Religion and Fertility in India:

The role of son preference and daughter aversion

Vani Borooah and Sriya Iyer

July 2004

CWPE 0436

Abstract

This paper brings together the notion of 'son preference' and the complementary concept of 'daughter aversion' to provide an explanation for larger Muslim, relative to Hindu, families in India. Just as sons bring 'benefits' to their parents, daughters impose 'costs' and complementing a desire *to have* sons is a desire *not to have* daughters. Consequently, the desire for sons increases family size while the fear of daughters limits it. A formal model, in which these two countervailing forces act so as to determine equilibrium family size and composition, is developed. Qualitative evidence about Hindus and Muslims in their attitudes towards sons and daughters is presented; as are quantitative results from a Poisson regression model estimated on data for 10,548 women who had attained their equilibrium family size. The analysis concludes that higher Muslim fertility compared to Hindus may in reality reflect significantly lower levels of daughter aversion among this community.

JEL classification: C25, J13, J15, O53, Z12

Keywords: Religion, fertility, infant mortality, contraception, gender bias, Poisson regression models

RELIGION AND FERTILITY IN INDIA: THE ROLE OF SON PREFERENCE AND DAUGHTER AVERSION[*]

VANI BOROOAH
School of Economics and Politics
University of Ulster

SRIYA IYER
Faculty of Economics and Politics
University of Cambridge

1 July 2004

1. Introduction

There are two demographic features about India that receive particular attention. The first, is gender bias - the small number of females compared to males. The number of females per 1,000 males is 933 in India (as reported in the 2001 Census) compared to a figure of 1,050 for Europe and North America and 1,022 for sub-Saharan Africa (Sen, 2001). Dreze and Sen (1996) have termed the low sex ratio in India as a "missing women" phenomenon: on the basis of sub-Saharan ratios, the number of "missing women" in India is estimated to be between 35-37 million (Dreze and Sen, 1996; Klasen, 1994).

The second feature is that the fertility rate of Muslim women is considerably higher than that for Hindu women. The latest findings of the National Family Health Survey (NFHS), conducted in 1998-99, show that for India as a whole, the Total Fertility Rate (TFR) was 2.8 for Hindus and 3.6 for Muslims[1] (International Institute for Population Sciences and ORC Macro International, 2000). At its most shrill, the higher fertility of

[*] Acknowledgements: We are grateful to the National Council of Applied Economic Research (NCAER) New Delhi, for providing us with the unit record data from their 1993-94 Human Development Survey, upon which this study is based.

[1] However, there were wide regional differences: for example in the state of Andhra Pradesh, the TFR for Muslims was 2.5 which was not significantly different from the Hindu TFR of 2.2.

Muslim women is blamed on Indian Muslims for obeying the tenets of Islam - and also being driven by their ambition to “outnumber" Hindus - in rejecting family planning and embracing polygamy.

Analysis and debate of these two issues proceed independently of each other. The adverse sex ratio is discussed (Sen, 2001) in the context of the preference that many South (and East) Asian families have for sons over daughters ("son preference") and the impact of such preference on the marriage market (Edlund, 1999), fertility (Bhat and Zavier, 2003), and dowry (Botticini and Siow, 2003), has also been studied. On the other hand, the "Muslim issue" is discussed entirely in terms of the number of children to Muslim, compared to Hindu, families without any reference to the gender of the children, with the focus of this discussion being on the low rate of contraceptive use among Muslim women - in particular, termination methods - compared to Hindu women.

Against this background, the purpose of this paper is to join together the two issues of "son preference" and "contraceptive usage" in order to provide a more benign explanation (compared to the caricature of high-fertility Muslims, described above) for larger Muslim families. The first strand of this explanation is to extend the notion of "son preference" to the complementary concept of "daughter aversion". This concept is developed more fully later in this paper. Suffice it to say, here, that just as sons bring "benefits" to their parents, daughters impose "costs"; consequently, complementing a desire *to have* sons is a desire *not to have* daughters. Consequently, the desire for sons tends to increase family size while the fear of daughters limits it. A formal model, in which these two countervailing forces act so as to determine equilibrium family size and composition, is developed in the next section.

From this we argue that a reason why Muslims have larger families than Hindus is that, firstly, they may not desire sons as much as Hindus[2] and, secondly, they are less apprehensive, compared to Hindus, of having daughters. In consequence, not only do Muslims have larger families than Hindus but they also have relatively more daughters than sons.

We support this argument using two types of evidence. The first is *qualitative* evidence, based upon a careful analysis of Hindu and Islamic religious sources, about differences between Hindus and Muslims in their attitudes towards sons and daughters and towards contraception. This evidence is detailed in section 3.

The second type of evidence is *quantitative* evidence, based on data for 10,548 women, who had terminated their fertility and who might, therefore, be regarded as having attained their equilibrium family size and

[2] In this context, Bhat and Zavier (2003) have commented that Hindus show greater son-preference than Muslims.

composition. Data on these women - of whom, 6,523 were Hindus, 549 were Muslim, and 3,476 were Dalits[3] - were culled from a larger survey of 33,230 rural households - encompassing over 195,000 individuals - spread over 1,765 villages, in 195 districts, in 16 states of India. This survey - commissioned by the Indian Planning Commission and funded by a consortium of United Nations agencies – was carried out by the National Council of Applied Economic Research (NCAER) over January-June 1994 and most of the data from the survey pertain to the year prior to the survey, i.e. to 1993-94[4]. Using these data, the paper estimates the number of living sons and daughters to the women, conditional upon the values of a number of determining variables, and estimates the degrees of "son preference" and "daughter aversion" of Hindu, Muslim and Dalit families. These estimates, which show a much lower degree of "daughter aversion" for Muslims than for Hindus, then provide a plausible explanation for larger Muslim families.

