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Contraceptive Method Mix:
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Influence of Son Preference on Contraceptive Method Mix: Some Evidences from 'Two Bengals'

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Abstract

Although the people of Bangladesh and the state of West Bengal of India share common cultural practices, they differ in contraceptive adoption and practice. The adoption of modern contraceptive methods among women/couples of the two Bengals when compared to each other is found to differ. The women/couples of West Bengal make significant and higher use of the natural method compared to that of their counterparts in Bangladesh. Using data from Demographic and Health Survey (DHS) of both the regions, and by employing the sequential logit models, the present study suggests that a greater reliance on natural methods among women of West Bengal is indeed related to higher preference for sons in this region compared to that in Bangladesh.

I. Introduction

The state of West Bengal of India and Bangladesh (erstwhile East Bengal) were united before the independence of India from the British in 1947. 'Bengal' (or 'Greater Bengal' according to Basu & Amin, 2000), as a whole, is a cultural and linguistic region and the cultural linkages between the 'two Bengals' continued even after the partition of Bengal (Inden& Nicholas, 2005; Amin et al.,

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2002). People of both the Bengals have been commonly speaking of a single 'Bengali society' (*Vagersamaja*) and 'Bengali culture' (*Vagersaskti*) (Inden & Nicholas, 2005).

Apart from sharing common cultural practices such as language, food habit, attire, and agro-climatic conditions, the people of the 'two Bengals' have some unique commonalities in history. The political factors which developed particularly during colonial period, facilitated in developing a single 'Bengali' identity (Bandyopadhyay et al., 1994; Lewis, 2012; Basu & Amin, 2000). In the recent past, the liberal intelligentsia of both the Bengals have rejected the orthodox Islamic view of culture and emphasized other identity markers, such as Bengali language and common cultural roots highlighting the 'Bengali' identity (Murshid, 1997).

Das Gupta and Narayana (1997) argued that a meaningful comparison of demographic processes can be carried out between Bangladesh and West Bengal at least for two reasons: first, Bangladesh and West Bengal were two halves of the same province before India's independence; and second, after partition, a large volume of migration continued to move across the border in search of livelihood, for the purpose of visiting relatives and for trade, thus facilitating an exchange of information on all aspects of life including childbearing.

Notably, both the regions have witnessed fertility transition almost at about the same time (since late 1970s or early 1980s) even after remaining an under-achiever with regard to standard preconditions for fertility decline such as, significant progress in the socio-economic front, substantial decline in infant mortality, marked improvement in maternal health, increase in the age of marriage and age of child bearing, and considerable progress in the status of women (Basu & Amin, 2000; Chattopadhyay & Goswami, 2006). Table 1 depicts some of the important demographic and health indicators of West Bengal and Bangladesh during the recent period.

Table 1: Some important demographic and health indicators of West Bengal and Bangladesh

Demographic and health indicators	West Bengal	Bangladesh
Population, 2011 ('000s)	91,348 ^a	152,518 ^b
Population density, 2011 (persons/sq km)	1029 ^a	1015 ^b
Sex ratio, 2011 (female/1000 male)	947 ^a	998 ^b
% population aged 6+ that is literate, 2011	77.1 ^a	56.1 ^d
% female population aged 6+ that is literate, 2011	71.2 ^a	53.4 ^d
Child (0-6 years) sex ratio, 2011	950 ^a	957 ^d
Life expectancy at birth	69.0 ^c	66.8 ^d
Infant mortality rate, 2011	32 ^e	37 ^d
Total fertility rate, 2011	1.7 ^e	2.3 ^f
Maternal mortality rate	212 ^g	194 ^h
% women who began child bearing between age 15-19	25.3 ⁱ	30.2 ^d
% mothers who had at least 3 ANC for last birth	62.0 ⁱ	31.5 ^f
% skilled attendance at delivery	47.6 ⁱ	18.0 ^f
% institutional delivery	42.0 ⁱ	14.6 ^f
% mothers who received skilled postnatal care within 2 days of delivery	40.7 ⁱ	27.1 ^f

Sources: ^a Census of India, 2011; ^bCensus of Bangladesh, 2011; ^c SRS-based Abridged Life Table, 2006-10; ^dReport of the Sample Vital Registration System, 2010; ^e Sample Registration System, 2011; ^f Bangladesh Demographic and Health Survey, 2013; ^gSample Registration System, 2007-09; ^h Bangladesh Maternal Mortality and Health Care Survey, 2010; ⁱ National Family Health Survey, 2005-06; ^{*}Child sex ratio for Bangladesh refers to 0-4 years age group.

Given the above understanding, one would perhaps expect that the contraceptive behaviour of women/couples would also be similar or at

least be comparable to one another in the two Bengals. But available evidences suggest a different picture and such evidences in some cases appear somewhat puzzling also. According to available information, women of West Bengal are ahead of their counterparts in Bangladesh in practicing contraception (71% in West Bengal 2005-06 and 56% in Bangladesh in 2007) suggesting a greater commitment on their part to control fertility (IIPS & Macro International, 2007; NIPORT et al., 2009). But, puzzling evidence is that despite higher commitment to control fertility, a significantly higher proportion of women/couples in West Bengal, compared to their counterparts in Bangladesh, practice less effective and less efficient natural contraceptive methods giving a reverse message that a substantial proportion of contraceptive users in West Bengal in reality may not be that committed in the control of fertility. As the recent evidence reveals, during the last two decades the proportions of natural and modern method users in Bangladesh varied between 8-10% and 36-48% respectively (NIPORT et al., 2009). The corresponding figures in West Bengal have been respectively 18-21% and 38-50% (IIPS & Macro International, 2007) (Table 2).

Table 2: Recent contraception use rates (in percent) by methods in West Bengal and Bangladesh

Year	Contraception use rate		
	Any method	Any modern method	Natural methods
West Bengal*			
2005-06	71.2	49.9	21.3
1998-99	66.6	47.3	18.5
1992-93	57.7	37.6	19.6
Bangladesh@			
2007	55.8	47.5	8.3
1999/00	53.8	43.4	10.3
1993/94	44.6	36.2	8.4

Sources: *International Institute for Population Sciences (IIPS) & Macro International Inc. (2007) *National Family Health Survey 2005-06 (NFHS-3)*, India, IIPS, Mumbai.; @National Institute of Population Research and Training (NIPORT), Mitra and Associates, & ICF International (2009).

