MULTIDIMENSIONAL SCALOGRAM ANALYSIS OF PHILIPPINE CITIES, 1960–70: A TYPOLOGICAL APPROACH TO COMMUNITY MODERNIZATION

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OVER THE years, scholars have invoked the phenomena of change, development, urbanization, and related events more broadly termed "modernization" as focal points for the analysis of social behavior. while they agree on the consequences of modernization, however, they seem to show less unanimity on the precise measurement of this term due in part to inadequate conceptualization. As an example, modernization is believed to be associated with the process of growth, such as that occurring in communities, which approximates a transitional change from what Robert Redfield calls "folk" to "urban." Yet this view is doubtful on the grounds that modernization is not a matter of linear, evolutionary transformation of communities from simple to complex, from rural to urban, or from traditional to modern [10]. A related problem in the conceptualization of modernization is the implicit idea of "Westernization" built into it, particularly when applied to growing economies which once had been under colonial rule.

This study presents an alternative way of looking at modernization within a developing country, the Philippines, using cities as units of analysis. Its aims are twofold. First, construction of an empirical typology of cities by application of a recently developed multivariate technique, called multidimensional scalogram analysis, utilizing available trend data from census files. The approach adopted here is basically inductive; we hope to relate patterns of city modernization to existing models of growth (or development) instead of testing the validity of these models against our data. Our second aim is to validate this typology with a measure of modernization, phrased as "urban complexity" or "differentiation," developed by Fujimoto [7] for thirty-nine Philippine cities.

I. MODERNIZATION CONCEPTUALIZED

By modernization we mean a generic process that embodies the many interrelated facets of population dynamics (e.g., urbanization), commercial develop-

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ment, industrialization, and other familiar measurements of socioeconomic growth which move together toward a particular direction.[1] (For the purposes of this paper, modernity and development are used synonymously in a loose sense. The derived concept, modernization, carries with it the idea of a process, with modernity being the end result of that process.) These individual facets in and of themselves, as variables, may be regarded as distinct areas of socioeconomic development for particular purposes of research. But as Schnore [16] has pointed out, these sectors are part of a broader, underlying dimension or factor, called "modernization." Writers have also shown that the combined effect of such variegated measures of modernization leads to a "systemic push" toward increased mobilization for political participation [3], and sophisticated value orientations [17] among individuals, to mention but a few.

On the societal level, modernity has been identified with such a state of affairs as extensive utilization of inanimate energy [10] [18], socioeconomic development [15], and democratization of a political system [20], among others. A somewhat different perspective is taken by Young and Young [22] who consider structural variables (e.g., differentiation, centrality, solidarity) on the community level as explanatory concepts for social changes of various kinds.

The research tradition formalized by the Youngs has influenced many scholars in devising operational referents of modernization, notably Fujimoto's works on the development of Philippine towns and cities [6] [7]. According to this view, development is essentially an information processing ability on a general dimension of differentiation, where differentiation is defined as "the degree to which the community projects diverse areas of meaning" [6, p. 200]. In his first study, Fujimoto lined up fifteen municipalities in Oriental Mindoro by a Guttman scale according to presence or absence of such institutions (items) as a sewer system, a public phone, and a bank, down to such simpler ones as a municipal building and a post office [6].

In a subsequent analysis of urban complexity [7], Fujimoto has shown the increasing differentiation of thirty-nine Philippine cities in 1965, through use of a similar technique, into three areas of meaning: commercial, recreational, and public articulation, where the latter "refers to those features indicating a city's awareness for its own well-being (police, traffic, fire, education) as well as the degree to which it is tuned in to the greater world around it" [7, p. 78]. He then ranked these cities on three separate scales indicating presence or absence of such modern items as a television station, a stock market, local newspapers, and other related indicators of urban development. Finally, he generated a global measure of differentiation by "interlarding" (combining) selected items from such scales, and this new scale was as highly reproducible (a criterion for a good Guttman scale) as the other three. Fujimoto concluded that this suggests the

[1] Our argument that modernization takes a specified direction is borne out by more than one study. Irwin [10] has summarized a few popular conceptions in the literature pointing to this, such as "evolutionary transition," "process of acquisition of traits common to more developed societies," and "technological transformation" of simple societies, among others.

subsuming and unidimensional nature of the differentiation concept [7, p. 80].

On this score, Fujimoto's differentiation is proximate to, and consistent with, our usage of modernization. That both concepts are systemic processes encompassing various arenas of social life is beyond doubt. Such similarity for the most part justifies the choice of the Fujimoto scales as major criteria for validating our measure of modernity.

While modernization and differentiation are parallel concepts, in our analysis at least, certain points of dissimilarity are in order. Whereas Fujimoto relied on a data collection strategy using key informants (i.e., government workers), our research method made use of aggregate data based on household and population traits. Fujimoto used Guttman scales to rank cities in one dimension according to degrees of complexity, while this study tried a modified scaling procedure, known as multidimensional scalogram analysis, which makes no assumption on dimensionality (see later section). The differences are obvious, but neither approach can lay a claim for more validity. From a technical point of view, however, incongruencies of this nature are advantageous to comparative research involving validation of instruments measuring the same concept but developed independently of each other.

