# Female Education and the Intensification of Son Preference on Regional Fertility in India

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**Abstract.** *The study examines the impact of son preference on the pace of fertility among women of different educational levels in the 14 Indian states of Bihar, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Andhra Pradesh, Karnataka, Kerala, Orissa, Tamil Nadu and West Bengal with reference to the findings of the NFHS 2 survey (1998-99). In the northern/western states there appears to be an increased preference for at least one son in 1992-99 as compared to the southern/eastern states. In contrast to their counterparts in the southern states, educated women in the northern/western states demonstrate a greater inclination toward continuing childbearing for a son on the basis of having only daughters. Son preference continues to affect fertility at lower parities and could slow down fertility decline especially in the populous northern/western sates.*

**Keywords:** Son preference, female education, National Family and Health Survey 1998-99, Indian states.

## 1. INTRODUCTION

In India there are large regional and educational differences in fertility decline and in the intensity of sex discrimination in different regions, with the northern and central states being the traditional strongholds of son preference and relatively slow fertility decline (Dyson and Moore, 1983; Das Gupta and Mari Bhat, 1997; Arnold et al., 1998). Whether the impact of son preference on the pace of childbearing differs for women of differing levels of education also needs to be examined in the different states, given the well documented effect of education on fertility (Kishor, 1995; Das Gupta, 1987; Dreze and Murthi, 2001). Das Gupta's (1987) article documented the positive relationship between female education and relatively higher female infant and child mortality rates in the Punjab. Does education increase the impact of son

preference on fertility in different states of India? The effect of female education in particular needs to be studied in the light of it being touted as a means to improve the status of women and reduce the preference for sons.

## 1.1 The Interaction Between Education and Son Preference

While there is extensive literature on the impact of son preference on fertility in different countries of the world, particularly in South and East Asia, there is a need for research on the strength of the phenomenon of son preference on the fertility behavior of educated women. Women of ?high status? are often regarded as the vanguard of the fertility transition in developing countries and have clearly led the way during India?s recent fertility decline (Dreze and Murthi, 2001). However, recent evidence from India points to the fact that the spread of modern education, the exposure to the mass media and the availability of modern medical technology, particularly in the urban areas has not only lowered fertility but also increased selectivity about the sex of children a couple bears (Basu, 1999). Better educated women occupying higher socio-economic statuses can more effectively control both fertility and mortality and are in a better position than their uneducated counterparts to use contraception and modern technology to achieve their desired family size and the sex of their children (Das Gupta, 1987). Educated parents may be particularly sensitive to gendered market forces. They may act in an even more economically rational manner, favoring male births in contexts where boys bring the greatest economic returns to investment (Cleland and Harris, 1998).

The core level of son preference that seems to be strengthened by modernization and education is apparent in the fertility declines of the northern and western Indian states, such as those of Haryana, Punjab, Gujarat and Maharashtra (Das Gupta and Mari Bhat, 1997; Arnold, 1998; Dyson, 2001). These states are characterized by high male to female sex ratios along with medium declines in fertility. In contrast the southern states of Kerala and Tamil Nadu show improvements in the sex ratios along with substantial declines in fertility to below replacement levels. It is necessary to ascertain whether the educated, contracepting couples are responsible for the perpetuation of sex bias in different regions of India and whether a north-south convergence in fertility patterns and sex bias is emerging.

### 1.2 The Intensification Effect of Son Preference on Educated Women

As fertility declines an 'intensification effect' kicks in, where the total number of children couples want falls more rapidly than the total number of desired sons, and parents tend to definitely want at least some sons within a smaller family (Das Gupta and Mari Bhat, 1997). The Chinese and Korean fertility declines have been dominated by the intensification effect of son preference at lower parities, particularly in terms of the reluctance on the part of couples to bear excess daughters within a one or two child family setting, resulting in relatively higher mortality for second or third order daughters and female fetuses (Choe et al., 1998; Larsen et al., 1998; Lee, 1996; Park and Cho, 1995; Graham et al., 1998). The desire for at least one son appears to make a major contribution to the high reported sex ratios at birth in China and South Korea. One-child families in China and South Korea have a sex ratio exceeding 200 and five-child families have a ratio below 50 (Park and Cho, 1995).

