An Examination of The Intensification Effect of Son Preference on Recent Trends in Regional Fertility in India

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Abstract. *Son preference's impact on Indian fertility is examined within 14 major states, utilizing the NFHS surveys of 1992-93 and 1998-99 but with emphasis on the NFHS-2 survey. The 14 states are grouped into two on the basis of the strength of son preference. The analysis indicates that the birth hazards for the gender composition of surviving children are highest at parity 3 for the majority of the 14 states. The intensification effect, or increasing impact of son preference at lower parities, is manifested in strong son preference states experiencing large fertility declines such as Punjab and Haryana. Son preference continues to affect fertility at lower priorities and it is possible that a floor well above replacement level is forming, especially in the populous northern/central states. However, with the increasing incidence of sex-selective abortions it is possible that lower fertility with dramatically skewed sex ratios at birth will result*

Keywords: Son; preference; intensification; effect; regional; fertility; India; trends.

1. Introduction

Birth rates have declined considerably in India since the 1970s. The total fertility rate of 3.2 in 2001 was two children less than the 1981 TFR. There is no sign of a reversal in this fertility transition, however a recent slowing down of the rate of decline of the birth rate suggests that some significant barriers lie between current fertility levels and replacement fertility. According to Haub (2002), the vital rates from India's Sample Registration System for 2000 indicate that the fertility decline has reached a classic "plateau". Moreover, the large interregional and interstate disparities in the pattern of fertility decline have persisted.

The paradox of the slow and spatially uneven course of India's demographic transition despite strong governmental motivation to lower fertility levels calls for analysis of the socio-economic and cultural factors that can either help or hinder in the diffusion of fertility control. One of the socio-cultural factors that is coming under increasing scrutiny is couples' norms regarding family size and composition, (Mutharayappa et al. 1997; Basu 1999; Mutharayappa et al. 1997) indicate that in the National Family Health Survey (NFHS) I (1993), most couples in India desired to have at least three children, two sons and one daughter, while Basu (1999) observes that in an all India survey conducted by the Operations Research Group (1990), most couples were continuing to have additional children until the desired number of sons is attained. The recently concluded NFHS 2 of 1999 shows that though people are aware of the importance of small families, they are not keen to adopt family limitation practices at lower parities. The average family size for all of India continues to be 3.2, well above replacement levels, with the ideal gender composition of two sons and one daughter.

One frequently mentioned reason for high levels of desired fertility is the importance of having sons, in patriarchal societies for economic, social, and religious reasons, and the impact of son preference on demographic outcomes in many countries in South and South-east Asia such as India, Bangladesh, Pakistan, China and South Korea (Arnold et al. 1998; Mutharayappa et al. 1997; Rahman et al. 1992; Choe et al. 1992; Larsen et al. 1998; Lee 1996; Park and Cho 1995; Graham et. al. 1998; Wang 1996). Patriarchal kinship systems and their incumbent preference for sons has been well documented in the literature as one of the many causes of India's uneven fertility decline (Dyson and Moore 1983; Dyson 2001; Arnold et al. 1998; Dreze and Murthi, 2001). Thus the northern high population states of India such as Uttar Pradesh, Bihar and Rajasthan exhibit high fertility rates as compared to the southern states of Kerala, Tamil Nadu and Andhra Pradesh, because of the relative strong patriarchal kinship systems in the northern regions of India and their resultant preference for sons (Dyson and Moore 1983).

Further, the intensification of the preference for sons has also been documented as the levels of fertility falls in societies that are traditionally patriarchal with strong preferences for sons, as in China, South Korea and India (Hull 1990; Zeng Yi et al. 1993; Park and Cho 1995; Das Gupta and Mari Bhat 1997). The intensification effect hinges on the view that when fertility declines, the total number of children couples desire falls more rapidly than the total number of desired sons, and that couples continue to desire sons within small family norms (Das Gupta and Mari Bhat 1997). In

the case of the uneven fertility decline in the different states of India, Das Gupta and Mari Bhat (1997) and Arnold et al. (1998) observe that the intensification effect has been manifested more prominently in the sex bias in infant and child mortality in those northern states of India experiencing fertility decline that have had strong son preferences.

While several studies have been undertaken on the impact of the intensification effect of son preference on sex ratios at birth and the survival outcomes of female infants (Das Gupta 1987; Das Gupta and Mari Bhat 1997; Arnold et al. 1998 among others) there is little known research on the impact of the intensification effect on the pace of fertility. The intensification effect can also be studied in terms of the pressure on a couple to increase the pace of childbearing at lower and lower parities on the basis of the perceived 'lack' of sons at any given parity. The aim of this paper is to study the impact of the intensification effect of son preference on the pace of childbearing in the various states of India, with particular interest in the manifestation of the intensification effect over time.

Several paths to exercising control over the gender composition of surviving children exist. Studies have documented the expanded use of modern technologies to determine the sex and fetuses along with the practice of sex-linked abortion (Park and Cho 1995; Sachar et. al. 1990; Venkatachalam and Srinivasan 1993). Where this strategy is not followed closely, one should expect parents practicing family planning who perceive a need for a son to have another birth quickly since this best retains some of the time-use advantages of reduced family size.

This is especially true for India, where fertility decline has been slowly responding to the government's goal of obtaining replacement level fertility of a TFR of 2 by the year 2020. With increasing awareness of the stalling of the fertility decline in India due to the tardy decline in fertility in the most populous states of India (Haub 2002), that also happen to have the strongest son preference regimes, it is possible to hypothesize that the impact of son preference on fertility seems to be intensifying in these states at the critical parities of 2 and 3, where the progression to third and fourth births in an effort to have sons, is slowing down the entire country's progress towards replacement levels of fertility. However, with declining family sizes to a TFR of around 2.2 in many states of India, as the recent Census of India 2001 and the NFHS 2 (1998-99) have shown, the pressure to bear a son may start appearing after the very first child is born. This is the intensification effect of son preference at work on the pace of childbearing along with the parity effect. This effect is particularly visible when the combination of strong son

preferences and rapidly declining fertility exists as in the northern states of Punjab and Haryana (Das Gupta 1987; Das Gupta and Mari Bhat 1997).

Thus state-specific analyses are important in India, where family planning decisions and program implementation are state based and decentralized. The focus of this study is to look at the varying impact of son preference as measured by the sex composition of the surviving children at different parities, particularly from parity 1 to 3, on the pace of childbearing in different states of India, and to make a comparative analysis of the changes in the impacts of son preference on fertility over time in these states, as can be done by a study of the two NFHS 1 (1992-93) and NFHS 2 (1998-99) data sets. Since the NFHS 2 data set has become available relatively recently, a comparative analysis of the two NFHS data sets tracing the changes in the impact of son preference's impact on fertility has not yet been done. While research has documented the extent of the impact of son preference on different states in India for parities 2 and 3 and using only NFHS 1 data (Mutharayappa et al. 1997; Arnold et al. 1998; Gurak and Potdar 2001) little attention has been given to the impact of son preference on fertility at parity 1, a critical parity as more and more Indian states are reaching close to replacement level fertility, and to the changing scenario of the pace of childbearing being influenced by son preferences by making a comparative analysis of the two NFHS 1 and 2 data sets.

