Demography India Vol. 26, No. 1 (1997),
pp. 37-44

Alok Ranjan*

Fertility Transition in Indian States 1985-1992

Introduction

TN this paper we attempt to analyze transition in crude birth rate in Indian states during the period 1985-92 through the use of a decomposition methodology. It is well known that not only the levels but the trends in crude birth rate vary widely across the Indian states. The decomposition methodology used in this analysis makes it possible to identify factors which may be responsible for differential transition in crude birth rate in different states of the country. The analysis is built upon the information on levels of fertility available through the Sample Registration System for 15 major states of the country.

If conception outside the institution of marriage is ignored then the change in the crude birth rate may be influenced primarily by three factors—(i) risk of conception during married reproductive period; (ii) pattern of entry of females into married reproductive period; and (iii) age structure of the population. All social, cultural, demographic, economic and family factors operate through and only through these three factors to influence crude birth rate. The decomposition methodology employed in this analysis permits to measure the extent of change in the crude birth rate attributed to the change in the risk of conception; change in the patterns of entry into married reproductive period; and change in the age-structure of the population.

---

* Honorary Director, 'Shyam' Institute of Public Corporation and Community Development. Datia, M.P.-475661.

Methodology

Let

CBR = Crude birth rate
TFR = Total fertility rate
TMF = Total marital fertility rate

Then

$$CBR = TFR^* (CBR/TFR) = TMF^*(TFR/TMF)^* (CBR/TFR) \qquad (1)$$

Equation (1) is the basic relationship that we use in this analysis. The first term on the right side of the equation is a measure of risk of conception during the married reproductive period. The second term, on the other hand, is nothing but the index of fertility inhibiting effect due to proportion of females married (Bongaarts, 1978, 1982) and is a measure of the entry of females in the married reproductive period. Finally, the third term on the right is the measure of age structure effects on crude birth rate (Horiuchi, 1991).

It is easy to derive from equation (1) that

$$r_b = r_m + r_{mf} + r_{bf} \qquad (2)$$

where

$r_b = \ln (CBR2/CBR_1)$
$r_m = \ln (TM_2/TM_1)$, TM = (TFR/TMF)
$r_{bf} = \ln (AS_2, AS_1,)$, AS = (CBR/TFR)

The index r_b is used in this analysis as the index of transition in the crude birth rate over two points of time. It is clear from equation (2) that the transition in the crude birth rate over a given time is the algebraic sum of the transition in the fertility inhibiting effect of marriage as measured by the Bongaarts' index of marriage; transition in the risk of conception within the married reproductive period as measured by the marital fertility rate and the transition in the age structure effects on crude birth rate as measured by the ratio of crude birth rate to total fertility rate. Equation (2) makes it possible to decompose the transition in the crude birth rate into the transition in the total marital fertility rate, transition in the fertility inhibiting effect

of marriage and transition in the age structure effects on the crude birth rate. Since both fertility inhibiting effect of marriage and age structure effects on crude birth rate are beyond the scope of family welfare programme, the decomposition also permits to analyze the role of programme and non-programme factors in the transition in crude birth rate.

Findings

Table 1 compiles information on the three indicators used in this analysis—crude birth rate, total fertility rate and total marital fertility rate—for the country as well as for its states as obtained through the Sample Registration System. Between 1985 and 1992, crude birth rate in the country decreased by 3.7 absolute points—from 32.9 in 1985 to 29.2 in 1992. During the same period total fertility rate decreased by 0.7 absolute points which is larger than the decrease of 0.5 absolute points during

