Correlates of the desired family size among Indian communities

(fertility/India/ethnicity/castes)

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ABSTRACT   The People of India database of the Anthropological Survey of India documents 631 cultural, ecological, and economic traits of the 4635 communities to which the entire Indian population is assigned. Focusing on 1342 communities of South India, we looked for correlates of low (1 or 2 children) and high (4 or more children) desired family size (DFS) reported as the norm for any given community by key informants. We found 10 cultural and 18 economic traits to be significantly correlated to high DFS and 21 cultural and 9 economic traits to low DFS. The economic traits so identified are compatible with high family size being desired by parents who have little capability of investing in quality of offspring, but whose children contribute economically from an early age. In contrast, communities desiring low family size are part of the modern intensive agriculture/organized industry/services sector and invest heavily in educating their children. A composite index based on 27 economic traits (CEI) has a high predictive value with respect to the DFS for the entire set of 4635 Indian communities. The 31 cultural traits highly correlated to high or low DFS constitute 5 clusters that can be identified as characterizing scheduled tribes, scheduled castes, rural and landless lower castes, urban upper castes, and Moslems. Whereas economic traits have similar influence on DFS within each of these ethnic categories, Moslems demonstrate a significantly higher DFS for lower values of CEI.

Segmented into thousands of communities, India harbors one of the most culturally heterogeneous of human societies. Many members of a significant proportion of Indian communities still pursue traditional, hereditarily prescribed modes of subsistence ranging from trapping birds, shifting cultivation, artisanal fishing, and nomadic sheep herding to mat weaving, pottery, and the dispensing of herbal medicines. At the same time Indian society is rapidly industrializing, with large tracts of land under intensive chemicalized agriculture and a substantial modern industrial and services sector. The interaction between the traditional and the modern in this diverse society is a matter of great scientific interest. The Anthropological Survey of India has recently concluded a major ethnographic survey project (1) called the "People of India" (POI) that provides excellent material (2–4). This material is in many ways superior to the Human Relations File at Yale University (5). We attempted this study with reference to the desired family size (DFS) reported as a community norm focusing on 1342 communities of the 4 southern states of India.

MATERIALS AND METHODS

The POI project, conducted between October 1985 and March 1992, aimed at preparing a basic ethnographic account for all communities of India (1). For this purpose the entire Indian population was assigned to 4635 communities distributed over 32 states and union territories. An entire series of ethnographic surveys, district gazetteers, and community-wide censuses (compiled under British rule and largely between 1881 and 1941), and lists of scheduled and socially backward communities compiled following independence in 1947, formed the basis for the identification of these 4635 communities. Indian society is primarily made up of endogamous caste groups variously estimated to number between 40,000 and 60,000 (6). These caste groups have tended to retain their identity even after conversion to Islam or Christianity. A number of the endogamous tribal groups constitute another significant component of this segmented society. In modern times these endogamous groups have tended to merge into larger clusters, with gradual loss of their traditional basis of division based on occupation and hierarchy, and have acquired newer meaning as politically organized interest groups. The 4635 POI communities represent such clusters of erstwhile endogamous groups with the bulk of the population living in contiguous geographical territories, with broadly shared patterns of traditional occupation and socio-economic status.

The POI project set out to describe all of these communities including their histories and cultural traits, how they perceive themselves today, and the changes they experience in the many facets of their life, especially since independence in 1947. This information was generated on the basis of group interviews, as well as interviews with 24,951 key informants in 1,011 cities and towns and 3,581 villages distributed over 421 of a total of 465 districts. They were conducted by 500 trained scholars, of whom 284 belonged to the Anthropological Survey of India and 216 to various universities and research organizations (1). From these interviews and available literature, both administrative and scholarly, the investigators prepared a descriptive account of all of the communities focusing on ecology and resource use, languages, social organization, interactions and linkages with other communities, economy, occupation, and response to modern developments. These descriptive accounts formed the basis of a computerized database, recording which of a possible total of 891 traits is present in each community (1, 7). Interinformant and interlocational variation was deemed to be within acceptable limits for 668 of these traits. We further concentrated our analysis at the initial stage to 1342 communities from the 5 southern states of Karnataka, Kerala, Andhra Pradesh, Tamilnadu, and Pondicherry because they have been much less affected by large-scale migrations. In the beginning of the study we focused on the trait of DFS (8) because we already understood a great deal of the nature of variation in this trait thanks to a long series of studies, culminating in the National Family Health Survey (9–11). Conducted over 1992 and 1993 by the International Institute of Population Sciences, Bombay, in collaboration with the population research centers of the different states and union territories of India, this survey involved interviews with 89,777 married or formerly married women of ages 13–49 chosen from randomly selected households focused on a number of traits, including health and fertility and DFS. Results of the National Family Health Survey show that DFS, as reported at the household level, is an excellent indication of

Abbreviations: DFS, desired family size; CEI, composite economic index; POI, People of India.

fertility. The fertility actually achieved for the broader group to which the households belong tends to be a little higher, but group level differences in actual and DFS are invariably in concordance. The survey identifies the women and their households only in terms of broad categories based on religion, status as scheduled castes and tribes, and levels of education. The results of this survey provided an excellent way of cross-checking the reliability of POI information. In turn, the POI data allowed us to enrich our understanding of this significant trait through far more extensive intercommunity comparisons.