2. Data and Methods

Based upon the above observations the study investigates the following propositions concerning the linkages between gender composition of surviving children and the pace of childbearing. In this study, it is hypothesized that son preference, operationalized in the sex composition of surviving children, will have a positive impact on the pace of childbearing among couples, and that at different parities, couples with a perceived 'lack' of the number of desired sons in their surviving children, will respond by having a subsequent birth faster than couples satisfied with the sex composition of their surviving children. This effect will be stronger at middle rather than at high or low parities, since couples with strong desires for sons who adopt small family norms would prefer to have at least one son within the small family, but will typically begin consciously planning for children of a particular sex only after the first or second births, (Mutharayappa et al. 1997; Radkar 1999). The intensification effect of son preference on the pace of fertility at each parity will be examined by looking at either the continued pressure on women with a lack of sons to hasten their pace of childbearing as

compared to their counterparts with the desired number of sons over time, or the shifting of the pressure points of gender composition of the surviving children on the pace of fertility to lower and lower parities over time.

To examine the effect of son preference on the demographic outcomes of childbearing, this paper utilizes data from the two National Family Health Surveys (NFHS 1 & 2) conducted in the 14 Indian states of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, West Bengal, Orissa, Maharashtra, Gujarat, Karnataka, Tamil Nadu, Kerala, and Andhra Pradesh in 1992-1993 and in 1998-99. The NFHS are nationally representative sample surveys of approximately 90,000 ever-married women, aged 13-49, interviewed in 25 states and the union territory of Delhi, which include more than 99% of the Indian population. Only 14 Indian states are used in the analysis since they account for more than 95% of the Indian population and are quite adequately representative of the regional distribution of the population. While the all India NFHS data sets provide a general picture of the impact of son preference on the pace of childbearing, the 14 state data sets give detailed information on the working of the son preference effect on the pace of childbearing at the state level. Considering the extensive regional and state variations in fertility, and the strength of the son preference phenomenon in India, a state-wise analysis is justified.

The use of the two NFHS data sets permits us to assess the progress of the impact of son preference on the pace of fertility at the state level over time. In this paper, the NFHS 2 data provides the cornerstone of the analysis of the changing impact of son preference and the intensification effect on fertility during the late nineties versus the earlier periods of the seventies and the eighties.

For this study three analytic samples were derived for the country as a whole and for each state, each consisting of all women who had, at one point in time, either one, two or three surviving children. This was accomplished by sifting through the reproductive history of each woman, eliminating dead children so as to select only those women that had one, two or three simultaneously surviving children at the time of the observation window of 72 months. For example, checking through all women with one surviving child and then rechecking for all women with a second surviving child, while the first child was still alive arrived at a woman with two surviving children at the same time. The dynamics of son preference's impact on fertility are quite different at each parity, with women with one living child of a particular gender having quite a different response to subsequent childbearing than a woman with only three living daughters and her response to subsequent

childbearing. For this reason, the three analytical sub samples were created. Since most of the impact of son preference is observed in the middle parities, and its effect begins to diminish at higher parities (Mutharayappa et al. 1997; Arnold et al. 1998), women with a maximum of three simultaneously surviving children are considered in the analysis. Women that progress to four or more children are likely to attain the desired gender composition without being under undue pressure to bear sons at lower parities.

Event history techniques are used to estimate the influence of son preference on parity progression, for all of India, and the 14 different states. The Cox partial likelihood model is well suited in the analysis of the timing of an event, and the impact of various predictor variables on the likelihood of the occurrence of an event. In this analysis, the event of interest in the different analytical models at different parities is the birth of the next child. While a number of demographic and socio-economic variables, such as age of the mother at the start of a transition from one parity to the next, her education, religion and area of residence, are considered in their relative ability to influence the *hazard* or likelihood of the occurrence or non-occurrence of the event of interest, the focal independent variables is son preference as measured by the sex composition of the surviving children of a couple at different parities. This variable, the 'number of girls' variable in the analysis, indicates the impact on the pace of childbearing of the number of daughters at each parity, taking on values from 0 to n, n being the parity under consideration. Thus at parity 3, the 'number of girls' variable takes on the values ranging from 0 daughters to 3 daughters. Separate dummy variables for each configuration of the number of daughters at a given parity were tested for their impact on the pace of childbearing and did not yield statistically different results from using one dummy variable for the number of daughters. Hence for the sake of parsimony, the single independent variable of 'number of girls' is used in the analysis.

The period variables measure the impact of different time periods in terms of the demographic transition on the pace of childbearing. The period analysis used the NFHS 2 survey data since those data contain information from the 1960's up to 1999. The reference category of pre-1980 signifies a period of substantial increases in the total Indian population with fertility rates decreasing slowly along with large declines in mortality. The other categories of period 1980-85 and period 1986-92 indicate the beginning of the fertility transition with strong program efforts by the family planning program and the after effects of the compulsory sterilization drive of the late seventies begun by Sanjay Gandhi. The fourth period variable period 1992-99 captures only those births that occurred in the tail end of the NFHS 2 survey window. Period

1992-99 hence isolates the dynamics of fertility change and changes in underlying son preferences during the most recent period, when many states experienced the completion of the fertility transition and other states showed generally large declines in fertility. The other independent variables included are female education, area of residence and religion.

The study estimates survival models because of the need to handle right-hand censoring and because of the need to utilize information on the duration since the index birth. It is assumed that having a birth within a year of two of the index birth represents an outcome that is quite distinct from having a birth five or more years later. Given a desire to have a son and the condition of not having one, we expect couples to attempt to have another birth as quickly as possible or at least more quickly than those for whom the gender mix of their children is relatively unimportant. These expectations apply only when some degree of fertility control is being practiced: a condition that holds for India in general. The Cox proportional hazard model provides a suitable estimation method for two reasons. First the Cox partial likelihood algorithm provides robust estimates of covariate effects and it is these effects that form the primary concern of this analysis (Allison 1984; Vuchinich et. al. 1991). Second, there are no a priori expectations concerning duration dependent effects and thus the study chose not to use parametric procedures.

The full and nested models for all of India and for the 14 states data were run separately, each time utilizing information from either one of the NFHS 1 and NFHS 2 surveys. In this way we can assess the extent of change in the impacts of all the independent variables, such as gender composition, education, period, religion and area of residence over the two survey periods. The parameter estimates for the control covariates and for the focal independent variables for the main effects models for the fourteen states of India are presented below.

