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A NEW APPROACH TO THE STUDY OF SOCIO-CULTURAL CHANGE, MARRIAGE, CASTE AND RELIGION IN SRI LANKA (CEYLON)

by

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Social researchers continue to confront methodological problems in the description and study of socio-cultural institutions. We propose a method of study wherein the structural characteristics associated with the entity under study are represented by matrices (double entry tables). The matrices themselves have an operator representation. Their commutation relations, time sequences of the off diagonal elements, etc., are important indicators of the dynamics of structural change and the emergence of new social entities. As an illustrative example, it is shown how the institution of marriage in Sri Lanka (Ceylon) could be studied, embedded in the caste and religion substructures. Matrix representations in the bases are given : interesting numerical data on caste, religion and marriage in Sri Lanka (Ceylon), are extracted, and quantitative estimates of the break down of caste barriers are presented, using data for 1972 and 1982.

1. Introduction

Social researchers continue to confront methodological problems in the description and study of socio-cultural institutions. This difficulty is most marked in problems where the time evolution of social groups, breakdown of existing structures and the rise of new structural relations, etc., become important. Also serious epistemological problems are confronted in regard to the limits of validity and criteria of truth found in sociological investigations which forget the dynamic aspects of social institutions.

In principle, all scientific studies, be they of social or physical systems, involve an examination of two aspects, viz., the initial conditions describing the system at a time and the dynamical conditions that govern the evolution of successive configurations of the system. Even the static interrelations which exist within the components of the initial state, pose such complex problems that much of social science becomes essentially narrative and descriptive. Some of the simpler parameters which describe the initial state may be quantifiable and become a statistic. However, they often remain pure statistical entities quite divorced from the underlying structure within which they should have been embedded.

When we come to the time dependent aspects of the problem, very often we have nothing more than the contributions of historians. In the more traditional investigations, the account is purely descriptive. But the more näive attempts at quantifications lead to senseless collections of 'statistics' which have lost the sparkle of intuitive wisdom and also failed to attain the sculptured beauty of the respectable sciences.

The simple statistical approach, where a selected property of the system is studied is quite common in the more easily quantifiable social sciences, e.g. economics, demography, etc. But the increasing interest in the dynamics of social change (B. Barber 1957, Andre Beteille 1965, Singer 1964, Sirsikar 1970) demands a methodology much more complete than the statistical approach found in, for example, Singer, or Sirsikar. Some of the more recent work in this direction have not shown any significant improvement.

One may 'measure' or quantify various properties of the socio-cultural system asserting that there is a need to characterise the system before any 'measuringful' study can be carried out. There is indeed a certain measure of truth in this inductive point of view. But the inductive point of view becomes a sterile cataloging of data unless it is guided by a theory which tells the experimentalist or field worker what sort of data should be gathered.

Another dead-end common in many basic studies is an attempt to define such things as 'caste', 'class', etc., in some semantically precise way. In the first place these are not precise concepts but are categories enveloping an ensemble of concepts. Such concepts should be undefined elements within a theory which defines them purely through their structural relation to other categories present in the theory and through the empirical content of the theory. Nowadays no one ever attempts to define what an atom is. But it becomes measuringful as a concept which describes and inter-relates a vast array of experimental and theoretical material.

Unlike the physical scientist, the social scientist does not have the advantage (or the 'disadvantage') of an extremely sophisticated and advanced mathematical edifice which demands years of painful study and discipline. And yet, the lack of a theory is never a justification for measurements without a unifying theme. We insist that an abstract model of the system must be the orienting factor in the field-worker's mind. In fact, this model should be proposed in concrete terms, and the quantitative data should be looked upon as a characterisation of the basic parameters of the model which mimicks the gross socio-cultural system. The socio-cultural system has to be approximate by a series of models of increasing sophistication. Each model precedes the previous one by having been modified or more completely characterised in

the light of the field data. This approach, increasingly accepted in quantitative economics, demography, etc., has been the current methodology in the physical sciences for a long time. Undoubtedly, one may assert that all sociological studies have been guided by some form of theory. But we mean an approach which is more concrete than a merely philosophical point of view derived from Freud, Marx or Levi-strauss.