Of the 1342 south Indian communities, 1284 belong to one or more of the following three categories of the DFS: 1 or 2 children, 3 children, and 4 or more children. No information on DFS was available for the other 58 communities. More than one of these categories was recorded in 55 communities. Additionally, seven communities were considered to be heterogeneous concerning other criteria, such as multiplicity of mother tongues. We therefore decided to focus on the remaining 1222 communities. These 1222 communities recorded the presence of 631 of 668 traits. It is this data set of occurrences of the 631 traits for 1222 south Indian communities, indicating one of three choices of DFS, which constitutes the primary basis of our analysis.

RESULTS AND DISCUSSION

Correlation Among Traits. Of the 1222 communities the DFS is 1 or 2 children for 250, 3 children for 813, and 4 or more children for 159 communities. These communities also recorded the occurrence of 628 other traits. We looked for significance of departure in the proportion of communities exhibiting those traits associated with one of the three DFS values. For the DFS value of 3 children, there is no significant departure from the proportion in the entire data set of 0.665 (813/1222) at 1% level by the χ^2 test, whereas the proportions did differ significantly for a number of traits associated with the DFS of 1 or 2 children, as well as the DFS of 4 or more children. We therefore focused on the 409 remaining communities where the proportions differed significantly. These 409 communities recorded the occurrence of 595 traits other than DFS. Of these, 368 traits were shown by 20 or more communities. We decided to ignore the 227 traits shown by 20 or fewer of the 409 communities, and looked at the significance of departure of proportions in the entire data set employing the χ^2 test as well as the Z test for the 5% level of significance using the Bonferroni criterion of $0.05/368 = 0.000135$. Such an

Table 1. Relative magnitude of influence of 58 traits significantly correlated with either low (top 28) or high (bottom 30) DFS

A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
1	E	Girls study up to postgraduate level	57	56	56	52	221	31	C	Consummation ceremony at groom's residence	23	25	25	21	94
2	C	Brahman varna	58	58	57	42	215	32	C	Jowar (sorghum) consumed	20	29	29	13	91
3	C	Vegetarian community	54	53	54	43	204	33	E	Labor (traditional) as occupation	17	27	27	19	90
4	E	Industry (continuing) as occupation	56	55	55	37	203	34	E	Girls study up to primary level	28	23	23	14	88
5	E	Boys study up to postgraduate level	49	49	49	55	202	35	C	Bride-price (cash)	16	26	26	17	85
6	E	Industry (newly acquired) as occupation	55	54	53	36	198	36	E	Child labor exists	26	21	21	7	75
7	C	Other's perception of the community is high	53	46	46	48	193	37	E	Formal education is partly favorable for boys	15	24	24	11	74
8	E	Scholars found in the community	44	45	45	58	192	38	C	Divorce with social approval	24	22	22	5	73
9	E	Savings favored	35	50	50	56	191	39	C	Sacred specialists for marriage ceremony	11	18	18	24	71
10	C	Thread-wearing ceremony observed	52	48	48	41	189	40	C	Beef consumed	19	20	20	12	71
11	C	First feeding of cereals (Annaprashan) observed	50	51	51	35	187	41	E	Landless community	25	19	19	6	69
12	E	Family planning programs favored	38	57	58	33	186	42	E	Labor (continuing) as occupation	29	14	14	8	65
13	C	Creative artists are found in the community	51	47	47	40	185	43	C	Individual affiliation to PIR	9	11	12	29	61
14	C	Disposal of bones in water	45	44	44	51	184	44	C	Marriage with mother's sister's daughter allowed	8	10	10	28	56
15	E	Girls study up to college level	46	41	41	50	178	45	C	Family affiliation to PIR	7	9	9	30	55
16	C	Kanyadan (a marriage ritual) exists	47	42	42	47	178	46	C	Women take alcoholic drinks occasionally	13	16	16	9	54
17	E	Mainly land-owning community	48	40	40	44	172	47	C	Men take alcoholic drinks regularly	14	15	15	10	54
18	E	Engineers/Doctors found in the community	36	39	39	57	171	48	C	Self-perception of the community is low	18	17	17	2	54
19	E	Administrators found in the community	41	37	37	54	169	49	C	Scheduled castes	10	13	13	16	52
20	E	Prefer modern family planning methods	32	52	52	32	168	50	C	Mehar (bride price): promised for future	5	8	8	27	48
21	E	Formal education is favorable for girls	33	43	43	49	168	51	C	Other's perception of the community is low	22	12	11	1	46
22	E	Watch television	37	38	38	53	166	52	C	Circumcision ceremony for boys conducted	6	6	6	26	44
23	E	Members in defense service found in the community	43	36	36	45	160	53	C	Widow remarriage allowed	30	4	4	3	41
24	E	Entrepreneurs/businessmen found in the community	31	35	35	46	147	54	C	Islam (exclusive)	3	3	3	25	34
25	C	Leadership at regional level	42	34	34	34	144	55	C	Women take alcoholic drinks	12	7	7	4	30
26	E	Settled cultivation (traditional)	39	32	32	38	141	56	E	Hunting and gathering (traditional) occupation	4	5	5	15	29
27	C	Dead are cremated	34	33	33	39	139	57	E	Arts and crafts: basketry	1	1	1	23	26
28	E	Irrigation through canals	40	31	31	31	133	58	E	Trapping birds and animals (traditional) occupation	2	2	2	18	24
29	C	Polygyny:nonsororal	21	30	30	22	103								
30	C	Sororate:junior allowed	27	28	28	20	103								

