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Interrelationship Between Development and Fertility

IT is said that development is the best contraceptive for achieving a decline in fertility. Counter evidence is, however, also available on fertility decline without socio-economic development. There are thus gaps in our knowledge in the understanding of the interrelations between the population parameters like fertility and mortality, and the socio-economic development. The policy makers and programme managers thus look forward to researches on this subject.

Before an attempt is made to study the interrelation between development and fertility, it is a necessary to understand the meaning of 'development' as it cannot be a purely an economic phenomenon involving only an increase in per capita incomes. All aspects of human life that determine the quality of life, e.g. development in : (i) economic and social well-being, (ii) industry and agriculture, (iii) trade and finance, (iv) employment and education, (v) health and housing and (vi) science and technology, should be taken into account in considering development. Every community is concerned with the fertility of its members, for it plays varied roles, economic, social and psychological, social security and family lineage. These socio-economic and cultural factors affect the reproductive behaviour either as an independent or intervening variables. It is, however, not clear how the development process acts as a mechanism interacting with fertility. According to Easterlin (1980), fertility is determined by the interaction of three factors : the potential supply of children, the demand for children and the cost of regulating family size. He believes that unless the demand is lower than the potential output of children, there is no motivation for fertility regulation and parents will have as many children as they

wish. If the potential output exceeds demand, parents are faced with the prospects of having unwanted children and will be motivated to regulate fertility. However, the use fertility regulation depends upon its costs. Each of these determinants of fertility are further linked to the major aspects of social change accompanying modernization.

Freedman (1982) believes that, under current conditions, high levels of modernisation on the Western model are not a necessary condition of fertility decline. Motivations for low fertility may come from relatively smaller subsets of developmental changes.

The primary objective of this study is, thus, to understand the relationship between the levels of development and the fertility. It examines each components of development and its impact on fertility behaviour. The central hypothesis is that greater the extent to which rural population is participating in development, the earlier and the more rapid will be the decline in the overall fertility. The unit of analysis in testing the hypothesis is a village.

Data and Methodology

The fertility data used here were taken from the study 'Infant Mortality and its Causes in Gujarat' conducted by Gandotra *et al* (1982), For the purpose of sampling, Gujarat State was divided into three natural divisions ;viz. Saurashtra, North Gujarat and South Gujarat. Multistage stratified sampling design was used to draw samples from these three divisions. During the first stage of sampling, a belt of three districts from each of the three divisions, with a random start, was selected. The districts selected from Saurashtra division were : Bhavnagar, Amreli and Junagadh, whereas the ones selected from North Gujarat division were : Banaskantha, Sabarkantha and Mehsana. And the belt of districts selected from South Gujarat division were Baroda, Bharuch and Surat. Using the sampling frame of the Sample Registration Scheme (SRS) in rural Gujarat, 38 units (a village or a segment of a village) were selected from a total of 166 units, The number of units selected in the sample from Saurashtra, North Gujarat and South Gujarat divisions were 10, 13 and 15 respectively. 38 villages were, thus, selected from the nine districts. Household was taken as the third stage sampling unit and a sample of 7833 currently married females in the age group 15-49 was obtained. The number of sampled currently married females were 2444, 2467 and 2922 from Saurashtra, North-Gujarat and South-Gujarat divisions respectively. The data collected included information on age at consummation of marriage, number of live births, children in the age group 0-9 and the use of family planning.

The questionnaire for this study, however, did not contain any information about the development status of the selected villages from which the fertility data were obtained. A special questionnaire was thus prepared for this pur-

pose. The data collected in this questionnaire relate to population pressure, physical facilities, social facilities, agricultural facilities, non-agricultural facilities available in the selected village. Available Census data in this connection was also obtained to supplement the data obtained by a special questionnaire on the above items. The information pertaining to the development of a village was collected through concerned Taluka Development Officer. The TDO collected the requisite information about the concerned village from Talati (Secretary of the Panchayat) who is stationed in that village. The information about the development level of the villages thus collected is quite reliable. Since it was not possible to get the requisite information about one of the 38 villages, it was dropped from the analysis of the data. Village level information sets for 37 villages were used to estimate the level of development and fertility of the concerned village

Composite Index of Development

Five dimensions of development were integrated together to prepare a composite index of development. These five dimensions are : physical, social, agricultural, and non-agricultural facilities and population pressure. The list of component factors for each dimension of development is given in Table 1. Six component factors were taken to measure physical facilities, three factors to determine social facilities; five factors to measure agricultural facilities, two factors to determine non-agricultural facilities and two factors to measure population pressure. Thus, in all eighteen factors were considered in this study to determine the level of village development. Before constructing the composite index, the standard score of a village on a particular variable is obtained as follows :

$$Y_{ij} = \frac{X_{ij} - X_{j(\min)}}{X_{j(\max)} - X_{j(\min)}} \times 100$$

where, $i = 1, 2, \dots, 37 =$ Number of villages

$j = 1, 2, \dots, 18 =$ Number of variables

$Y_{ij} =$ Standard score of the j th variable in the i th village

$X_{ij} =$ Observed score of the j th variable in the i th village

$X_{j(\min)} =$ Observed minimum score of the j th variable over all the villages.