II. MODERNIZATION MEASURED

As a dynamic concept, modernization eludes operational measurement by cross-sectional data. One way out of this methodological problem is to collate relevant time-series material, in this case data for 1960 and 1970, selected on the basis

TABLE I

SUMMARY OF INDICATORS USED FOR MSA

Variable/Indicator	Definition
I. Education:	
1. Literacy	% of population five years and above able to read and write
2. Higher education	% of population completing high school education or better
II. Demographic:	
3. Density	Population per square mile of land area
4. Population size	Total city population
III. Housing conditions:	
5. Strong	% of dwellings made up of strong materials (e.g., cement, asbestos, etc.)
6. Commercial	% of dwellings classified as commercial and industrial
IV. Consumption of durable goods:	
7. Radio	% of households with radios
8. Flush toilet	% of households with flush toilets
9. Piped water	% of households with piped water
10. Electricity	% of households with electric lights
V. Ethnolinguistic:	
11. Tagalog	% of population able to speak Tagalog
12. Chinese	% of Chinese population

Source: *Censuses of the Philippines, Population and Housing,* 1960 and 1970 eds. (Manila, Bureau of Printing).

of availability and comparability. Five groups or clusters of ecological variables were selected: (a) education, (b) demographic, (c) housing, (d) consumption of durable goods and services, and (e) ethnolinguistic. These, in turn, tap twelve indirect proxy indicators for the vital components of modernity as has been suggested in the literature (see Table I). Fifty-eight cities as of 1970 (out of a total population of sixty) were included in the analysis for which data were gathered from the 1960 and 1970 censuses. (It must be noted that in 1960, only thirty-two of these cases had been created as cities, in a legal administrative sense, while the rest were either provincial capitals, big *poblaciones*, or municipalities.)

Education has received much attention among writers as a familiar indicator of social development [20], measuring the ability of the population to articulate its demands and exert pressures for social change. As a trait of cities, it is here conceived of as an index for general level of awareness (literacy) and the amount of skills or articulation (higher education) that comes with modernization.

Demographic indicators, namely, density and population size, are taken to mean concentration and urbanization—concepts that reflect the initial signals for modernizing cities. That urbanization is an important component of modernization is discussed in Lerner's developmental sequence theory [13], which argues that urbanization provides the base for incremental change in literacy, media utilization, and other aspects which, in turn, promote economic growth.

Housing conditions indicate the degree of urban sophistication, as may be judged from the quality of houses people live in. They are also indicative of the diversified types of social transactions characterizing commercial or industrial activities. Thus, the percentage of houses classified as commercial and industrial may be used as a surrogate measure for the level of industrialization. On the other hand, houses made up of strong materials indicate urban taste [9] accompanying industrialization.

Consumption of durable goods and services is a familiar index of level of living [2], which further indicates welfare and well-being. No doubt possession of a radio implies access to and participation in a modern network of communication other than the usual word-of-mouth tactic of gathering and transmitting ideas. In the same vein, the range of households which directly benefit from electric power for lights and other domestic needs is also indicative of well-being closely associated with industrialization.

Housing types and consumption of goods are both reinterpretable in a broader context as "social welfare" indicators, referring to the "good" things in life that provide enjoyment and comfort (or satisfaction) for those who have access to them.

Finally, some ethnolinguistic traits are regarded as excellent correlates of cosmopolitanism and orientation to urban life, such as the percentage of population able to speak Tagalog (Philippine national language) and the percentage of population of Chinese descent. Ability to speak Tagalog is considered a measure of cosmopolitanism—defined as exposure to a variety of social environments, particularly applicable among the non-Tagalog—or an increasing orientation

TABLE II

MATRIX OF SIMPLE CORRELATIONS AMONG THE MODERNITY INDICATORS

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Literacy	..	72	36	16	57	46	62	57	63	65	58	44
2. Higher education	46	..	56	47	83	49	88	85	81	89	52	73
3. Density	22	60	..	34	57	27	67	72	55	68	34	38
4. Population size	16	57	36	..	42	29	44	52	34	45	25	58
5. Strong	37	48	46	34	..	27	86	88	78	87	61	64
6. Commercial	38	50	27	23	35	..	45	35	34	47	28	58
7. Radio	61	62	42	37	76	43	..	96	79	96	62	66
8. Flush toilet	42	82	59	42	57	32	59	..	77	93	63	65
9. Piped water	40	66	52	24	57	39	56	74	..	86	58	66
10. Electricity	43	75	64	50	73	47	75	84	73	..	60	73
11. Tagalog	43	45	32	22	75	19	65	48	42	58	..	40
12. Chinese	38	74	50	45	36	50	48	64	58	69	28	..

