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Sequences of Birth History among Indian Mothers born between 1956-1960

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ABSTRACT *In many societies the preference for sons is a long-standing cultural custom. In recent decades such preferences have also been fulfilled by sex-selection abortion in countries where parents desiring fewer children find efficient methods to identify the sex of the fetus. India is one of those countries demonstrating a very high SRB in recent decades. According to the most recent estimates, the overall SRB is approximately 110 with meaningful differences among states, but the conditional sex ratio is much higher if the previous births were female. These estimates are supposedly the result of parental strategies aimed at having at least one son in the family. This study highlight such strategies by analyzing the birth history trajectories of a generation of women born between 1956 and 1960, and identifying their characteristics according to the path they belong to.*

Introduction

In many societies the preference for sons is a long-standing cultural custom. It often leads to higher mortality among women compared to men due to different care and differentiated food strategies that penalize females. In recent decades such preferences have also been fulfilled by sex-selection abortion in countries where parents desiring fewer children find efficient methods to identify the sex of the fetus. (Bongaarts, 2013). A patriarchal social environment in which girls are considered as a source of "impoverishment" for the family as opposed to boys, who are seen as economically and emotionally advantaged, exacerbates the practice of sex selection abortion. Prenatal sex selection is leading to distortion in the levels of the sex ratio at birth (SRB), reaching between 110 and 120 male births per 100 females in several Asian countries, which is heightened for second parity and even higher among mothers without sons (Guilmoto, 2012).

India is one of the Asian countries demonstrating a very high SRB in recent decades. Although some studies forecast a decline in the coming years (Das Gupta, Chung, and Shuzhuo, 2009) , SRB remains high. According to the most recent estimates, the overall SRB is approximately 110 (with meaningful differences among states) but the conditional sex ratio is much higher if the previous births were female (Jha, Kesler, Kumar, Ram F., Ram U., Aleksandrowicz, Bassani, Chandra, and Banthia, 2011). These estimates are supposedly the result of parental strategies aimed at having at least one son in the family. This study attempts to highlight such strategies by analyzing the birth history trajectories of a generation of women born between 1956 and 1960 and identifying the characteristics of the women according to the path they belong to. In particular, our objective is to measure the impact of the sequence and timing of preceding births on the fourth birth probability.

Data and method

Data derives from the last National family health survey (NFHS-3) carried out in 2005-2006. The survey records the births history of each mother aged 15-49 years old and provides several pieces of information about the women. Among them, education, contraceptive prevalence and the subjective perception of gender role are taken into account. To reach our objective, cohorts of women born between 1956 and 1960 (9807 cases) were selected since in 2005-2006 they were at the end of their reproductive history Moreover, they were in the middle of their reproductive period, when total fertility rates started to decline and techniques to assess the sex of the fetus became available.

Using this data a new statistical approach is implemented. In particular, we pay attention to the gender sequences of births using the sequences analysis (SA) technique (Abbott, and Tsay, 2000), which approaches the analysis with a life course perspective and is able to identify sequence models considering both the state and the timing of events (Billari, 2005). The advantage of this analysis is that it supplies sequences simultaneously and simplistically, that take states and timing into consideration. This technique uses the *Optimal Matching Analysis* (Gauthier, Widmer, Bucher, and Notredame, 2009). which is a wide range of pattern-matching algorithms utilizing an algebraic approach and using mono-linear sequences, that provides a similarity measure for each sequence pair. The distance between two sequences is defined as the minimum total cost of transforming one sequence into another. The underlying hypothesis of this measurement type is that an alignment of sequences corresponds to similar "life models" and dissimilarities can be shown both in states and timing (Billari, 2005). Therefore, the SA technique relies upon the application of Cluster Analysis to identify the different types of life courses (Aassve, Billari, and Piccarreta, 2007), which are interpreted as profiles associated with the particular characteristics of each sequence.