The 14 major states used in the analysis can be grouped loosely into two groups of central/western states that are characterized by more unfavorable female to male sex ratios at birth and in infant and child mortality and those southern/eastern states that are characterized by more favorable of these sex ratios as far as female advantage is concerned (Dyson and Moore 1983; Arnold et al. 1998; Das Gupta and Mari Bhat 1997). These two categories of states also exhibit quite different demographic regimes, with the eight northern/western states of Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat, Punjab and Haryana having high or medium fertility levels, and the six southern/eastern states of Andhra Pradesh,

Karnataka, Kerala, Tamil Nadu, West Bengal and Orissa characterized by low fertility.

While the northern states of Punjab and Haryana have experienced large fertility declines and are near replacement level fertility (NFHS 2 India Report, 2000), they have been included in the first category of eight northern states because of the manifestation of high levels of son preference in terms of kinship systems (Dyson and Moore 1983, Das Gupta 1987), differential contraceptive use (Mutharayappa et al. 1997; Potdar 2002), and significant gender differentials in infant and child mortality (Arnold and Kishor 2002). In the same stride of arguments, the eastern states of West Bengal and Orissa with medium levels of fertility have been included in the second category of southern states because they exhibit lower son preferences in the various social and demographic indicators listed above.

The analysis is presented separately for each parity, since the main purpose of the study is to examine whether gender composition's impact on fertility is being expressed at lower and lower parities with fertility decline in these states. The intensification of the need to have sons at lower parities has been the case in strong son preference countries such as South Korea and China, that have experienced considerable fertility declines in the past three decades, (Das Gupta and Mari Bhat 1997). It is interesting to note whether the same fertility behavior pattern in response to intensifying son preference is seen in the two groups of states under consideration here.

3. Results of The Parity Level Multivariate Analysis For Northern/Central India

The multivariate analysis highlights the importance of the other independent variables such as education, period and religion on the pace of fertility.[1] However, since the impact of the gender composition variable on fertility is the main aim of this study, a detailed analysis of this focal variable on the fertility transition in the eight states of northern/central India is presented here.

Table 1
ADJUSTED HAZARD RATIOS FOR THE INDEPENDENT VARIABLE OF GENDER COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING IN NFHS 1 AND 2 FOR EIGHT INDIAN STATES FOR TRANSITIONS FROM PARITY 1 TO 3 (UPPER HAZARD VALUES ARE FOR NFHS 1 AND LOWER HAZARD VALUES ARE FOR NFHS 2)

Independent variables effect	Madhya Pradesh	Rajasthan	Haryana	Punjab	Bihar	Uttar Pradesh	Maharashtra	Gujarat
Number of	1.01	1.13**	1.04	1.08	1.09*	1.10**	1.06	1.07*
girls (n=1)	1.07*	1.07*	1.13*	1.30**	1.15**	1.09**	1.12**	1.05
Number of	1.07	1.08**	1.12*	1.18**	1.03	1.07*	1.06**	1.11*
girls (n=2)	1.11**	1.14**	1.36*	1.22**	1.08**	1.10**	1.10**	1.15**
Number of	1.18**	1.23**	1.30**	1.22**	1.12**	1.31**	1.08**	1.26**
girls (n=3)	1.23**	1.23**	1.40**	1.31**	1.13**	1.38**	1.15**	1.40**

Source: * indicates significance at p< 0.01 ** indicates significance at p< 0.001.
Mother's age, education, period, religion and area of residence were included in all the models as the independent variables but are not shown here.

A comparative analysis of NFHS 1 and NFHS 2 provides a quick indication of change in the impact of son preference on childbearing over time. Table 1 contrasts NFHS 1 and NFHS 2 results of the multivariate analysis for the impact of gender composition on the pace of childbearing at parity 1-3. Son preference or the impact of gender composition on birth hazards increased for all states at parity 1 over the two NFHS surveys except for Rajasthan, Uttar Pradesh and Gujarat. For example, the transitions for Bihar for parity 1-2 during the NFHS 1 and NFHS 2 in general show a strengthening of the son preference variable, that is the gender composition of surviving children at a parity, on the pace of childbearing especially at lower parities. Thus, in NFHS 1, at parity 1, a woman with one daughter is 9% more likely to have a subsequent birth than a woman with one son. The hazard of 1.09 is significant at the 95% confidence interval. In NFHS 2, at parity 1, a woman with one daughter is 1.15 times more likely to have a subsequent birth than a woman with one son, and this hazard is highly significant at the 99% confidence interval. In Punjab, the comparative hazard for women with one daughter having a subsequent birth increased significantly from 8% in NFHS 1 to 30% in NFHS 2 as compared to women with one son. In the case of Madhya Pradesh, Punjab, Haryana and Maharashtra, the hazards for women with one daughter having a subsequent birth as compared to women with one son have not only increased in NFHS 1 as compared to NFHS 2, but have also become significant. In the case of Madhya Pradesh, at parity 1, the hazard has increased from a very low 1.01 in NFHS 1 to significant but still small hazard of 1.07 in NFHS 2. This could perhaps be due to only small declines in fertility in Madhya Pradesh over the NFHS period and hence the pressure of

bearing a son at parity 1 does not greatly affect the pace of childbearing both during the NFHS 1 and NFHS 2 periods.

However, in the case of Haryana, Punjab and Maharashtra, for parity 1, the hazards have increased in both size and significance over the NFHS period. This shows that in those states with strong son preferences but rapidly declining fertility, couples are manifesting the 'intensification effect'; they want to have at least one son within their smaller completed family, and hence are being affected by the gender of their surviving child in their pace of childbearing at lower parities over time.

In states such as Rajasthan and Uttar Pradesh the declines in fertility have not been significant and hence the pressure of bearing a son at parity 1 does not significantly affect the pace of childbearing both during the NFHS 1 and NFHS 2 periods. In the case of Gujarat a state with strong son preferences coupled with medium fertility declines, the preference for sons does not significantly impact fertility at parity 1 for the NFHS 2, indicating either that couples are indifferent about the sex of the first child or it could indicate resorting to large scale sex selective abortions at parity 1. This would subdue the effects of son preference over time on the pace of childbearing for the second birth. Arnold and Kishor (2002) have shown that Gujarat has the highest sex selective abortions in recent years along with Punjab and Haryana. In Maharashtra, another state with medium fertility decline and gradually increasing son preference over time, there is an increase in size and significance of the hazard for gender composition over the NFHS period. This state has been recently coming under considerable research and media attention, for its increasingly unfavorable sex ratios at birth and the probable large incidence of sex selective abortions (Retherford and Roy 2003; Sharma 2002), indicating strengthening of son preferences in this state with fertility decline.