In view of the above bemusing observations, the present exercise intends to understand why the contraceptive method mix differs so strikingly in the two Bengals; particularly, the method mix in West Bengal, which is distinctly biased towards natural contraceptive methods and when women/couples of this region are significantly inclined to adopt contraception reflecting a higher commitment to control fertility than their counterparts in Bangladesh.

II. Theorizing Hypothesis

As the theoretical understanding goes, the variation in the contraceptive method mix as evident in the two Bengals could arise either due to variation in supply side provision, or because of the varying demand/preference for methods among women/couple of the two regions.

As regards to the supply side variation, Amin et al. (2002) have argued that the differential service delivery approaches between the two regions are possibly responsible for the variation in the method mix. However, given other evidences, it appears, such a claim may at best be partially true. The emphases of the family planning programmes in the two Bengals though might have differed by some degree; they are largely similar, particularly in view of the delivery of modern methods. The family planning programme of India mainly embraced target-oriented, time-bound and client-centred approach, and has persistently encouraged modern methods (except during the initial years), particularly in relation to the female sterilization (Srinivasan, 2006; Dyson, 2004; Srinivasan, 1998; Visaria, 2000, Zachariah et al., 1994; Oddens, 1997; Allan Guttmacher Institute, 1994). Being a vertically sponsored programme, the family planning programme was implemented in West Bengal in the same spirit. Similarly, after independence in 1971, the government of Bangladesh expanded its family planning programme at the grass-root level by well-trained family planning field workers (FPWs) to provide doorstep delivery of information and services of modern contraceptive methods (Mostafa & Islam, 2010; Islam et al., 2004; Khuda, 2000; Khuda & Hossain, 1996; Khuda et al., 2001; Khuda, 2004). Thus, since its inception, the public sector with greatest

emphasis on modern methods has remained the major provider of family planning services in both the regions (IIPS & Macro International, 2007; NIPORT et al., 2013). Given this, the speculation of Amin et al. (2002) holding the supply provision of contraceptive methods as responsible for differential method mix in the two Bengals does not seem sufficient to explain the situation. Particularly, it hardly explains why the women/couples of West Bengal significantly rely more on natural methods compared to their Bangladeshi counterparts.

Thus it seems that differential contraceptive practices in the two Bengals could be a function of demand side variation for different contraceptive methods. There could be two plausible reasons for such demand variation. First, it could be due to the distinct variation in religious faith in these two regions and secondly, it could be owing to variations in their fertility preference in terms of number and sex composition of the children.

As regard to religion, it is well known that the Bangladeshis are predominantly the follower of Islam while those living in West Bengal in the largest number believe in Hinduism. The religious and associated cultural variation although have the potentials to influence the acceptance and choice of contraceptive methods, evidence in this regard is not concrete enough. Arguably, different individuals within a religion may interpret religious teachings regarding contraception differently and may even ignore the religious teachings for this purpose. While the injunctions of the Catholic Church are quite explicit regarding the usage of contraception, there is no recognized central authority among both Muslims and Hindus in this regard, either globally, or even within a country. Although there is no consensus on the 'Islamic' position on the question of fertility and contraception use (see Omran, 1992 for detail discussion), the majority of Islamic jurists indicate that the family planning, particularly, the coitus interrupts (natural method) is permitted (Poston et al., 2005). Authorities also permit modern methods as lawful, given that they are temporary, safe, and legal (Schenker & Rabenou, 1993). Notably, fertility transition is underway in a number of predominantly Muslim countries such as Tunisia, Iran, Turkey, Algeria and

Indonesia indicating a widespread use of contraception in these countries (UNFPA, 2007). Also, fertility transition has been underway among Muslims in Bangladesh and in various states of India, including West Bengal (NIPORT et al., 2013; IIPS & Macro International, 2007; Alagarajan & Kulkarni, 2008). It seems, therefore, clear that the religion *per se*, particularly Islam as a religion acts no more as a barrier to contraceptive usage.

Further, people with same religion may behave differently in diverse cultural settings, indicating that the latter is strong enough to modify the former (Chattopadhyay & Goswami, 2006). Similarly, it is also noticed that within a region, people can act in a different manner if religious identity is very strong and cultural assimilation (or social integration) is less powerful than the religious dogma and practices within the group. Available evidences suggest that the contraceptive use differentials according to religious affiliation do not vary much (statistically insignificant) in both the regions (last two panels of Table 4). Hence it emerges that the religious variations may not be a strong reason behind differential choice and use of contraceptive method in the two Bengals, particularly it fails to explain the significant higher use of natural methods by the women/couples in West Bengal compared to their counterparts in Bangladesh.

Now, if we admit the fact that the sole motive of using contraception is to limit the family size, then the demand variation for different contraception may have something to do with the variation in fertility preference, particularly in terms of number and sex composition of the children. A number of studies have found that independent of socio-demographic and economic factors, the preference for the son has significant bearings on the desired family size, fertility decision, and the contraceptive practices in South Asia, including India and Bangladesh (Jayaraman et al., 2008; Stash, 1996; Arnold, 2001; Brugess & Zhuang, 2002; Kingdon, 2002; Pande, 2003; Das Gupta et al., 2002; Arnold et al., 1998; Pelletier, 1998; Timaeus et al., 1998). Some studies have argued that the users of natural methods are least motivated to control fertility (DeGraff & de Silve, 1991, 1996; Husain et al., 2013). Further, it is argued that the natural method users often

have unsatisfied fertility, particularly in terms of the son, which influences them to be ambivalent about timing of conception as well as the use of effective modern methods.

Taking a cue from the above mentioned studies, the present study intends to explore whether the documented differentials in contraceptive method mix, noticed in the two Bengals, have some relationship with the differential preference for the son in the two regions.