Note: Pearson's product-moment correlations (decimals omitted). Coefficients at the upper half of the matrix are derived for the 1960 data; those at the lower half, for the 1970 data.

toward the national culture, phrased more broadly as "nationalism" or "Filipinism." While a percentage of Chinese population is also associated with cosmopolitanism, in the sense of being migrants, an alternative view treats this population as representing the "relative economic importance of a place" [4, p. 787] within the Philippines.

These indicators were then intercorrelated and their relationships displayed in Table II. All 132 coefficients are positive, as predicted. At first glance, the results suggest a general support for the utility of our selected indicators.

III. MULTIDIMENSIONAL SCALOGRAM ANALYSIS

Our approach to measuring modernization utilized a sophisticated, nonmetric distance technique, known as multidimensional scalogram analysis (MSA-1), designed for high-speed computers. Bloombaum describes this method as follows:

> MSA is in a sense a generalization of the familiar Guttman scale. Instead of focusing attention on the question of whether a set of items is unidimensional, MSA directs attention to the question of how many dimensions it takes to represent adequately a body of data. MSA establishes the smallest space in which points, characterized by their category scores on all the items, fall into contiguous regions. [1, p. 77]

As a distance analysis, subjects or cases are mapped out as points in a Euclidean space where similar ones occupy a common region. Conversely, dissimilar cases tend to group together in opposite regions. Extending this logic to the analysis of city-types, we would expect cities which are rated "high" on all the modernization traits to cluster tightly in a particular location in the spacegram; cities rated "low" on these characteristics would cluster in another. The extent to which this principle of grouping consistently shows up in the data will be reflected by the degree of fit, technically termed coefficient of contiguity,

which takes on a value ranging from 0 to 1.0 (a perfect fit). As a rule of thumb, the higher the coefficient, the better the fit.

MSA is thus a suitable technique for typological analysis since it sorts out cities into distinct types based on their scores on the twelve study variables. Generally, there are as many city-types as there are (dissimilar) individual cities, but we hope to uncover clusters which reveal unique groupings. The approach, then, is essentially empirical and inductive, which begins with the assumption that an underlying structure in the data, if any, will emerge. In turn, this structure is discussed in relationship with extant models of deveolpment, which we shall present at the later part of this paper.

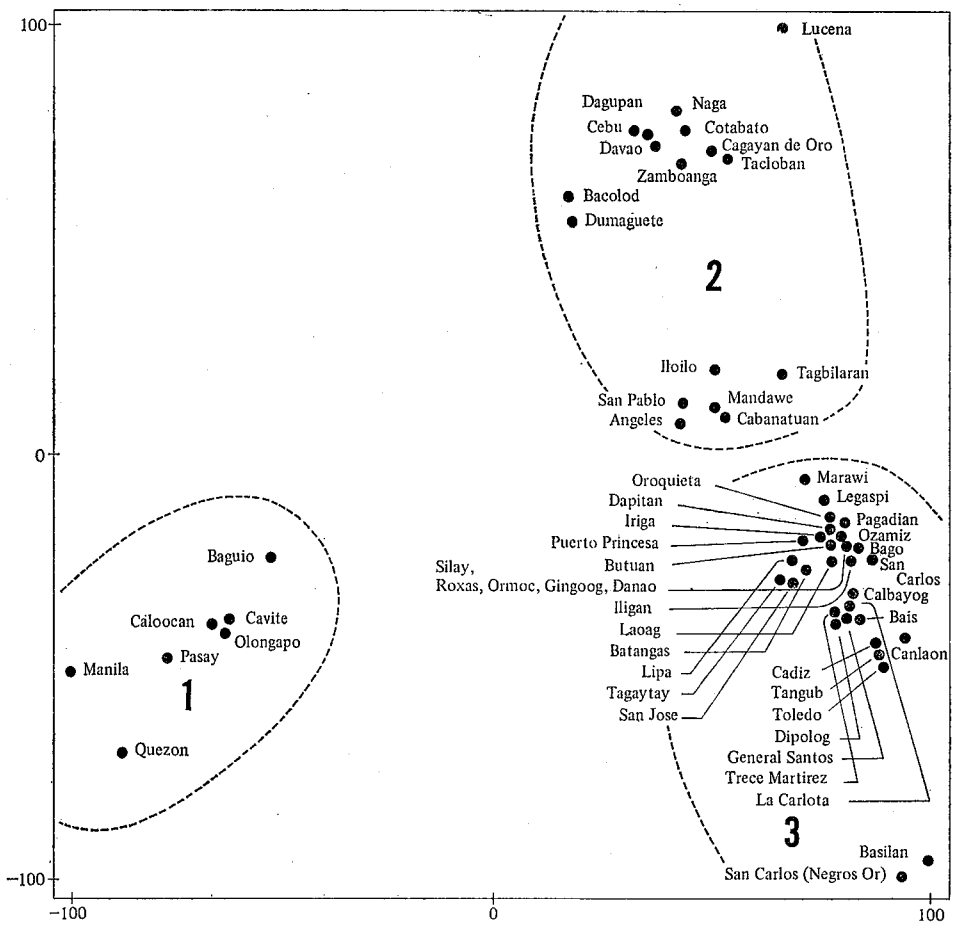
Like the Guttman scale, MSA is relatively free from the stringent assumptions imposed by most statistical techniques. Its decided advantage over the Guttman scale, however, is the ability to illustrate a locational pattern or configuration. Further, MSA is capable of handling both discrete and continuous data with category scores equal to or less than twenty, in comparison with the Guttman scale which is often applied in an analysis of dichotomous variables. Because our data—being interval measurements—exceeded such computer limits, their ranges were reduced into four-point scales. Capitalizing on the mean average and standard deviation (SD)—plus one or minus one, as cutting points—we assigned a score of 1 for values found one SD below the mean; 4 for values one SD above the mean; 3 for values in between the mean and one SD above it, and 2 for values in between the mean and one SD below. In this analysis, 1 is qualitatively taken as "lowest" and 4, "highest."

