	−0.073	0.370	0.6855
0.083	0.142	0.016	0.367	0.8164
0.023	0.009	0.076	0.813*	0.9364
0.114	−0.034	0.067	−0.056	0.7188
−0.045	−0.020	−0.274	−0.121	0.4874
0.084	−0.011	0.095	0.770*	0.9409
0.068	−0.004	0.027	0.454	0.8433
0.068	−0.108	−0.071	0.235	0.8916
0.156	0.180	0.134	0.500	0.7269
0.718*	−0.053	0.018	0.251	0.7546
−0.180	0.616	−0.116	−0.063	0.7271
−0.167	−0.100	−0.283	−0.280	0.7580
−0.048	−0.095	0.019	−0.228	0.7164
−0.089	−0.279	0.043	−0.330	0.9102
0.046	0.892*	0.136	−0.001	0.8538
−0.124	−0.185	0.142	−0.228	0.7621
−0.199	−0.095	−0.018	0.443	0.7250
−0.041	−0.083	−0.813*	0.040	0.7184
0.461	0.073	0.015	−0.001	0.5676
0.236	−0.009	−0.222	0.148	0.7840
−0.059	−0.036	−0.019	−0.005	0.8662
−0.074	−0.046	0.298	0.189	0.6950
0.272	0.112	−0.166	0.341	0.7015
0.614*	0.091	0.054	0.352	0.7151
0.544	−0.197	0.068	−0.005	0.6263
0.502	0.093	−0.203	−0.208	0.7684
0.101	0.158	0.210	−0.312	0.7729
0.234	−0.038	−0.220	0.366	0.8623

are grouped as the underdeveloped countries. Thirty-three countries from No. 46 (Costa Rica) to No. 79 (U.S.A.), plus three rapidly growing Asian countries, i.e., South Korea, Taiwan, and Malaysia, are treated as the developed group. The nineteen intermediate countries from Costa Rica (No. 46) to Israel (No. 61), plus the above three Asian countries, are included in both studies for developed and underdeveloped groups.

For each of these two groups the principal component analysis and the rotation of reference axes were separately applied with the aim of identifying sets of variables that appear with high factor loadings in the principal components. When we found a group of variables which tend to vary together, and thus contribute to one factor axis with a meaningful interpretation, the first principal component was recomputed for them and was used as a composite indicator representing the group. Then the variables which were used for constructing the group were excluded from further analysis to make sure that any variable is used only once in constructing composite indicators. This was to avoid creating artificially high correlation among composite indicators.

Analysis (1)

In Tables III and IV, we summarize the results of the component analyses with a reference axis rotation by the normal varimax method applied to the underdeveloped and the developed country groups separately. We have based our analyses on the correlation matrices of the original indicator variables. Before the rotation of the axis, the principal components which, with their variances (eigen values), exceeded unity were adopted for the estimation of factor loadings.

For the underdeveloped group, the contribution after rotation concentrated on the first and the seventh axes, extracting a large portion of the total variability of the original variables. The following five indices showed high factor loadings on the first component: DETH (crude death rate), INFM (infant mortality rate per 1,000), PHYS (inhabitants per physician), LITE (literacy rate), FIRS (enrollment in first level education), and LIFE (life expectancy at birth). Those factor loadings were between .72 and .81, in absolute values. As for the seventh component, GDPH (per capita GDP), CONS (per capita consumption), ENRG (per capita energy consumption), STEL (per capita steel consumption), and COEL (per capita consumption of electricity) showed high factor loadings between .69 and .88. These five variables are closely related to production and consumption activities. Observing that the contribution of the first axis, roughly showing the basic standard of living, was higher than that of the seventh economic axis, we can say that the indicators concerning the standard of living identifies the differences of the countries in the early stage of development more clearly than the indicators of economic activities, such as per capita GDP.

For the developed group, the concentration of contribution was seen at the first, second, and ninth components, as shown in Table IV. The ninth component contains such production and consumption indices as GDPH, CONS, ENRG, STEL, and COEL. They are the same composition as the seventh component

in the case of underdeveloped group, and their factor loadings are between .77 and .90.

From these results we may conclude that five economic (production and consumption) indices, namely, GDPH, CONS, ENRG, STEL, and COEL, are of high discriminating power both for developed and underdeveloped countries. Therefore, we decided to condense these five indices into a composite indicator and to name it the *economic activity level.* On the other hand, the standard of living indices, DETH, INFM, PHYS, LITE, FIRS, and LIFE, did not converge upon one component in the study of advanced group.

Analysis (2)

Excluding the indicator variables which we chose to construct the economic activity level, we proceeded to perform a similar analysis to other value-related variables for the two country groups.[1]

In the case of the underdeveloped group, the cumulative contribution ratio for the first five principal components was 72.1 per cent. The communality was mostly centered on the first principal component, and the following five indices of the first component show high factor loadings between .73 and .86 in absolute values: DETH (crude death rate), INFM (infant mortality rate per 1,000), PHYS (inhabitants per physician), LITE (literacy rate), FIRS (enrollment in first level education), COLR (per capita calory intake), and LIFE (life expectancy at birth). From these observations and the results of Analysis (1), we have condensed these seven indices into a composite indicator, the *standard of living.* The beginning period of development can be viewed as the time of meeting the primary demands of subsistence included in this indicator.

In Table V, the correlation coefficients between these standard of living indices

TABLE V

CORRELATION COEFFICIENTS BETWEEN STANDARD OF LIVING INDICES AND PER CAPITA GDP

	Correlation Coefficients with Per Capita GDP	
	Underdeveloped Group	Developed Group
DETH	−.60	−.32
INFM	−.55	−.51
PHYS	−.45	−.30
LITE	.60	.60
FIRS	.79	—
LIFE	.63	.54
COLR	.51	.43

and per capita GDP are shown for the two country groups. It is our contention that if a set of indicator variables are to be viewed as measures of a part of

[1] The results of this analysis and the following Analysis (3) in tabular form are given in [18].

development, they ought to be correlated with measures of other parts of development. As is seen in Table V, all the living standard indices show higher correlation with GDPH (per capita GDP) in the underdeveloped country group than those in the developed group. The improvement of the conditions related to these indicators of primary living values appears to be more relevant in the early stage of development than in the later period.

The indicators of the standard of living still have a high power of discrimination for the developed group. However, several new indices became distinct with high factor loadings in this case. They are NEWS (newspaper circulation per 1,000), ROOM (inhabitants per room), WATR (per cent of households with piped water), ELEC (per cent of households with electricity), ANPR (per capita animal protein intake), and SECD (enrollment in second level education).

Table VI shows the correlation coefficients between these variables and per capita GDP for the developed and underdeveloped groups. The correlation

TABLE VI
CORRELATION COEFFICIENTS BETWEEN CULTURAL INDICES AND PER CAPITA GDP

	Correlation Coefficients with Per Capita GDP	
	Underdeveloped Group	Developed Group
ROOM	−.30	−.60
WATR	.23	.64
ELEC	.43	.71
ANPR	.65	.78
SECD	.29	.71
NEWS	.66	.83
RADO	.61	.80
2ROM	—	.69

coefficients of the developed countries are higher than those of the underdeveloped group for these variables. We added RADO (radios per 1,000) and 2ROM (per cent of households with two persons or more per room) to this group and constructed a condensed indicator named *cultural level.* This indicator is concerned with better quality of food and housing, secondary education, and other matters related to quality of life, which become increasingly relevant toward the later phase of development.

Analysis (3)

Lastly, excluding the indicators already treated above, we examined structural variables using principal component analysis. According to the analysis, the contribution of the first axis to the total variabilities was 31 per cent, and the following six indicator variables appeared with high loadings on the first axis: AGRP (proportion of agriculture in GNP), MAGR (per cent of economically active males

employed in agriculture), 2URB (proportion of population living in localities of 20,000 or more), URBN (urban population ratio), MANP (proportion of manufacturing in GNP), and WAGE (proportion of salary and wage earners among economically active males). The correlations between these six variables and per capita GDP are shown in Table VII. The first four variable (AGRP, MAGR, 2URB, and URBN) showed higher correlation coefficients with GNP in the underdeveloped group, and the last two (MANP and WAGE—*industrialization* indicator) took higher correlation coefficients in the developed group.

TABLE VII

CORRELATION COEFFICIENTS BETWEEN THE STRUCTURAL VARIABLES AND PER CAPITA GDP

	Correlation Coefficients with Per Capita GDP		
	Underdeveloped Group	Developed Group	
AGRP	−.62	−.52	Higher correlation coefficients in underdeveloped group
MAGR	−.64	−.62	
2URB	.63	.42	
URBN	.76	.65	
MANP	.46	.61	Higher correlation coefficients in developed group
WAGE	.36	.62	

Next, using the data only of underdeveloped countries, we applied the principal component analysis to the first four indices above and rotated the factor axes. The results are shown in Table VIII. As is shown in this table, the agricultural proportion indices were clearly distinguished from the urbanization indices. Therefore, we put together the two agricultural proportion indices into one group (an indicator of *agricultural proportion*) and the two urbanization indices into an indicator of *urbanization*. The industrial ratio indices were also put together into the indicator of *industrialization*. Thus, we obtained six indicator groups. As for making a composite indicator for each group, as we have already explained, the first principal components were employed for each group separately, using the available data of all seventy-nine countries.