III. Conceptual Framework

The conceptual framework of the study distinguishes the desire for fertility regulation into two groups: strong desire and weak desire. In the context of the son preference, when the desired number of sons is achieved, the intention to regulate fertility would likely to be strong and women/couples would go for efficient modern methods to secure maximum protection. However, the intention to stop childbearing could be weak if the desired number of sons remains unachieved and in such a case women/couples either would not use any contraceptive method, or would use inefficient or ineffective means of contraception such as natural methods even if modern methods were available.

IV. Data, Variables and Analytical Models

Data and Variables:

Unit-level data obtained from India's third round of National Family Health Survey (NFHS), 2005-06, and Bangladesh Demographic and Health Survey (BDHS), 2007 round were utilized to carry out the present investigation for West Bengal and Bangladesh respectively. Both these surveys are part of the Demographic and Health Survey (DHS) conducted in different parts of the world at regular intervals. Both the surveys are comparable in methodology or sampling designs; both have adopted multistage, stratified and systematic sampling design to select the ultimate areas and respondents to collect information (see IIPS & Macro International, 2007 and NIPORT et al. 2009 for details of sampling design and data collection methodology).

In West Bengal, 6,794 women aged 15-49 years and 2,669 men aged 15-54 residing in 5,992 households and in Bangladesh, 10,996 women and 3,771 men of said age groups residing in 10,400 households were interviewed. The present study has been restricted to the currently married women who had at least a live-birth, were non-pregnant and non-menopausal at the time of the survey. The above restriction left 4,318 and 8,682 women for analyses in West Bengal and in Bangladesh respectively.

Variables:

Since our principal research question is to see whether the son preference has anything to do with the contraceptive method mix, particularly with the use of natural methods, we have combined the contraceptive method use, the dependent variable, into following three groups: modern method users (IUD, pill, injectables, implants, norplant, condom (including female condom for West Bengal), female and male sterilization), natural method users (periodic abstinence/rhythm/safe period and withdrawal) and non-users or users of folkloric methods that do not have any proven efficacy. The main predictor variable of the study is the sex composition of the children particularly the number of sons a woman has in a given parity. Thus, we have categorized women by their number and sex composition of living children at each parity as follows: parity 1 (0 sons, 1 son), parity 2 (0 son, 1 son, 2 sons), parity 3 (0 son, 1 son, 2 sons, 3 sons), and parity 4+ (0 son, 1 son, 2 sons, 3 sons, 4 or more sons).

In the absence of sex-selective abortions, the sex of a baby at any given parity is biologically determined (Jayaraman et al., 2008). However, the possibility of sex-selective abortion may not be ruled out in totality in both the regions and such practice could be associated with socio-demographic, economic and cultural factors. In view of these, we have controlled a number of potential confounders in the multivariate models. These are: age and age-square of respondents; education of respondents; occupation of respondents' partners (categorized as: not-working/primary, secondary, tertiary); place of residence (categorized as: rural, urban); wealth index (categorized as: poorest, poorer, middle, richer, richest) (for details of calculation see NIPORT et al., 2009;

IIPS & Macro International, 2007); exposure to family planning messages in any mass media during preceding month of survey (categorized as: no/irregular, almost regular/regular); religious affiliation of the respondents (categorized as: Non-Islam, Islam); degree of participation in household decision making and, intention to have another child (no, yes). In addition, caste of the respondent is controlled in case of West Bengal (categorized as: scheduled caste, scheduled tribe and others).

Inclusion of variables like marital duration, partner's age and education, and respondents' work status have been avoided in the multivariate models due to their multicollinearity with other variables. For example, correlation coefficients between women's age and marital duration are found 0.91 and 0.95 in West Bengal and Bangladesh respectively. Similarly, correlation coefficient between women's education and education of husband is found 0.77 and 0.76 in West Bengal and Bangladesh respectively. Similar findings were previously obtained by Husain et al. (2013).

The study has utilized both descriptive and multivariate statistical methods. To account for individual level variations, the multivariate analyses on unit-level data were performed using sequential logit regressions. We have estimated adjusted odds ratios (AOR) and average marginal effects (AME) to understand the effects of number and sex composition of living children by parity.

In the analyses, the sample weights as calculated by the surveys are used which allows correction of disproportionate representation of women from West Bengal and Bangladesh. Thus, the results presented in the tables and used for interpretation are weight-adjusted.

Analytical Model

According to our conceptual framework, after achieving the desired number and sex composition of children a couple will first decide to adopt contraceptive method and then choose a method which will provide them the maximum utility. Thus, unlike previous works (for example, Amin et al., 2002; Husain et al., 2013), which used simultaneous models like multinomial logit models we have

employed sequential logit (SL) models. SL model is consistent with utility maximization behaviour (Buis, 2007).

This model estimates the effect of the explanatory variables on the probabilities of passing a set of transitions (Buis, 2007). It first estimates the likelihood of adopting a contraceptive method through conventional logit model (Transition 1) and subsequently would focus exclusively on women who use particular method and would estimate the probabilities of choosing different contraceptive methods viz. the natural methods or modern methods, using another conventional logit model (Transition 2).

Mathematically, let us suppose that J alternatives are divided into H sub-choice sets, A_1, A_2, \dots, A_H . Then by dividing an individual's choice process into two stages/transitions, so that (in Stage/Transition 1) an individual chooses one of the H sub-choice sets, or A_h for some h ; and (in Stage/Transition 2) an individual chooses alternative $j \in A_h$, i.e.

$$\text{(Stage/Transition 1) } \Pr(y \in A_h) = \exp(\mathbf{x}\boldsymbol{\delta}_h) / \sum_{u=1}^H \exp(\mathbf{x}\boldsymbol{\delta}_u),$$

for $h=1, \dots, H$ - (1)

$$\text{and(Stage/Transition 2) } \Pr(y=j|A_h) = \exp(\mathbf{x}\boldsymbol{\alpha}_j) / \sum_{k \in A_h} \exp(\mathbf{x}\boldsymbol{\alpha}_k),$$

- (2)

where $\boldsymbol{\delta}_h \in \mathbb{R}^K$, $h = 1, 2, \dots, H$ and $\boldsymbol{\alpha}_j \in \mathbb{R}^K, j=1, \dots, J$.