It is reasonable to suppose that if Muslim parents are less averse to daughters than Hindus, they would take better care of them than Hindus. In particular, we would expect female infant mortality rates to be lower for Muslim, than for Hindu, families. A demographic feature in India, that has drawn little comment, is that infant mortality among Muslims, at 59 per 1000, is much lower than that among Hindus, at 77 per 1000 (Bhat 2001). Similarly child mortality, which is 83 per 1000 for Muslims, is substantially lower than child mortality among Hindus, at 107 per 1000 (IIPS and ORC Macro International 2000). These findings seem to suggest that Muslim parents, on average, appear to look after their offspring better than their Hindu counterparts. This proposition is explored further in this paper by estimating separate equations for "explaining" male and female infant deaths and drawing attention to the importance of the religious background of parents - even after controlling for non-religious factors - in determining these numbers.

When the empirical analysis was extended to all the currently married women in the sample, we found not only that Muslim mothers, who had terminated their fertility, have (because of lower "daughter aversion") larger families than Hindus, but that Muslim mothers, in general, were more reluctant to terminate their fertility than Hindus. On average, Muslims are less likely than Hindus to use contraception: the percentage of couples using contraception, as measured by the

[3] Persons belonging to the castes and tribes – also known as Scheduled Castes/Tribes - recognised by the Indian Constitution in 1947 as deserving special recognition in respect of education, employment and political representation.

[4] Details of this survey - hereafter referred to as the NCAER Survey - are to be found in Shariff (1999). The data appendix to this paper discusses these data in further detail.

contraceptive prevalence rate, is 49% for Hindus and 37% for Muslims (IIPS and ORC Macro International, 2000). However, contraceptive use, among Hindus and Muslims, is much lower than among women belonging to other religious groups: 52% for Christians and 65% of Jain couples use contraception. (IIPS and ORC Macro International, 2000). There are also interesting differences between religious groups as to whether or not they prefer spacing or termination methods: compared to Hindus, Muslims, Sikhs, and Jains are far more likely to use spacing methods[5] (IIPS and ORC Macro international 2000). There are also generational effects to be considered i.e. younger women of all religions are more likely to use contraception than older women who may be more resistant.

These differences in contraceptive adoption between different religious groups need to be studied more carefully. Field evidence from India suggests that notwithstanding the lower contraceptive usage of Muslim women, they want to use contraception to the same extent as Hindu women (Jejeebhoy and Sathar 2001, Iyer 2002). This nexus between religion and attitudes to contraception is the second strand of the paper.

As a significant 'proximate' determinant of fertility, contraceptive use is one of the most significant variables through which government policy might effect a fall in fertility (Parker and Mauldin 1983, Bongaarts 1997). While the determinants of contraceptive use in developing countries (including India) has been heavily researched (Westoff 1988, Chen et all 1990, Bongaarts 1991, Chandrasekaran 1952, Khan and Patel 1997, Moulasha and Rao 1999), very few of these studies have focused explicitly on religion (Basu, 1997; Jeffery and Jeffery 1997, 2002; Jejeebhoy and Sathar 2001; Borooah 2002) and even fewer investigations have explored the interactions between religion, economic circumstance and contraceptive behaviour (the exceptions being Amin *et al* 1997, and Iyer 2002). There has, in fact, been very little systematic exploration of these interactions in the Indian context using large-scale sample survey data representative of India more widely. Against this background, this paper models the demand for different types of contraception - no contraception, spacing methods, and termination methods - using an ordered logit model paying careful attention to both the religious backgrounds of the women and their non-religious attributes.

This paper proceeds as follows: Section 2 presents a model of son preference, daughter aversion and the demand for children. Section 3 discusses son preference and daughter aversion in Hinduism and Islam.

[5] Adoption of a termination method, such as female sterilisation (specifically the tubal ligation method), is lowest among the Muslims and highest among the Buddhists, followed by the Hindus.

Section 4 presents the main econometric estimations and results explaining the number of living sons and daughters, and the number of male and female deaths. Section 5 presents results for the demand for contraception. Section 6 concludes the paper.

2. 'Son Preference', 'Daughter Aversion' and the Demand for Children

Let S, D and $N = S + D$ represent, respectively, the number of sons, daughters and children to a family. The family gets positive utility from sons and negative utility from daughters – hereafter, the positive utility associated with sons is referred to as the benefit from sons and the negative utility associated with daughters is referred to as the cost of daughters. Let $B(S)$ and $C(D)$ represent the benefit and cost functions associated with, respectively, S sons and D daughters where:

$$\begin{aligned} &\partial B/\partial S > 0,\ \partial C/\partial D > 0 \\ &\partial^2 B/\partial S^2 < 0,\ \partial^2 C/\partial D^2 > 0 \end{aligned} \qquad (1)$$

A family with S sons and D daughters will decide in favour of (against) having another child if the marginal expected utility (EU)associated with another child is positive (negative) where:

$$EU = \pi B'(S) + (1-\pi)C'(D) \qquad (2)$$

If it is assumed, for the moment, that π, the probability of having a son, is a half, then the family will decide to have another child if, and only if, $B'(S) > C'(D)$ - the marginal benefit of a son outweighs the marginal cost of a daughter - and will decide against another child if, and only if, $B'(S) < C'(D)$ - the marginal benefit of a son is outweighed by the marginal cost of a daughter. An equilibrium number of children is one to which the family does not wish to add.