Traits are listed in descending order (column A) with respect to the sum of ranks as determined by (*i*) proportion of communities with low DFS (column D), (*ii*) correlation coefficient (column E), (*iii*) logarithmic odd ratio (column F), (*iv*) weights for the first principal component (column G). The 58 traits are classified as cultural (C), if primarily determined through tradition of the community and economic (E), if closely linked to status of the community in the present day economy (column B). Column H is the sum of the ranks as indicated in columns D, E, F, and G.

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analysis suggests 58 of these traits as being significantly associated with DFS, 28 with low and 30 with high DFS.

Relative Magnitude of Influence. We were further interested in estimating the relative magnitude of the influence of these associated traits on DFS, and in ascertaining if the traits occur in meaningful clusters. The relative magnitude of the influence of the associated traits could be estimated in several different ways. (*i*) The proportion of the communities showing that trait expressing low (or high) DFS. (*ii*) The correlation coefficient *R* between the trait and low (or high) DFS. (*iii*) The logarithm of the ratio of odds: high DFS/low DFS communities among those showing trait i divided by the high DFS/low DFS communities that do not report the trait i. (*iv*) The weights given to the trait in the first principal component obtained from a principal component analysis of the 409 × 58 data matrix (The first principal component explains 21.89% of the variation). Table 1 shows that the relative magnitudes of the influence of the traits estimated by these four ways are by and large consistent. That a trait relating to women's education tops this table is in agreement with earlier findings (12, 13). We have therefore arranged the 58 traits in descending order of the sum of the ranks based on these 4 criteria.

Parental Self-Interest. We attempted to assess whether the association of this set of 58 traits could be explained on the basis of some plausible model of determinants of DFS. The most appealing model in this context postulates that parents view children either as consumer goods or producer goods (14, 15), depending on the kind of economy in which the household is involved (12, 16). Where earnings are dependent on the

acquisition of a high level of technical skills, long periods of investment in the training of children are essential before they can be economically productive. Children are therefore not in a position to contribute to the household economy over most of the economically active lifespan of the parents. Parents then view offspring as consumer goods; as a source of personal satisfaction, with a relatively small number leading to a saturation in the level of satisfaction. Furthermore, in such a system, the parents would be faced with a trade-off between the number and quality of children (15, 17, 18) or the extent of investment per child. Because the future earning capabilities of the children improve with increasing investment of time and resources in training, parents are motivated to produce a relatively small number of children and invest substantially in each of them. Parents belonging to economic strata, where earnings are not based on a long period of formal acquisition of technical skills, tend to view children as producer goods capable of adding to the income of the family from an early age. In such a situation parents are not in a position to invest very much in the children in an effort to enhance their earning capabilities, but are instead in a position to use them to add to the family's income. These parents would benefit from producing a large number of children, and would therefore desire large families.