The intensification effect is particularly manifest in those settings where a preference for sons remains unchanged within declining fertility, and parents are reluctant to bear excess daughters, resulting in unfavorable outcomes for 'excess daughters' (Das Gupta, 1987; Das Gupta and Mari Bhatt, 1997). Earlier research on the intensification effect of son preference in India has examined its impact on infant mortality (Das Gupta, 1987; Das Gupta and Mari Bhatt, 1997). This paper looks at the intensification effect of son preference on fertility and whether it manifests itself among educated women in different parts of India.

## 2. DATA AND METHODS

To examine the intensification effect of son preference on fertility, this paper utilizes state-level data from the National Family Health Survey 2 (NFHS 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 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. The analysis

compares the strength of the impact of son preference on fertility behavior across the 14 states over the 1992-99 period: a period during which fertility decline has been significant in India.

The 14 major states have been grouped loosely into two groups of northern/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 fertility 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, 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.

For this study our analysis is limited to parity progression during the period from 1992-99 among women with one, two or three surviving children (referred to as parities 1, 2 and 3). Women with more than three surviving children were not considered in the analysis since women that progress to four or more children are likely to attain the desired number of sons and daughters without being under undue pressure to bear sons at lower parities. The gender measure of 'number of girls' 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 and estimates the impact of each additional daughter on the likelihood of a woman having a subsequent birth as compared to a woman with all surviving sons. The reference category for each parity is women with all sons.

It is hypothesized that women with each additional daughter amongst their surviving children, will respond by having another birth faster than women with all sons as their surviving children. This effect will be larger for educated women opting for smaller families but with strong son preferences. The effect of son preference will be greater at middle rather than at high or low family sizes, 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). It is also hypothesized that a shifting or intensification of the pressure to bear sons on the pace of fertility occurs as early as after the first birth for women opting for small families.

The Cox Partial Likelihood model is used to estimate the influence of the gender of the surviving children on the likelihood or hazard of a mother having a subsequent birth, after controlling for a number of demographic and socio-economic variables such as age of the mother at birth of the last child, religion and area of residence. A hazard ratio greater than 1 signifies a positive impact of every additional surviving daughter and no sons on the likelihood of a woman having another child in the next 6 years[1]. A hazard ratio equal to or less than 1 implies the opposite: having an additional daughter does not influence whether a woman will have another birth in the next 6 years. Separate models are run at each parity for each education category (less or more than 7 years of education), to examine the impact of the number of surviving daughters on the likelihood of having another birth in the next 6 years.

The analysis is presented by parity or birth order, since the main purpose of the study is to examine whether gender composition's impact on fertility is being expressed at smaller family sizes with fertility decline.

## 3. RESULTS

### 3.1 Analysis of the Impact of Education on the Relationship Between Son Preference and Fertility in Northern/Western India for Parity 1-3

Table 1 provides summary statistics by state of the average number of daughters born to a couple at the beginning of each parity transition as well as the total births at the beginning of each parity transition.

**Table 1**
**DESCRIPTIVE STATISTICS FOR NUMBER OF DAUGHTERS OUT OF TOTAL BIRTHS FOR WOMEN IN THE 14 INDIAN STATES AT THE BEGINNING OF EACH OF FOUR PARITY TRANSITIONS**