The prevalence of third births is significant for the attainment of replacement level fertility (Nath and Land 1994). The transition from a parity of 2 to 3 by a couple in order to have at least one son can slow down the process of a population reaching replacement level fertility. It is at this transition from 2 to 3 births that the pressure to bear sons begins to significantly influence the pace of childbearing at the all India level and at the state level where strong son preference regimes exist. The transitions for the northern/central states of Madhya Pradesh, Rajasthan, Haryana, Punjab, Bihar, Maharashtra, Uttar Pradesh and Gujarat showed an increase in hazard ratios and their significance for the gender composition variable, that is the number of daughters among surviving children at parity 2 as compared to parity 1. At

this parity level, most couples who have opted for smaller families of an average size of 3, start getting strongly influenced by the lack of sons among their surviving children and subsequently are more likely to have another birth more quickly than couples with two sons at parity 2. Thus Table 1 shows that the hazards of having a subsequent birth have increased in significance over time between NFHS 1 and NFHS 2 for those women with two daughters as compared with women with two sons for all the eight states under consideration.

In Haryana for example, NFHS 1 women with two daughters had hazards of having a subsequent birth 24 percent larger than those of women with two sons. It is for those states with strong son preferences combined with the adoption of small family norms such as Punjab and Haryana, that one sees the largest hazards of having a subsequent birth based on the perceived lack of sons at parity 2. This once again shows that in those states with strong son preferences but rapidly declining fertility, couples are manifesting the 'intensification effect'; they want to have at least one son within their smaller completed family, and hence are being affected by the gender of their surviving child in their pace of childbearing at lower parities over time.

In states such as Uttar Pradesh, Madhya Pradesh, Rajasthan and Bihar that have strong son preferences but larger total fertility rates (TFRs), though the hazard of having a subsequent birth based on sex composition of earlier children is significant, it is not large since couples can opt for larger families in order to fulfill their desire for sons. The event of the fourth birth in the context of son preference is important since it is at this transition that women with all daughters who have opted for slightly larger completed family sizes than 2 or 3, are beginning to feel the need to have at least one son both at the all India level and in those states where strong son preference regimes exist. This is because in a regime of declining fertility and persistent son preferences women at parity 3 without the desired number of sons are under the greatest pressure to have a subsequent birth as compared to women who already have the desired gender composition. This is in consonance with the earlier literature on son preference indicating that son preference's impact is greatest at the middle level parities in regimes of son preference and declining fertility (Mutharayappa et al. 1997; Arnold et al. 1998).

At the present stage of India's fertility transition with an average family size of 2.9 per woman (NFHS 2 India Report 2000), one would expect the impact of son preference to manifest itself strongly at parity 3, since at this parity are a sub-sample of women who have had three children, yet are not satisfied with the number of sons they have, and continue to have another

birth in the hope of having at least one son. One would also expect that with further declines in Indian fertility, the pressure to bear sons will manifest at lower parities as seen in other countries with persistent son preferences combined with large fertility declines such as South Korea, China and Taiwan (Choe et al. 1998). In fact, the 'intensification effect' of son preference can be seen in some of the Indian states undergoing large fertility declines without changes in their son preferences at parities 1 and 2, as shown in earlier sections of this paper. The eight northern/central states examined in this section are predominantly high son preference states where fertility levels have declined considerably in the past two decades despite strong son preference socio-cultural systems (Das Gupta and Mari Bhat 1997). This is particularly true of the northern states of Punjab and Haryana where the TFRs have declined from approximately 5.5 to 2.1 over the 1980-99 period (IIPS 2000), and son preference pressures continue to increase (Arnold and Kishor 2002). It is interesting to note whether the national pattern of an increase of birth hazards associated with the gender composition variables at parity 3 is also present at this parity for the eight states.

As stated earlier, the comparison of birth hazards over the two NFHS surveys provides a quick picture of the change in son preference's impact on fertility. Table 1 shows that the hazards associated with the birth of each additional daughter have increased in size and significance over time between NFHS 1 and NFHS 2 for women with no sons as compared to women with three sons for all the eight states under consideration. Taking a few examples, the hazard of a subsequent birth based on gender composition increased in size from 1.30 in NFHS I to 1.40 in NFHS 2 for Haryana at parity 3. The birth hazard for the gender composition variable has increased from 1.22 for NFHS 1 to 1.31 for NFHS 2 for Punjab and for Uttar Pradesh the increase was from 1.31 for NFHS 1 to 1.38 for NFHS 2.

The intensification effect or the manifestation of an increased pressure to bear sons at lower parities with declining fertility can be seen at parity 3 for all the eight states over the two NFHS surveys. The intensification effect is particularly visible for those states that have experienced high to medium level decline in fertility and exhibit strong son preferences. Examples of such states are Haryana, Punjab, Maharashtra, Gujarat, Rajasthan and Madhya Pradesh that display large hazards of having a subsequent birth based on the perceived lack of sons at parity 3 over the two NFHS periods. As a greater number of couples are opting for smaller families of two and three children, the need to have a son within this smaller family is being manifested by an 'intensifying' of the pressure to bear sons at parity 3 over time. In contrast, the states of Uttar Pradesh and Bihar, with small declines in fertility and high son

preferences do not exhibit large gender composition hazards over time since couples continue to opt for larger families within which the desired number of sons can be attained.

A major indicator of the intensification effect is the shifting of the maximum pressure points to bear sons to lower parities over time. This aspect of the intensification effect is seen in Punjab where fertility declines and persistent son preferences have resulted in equally large and significant gender composition hazards as at parity 3 appearing at parity 1 over time (Table 1). Since Punjab is the only state in this group that displays this particular aspect of the intensification effect, it is important to make a cross parity comparison for the state to highlight this point.

4. Results of The Parity Level Multivariate Analysis For The Southern/Eastern Indian States: Parity 1-3

The results of the multivariate analysis indicate that other independent variables hypothesized to impact fertility such as female education of seven years or more, period, religion and area of residence have had varying effects on fertility over time and across parities.[ii] However, in this paper only the impact of the predictor variable of gender composition on fertility is presented.

Table 2 summarizes the fertility impact of the gender composition of surviving children variable across parities 1-3 for the two NFHS surveys in order to estimate change in the impact of this variable on fertility over time. At parity 1 the fertility transitions for the southern/eastern states of Andhra Pradesh, Karnataka and Tamil Nadu showed a slight increase in hazard ratios over the two NFHS surveys but they were not significant. However, in Kerala, West Bengal and Orissa, those women with one surviving daughter for NFHS 2 were less likely to have a subsequent birth as compared to their counterparts with one surviving daughter for NFHS 1, but the influence of gender composition on fertility was not significant for either of the NFHS surveys at parity 1.