In this publication we propose a method whereby a socio-cultural entity (to be called a 'sontity') could be studied 'embedded' in a posited structure. We will illustrate the method by taking as an example the institution of marriage in a society structured by caste and religion. Cast and religion provide the structure within which the system to be studied is to be 'embedded.' Time evolution of the system will be associated with the 'breakdown' of the caste structure to be increasingly replaced by a class structure formed by elitist groups. Thus the abstract model to be formulated will be a useful vehicule for the study of time evolution of societies. The model should be capable of giving a quantitative meaning to expressions like "caste is more important in southern province marriages than in western province marriages", etc. Another interesting aspect should be its power to test the consistence of structural data obtained from studies on sontities which are believed to be of the same type. For example, the concept of caste is empirically related to behaviour patterns in regard to the following : Marriage (M) commonsality (C) and interpersonal manners of address (I). But naturally, marriage may be 'more strongly' determined by caste, than by interpersonal manners of address. The structure loosening effect on M due to the laxity in I, and vice versa, are important factors governing the dynamics of the socio-cultural system. How could these be quantified and measured? What are the kinetic generators of the system? The model must contain hypotheses for these, as a part of the model.

The general procedure we propose for formulating a working model is as follows: Select some characteristics of the socio-cultural system evidently consistent with the sontity under study. Thus for instance, in a study of marriage, it could be the caste structure, class structure, or the religious structure of the system under study. Evidently, the real system will be infinitely detailed in structure. So we have to think of an infinite dimensionol representative space as the space (or field) described by the model. But if we consider our social system to be dominated by 4 major castes, 3 major religions, we can limit ourselves to a seven dimensional representative space described by 7 unit vectors. Interactions between these 7 factors will have to be presented as 7×7 double entry tables (matrices). (Non-mathematical readers should go directly to section 2). Every sontity describes some form of social action (or ensemble of actions) involving individuals or groups. Thus, for every sontity, we assume that there exists a mathematical operator (or

more generally, an ensemble of mathematical operators) which 'exists' (which acts) in the representative space. In effect, we construct a mathematical image of the social system and its socio-cultural entities as an abstract multi-dimensional space with a set of representative operators. Since these operators exist in the multi-dimensional space defined by the basis vectors (each vector representing a structural characteristic such as caste) it is immediately evident that each mathematical operator will have a matrix representation in the given structural basis These matrices will thus be algebraic representations of the sontities being studied within the abstract model, In section 2 we shall address ourselves to the task of constructing these matrices which form the empirical content of the theory.

The reader should note the epistemological consequences of this model. The society, with its structure, is mirrored by a multi-dimensional space having the desired structural characteristics of the original system. Socio-cultural entities (sontities) become mathematical operators in the abstract space. They are empirically displayed as tables of numbers, viz., matrices. Thus the laws governing the interplay between sontities become a part of the particular algebra obeyed by the matrix elements. Thus, the task of field work is the determination of this algebra, together with the time evolution properties of the operators (or matrices).

One of the most interesting characteristics of an operator algebra, as opposed to a scalar algebra, is the commutation properties of the operators. The operation of tying one's tie, denoted by the operator T, followed by tying one's shoe laces, denoted by S, leads to the same effect irrespective of the order of operations. Thus one says that ST = TS, the two operators are said to commute. On the other hand the operator X, representing the act of putting on one's socks, and the operator Y, representing the act of wearing one's shoes, do not commute since XY does not have the same final result as YX. Evidently then, some of the mathematical operators in our abstract space will commute, whilst others will not commute. *The hypothesis, to be followed within this theory, is to contend that the noncommutativity of the representative operators is the impetus to structural change in the system.* We propose that the socio-cultural system will break-down in a direction determined by each operator attempting to achieve a diagonal matrix representation (i.e., commutation). The extent of the interaction between two sontities is then given by the commutator between two corresponding mathematical operators.

It should be noted that a program of field work to study a particular social topic will itself have a mathematical operator, say F, as its representative in the abstract space. If the program of field work disturbs the sontity, say S, which is being studied, then evidently S and F are non-commutative operators.