$X_{j(\max)} =$ Observed maximum score of the j th variable over all the villages.

The standard score, for each village and for all the variables except (i) distance of the village from the nearest town (in km), (ii) percentage of scheduled caste

TABLE 1—FACTORS CONSIDERED UNDER EACH DIMENSION OF DEVELOPMENT AND THEIR MEASUREMENT

<i>Dimension of Development</i>	<i>Factors considered</i>	<i>Measurement of Factor</i>
I—Physical facilities	1. Electricity	Percentage of households with electricity in the village
	2. Tap Water	Percentage of houses with tap water (including common tap) in the village.
	3. Health facility	Number of private or government dispensaries, health centre (including sub-centre) and hospital in the village
	4. Pucca road	In case the village is connected by pucca road, the score-1, otherwise-0
	5. Post office	If the village has a post office, the score-1, otherwise-0
	6. Distance from the nearest town	Distance of the village from the nearest town in actual km
II—Social facilities	7. Secondary & higher Education	Number of students in secondary and higher education per 1000 population in the village
	8. Literacy	Percentage of literate population in the village
	9. Scheduled caste and scheduled tribe population	Percentage of scheduled caste and scheduled tribe population in the village
III—Agricultural facilities	10. Irrigated land	Percentage of irrigated to total land in the village
	11. Electric motors/diesel pumps used for irrigation	Number of electric motors/diesel pumps used for irrigation per 1000 acres of cultivable land in the village
	12. Tractors	Number of tractors per 1000 acres of cultivable land in the village
	13. Thrashers	Number of thrashers per 1000 acres of cultivable land in the village
	14. Price of cultivable land	Average price of one acre of cultivable land (in 100 Rupees) in the village
IV—Non-agricultural facilities	15. Industrial units	Number of industrial units in the village
	16. Workers in non-agricultural work	Percentage of non-agricultural workers out of total workers in the village
V—Population pressure	17. Dependency ratio	Percentage of non-workers out of total workers in the village
	18. Population density (agricultural)	Population per 100 acres of cultivable land in the village.

and scheduled tribe population to total population, (iii) number of non-workers per 100 workers and (iv) population per 100 acre of cultivable land, were obtained by using the above formula as these variables are positively related with the development. In the case of four variables negatively related to development, the standard score for each village was obtained by the formula.

$$Y_{ij} = \left[1 - \frac{x_{ij} - x_{j(\min)}}{x_{j(\max)} - x_{j(\min)}} \right] \times 100$$

The composite index of development was computed by taking the average standard score of all the 18 development indicators of a village. Based on the overall composite indices of development the villages were further classified into low, medium and high levels of development. 12 out of 37 villages were classified as low development villages with a composite index score ranging from 10 to 24 and the mean score being 17.75 (see Table 2) Similarly 13 villages were categorised as medium development villages with a composite index score ranging between 25 to 37 and the mean score of 32.46. The remaining 12 villages were considered as highly developed villages with the composite index score ranging from 38 to 73 with a mean of 48.92.

TABLE 2—CLASSIFICATION OF VILLAGES BY LEVELS OF DEVELOPMENT

<i>Level of Development</i>	<i>Range</i>	<i>Composite Index Score</i>		<i>Number of Villages</i>
		<i>Mean</i>	<i>Standard Deviation</i>	
High	38-73	48.92	9.60	12
Medium	25-37	32.46	4.50	13
Low	10-24	17.75	7.78	12
Total	10-73	33.03	14.17	37

Development Vs. Fertility

It is believed that the availability of physical facilities like electricity, protected drinking water through a personalised or public tap, number of dispensaries/PHC/Sub-Centre/Hospital in a village, connection of a village with pucca road, availability of a post office and the distance of a village from the nearest town may to a certain extent, influence the thoughts of the inhabitants and their fertility motivations. Similarly, the literacy level of the village population and the proportion of its members having secondary and higher education is likely to be associated negatively with the fertility of the concerned population. It is further hypothesised that higher the proportion of scheduled caste/scheduled

tribe population in a village, the higher is the fertility of that village.