Several of the 58 traits significantly associated with small or large DFS are consistent with such a model of parental pursuit of self-interest (Table 1). Four of the 28 traits associated with low DFS pertain to the tendency of the community to be favorably inclined toward formal education for girls and to
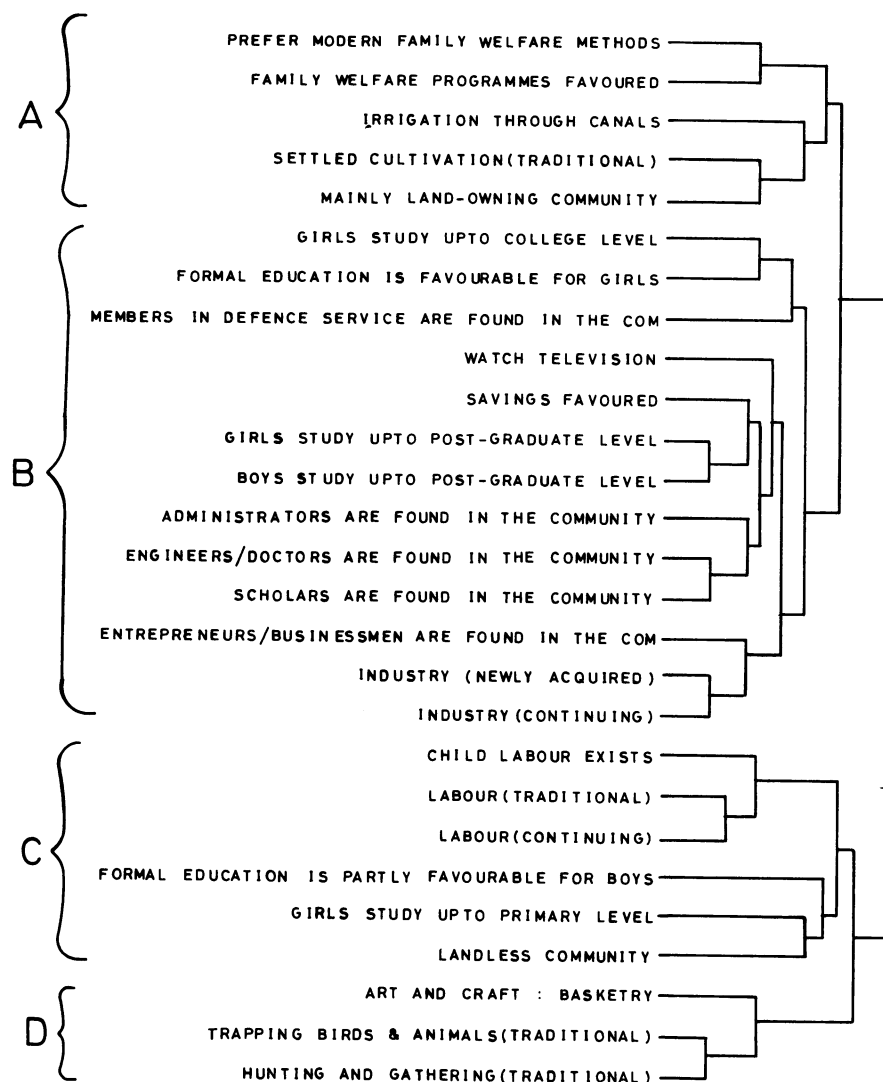

FIG. 1. Complete linkage dendrogram of 27 economic traits significantly associated with either low or high DFS.

educate both boys and girls through college or beyond. Two of the 30 traits associated with high DFS similarly pertain to unfavorable attitude toward the education of girls and girls studying only through primary school level. Eight traits associated with low DFS indicate the involvement of many members of the community in modern professions requiring high levels of technical training such as administrators, scholars, engineers, entrepreneurs, or employment in the industrial sector. In contrast, three of the traits associated with high DFS indicate the dependence of community members on unskilled labor and especially child labor, whereas three other traits indicate their involvement in traditional occupations not dependent on formal education, such as trapping birds, hunting, and basketry. Six other traits associated with low DFS point to the involvement of the community in either intensive agriculture or urban sectors, whereas two pertain to acceptance of modern family planning methods. Thus, as many as 27 of the 58 traits seem consistent with DFS being a parental decision in self-interest (Fig. 1). The other 31 traits are cultural traits linked less directly to economic behavior. Their association with DFS can be interpreted only in the context of the Indian social organization.