TABLE 1: CURRENT LEVELS AND TRENDS IN CRUDE BIRTH RATE, TOTAL FERTILITY RATE AND TOTAL MARITAL FERTILITY RATE IN INDIA

State	*Crude birth rate*		*Total fertility rate*		*Total marital fertility rate*	
	1985	*1992*	*1985*	*1992*	*1985*	*1992*
Andhra Pradesh	30.9	24.9	3.7	2.8	4.8	4.2
Assam	34.7	30.4	4.1	3.4	7.1	6.5
Bihar	38.1	31.7	5.4	4.6	6.3	5.6
Gujarat	32.9	27.9	3.9	3.2	5.2	4.3
Haryana	36.0	31.9	4.6	3.8	5.7	5.0
Karnataka '	29.6	26.2	3.6	2.9	5.5	4.8
Kerala	22.9	17.8	2.4	1.7	4.8	3.8
Madhya Pradesh	37.9	34.7	4.6	4.4	6.2	5.5
Maharashtra	30.0	25.5	3.5	2.9	4.8	4,2
Orissa	32.0	27.9	3.8	3.1	5.2	4.9
Punjab	29.1	27.0	3.5	3.1	5.0	4.8
Rajasthan	38.6	34.6	5.5	4.5	6.2	5.4
Tamil Nadu	25.5	20.3	2.8	2.2	4.7	4.2
Uttar Pradesh	38.0	36.0	5.6	5.2	6.4	6.4
West Bengal	29.8	25.8	3.7	2.9	5.5	4.6
India	32.9	29.2	4.3	3.6	5.6	5.1

the same period in the total marital fertility rate. Obviously, factors that operate out side the institution of marriage have also contributed towards fertility transition.

Among the states of the country, largest absolute decrease in the crude birth rate during the period under reference has been observed in Bihar followed by Andhra Pradesh, Tamil Nadu, Kerala and Gujarat. On the other hand decrease in this rate was smallest in Uttar Pradesh. In Punjab, Madhya Pradesh and Kamataka also, decrease in crude birth rate has been small compared to other states of the country.

In terms of total fertility rate, absolute decrease was largest in Rajasthan followed by Andhra Pradesh, Bihar, Haryana and West Bengal. On the other hand this decrease was smallest in Madhya Pradesh followed by Uttar Pradesh and Punjab. Absolute decrease in total marital fertility rate, however, was largest in Kerala followed by Gujarat, and West Bengal, whereas this decrease was smallest in Uttar Pradesh, there has been virtually no change in this rate during the period under reference. In Punjab and Orissa also, absolute decrease in this rate has been very small.

In Table 2, the index of fertility inhibiting effect of marriage and the age structure effects on crude birth rate have been calculated for the country as well as for its

TABLE 2: INDEX OF FERTILITY INHIBITING EFFECT OF MARRIAGE AND AGE STRUCTURE EFFECTS ON CRUDE BIRTH RATE IN INDIA

State	*TFR/TMF*		*CBR/TFR*	
	1985	*1992*	*1985*	*1992*
Andhra Pradesh	0.771	0.667	8.35	8.89
Assam	0.577	0.523	8.46	8.94
Bihar	0.857	0.821	7.06	6.89
Gujarat	0.750	0.744	8.44	8.72
Haryana	0.807	0.760	7.83	8.39
Kamataka	0.655	0.604	8.22	9.03
Kerala	0.500	0.447	9.54	10.47
Madhya Pradesh	0.742	0.800	8.24	7.89
Maharashtra	0.729	0.690	8.57	8.79
Orissa	0.731	0.633	8.42	9.00
Punjab	0.700	0.646	8.31	8.71
Rajasthan	0.887	0.833	7.02	7.69
Tamil Nadu	0.596	0.524	9.11	9.23
Uttar Pradesh	0.875	0.813	6.79	6.92
West Bengal	0.673	0.630	8.05	8.90
India	0.768	0.706	7.65	8.11

major states. For the country, the index of fertility inhibiting effect of marriage decreased from 0.768 in 1985 to 0.706 in 1995—an absolute decrease of 0.062 points. On the other hand, the age structure effects on crude birth rate increased from 7.65 in 1985 to 8.11 in 1992, an absolute increase of 0.46 points. Among the states, largest decrease in the index of marriage has been observed in Andhra Pradesh followed by Orissa, Tamil Nadu and Uttar Pradesh. By contrast, in Madhya Pradesh, the index of marriage increased during the period under reference leading to a reduction in the fertility inhibiting effect of marriage. Other states where decrease in the index of marriage has been relatively small are Gujarat, Bihar and Maharashtra.