The number of electric motors, diesel pumps, tractors and thrashers used per 1000 acres of cultivable land in a village coupled with the price of one acre of cultivable land determine the level of agricultural development of a village, Similarly, the number of industrial units coupled with the proportion of non-agricultural workers out of the total workers in a village would determine the economic development of that village, It is presumed that as a result of economic development of a village, the economic cost of children may increase due to educational and occupational aspirations of parents for their children. This, in turn, may create a negative motivation, among the developing village community, for large family size.

Percentage of population dependent on total workers in a village and population density may become a barrier in the development process of a village and this in turn may effect the fertility behaviour of the community under consideration. It is hypothesised that higher the population pressure in a village, the lower may be its fertility.

In general, it is expected that higher the level of development of a village, based on the five dimensions of development, the lower may be its fertility.

The measures of fertility considered over here are child/women ratio and child/married women ratio. The former one is defined as the number of children in 0-9 age group per 1000 women in the age group (15-49). The second index is also defined in the same way except that it takes into account only married women in calculating current fertility.

Results and Discussion

Table 3 presents correlation coefficients between different components of development and the variables (i) child-women ratio, (ii) child married women ratio, (iii) use of family planning and (iv) age at effective marriage respectively. Table 3 clearly illustrates that there does exist a negative relationship between the level of development and fertility. The magnitude of the correlation coefficients, however, indicates that the relationship is quite weak. Among the different dimensions of development, physical development coupled with the availability of industrial units and/or the number of workers in non-agricultural work seem to be highly correlated with fertility as compared to the other dimensions of development. Further, between the two indices of fertility considered, the correlation in the case of all the components of development was relatively higher when the child marital women ratio was used as an index of fertility. This was expected to be so as CMWR is relatively more sensitive index of fertility than C W R.

Use of family planning in a village was found to be poorly correlated with the individual as well as overall level of development as measured by the com-

TABLE 3—RELATIONSHIP BETWEEN DIFFERENT COMPONENTS OF DEVELOPMENT AND (i) CHILD WOMEN RATIO,(ii) CHILD MARRIED WOMEN RATIO, (iii) AGE AT EFFECTIVE MARRIAGE, AND (iv) PERCENTAGE USERS OF FAMILY PLANNING RESPECTIVELY

<i>Variable</i>	<i>Composite Index</i>	<i>Physical</i>	<i>Social</i>	<i>Agricultural</i>	<i>Non-Agricultural</i>	<i>Population Pressure</i>
1. C W R	-. 207	-. 271	-.110	-.066	-.236	.164
2. C M W R	-. 252	-.308	-.172	-.081	-.279	.173
3. Use of family planning	.078	.097	-.059	.040	.120	.076
4. Female age at effective marriage	.333	.217	.221	.406	.286	-.057

posite index.

The female age at effective marriage was positively associated with different levels of development. This, in other words, means that if the development level of a village is relatively high, the effective age at marriage of the girls of that village is also high. The correlation, however, was not strong enough to yield any definite conclusion.

Having had a look into the correlation of different components of development with fertility, we may turn to the association of different levels of development with fertility, family planning use and female age at effective marriage. The results are presented in Table 4. It is obvious that the villages that were highly developed had a C W R of 12.95, whereas the villages with low level of development had C W R of 13.22 per 100 women. Similarly villages with high level of development had CMWR of 15.90 per 100 women whereas the corresponding value of CMWR among villages having low level of development was 15.97. This clearly suggests that level of development does play a positive role, though quite small in lowering down fertility.

As regards the use of family planning, Table 4 clearly delineates that use of family planning was relatively higher among villages with relatively higher level of development. Similarly, the female age at effective marriage was reported to be slightly higher with relatively high level of rural development.

Since the relationship between the overall level of development and fertility is rather weak, an attempt was made to explore the extent of relationship of each of the 18 independent developmental variables on fertility. It was believed that though some of these independent variables may be significantly associated with fertility, their overall average impact may be getting nullified because of poor relationship of the remaining developmental variables with fertility. This sort of analysis will be useful in arriving at a conclusion as to which of

the developmental variables play significant roles in determining the level of fertility. Step-wise regression analysis is used here to study this interrelationship and predictability of one or a set of development variables with fertility. Since this technique takes care of direction and magnitude of the impact of one variable on the other, no adjustment with the data like changing the sign of the variable or making any sort of transformation was made.