TABLE VIII

FACTOR LOADINGS OF STRUCTURAL INDICES: UNDERDEVELOPED GROUP

Code	1	2	Communality
MAGR	0.0975	0.8600	0.7491
AGRP	0.1540	0.8429	0.7342
2URB	−0.9292	−0.1276	0.8796
URBN	−0.9274	−0.1450	0.8812
Contribution Rates	.440	.373	

Each of the six composite indicators was constructed from twenty-six original variables by multiplying the weights. The weights are shown by the asterisks after the figures, otherwise zero, in Table IX. The figures are the correlation coefficients between the composite indicators and the original variables. The

TABLE IX
CORRELATION COEFFICIENTS BETWEEN COMPOSITE INDICATORS AND ORIGINAL VARIABLES

Original Variables \ Composite Indicators	Economic Activities	Standard of Living	Cultural Level	Industrialization	Urbanization	Agricultural Proportion
GDPH	0.987*	0.640	0.911	0.781	0.611	−0.777
CONS	0.982*	0.642	0.901	0.765	0.617	−0.773
ENRG	0.918*	0.528	0.783	0.648	0.532	−0.562
COLR	0.583	0.683*	0.684	0.562	0.585	−0.643
DETH	−0.441	−0.870*	−0.531	−0.546	−0.697	0.638
INFM	−0.659	−0.886*	−0.688	−0.725	−0.709	0.747
PHYS	−0.398	−0.777*	−0.399	−0.528	−0.602	0.639
LITE	0.645	0.930*	0.695	0.709	0.708	−0.778
FIRS	0.165	0.667*	0.197	0.271	0.517	−0.514
NEWS	0.852	0.671	0.895*	0.779	0.694	−0.767
RADO	0.822	0.547	0.717*	0.602	0.513	−0.623
ROOM	−0.758	−0.566	−0.876*	−0.702	−0.496	0.665
2ROM	−0.816	−0.544	−0.925*	−0.751	−0.523	0.704
WATR	0.595	0.268	0.736*	0.535	0.336	−0.451
ELEC	0.675	0.508	0.842*	0.659	0.573	−0.632
STEL	0.958*	0.598	0.896	0.799	0.607	−0.750
COEL	0.844*	0.487	0.737	0.631	0.393	−0.606
ANPR	0.791	0.747	0.889*	0.721	0.702	−0.776
LIFE	0.658	0.946*	0.701	0.735	0.733	−0.773
SECD	0.747	0.706	0.807*	0.728	0.681	−0.758
MAGR	−0.757	−0.752	−0.815	−0.749	−0.768	0.922*
AGRP	−0.644	−0.768	−0.664	−0.756	−0.759	0.918*
MANP	0.700	0.699	0.739	0.891*	0.610	−0.728
2URB	0.439	0.687	0.532	0.528	0.939*	−0.717
WAGE	0.680	0.577	0.721	0.891*	0.578	−0.730
URBN	0.671	0.794	0.738	0.723	0.939*	−0.848

Note: See Table III.

TABLE X
CORRELATION COEFFICIENTS BETWEEN COMPOSITE INDICATORS

		Z_1	Z_2	Z_3	Z_4	Z_5	Z_6
Economic level	Z_1	1.0	.619	.902	.773	.591	−.762
Standard of living	Z_2		1.0	.683	.716	.789	−.820
Cultural level	Z_3			1.0	.819	.676	−.804
Industrialization	Z_4				1.0	.666	−.818
Urbanization	Z_5					1.0	−.830
Agricultural proportion	Z_6						1.0

TABLE XI
NORMALIZED FACTOR SCORES

Country	Economic Activity	Standard of Living	Cultural Level	Industrialization	Urbanization	Agricultural Proportion
Malawi	−0.750	−2.049	−0.889	−0.899	−1.045	0.847
Nigeria	−0.745	−1.630	−0.806	−1.027	−1.058	1.571
Burma	−0.745	−1.517	−0.936	−0.961	−1.395	0.880
India	−0.711	−1.257	−0.995	−1.385	−1.004	1.289
Nepal	−0.716	−1.846	−0.629	−1.448	−1.710	2.763
Haiti	−0.738	−1.899	−0.908	−1.564	−1.415	1.992
Uganda	−0.716	−1.381	−0.553	−1.027	−1.684	0.942
Sudan	−0.715	−1.664	−0.489	−0.835	−1.498	1.511
Kenya	−0.697	−1.121	−0.740	−0.707	−1.560	0.809
Thailand	−0.664	0.005	−0.921	−1.370	−1.144	1.098
Ceylon	−0.679	0.519	−0.557	−0.348	−1.170	0.551
South Korea	−0.598	0.487	−1.068	−0.715	−0.279	0.593
Mozambique	−0.677	−1.439	−0.446	−0.854	−1.314	1.080
Sierra Leone	−0.672	−1.557	−0.595	−1.091	−1.182	0.809
Cameroon	−0.664	−1.379	−0.601	−0.854	−1.045	1.495
Bolivia	−0.656	−0.769	−0.733	−0.454	−0.177	0.408
United Arab Republic	−0.628	−0.246	−0.503	−0.749	0.303	0.697
Morocco	−0.640	−1.292	−0.595	−0.869	−0.472	0.654
Tunisia	−0.609	−1.034	−1.075	−0.417	−0.399	0.037
Syria	−0.591	−0.610	−0.829	−0.337	−0.358	0.151
Senegal	−0.635	−1.596	0.073	−0.854	−0.708	1.126
Algeria	−0.570	−0.903	−0.309	−0.245	−0.327	0.952
Paraguay	−0.641	0.429	−1.131	−0.756	−0.541	0.770
Southern Rhodesia	−0.516	−0.571	−0.627	0.494	−1.200	0.237
Ecuador	−0.598	0.024	−0.822	−0.415	−0.381	0.535
Ghana	−0.603	−0.997	−0.493	−1.325	−0.949	0.743
Honduras	−0.614	−0.586	−1.138	−0.747	−0.949	1.123
Mauritius	−0.605	0.413	−0.376	−0.579	0.123	−0.307
Jordan	−0.566	0.057	−0.955	−0.532	0.209	−0.542
Taiwan	−0.515	1.002	0.035	0.220	1.452	−0.133
Iraq	−0.526	−0.659	−1.035	−0.961	0.948	0.309
Ivory Coast	−0.605	−1.362	−0.478	−0.515	−1.045	0.809
El Salvador	−0.576	−0.265	−0.623	0.532	−0.398	0.740
Dominican Republic	−0.578	0.150	−0.888	−0.464	−0.527	0.435
Peru	−0.519	0.074	−0.858	−0.571	−0.097	0.334
Liberia	−0.555	−1.428	−0.496	−1.466	−1.080	0.691
Iran	−0.503	−0.989	−0.999	0.568	−0.436	0.156
Philippines	−0.557	0.285	−0.685	−1.100	0.537	0.052
Guatemala	−0.566	−0.623	−1.116	−0.502	−0.447	0.690
Zambia	−0.577	−1.343	−0.781	−0.986	−0.915	−0.243
Colombia	−0.512	0.010	−0.226	−0.133	0.303	0.625
Malaysia	−0.524	0.348	−0.587	−0.447	−0.180	0.834
Turkey	−0.511	−0.489	−0.646	−0.961	−0.399	0.574
Nicaragua	−0.503	−0.174	−1.074	−0.212	−0.168	0.811
Brazil	−0.436	0.206	−0.185	−0.102	0.039	−0.069
Costa Rica	−0.391	0.862	−0.023	0.233	−0.455	0.377

TABLE XI (Continued)