IV. RESULTS AND ANALYSIS

Results of the analysis using MSA are striking. The observed coefficients of contiguity are satisfactorily high for a two-dimensional solution: 0.947 for the 1960 data, and 0.986 for the 1970 data. These results are adopted here. Coefficients for a one-dimensional MSA are: 0.986 and 0.956, respectively, while those for a three-dimensional solution are 0.898 and 0.991. Although one dimension offers the most parsimonious structure, which ranks cities from low to high in a straight line ranging from -100 to 100, it yields a lower construct validity than the two-dimensional solution when correlated with the Fujimoto scales. Results for three dimensions, which portray cities in a cube-like diagram, are both ambiguous and difficult to analyze. The contiguity coefficient indicates the worst fit for the 1960 data, but apparently shows the best fit for the 1970 data. Hence, the three-dimensional solution was dropped from the analysis, as was the one-dimensional solution.

Figure 1 displays the relative spatial position of cities in 1960 according to a two-dimensional structure. On this diagram, Philippine cities may be partitioned in several ways depending upon the researcher's particular theoretical orientation. For our purposes, they are grouped into three clusters with the arbitrary labels: "traditional" (cluster 3), "urban" (cluster 2), and "core" (cluster 1) cities. The number of traditional cities surprisingly predominate beyond

Fig. 1. Two-Space Diagram of Philippine Cities, 1960



our expectations, comprising more than half (thirty-four out of fifty-eight) of Philippine cities in 1960. An inspection of the individual scattergrams for twelve characteristics shows that cities in this cluster are generally low scorers, as has been predicted of less modern cities. They tend to depict a rural profile, which these examples would bear out: Trece Martirez, smallest city in terms of size, has only a total population of 4,422 in 1960. Basilan is a plantation community. Tangub "still has that very rural atmosphere." And Tagaytay, with a population slightly larger than Trece Martirez, "only boasts of a year-round coolness" that makes it an excellent tourist spot (quoted in [19, p. 318]).

The second group of cities conforms to a community whose urbanization and industrialization have begun to creep in, but whose level of modernization falls short of those in cluster 1. Their scores on the study variables are generally higher than those in cluster 3, but are lower than those in cluster 1. Upon careful examination, such cities as Iloilo, San Pablo, Angeles, Mandawe, Cabanatuan, etc.—in the lower zone of this cluster—were regarded members of cluster 2

instead of cluster 3. They are most similar to Bacolod City, Dumaguete City, and other cities which have risen to prominence as the new urban centers in recent times. In addition, Fujimoto did rank them higher in scale positions than those in cluster 3 cities. This brings to mind the notion of "transitional" growth characteristic of the emerging frontier cities in the Philippine urban landscape. Seventeen of fifty-eight cities are situated in this category, telling us of the more developed cities of Cebu, Naga, Davao, Iloilo, and Lucena, to name a few examples.

Turning now to cities in cluster 1, some additional insights may be advanced at this point. In this group, we have found among others the familiar city of Manila and its outlying satellites (Pasay, Caloocan, and Quezon)—the whole constellation being called Greater or Metro Manila—which at once capture the concept of a primate city [8]. That is, a city with many times the population of the next largest city within the nation, coupled with a multiplicity of functions and attractions which gave it dominance. Usage of primacy has had the implicit negative connotation of treating the city as a destructive organism analogous to a leech that siphons off a nation's physical or human resources. Our objection to such usage, in this case Manila as a primate city, stems from the inclusion of Olongapo, Baguio, and other adjoining towns (e.g., Makati, Marikina, Parañaque, Las Piñas, etc.) which lack the element of "bigness," however measured. For instance, Baguio and Olongapo have populations in 1960 of about fifty thousand, almost the same size as Cavite, but far lower than Manila's over a million people, or Quezon's nearly half-a-million residents. Yet these two cities themselves are part of a "superstructure" whose functions for the whole nation are necessary for its survival as a social system. We thus propose a more embracing concept of "core" cities, adapted from geography [21, Chap. 10], referring to not just one principal city but many similar urban areas dedicated to the creation and maintenance of basic support systems in society. Such cities are also appropriately considered this society's repository of dominant values, cultural symbols, and other defining traits of national identity. Rephrased another way, our core cities occupy a "central" position within the Philippines as standard bearers of modernization.[2]