To apply this technique we must consider three aspects: the number of births (quantum), gender sequences (sequencing) and first and inter-pregnancy intervals (timing). Since our objective is to measure the impact of the sequence and timing of preceding births on the fourth birth probability we choose to consider women with at least three children and look up to the third order of birth to define the sequences. Moreover, we consider the semester as a time unit (30 years of observation) achieving sequences that are 60 semesters long and, finally, we consider 9 possible states: no births (coded 0); 1 son (1); 1 daughter (2); 2 sons (11); two daughters (22); first son then daughter (12); first daughter then son (21); third birth male (31) and third birth female (32). To determinate the costs we apply a strategy to set all substitu-

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tion costs to a constant by using an identity matrix (Billari, 2001; Gauthier et al. 2009).

Finally, since we assume that the gender and timing sequence of previous births affects the probability of a fourth birth, we opt for a logistic model regarding 45-49 year old women with at least 3 children (7,185 women). As independent variables, we select certain structural variables as suggested by the literature: residence, area, education, religion, and wealth. In addition, we introduce contraceptive prevalence and two dimensions on gender conditions as female empowerment: autonomy and isolation[1].

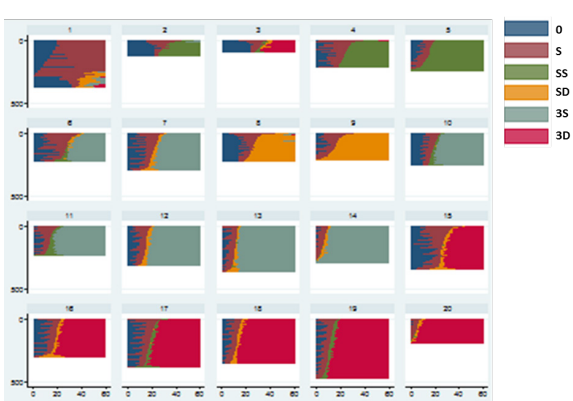
The reproductive behavior is also investigated through the mean timing between one state and another (Short -as reference, Medium, Long). Finally, the gender sequence up to third order births is introduced in the model in order to study the effect of the gender of previous children (SSS (with S =son), as reference to the seven sequences with at least a daughter (D) follow).

Son preference, birth sequences and logistics model

The reproductive histories were the result of personal strategies that implied a rational choice about the gender and number of children to be welcomed into the family. The path of the reproductive biographies is determined by the aspect related to the ideal number of children. According to the last DHS survey, approximately 75% of Indian women desired the same number of sons and daughters. The crucial difference was the need, or "the duty", to give birth to at least one son. In fact 22% of the same women had hoped to have more sons than daughters, whereas only 2.3% showed the opposite desire. This is also evident when the desire for one more child is analyzed, controlling for the children already born. Mothers without males were much more likely to have another child compared to mothers with at least one son. This is especially true from the third child onwards as the demand for children among Indian women was approximately four children[2].

The results of these strategies can also be assessed through the clusters of sequences[3]. As regards all women born between 1956-1960, we observe that the propensity to have a third child is relatively high since the Total Fertility Rate of this generation was almost four children. Moreover, among the mothers whose first born child was a son, it was much easier to stop or delay births (cluster 1,2,3 of Fig.1).

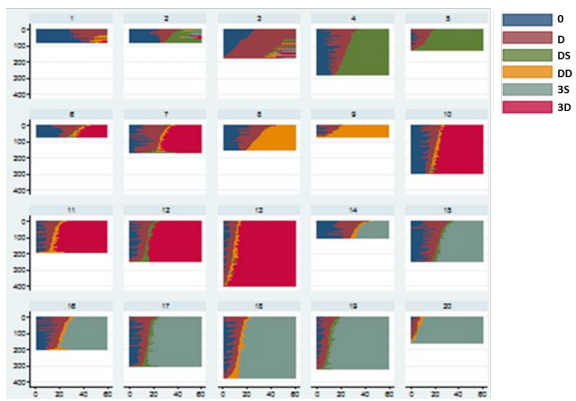
Fig.1 Sequence plot by cluster. Mothers of first child = son*