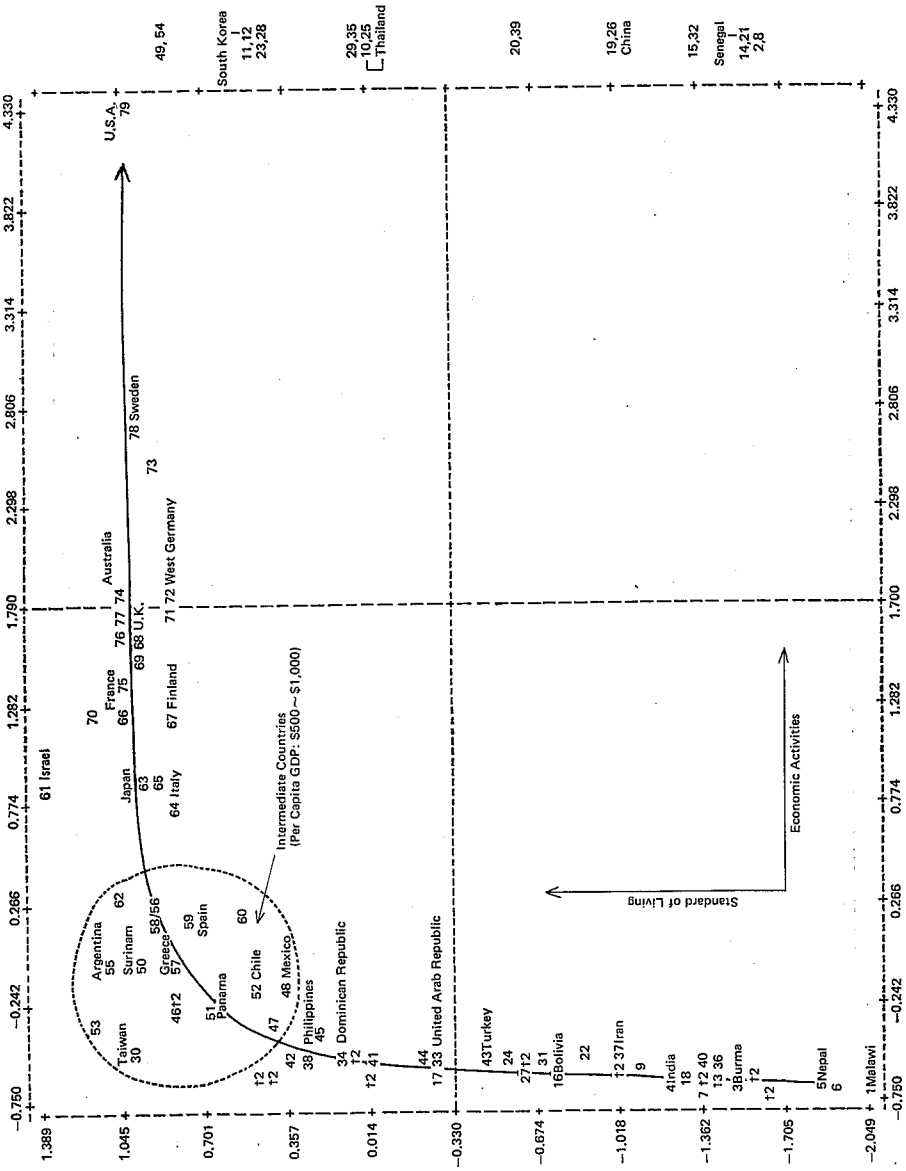
Country	Economic Activity	Standard of Living	Cultural Level	Industrialization	Urbanization	Agricultural Proportion
Portugal	−0.345	0.442	0.279	1.348	−0.804	−0.210
Mexico	−0.281	0.341	−0.868	0.971	0.219	0.063
Jamaica	−0.285	0.827	−0.327	−0.216	−0.598	−0.416
Surinam	−0.161	0.950	−0.156	0.041	1.010	−0.596
Panama	−0.288	0.674	−0.442	−0.721	0.068	0.282
Chile	−0.244	0.511	0.027	1.197	1.210	−0.873
Uruguay	−0.299	1.183	1.063	0.461	1.835	−0.997
Singapore	−0.220	0.829	0.128	0.572	2.069	−1.696
Argentina	−0.173	1.145	0.612	−0.771	0.997	−0.834
South Africa	0.249	0.920	0.621	1.259	0.260	−0.780
Greece	−0.070	0.809	0.201	−0.749	−0.360	−0.158
Trinidad and Tobago	0.208	0.902	0.006	0.468	1.160	−1.145
Spain	0.122	0.754	0.542	0.774	0.777	−0.146
Venezuela	0.204	0.568	0.135	0.077	1.096	−0.748
Israel	0.819	1.389	0.792	0.038	1.742	−1.442
Ireland	0.299	1.048	1.068	0.737	0.164	−0.408
Japan	0.861	0.987	1.507	1.178	1.837	−1.010
Italy	0.695	0.873	0.771	1.200	0.583	−0.921
Austria	0.890	0.893	1.351	1.271	0.419	−1.273
Netherlands	1.199	1.044	1.620	1.343	1.534	−1.354
Finland	1.155	0.866	1.122	0.819	0.210	−0.562
United Kingdom	1.583	0.992	2.110	1.810	1.981	−1.752
Belgium	1.475	0.962	1.804	1.419	0.745	−1.584
New Zealand	1.199	1.153	1.764	1.421	1.315	−1.228
Luxemburg	1.675	0.811	1.606	1.948	0.568	−1.451
West Germany	1.752	0.826	1.605	2.610	0.882	−1.423
Norway	2.490	0.939	1.584	1.146	−0.126	−1.161
Australia	1.777	1.049	1.731	1.152	1.974	−1.308
France	1.345	1.026	1.618	1.585	0.733	−1.258
Denmark	1.620	1.042	1.600	1.163	1.301	−1.075
Switzerland	1.671	1.031	1.539	1.346	0.247	−1.301
Sweden	2.661	0.943	1.741	1.416	0.991	−1.387
U.S.A.	4.330	1.073	2.558	1.431	1.152	−1.650

correlation coefficients among composite indicators themselves are shown in Table X. Table XI shows the final scores of our composite indicators after normalization.

IV. THE DEVELOPMENT PATH AND THE MEANING OF INDUSTRIALIZATION AND URBANIZATION

In this section, we examine the paths of social, economic, and cultural development based on the results of our computation. First, we observed the relation between the level of economic activity and standard of living. Expressing the former on the horizontal axis and the latter on the vertical axis, the positions of the seventy-nine countries are plotted in Figure 1. In this figure the plotting

Fig. 1. Economic Activities and the Standards of Living



Note: †2, †3, etc., show the points of overlap, and the country number is shown on the right hand side.