Incidentally, the core cities both have theoretical and empirical significance as contiguous regions. They in fact form a nucleus of cities tightly squeezed within a 120-mile radius, excluding Baguio which nestles in the mountains of the north. What is interesting in these cities is their unique, specialized variety of functions. Manila has been the nation's center for economic, cultural, educational, and political activities. It is the locus of extensive entrepreneurial arrangements, ranging from banking and manufacturing to the more lucrtaive

[2] The idea of "recognition" accorded to a system is contained in Young and Young's concept of centrality [22], or the "access that the community has to a region or, in more formal terms, the degree to which the symbols of the subsystem are 'congruent' with those of the system." Their usage of centrality is analogous to our conceptual description of core cities with respect to the national community (i.e., the Philippine society), or even to an international region.

types of commercial exchange. It is also the seat of the Catholic church hierarchy, and the site of the Philippine government. Educationally, the biggest universities are located in Greater Manila, such as the better-known University of the Philippines and Ateneo University in Quezon City. Manila International Airport and the domestic terminal, in Pasay City, are the portals of the country's communication to the outside world and within. And Cavite, with its reputation as the battleground for the nineteenth-century Philippine Revolution and home of the heroes during this era, has been a historic city for tourism and research.

But what about Baguio and Olongapo? Baguio's cool temperature (annual average is 64°F), earning it the label "Salinas of the Philippines," and panoramic rice terraces in Banawe have made it a favorite summer resort for people from the busy streets of Metro Manila and the even busier cities outside the country. It is a place for vacation and fun. More importantly, Baguio is the locus of the Philippine Military Academy. Olongapo shares this defense function, being a service center for military personnel from the large U.S. naval station at Port Olongapo. Unexpectedly, Angeles, site of the U.S. Clark Air Base, did not belong to this cluster. (The 1970 data, however, straightened out this anomaly.)

On another theoretical plane, we may view Philippine cities as essentially of two kinds: core and periphery. This statement, while nominalistic and crude, is not without justification as Figure 1 (and later, Figure 2) would attest. Here, MSA markedly separates the "magic" cities in cluster 1 from all others on the horizontal axis. An independent line of evidence, inferred from Fuchs and Luna's factorial study of Philippine provinces [5], has in fact shown that the factor "urbanization-modernization" (indicated by population density, per cent literate, per cent labor force in professions, and cognate measurements) is more highly emphasized in the core regions than it is in the peripheries. As in our data, the gap between these regions or cities suggests the existence of a dualistic attribute. Dualism, we have been told, is characteristic of regions with severely unequal rates of growth as a consequence of different forces operating in one area compared to another [14].

At this juncture, a conceptual distinction between core-periphery and dualism is badly needed. The idea of functions aside, core-periphery analysis has the sociological overtone of discriminating cities on more abstract traits, such as values and world views representing national character. Just as "white, Anglo-Saxon Protestants" have been dubbed the carriers of American tradition, so the percentage of Tagalog speakers in the Philippines reasonably captures the essence of that tradition as the country's dominant culture. Our core cities indeed take a "lion's share" of the enduring Philippine tradition as a manifestly Tagalog region (mean percentage of Tagalog speakers is 93 as opposed to 25 for the peripheries), not to mention the fact that they are known centers for nationalistic movements.

Dualism, on the other hand, is a process sequel to or accompanying modernization (or traditionalism, as the case may be) which maintains or increases the gap between two regions as a result of social forces favoring the growth of one but prohibiting the other. It is thus a synonym for "flexibility-rigidity," a con-

dition referring to an open social system characterizing cities, on one pole, and a closed social system, on the other. But as Fuchs and Luna [5] have observed, dualism diminishes with time. According to them, in 1939 urbanization and modernization is spatially confined to Manila and its immediate environ, but in 1960 it has spread outward to adjoining provinces. The issue leaves it open, however, if such duality has narrowed down further in recent times. Our contention is that it has.

In-depth analysis of results of MSA brings us a step closer to dimensional significance. Figure 1 does suggest that modernization of Philippine cities in 1960 leads up to either a curvilinear or bilinear pattern. The underside of such trend, if any, no doubt is far more complex than one may read from the diagram presented. Were cities in the marginal group (cluster 2) tilted toward the core cities, the curvilinear hypothesis would have been upheld. It is instructive for the reader to imagine a configuration in that diagram as one of a broken bell-shape, if the clusters were joined together.