Figure 1 illustrates the falling marginal benefit (MB) curve for sons and the rising marginal cost (MC) curve for daughters. A horizontal line, across the diagram, represents an equilibrium number of sons and daughters at the points where it, respectively, cuts the MB and MC curves: at these points, the marginal benefit of a son is exactly outweighed by the marginal cost of a daughter. From the set of equilibrium son-daughter configurations two special cases may be distinguished. First, the point X in the diagram represents a *no son equilibrium*: a family with no sons and D_X daughters will not want to increase its family size, in the hope of a son, because the marginal cost, in the event of a daughter, would exceed the marginal benefit from a son. Second, the point Z in the diagram represents a *parity equilibrium*: a

family with an equal number of sons and daughters ($S_Z=D_Z$) will not want to increase its family size. By contrast, all other equilibrium points - a family of S_Y sons and D_Y daughters ($S_Y< D_Y$), or S_W sons and D_W daughters ($S_W> D_W$) - represent *non parity equilibrium.*

Two concepts may be defined: *son preference* and *daughter aversion*. In Figure 2, the marginal cost curve OH represents a higher degree of "daughter aversion" than the curve OM since, for a given number of daughters, the marginal cost of daughters is higher for OH than for OM. Then the "no son equilibrium" will be greater with a lower (OM) than with a higher (OH) degree of daughter aversion: $D_M>D_H$. Equally, the parity equilibrium will be greater with a higher than with a lower degree of daughter aversion: $D^*_M>D^*_H$. Lastly, with a given number of sons in the family, S^{**}, the equilibrium number of daughters will be greater with a lower, than with a higher, degree of daughter aversion: $D^{**}_M>D^{**}_H$.

In Figure 3, the marginal benefit curve BH represents a higher degree of "son preference" than the curve BM since, for a given number of sons, the marginal benefit of sons is higher for OH than for OM. The "no son equilibrium" is the same with a lower (BM) than with a higher (BH) degree of son preference: $D_M=D_H$. However, the parity equilibrium will be greater with a higher than with a lower degree of son preference: $S^*_H>S^*_M$. Lastly, with a given number of daughters in the family, D^{**}, the equilibrium number of sons will be greater with a higher, than with a lower, degree of son preference: $S^{**}_H>S^{**}_M$.

Suppose now that there are two groups, Hindus and Muslims, such that Muslims have the same degree of son preference as Hindus, but a lower degree of daughter aversion. Then by Figure 2, Muslims will always have an equilibrium family size larger than that of Hindus. On the other hand, if Muslims have the same degree of daughter aversion as Hindus, but a lower degree of son preference then, by Figure 3, Muslims will always have an equilibrium family size smaller than that of Hindus.

The line HH′ in Figure 4 represents the *equilibrium locus*: all points on HH' represent son-daughter combinations at which the family is in equilibrium (in the sense of not seeking an increase in its size). The equilibrium locus slopes downwards reflecting the fact that, as the number of sons increases, the marginal utility of sons falls; to be in equilibrium the marginal cost of daughters must also fall for which a smaller number of daughters is required. 'No-son equilibrium' is attained with OH daughters and 'parity equilibrium' is attained at X where the equilibrium locus intersects the 45^0 line through the origin. No-daughter equilibrium is attained with OH' sons: the family does not seek an increase in its size even though it has only sons because the marginal utility of sons has fallen to zero.

Suppose HH′ represents the equilibrium locus for Hindus. Suppose that Muslims have the same degree of 'son preference', but a lower degree of 'daughter aversion', than Hindus. Then, as Figure 2 shows, Muslims will have a *larger* no-son, and a *larger* parity, equilibrium than Hindus; but, because Muslims have the same degree of son preference, they will have the *same* no-daughter equilibrium as Hindus. Consequently, the Muslim equilibrium locus will be represented by MH′ in Figure 4 and, in equilibrium, Muslims will have *larger* families than Hindus.

On the other hand, suppose that Muslims have the same degree of 'daughter aversion', but a lower degree of 'son preference', than Hindus. Then, as Figure 3 shows, Muslims will have a *smaller* no-daughter, and a *smaller* parity, equilibrium than Hindus; but, because Muslims have the same degree of daughter aversion, they will have the *same* no-son equilibrium as Hindus. Consequently, the Muslim equilibrium locus will be represented by HM' in Figure 4 and, in equilibrium, Muslims will have *smaller* families than Hindus.

3. Son Preference and Daughter Aversion in Hinduism and Islam

This section discusses attitudes towards sons and daughters in Hinduism and Islam. It examines attitudes that encourage gender bias, and foster son preference and daughter aversion, and it argues that while, theologically, Hinduism exhibits greater son-preference than Islam, the latter may exhibit lower daughter aversion.

Both Hindu and Islamic scriptures show a distinct bias towards males compared to females. In the *Koran*, all Muslim males are encouraged to marry; however, the universal remarriage of widowed and divorced women is also highly encouraged (Qureshi 1980: 564; Youssef 1978: 88, Coulson and Hinchcliffe 1978: 37-38). Parents and guardians exercise control over the selection of marriage partners, and a dower or "bride price" is paid to the bride or her guardian (Youssef 1978: 78). This is important for Muslim families as the investments in daughters are in a sense, recoverable. This is also aided by the fact that marriage (or the *nikah*) is defined not really as a sacrament, but more as a civil contract, which has as its object the procreation of children[6].