TABLE 4—CHILD WOMEN RATIO, CHILD MARRIED WOMEN RATIO, USE OF FAMILY PLANNING AND AGE AT EFFECTIVE MARRIAGE BY LEVEL OF DEVELOPMENT

	<i>High</i>	<i>Medium</i>	<i>Low</i>
C W R (per 1000 women)	12.95	13.05	13.22
C M W R (per 100 married women)	15.90	15.92	15.97
Percentage users of family planning	43.1	41.5	40.4
Female age at effective marriage	16.93	16.85	16.75

All the development variables were regressed stepwise with the dependent fertility variable-children ever born. This analysis is presented in Table 5. Percentage Scheduled caste/Scheduled tribe population in a village was found to be the most important variable contributing thereby 43 percent of the total variance. Next most important variable was the literacy level of the population of a village. This variable contributed about 23 percent of the total variance. Connection of village by pucca road and percentage of houses having tap water facility contributed about 5 and 4 percent of the total variance. 72 percent of the total variance was found to be explained by these four variables. Rest of the developmental variables did not have significant regression coefficients and hence these variables were not found to be contributing to R^2 adjusted for the degree of freedom.

The above analysis clearly illustrates that only four out of the eighteen developmental variables of a village were associated to a certain extent with fertility. It further reveals that when all these variables were pooled together and composite index was formed even these four factors lost their importance. On averaging the impact of all developmental variables, their relationship with fertility turned out to be rather weak. It appears that the level of development of even developed villages is still low and that it has not attained the threshold when it can start to cause a substantial decline in the level of fertility. Economists argue that if an economy is growing sufficiently rapidly, the general socio-economic well-being of the whole population will improve. It has, how-

TABLE 5—RESULTS OF STEPWISE REGRESSION ANALYSIS WITH NUMBER OF CHILDREN EVER BORN PER WOMAN AS DEPENDENT VARIABLE

<i>Variable entered</i>	<i>Regression coefficient</i>	<i>t-value</i>	$R^2_{adj}^+$	<i>Contribution to R^2</i>	<i>Remarks</i>
<i>Step I</i>			0.429	0.429	
Percentage scheduled caste/scheduled tribe population	0.01892	5.130**			
<i>Step II</i>			0.645	0.226	
1. Percentage scheduled caste/scheduled tribe population	0.02113	7.166**			R^2 increased significantly
2. Percentage literate population	-0.03219	-4.713**			
<i>Step III</i>			0.692	0.054	
1. Percentage scheduled caste/scheduled tribe population	0.02040	7.388**			R^2 increased significantly
2. Percentage literate population	-0.02767	-4.181**			
3. Connection of village by pucca road	-0.50323	-2.486*			
<i>Step IV</i>			0.724	0.039	
1. Percentage scheduled caste/scheduled tribe population	0.02135	8.069**			R^2 increased significantly
2. Percentage literate population	-0.02250	-3.369**			
3. Connection of villages by pucca road	-0.45353	-2.353*			
4. Percentages of houses having tap-water facility	-0.00644	-2.216*			
<i>Final Step</i>			0.692		
All variables	—	—			R^2 remained unchanged

*If $t > 2.031$ at 35 degrees of freedom, the values are significant at 0.05 level.

**If $t > 2.727$ at 35 degrees of freedom, the values are significant at 0.01 level.

+Adjusted for degrees of freedom.

ever, been observed that despite general satisfactory rates of growth in the per capita income, the general living conditions in many parts of the world have not improved as expected and inequalities may have increased, Kocher (1973) observes that inappropriate technologies, policies and institutions may probably result in a dualistic pattern of agricultural growth within which a smaller proportion of the rural population may experience rapid improvements in income, living conditions and considerable modernization, while the living conditions and life styles of most of the rural population may not improve much. As a result the small but the advantaged segment of the rural population may well desire and achieve smaller families but the bulk of rural families will remain largely traditional with little incentives to have fewer children. Thus, under these conditions there is likely to be little, if any, decline in overall fertility and the national programme of family planning would be of little interest to the bulk of the rural population. As a supportive evidence, the case of Sri Lanka could be cited which experienced a much larger fertility decline in recent years as compared to India. One of the reasons for this may be that the distribution of living conditions in Sri Lanka is substantially more egalitarian than in India. The evidence of agricultural and demographic modernization is further reinforced by Khanna study which was conducted in small rural area of Ludhiana in Punjab. Agricultural development has apparently been both rapid and more widely shared in Punjab than in the rest of India and this seems to have effected a decline in its fertility. One may thus conclude that unless the inequalities in the socio-economic development of the developing villages are reduced and the level of development of a village reaches a certain threshold, the fruits of development are not likely to effect a substantial decline in fertility.

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