Fig. 2. Economic Activities and Cultural Level

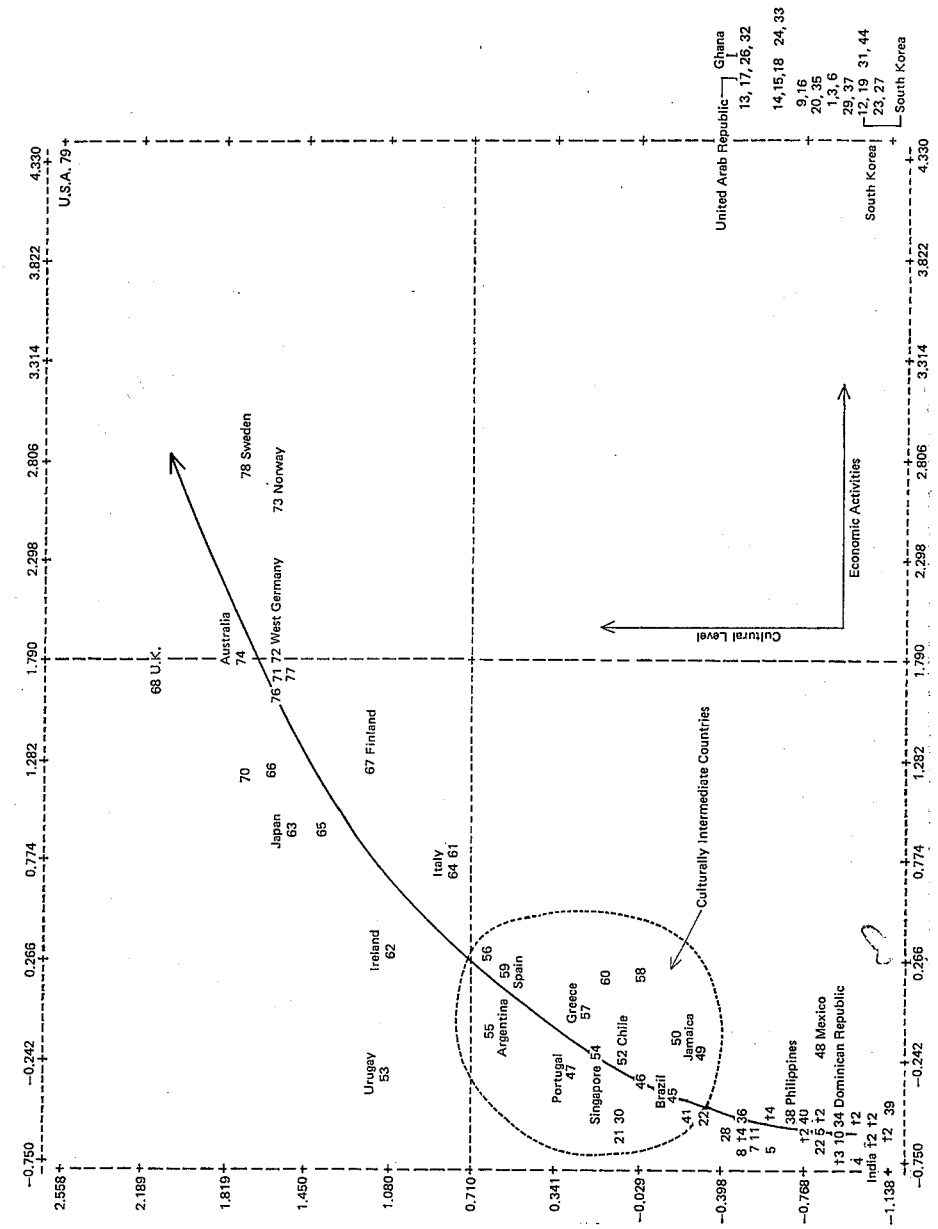


Fig. 3. Standard of Living and Cultural Level

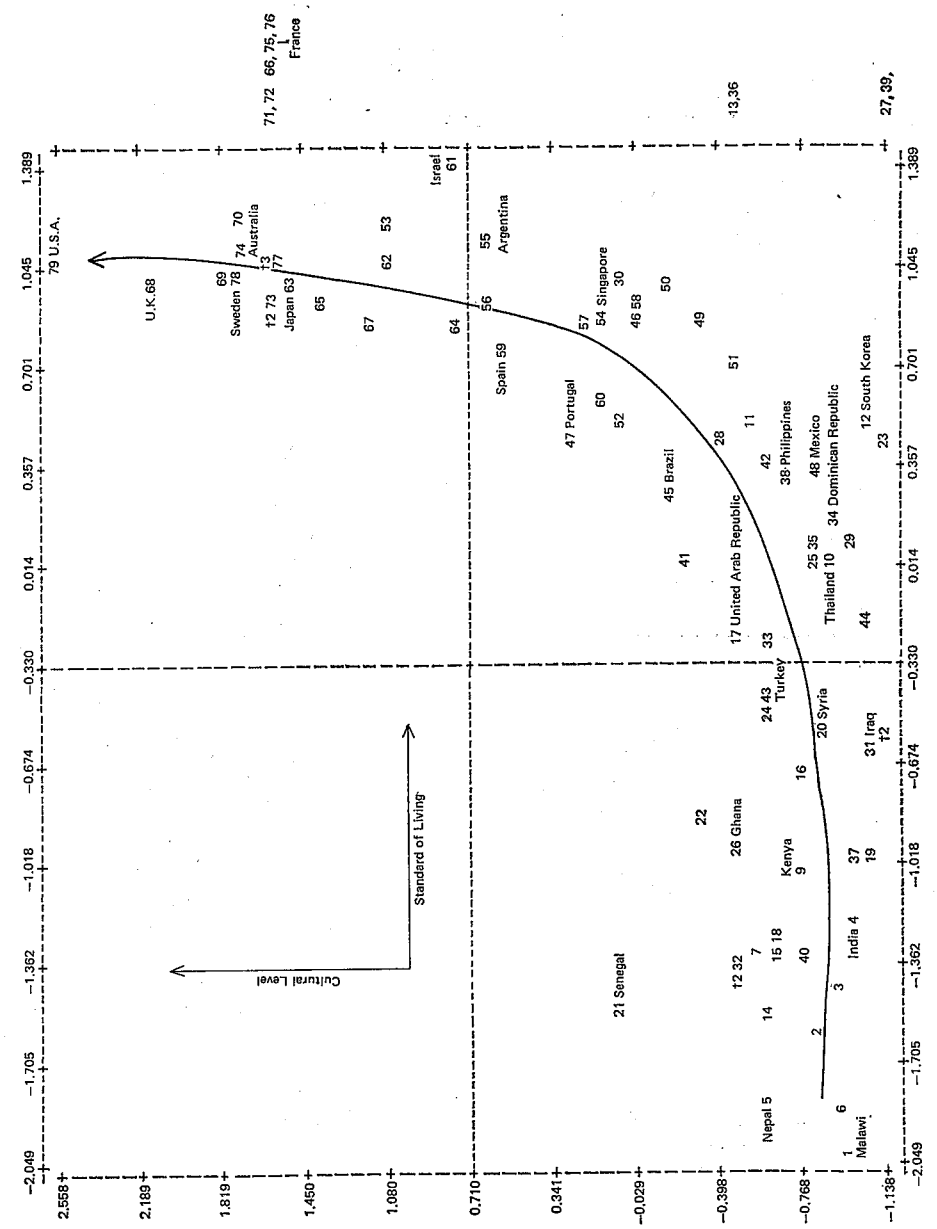


Fig. 4. Economic Activity and Agricultural Proportion

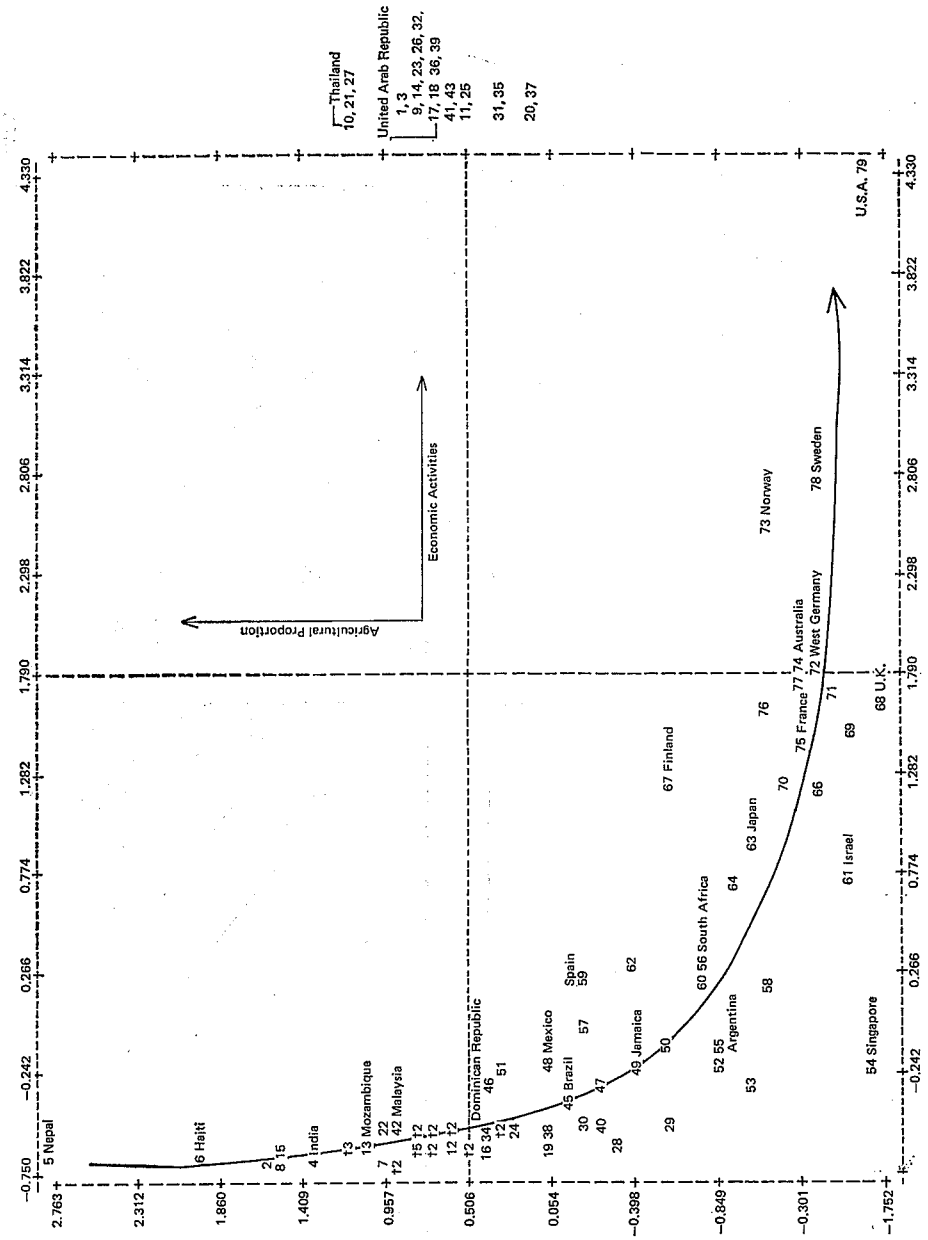


Fig. 5. Industrialization and Economic Activities

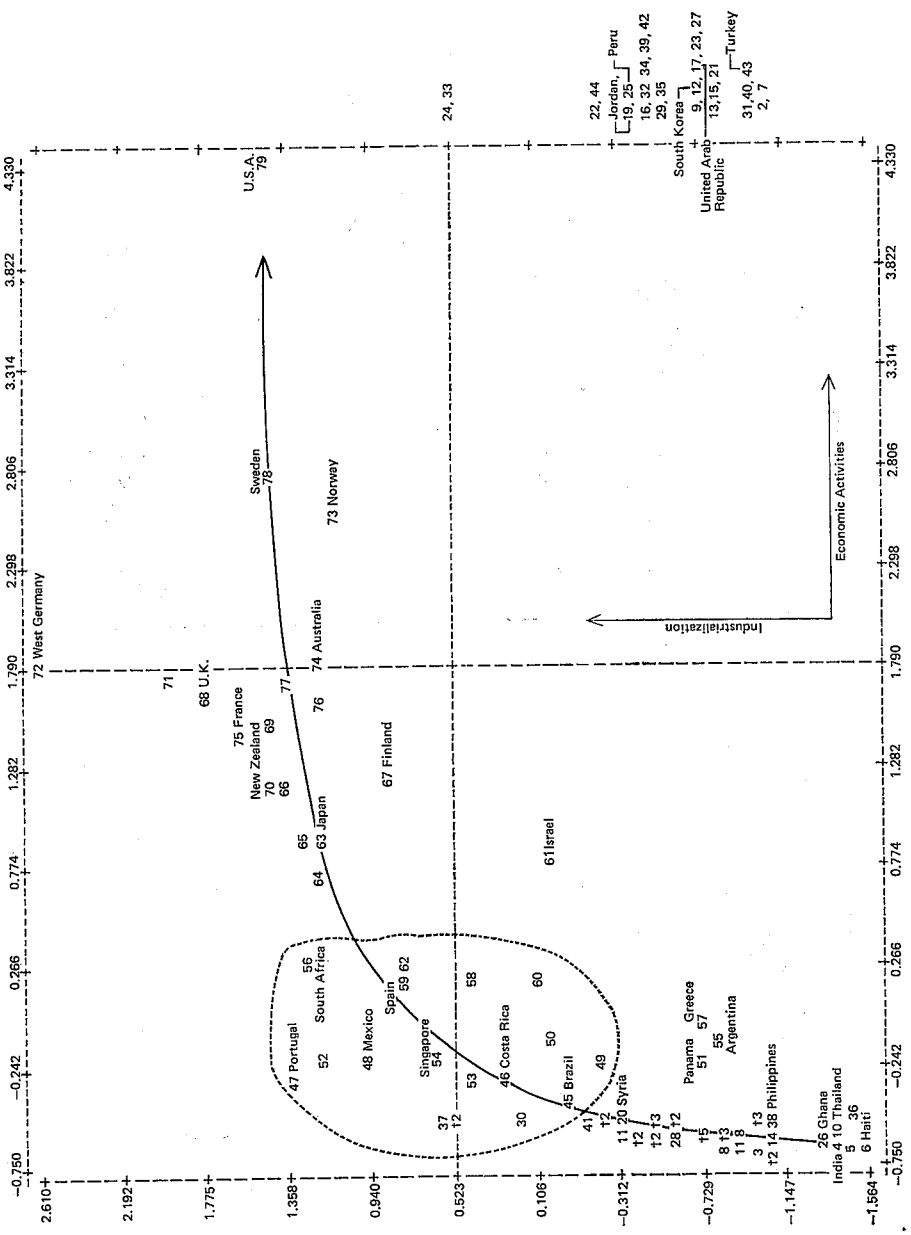


Fig. 6. Economic Activity and Urbanization

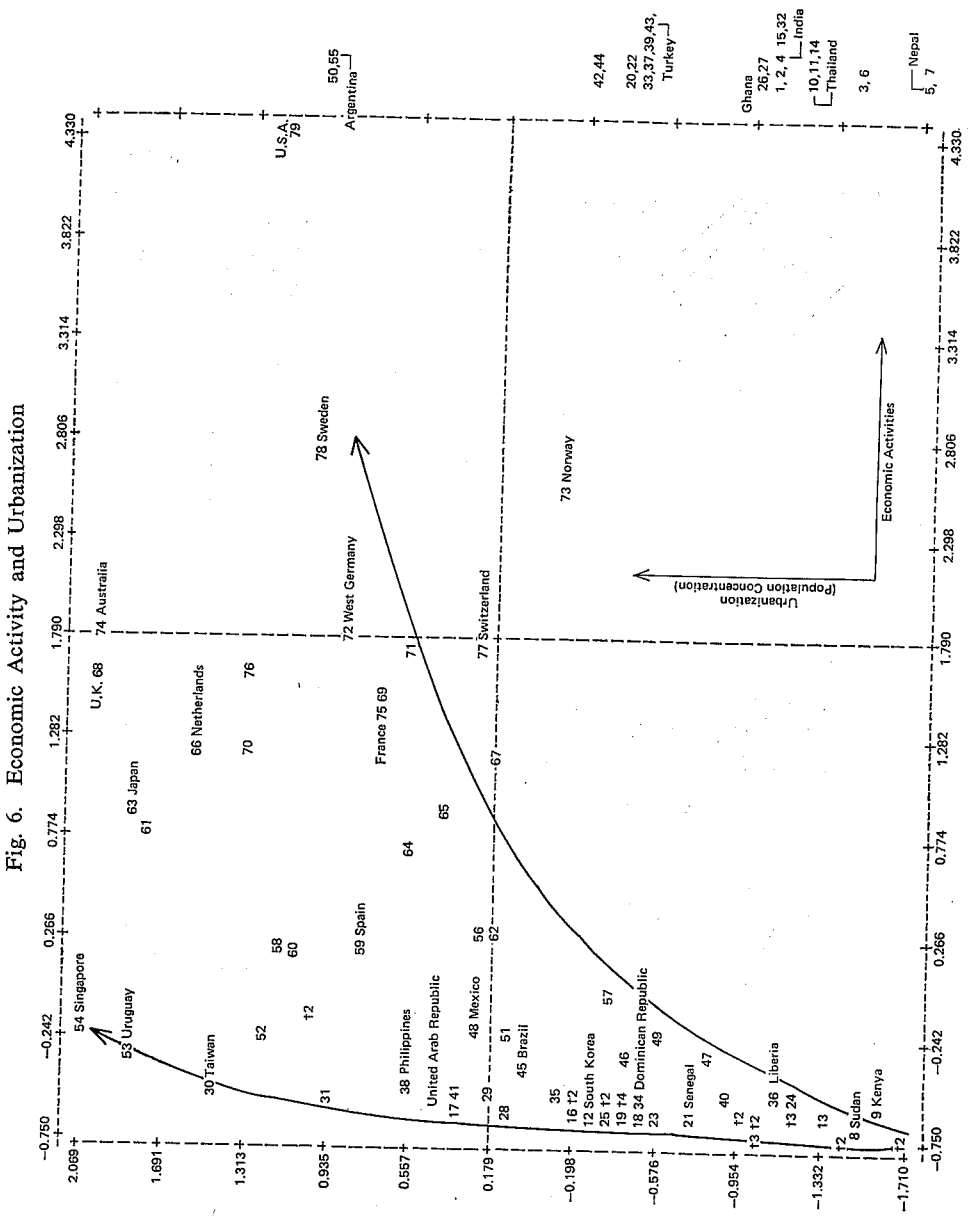