However, Islamic law does not treat men and women equally. It does not require a husband to obtain permission from a court or from current wives in order to contract a second marriage but it constrains a

[6] For a Muslim marriage to be legally valid, it needs to meet four conditions: proposal by one party; acceptance by the other; the presence of a sufficient number of witnesses (two in Sunni law); and a formal expression of both the proposal and the acceptance at the same meeting (Azim 1997).

woman to have only one husband[7]. It is interesting that not all aspects of the classical provisions in Islamic law for the sanction of polygyny are implemented in India. As early as the Indian Census of 1961, polygyny was practised least by Muslims and the most by tribal communities in northern India (Iyer 2002).

Like Islam, Hinduism also encourages all Hindus to enter married life[8]. Unmarried Hindu goddesses in Indian mythology are often portrayed as dangerous and violent, while married goddesses are reputed for their tranquillity and obedience (Kinsley 1988: 203). Polygyny is tolerated in Hindu scriptures, but only in the absence of male offspring: this again reflects a strong degree of son preference. Although it is illegal, Hindu marriages are often accompanied by the giving and taking of dowries which reflects the existence of hypergamy in the marriage market – women being given in marriage to wealthier men within the same caste group (Caldwell, Reddy and Caldwell, 1983). The dowry essentially operates as an economic compensation for the man's family for undertaking the marriage (Rao, 1989). But, since this implies that investments in daughters are less recoverable for Hindus compared to Muslims, it engenders a greater degree of both son-preference and daughter-aversion among Hindus.

This is exacerbated by the fact that in Hinduism, women and men are viewed differently. For example, Vyasa argues in the *Mahabharata* that 'A woman is supposed to have one husband, a man many wives. … A woman may have a second husband for progeny in case of difficulty' (Deshpande, 1978: 90). Although polygyny became illegal for Hindus in India in 1955 with the Hindu Marriage Act legislation, the theology of Hinduism encourages the early marriage of women compared to men, and treats men and women differently.[9]

---

[7] A Muslim woman in India can legally have only one husband; otherwise, she is liable for bigamy and the offspring of such a marriage are deemed illegitimate (Azim 1997).

[8] For example Shakuntala, a princess from Hindu mythology tells Dushyanta her beloved that 'when a husband and wife are carrying on smoothly, then only pleasure, prosperity and piety are possible' (Deshpande 1978: 91).

[9] But these differences in the textual theology of Islam and Hinduism on marriage and polygyny need also to be evaluated in the context the Child Marriage Restraint Act of 1978 which sets the legal age at marriage for all women and men at, respectively, 18 and 21 years. When this Act was proposed first in 1929, some Muslim representatives who debated it opposed the Act on the grounds that it was irrelevant since child marriage had no sanction in Islam. Others argued that if Muslims practised child marriage it was because they were following the example of the Hindus. Ultimately everyone voted in favour of the Act, but the dynamics of the process of negotiation cast interesting historical light on these issues (Minault 1998: pp. 302-303).

3.1. Attitudes to Sons and Daughters in the Hindu Scriptures

There is considerable difference between Hinduism and Islam with respect to the role of sons and daughters. The preference for sons compared to daughters in classical Hinduism is reflected, for example, in the scriptural provisions for divorce: in the *Mahabharata,* a husband has sanction to terminate a marriage if 'a wife… acts as she pleases, who is sterile or *gives birth only to daughters* or whose children die young.' (emphasis added; Deshpande, 1978: 93). This view of daughters being in some sense 'inferior' to sons pervades the Hindu scriptures[10].

Some scholars have argued that in Hinduism, the role of women in the family is considered very important. As Radhakrishnan argues, the 'general Hindu view of woman is an exalted one - it regards the woman as the helpmate of man in all his work: *sahadharmini* … the wife has an equal position with the husband in all domestic and religious concerns ... Every woman has a right to marry and have a home' (Radhakrishnan, 1939: 379) The role for women in Hinduism is clearly defined to be 'equal in every respect'. However, the Hindu scriptures mainly see the woman only in relation to the man, and give her an 'equal', 'exalted' position, as a 'helpmate' only within marriage and the family.

It is important to note that though Hinduism does not consider women to be inferior to men within the family, it does not assign them any role outside the domestic sphere. The lack of a role for women outside the home is justified by the Hindu scriptures using notions of women's supreme 'self-sacrifice' of which they are seen as being more capable than men. The Hindu scriptures also put forward the view that because child-rearing is time consuming, women should not be 'burdened' by having to work outside the home and that the economic responsibilities of the family are to be shouldered by men[11].

This essentially *religious* notion of 'women's self-sacrificing nature' is reflected in the unequal distribution of food and health-care allocations between men and women, sons and daughters, high birth-order and low birth-order children, which many commentators have observed about contemporary India. It is thus easy to see that as far as the content of Hinduism is concerned, women appear to be '*unequally equal*', and that this odd status may have implications for fertility. Most

[10] This is reflected in the large literature that has examined gender differentials in marriage in India (Mukhopadhyay 2000; Kapadia 2000) and marriage-related issues such as dowry (Anderson 2003; Sen 1998; Deolalikar and Rao 1998). Gender biases have also been investigated more widely in the context of Indian demography and development (Kishor 1993; Krishnaraj, Sudarshan and Shariff 1998; Murthi, Guio and Dreze 1995; Bhat and Zavier, 2003).

[11] 'While man has to take to worldly pursuits (yajñapradhanya), woman is capable of self-control and self-denial (tapahpradhyanya).' (Radhakrishnan, 1927: 61).

significantly, this would encourage a high degree of son-preference and daughter aversion, motivated, this time, by religious notions of women's self-sacrifice.