Behavior of Social Constituents. The two broad divisions of the Indian society are: (*i*) the tribals who have been outside the fold of organized religions until recent times, and (*ii*) the mainstream society within the folds of Hinduism, Christianity, and Islam. Over the centuries the tribals have been slowly absorbed at lower levels in the Hindu hierarchy; in recent decades large numbers of them have been converted to Christianity. Nevertheless they retain rather separate identity as well as a special constitutional status as scheduled tribes. There are 636 (13.7%) POI communities so classified. Traditionally the Hindu communities have been assigned to five hierarchical categories, or varnas. In descending order of social status they include: Brahmans or priests (362, 7.8%), Kshatriyas or warriors (737, 15.9%), Vaisyas or traders (434, 9.4%), Sudras or peasants and artisans (1348, 29.1%), and the untouchable group, now largely making up the scheduled castes (751, 16.2%). The numbers in parentheses indicate numbers and percentages of POI communities. The scheduled caste is of course an administrative category, and a few of the scheduled caste groups also claim Kshatriya or Shudra varna. On conversion to Islam or Christianity, the community divisions
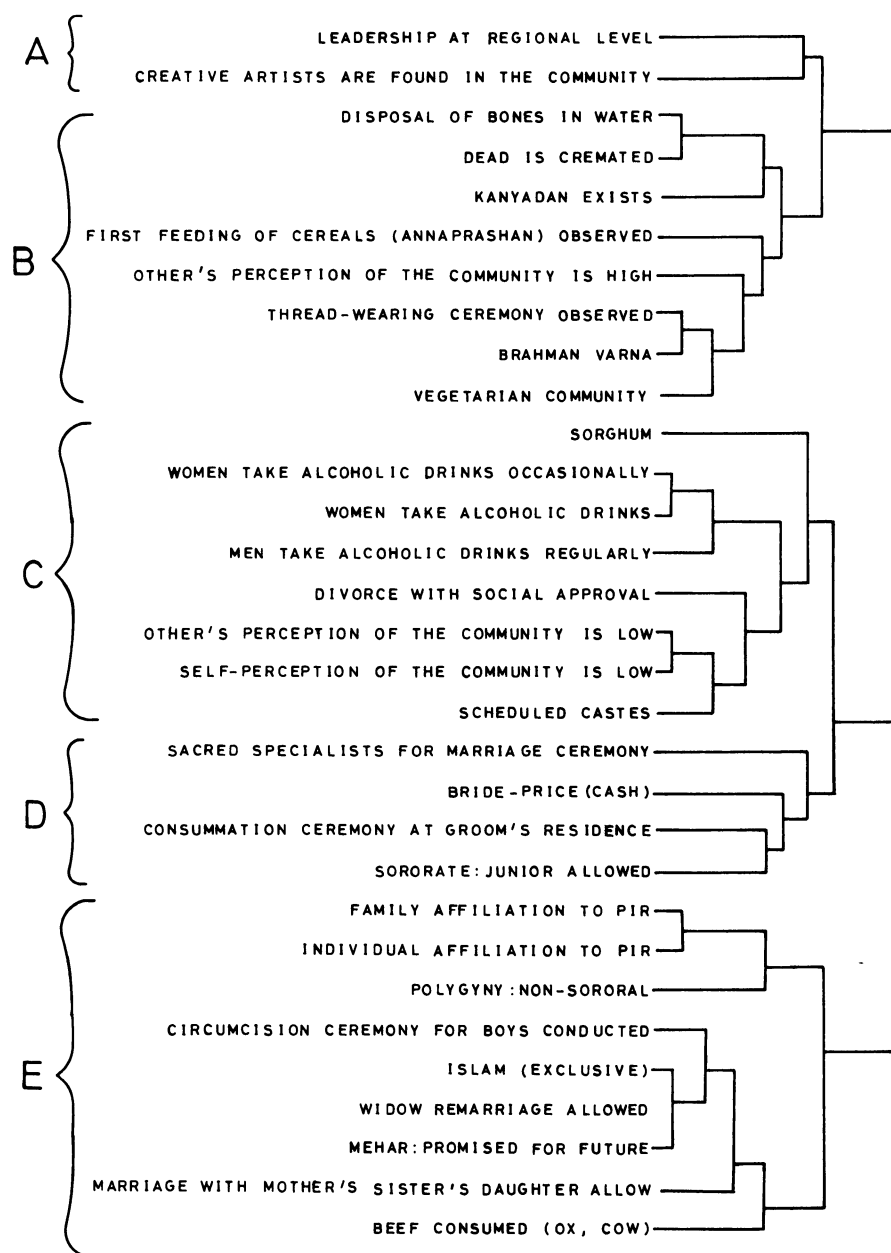

FIG. 2. Complete linkage dendrogram of 31 cultural traits significantly associated with either low or high DFS.

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have tended to remain intact, along with their assigned social status. POI recognizes 584 (12.6%) Moslem communities of which 5 belong to scheduled castes and 19 to scheduled tribes and 339 (7.3%) Christian communities with 21 scheduled castes and 149 scheduled tribes. All of these communities inside and outside the fold of Hinduism still tend to recognize a place in social hierarchy, and six of the POI traits are self-perception of the community's status as high, medium, or low and other's perception of the community's status as high, medium, or low.