Clearly, to obtain unique (i.e., verifiable) results, one must ensure that one's method of study F, is chosen to be as far as possible commutative with the topic under study.

Consider an abstract space limited only to the structure represented by three castes, to be denoted by three orthonormal vectors (mutually perpendicular basis) C_1, C_2 and C_3. We study the socio-cultural entity of marriage, denoted by the operator M, in this abstract space. We look for a matrix (i.e. tabular) representation of M. This is considered in the next section.

2. Construction of a representative matrix (tabular representation)

To characterise the abstract operator in terms of empirical quantities, we take a sample of the society under study and obtain, for this sample, the number of marriages of individuals from caste 1 to itself (in-caste marriage). This number is denoted by M_{11}. Similarly the number of marriages for caste 1 to individuals in caste 2 will be derived by M_{12}. In this way we form the matrix representation, or double-entry table, thus

$$M = \begin{matrix} M_{11} & M_{12} & M_{13} \\ M_{21} & M_{22} & M_{23} \\ M_{31} & M_{23} & M_{33} \end{matrix}$$

Any element of M, denoted by M_{ij} is an index of inter-marriage between caste i and caste j. If $i \neq j$, then M_{ij} is called a non-digaonal element or an 'off-diagonal' element. If marriage is exclusively caste structured, all except the diagonal elements (i.e. M_{11}, M_{22}, M_{33}) will be zero. The existence of non-diagonal elements from zero is a measure of the break-down of caste structure. M_{11}, M_{22}, and M_{33} will be in proportion to the percentage population of castes C_1, C_2 and C_3 in the sample. Once the matrix has been obtained, all the theorems of matrix algebra become immediately available to the social scientist, placing at his disposal an extremely powerful mathematical weaponry.

What is the place of standard statistical methods within this scheme? Statistics, as applied to social problems, consists of establishing the acceptability of data obtained by studying samples rather than complete systems, so that all the standard statistical methods become necessary for determining the elements M_{ij} from empirical data. Statistical analysis will reveal the reliability limits of each number. But once the numbers have been established, they must be looked upon as representing some aspect of a mathematical model of the system under study. What most social studies lack is this system, viz., the abstract representative space and its inter-relations as described by a suitable algebra defined in the space.

3. Illustrative Example

The traditional marriage in Sri Lanka (Ceylon) is 'arranged' by the parents of the bride and bridegroom, in such a way that the social level of the two families match. This is often done through the intermediary of a 'marriage broker' who is the go-between of the two families. In recent years newspaper advertisements have been used (as also in other countries) to an increasing extent to find marriage partners.

These advertisements usually indicate the caste, religion and other characteristics of the advertising party, whilst specifying the social background of the desired partner. P. T. M. Fernando (1964) has made an analysis of these newspaper advertisements and discussed the factors determining marriage in Sri Lanka. In order to circumvent tedious field work, we have ourselves chosen these advertisements as our source of data.

It should be noted that this sampling method is nearly perfect in that it is a 'natural sample' rather than an experimentally imposed sample. (i.e. in our language, the sampling operator commutes with the system operators). The sample will be representative of the literate urban and semi-urban middle class Sri Lankan society. (It would be meaningless to look for a sample representative of the 'whole' of Sri Lanka as it is a mixture of urban, village and ur-village settlements, having large ethnic-linguistic and religious inhomogeneities). The sampling method is well-defined and precise. 'Caste' is comprehended and used as it occurs in the advertisements—i.e. as used by the people themselves.

The institution of marriage M consists of a number of operations involving marriage proposal or courtship, engagement and finally the act of marriage. Thus the operator corresponding to M could be decomposed into an ensemble of operators A, B,. . . . where A for example, may be taken to represent the act of proposal. Our data (from the newspapers) enables us to study A, which is sociologically the most interesting.