Fig. 7. Standard of Living and Urbanization

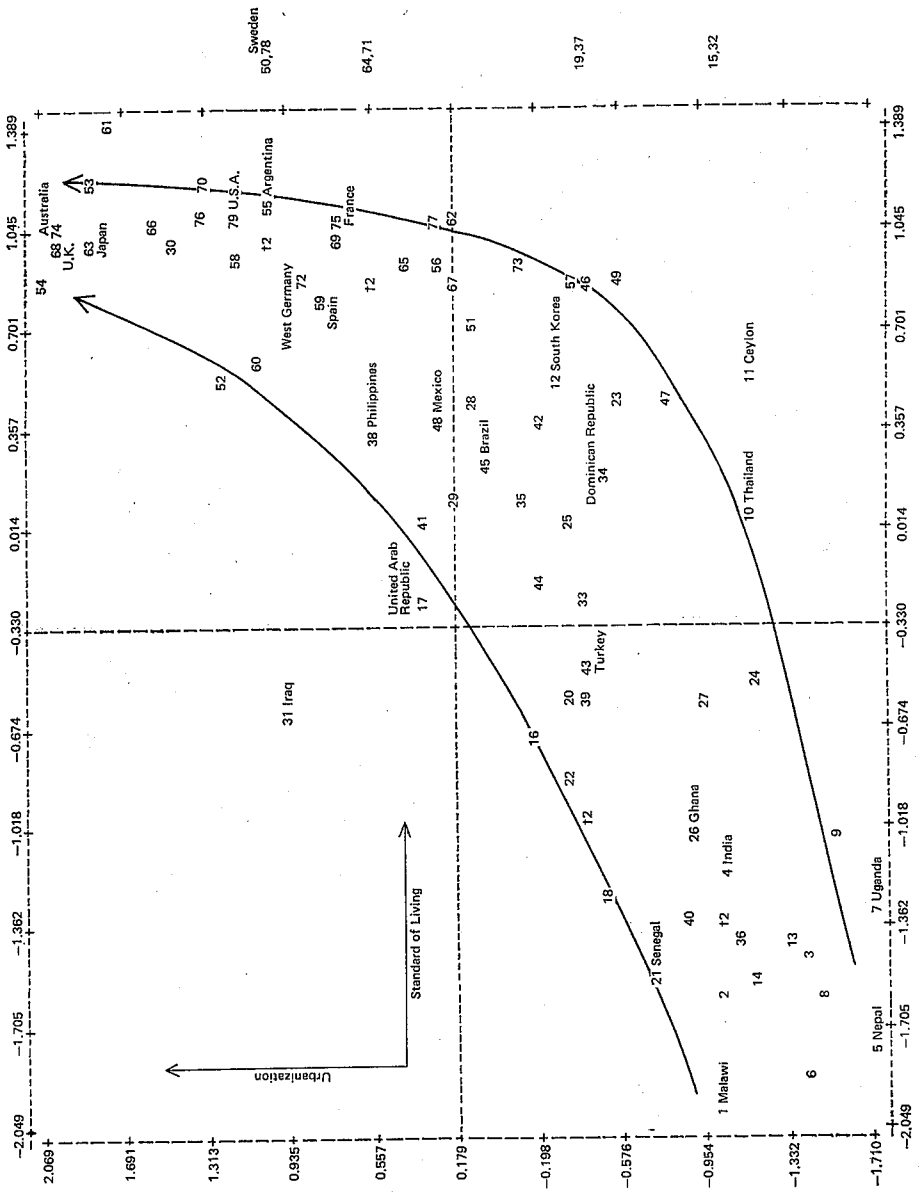
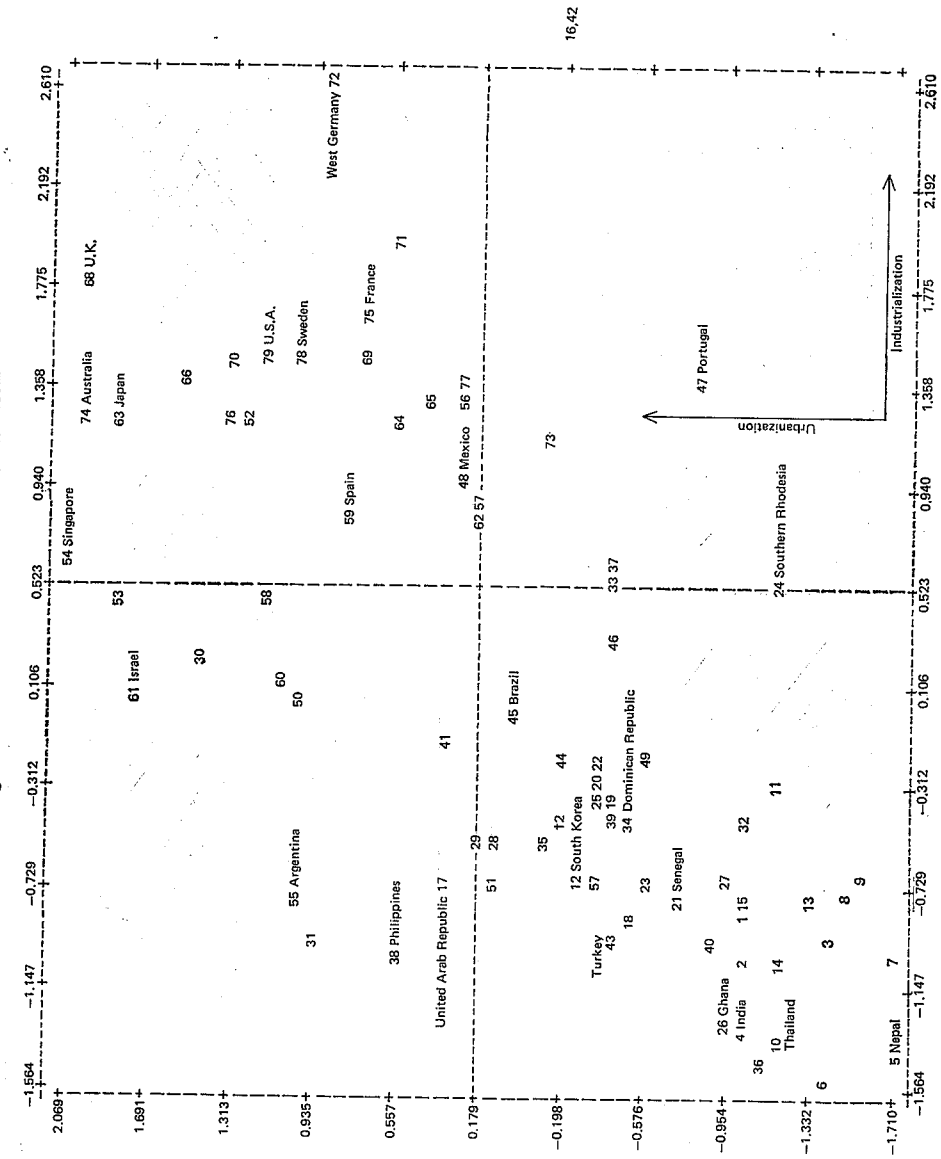


Fig. 8. Industrialization and Urbanization



is made by using the country number in place of the name of the country. The number represents the rank of each country in terms of per capita GDP, which are listed in Table II. Therefore, Figure 1 enables a three-dimensional comparison to be made.