In the stratified society of India a community's dependence on either modern occupations demanding a high level of investment in the offspring, or on unskilled labor promoting child labor is strongly related to its position in the traditional social hierarchy and to its traditional hereditary occupation. Communities traditionally enjoying a high social status and involved in learned professions, in land ownership, or trade today tend to dominate the modern sector and show low DFS; communities traditionally relegated to a lower social status and involved in hunting, gathering, farm labor, or artisanal occupations tend today to subsist largely by unskilled labor and show high DFS. This is consistent with the findings of the National Family Health Survey that scheduled castes everywhere show a higher DFS as well as higher levels of fertility (9-11, 13). High and low status communities in the Indian society possess characteristic kinship patterns, rituals, food taboos, and cultural practices. In consequence, a number of these are strongly associated with low or high DFS (Fig. 2).

Trait Clusters. We examined whether the 27 economic and 31 cultural traits could be objectively aggregated into clusters. For every pair of traits, the Pearson product-moment correlation coefficient (based on the joint occurrence of these traits in the 409 communities) was taken to be a measure of association, and the 27 × 27 (or 31 × 31) matrix was subjected to hierarchial cluster analysis using the complete linkage algorithm. Other measures of distance (e.g., Euclidian) and algorithms (e.g., single linkage) also led to very similar clusters, suggesting this grouping to be robust. As Fig. 1 shows, the 27 economic traits form 4 distinct linkage groups. Linkage group A suggests that landowning communities practicing irrigated agriculture are motivated to practice modern family planning methods and desire small families. This may in part be related to the need for considerable technical training for successful pursuit of intensive agriculture, and the desire not to further reduce already quite low levels of landholding. Linkage group B reflects involvement in modern industries and services sectors dependent on high levels of technical training. As expected, these are traits associated strongly with low DFS. Linkage groups C and D include traits associated with high DFS. Group C reflects involvement of communities in unskilled labor, including child labor coupled to a low motivation

to educate children. Group D includes traits of forest dwelling communities outside the modern economy.

Fig. 2 shows clusters constructed in the same fashion as in Fig. 1 for the 31 cultural traits. Clusters A and B are associated with low DFS, C, D, and E with high DFS. Linkage cluster A has two characteristics primarily associated with upper castes that are in a sense intermediate between economic and cultural traits; the other four linkage clusters represent cultural traits associated with specific components of the Indian society. Linkage cluster B includes traits of the Hindu upper castes. It is these castes that today dominate the organized industry/services sectors, have a tradition of learning, and continue to invest heavily in their children's education. As expected, these traits are linked to low DFS. Linkage cluster C represents traits associated with lower, landless, rural communities primarily engaged in unskilled labor. Linkage cluster D represents cultural traits of forest dwelling tribal communities outside of modern economy. As expected, these two trait linkage groups are associated with high DFS.

The fifth trait linkage group (E) includes cultural practices of Moslem communities and is associated with high DFS. This association, consistent with the results of the National Family Health Survey (9-11, 13), is partly explained by the fact that a large proportion of Moslem communities do belong to lower social and economic strata and are engaged in unskilled labor. We shall examine below the tendency of Moslem communities to prefer large families.

Composite Economic Index (CEI). Most of the 58 traits strongly linked to low or high DFS can thus be reasonably interpreted as a consequence—either direct or indirect—of the decision by parents pursuing economic self-interest. Twenty-seven of the 58 traits can be visualized as directly related to the nature of economic pursuits of the majority of community members and thereby influencing the DFS. Notably, none of these traits is exclusively associated with low or high DFS; a small proportion of the communities with girls studying beyond college level still prefer high DFS, and a small proportion of communities in which child labor is prevalent still report preference for low DFS. Nor, as seen above, are we in a position to assign clear cut ranks in terms of relative magnitude of influence to this set of traits. It may then be more appropriate to rank the communities on the basis of a composite index involving these 27 economic traits, leaving aside the other 31 cultural traits whose association is more in consequence of historical accidents. We can therefore rank any community by assigning it a composite score with +1 for the 18 economic traits associated with low DFS, and −1 for the 9 economic traits associated with high DFS (see Table 1).
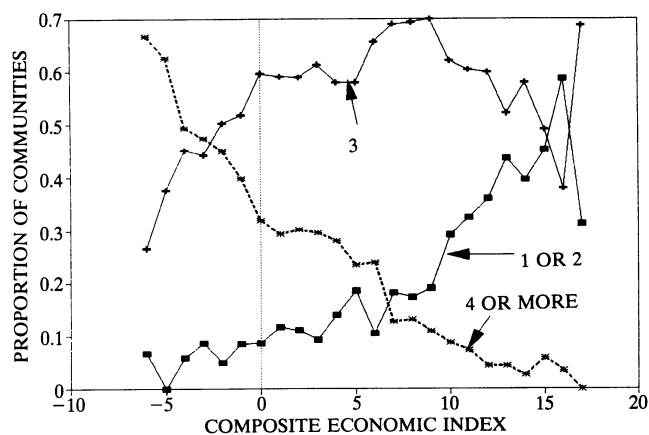