Table 2
ADJUSTED HAZARD RATIOS FOR THE GENDER COMPOSITION OF SURVIVING CHILDREN VARIABLE AFFECTING THE PACE OF CHILDBEARING IN NFHS 1 AND 2 FOR SIX INDIAN STATES FOR TRANSITIONS FROM PARITY 1 TO 3. UPPER HAZARD VALUES ARE FOR NFHS 1 AND LOWER HAZARD VALUES ARE FOR NFHS 2

Independent variables effect	Andhra Pradesh	Karnataka	Kerala	Tamil Nadu	West Bengal	Orissa
Number of girls	1.02	1.00	1.02	1.01*	1.05	1.10*
(n=1)	1.06	1.05	0.98	1.03	1.02	1.02
Number of girls	1.09*	1.03	1.01	1.08*	1.07*	1.07*
(n=2)	1.03	1.10*	1.05	1.13**	1.15**	1.10*
Number of girls	1.08*	1.16**	1.03	1.07	1.13**	1.10*
(n=3)	1.27**	1.21**	1.04	1.06	1.10*	1.21**

Source: * Indicates significance at $p< 0.01$; ** Indicates significance at $p< 0.001$.
Mother's age, education, period, religion and area of residence were included as independent variables in all the models but are not shown here.

The main finding here is that the birth hazards for the gender composition variable are essentially zero. Only 2 of the 12 coefficients are significant and only one (Orissa in NFHS 1) is more than significantly different from 1. Given such a pattern, it is possible to understand the lack of son preference barriers in these states' ability to achieve large fertility declines in recent years, especially for the states of Kerala and Tamil Nadu.

As stated earlier, the significance of the third birth lies within the context of a population attaining replacement level fertility (Nath and Land 1994). In all six states examined here, for parity 2, the TFR in NFHS 2 was less than 3, and for the states of Kerala and Tamil Nadu, below replacement level fertility had been reached. Within the context of close to replacement level fertility being already achieved in most of these states, the transition from a parity of 2 to 3 by a couple in order to have at least one son can slow down the process of a population reaching replacement level fertility. It is at this transition from 2 to 3 births that the pressure to bear sons begins to significantly influence the pace of childbearing in some of the northern states where fertility has been declining and strong son preference regimes exist. In those states with socio-cultural systems that engender low son preference, the pressure to bear sons does not emerge at parity 1, as the previous section showed, however this could be because women at parity 1 for India as a whole, do not exhibit any gender preference at this parity, and a first born of either sex is generally welcome in most parts of India (Das Gupta 1987). It is of interest to note whether the pressure to bear sons on the pace of childbearing that emerges at parity 2 and continues until parity 3 in the eight northern/central states characterized by high son preferences, does repeat itself in the six southern/eastern states with low son preferences.

In the southern/eastern states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, West Bengal and Orissa the hazard ratios for the gender composition variable increased. At parity 2, most couples that have opted for smaller families of an average size of 3, and are not satisfied with the gender composition of their surviving children, are more likely to have another birth more quickly than couples with two sons at parity 2. Table 2 shows that the hazards of having a subsequent birth on the basis of the gender composition variable have increased in significance over time between NFHS 1 and 2, with the exception of Andhra Pradesh. However, the hazards are much smaller for both the NFHS 1 and NFHS 2 periods for these six states as compared to the corresponding hazards for the eight northern/central states shown in Table 1. This indicates that while the preference for sons is operating on the pace of childbearing in the 6 states considered here, the impact is weaker than in the eight states analyzed earlier.

In the states of Tamil Nadu and West Bengal, the birth hazards for the gender composition variable for NFHS 2 are the highest at 1.13 and 1.15 respectively and have increased from 1.08 and 1.07 for NFHS 1. It is interesting to note that in Tamil Nadu, son preference plays a significant role in the pace of childbearing for both NFHS 1 and 2. Traditionally this southern state has shown more unfavorable sex ratios at birth for females and numerous incidences of female infanticide as compared to other southern states (Bumiller 1990; Venkatachalam and Srinivasan 1993). In Karnataka a strengthening into significance of the impact of the gender composition of the surviving children on the pace of fertility occurred over the two NFHS surveys. West Bengal and Orissa also had monotonic increases in significant gender composition hazards over time. This increase in size and significance of hazards for Karnataka, Tamil Nadu, West Bengal and Orissa over time could lend credence to the convergence hypothesis of southern/eastern states strengthening the impact of their hitherto weak son preferences on subsequent fertility (Basu 1999). This could also indicate that in those states with strong son preferences but rapidly declining fertility such as Tamil Nadu, Karnataka and West Bengal, couples are manifesting to some extent the intensification effect; they want to have at least one son within their smaller completed family, and hence are being affected by the gender of their surviving child in their pace of childbearing at lower parities over time.

For those states in the south such as Kerala and Andhra Pradesh with weaker son preferences at parity 2, the impact of the gender composition variable changed only marginally over time. For Andhra Pradesh the birth hazard for gender composition of surviving children actually declined in size

and significance between 1992 and 1999. All six states have low fertility rates ranging from 2.46 for Orissa to 1.96 for Kerala (NFHS 2). Hence, one can expect the manifestation of son preference, if at all, on the pace of childbearing only until parity 3, since most couples in these states do not progress beyond parity 4.

At parity 3, one can expect the impact of gender composition of surviving index children on the pace of childbearing to be weak since all the six states have low fertility rates ranging from 2.46 for Orissa to 1.96 for Kerala during the NFHS 2 (IIPS 2000), and most couples in these states do not progress to bearing more than three children. Infant mortality is also low in these states, except for Orissa, and hence not many couples at parity 3 will be affected by infant deaths in their decisions to stop or continue childbearing. Therefore at this parity, the 'parity effect' can be expected to be working strongly, that is couples want to limit their childbearing, irrespective of the gender composition of their surviving children (Das Gupta and Mari Bhat 1997).

The transitions for the southern/eastern states of Andhra Pradesh, Karnataka, and Orissa showed an increase in hazard ratios and their significance for the gender composition of surviving children variable, that is the number of daughters among surviving children at parity 3 as compared to parity 2, while the low fertility states of Kerala, and Tamil Nadu showed a slowing down of the pace of childbearing on the basis of the gender composition of surviving children during NFHS 2 for parity 3 as compared to parity 2. West Bengal also showed a decrease in the hazard of a subsequent birth on the basis of the gender composition variable, although its fertility is greater than that of Andhra Pradesh and Karnataka, perhaps indicating that gender is of declining importance at this parity for couples that decide to continue with childbearing.

At parity 3, the intensity of the impact of the gender composition of surviving children on the pace of childbearing is evident in the states of Andhra Pradesh, Karnataka, West Bengal and Orissa, where most couples who have opted for smaller families of an average size of 4, start getting influenced by the lack of sons among their surviving children and subsequently are more likely to have another birth more quickly than couples with three sons at parity 3. Thus Table 2 shows that the hazards of having a subsequent birth have increased in significance over time between NFHS 1 and 2 for those women with three daughters as compared with women with three sons for the states of Andhra Pradesh, Karnataka, and Orissa. Coincidentally, Andhra Pradesh and Orissa also have the highest TFR in this

group of 6 states, indicating that the increasing pressure to bear sons at parities 2 and 3 over time could be a hindrance to the attaining of replacement level fertility in these states. However, the hazards are much smaller for both the NFHS 1 and NFHS 2 periods for these six states as compared to the hazards for the same NFHS periods for the eight northern/central states shown in Table 1.