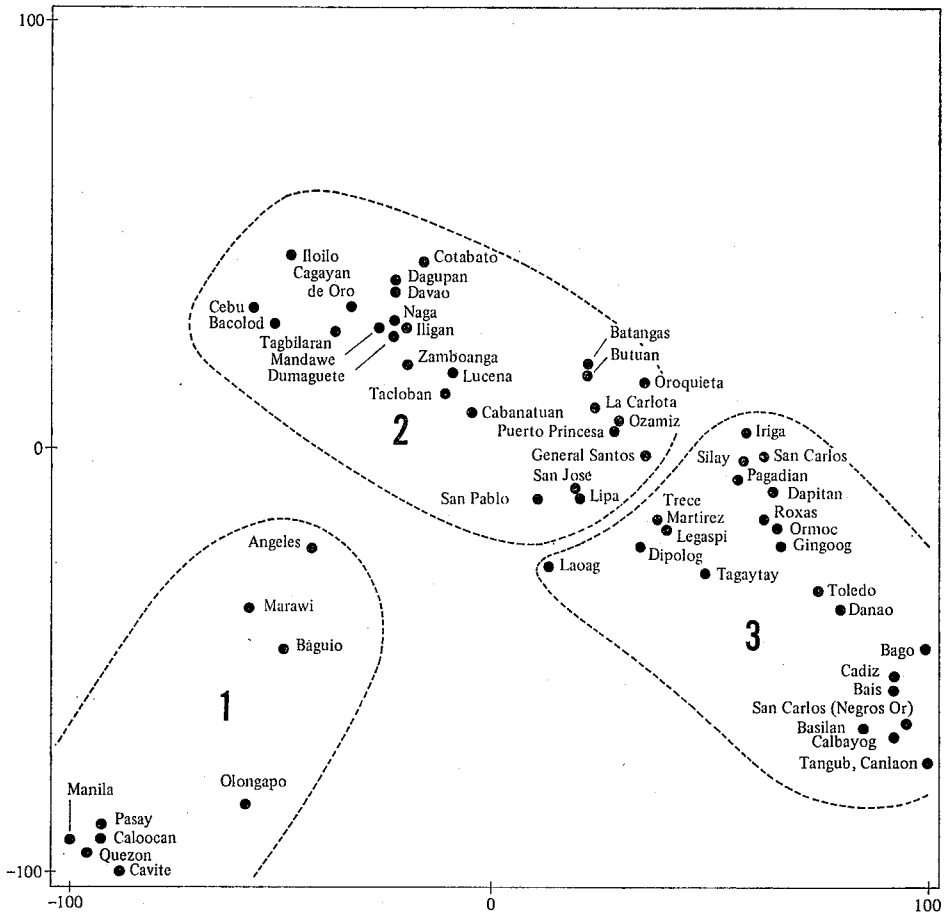
Our subsequent analysis of city data for 1970, using exactly the same study variables or characteristics and technique yields an almost identical structure of modernity (Figure 2) in comparison with that in 1960.[3] This structure, however, throws more light in favor of the curvilinear hypothesis. It is thus argued that modernization of Philippine cities behave like a curve, contrary to the commonly held belief that it follows a straight line. This is so because the core cities modernize (and perhaps will continue modernizing) at a different plane. Peripheral cities, in all probability, are the ones modernizing in a linear fashion.

Furthermore, the magnitude of dualism has decreased, nearly closing the once-wide chasm between core cities and peripheries. In either case, the peripheral cities apparently are changing as are the core cities themselves, judging from the shifts in city positions in the two diagrams.

Interestingly enough, the 1970 diagram portrays certain unexpected changes. Marawi, for example, which was classified as a traditional city in 1960, experienced a quantum jump into the core group in 1970. What accounts for this dramatic change? In the absence of sufficient data to augment our analysis, at best we can suggest intuitive explanations. Geographically, Marawi is in the southern region, Mindanao, and has been the heart of Islamic culture and arts (Marawi is 95 per cent Muslim). It is the home of the second biggest Muslim group, the Maranao, and the site of the largest state university ever to be put up in the south, the Mindanao State University. The MSU, which was chartered

[3] The acid test of the extent to which these two configurations are alike can be determined by an interpoint correlation of cities in 1960 and 1970. Since this procedure is computationally tedious, a surrogate method is done by correlating their scores for the horizontal and vertical axes. The product-moment correlation between the horizontal axes for 1960 and 1970 is $r=0.82$; that for the vertical axes for 1960 and 1970, $r=0.72$. This means that both city structures, on the average, share a common variance of 59 per cent (mean $r=0.77$ squared and multiplied by 100). Interpreted another way, this variance is a summary index for the degree of change (or nonchange) in modernization process between 1960 and 1970, where nonchange ideally results in perfect variation (100 per cent) or a correlation of 1.0 between the axes.