| STATE | STATE | Transition 1 | Transition 2 | Transition 3 | Transition 4 |
|---|---|---|---|---|---|
| Madhya Pradesh | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.0 |
| | Total births | 5,270 | 4,024 | 2,547 | 1,231 |
| Rajasthan | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.0 |
| | Total births | 7,004 | 5,925 | 4,560 | 2,800 |
| Bihar | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 1.9 |
| | Total births | 6,079 | 5,059 | 3,859 | 2,449 |
| Uttar Pradesh | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 1.9 |
| | Total births | 8,009 | 6,791 | 5,261 | 3,152 |
| Maharashtra | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.2 |
| | Total births | 4,751 | 3,921 | 2,534 | 1,093 |
| Gujarat | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.1 |
| | Total births | 2,928 | 1,966 | 1,023 | 431 |
| Haryana | Mean # of Daughters at start of interval | 0.5 | 0.8 | 1.4 | 2.0 |
| | Total births | 2,332 | 1,596 | 883 | 774 |
| Punjab | Mean # of Daughters at start of interval | 0.5 | 0.8 | 1.4 | 1.9 |
| | Total births | 2,561 | 2,178 | 1,395 | 603 |
| Andhra Pradesh | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.1 |
| | Total births | 3,543 | 2,925 | 1,793 | 770 |
| Karnataka | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.5 | 2.1 |
| | Total births | 3,902 | 2,082 | 1,106 | 953 |
| Kerala | Mean # of Daughters at start of interval | 0.5 | 1.0 | 1.5 | 2.0 |
| | Total births | 2,569 | 2,032 | 959 | 331 |
| Tamil Nadu | Mean # of Daughters at start of interval | 0.49 | 0.94 | 1.46 | 2.06 |
| | Total births | 3,248 | 1,783 | 750 | 277 |
| West Bengal | Mean # of Daughters at start of interval | 0.48 | 0.94 | 1.48 | 2.02 |
| | Total births | 3,706 | 2,752 | 1,633 | 803 |
| Orissa | Mean # of Daughters at start of interval | 0.5 | 0.9 | 1.4 | 2.0 |
| | Total births | 3,289 | 2,201 | 1,227 | 488 |

Table 2 represents the likelihood of having a subsequent birth from parity 1-3 for the time period of 1992-99 for women with different levels of education. At each parity, educated women with each additional surviving daughter are compared with educated women with all surviving sons in their likelihood of having another birth within the next 6 years[1]. Similarly at each parity, less educated women with an increasing number of surviving daughters are compared with less educated women with all surviving sons in their likelihood of having another birth within the next 6 years. Table 2 shows the birth hazards for the states of Madhya Pradesh, Rajasthan, Bihar, Uttar Pradesh, Maharashtra, Gujarat, Haryana and Punjab.

**Table 2**
**ADJUSTED[1)] HAZARD RATIOS FOR WOMEN OF HAVING ANOTHER CHILD WITHIN 6 YEARS FOR PARITIES 1 TO 3 BY EDUCATION AND NUMBER OF DAUGHTERS FOR 8 HIGH SON PREFERENCE STATES**

| 1992-1999/ State | Hazard Ratios of Having Next Child Within Six Years | | | | | |
|---|---|---|---|---|---|---|
| | Parity 1 | | Parity 2 | | Parity 3 | |
| | < 7 years education[a] | 7+ years education[b] | < 7 years education[c] | 7+ years education[d] | < 7 years education[e] | 7+ years education[f] |
| Madya Pradesh | 1.03 | 1.30 | 1.10 | 1.29 | 1.30** | 1.53 |
| Rajasthan | 1.10 | 0.94 | 1.18* | 1.42 | 1.34** | 2.63* |
| Bihar | 1.22* | 1.14 | 1.08 | 0.92 | 1.12 | 1.30 |
| Uttar Pradesh | 1.01 | 1.16 | 1.16* | 1.08 | 1.14* | 1.23 |
| Maharashtra | 1.19 | 1.20* | 1.24* | 1.40* | 1.51** | 1.19 |
| Gujarat | 0.90 | 1.01 | 1.36** | 1.24* | 1.42* | 1.37 |
| Haryana | 1.41* | 0.95 | 1.41** | 1.90* | 1.54** | 1.08 |
| Punjab | 1.15 | 1.70** | 1.00 | 1.01 | 1.57* | 1.10 |

*Notes:*

a. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with one daughter (compared with one son) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

b. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with one daughter (compared with one son) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

c. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with two daughters (compared with two sons) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

d. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with two daughters (compared with two sons) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

e. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with three daughters(compared with three sons) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

f. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with three daughter (compared with three sons) is statistically significant, with * indicates p<0.05, ** indicates p<0.001.

1) Mother's age, education, period, religion and area of residence were included as independent variables in all the models but are not shown here. A detailed analysis of the impact of these variables on fertility are presented in Potdar (2003).

