Son Preference and Sterilization in the Context of Fertility Decline in Tamil Nadu, India

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Abstract
Tamil Nadu has long been regarded as a demographic outlier in India, yet within the context of below-replacement fertility, sex ratios have worsened in recent years. Female sterilization is widespread, but it is not clear how the timing of sterilization adoption is influenced by son preference. We use pooled data from the National Family Health Survey to analyze how women's risk of sterilization varies depending on the sex and number of children, and how these patterns have changed across marital cohorts. Results suggest that sterilization has been adopted more rapidly in recent cohorts, particularly among women with two children with at least one son. Although some couples desire to have one girl as well, in the most recent marital cohort, those with 2 boys adopt sterilization at the same rate as those with 1 girl/1 boy, suggesting that a small completed family size trumps the preferred sex composition of children.

Key words: sterilization, India, son preference

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Background

The southern state of Tamil Nadu has long been regarded as a demographic and social outlier in India. For example, fertility reached replacement level by 1993, and had dropped to 1.6 by 2011 even as the all-India TFR remained at 2.7 (Guilmoto and Rajan 2013). Couples have traditionally relied on female sterilization once reaching their reproductive goals, while the use of other modern contraceptive methods for spacing has been extremely low (NFHS-3). Consequently, in places where fertility has declined, women's reproductive spans – the time between marriage and sterilization – have shortened significantly, as documented in Andra Pradesh, another state in South India (Padmadas, Hutter, and Willekens 2004). Nevertheless, childbearing compressed in young ages groups could potentially contribute to more rapid population growth than would occur with more spacing and later childbearing (Matthews et al. 2009). Within the fertility transition context, it is therefore important to understand the timing of sterilization and its determinants.

Tamil Nadu is also known for relatively high indicators of gender equality, including an apparent absence of son preference (Dyson and Moore 1983; Das Gupta et al. 2003). However, in tandem with the fertility decline, sex ratios favoring boys have become more skewed in recent decades, converging toward rates for the rest of India. For example, the child sex ratio (ages 0-6) for rural Tamil Nadu reached 107.4 by 2001 compared to 107.1 for all rural India (Srinivasan and Bedi 2008). Previous research has found that adoption of sterilization is dependent on the sex composition of surviving children, with delay in places where son preference is high (Rajaram 1998). We hypothesize that the decision about when to use female sterilization will similarly be influenced by sex composition in Tamil Nadu. In addition, as fertility declines to ever lower levels, the number of surviving children will also be important, with those parents who reach their desired sex *and* number composition adopting sterilization a faster pace than those who do not.

Existing research on the determinants of sterilization is primarily cross-sectional, often comparing woman of childbearing age who have been sterilized to those who have not at one moment in time and focusing on time invariant factors such as region and socioeconomic status (Oliveira, Dias, and Padmadas 2014). Such an approach, however, cannot detect the more nuanced effects of child sex/number composition. Two exceptions from India have employed a life course perspective to examine son preference and sterilization. The first study takes place in Madhya Pradesh, a North Indian state with a fertility level of 3.9 in 2001. The authors construct pregnancy-interval data for women who have given birth to at least 1 child, defining each subsequent interval as the time between two successive pregnancies; sterilization is one possible outcome (Edmeades et al. 2012). Results show that women with two or more sons (alone or in combination with girls) are more likely to be sterilized at the end of an interval compared to women with daughters only. Overall, the most preferred combination in this context is two sons and one daughter.

A second study utilizes data from three waves of a study of women in two urban slum populations in Bengaluru in Karnataka, South India (Edmeades et al. 2011). Women with any sons are more likely to be sterilized in the interval between waves than those with no sons, with the strongest effect at lower parties. In other words, in this low-fertility context, desires for a

small family outweigh the desire for at least one son. Yet a drawback to this research is that the exact timing of sterilization is not taken into account. The sex composition of children could change between waves due to child births and deaths, ultimately influencing the decision in that interval. Both papers examine the timing of sterilization in pregnancy intervals, which does not fully take into consideration the changing sex composition of surviving children. Furthermore, the sample includes similarly-aged women surveyed in a relatively short time period. Such an approach inhibits a comparison of the way the timing of sterilization in relation to child sex composition has changed in recent decades, which is likely to vary in the context of compressed reproductive spans (Padmadas et al. 2004) and lower total fertility.

In this paper, we advance the literature on son preference and contraceptive choice by investigating how the number and sex composition of surviving children is associated with the timing of sterilization across successive marital cohorts. Much existing research on son preference focuses exclusively on parents' desires for at least one son. The current family planning slogan in Tamil Nadu, "We 2, Ours 1," reflects additional pressures on families for one child. However, in Tamil Nadu, evidence has shown that parents wish to have one daughter as well (Diamond-Smith, Luke, and McGarvey 2008). In contrast to previous work, our approach models the hazard of sterilization since the initiation of marriage, which provides information on the contribution of child sex composition to the shortening of women's entire reproductive spans – from first exposure to the risk of pregnancy to the completion of childbearing. By examining sterilization timing across marriage cohorts, it becomes possible to see the effects of son preference on contraceptive decision-making as the fertility transition unfolds.