P. T. M. Fernando points out that religion and caste seem to be the most important factors in Sri Lanka marriages. As such we shall attempt to represent A in a space spanned by a caste sub-space and a religion sub-space. On studying a sufficiently large sample of advertisements, one comes across most of the castes of Sri Lanka. We will restrict ourselves to the four main Sinhalese castes appearing in the samples, and similarly study only Buddhist (B) Catholic (C) and Protestant (P) groups. The four main castes, arranged in order of decreasing frequency of appearance in the advertisements, are "Goigama" (G), "Karawa" (K) "Durawa" (D) and "Salagama" (S). For an account of these castes the reader is referred to Bryce Ryan (1953).

Although we are dealing with only four castes, it is convenient to think of a fifth group consisting of those caste liberates who have emancipated themselves of the caste structure. Those unconcerned by caste will be denoted by U(C). They would be (for the moment) considered to be orthogonal to, i.e., independent of, the set of G, K, D, and S. Hence the caste sub-space could be treated as 5-dimensional, i.e. G, K, D, S and U(C). Similarly, the religion sub-space, consisting of B, C, P and U(R), where U (R) are the religion liberates, would be 4-dimensional. Hence the total representative space is 9-dimensional. This approach where the caste and religion liberates are treated as extra dimensions is unnecessary but rather convenient. A more satisfactory formal approach is to treat U(C) and U(R) as being linearly dependent on the caste (and religion) base vectors respectively. Thus, as an alternative to treating the caste-liberate groups as forming a new vector orthogonal to the set G, K, D and S, we may take the hypothesis that U is a linear combination of G, K, D and S such that $U = (A_{11})^{\frac{1}{2}}G + (A_{22})^{\frac{1}{2}}K + (A_{33})^{\frac{1}{2}}D + (A_{44})^{\frac{1}{2}}S$ with the trace ΣA_{ii} normalised to unity. This procedure is equivalent to dividing the caste-liberates in proportion to the caste distribution found in the system This has been done in Fig. 3. It should be noted that the matrices given in Figs. 1-4 have been normalised to have a trace equal to 100.

The sample studied consisted of Sunday newspaper advertisements of the "Ceylon Observer" and the Sinhalese Language analogue, the "Silumina," over a period of time. The general consistency of the data obtained each week was established by statistical analysis. In the following we shall present data obtained from a study of the advertisements which appeared in January 1972 and August 1982, as giving a 10-year time evolution. More detailed analysis of data over a number of years, showing time series trends, etc., will be reported elsewhere. The data for 1982 were not as carefully treated as those of 1972 as the '82 data were collected over a short visit to the island.

The sample size, obtained from English newspapers was 200 whilst that for the Sinhalese newspapers was 250. From an analysis of these advertisements, the number of in-caste marriage proposals for each caste, as well as cross-caste acceptance could be sometimes ascertained. These matrices A_{ij} are given in figures 1, 2, 3, and 4. Only data pertinent to the resident Sinhala Communily has been used in the analysis.

Let us examine Fig. 1A to see what it implies. The sum of the diagonal elements A_{11} A_{22} A_{33} and A_{44} (i.e. 61, 25, 7.2 and 6.8) has been made 100 and all the elements have been proportionately adjusted. Although it is not quite correct to read into the matrix without working out its eigenvalues, since the non-diagonal elements are small we can state that 61 % of the English

sample are of the Goigama caste, 25% of the Karawa caste, 7. 2% and 6.8% are of Durawa and Salagama castes respectively. The column U in Fig. 1, should be understood to mean that 2% of the Goigama caste are willing to marry any caste, 15% of the Karawa caste are willing to marry from any caste, etc. Thus we see that in Fig. 1A, Fig. 1B and Fig. 2, the Durawa caste is the most caste-liberated group. Also, as expected, the English educated samples show greater caste liberation than Sinhalese educated samples, as seen by comparing Fig. 1 with Fig. 2. The lowest entry in Fig. 1 and in Fig 2 gives the approximate percentage of advertisers who did not indicate their caste, and expressed caste liberation in regard to choice of partner. Thus we could say that the 1972 samples show that 11% of the English-speaking middle-class Ceylonese are caste-liberated whilst the Sinhalese educated caste-liberates are only a 5.8%. The 1982 data are in Fig. 1B and show greater caste liberation. The non-diagonal elements in Figs. 1 and 2 (more strictly, those in Fig. 3) are the indicators of social change and caste break-down. In Fig. 1A we see that about 9.8% of the Karawas (0.19 $\times$ 100/25) are interested in marrying Goigama.