Table 2 includes the four high fertility and high son preference states of Madhya Pradesh, Rajasthan, Bihar and Uttar Pradesh, the two medium fertility states of Gujarat and Maharashtra and the two low fertility states of Punjab and Haryana: all eight states however exhibit high son preferences. Table 2 shows that in general, less educated women in the high fertility states do not have significantly large and positive birth hazards on account of the gender variable since the average family is big and a couple can attain the desired number of sons and daughters within this family size. The majority of women are also illiterate in these states and women with seven or more years of schooling are a minority. Thus for the less educated women in the four high fertility states, the likelihood of having another birth based on the number of daughters for parity 1 and 2 are less than 25% for every additional daughter over the 1992-99 period. In 1992-99, for parity 3, it is only in Madhya Pradesh and Rajasthan that less educated women are significantly more likely to have a subsequent birth based on the number of daughters as compared to their counterparts with all sons.

Within this high fertility scenario, more educated women are opting for smaller families in recent years with the average number of children being 2.64 among women with 7 or more years of education (NFHS-2, 2000). However, the underlying preference for sons does not weaken with female education in these states, and for the most part educated women with an increasing number of surviving daughters at each parity indicate a positive chance of having a subsequent birth as compared to women with all surviving sons. However, except for Rajasthan, where educated women with all 3 surviving daughters are 163% more likely to have a child in the next 6 years. These hazards may not be statistically significant due to the small number of educated women in these categories.

Table 2 also indicates that in the northern/western states of Punjab, Haryana, Maharashtra and Gujarat, with comparatively higher female education and high to medium fertility declines, the impact of son preference on subsequent fertility is evident after the first surviving daughter itself. At parity 1, less educated women in Haryana with no son are 41% more likely to have another birth within 6 years as compared to less educated women with no daughter. For the more educated women in Punjab, the likelihood of a woman with no sons having another birth in the next 6 years is 70% higher than for their counterparts with no daughter. The chances of having another child based on gender composition are largest at this birth order signifying the intensification of desire to bear a son after the first daughter. It is interesting to

note that despite declining fertility and greater female education, son preference's impact on the pace of fertility in Punjab remains strong.

At parity 2, both less educated and more educated women in Maharashtra, Gujarat and Haryana have gender hazards that are significant and greater than 1.20: this indicates that the pressure to bear a son is strongest at parity 2 with every additional surviving daughter among both educational categories.

At parity 3, women with less education in all four states of Maharashtra, Gujarat, Haryana and Punjab have large and significant hazards greater than 1.40 and this indicates the continued pressure on less educated women with an increasing number of surviving daughters and no sons to continue child bearing in the hope of at least one son. However, none of the birth hazards are significant at parity 3 for educated women in these states since few women in this category opt for large families and the sample sizes are small.

As stated earlier, these four states are characterized by medium to high fertility decline, moderate to high levels of female education and high levels of son preference and it is within such a paradigm that the intensification effect of son preference on the pace of childbearing can be seen.

This could result in either a stalling of the fertility decline in medium fertility states of Maharashtra and Gujarat (Haub, 2002) or a skewing of sex ratios at birth to abnormal levels in low fertility states of Delhi, Punjab and Haryana (Retherford and Roy, 2003). Compared with other countries in the world, Punjab with a sex ratio at birth of 1.20 in 1984-98 has one of the highest sex ratios at birth in the world (Retherford and Roy, 2003).

### 3.2 Analysis of the Impact of Education on the Relationship Between Son Preference and Fertility in Southern/Eastern India for Parity 1-3

Earlier studies have shown that son preference does not significantly or uniformly influence the pace of fertility among women in the six Indian states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, West Bengal and Orissa (Potdar and Gurak, 2003; Mutharayappa et al., 1997). It is

interesting to examine whether more educated women who have led the fertility decline in recent decades also exhibit a change in their pace of fertility on the basis of the gender composition of their surviving child/children at each parity. To the extent that son preference remains a strong motivating force among more educated women, they are in the best position, given their greater use of reversible methods of birth control, to respond to a perceived need for a male birth by speeding up their fertility, and hence if there is any son preference manifested by educated women in general, it would be most clearly seen in these states, since they are characterized by large educated female populations. Table 3 summarizes for the 6 states, for parity 1-3, the effects of having an increasing number of surviving daughters and no sons on the likelihood of a woman having a subsequent birth within 6 years, by education.