Fig. 2. Two-Space Diagram of Philippine Cities, 1970



in 1961, might have helped speed up the tempo of Marawi's modernization, given this city's high-urbanization potential and increasing volume of commercial activities to begin with. In the Philippines, Marawi is the only counterpart of Baguio City, for it is also an ideal place for recreation during the hot season. This function, however, has not been any more exploited than the idea of cultural integration of the Muslims, the nation's largest ethnic minority, as embodied in the principal objectives of the MSU. Marawi City, then, might represent an emergent center for cultural integration.

Another city which has dramatically changed is Angeles. Unlike Marawi, Angeles joined the ranks of the core cities as it should have, due to its important (defense) function cited previously. It comes as no surprise that this city came up to be one of the most modernized places in the country, as were the other cities in and around Manila. We would like to note that Angeles is only about fifty miles away from the heart of the core cities. Its proximity thus strengthens

the argument that distance to a developed region affects a community's rate of modernization even more rapidly.

Nine other cities which have moved upward—now from low to intermediate modernity—include Ozamiz, Puerto Princesa, General Santos, Lipa, San Jose, Oroquieta, Batangas, Butuan, and La Carlota. They queue behind such cities that occupy the lower portion of cluster 2, places which have "arrived" a little earlier in 1960. This made the present number of intermediate cities swell in number from seventeen to twenty-six, the largest cluster by far. Iligan, an example of a rapidly growing city in Mindanao, has surprisingly modernized at a rate now at par with Dumaguete, Naga, and Mandawe. One reason for this phenomenal change is the influx of heavy industries, complemented by the excessive thrust of urbanization (Iligan has a population growth rate of 105 in 1960). Within the Philippines, Iligan and Marawi—both capital cities of the two Lanao provinces—spanned only by a twenty-five-mile road, are examples of "boom towns" [7, p. 83].

Almost by definition, if cluster 2 cities change in membership, so do cluster 3 cities (traditional). Yet this change does not preclude that the traditional cities in and by themselves remain in that plight forever. They also modernize with time, though slowly, if they do not decay.

Delineating now the cutoff point between clusters 2 and 3 has been more difficult than it was in 1960. We thought it was prudent to locate a line sensitive to the division of cities within the peripheral group based on capacity for change. This line represents the "natural" break that sets off cities in cluster 2 from those in cluster 3, bearing in mind that fast-growing cities in the latter are likely candidates for membership in the former. Our efforts to validate city groupings in the subsequent section of this paper have corroborated the logic of this analysis.

In summary, MSA has revealed two important aspects of modernization: the decreasing dualism among Philippine cities within the time span we covered, and the curvilinear pattern of modernization. These results would not have been possible if we dealt exclusively with cross-sectional information and utilized other data-reduction techniques.

V. VALIDITY OF MSA CITY-TYPES

An unanswered question at hand is this: How valid is the tripartite classification derived from MSA? The extent to which these city-types accurately reflect what they purportedly measure will be regarded as an index of validity. Construct validation is one way of estimating this index to assess whether the modernization typology behaves like the concept it is supposed to represent [11, pp. 23–24].

To do this requires a comparison of our typology with an existing measure of the same construct, though differently defined, arrived at by a maximally unique apparatus or technique. We are fortunate to have the Fujimoto scales of urban complexity as "criterion" variables for thirty-eight Philippine cities (excluding Lapu-Lapu City). Ranking of Philippine cities on these scales were then divided into two equal distributions, "high" and "low," using the median

TABLE III

PERCENTAGE OF CITIES WITH SCORES ABOVE MEDIAN (HIGH) IN THE FUJIMOTO SCALES, BY MSA CITY-TYPES

Fujimoto Scales (about 1965)	MSA City-Types, 1960			Gamma*	MSA City-Types, 1970			Gamma*
	1	2	3		1	2	3	
1. Interlarded	100	93	22	.97	86	83	15	.83
2. Commercial	100	87	17	.96	86	72	0	.91
3. Articulation	80	80	11	.86	71	72	0	.82
4. Recreation	80	73	28	.71	86	61	23	.72
$n=$	(5)	(15)	(18)		(7)	(18)	(13)	

* Tests of significance are inappropriate here as the cases do not strictly represent a random sample. Moreover, the computed Chi-Square values for all crosstabulations are significant at $p=0.1$ level or better, with two degrees of freedom.

as cutoff point, after which we proceeded to crosstabulate the cases with the clusters isolated by MSA. A measure of validity was finally calculated for each crosstabulation through use of gamma coefficient. This correlation formula was chosen because the categories somehow reflect order instead of pure nominal classes (i.e., natural dichotomies, such as sex and color).

The results of our correlational analysis, in Table III, are quite gratifying. Evidently, there exists a strong, positive agreement between Fujimoto's scales of urban complexity and our tripartite city classification based on MSA. Despite the timelag between these two measurements, their correlations of 0.71 to 0.97 (by gamma coefficient) are exceptionally high for this exploratory effort. Because Fujimoto has not rigorously validated his scales, the correlations just reported may be viewed as construct and concurrent validity for both MSA and the Fujimoto scales. Their agreement also implies that both approaches are to some degree interchangeable. We may add that preference for each will depend on the theorist's particular methodological interests or research objectives.