Data and Method

To carry out our analysis, we pool data on women's reproductive histories from three rounds of the National Family Health Survey in Tamil Nadu, India, 1992/93, 1998/99, and 2005/06 (NFHS-1, NFHS-2, NFHS-3), including month and year of marriage, child births, child deaths, and date of sterilization, our primary outcome of interest. By leveraging the dates of these events, we construct a person-months file and employ proportional hazards models with time-varying covariates: namely, the sex composition and number of children as it changes post-marriage. With a cross-sectional approach, modeling sterilization becomes problematic because it does not take into account the fact that many women interviewed have not yet completed their reproductive spans; they may, for example, have additional children and/or adopt sterilization in the future. In addition, women's sex composition of children is viewed at one point in time. Our use of Cox regression models accounts for this right-censoring and the changing sex composition of children during women's reproductive histories.

Table 1 presents an overview of the pooled data across three marital cohorts: women married in the 1960s/1970s, the 1980s, and the 1990s/2000s. Consistent with existing research on compressed reproductive spans (Padmadas et al. 2004), the pattern across these cohorts shows average age at first marriage increasing by nearly three years (16.8 to 19.9) while average age at first birth rises by two years only (19.3 to 20.4). More dramatically, the average number of marital years to sterilization was about a decade for those married in the 1960s/70s, compared to just 6.7 years in the 1980s and 4.8 years among the most recent cohort.

For the descriptive analysis and preliminary results, we classified women according to the sex/number composition of surviving children at time of interview into seven categories.

Consistent with the documented drop in total fertility across these decades, the percentage of women with 3+ mixed sex children fell from 61.5% in the 1960s/70s to just 33% in the 1980s and 12.2% in the 1990s/2000s, although care must be taken in examining this cross-sectional snapshot as women married more recently were interviewed closer to their marriage dates, making them less likely to have completed their reproductive spans.

Table 1. Ever-married women in Tamil Nadu (NFHS 1-3, weighted)

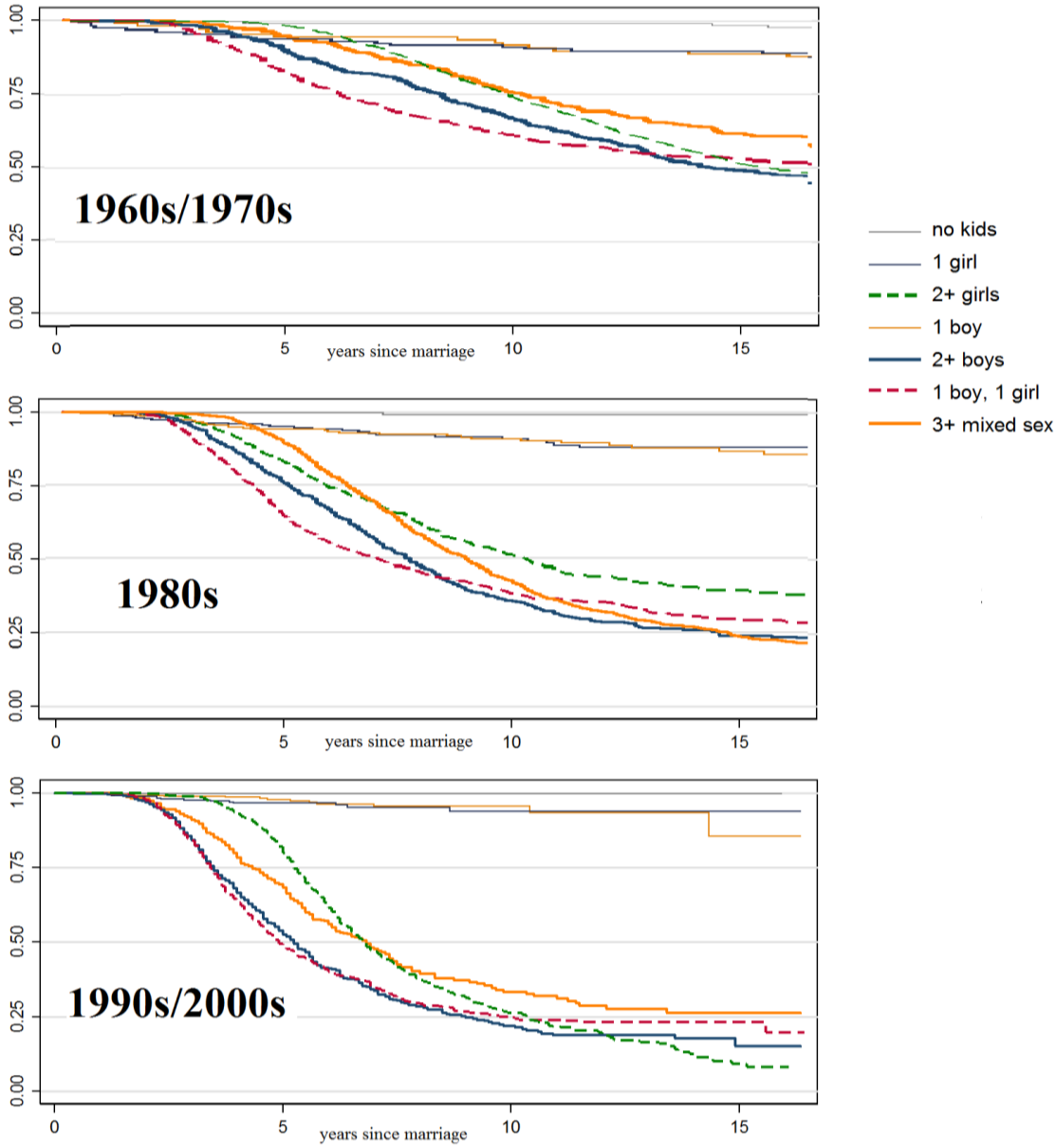
	1960s/1970s	1980s	1990s/2000s	OVERALL
Mean age at interview (years)	40.5	32.4	26.2	32.5
Mean age at first marriage (years)	16.8	18.3	19.9	18.5
Mean age at first birth (years)	19.3	20.4	21.4	20.4
Average number of children born	3.5	2.3	1.5	2.4
Composition of children (%)				
no children	3.4	6.5	20.1	10.5
1 girl	2.7	8.0	13.5	8.4
2+ girls	7.0	10.6	9.4	9.1
1 boy	4.0	9.0	14.9	9.7
2+ boys	11.2	13.8	11.5	12.2
1 boy, 1 girl	10.1	19.0	18.3	16.1
3+ mixed sex	61.5	33.1	12.2	34.0
Ideal number of..				
boys	0.86	0.79	0.68	0.77
girls	0.74	0.71	0.64	0.69
Sterilization				
% sterilized	51.6	51.6	34.3	45.3
marriage years to sterilization	10.0	6.7	4.8	7.3
Education (%)				
none	52.5	39.6	18.3	35.7
primary	29.7	30.6	23.5	27.8
secondary	15.6	24.6	44.9	29.3
higher	2.2	5.2	13.2	7.2
Rural (%)	66.2	60.1	56.4	60.6
Religion (%)	0.0	0.0	0.0	0.0
Hindu	88.9	88.8	88.8	88.8
Muslim	5.7	5.5	4.9	5.3
Christian	5.2	5.6	6.1	5.6
other / don't know	0.2	0.1	0.3	0.2
Caste (%)	0.0	0.0	0.0	0.0
Scheduled caste	22.3	21.7	21.2	21.7
Scheduled tribe	0.8	0.6	0.7	0.7
Other backward caste	37.3	49.9	71.9	54.1
other / don't know	39.7	27.8	6.2	23.5
N	3,880	4,449	4,735	13,064