FIG. 3. Proportion of 3925 Indian communities showing preference for 1 or 2, 3, or 4 or more children over the entire range of values of CEI.
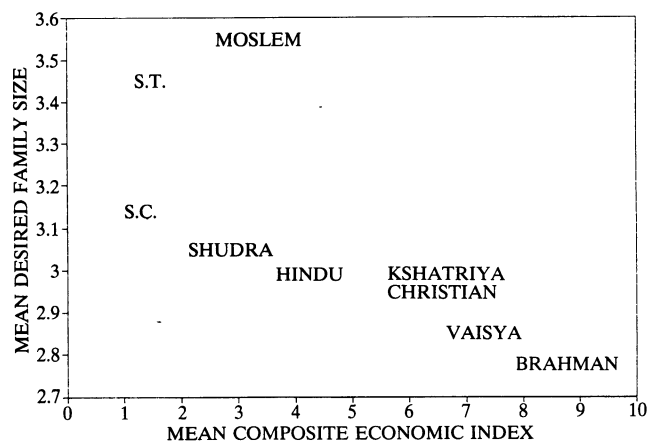

FIG. 4. DFS as a function of the CEI for the major constituents of the Indian society. Brahman, Kshatriya, Vaisya, and Shudra represent, in descending order of social hierarchy, the four large categories of Hindu communities ranked above the scheduled castes and scheduled tribes. Christians and Moslems represent two religious categories, and include some scheduled castes and tribes.
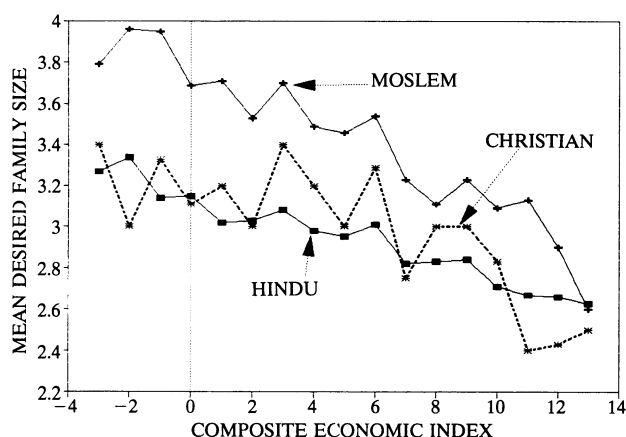
FIG. 5. Relationship between the DFS and the CEI for Hindu, Christian, and Moslem communities.

This score has been constructed on the basis of 409 south Indian communities showing a unique family size preference for either 1 or 2, or 4 or more children. Its strength may be tested by applying it to the entire set of 4635 POI communities. Of these, 3925 communities state a unique DFS, either 1 or 2, 3, or 4 or more children. The computed CEI for these 3925 communities ranges from −6 to +18. Fig. 3 shows the proportion of communities exhibiting various DFS for a given value of CEI. There is a significant positive correlation ($r = 0.9$) between CEI and low DFS, and a significant negative correlation ($r = 0.96$) between CEI and high DFS. The proportion of communities desiring three children increases rapidly between CEI of −6 and 0, more slowly between CEI of 0 and 10, and fluctuates at higher CEI values. CEI is evidently of broad explanatory value in terms of demographic behavior of Indian communities.

Fig. 4 displays mean DFS (computed by equating 1 or 2 with 2, and 4 or more with 4) as a function of mean CEI for the various social categories for the entire set of 3925 community elements. The correlation among social status, economic status, and DFS is clearly evident. In terms of CEI, Moslem communities are close to the fourth or Shudra category, and Christian communities to the second or Kshatriya category of Hindus. This reflects the known historical bias during the course of conversion to these religions. What is notable, however, is that whereas the observed DFS for Christians is close to Hindu communities with an equivalent value of CEI, the observed DFS for Moslem communities appears to be significantly higher than that for the Hindu communities with a similar mean value of CEI (see also refs. 19 and 20). This is consistent with the findings of the National Family Health Survey (9–11, 13).