In Table 3, estimates of the index (r_b) *as* well as r_{mf}, r_m, and r_{bf} , have been presented for the period 1985-92. It may be seen from the table that for the country as well as for all states included in the analysis, the index is negative. This implies that in the, country as well as in all of its major states, crude birth rate has declined during the period between 1985 and 1992. But the magnitude of the index varies widely indicating that the amount of decrease in the crude birth rate has varied

TABLE 3: INDICES r_b , r_m AND r_{bf} IN INDIA AND STATES 1985-92

State	r_b	r_{mf}	r_m	r_{bf}
Andhra Pradesh	-0.216	-0.134	-0.145	0.063
Assam	-0.132	-0.088	-0.099	0.055
Bihar	-0.184	-0.118	-0.043	-0.024
Gujarat	-0.165	-0.190	-0.008	0.033
Haryana	-0.121	-0.131	-0.060	0.070
Karnataka	-0.122	-0.136	-0.080	0.094
Kerala	-0.252	-0.234	-0.111	0.093
Madhya Pradesh	-0.088	-0.120	0.075	-0.044
Maharashtra	-0.163	-0.134	-0.055	0.026
Orissa	-0.137	-0.059	-0.144	0.066
Punjab	-0.075	-0.041	-0.081	0.046
Rajasthan	-0.109	-0.138	-0.063	0.091
Tamil Nadu	-0.228	-0.112	-0.129	0.013
Uttar Pradesh	-0.054	0.000	-0.074	0.020
West Bengal	-0.144	-0.179	-0.065	0.099
India	-0.119	-0.094	-0.084	0.058

widely across the states of the country. For the country as a whole, the value of the index has been found to be-0.119. Among the states, deviations from this national average are significant. Highest value of the index r_b has been observed in Kerala followed by Tamil Nadu and Andhra Pradesh. On the other hand, in Uttar Pradesh, the magnitude of the index has been found to be lowest indicating that decline in crude birth rate in the state was only marginal. Other states where transition in crude birth rate was significantly slow are Punjab and Madhya Pradesh.

Like the index r_b the index r_{mf} which is a measure of transition in total marital fertility rate has also been found to be negative for the country. Among the major states, the index has been found to be negative in all states except in Uttar Pradesh where it is zero meaning that there has been practically no transition in total marital fertility rate in Uttar Pradesh during the period under reference. In other states of the country, a negative index r_{mf} indicates that the risk of conception during married reproductive period has decreased between 1985 and 1992. However, as is clear from the table, magnitude of this decrease varies widely across the states. Highest magnitude of the index r_{mf} has been observed, once again, in Kerala followed by Gujarat and West Bengal meaning that transition in total marital fertility rate in these states has been quite rapid. On the other hand, in addition to Uttar Pradesh, the magnitude of this index has been found to be significantly low in Punjab, Orissa and Assam.

Expectedly, inter-state variation in the nature and extent of transition in total marital fertility rate has not been same as that in the crude birth rate. This is expected as both level and transition in the crude birth rate is affected by level and transition in the proportion of females married and the age structure of the population in addition to the transition in total marital fertility rate.

Coming to the index r_m which measures the transition in the fertility inhibiting effect of marriage, it may be seen from the table that barring Madhya Pradesh, in all the states of the country, the index has been found to be negative and the magnitude of the index varies across the states. Highest value of this index has been observed in Andhra Pradesh followed by Orissa, Tamil Nadu and Kerala. On the other hand, in addition to Madhya Pradesh, in Gujarat, there has been practically no transition in the fertility inhibiting effect of marriage whereas in Bihar, Maharashtra and Haryana, transition in the fertility inhibiting effect of marriage has been found to be exceptionally low.

Finally, direction of the transition in the age structure effects on crude birth rate, as measured by the index r_{bf} has been found to be opposite to the direction of the transition in crude birth rate for the country as a whole as well as in all states of the country except Bihar and Madhya Pradesh. This implies that in the country as a whole as well as in most states of the country, the transition in age

structure effects on crude birth rate has acted to retard the transition in the crude birth rate. In Bihar and Madhya Pradesh only, transition in the age structure effects on crude birth rate has acted to accelerate the transition in crude birth rate.