A rather distinct pattern makes its appearance here with respect to the standards of living and the levels of economic activities. Among underdeveloped countries, there is a much greater diversity in fundamental conditions of living in comparison with the differences in the levels of economic activities. The early stage of development proves to be one of striving to meet the primary demands of subsistence, rather than substantially to increase economic activities. Figure 1 also depicts a turning point from this stage of improving the basic living conditions to a new stage of advancement. The increase in the standard of living scores begins to subside around the level of such intermediate countries as Greece, Singapore, Chile, and Argentina, whose per capita GDPs correspond to the range of \$500–1,000. Beyond this threshold, the subsistence level indicator is seen to lose its significance, while the development proceeds by elevating the level of economic activity. Judging from these observations, the living standard indicator is effective in identifying the differences in conditions of countries only at the early stage of development, that is, below \$500 in terms of per capita GDP. Other indicators are needed for identifying the emerging dimensions of the later period of development. We also wish to point out the danger of comparing development only in terms of GNP, in view of the fact that a country's rank in per capita GDP does not correspond to the socioeconomic order as illustrated in Figure 1.

Next, we proceed to examine the relation between economic activities and the level of culture. In Figure 2 economic activity is measured on the horizontal axis and the cultural level on the vertical axis. From this figure we may judge that the cultural level is a valid indicator for identifying development at the later period, while it is not effective at the beginning period of development. Several remarks can be made on the relative positions of some countries. First of all, the United Knigdom takes a fairly high score on cultural level in comparison with her per capita GDP. There are several other countries whose cultural scores were relatively high, such as New Zealand, Japan, Ireland, Uruguay, and Argentina. There are some countries which can be classified as underdeveloped in terms of GDPH, but rank intermediate as far as their cultural levels are concerned. These include Senegal, Taiwan, and Algeria whose per capita GDPs are between \$210 and \$225. On the other hand, many Central American countries have relatively low cultural scores in spite of their intermediate status in per capita GDP. In particular, Mexico, Guatemala, Panama, Jamaica, and Nicaragua show poor scores. Mexico and Panama are ranked among the intermediate countries in terms of per capita GDP (over \$500), but they may be underdeveloped countries, culturally speaking.

The relation between the standard of living and cultural level is depicted in

Figure 3. The expected development path is shown by the arrow. That is, in the beginning period countries tend to improve the standard of living, and to elevate the cultural level at latter periods. Among others, we note here the following observations: (1) Central American countries and Asian developing countries (except India) have fairly low scores on the cultural level, in comparison with their relatively high standards of living, (2) countries with large territories, for example, Brazil, Colombia, Chile, Venezuela, the United Arab Republic, and Turkey, have relatively high cultural scores in comparison with their standards of living, and (3) the standards of living of Senegal and Algeria were very low, but their cultural scores were relatively high.

Figures 4 and 5 show the changes in agricultural proportions and industrialization (each measured on the vertical axis) in relation to the changes in the levels of economic activities. From Figure 4 we observe that the proportion of agriculture declines smoothly as the economy grows. Conversely, industrialization proceeds smoothly as the economy grows. However, the starting positions of industrialization are quite diverse, as illustrated in Figure 5. West Germany takes the lead in the industrialization score, followed by various other European countries. On the other hand, Greece, Argentina, and Panama showed the lowest scores in industrialization among the intermediate country group.

We now turn our attention to the meaning of industrialization and urbanization in the process of socioeconomic development. The relation between economic activity and industrialization is such that industrialization proceeds as the economy develops (see Figure 5). As seen in Figure 6, urbanization does not show such a clear trend, proceeding irregularly as the economic activities increase. However, the process of urbanization tends to diversify as the levels of economic activities are elevated, and seems to depend, first, upon the size of the country. Such small countries as Singapore, Uruguay, and Taiwan are ranked among the highest in our urbanization scores, though their economic levels are not very high. Japan, the United Kingdom, and Israel also show higher urbanization scores relative to income. The United States, Sweden, Norway, and Switzerland, on the other hand, seem to have achieved economic development without much concentration of population into urban areas.

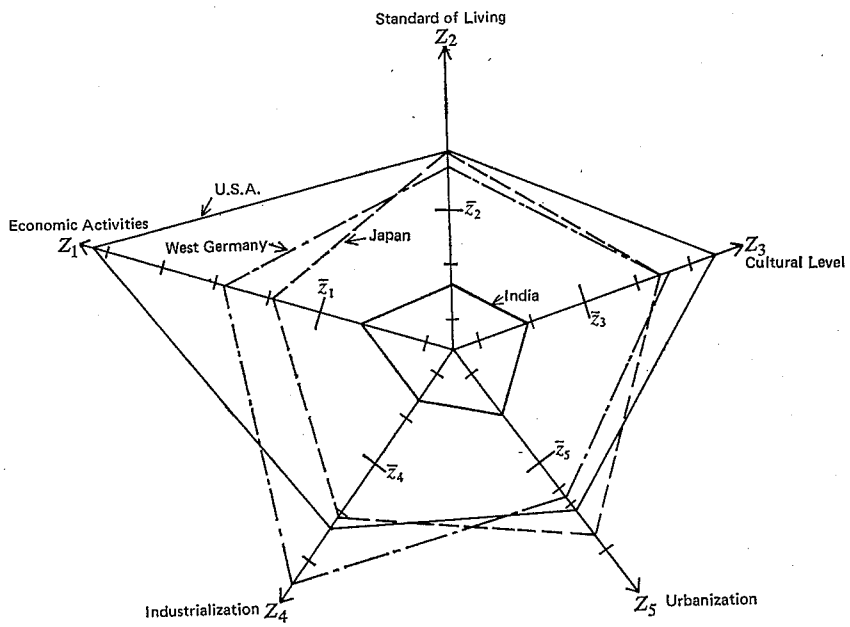
Next, the relation between urbanization and the living standard is illustrated in Figure 7. The standard of living is seen to be improved as urbanization proceeds, but with considerable variation. As an overall trend, the gain in living standards starts to diminish beyond a certain point of urbanization. Finally, as shown in Figure 8, the correlation between industrialization and urbanization turned out to be extremely weak in our measurements of these indicators. However, a time-series analysis for a certain country would be more appropriate in order to test the hypothesis that urbanization proceeds with the advancement of industrialization. Thus, we can only infer that urbanization and industrialization are rather complex and diverse processes depending upon the size of the country, the extent of the external contacts of the society, and many other factors. These processes of social change will be different from country to country, and should not be explained by one simple causal relationship.

V. INTERNATIONAL COMPARISONS

Using the standardized factor scores in Table XI, we compared the profiles of each country in the five dimensional diagram. These profiles are shown in Figures 9 to 18 for representative country groups. Since the original data have been collected with the view of identifying the socioeconomic development of underdeveloped countries, there may be some questions in comparing the advanced countries by the same condensed indicators, even though we have drawn portraits of developed countries in Figures 9 and 10. (The world average of each axis is shown by $\bar{z}_i$).

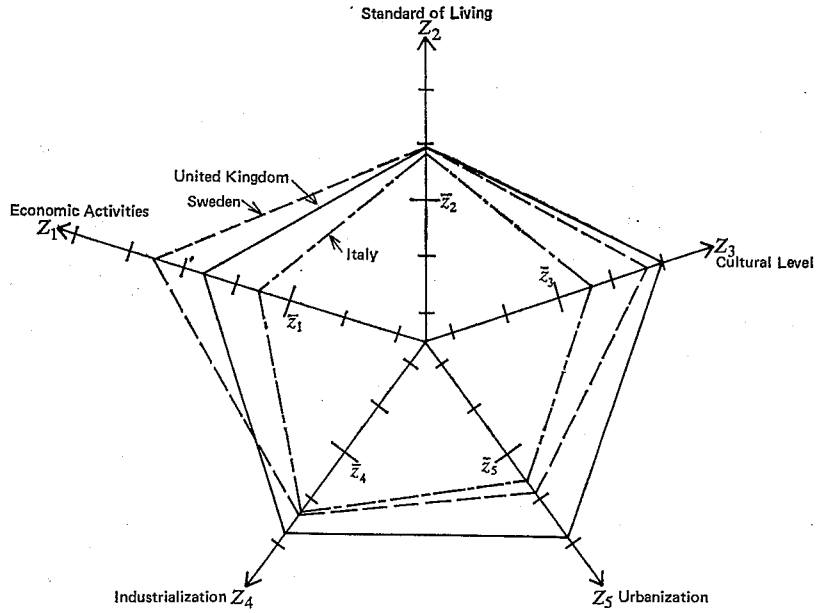
The economic (production and consumption) level of the United States towers above the rest, reflecting the mass-consumption society of the United States and the predominance of consumption in our study (the indicator of economic activity level contains per capita consumption levels of energy, steel, electricity, animal protein, and calories). On the other hand, Japan's profile is well-balanced within our indicators, and the concentration of population in urban areas is more striking in Japan than in the United States and European countries. West Germany comes out to be more industrialized than Japan and the United States. France, Belgium, the Netherlands, Switzerland, Austria, and other European countries possess the similar profiles to that of West Germany. In addition, for the purpose of illustrating the gap between the developed and underdeveloped countries, we drew the portrait of India in the same figure (Figure 9). In Figure 10 the profiles

Fig. 9. Developed Countries I



Note: $\bar{z}_i$ $(i=1,\cdots,5)$ indicates the world averages.