This model is identifiable with the normalization $\boldsymbol{\delta}_H = \mathbf{0}$ and $\boldsymbol{\alpha}_{j_h} = \mathbf{0} \forall h$, where j_h is the first element in A_h . It is easy to derive this model in the context of utility maximizing behaviour by defining separately the utilities for each choice set A_h at the first stage and for each alternative $j \in A_h$ at the second stage. In SL model, the values of utilities of the second-stage alternatives do not influence the decisions at the first stage. It can be interpreted that if the 'among-group' differences in utilities are much larger than the 'within-group' differences in utilities, so that the latter is negligible compared to the former, then the choice process is regarded as consisting of two stages that can be treated almost independently (Nagakura & Kobayashi, 2009). Advantage of SL model is that the model does not require testing the property of Independence of Irrelevant Alternatives (IIA) as in case of multinomial logit model.

AME, which depict sensitivity of probability of event compared to variations of the explanatory variables, were also calculated at each stage of transition to provide a sense to the obtained results. Data were analyzed using Stata Release 11.

Arnold Index

To substantiate the findings of the multivariate models, we have also used the 'Arnold Method' (Arnold, 1985) of gender preference. The index is calculated by assuming that all couples with a given number of living children would have the contraceptive use rate which is the highest for any sex composition with same number of living children. In the formulation of index it is assumed that one of the sex compositions, which is most desired has the highest prevalence level and in absence of gender preference all couples having the same number of living children would have the same prevalence level. Criteria other than the contraceptive prevalence can also be used in the same manner (Kulkarni, 1999). The overall impact of son preference on contraceptive use using a 'parity specific contraceptive use approach' as proposed by Arnold is as follows:

$$\frac{\sum C_i * P_i}{\sum P_i}$$

Where, C_i = maximum contraceptive use rate at each parity 'i';
 P_i = number of women at each parity 'i'.

The extent of son preference on contraceptive use = Expected contraceptive use in absence of gender preference (in %) – actual contraceptive use (in %). However, Bairagi (1987) pointed out that Arnold method has some shortcomings, especially if there is heterogeneity in the preference, but, the effect of such heterogeneity would be quite small in practice (Arnold, 1987). To understand the extent of gender preference on contraceptive use, only the prevalence of modern method is used in the computation.

V. Results

Sample Characteristics

Table 3 presents the weight-adjusted sample characteristics of the respondents of West Bengal and Bangladesh. The median

age of respondents from West Bengal is found a bit higher compared to that of their counterparts in Bangladesh, but the median age of respondents' partners is found the same in both the regions.

Table 3: Background characteristics of currently married non-pregnant women with at least one living children of West Bengal and Bangladesh, NFHS (2005-06) and BDHS (2007)

Background characteristics	West Bengal	Bangladesh
% Not using any method/ using folkloric method	21.8	38.0
% Using natural method	21.8	8.5
% Using modern method	56.5	53.4
Median age of respondents	32.0 (8.5) [15,49]	30.0 (8.9) [15-49]
Median age of respondents' partners	40.0 (9.7) [17,77]	40.0 (10.7) [18,91]
Place of residence(%)		
Rural	70.8	78.2
Urban	29.2	21.8
Mean years of schooling of respondent	4.2 (4.4) [0,18]	4.1 (4.1) [0,17]
Mean years of schooling of respondents' partners	5.6 (5.0) [0,20]	4.7 (4.9) [0,19]
Respondent's occupation(%)		
Not-working	67.7	68.7
Primary sector	24.0	18.7
Secondary sector	6.5	11.2
Tertiary sector	1.8	1.6
Partner's occupation(%)		
Not-working/working in primary sector	70.0	51.0
Working in secondary sector	23.1	39.1
Working in tertiary sector	6.9	9.9

Table 3 ...continued from previous page:

Background characteristics	West Bengal	Bangladesh
% of respondents exposed to family planning messages in any mass media[#]	57.2	35.7
Religion(%)		
Non-Islam	74.2	9.2
Islam	25.8	90.8
Caste(%)		
Forward castes	69.0	—
Scheduled castes	26.6	—
Scheduled tribes	4.4	—
Wealth quintiles(%)		
Poorest	23.6	19.3
Poorer	25.0	19.5
Middle	19.9	19.9
Richer	17.2	21.2
Richest	14.3	20.1
Number of living children(%)		
1	28.0	20.7
2	34.0	25.1
3	19.5	19.4
4+	18.5	34.8
Mean number of living son	1.3 (1.0) [0,8]	1.4 (1.1) [0,7]
Mean number of living daughter	1.2 (1.1) [0,7]	1.3 (1.2) [0,10]
Mean level of participation in household decision making by the respondents[§]	2.0 (1.5) [0,4]	2.7 (1.4) [0,4]
Total cases (weighted)	42,989	83,238

Notes:

The variable was created from three separate variables, namely, 'heard family planning messages on radio in last month', 'heard/seen family planning messages in TV in last month', 'read family

planning messages in newspaper in last month'. If the respondent is exposed to any of the above, then she is considered to be exposed to family planning messages.

\$ The variable was created from four separate variables, namely, 'respondent has any say in obtaining own healthcare', 'respondents has any say in major household purchase', 'respondents has any say in daily needs of household, and 'respondents has any say in visiting her own friends/relatives'. These dummy variables are added and treated as continuous variable ranging from 0 (no say in any decision) to 4(has say in all decisions).

() provides standard deviations of the variable, while [] provides range of the variable

The predominance of rural respondents is observed in both the regions. The educational attainments among respondents and of their partners in both the regions are found to be poor. It is around 4 years for the respondents in the two Bengals, while it is 5.6 years and 4.7 years for respondents' partners in West Bengals and Bangladesh respectively. Although more than two-third of the respondents in both the Bengals are not engaged in any wage earning activities, women (and their partners as well) of Bangladesh and West Bengal differ substantially in terms of the type of occupation they follow. The economic conditions of the respondents' households of the two Bengals too seem to differ somewhat with situation being better in Bangladesh than in West Bengal. However, as already known, these two regions differ significantly because of the people's religious affiliations; about three-fourth of the respondents in West Bengal are believer of Hinduism, while in Bangladesh more than 90% are followers of Islam.