These results give, perhaps, for the first time, properly formulated data on the distribution of castes in Ceylon among the Sinhalese. These data are probably reliable for middle class literate groups and hence apply to a fairly large section of Ceylon. More detailed statistical data give us the results shown in Fig. 5.

The reliability limits have been indicated in terms of the observed statistical fluctuations. In our own view, one of the most important results of this study is the quantification of the break down of caste structure. U(C) in Fig. 1 and Fig. 2 indicates the extent of caste break down in each caste.

In forming Fig. 4 we have treated the religions subspace as being independent of the caste subspace, and obtained a matrix representation A_{ij} (R) directly, from the empirical data for religious preferences indicated in the sample studied.

We can construct an indirect representation for A_{ij} (R) denoted by A_{ij} (C) in the following manner. Knowing the distribution of castes in each religion we can write, for example, for B (i.e. representing Buddhist groups),

$$B = A_{bg}\,G + A_{bk}\,K + A_{bd}\,D + A_{bs}\,S$$

where A_{bg}, A_{bk} etc., are expansion coefficients, G, K, D, and S are the unit vectors representing Goigama, Karawa, Durawa and Salagama in the representative space. We can similarly express C (Catholic) and P (Protestant) vectors in terms of the caste vectors. In general if we write

$$R_i = \sum_a a_{ia} C_a$$

where R is the i-th religion vector, C_a the a—th caste vector, we have, for the matrix elements of A in the religious basis

$$\langle R_i|A|R_j\rangle = \sum_{a\beta} a_{ia} a_{j\beta} \langle C_a|A|C_B\rangle$$

where the bracket notation common in the theory of vector spaces had been used for convenience.

Thus we can derive A_{ij} (C), the religion representation of the marriage operator, from the caste substructure if the coefficients a_{ia} are available. On analysis of the empirical data available to us, it was found that the statistical fluctuations were too large for the numbers to be very reliable. However, since we are mainly interested in presenting a methodology, and since some data taken with caution could be better than nothing, we will indicate the derivation of A_{ij} (C) from A_{ij} (C) of Fig. 1.

The linear expansion of the vectors for religions, in terms of the caste structure were taken to be

$$\begin{aligned} B &= \sqrt{.9}\,G - \sqrt{.7}\,K + \sqrt{.7}\,D - \sqrt{.6}\,S \\ C &= \sqrt{.05}\,G - \sqrt{.1}\,K + \sqrt{.3}\,D - \sqrt{.3}\,S \\ P &= \sqrt{.05}\,G - \sqrt{.2}\,K + \sqrt{.1}\,D - \sqrt{.1}\,S \end{aligned}$$

for the 1972 samples, on the basis of the limited empirical data on the distribution of castes by religion that was available to us. It is found that, given the error limits of the data, the matrix of Fig. 1 could be treated as diagonal for this purpose.

Hence we obtain the representation given below, in Fig. 6.

We could regard Fig. 4 and Fig. 6 as reflecting the same socio-cultural entity from two distinct points of view. In Fig. 4 religion substructure is uppermost, in Fig. 5 caste substructure is uppermost. Fig. 6 says that if caste is the determinative factor then there should be large (e.g. 3.4, 5.8, 3.9) inter-religious marriages in the social systems, whilst Fig. 4 says that actually this is not so. The implication is that Buddhism, Catholicism and Protestant christianity in Sri Lanka (Ceylon) are factors which tend to destroy the caste substructure. That is, the religious substructure (which cuts across the caste substructure) is more important than the caste substructure. The matrices of Fig. 4 and Fig. 6 enable us to discuss these questions quantitatively.

A comparison of Fig. 1A and 1B, for data obtained in 1972 and 1982, shows a definite increase in the break down of caste barriers. All the off-diagonal elements shown have increased. Further, the column U (C) for 1982 shows a strong increase in comparison to U(C) of 1972.