Fig. 10. Developed Countries II



of other representative European countries are illustrated. As typically seen in the profile of the United Kingdom, they are mostly well-balanced and their scores surpass the world averages. New Zealand, Australia, Finland, and Denmark have profiles similar to the United Kingdom, while Norway is of the Swedish type. Spain takes an Italian-type profile.

Let us now turn to the examination of developing Asian countries with reference to the profile of Japan. They are illustrated in Figures 11–13. In Figure 11 all socioeconomic levels of India, Nepal, and Burma are extremely low in comparison not only with Japan, but also the world averages. It is quite interesting that Ceylon (Sri Lanka), whose per capita GDP is just the same as those of India and Burma, exceeds these countries in sociocultural indicators. Southeast Asian countries, namely, Thailand, Malaysia, and the Philippines, may still be classified in the group of underdeveloped countries. Their sociocultural indicators are below the world averages, except their standards of living and urbanization (Figure 12). These countries and South Korea are ranked in the intermediate country group in Asia. On the other hand, Singapore and Taiwan have scores equal to, or above, the world averages except the economic activity level. They may be ranked in the underdeveloped group in terms of per capita GDP, but they are classified in the intermediate group in terms of sociocultural indicators (Figure 13).

The profiles of the Middle Eastern and Arab countries are shown in Figure 14. Israel has scores and pattern similar to those of developed countries. In particular, its urbanization indicator shows a very high score. The United Arab Republic, Iran, and Iraq are placed between the intermediate and under-

Fig. 11. Asian Countries I

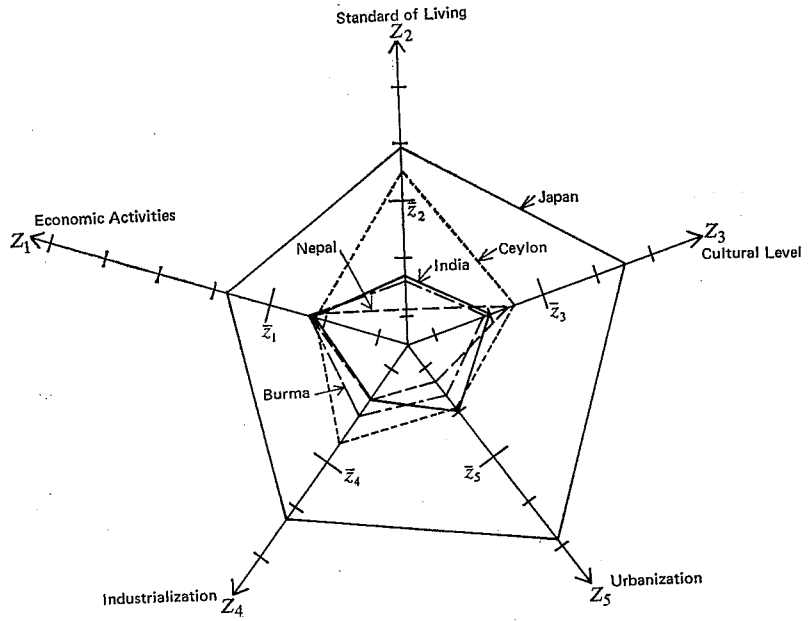


Fig. 12. Asian Countries II

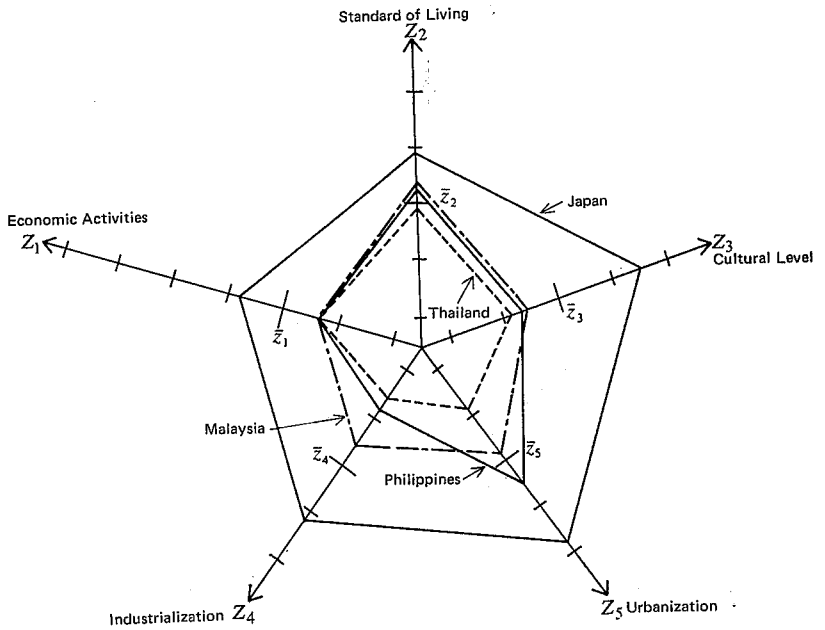


Fig. 13. Asian Countries III

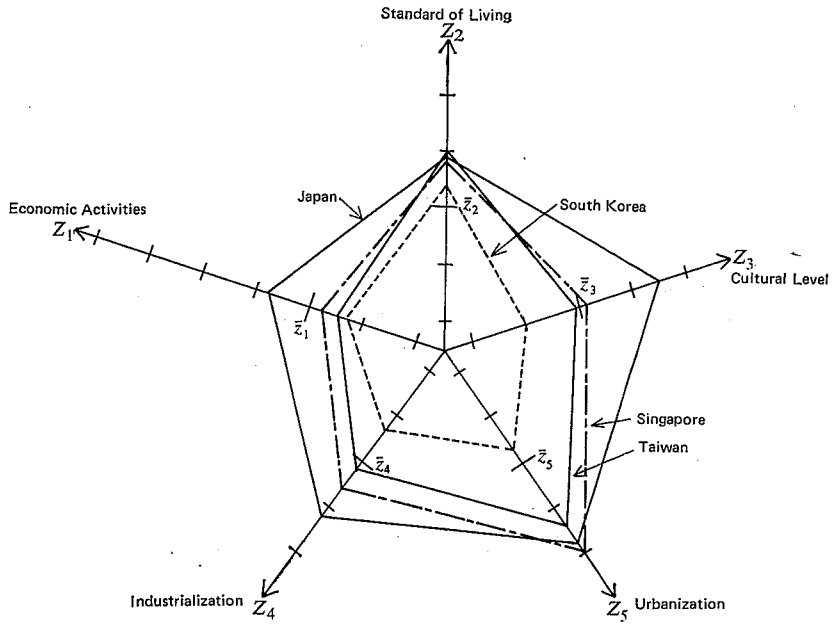
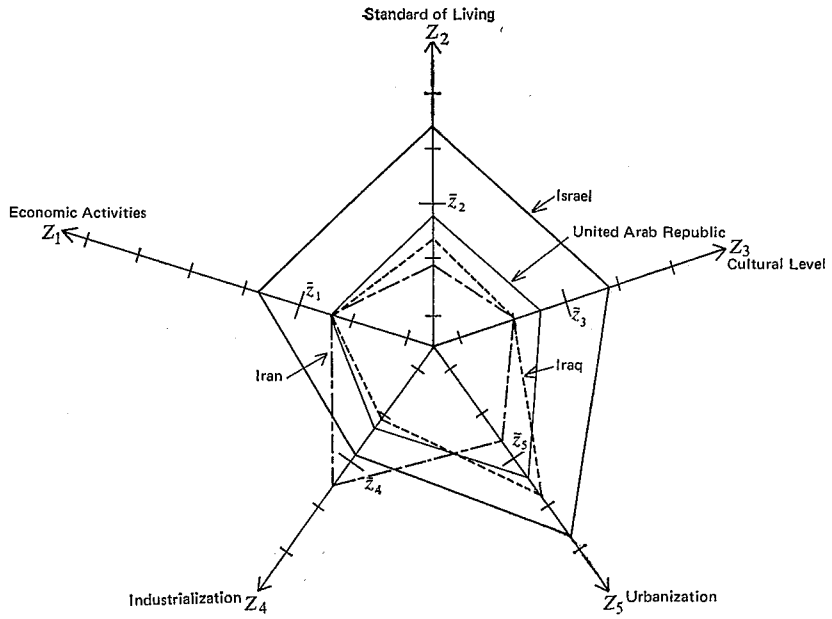


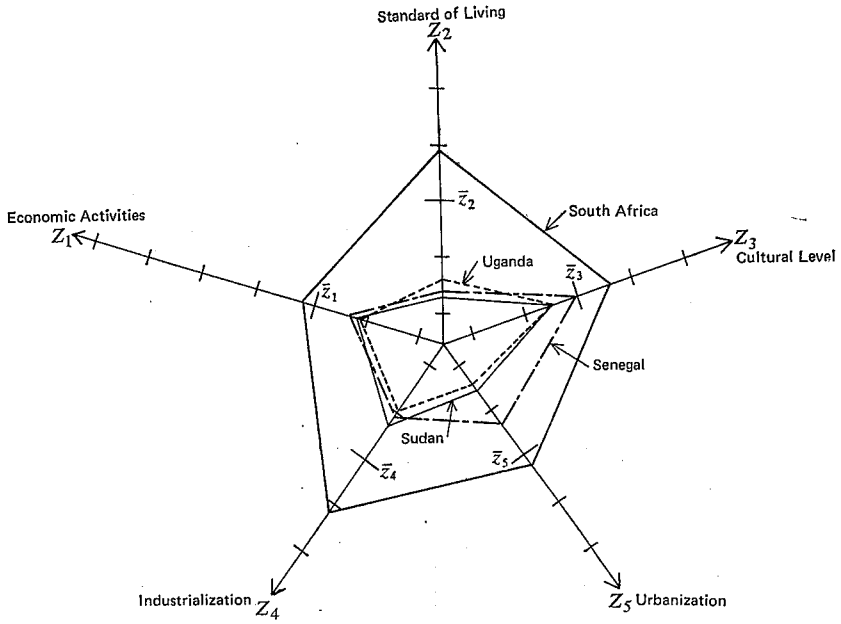
Fig. 14. Middle East and Arab Countries



developed countries from a sociocultural point of view. However, Iran registers a high score in industrialization, and the United Arab Republic and Iraq show high scores in urbanization. In these scores all three countries exceed the world averages.