Exposure to family planning messages is 21 percentage-points higher among respondents of West Bengal compared to their Bangladeshi counterparts. The fertility situation is found somewhat unfavourable in Bangladesh compared to West Bengal at the time of survey; women with four or more children represent about 35% in Bangladesh but such women constitute only 19% in West Bengal. Interestingly, the women of Bangladesh enjoy a marginally better position in household decision making, than their counterparts in West Bengal.

Descriptive Analyses

Few demographic and reproductive indicators of women of West Bengal and Bangladesh are presented in Table 4. In West Bengal the median age of the users of natural and modern methods varies only marginally being 31 years for former and 32 years for latter (not statistically significant). This tends to indicate that the users of these two types of methods in West Bengal do not belong to two distinct phases of the reproductive cycle. The situation is found reverse and statistically significant in Bangladesh with median age being higher for natural method users (36 years) and lower for modern method users (29 years). This age difference tends to indicate that in Bangladesh the natural methods users mostly may be the women who have completed their family size, reached the age of reduced fecundity and experienced irregular sexual contact. It could also be due to the husband's disapproval of using natural method at a young age.

Another important observation to be noticed from Table 4 (second panel) is that in West Bengal the desire for 'additional child' is found more among users of the natural methods compared to modern methods users, but the situation is just the opposite in Bangladesh. This tends to confirm our earlier contention that natural methods users in Bangladesh may be the women, who have reached higher ages, encountered reduced fecundity and almost completed the family size.

Table 4: Fertility preferences and gap between actual and ideal number of boys and girls by contraceptive choice in West Bengal and Bangladesh, NFHS-3 (2005-06) and BDHS (2007)

Indicators	West Bengal			Bangladesh		
	Natural	Modern	t-ratios	Natural	Modern	t-ratios
Median age of respondents	31.0	32.0	2.58	36.0	29.0	13.06***
% of respondents wish to have another child	24.5	8.5	—	18.3	25.0	—

Table 4: ...continued from previous page

Indicators	West Bengal			Bangladesh		
	Natural	Modern	t-ratios	Natural	Modern	t-ratios
Mean difference between actual number of son and ideal number of son ^a	0.10	0.39	6.71***	0.45	0.38	2.37
Mean difference between actual number of daughter and ideal number of daughter ^b	0.39	0.41	1.55	0.52	0.45	3.74
t-ratios between a and b	4.01***	0.19	—	0.94	0.26	—
Respondents belong to non-Islam [#]	27.1	72.9	0.80	16.5	83.5	1.44
Respondents belong to Islam [#]	30.4	69.6		13.5	86.5	

p<0.05; *p<0.01; #among those who were using any contraceptive method at the time of survey

The Table 4 further reveals that the actual number of son(s) among both groups of contraceptive users in the two Bengals exceeded the ideal number of sons that they desired to have, but such difference is much larger and statistically significant between modern and natural method users in West Bengal though not so in Bangladesh. Furthermore, the gap between the actual and desired number of sons and of daughters is found statistically significant ($p=4.01$; $p<0.01$) among natural method users in West Bengal i.e. the natural method users in West Bengal have much larger number of daughters in excess than the same for the sons. However, no such significant difference is noticed in Bangladesh. From these observations, as it appears, despite mismatch in targeting by both groups of method users in

both the regions—the natural method users in West Bengal – that may be considered a better achiever of desired number of sons, than any other group, also fall behind all others in terms of producing surplus number of son(s) relative to the desired number. The observations with regard to contraceptive method mix by parity and gender composition of living children, however, throws some additional lights on this issue. From Table 5, it can be observed that in both the Bengals, the adoption of contraceptive method, particularly the modern methods, increases with the increase in the numbers of sons up to parity 3. But in West Bengal, the women tend to switch-over to modern methods from natural methods with the increase in the number of sons up to parity 3. Now the question arises, why the use of natural methods declines in West Bengal with the increased number of sons if these methods are reliable, effective and efficient and women/couples use them to control fertility? A plausible answer would be that the women of West Bengal use natural methods perhaps as a transitory method during the reproductive cycle when they are yet to achieve desired number of son(s) (Table 5).

To investigate further, we have calculated the sex-ratio of the living children (defined as number of living boys per hundred living girls) among non-users and different user groups in both the Bengals (Table 5). Among Bangladeshi couples the number of living boys always exceeds the number of living girls up to parity 3 and such differences are marginal between different method users, particularly at parity 2 and parity 3. In contrast, compared to the modern method users, the non-users as well as the users of natural methods have significantly higher number of living girls compared to boys at parity 2 and parity 3 in West Bengal. These evidences tend to confirm our above assertion that in West Bengal both non-use of methods and higher use of natural methods at parity 2 and 3 may be linked to couple's non-fulfilment of target for desired number of son(s).

The observations of descriptive analyses needs to be tested for controlling the potentially confounding socio-demographic, economic and cultural covariates which may have substantial influence both on contraceptive method mix and on gender preference.