The breaking-up tactic and analysis of categories, however crude, are straightforward procedures suited for evaluating cities ranked by scales with conceptually incompatible dimensions.[4] In certain ways, such steps are superior to the more complicated, nonlinear correlational method. Moreover, a curvilinear formula may be applied whenever necessary, as will be done here later.

We have extended the validation procedure by attempting to capture some dimensional meanings implicit in the results of MSA. Arrangements of cities according to the horizontal and vertical axes are interpreted furthermore as indicating city positions on two continua: "core-periphery" and "urban-traditional," consistent with the concepts we coined earlier (also see [12]). For example, cities on the horizontal axis are interpretable along a "core-periphery" dimension. This dimension is particularly appropriate in describing the 1960 data in

[4] A one-dimensional MSA theoretically is comparable to a Guttman scale. In this case, city rank-order positions may be compared with those for the Fujimoto scales through a more refined correlational formula, such as Pearson's product-moment r, rank correlation or Kendall's tau.

TABLE IV

PRODUCT-MOMENT CORRELATIONS BETWEEN THE FUJIMOTO SCALES AND MSA AXIAL SCORES

Fujimoto Scales	MSA 1960		MSA 1970	
	Horizontal	Vertical	Horizontal	Vertical
1. Interlarded	.62	.60	.67	.56
2. Commercial	.66	.68	.73	.63
3. Articulation	.62	.61	.66	.62
4. Recreation	.58	.50	.61	.37
$n=$	(38)	(31)	(38)	(30)

which cities are markedly ordered on that continuum. On the other hand, the vertical axis may be treated as an "urban-traditional" dimension, with the exception of the core cities which have negative scores as do the traditional cities.[5] For each diagram, we then compared the axial scores of cities (after reversing the signs for the horizontal axis) with those in the Fujimoto scales. Since cities on the vertical axis are linearly ordered among peripheral cities, especially in the 1960 data, the core cities were not entered in the computation. While this omission amounted to some city losses, our overall results (Table IV) are generally in line with the findings presented in Table III.[6] Despite the low magnitude of the observed correlations (by product-moment formula), such relationships are taken to yield basically the same information as do the gamma coefficients. (Gamma is somewhat more inflated than the conservative estimate resulting from product-moment correlation.)

These correlations are now viewed as additional validity coefficients for the (conceptual) dimensions of MSA in 1960 and 1970 Philippine cities.

VI. CONCLUSIONS

The feasibility of constructing a typology of cities has been successfully shown in this study. Three theoretical types have emerged through the application of MSA, namely, core, urban, and traditional. In a way, these groups of cities may

[5] City positions in the Euclidean space should be viewed as relative and configurational. That is, the axes are merely lines without any special meaning so far as interpreting locations is concerned. Since MSA is invariant to rotation, as are the other nonmetric techniques originally developed by Louis Guttman and James Lingoes, the configuration of cities remains the same no matter where the axes are drawn. Thus, cities located at the negative side of the continuum, such as the core cities, are interpretable as "high" on the core-periphery dimension relative to the other cities.

[6] Applying a curvilinear formula for the thirty-eight cities on the horizontal axis yielded similar results for the 1970 data, the r's being 0.56, 0.60, 0.62, and 0.49, in that order (reading downward) of the paired comparison displayed in Table IV. Moreover, the curvilinear correlations for the 1960 data are: 0.35, 0.41, 0.38, and 0.27, or a reduction of about half the magnitude of computed coefficients compared to that table. These findings reinforce our interpretation that the pattern of modernity among cities in 1970 is curvilinear.

be thought of as ordinal rankings in terms of modernization process, but are considered evidence for the nonlinear (i.e., curvilinear) trend of modernization within the Philippines. A dimensional interpretation of these types suggests that they are reducible into two continua: core-periphery and urban-traditional. Their arrangement, however, does not neatly fit these two axes due to a distortion produced by the nonlinear patterning of cities.

In addition, use of MSA has pointed out an accompanying characteristic of modernization, dualism, which distinguishes the core cities rather sharply from the peripheral cities. This is taken as meaning that modernization tends to be polarized as a result of different forces operating from one region to another. McGee [14] has analyzed its implications for planned development, particularly along lines of easing out social inequities brought about by swiftly moving influences of modernization in many Asian cities. Happily enough, we found dualism among Philippine cities to be diminishing overtime, supporting previous research [5].

Efforts to validate the tripartite city classification and the two-dimensional structure of modernity have yielded satisfactory results. A close agreement of these typological categories with the Fujimoto scales of urban complexity has been observed, taken here as evidence of validity of the classification/rankings of cities through MSA. Thus, we have established that MSA is a useful technique in generating a typology of cities as a framework for the study of social change and modernization.

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