The strengthening of the hazards and their increased statistical significance over time for the states of Andhra Pradesh, Karnataka, and Orissa, at parity 3 shows that in these states with traditionally weak son preferences but medium level declining fertility couples are manifesting to some extent the 'intensification effect' of son preference: they want to have at least one son within their smaller completed family, and hence are being affected by the gender of their surviving child in their pace of childbearing at lower parities over time. The 'convergence hypothesis' of Basu (1999) could also be at work here, with declining fertility, states that espoused low son preference are beginning to manifest some impact of gender composition of surviving children on the pace of subsequent childbearing at lower parities, akin to that of the northern/central states.

For those states in the south/east such as Kerala, Tamil Nadu and West Bengal, with weaker son preferences at parity 3, the impact of the gender composition variable did not change over time and remained more or less the same between 1992 and 1999.

5. Summary of Findings

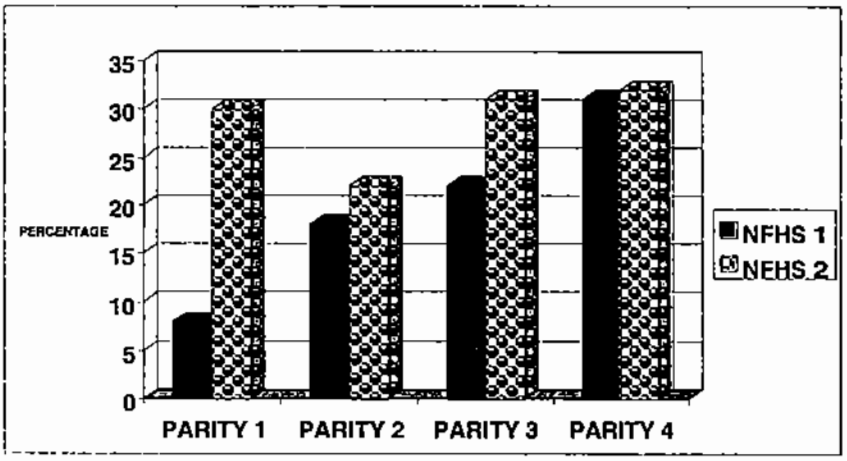
The objective of this study was to examine the changing impact of son preference on fertility and the emergence of the intensification effect of son preference in the 14 states of Bihar, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Andhra Pradesh, Karnataka, Kerala, Orissa, Tamil Nadu and West Bengal, with particular reference to the findings of the two NFHS surveys of 1992-93 and 1998-99. To the extent that marked regional and temporal variations in fertility and son preferences characterize the Indian demographic transition, this study sought to determine the regional pattern of the impact of son preference or the gender composition of the surviving children at any given parity on the pace of childbearing in India.

The detection of son preference on fertility as examined by this paper would work best where sex selective abortion was non-existent. Sex selective

abortions would considerably lower the impact of son preference on subsequent fertility, since couples would be able to attain the desired sex composition of their children through pre-natal tests and abortions of unwanted female fetuses, without having subsequent births in order to have at least one son.

The multivariate analyses at the northern/central states level etch a picture that is quite akin to the national level since the bulk of the Indian population lives in these 8 states and the reproductive patterns of these states delineate the nature of national reproductive patterns. The analysis of the changing impact of son preference on fertility in the northern/central states also reveals the progressive strengthening of the son preference effect at the important parities of 2 and 3 over the two NFHS surveys. Women in high son preference regimes faced with large fertility declines, such as in the states of Punjab and Haryana, are now under the greater pressure to bear sons at parity 1 during NFHS 2 rather than at higher parities during NFHS 1. Thus in Punjab, the manifestation of the 'intensification effect' or the shifting of the maximum pressure to bear sons based on the 'lack' of sons from parity 2 and 3 to parity 1 is evident in the second largest and significant birth hazard of 1.30 based on gender composition of the surviving children emerging at parity 1 for NFHS 2, when for the NFHS 1, the largest hazard for this variable was at parity 3 and parity 4 (Figure 1). In the case of Haryana, the largest birth hazards for gender composition also emerge at parity 2 of 1.36 and at parity 3 of 1.40 for NFHS 2, when the largest birth hazard for this variable was 1.30 at parity 3 for NFHS 1. This indicates that the pressure points of son preference are 'intensifying' or moving to lower and lower parities over time in the states of Punjab and Haryana faced with large fertility declines in recent years and with relatively unchanging son preferences. In the case of all other states in this group, the maximum pressure of son preference on subsequent births continues to be at parity 3, and the birth hazards for sex composition of the surviving children have increased at parity 3 over the two NFHS surveys.

Figure 1
THE SUBSEQUENT BIRTH HAZARD OF WOMEN ADDITIONAL DAUGHTER COMPARED TO SONS BY PARITY AND NFHS SURVEYS FOR PUNJAB



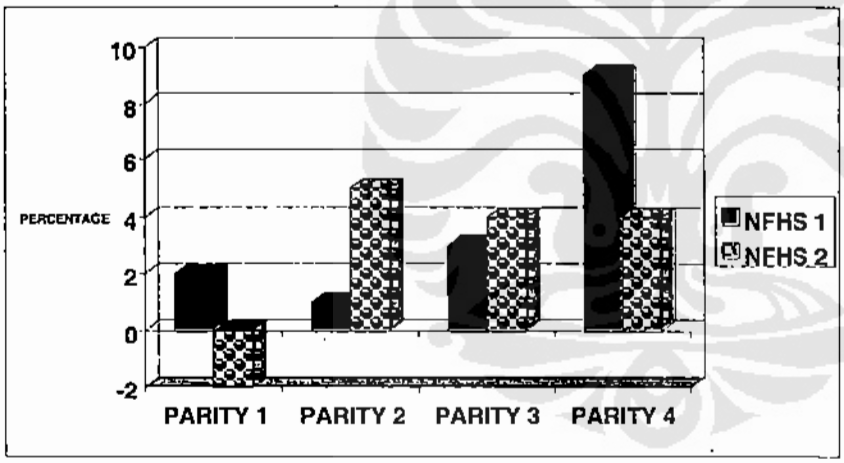
Birth hazards for sex composition of the surviving children are large at parity 3 and are increasing over time in Maharashtra, Madhya Pradesh, Rajasthan, Uttar Pradesh and Gujarat. This could possibly explain the slow moving fertility decline that marks these states. Son preference in these states starts becoming evident only at parity 3, since here women opt for larger families and can attain their desired gender composition within this context. To the extent that son preference continues to affect fertility at parities 1, 2 and 3, even in low fertility states such as Punjab and Haryana, it is possible that a floor well above replacement level is forming, making it difficult to eliminate entirely the effect of son preference especially in the more populous northern and central Indian states. However, with the increasing elimination of unwanted higher order female births through sex-selective abortions in many states with strong son preferences such as Haryana, Punjab, Gujarat and Maharashtra (Arnold and Kishor 2002), it is possible that lower fertility could be attained in these states. Will Indian daughters continue to be sacrificed at the altar of low fertility and dramatically skewed sex ratios at birth?