Table 5: Contraceptive choice (in percent) among women according to parity and gender composition, and sex ratios of living children in West Bengal and Bangladesh, NFHS-3 (2005-06) and BDHS (2007)

Gender-parity composition	West Bengal					Bangladesh				
	Not using	Using natural methods	Using modern methods	Number of cases (weighted)	Not using	Using natural methods	Using modern methods	Number of cases (weighted)		
Parity 1										
No son	29.5	38.4	32.1	4,145	46.4	4.9	48.7	8,090		
One son	27.0	36.7	36.3	5,339	38.5	7.1	54.4	9,170		
Parity 2										
No son	24.6	28.9	46.6	2,801	38.3	8.5	53.1	4,345		
One son	18.8	21.6	59.6	7,284	29.7	7.5	62.8	11,759		
Two sons	13.3	16.3	70.4	3,636	27.2	8.4	64.4	4,777		
Parity 3										
No son	22.4	25.1	52.6	1,090	40.1	7.2	52.7	1,991		
One son	15.4	15.0	69.6	3,668	37.1	10.2	52.7	6,678		
Two sons	13.4	10.7	76.0	2,956	30.5	9.3	60.2	5,845		
Three sons	10.3	8.5	81.1	856	28.6	7.7	63.7	1,593		
Parity 4+										
No son	31.9	16.9	51.2	758	43.1	7.6	49.3	1,858		
One son	20.3	14.6	65.1	2,959	40.8	10.5	48.7	6,872		
Two sons	23.5	14.1	62.4	3,815	38.2	10.1	51.7	9,645		
Three sons	24.2	15.7	60.1	2,290	44.5	9.5	46.0	6,886		
Four or more sons	40.5	11.4	48.1	1,392	54.9	10.9	34.2	3,729		

Table 5: ...continued from previous page

Gender-parity composition	Bangladesh							
	West Bengal				Bangladesh			
	Not using	Using natural methods	Using modern methods	Number of cases (weighted)	Not using	Using natural methods	Using modern methods	Number of cases (weighted)
Parity-wise sex ratios of living children								
No. of living boys per hundred living girls at parity 1	129	125	141		110	141	131	
No. of living boys per hundred living girls at parity 2	98	90	141		104	116	118	
No. of living boys per hundred living girls at parity 3	88	87	111		104	111	113	
No. of living boys per hundred living girls at parity 4+	97	75	94		98	93	98	
Total	21.8	21.8	56.5	42,989	38.0	8.5	53.4	83,238

Sequential logit analyses

AOR and AME obtained from the SL models estimated at each parity for West Bengal and Bangladesh are presented in Table 6. Transition 1 signifies the odds and transitional probabilities of adopting a contraceptive method as opposed to not-using a method, while transition 2 indicates the odds and transitional probabilities of choosing a modern method over the natural method controlling for a range of covariates. Women with no living son are considered as the reference category in the multivariate models.

Transition – 1

From AOR and AME of Transition-1, it may be noted that up to parity 2 women of both the regions are more likely to accept any contraceptive method in varying degree with increase in the number of sons. For example, at parity 1, women of West Bengal with one living son are 1.94% more likely to adopt any contraception compared to their counterparts who do not have a living son. The corresponding figure is 7.22% among Bangladeshi women. The likelihood of contraceptive adoption among second parity women, who have two living sons is substantially higher in West Bengal compared to Bangladesh (AOR = 1.75, AME = 0.0970 at 1% significance level for West Bengal against AOR = 1.25, AME = 0.0440 at 1% significant level for Bangladesh). Although the AOR and AME of contraceptive adoption increase monotonically with the increase in number of living sons among third parity women in West Bengal (AOR = 1.38, AME = 0.0333 at 5% significance level for women with one living son; AOR = 1.46, AME = 0.0387 at 5% significance level for women with two living sons; AOR = 1.94, AME = 0.0681 at 1% significance level for women with three living sons), no clear pattern has emerged among corresponding groups of women in Bangladesh regarding this. Rather at parity 3, Bangladeshi women with one living son are found significantly less likely to use any contraceptive method compared to women who have no living son (AOR = 0.71, AME = -0.0696 at 1% level of significance). Further, at third parity, the likelihood of contraceptive adoption does not vary significantly for women with two or three living sons compared to women with no living son.

At parity 4+ (with four or more living children), contrary to the women of West Bengal, the women of Bangladesh remain significantly less likely to embrace any use of contraception. As mentioned before, this could be due to lesser fecundity and irregular sexual contact associated with age. The reason for women of West Bengal not showing such lower use of contraception at higher parity/age may be due to the higher usage of female sterilization which once performed after achieving the desired family size, is there forever. This is not true for modern temporary methods mostly practised in Bangladesh.

Transition – 2

The AOR and AME obtained from the Transition 2 reveal that up to parity 3 the likelihood of choosing a modern method over the natural methods significantly and monotonically increases as the number of living sons rises in West Bengal, but this has not been found in Bangladesh (Table 6). In West Bengal the first parity women with a living son are 6.66% more likely to adopt modern methods compared to their counterparts who have no living son. In contrast, in Bangladesh, the first parity women with one living son are 1.89% less likely to adopt modern methods. This possibly indicates that they desire to have at least one daughter. Second parity women of both the regions are significantly more likely to accept modern methods with the increase in the number of living sons, but the likelihood of such switch-over is much higher in West Bengal than in Bangladesh (AOR = 1.31 and AME = 0.0481 for one living son and AOR = 2.07 and AME = 0.1305 for two living sons in West Bengal; AOR = 1.48 and AME = 0.0377 for one living son and AOR = 1.44 and AME = 0.0355 for two living sons in Bangladesh). At parity 3, women of West Bengal tend to overwhelmingly embrace modern methods discarding the natural methods with increase in the number of sons. AME suggests that in West Bengal at parity 3, compared to women with no living son, the women with one, two or three living sons are respectively 10.32%, 15.89% and 20.09% more likely to use modern methods. But the situation is completely different in Bangladesh where women at parity 3 are significantly less likely to adopt modern means if they have one living son compared to the women with no living son (AOR = 0.74; AME =

Table 6: Odds ratios and average marginal effects as obtained from sequential logit regression models of contraceptive method choice among women according to parity controlling a range of background characteristics¹ in West Bengal and Bangladesh NFHS-3 (2005-06) and BDHS (2007)