This is reinforced by the great emphasis in Hindu philosophy on the role for surviving sons. In Hinduism, 'at the end of the (*Sraddha*) ceremony the performer asks, "Let me, O fathers, have a hero for a son!"' (Radhakrishnan, 1927: 59-60). A common Vedic blessing for newly-married Hindu women is 'May you be the mother of a hundred sons'. The Mysore Population Study described one of the traditional Vedic blessings for married women popularly used in Karnataka 'May she bear ten sons, and make of her husband an eleventh!' which is also a good example of son-preference in Hindu societies (United Nations, 1961: 130).

3.2. Attitudes to Sons and Daughters in Islam

Son-preference is also evident in Islamic society which gives men a more prominent place than women within the family. Under Islamic law, sons are given twice as large an inheritance as daughters and a man's testimony in court is worth twice that of a woman. Coulson and Hinchcliffe (1978) have argued that 'Quranic provisions concerning women's status and position were dissipated and largely lost over time. Islamic law has continued to reflect the patriarchal and patrilineal nature of a society based on the male agnatic tie. Within the scheme of family law which developed in this way, woman, whether as daughter, wife, or mother, occupied an inferior position' (Coulson and Hinchcliffe, 1978: 38).

According to Obermeyer (1992), women in Islamic societies, regardless of ethnic origin, have been restricted to a lifestyle that guaranteed preservation of family honour and prestige.[12] There are strict institutional mechanisms in Muslim societies which prevent much contact between men and women: strict segregation of the sexes in schools, at work and an informal separation of the sexes in all recreational activities (Youssef, 1978). Landes (1998) has also pointed out that the gender discrimination, observed particularly in the Arab Muslim nations, not

[12] However, in India, the role of the Muslim woman has not always been to observe the veil and be restricted to the home. As Engineer argues, there are instances in Indian history where Muslim women who belonged to the ruling dynasties fought and led battles on the battlefield. Among them are Gul Bahisht against the Raja of Jalore in the time of Alauddin Khalji; Noorjehan (the wife of Jehangir) whose hunting exploits included killing lions and mounting elephants, and are described in the Tuzk-i-Jahangiri; and Chand Khatun (also called Chand Sultana), who defended the kingdom of Ahmednagar against the Mughal emperor Akbar's army. For more on this, see Engineer, 1997: 12.

only restricts the opportunities of women, but it also undermines the 'drive to achievement of boys and men' (Landes, 1998: 412).

A feature of Muslim societies is that Muslim women gain respect and status when they marry and have children, thereby improving their bargaining position in the social structure (Youssef, 1978). Since women derive status from motherhood, even when divorced or rejected for a second wife, children represent a form of social insurance against the threat of divorce or polygamy. Consequently, 'Offspring guarantee to the woman status and respect that extends far beyond her position in the conjugal home and reaches into the heart of her own family's and the community's valuation of her. Hence, we may expect women to continue childbearing activities throughout their reproductive years - whether they are happy in their marriage or not.' (Youssef, 1978: 79).

There is evidence of son-preference among Muslim families in India, especially in the acceptance of the dowry system. The force behind this, affecting all religions in India, is the process of 'Sanskritization' – the adoption of the rituals of higher castes. However, son-preference is not as unequivocal with Muslims as it is with Hindus. Early in the 20th century, Maulana Ashraf Ali Thanavi wrote a compendium of useful knowledge for women in which he condemned expressions that bless a Muslim woman by wishing her husband, brother, or children long life, or wishing for her many sons and grandsons[13] (Minault 1998: 62). The example points to differences between Muslims and Hindus in their respective degrees of son-preference.

Empirical evidence from India suggests lower daughter aversion among Muslims compared to Hindus. Azim (1997) in his study of 378 Muslim women and men in Mangalore, found that over two-third of respondents in his sample *did not* prefer sons, over daughters (Azim 1997: 187); moreover, a large proportion of those who did were from poor and illiterate households (Azim 1997: 189). The main reasons for wanting a male child were family continuity, old-age support, and anxiety about dowry payments. (Azim 1997: 189).

3.3. Islam, Hinduism, and the Demand for Contraception

Islam has traditionally been portrayed as disallowing birth control or abortion under any circumstances. This may be because of a streak of fatalism, 'a strong belief in the active providence of God' (Youssef, 1978: 87) and the belief that 'Allah creates sexuality and determines procreation and barrenness.' (Youssef, 1978: 87).

[13] Thanavi believed that these characteristics were not 'sufficiently' Islamic because to view women blessed in terms of their relation to men and sons devalues their relationship to God and hence goes against the tenet that all are equal in his sight. (Minault 1998: 69).

However, scholars such as Obermeyer argue that the position of Islam on birth control and abortion depends very much on the interpretation of the different schools of Islamic jurisprudence (Obermeyer, 1992). According to Obermeyer (1992), Sunni and Shia positions on birth control are derived from the writings of Al-Ghazali, a medieval Islamic theologian, who outlined many situations where birth control was permissible: for example, if one of the partners was afflicted with a disease which could be passed on to the children; or, if there was concern for the effect of too many pregnancies on the wife's health (Obermeyer, 1992: 43). She also argues that some schools of Islamic jurisprudence permit abortion. While the Malikis school prohibits abortion outright, most other schools permit abortion up to the time when the foetus is regarded as being 'ensouled', a definition which, depending on the school, varies to include the 40th, 80th or 120th day of pregnancy. (Obermeyer, 1992).