Son preference also influences fertility in the southern/eastern states and this influence appears to be increasing recently. However, its effect on fertility begins to manifest itself from parity 2 onwards, and the impact is weaker than in the eight northern/central Indian states analyzed earlier. To the

extent that couples still opt for an average of two children, as is the case in four of the six states considered here for NFHS 2, with Kerala and Tamil Nadu actually having TFRs below 2 for NFHS 2, son preference does not seem to alter the pace of childbearing at parity 1. This is a positive factor in the fertility transition in these states, in the sense that couples with two children are then more likely to stop at two, without considering the sex composition of their completed family. This implies that the 'parity effect' would work more strongly than the 'intensification effect' in these states (Das Gupta and Mari Bhat 1997).

Table 2 shows that the pace of childbearing at parity 1 is marginally affected by gender composition for all six states concerned, and that between the NFHS surveys, gender composition's impact on fertility has not changed much, except in the case of Orissa where the birth hazard for this variable has declined from 1.10 for NFHS 1 to 1.02 for NFHS 2. Kerala is a good example of a contrast to Punjab in its fertility behavior with regard to the gender composition variable and hence a separate representation of its birth hazards is needed (Figure 2).

Figure 2
THE SUBSEQUENT BIRTH HAZARD OF WOMEN WITH EACH ADDITIONAL DAUGHTER COMPARED TO WOMEN WITH ALL SONS BY PARITY AND NFHS SURVEY FOR KERALA (PERCENTAGE)



In Kerala, during NFHS 2, the birth hazard for the number of girls variable was 0.98 at parity 1, showing a slight daughter preference in this state at parity 1, i.e., women with 1 daughter are 2% *less likely* to have a subsequent birth than women with one son for Kerala, the maximum birth hazard (that is not significant), for a subsequent birth based on the gender composition of surviving children is 1.05 at parity 2 during NFHS 2, comparing to a significant birth hazard of 1.22 for this parity for Punjab. Hence, the pressure to bear sons in Kerala has not interfered with its fertility decline to below replacement levels in recent years.

Overall, the impact of son preference on the pace of childbearing continues to increase over time in all the 14 states considered here, and given the pace of fertility decline in the different states of India, it seems difficult to attain replacement level fertility in all these states within the near future with the continued pressure on couples to bear sons.

Son preference continues to influence fertility among Indian women and the effect of such preferences has intensified among women from the northern and western states of Haryana, Uttar Pradesh and Maharashtra, whose large populations impact the decline in India's overall fertility significantly. The southern states such as that of Tamil Nadu, are characterized by very little son preference, smaller populations and below replacement level fertility. Area specific programs are needed to tackle the slow decline in fertility rates in the populous states of the north and central-western parts of India. As fertility levels have been falling in India, the traditional values attached to having sons have remained unchanged, and women in the post- 1980 period want smaller families but at least one son.

It is possible that son preference will contribute to a stalling of the fertility decline well above the replacement level of fertility of an average of two children per woman. Policy makers need to look at the phenomenon of son preference in order to remove one of the barriers to the continued decline in fertility in India. Even with a strong family planning program and the availability of fertility regulation measures, the endeavor of policy makers may fail due to the desire of couples to continue childbearing until a son is born. Legal and community level interventions such as the banning of dowry and the increasing visibility of females in educational and workforce roles and in the provision of old-age support for parents are critical for removing the socio-cultural and economic supports of son preference.

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An earlier draft of this paper was presented at the annual meetings of the Population Association of America, Washington, D C (March 2001).

Appendix

Table A1

HAZARD RATIOS FOR INDEPENDENT VARIABLES OTHER THAN GENDER COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING IN NFHS II FOR EIGHT INDIAN STATES FOR TRANSITIONS FROM PARITY 1 TO 2

Independent variables effect	Madhya Pradesh	Rajasthan	Haryana	Punjab	Bihar	Uttar Pradesh	Maharashtra	Gujarat
7+ years of education	0.95	1.00	0.91	0.85**	1.10*	0.83*	0.97	0.85**
Period80-85	1.08	1.00	1.04	1.10	1.13*	0.98	1.00	0.97
Period86-92	1.05	0.96	1.04	1.05	1.14**	1.00	0.95	0.95
Period 92-99	0.87*	0.77**	0.80**	0.82*	0.80**	0.84**	0.94	0.81**
Sikh/Muslim§	1.32**	1.07	0.91	0.90*	1.04	1.14**	1.12*	1.11
City	0.93*	0.90*	0.93	0.85*	1.00	1.04	0.92*	0.90*

Source: *indicates significance at p< 0.01 ** indicates significance at p< 0.001.
age of the mother at the start of the transition was included as an independent variable but has not been shown here, the focal independent variable of gender composition included in the analysis but shown in Table 1.
§ the religion variable takes on the value of 1= Sikhs in the states of Punjab and Haryana, where Sikhism is one of the main religions, otherwise the religion variable takes on the value of 1= Muslims in all the other states where Islam is a major religion

Table A2

HAZARD RATIOS FOR INDEPENDENT VARIABLES OTHER THAN GENDER COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING IN NFHS II FOR EIGHT INDIAN STATES FOR TRANSITIONS FROM PARITY 2 TO 3

Independent variables effect	Madhya Pradesh	Rajasthan	Haryana	Punjab	Bihar	Maharashtra	Uttar Pradesh	Gujarat
7+ years of education	0.68**	0.70**	0.52**	0.51**	0.83**	0.75**	0.64**	0.47**
Period80-85	0.95	0.93	0.90	0.84*	1.15**	0.86*	1.00	0.87*
Period86-92	0.84**	0.81**	0.75*	0.75**	1.18**	0.70**	0.95	0.70**
Period 92-99	0.68**	0.60**	0.52**	0.60**	0.72**	0.67**	0.73**	0.63**
Sikh/ Muslim§	1.25**	1.10	1.00	0.77**	1.14*	1.43**	1.28**	1.25*
City	0.92	0.92	0.90	0.84*	0.95	0.90*	0.94	0.90*

Source: * indicates significance at p< 0.01 ** indicates significance at p< 0.001.

mother's age at the start of the transition was included in the models but is not shown here, the focal independent variable of gender composition included in the analysis but shown in Table 1.

§ the religion variable takes on the value of 1= Sikhs in the states of Punjab and Haryana, where Sikhism is one of the main religions, otherwise the religion variable takes on the value of 1= Muslims in all the other states where Islam is a major religion.