Gender-parity composition	Transition 1: Adoption of contraception (Not using Vs. Using)						Transition 2: Choice of contraception (Natural method Vs. Modern method)					
	West Bengal			Bangladesh			West Bengal			Bangladesh		
	Odds ratio	Average marginal effect	Z-stat	Odds ratio	Average marginal effect	Z-stat	Odds ratio	Average marginal effect	Z-stat	Odds ratio	Average marginal effect	Z-stat
Parity 1												
No son (ref)	1.00			1.00			1.00			1.00		
One son	1.12	0.0194	2.24*	1.38	0.0722	9.95***	1.34	0.0666	5.64***	0.82	-0.0189	-2.81**
N (weighted)		9,484			17,260			9,484			17,260	
Parity 2												
No son (ref)	1.00			1.00			1.00			1.00		
One son	1.20	0.0238	2.91**	1.09	0.0168	2.06*	1.31	0.0481	4.35***	1.48	0.0377	5.59***
Two sons	1.75	0.0970	7.66***	1.25	0.0440	4.57***	2.07	0.1305	10.25***	1.44	0.0355	4.46***
N (weighted)		13,721			20,881			13,721			20,881	
Parity 3												
No son (ref)	1.00			1.00			1.00			1.00		
One son	1.38	0.0333	2.86**	0.71	-0.0696	-5.70***	2.18	0.1032	8.44***	0.74	-0.0344	-2.86***
Two sons	1.46	0.0387	3.09**	0.98	-0.0049	-0.39	3.33	0.1589	11.48***	1.02	0.0019	0.16
Three sons	1.94	0.0681	4.24***	1.11	0.0220	1.36	4.57	0.2009	10.48***	1.31	0.0309	1.98
N (weighted)		8,570			16,107			8,570			16,107	
Parity 4												
No son (ref)	1.00			1.00			1.00			1.00		
One son	1.83	0.1052	6.28***	0.98	-0.0046	-0.37	1.02	0.0024	0.13	0.77	-0.0365	-2.37*
Two sons	1.49	0.0690	4.18***	1.11	0.0242	1.85	1.01	0.0009	0.05	0.82	-0.0277	-1.84*
Three sons	1.61	0.0829	4.64***	0.93	-0.0171	-1.35	0.95	-0.0079	-0.41	0.81	-0.0230	-1.94*
Four or more sons	0.88	-0.0219	-1.19	0.66	-0.0926	-6.72***	1.09	0.0129	0.60	0.58	-0.0777	-4.73***
Total weighted cases		11,214			28,990			11,214			28,990	
		42,989			83,238			42,989			83,238	

Control variables include age of respondents, squared age of respondents, education of respondents, degree of exposure to family planning messages in different media, degree of participation in household decision making, work status of respondents' partners, household wealth, religion, caste (in case of West Bengal data), place of residence, and want of an additional children.

***p<0.01, **p<0.05, *p<0.10

-0.0344). Further, in Bangladesh, at parity 3, the likelihood of adopting modern methods do not vary significantly with further increase in the number of living sons. From these findings it appears that once Bangladeshi women reached the parity 3, the sex composition of the children matters little on the choice of contraceptive methods.

At parity 4+, the use of modern methods in West Bengal do not differ significantly in accordance with the sex composition of living children while in Bangladesh, such likelihood decreases significantly. From these evidences, it appears that the 'parity' plays a greater role over the 'gender' in determining contraceptive choice in Bangladesh, particularly after parity 2; but in West Bengal, 'gender' plays a superior role over the 'parity', particularly at parity 2 and 3.

Arnold Index

Using the 'Arnold Index', the actual and expected prevalence levels of modern contraceptive measures for West Bengal and Bangladesh are given in Table 7. A positive difference between expected prevalence and the actual prevalence indicates a depressing impact of gender preference on the use of modern methods. It may be noted that the decision on the action to use a method (modern method here) is hypothesized to depend on son preference following our above observations.

Table 7 indicates that, in West Bengal, at each parity, acceptance of modern contraceptive methods was higher among women with one or more living sons and the practice of modern contraceptive methods is found less among couples with no son. As observed, in West Bengal, at parity two, the modern contraceptive use increases from 48.4% for women who have no son to 62.2% for women who have one surviving son and increases further to 70% for those who have two surviving sons. Similarly, among women who have three living children, the modern method use increases from 56.3% for women who had no living son, to 78% of women who have three sons. However, among Bangladeshi women, such wide differences are not observed, between adoption of modern contraception and the

Table 7: Arnold index for actual and expected usage of modern contraceptive methods (in percent) among currently married women with at least one living children in West Bengal and Bangladesh, NFHS-3 (2005-06) and BDHS (2007)

	West Bengal			Bangladesh		
	Currently using modern methods	Expected use in absence of sex preference	Number (weighted)	Currently using modern methods	Expected use in absence of sex preference	Number (weighted)
One child	34.5	35.5	3,630	50.6	52.1	9,545
No son	33.2			48.7		
One son	35.5			52.1		
Two children	61.8	70.0	9,004	60.7	62.6	14,264
No son	48.4			56.6		
One son	62.2			61.2		
Two sons	70.0			62.6		
Three children	72.5	77.7	6,459	58.7	61.8	10,804
No son	56.3			60.5		
One son	73.4			55.5		
Two sons	74.1			60.1		
Three sons	77.7			61.8		
Four or more children	58.8	61.8	5,171	44.8	49.4	9,788
No son	57.1			41.5		
One son	61.6			48.2		
Two sons	61.8			49.4		
Three sons	59.5			44.1		
Four or more sons	48.1			34.2		
Total	56.5	65.1	24,264	53.4	57.2	44,401

number of living sons. At parity two, the modern contraceptive use among Bangladeshi women increases from about 57% for women with no son to about 63% for women with two sons and at parity three, such differences are minimal, 60.5% for women with no son, to 61.8% for women with three living sons.

The overall estimate of modern method use among currently married non-pregnant women through Arnold Method was found to be 56.5% in 2005-06 in West Bengal, which could have been 65.1% had there been no preference for the son. On the contrary, in Bangladesh the use rate of modern methods could have been higher by only four percentage-points in the absence of son preference. However, in both cases, the differences are found significant according to proportionality test (not shown) but in West Bengal, the margin of difference is more than twice than in Bangladesh.

VI. Discussion and Concluding Remarks

When sex preference influences fertility decision then the women/couples at any parity would like to have another child if they fail to achieve the desired sex composition of children. They tend to either avoid using any contraception or would go for an ineffective or inefficient method in order to allow themselves a chance to fulfil their desire for a child of a particular sex.