*Women married before 1960 excluded; weighted estimates shown here.

Preliminary Results

As noted above, the event history analysis will include time-varying sex/number composition of children from the first month of exposure at marriage through a women's reproductive history, ending at month of sterilization, menopause, or date of interview. Figure 1 provides initial results with Kaplan-Meier survival estimates for women at risk of sterilization post-marriage, based on the number and sex composition of children at interview date across three marital cohorts. Across all three groups, women with 1 boy, 1 girl are most likely to be sterilized, although the timing appears to vary quite notably: about half of women with 1 boy, 1 girl were sterilized 15 years following marriage in the earliest cohort, whereas half of women with 1 boy, 1 girl were sterilized about 7 years post-marriage in the 1980s cohort and about 5 years post-marriage in the 1990s/2000s.

Figure 1. Kaplan-Meier survival estimates:
Timing of Sterilization and Years Post-Marriage, by Marital Cohort



The compression of nearly all the number/sex composition reproductive spans is notable across these graphs, with adoption of sterilization occurring more rapidly among those who were more recently married. It is also possible to see changes potentially stemming from the low fertility context. Whereas the lines for 3+ mixed sex children and 2+ boys are clearly distinguishable for the 1960s/1970s and 1980s, they overlap substantially for the most recent marital cohort. This may suggest that although many parents want 1 boy, 1 girl, if two boys are born, some couples opt for sterilization to avoid the costs associated with an additional child. Women married in the 1990s/2000s with 2+ girls (dashed green line), however, put off sterilization longer.

Next Steps

As noted above, regression modeling will account for the right-censoring in the data due to interview exit. While the Kaplan-Meier survival estimates provide a snapshot of marital cohort differences, these curves only model women whose fertility at the time of interview places them in the given group. Our event history analysis will allow child number and sex composition to vary over time, which will more accurately model the timing of sterilization. Cox regression analyses with additional covariates, including age at marriage, education, caste, and religion, will be done separately by marital cohort before we pool data in a complete model to text for interactions between cohort and child composition. Such a step will make it possible to explore the meaningful differences in number and sex composition, and how they relate to timing of sterilization, in the context of total fertility decline over the past five decades.

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