African countries are illustrated in Figures 15 and 16. The Union of South Africa is considered to be one of the developed group, since her sociocultural structures are quite heterogeneous to the other African countries as shown in Figure 15. The remaining African countries are divided into two groups: a

Fig. 15. African Countries I



"culture-oriented" type and a "balanced" type. The former is characterized by having relatively high cultural scores with low indicators of living standard. For instance, Uganda, Senegal, and Sudan have these characters (see Figure 15). Cameroon, Mozambique, Ivory Coast, Sierra Leone, Liberia, and Kenya also belong to this type. Southern Rhodesia, on the other hand, took a higher score in industrialization, above the world average (see Table II). The "balanced" type is illustrated in Figure 16. Such African countries as Algeria, Nigeria, and Tunisia, are classified in this type. The characteristics of this type are such that the levels of all axes are very low, but balanced. Ghana, Zambia, and Morocco seem to belong to this type.

In Figure 17, the characteristics of South American countries are shown. Judging from this figure, the large countries such as Brazil, Argentina, Chile, and Venezuela possess sociocultural scores just over the world averages and well-balanced on every axis. Colombia, Uruguay, and the other South American countries show the same profile as the above countries. Ecuador and Bolivia show scores very

Fig. 16. African Countries II

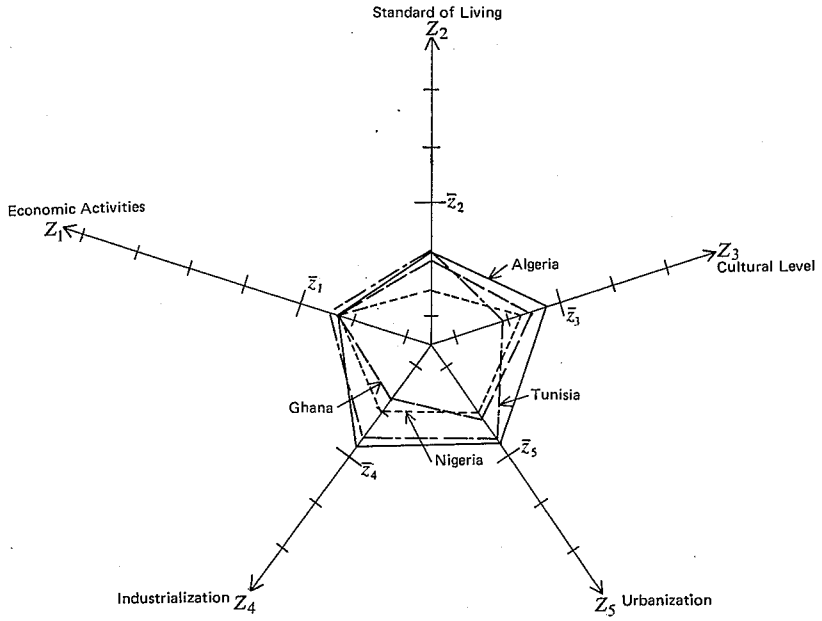
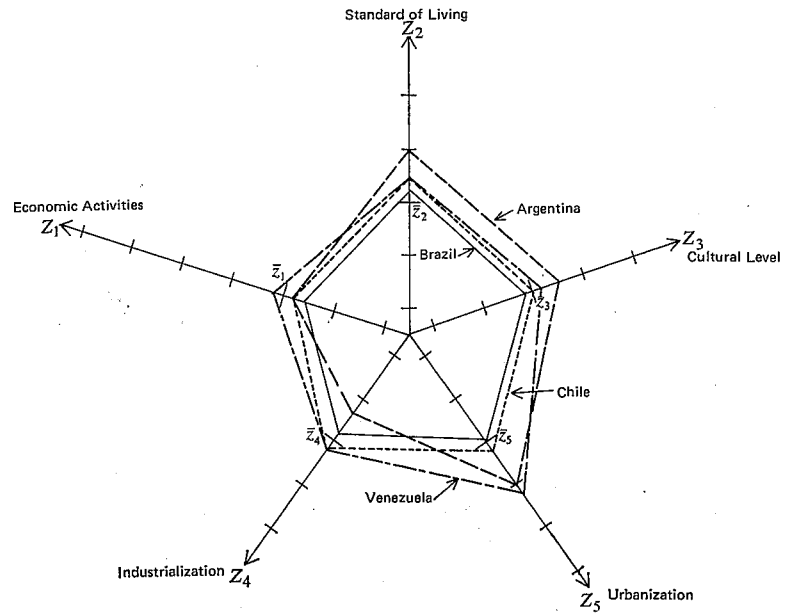
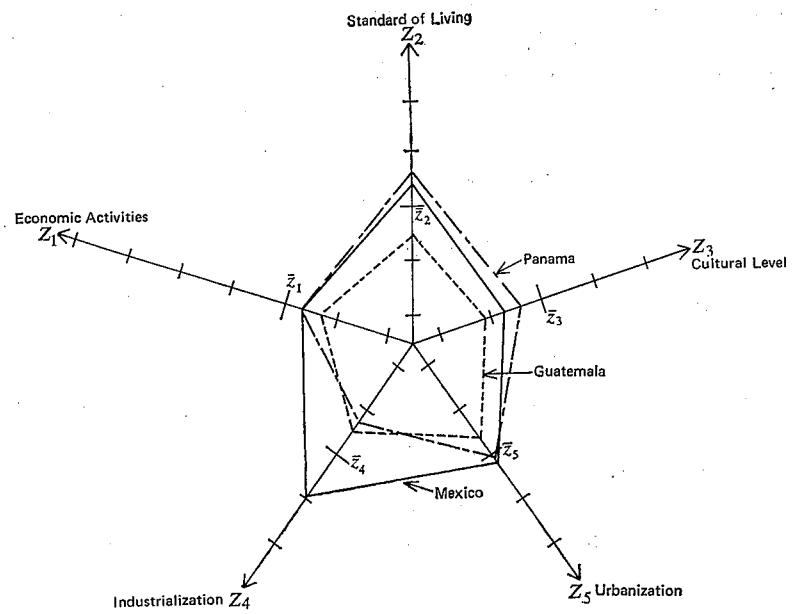


Fig. 17. South American Countries



similar to Brazil. Central American and Caribbean countries have the common features of fairly high standards of living coupled with extremely low cultural levels. These profiles are shown in Figure 18. One exception is the high industrialization score of Mexico. The rest of the Central American and Caribbean countries are mostly similar to Panama and Guatemala. For example, Costa Rica, Nicaragua, Jamaica, Dominican Republic, El Salvador, and also Paraguay of South America belong to this group. It is quite interesting that poor conditions of public peace and order in Central American and Caribbean countries seem to be reflected in these sociocultural indicators.

Fig. 18. Central American and Caribbean Countries



VI. CONCLUDING REMARKS

In this paper we attempted to develop an effective indicator or set of indicators for socioeconomic development by employing the methods of principal component and factor analysis. Using the factor scores obtained, we have examined various development paths, made international comparisons, and considered the meaning of urbanization and industrialization in the process of socioeconomic development. The results suggest, we think, that a quantitative analysis of social development can be conducted using these procedures. By constructing a system model, it will also be possible to do various simulation analyses in order to present some directions for social policies. We believe this sort of empirical study is significant, particularly since most countries urgently need synthesized social, economic, and welfare policies.

However, we realize shortcomings of our results. This is but one of many

possible quantitative analyses of socioeconomic development, and is only a preliminary approach to these problems. There may also be some questions about our approach. For instance, there is a question of whether or not we had concrete ideas beforehand on the overall social system, value judgments, ways of data selection, development mechanism, and the like. However, these would be questions applicable for any approach in a wide and unsettled field of study like ours.

In examining the development paths, time-series data might be more suitable than the cross-national data we employed. There are many other social and political variables that we wanted to incorporate but couldn't, partly because of data deficiencies and also because of low loadings. Among these variables some may provide more meaningful information to our analysis. We are aware of such limitations of our study as data reliability, questions about the method of setting the framework, and the analytical methods we employed.

However, after taking these limitations into consideration, our results still seem to prove that the measurement of development by social indicators is more significant and useful than a purely economic approach, such as the one using GNP alone. Furthermore, our methods suggest that it will be possible to obtain useful data for socioeconomic policy by selecting relevant variables and axes corresponding to the aims.

Our next objective will be to construct a systems model of socioeconomic development and to examine it empirically, based on these results. Since we have already studied the interrelationships among socioeconomic variables by methods of principal component and factor analysis, we need to clearly define the objectives of "social development" in the next step. After that step we should construct an operational social system model to clarify the structure and mechanism of socioeconomic development. Then we will be able to make various predictions and the measurement of policy effects by the methods of simulation.

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