Given the above understanding, the present study has tried to explore, in spite of sharing similar cultural practices, whether the non-similar contraceptive method mix as evident among women/couples of West Bengal, India and Bangladesh has anything to do with their gender preference for children, particularly, with their preference for the son.

The present analyses suggest that after controlling a number of potential confounding factors, the contraceptive adoptions, and the method mix, are guided by differential son preference that persists disproportionately in these two regions. The analyses show that in West Bengal, at each parity, women with more sons are significantly more likely to switch-over to modern contraceptive methods from natural methods, but such a shift does not entirely hold good for Bangladesh. Rather in Bangladesh, no clear pattern is found for both adoption and choice of contraceptive methods particularly after parity 2. The results obtained from Arnold index of gender preference also rendered similar observations. Although the use of modern method in both the regions is guided by son preference, the

extent of influence is much stronger in West Bengal than in Bangladesh. Using data from BDHS 1996-97 and Matlab DSS, Kamal et al. (2007) found that Bangladeshi women tend to adopt a contraceptive method after securing at least a living son, which has also been found among women of parity 1 and parity 2 in the present study. They have also found that women of Bangladesh mostly use modern methods during their peak reproductive years, after which some of them with at least one living son tend to switch to periodic abstinence, which also support our findings to a considerable extent.

As regards to son preference, it may be noted that there is no concrete evidence in West Bengal which suggest that if the unwanted child is a girl, she is tagged as 'unwanted' or being deprived of other privileges such as immunization, nutrition, education, and other acts of well being. In this context Eklund (2011) argued that when 'a mother who hopes to have a son and who is disappointed when she has a girl but does not adopt any behaviour to deselect or discriminate against the daughter has latent son preference' (Eklund 2011: 17). According to Sudha and Rajan (1998), absence of discrimination against female children does not necessarily mean that the gender preference for having a son is completely absent. Hence, as it appears, the intensity, nature and the form of son preference that persists in West Bengal is completely different from that found in the North-western states of India where the son preference is generally manifested through sex-selective abortions, female infanticides, higher infant and child mortality, and poorer nutritional status among girls compared to boys (Arnold et al., 1998; Roy & Chattopadhyay, 2012). The preference for son in West Bengal seems to work at attitudinal level. Due to this 'latent' form of demand, the women/couples who have unfulfilled desire for son(s) perhaps prefer natural methods over the modern methods to give themselves a chance to fulfil their desire. In other words, they may not be overly concerned with pregnancy or the failure of contraceptive methods (natural) as well as the cost (economic and/or social) of unwanted child(ren).

For 'latent' form of son preference in West Bengal there could be

multiple explanations. It is well established that the average landholding size among farmers of West Bengal has become small after the successful implementation of the land reform programmes in the State during the 1980s. In this context, Roy & Chattopadhyay (2012) argued that currently there is lesser fear among the rural people of West Bengal to lose the landed property to the daughter in-law's family in the next generation. Also, the values and lessons laid down by various social reformers, poets, novelists etc. during the period of 'Bengali Modernism' and continuation of this legacy; possibly restrict couples in West Bengal from manifesting son preference overtly.

Research conducted during the last quarter of the twentieth century demonstrated a strong son preference in Bangladesh (Chen et al., 1981; Mannan, 1988; Amin & Mariam, 1987; Muhuri & Samuel, 1991; Chowdhury, 1994; Alam & Bairagi, 1994; Gu & Roy, 1995).

Notwithstanding these findings, a number of recent studies empathetically argued that there is a reorientation of the preference for daughters over the sons in Bangladesh; the son preference has weakened in the country in the recent past (Basher, 2007; Fraser et al., 2011; Kabeer, 2012). According to Fraser et al.(2011) although majority of the women in rural Bangladesh do not participate directly in the labour market, the labour related economic changes of recent years have affected the preference for the son in the country. According to them, women in recent years, both as daughters and wives, are shouldering an increasing share of the social and familial burden at home, while men are migrating to cities, as well as abroad, to harness better earning opportunity. In effect, the women in Bangladesh are mostly acting as buffer between the family and the local community.

Using DHS data another study found that women of Bangladesh are remarkably superior in economic decision making, compared to their counterparts in West Bengal (Chattopadhyay & Goswami, 2007) and this happened due to various micro-credit activities on agriculture, fisheries, rural welfare etc. of the institutions such as

Grameen Bank and Bangladesh Rural Advancement Centre (BRAC). They further argued that due to such economic empowerment, the rural society perhaps has started recognizing the economic importance of women in addition to their day-to-day familial role leading to a reduction in the preference for son at the societal level. In a recent study, Kabeer (2012) notes that the young Bangladeshi mothers these days not only want smaller number of children but no longer care whether the child is a boy or girl. This is because the girls currently face enough demand from the labour market, particularly from the export-oriented garment industry etc., and can assist parents, while the sons are increasingly failing in their responsibilities to look after the older parents.

Additionally, the country's education policy, which was adopted in 2000, created a special fund for female students, made provisions for non-formal education, higher professional and technical education for girls, transport facilities, and scholarship for them at the secondary level (Begum et al., 2012). Such initiatives to empower women, particularly in the economic front, are yet to take place in West Bengal.

However, it must be acknowledged that the present study has some limitations. First, the study is based on cross-sectional data at a single point in time, which ideally does not allow determining cause-effect relationship between gender preference and contraceptive choice. Second, due to the non-availability of contextual and community level variables, we could not adjust our findings against community level variables. Finally, the data on desired fertility are self-reported data, which could be biased due to rationalization.

Despite the above limitations, it may be concluded that the present study has been able to establish a linkage between contraceptive method mix and son preference in the two Bengals. Such association being somewhat weaker in Bangladesh and stronger in West Bengal, causes a variation in the contraceptive method mix in these two regions. As indicated by the analyses, the use of natural methods is practised in West Bengal as a

temporary measure when the couples are still to complete their family size with desired sex composition. Once the desired family size, with desired sex composition, is attained the women/couples of West Bengal shift to more reliable and effective modern method. In contrast, the son preference being largely neutralized in Bangladesh, couples go for embracing effective modern contraceptive methods, once the desired number of children is achieved.

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