**Table 3**

**ADJUSTED[1] HAZARD RATIOS FOR WOMEN OF HAVING ANOTHER CHILD WITHIN 6 YEARS FOR PARITYS 1 TO 3 BY EDUCATION AND NUMBER OF DAUGHTERS FOR 6 LOW SON PREFERENCE STATES**

| State | Hazard Ratios of Having Next Child Within Six Years | | | | | |
|---|---|---|---|---|---|---|
| | Parity 1 | | Parity 2 | | Parity 3 | |
| | < 7 years education[a] | 7+ years education[b] | < 7 years education[c] | 7+ years education[d] | < 7 years education[e] | 7+ years education[f] |
| Andra Pradesh | 1.06 | 0.90 | 1.17 | 0.86 | 1.19 | 2.94 |
| Karnataka | 1.07 | 0.97 | 1.14 | 1.61* | 1.16 | 1.42 |
| Kerala | 0.87 | 1.04 | 0.76 | 1.05 | 0.79 | 1.02 |
| Tamil Nadu | 1.01 | 1.80* | 1.21 | 0.90 | 0.85 | 1.67 |
| West Bengal | 1.20 | 0.96 | 1.25* | 1.00 | 1.30* | 0.65 |
| Orissa | 1.90 | 1.17 | 1.29* | 1.26 | 1.07 | 1.43 |

*Notes:*

a. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with one daughter (compared with one son) is statistically significant, * indicates $p<0.05$.

b. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with one daughter (compared with one son) is statistically significant, * indicates $p<0.05$.

c. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with two daughters (compared with two sons) is statistically significant, with * indicates $p<0.05$.

d. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with two daughters (compared with two sons) is statistically significant, * indicates $p<0.05$.

e. The asterisks (*) in this column indicate that for women with less than seven years of education the likelihood of having another birth associated with three daughters (compared with three sons) is statistically significant, * indicates $p<0.05$.

f. The asterisks (*) in this column indicate that for women with seven or more years of education the likelihood of having another birth associated with three daughter (compared with three sons) is statistically significant, * indicates $p<0.05$.

1) Mother's age, education, period, religion and area of residence were included as independent variables in all the models but are not shown here. A detailed analysis of the impact of these variables on fertility are presented in Potdar (2003).

A glance at Table 3 shows that almost none of the birth hazards are significant at parity 1: for these states there is essentially no evidence of an effect of having no son at the level of one surviving child by educational category. In fact, Tamil Nadu has a significant negative gender composition birth hazard at parity 1 for women with 7 or more years of education: implying that educated women with one daughter and no son are 20% less likely to have a subsequent birth in the next 6 years as compared to their counterparts with one son and no daughter.

At parity 3, again the hazards are small and not significant except for educated women in Karnataka (1.61), and less educated women in West Bengal (1.25) and Orissa (1.29). At parity 3, it is only among less educated women in West Bengal that the pressure to bear a son increases by 30% the chances of women with each additional surviving daughter to have another birth within the next 6 years as compared to their contemporaries with all three surviving sons. Thus, the predominance of small and non significant birth hazards based on the gender of the surviving children at each parity indicate no preference for sons or daughters by education. This augurs well for the continued demographic transition in these states. Also, there does not appear to be a convergence in the fertility patterns of the northern/western and southern/eastern states: women in the north generally continue to display greater chances of having additional births based on the fact that they do not have any sons as compared to their counterparts in the south. This is not surprising considering that son preference is low in the southern/eastern states and is not an important factor in determining fertility despite declining fertility.

## 4. DISCUSSION

Despite declining fertility, son preference continues to influence the pace of childbearing among Indian women. The pressure to bear sons has particularly intensified among more educated women at parities 1 and 2, with each additional surviving daughter and no sons in the northern and western states of Punjab, Haryana, Gujarat and Maharashtra, and among less educated women at parity 3, with each additional surviving daughter and no sons in the states of Madhya Pradesh, Rajasthan, Punjab, Haryana, Gujarat and Maharashtra. These findings support the hypothesis that women with no surviving sons at middle family sizes (of three or four children) are at a greater probability of having more children in the strong son preference states than women with all surviving sons. The findings also support the hypothesis

that educated women with no sons but with strong son preferences are more likely to have another birth faster than educated women with no daughters at lower parities (a family size of two children). The shifting or intensification of the pressure to bear sons on the pace of fertility occurring as early as after the first birth for women opting for small families is seen among educated women in Punjab.