By contrast, Hinduism says little explicitly about limiting births. Abortion and the decision to use contraception are regarded as personal matters which are not within the purview of religious injunction. One explanation for this may be the notions of 'purity and pollution' which are strictly upheld in the day-to-day practice of traditional Hinduism. For example, matters pertaining to the reproductive functions of women, such as menstruation or childbirth, are viewed as making women temporarily 'impure'.[14] In scriptural Hinduism, the only reference to the control of births is indirect, in the context of norms about abstinence. For example, Vyasa argues that, 'He [the householder] should avoid intercourse with his wife when she is old or barren or ill-behaved, when her children die or when she has not yet attained maturity, *when she gives birth to daughters only or has many sons*.'(emphasis added) [15].

Although strict notions of 'purity and pollution' may be one reason why abortion and birth control issues are not specifically addressed in the Hindu scriptures, quotations, such as the above, also highlight the importance of sons. The exceptional context in which birth control is addressed is the case of the *kumari bharya*, a woman who is pregnant but not legally married. Abortion in this case was regarded as a sin: 'A girl who has conceived or delivered (before marriage) can expiate for her sin by undergoing three-fourths of the purifactory rite for a Brahmannicide; the remaining one-fourth is supposed to have been performed after

[14] This is reflected in the Hindu custom that no members of a family in which a birth has just taken place are allowed to visit a temple or to engage in auspicious religious occasions such as weddings,
from a minimum of ten to a maximum of up to forty days after the birth. This is also true of deaths, though the period of mourning extends for one whole year.

[15] As quoted by Radhakrishnan, 1947: 189.

childbirth.' (Deshpande, 1978: 93). Moreover, unlike the offspring of a *kumari bharya*, the sons of a mother born before wedlock were authorised to make offerings to gods. The same, however, does not apply to daughters. In scriptural Hinduism, therefore, the control of births is addressed indirectly, and, compared to Islam, even here there is considerable evidence of greater daughter aversion and son preference. In summary, this section has argued that while Hinduism and Islam both depict similar degrees of son preference, they depict very different degrees of daughter aversion.

4. Econometric Estimations and Results

The 10,548 currently married women in the sample, who had terminated their fertility by adopting a *termination* method of contraception, were, in terms of family size and composition, in equilibrium. For such women, indexed *i=1…10,548*, $S_i \geq 0$ and $D_i \geq 0$ represented their number of (living) sons and daughters. Tables 1 and 2 show, respectively, the number of living sons and daughters to these women: 4.6% of Hindu, compared to 5.1% of Muslim, women terminated their fertility without having any sons; on the other hand, 19.6% of Hindu women, compared to 13.4% of Muslim, women terminated their fertility without any daughters.

A plausible measure of the degree of 'son preference' is 1 – the proportion of women who terminated their fertility without any sons and the corresponding measure of the degree of 'daughter aversion' is the proportion of women who terminated their fertility without any daughters. On these measures, as Table 1 shows, the degree of son preference was lower for Muslims (0.949) than for Hindus (0.954): however, this difference was not statistically significant[16]. On the other hand, the degree of daughter aversion was greater for Hindus (0.196) than for Muslims (0.134) and this difference was statistically significant. Consequently, one may conclude from Table 1, that Muslims had (statistically) the same degree of son preference as Hindus but a significantly lower degree of daughter aversion. These facts are, as the preceding analysis showed, sufficient to result in a larger average (equilibrium) family size for Muslims than for Hindus.

4.1. Explaining the Number of Living Sons and Daughters

The thrust of the econometric equations was to explain the number of sons and daughters to these women in terms of their personal and household characteristics. Since the two dependent variables (S_i and D_i) were 'count' variables, in that they assumed nonnegative integer values,

[16] Z-value of 0.53

an appropriate estimation method is the *Poisson Regression Model* (PRM)[17]. The PRM assumes that each observation on the dependent variable (say, s_i) is drawn from a Poisson distribution with parameter λ_i, where this parameter is related to a vector of regressors, $\mathbf{x_i}$. The primary equation of this model is:

$$\Pr(S_i = s_i \mid \mathbf{x_i}) = \frac{e^{-\lambda_i} \lambda_i^{s_i}}{s_i!} \qquad (3)$$

and the most common formulation for λ_i is the loglinear formulation:

$$\log \lambda_i = \sum_{k=1}^{K} x_{ik} \qquad (4)$$

where x_{ik} is the observation, for the ith woman, on the kth regressor ($k=1\ldots K$).

The PRM estimates for the number of sons and daughters, to women who had terminated their fertility, are shown in Table 7. Also shown in Table 7, alongside the column of coefficient estimates, are the associated *marginal effects*. These effects show the increase/decrease in the expected number of sons ('sons' equation) or daughters ('daughters' equation) when the value of the relevant variable is increased by one unit, *the values of all the other variables being set to their, respective, means*.

Since, all the variables (except for the 'age at marriage' variable) were binary variables, taking 0/1 values, a unit increase in a variable implied a shift from one category to another. Thus, Table 7, shows that, *in equilibrium*, Muslim woman would, on average, have 0.27 more sons and 0.34 more daughters - while Dalit women, would have 0.08 more sons and 0.07 more daughters - than Hindu women *ceteris paribus*. Similarly, women who were literate would, in equilibrium, have 0.22 fewer sons and 0.11 fewer daughters than women who, along with their husbands, were illiterate.

In addition to influence of literacy and community, the number of sons and daughters, to women who had terminated their fertility, also depended on the region in which the women lived and on whether they worked and, if they did, the occupation in which they were employed. Living in the South, the East and the West resulted in a smaller number of sons than living in the North (the default region) or in the Central region. Women who worked as labourers or as cultivators had, in equilibrium, a smaller number of sons, but a larger number of daughters, than women

[17] Linear Regression methods will lead to inefficient and inconsistent estimates (Long and Freese, 2001).

who worked in worked in non-manual occupations or women who did not work.