4. Conclusion

We have presented a method of study of socio-cultural entities which enables one to obtain matrix representations of the entities from field data. The off-diagonal elements have been identified as the indicators of socio-cultural change, while the constancy of the diagonal elements reflect the degree of conservation. These ideas have been demonstrated by an example of an application to the concepts of caste and religion in Sri Lanka. The power and potential of the new method can be ascertained by comparing this study with the tradition methodology of, for example, P.T.M. Fernando (1966) who studied essentially the same questions.

		G	*K*	*D*	*S*	*U(C)*
G	..	61	.062	—	—	2.0
K	..	.19	25	—	—	15
D	..	.19	.062	7.2	—	40
S	..	.12	—	—	6.8	27
		—	—	—	—	11

Fig. 1*A*. Caste-caste marriage-proposals matrix Aij(C), English sample 1972. This matrix is to be understood as follows : 61% of the G-caste wished to marry into the G-caste only, but 2% of the G-caste were unconcerned about the partner's caste, as shown under U(C). 11% did not indicate any caste. A dash indicates unavailability of data. The other entries are understood similarly.

		G	*K*	*D*	*S*	*U(C)*
G	..	56	—	—	—	5.3
K	..	2.6	33	—	—	4.6
D	..	—	—	2.9	—	8.3
S	..	1.7	—	0.9	8.1	1.7
U(C)	..	—	—	—	—	16.7

Fig. 1*B*. Same as in Fig. 1A but data are from 1982 English language samples. Note the larger off-diagonal elements and the larger values of U(C) showing structural break down (of caste).

		G	*K*	*D*	*S*	*U(C)*
G	..	70	—	—	—	1.0
K	..	.15	13	—	—	2.6
D	..	.04	.04	8	0	14
S	..	.04	—	—	5	7.7
U(C)	..	—	—	—	—	5.8

Fig. 2. Caste-caste marriage-proposals matrix Aij(C), Sinhala language samples, 1972.

		G	*K*	*D*	*S*
G	..	61	1.2	.18	.18
K	..	6.0	25	.54	.49
D	..	5.5	2.1	7.9	.42
S	..	3.6	.85	.29	6.7

Fig. 3. Data of Fig. 1A contracted into a 4-dimensional representation by treating the U-vector as a linear combination of G, K, D, and S vectors—1972 English sample.

		B	*C*	*P*	*U(R)*
B	..	78	0	0	2.9
C	..	0	16	0	11
P	..	0	.06	6.9	8.6
U	..	—	—	—	5.1

1 *Year*	1972	1982
Goigama	68 ± 6%	61.31 ± 6%
Karawa	17 ± 6%	26.2 ± 5%
Durawa	8.0 ± 2%	5.4 ± 2%
Salagama	5.8 ± 2%	7.1 ± 2%

Fig. 5. Caste-caste breakdown of samples.

		B	*C*	*P*
B	..	82	3.4	5.8
C	..	3.4	9.3	3.9
P	..	5.8	3.9	8.2

Fig. 6. Religion-religion marriage-proposals matrix derived from the caste-caste matrix-Fig. 1; Aij(C), 1972 sample.

References

Barber, B., 1957, Social Stratification, New York.

Beteille, A., 1965, Caste, class and power, California.

Dumont, L,, 1966, Homo Hierarchicus—essai sur le systeme des caste. Gallimard, Paris.

Fernando, P.T.M., 1964, Factors affecting marital selection in Ceylon. Ceylon Journal of Hitorical Social Studies Vol. 7 No. 2, Colombo.

Hutton, J. H., 1946, Caste in India, Its Nature, Functions and Origins, Cambridge.

Piaget, J., 1968, Le Structuralisme, Paris

Ryan, B., 1953, Caste in modern Ceylon, New Brunswick, N.J.

Singer, R.M., 1964, The emerging elite, Cambridge, Mass.

Sirsikar, VM., 1970, Rural elite in a developing society, Poona.

Yalman, N., 1967, Under the Bo Tree, California.