The northern and western states have large populations that impact the decline in India's overall fertility significantly and strong son preference is one factor impacting couples opting for large families (Mutharayappa et al., 1997). The southern states such as those of Tamil Nadu and Kerala 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 1992-99 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 in some states. 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.

The most striking pattern is that more educated women experience a powerful pressure to bear sons within the strong son preference climate of the northern states. Obviously female education alone is not enough to remove gender biases in a strongly patriarchal society, where a premium is put on sons, while daughters are given a secondary status.

Policy makers, who have been emphasizing the need to educate the girl child as one of the indirect avenues of reducing fertility in India, may have to supplement the education drive with greater community and financial involvement in their efforts to remove the cultural and economic supports of son preference and make daughters only families more worthwhile. Some of these efforts could include strict enforcement of the dowry ban (giving or accepting dowry was banned by a national law called the Prohibition of Dowry Act, 1961) and the law requiring equal distribution of inherited property between sons and daughters (the nation wide Hindu Succession Act

was passed in 1956 and further amended in 2004), greater visibility to women's roles in education, industry, leadership and politics, a social security system that would remove the dependence on sons by parents during old age and an equal sharing of the responsibility of aging parents by both sons and daughters.

It is possible to use the media, particularly the television, the radio, press and films to highlight 'only daughters' families and their successful attainment of the family goals of education, employment and old-age and financial security of parents. In this way it can be widely advertised that sons are not a necessity in today's world, and that parents need not keep trying for sons and thereby increase the number of unwanted daughters in the family.

It is necessary for population policy to concentrate on is the achievement of accelerated fertility decline in the high-fertility states of the north. As Haub (2002) argues: if significant fertility decline does not resume, the populations of these large states will grow more rapidly, gaining an ever-increasing share of the national population. In that event, fertility could even rise, a possibility that has not yet caught the attention of planners.

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## NOTE

1. It is six (6) years because that is the period of observation: the analysis looks at the likelihood of a woman having a subsequent birth during a period of 6 years from the birth of her last child. For example, if a woman has a birth of a child in 1987, the analysis examines her probability of having another birth between1987-1993. The reason I took 6 years as the observation period is because 80% of women in India have another birth within 5-6 years of the previous birth.

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# APPENDIX

The Cox Partial Likelihood model is used to estimate the influence of the gender of the surviving children on the likelihood of a mother having a subsequent birth, after controlling for a number of demographic and socio-economic variables such as age of the mother, education (less or more than 7 years of education), religion, area of residence and period of observation (pre-1980, 1986-92, 1992-99)*. The dependent variable is a birth and the predictor independent variable is number of daughters. A hazard with a value greater than 1 implies that the number of surviving daughters positively influences the pace of subsequent child bearing and is an indication of the manifestation of son preference on the pace of fertility. A hazard less than 1 implies a negative influence of son preference on subsequent fertility. The main point of interest will be the influence of educational status on the impact of the gender of the surviving children on the pace of subsequent fertility. The implication here is that contraception is widely used to translate reproductive intentions into fertility-regulation behavior.

The gender measure of 'number of daughters' 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 number of live births under consideration. Thus at parity 3, the 'number of daughters' variable takes on the values ranging from 0 daughters to 3 daughters. Regarding the period variable, 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. Periods 1986-92 and 1992-99 isolate 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. Only the period 1992-99 is referenced in this paper.

Female education is categorized into two classes, those women with 0 to less than 7 years of education and those women with seven and higher years of education. Thus the variable called '7+ years of education' indicates women with seven or more years of education as compared to women with less than seven years of education.

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 parity with fertility decline in these states. We know that son preference does influence the pace of fertility among women in India and in the eight northern/western states from previous research on the subject (Arnold, et al. 1998; Potdar and Gurak, 2003). It is interesting to note whether the same fertility behavior pattern in response to intensifying son preference is seen among women of different educational categories in the two groups of states under consideration here.

## NOTE

* For a detailed analysis of the effect of other control variables such as age, religion and residence of the mother on the pace of childbearing please refer to the appendix at the end of the article or the author's doctoral dissertation on "Son Preference And Its Impact On Fertility In India: A Comparative Study Of 14 Indian States" (Potdar, 2003).