4.2. Explaining the Number of Male and Female Infant Deaths

Another clue to differences between Hindus and Muslims in their differing degrees of son preference and daughter aversion is provided by infant mortality rates (Table 8). The *male* infant mortality rate (male infant deaths as a proportion of male live births) was not very different between the Hindu (4.5%) and Muslim (4.7%) women who had terminated their fertility and, indeed, the difference between the Hindu and Muslim male infant mortality rates was not statistically significant. However, the female infant mortality rate (female infant deaths as a proportion of female live births) was considerably higher for the Hindu (6.3%) than for the Muslim (4.6%) mothers and this difference was statistically significant. Indeed, there was hardly any gender difference in Muslim infant mortality rates but there was a considerable gender gap in the Hindu infant mortality rates.

Table 9 shows the PRM estimates (along with the marginal effects) for the number of male and female infant deaths to all currently married women, whether or not they had terminated their fertility. The important point to emerge from these results is that, after controlling for other factors, Muslim women had a smaller number of both male and female infant deaths compared to Hindus. *Ceteris paribus* being Muslim, instead of Hindu, would have reduced the number of male deaths per woman by 0.038, a reduction of 23% from the mean number of male infant deaths per woman (computed over all the 25,796 currently married women who had had male live births) of 0.168: as a consequence, the male mortality rate would have fallen from its observed value of 6.8% to its 'all Muslim' value of 4.4%. By similar token, being Muslim, instead of Hindu, would have reduced the number of female infant deaths per woman by 0.017, a reduction of 10% from the mean number of female infant deaths per woman (computed over all the 23,646 currently married women who had had female live births) of 0.171: as a consequence, the female mortality rate would have fallen from its observed value of 7.4% to its 'all Muslim' value of 6.2%.

The number of male and female infant deaths was significantly affected by village-level infrastructure: safe drinking water[18] in villages

[18] The NCAER Survey gave details of the main source of drinking water for each of the 1,758 villages covered. The water supply of a village was defined as being 'safe' if the main source was one of: protected wells; tanker truck; piped water; hand pump. It was defined as being 'unsafe' if the main source was one of: ponds; dug wells; running streams/canals. It must be emphasised that the terms 'safe' and 'unsafe' are

was predicted to reduce the average number of male and female infant deaths per woman by, respectively, 4% and 8% and the presence of *anganwadis*[19] in villages was predicted to reduce the mean number of male and female infant deaths by , respectively, 5% and 7%. The number of male and female infant deaths was also affected by the quality of housing conditions and by the occupation of the mother: poor housing conditions[20] were predicted to increase the mean number of male and female infant deaths by, respectively, 7% and 15%, while women who worked as labourers were predicted to have, on average, 15% more male infant deaths and 9% more female deaths than the sample averages.

Overarching these factors was the importance of mothers' (and, to a lesser extent, fathers') literacy in reducing the number of male and female infant deaths. Literate mothers were predicted to have, on average, 17% fewer male infant deaths and 23% fewer female infant deaths than the sample means; by contrast, paternal literacy (in the face of maternal illiteracy) would lead to reductions of only 4% and 7%, respectively, in the average number of male and female infant deaths.

5. The Demand for Contraception

It requires effort on the part of a married couple to *not* have children in excess of the desired number. The basic relationship (set out in Becker, 1991) between the number of births (n), the period of exposure to births (E); the average time required to produce a conception resulting in a live birth (C); and the average period of sterility before and after a live birth (S) is:

$$n = \frac{E}{C+S} \qquad (5)$$

where C depends on the probability of conception during any coition (s) and the frequency (r) of coition (Sheps and Menken, 1973):

$$C \cong 1/rs \qquad (6)$$

---

defined entirely in terms of the source of drinking water and not in terms of any inherent standard of purity.

[19] *Anganwadis* are village-based early childhood development centres. They were devised in the early 1970s as a baseline village health centre, their role being to: provide government-funded food supplements to pregnant women and children under five; work as an immunisation outreach agent; provide information about nutrition and balanced feeding and provide vitamin supplements; run adolescent girls' and women's groups; and monitor the growth, and promote the educational development, of children in a village.

[20] These were described in this study as 'poor' if there was: (a) no ventilation; *and* (b) no separate kitchen; *and* (c) food was cooked on a charcoal-fired stove (*chula*).

Women marrying at the age of 20, and not using any contraception, would average eleven live births (Becker, 1991). If *E=288* months (that is they are fertile till the age of forty-four), the average interval between live births is twenty-six months (*C+S=26*); if *S=17* (Menken and Bongaarts, 1978), then *C=9*. Then the frequency of coition is $r = 1/9s$.

Suppose now that a woman desires to have only four children and, in order to facilitate this: (i) marriage is delayed by four years (so that now *E=240*); (ii) the period of infertility, during and after pregnancy, is extended to twenty months (by extending breast-feeding by three months) so that *S=20*. Then the wait-time to conception would have to rise from *C=9* to *C=40* months in order to accommodate the reduced number of desired children. Even if half the coital acts involved *coitus interruptus* – which reduced the probability of conception by more than 90 per cent - *C=40* from equation (6) implying that $r = 1/22s$: the frequency of coition would have to fall by nearly 60% from its original value of $r = 1/9s$.