Note: S= son, D= daughter * x-axis semester; y-axis frequency

On the contrary, very few mothers with a daughter as their first born child had the same reproductive behavior (1,2,3 of Fig. 2). Looking at the number of women who had stopped at two children if they were male (cluster 4, 5 fig.1) or at least had one male (5,6 fig.1; 4,5 fig. 2), the clusters confirm the need to have at least one son; whereas the amount of women who had stopped at two daughters is much lower. (8,9 fig.2). The interval between births also emphasizes the need for a son since the intergenesic intervals are shorter if the preceding birth is a daughter.

Fig. 2 Sequence plot by cluster. Mothers of first child = daughter*



Note: S= son, D= daughter * x-axis semester; y-axis frequency

To measure the impact of sequences on the probability of having a fourth child, we apply a logistic regression to the mothers with at least three children.

The results (Table 1) show the well-known effects of education and religion on a transition to higher orders of birth (higher levels of education decrease the probability of having a fourth child as well as following/declaring the Hinduism religion in comparison to other religions). Other structural characteristics show significantly different odds ratios, but only in the cases of women resident in the South-West versus those living in the North and in that of women with a respectively higher level of wealth, who have (a lower probability of having a fourth child., .

The socio-cultural characteristics significantly affect the probability of having a fourth child when expressed in behaviour: not being isolated, making use of contraceptives or having long intervals between births reduces the probability.

Finally, the sequence of the gender of progeny, all other factors equal, is crucial if there is at least one daughter. In particular, the propensity to have a fourth child increases significantly with the number of daughters already born and reaches its highest level among the mothers of three daughters.

Both the descriptive analysis, through the SA, as well as the results of the regression model, show that the presence of at least one son in the family was fundamental for Indian parents of this generation. Mothers without a son had already shortened the interval between births and increased their propensity to have one more child.

The forthcoming wave of DHS will allow for comparisons between the reproductive strategies of the older and

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younger generations, as the younger have had more opportunities to use devices that identify the sex of the fetus, in the context of a reduced demand for children.

Table 1- Odd Ratios and P-values of the Transitions to fourth birth among Indian women born in 1956-1960.

Logistic Model	Odds Ratios	P-value
Residence(Rural vs Urban)	1,007	Ns
Area (East vs North)	1,067	Ns
Area (South-West vs North)	0,482	*
Education (Low vs Illiterate)	0,685	*
Education (Middle vs Illiterate)	0,463	*
Education (Tertiary vs Illiterate)	0,161	*
Religion (Islam vs Hinduism)	2,535	*
Religion (Others vs Hinduism)	1,521	*
Wealth (Medium vs Low)	0,914	Ns
Wealth (High vs Low)	0,718	**
Isolation (No vs Yes)	0,672	*
Ever use Contraception(Yes vs No)	0,797	**
Autonomy (Low vs No Autonomy)	1,092	Ns
Autonomy (High vs No Autonomy)	1,101	Ns
Timing (Medium vs Short)	0,614	*
Timing (Long vs Short)	0,379	*
Sequence (SSD vs SSS)	1,526	*
Sequence (SDS vs SSS)	1,096	Ns
Sequence (SDD vs SSS)	1,877	*
Sequence (DSS vs SSS)	0,913	Ns
Sequence (DSD vs SSS)	1,604	*
Sequence (DDS vs SSS)	1,273	***
Sequence (DDD vs SSS)	2,219	*
Constant	7,098	*
N	7185	
-2 Log likelihood	7625,7	
Cox & Snell R Square	0,150	
Nagelkerke R Square	0,213	
ns: (p > 0,05)		
***: p < 0,05 - **: p < 0,005 - *: p < 0,001		

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