Age structure effects on crude birth rate may be attributable mainly to accelerated growth of female population at peak child-bearing ages, resulting from the influx into the age range of the cohorts born in 1950s and 1960s. In addition, these effects are also a reflection of fertility decline. A direct implication of decrease in fertility is the decrease in the proportion of population who are young children. This decrease in the proportion of young children results in the increase in proportion of the other age groups including female population in the peak child-bearing ages. These changes do not account for short term rise or fall in crude birth rate. Rather, they may be considered as a medium term trend influencing the transition in the crude birth rate.

A further examination of Table 3 reveals that Bihar is the only state in the country where transition in all the three components of crude birth rate has contributed for accelerating the transition in the crude birth rate. This is possibly the reason behind a relatively rapid fertility transition in the state which is reflected in both the absolute decline in crude birth rate as well as relatively larger magnitude of the index ^ in rest of the states, barring Madhya Pradesh, transition in age structure effects on crude birth rate has acted to retard the transition in the crude birth rate leading to a slow down of crude birth rate decline. In Karnataka, Rajasthan and West Bengal, the impact of age structure effects on crude birth rate in slowing down the crude birth rate decline appears to be quite substantial.

In Madhya Pradesh, on the other hand, decrease in the fertility inhibiting effect of marriage over time appears to be primarily responsible for the slowing down of transition in crude birth rate during the period under reference. It is the only state in the country where the fertility inhibiting effect of marriage has decreased instead of increasing during the period under reference. This decrease in the fertility inhibiting effect of marriage has off-set the impact of decrease in total marital fertility rate on the decrease in crude birth rate. Reasons for the decrease in fertility inhibiting effect of marriage in Madhya Pradesh are not known at present. On the other hand, transition in the age structure effects on crude birth rate in the state has contributed towards an acceleration in the transition in the crude birth rate decline. If the transition in the age structure effects on crude birth rate not been conducive to crude birth rate decline, transition in fertility in the state would have been even slower.

Conclusion

The purpose of the present analysis has been to analyze transition in crude birth rate in Indian states in the recent past and to identify factors that have contributed

to this transition. The analysis reveals that in most of the states of the country, decrease in the crude birth rate is attributable to the decrease in the total marital fertility rate and increase in the fertility inhibiting effect of marriage appears to be compensated, to a varying extent, by the changes in the age structure effects on crude birth rate. Over time, changes in the age structure effects on crude birth rate have tended to be in favour of larger number of births relative to the level of total marital fertility rate and proportion of females married.

Bihar and Madhya Pradesh are the only two states of the country which deviate from the above stated general pattern. In Bihar, age structure effects on crude birth rate has remained favourable to crude birth rate decline leading to an acceleration in the decrease in the crude birth rate than that dictated by the decline in total marital fertility rate and by the increase in fertility inhibiting effect of marriage. In Madhya Pradesh, on the other hand, although the age structure effects on crude birth rate have also been found to be conducive to an acceleration in the crude birth rate decline, yet the trend in the fertility inhibiting effect of marriage has acted to slow down the decline in crude birth rate during the period under reference. This pattern is typical of all the states of the country. Between 1985 and 1992, the total marital fertility rate in the state decreased by 0.7 absolute points which is well above the average decrease at the national average. But because of the adverse trend in the marriage patterns, the total fertility rate in the state decreased by only 0.2 absolute points during the same period which is well below the average decrease at the national level.

References

Bongaarts, J., 1978, A framework for analyzing proximate determinants of fertility. *Population and Development Review,* 4(1): 105-132. Bongaarts, J., 1982, The fertility inhibiting effects of intermediate fertility variables. *Studies in Family Planning,* **13** (6)/7): 179-189. Horiuchi, S., 1991, Measurement and analysis of cohort size variations. *Population Bulletin of the United Nations,* **30:** 106-124.