Table A3

HAZARD RATIOS FOR INDEPENDENT VARIABLES OTHER THAN GENDER COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING FOR NFHS II FOR EIGHT INDIAN STATES FOR TRANSITIONS FROM PARITY 3 TO 4

Independent variables effect	Madhya Pradesh	Rajasthan	Haryana	Punjab	Bihar	Maharashtra	Uttar Pradesh	Gujarat
7+ years of education	0.60**	0.57**	0.43**	0.52**	0.70**	0.60**	0.63**	0.53**
Period80-85	0.77**	0.80**	0.80*	0.70**	0.96	0.90	0.87*	0.75**
Period86-92	0.70**	0.71**	0.58**	0.46**	0.87*	0.62**	0.84**	0.68**
Period92-99	0.50**	0.48**	0.45**	0.36**	0.61**	0.54**	0.54**	0.47**
Muslim/Sikh§	1.23*	1.60**	0.87	0.77*	1.45**	2.00**	1.35**	1.32*
City	0.90*	0.87*	0.89	0.77*	1.02*	0.90*	0.90*	0.94

Source: * indicates significance at $p < 0.01$ ** indicates significance at $p < 0.001$

Mother's age was included in all the models as one of the independent variables but is not shown here, the focal independent variable of gender composition included in the analysis but shown in Table 1

§ The religion variable takes on a value of 1= Sikh for the states of Punjab and Haryana, where Sikhism is one of the dominant religions, while the religion variable assumes a value of 1 = Muslim in all other states

Table A4

HAZARD RATIOS FOR DIFFERENT INDEPENDENT VARIABLES OTHER THAN GENDER COMPOSITION AFFECTING THE PACE OF CHILDBEARING IN NFHS II FOR SIX INDIAN STATES FOR TRANSITIONS FROM PARITY 1 TO 2

Independent variables effect	Andhra Pradesh	Karnataka	Kerala	Tamil Nadu	West Bengal	Orissa
7+ years of education	1.26**	1.06	0.92	1.05	0.68**	1.11*
Period 1980-85	1.04	0.97	0.95	0.90*	0.90*	1.06
Period 1986-92	0.94	0.93	0.80**	0.86**	0.78**	1.00
Period 1992-99	0.80**	0.90*	0.74**	0.91	0.70**	0.85*
Muslim	1.16*	1.09*	0.87*	1.20*	1.15*	1.08
City	0.96	0.90*	0.96	1.01	0.90*	1.02

Source: * indicates significance at p< 0.01 ** indicates significance at p< 0.001
Age of the mother at the start of the transition was included in the model as one of the independent variables, but is not shown here. Gender composition's effect on fertility included in the model but shown in main text as table 2.

Table A5

HAZARD RATIOS FOR DIFFERENT INDEPENDENT VARIABLES OTHER THAN THE SEX COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING IN NFHS II FOR SIX INDIAN STATES FOR TRANSITIONS FROM PARITY 2 TO 3

Independent variables effect	Andhra Pradesh	Karnataka	Kerala	Tamil Nadu	West Bengal	Orissa
7+ years of education	0.66**	0.71**	0.92	0.75**	0.46**	0.68**
Period 1980-85	0.92*	0.86*	0.70**	0.78**	0.84*	0.93
Period 1986-92	0.67**	0.68**	0.41**	0.63**	0.68**	0.80**
Period 1992-99	0.44**	0.51**	0.40**	0.46**	0.43**	0.62**
Muslim	1.54**	1.42**	1.65**	1.38**	1.67**	1.12
City	1.05	0.93	0.77**	0.84**	1.01	0.94

Source: * indicates significance at $p< 0.01$ ** indicates significance at $p< 0.001$.
Mother's age at the start of the transition was included as an independent variable in all the models but is not shown here, the impact of gender composition on fertility included in the model but shown in the main text as Table 2.

Table A6

HAZARD RATIOS FOR DIFFERENT INDEPENDENT VARIABLES OTHER THAN THE GENDER COMPOSITION OF SURVIVING CHILDREN AFFECTING THE PACE OF CHILDBEARING IN NFHS II FOR SIXINDIAN STATES FOR TRANSITIONS FROM PARITY 3 TO 4

Independent variables effect	Andhra Pradesh	Karnataka	Kerala	Tamil Nadu	West Bengal	Orissa
7+ years of education	0.62**	0.69**	0.64**	0.77*	0.40**	0.71**
Period 1980-85	0.63**	0.76**	0.54**	0.60**	0.79*	0.90
Period 1986-92	0.52**	0.57**	0.40**	0.42**	0.54**	0.67**
Period 1992-99	0.62	0.46**	0.34**	0.30**	0.40**	0.57**
Muslim	2.10**	1.90**	2.68**	1.69**	1.77**	1.92**
City	0.96	0.88	0.81	0.76**	1.00	1.04

Source: *indicates significance at p< 0.01 ** indicates significance at p< 0.001.
Mother's age is included as an independent variable in all the models but is not shown.

[i] Please see tables A1-A3 in the appendix for this part. In the case of the impact of seven plus years of education, the significant decelerating impact of education on the pace of childbearing is seen in the NFHS 2 survey, for all the states in this group, for parity 2 and 3. The period variables at parity 2 and parity 3 show that while fertility was high in the 70's there has been a dramatic decline over the years, extending into the 90's, with Punjab at the forefront of this decline. Muslims, in comparison to Hindus, have higher hazards for subsequent births in the six states of Madhya Pradesh, Rajasthan, Bihar, Uttar Pradesh, Maharashtra and Gujarat for all three parities. Urban women slowed down the pace of childbearing compared to their rural counterparts, indicating that for all three transitions urban women showed a less than one hazard of having subsequent births for most states. For a more detailed analysis refer to the first author's doctoral dissertation (Potdar 2003).

[ii] Please see tables A4-A6 in the appendix for this part. At parity 1, it is only in Andhra Pradesh and Orissa that one sees positive and significant birth hazards for more educated women, while in the other four states, the birth hazards are either negative or positive but low and not significant. At parity 2 and 3, the negative impact of education can be clearly seen with women with seven plus years of education significantly slowing down their pace of fertility as compared to women with less or no education. Kerala is the only state in this group that indicates a hazard of 0.92, perhaps showing that there is little difference in birth hazards between women of the two educational categories in a state that has achieved 100%

literacy in the past decade. The period variables at parity 1 show that for all six states there has been a dramatic decline in fertility over the years, extending into the 90's corroborating the evidence that the demographic transition is well under way in these southern/eastern states (Arnold et al. 1998, Dyson 2001, Dreze and Murthi 2001). The Muslims in comparison to the Hindus as a reference category showed significantly higher levels of hazards for subsequent births, in most states for the NFHS 2 period especially for parities 2 and 3. Urban residence during NFHS 2 definitely slowed down the pace of childbearing where urban women showed a less than one hazard of having subsequent births as compared to their rural counterparts. However, the association between urban residence and fertility is difficult to trace in terms of causative linkages and requires further research which remains beyond the scope of this study.