Fig. 5 shows mean DFS as a function of CEI separately for Hindu, Christian, and Moslem communities. In all three cases mean DFS declines with increasing CEI, the slopes being significantly negative ($P < 0.01$) for Hindu and Christian, as well as Moslem communities. Clearly then the Indian communities respond to economic motivation in a similar fashion irrespective of their religious affiliation. However, while the slopes of the curves for Hindus and Christians are not significantly different from each other, that for Moslem communities is significantly higher in magnitude than either ($P < 0.05$). As a result, with increasing CEI, the DFS for Moslem communities comes down at a faster rate than the Hindus or Christians. Moslem communities at the upper end of the economic hierarchy thus have similar preferences for small families as the Hindu and Christian communities. However, they tend to prefer larger families at a significantly greater rate toward the lower level of the economic hierarchy. This may reflect the fact that Hindu communities with low levels of CEI are much more greatly influenced by the ideal of maintenance of low family size so vigorously promoted by the state (12, 21). It is possible that Moslem communities at the lower

end of the social and economic hierarchy feel insecure and perceive their group interests being advanced through larger numbers. Alternatively, they may have lower levels of access to opportunities to move into jobs in the organized sector that demand higher levels of investment in the training of their children. It is notable that Christian communities do not behave in this fashion. This may be related to the virtual absence of any social tension among Hindu and Christian communities, and the special educational opportunities provided by Christian institutions. But, by and large, this first comprehensive picture of the demographic behavior of Indian communities suggests that this behavior is moulded by the same economic and social determinants of the parental perceptions of self-interest that prevail the world over (16, 21–24).

1. Singh, K. S. (1992) *People of India: An Introduction* (Anthropological Survey of India/Seagull Books, Calcutta, India).
2. Singh, K. S. (1993) *The Scheduled Castes: People of India*, National Series Volume II (Anthropological Survey of India/Oxford Univ. Press, New Delhi, India).
3. Singh, K. S. (1994) *The Scheduled Tribes: People of India*, National Series Volume III (Anthropological Survey of India/Oxford Univ. Press, New Delhi, India).
4. Singh, K. S. (1994) *All Communities: People of India*, National Series Volumes IV, V, and VI. (Anthropological Survey of India/Oxford Univ. Press, New Delhi, India).
5. Murdock, G. P. (1967) *Ethnographic Atlas* (Univ. of Pittsburgh Press, Pittsburgh).
6. Gadgil, M. & Malhotra, K. C. (1983) *Ann. Hum. Biol.* 10, 465–478.
7. Joshi, N. V., Gadgil, M. & Patil, S. (1993) *Curr. Sci.* 64, 10–17.
8. Gadgil, M., Joshi, N. V. & Patil, S. (1993) *Hindu Surv. Environ.* 58–61.
9. Population Research Centre (Andhra University, Visakapatnam) and International Institute for Population Sciences (Bombay) (1995) *National Family Health Survey (MCH and Family Planning): Andhra Pradesh 1992* (PRC/Visakapatnam/IIPS, Bombay).
10. Population Research Centre (Institute for Social and Economic Change, Bangalore) and International Institute for Population Sciences (Bombay) (1995) *National Family Health Survey (MCH and Family Planning): Karnataka 1992-93* (PRC/Bangalore/IIPS, Bombay).
11. Population Research Centre (University of Kerala, Thiruvanantha-puram) and International Institute for Population Sciences (Bombay) (1995) *National Family Health Survey (MCH and Family Planning): Kerala 1992-93* (PRC/Thiruvananthapuram/IIPS, Bombay).
12. Caldwell, J. C., Reddy, P. H. & Caldwell, P. (1988) *The Causes of Demographic Change: Experimental Research in South India* (University of Wisconsin Press, Madison, WI).
13. Srinivasan, K. (1995) *Curr. Sci.* 69, 577–586.
14. Becker, G. S., ed. (1960) in *Demographic and Economic Change in Developed Countries*, National Bureau of Economic Research (Princeton Univ. Press, Princeton, NJ).
15. Becker, G. S. (1976) *Economic Approach to Human Behavior* (Univ. of Chicago Press, Chicago).
16. Dasgupta, P. (1992) *Ambio* 21 (11), 95–101.
17. Schultz, T. W. (1973) *J. Pol. Econ.* 81 (2), S2–S13.
18. Schultz, T. W. (1981) *Investing in People: The Economics of Population Quality* (Univ. of California Press, Berkeley, CA).
19. Operations Research Group (1983) *The Second All India Survey Report* (Operations Research Group, Baroda, India).
20. Operations Research Group (1990) *The Third All India Survey Report* (Operations Research Group, Baroda, India).
21. Raftery, A. E., Lewis, S. M. & Aghajanian, A. (1995) *Demography* 32, 159–181.
22. Arnold, F., Bulatao, R. A., Buripakdi, C., Chung, B. J., Fawcett, J., Iritani, T., Lee, S. J. & Wu, T. S. (1975) *The Value of Children: A Cross National Study* (East West Centre, Honolulu, HI).
23. Bulatao, R. A. & Lee, R. D. (1983) *Determinants of Fertility in Developing Countries* (Academic, New York).
24. Dasgupta, P. (1993) *An Enquiry into Well-Being and Destitution* (Clarendon, Oxford).