Assuming that coition gives positive utility to a couple, it is this enforced abstinence which, in the absence of birth control methods, is viewed as *the cost of restricting family size*. This cost is represented by DD (drawn as a line) in Figure 5. Costs are highest (since the frequency of coition is lowest) when the number of children is restricted to n^f where, n^f is the desired number of children in the absence of restriction costs; thereafter, costs fall as the number of children increases, reaching a value of zero when the number of children is equal to the woman's biological maximum, n^{max}.

On the other hand, exceeding the utility-maximising number of children also imposes costs and the cost of not restricting family size may be represented as a non-negative function of the difference: $U(n^f)-U(n)$. The curve LL in Figure 5 represents this cost which is positive except at $n=n^f$, when it is zero. The point F represents the point of intersection of the LL and DD curves and this yields n^* as the optimal number of children – and $m^*=n^*-n^f$ as the optimal 'overshoot' - *in the presence of "restriction costs", when birth control methods are not available.*

When birth control methods are available, the degree of abstinence required to attain a given family size falls, the DD curve shifts to the left and the optimal overshoot, m^*, falls. As the effectiveness and the ease of availability of birth control methods improve, information about them spreads, and their price falls, m^* approaches zero. With termination methods of birth control $m^*=0$, if such methods are employed when $n=n^f$. In the context of this model, therefore, contraception reduces the cost of attaining a desired number of children, but does not change the desired number of children.

Within this model, "group effects" operate through two channels. First, the desired number of children may be higher under peer pressure than under social autarky: $n^s > n^f$ in Figure 5. The strength of this influence depends on the group in question (for example, Hindus or Muslims) and upon the position of the individual within a group (literate versus illiterate; rich versus poor) but its existence reduces the costs of *not* restricting family size by shifting the LL curve in Figure 5 to MM. As this paper has argued, differences between Hindus and Muslims in their degrees of son preference and daughter aversion could lead to differences between them in their equilibrium family sizes.

Second, there may be 'psychic costs' associated with using contraception stemming from the fact that the group disapproves of some, or all, methods of contraception. Again, the strength of this influence varies by group, and by the position of an individual within the group, but its effect would be to shift the DD curve by very little, if at all: even when birth control methods are easily and freely available, the psychic costs of using contraception replace the abstinence costs of not using contraception. The upshot is that when peer pressure towards larger families is combined with group opposition to contraception, the optimal number of children (n^{**} in Figure 1) is likely to be greater than when these effects do not operate (n^{*}).

5.1. Econometric results for the demand for contraception

The pattern of contraceptive use by the Hindu, Muslim and Dalit women in the sample is shown in Table 10: a much larger proportion of Muslim women, relative to Hindu and Dalit women, did not use any contraception; among the Muslim women who did use contraception, there was, compared to Hindu and Dalit women, relatively greater reliance on spacing, than on termination, methods.

The econometric equation to explain contraceptive use attempted to capture some of the above features. The dependent variable for the equation was the variable *CNP* such that $CNP_i = 1$ if woman *i* did not use any contraception; $CNP_i = 2$, if she used spacing methods of contraception; and $CNP_i = 3$, if she had terminated her fertility through a termination method of contraception. Since this variable was ordinal, the appropriate method of estimation was by *ordered logit*.

The idea behind this model (Borooah, 2002) is that the demand for contraception may be represented by the value of the *latent variable*, H_i, with higher values of H_i representing higher levels of demand. One may consider this latent variable to be a linear function of *K* regressors whose values for individual *i* are: X_{ik}, $k = 1...K$. Consequently,

$$H_i = \sum_{k=1}^{K} X_{ik}\beta_k + \varepsilon_i = Z_i + \varepsilon_i \qquad (7)$$

where: β_k is the coefficient associated with the k^{th} variable and $Z_i = \sum_k X_{ik}\beta_k$. An increase in the value of the k^{th} factor will cause demand to rise if $\beta_k < 0$ and to fall if $\beta_k > 0$.

Since the values of H_i are, in principle and in practice, unobservable, equation (7) represents a latent regression which, as it stands, cannot be estimated. However, what is observable is a person's *contraceptive use* (in this study: no contraceptive use; use of spacing methods; use of termination methods) and the categorisation of persons in the sample in terms of contraceptive use is implicitly based on the values of the latent variable H_i in conjunction with 'threshold values', δ_1 and δ_2 ($\delta_1 < \delta_2$) such that:

$$\begin{aligned} &CNP_i = 1, \text{ if } H_i \le \delta_1 \\ &CNP_i = 2, \text{ if } \delta_1 < H_i \le \delta_2 \\ &CNP_i = 3, \text{ if } H_i > \delta_2 \end{aligned} \qquad (8)$$

The δ_1, δ_2 of equation (8) are unknown parameters to be estimated along with the β_k of equation (7).

A woman's classification in terms of her contraceptive use depends upon whether the value of H_i crosses a threshold and the probabilities of a woman being in a particular category of use are:

$$\begin{aligned} &\Pr(CNP_i = 1) = \Pr(\varepsilon_i \le \delta_1 - Z_i) \\ &\Pr(CNP_i = 2) = \Pr(\delta_1 - Z_i \le \varepsilon_i < \delta_2 - Z_i) \\ &\Pr(CNP_i = 3) = \Pr(\varepsilon_i \ge \delta_2 - Z_i) \end{aligned} \qquad (9)$$

If it is assumed that the error term ε_i, in equation (7), follows a logistic distribution then equations (7) and (8) collectively constitute an *ordered logit* model[21] and the estimates from this model permit, through equation (9), the various probabilities to be computed for every person in the sample, *conditional upon the values of the determining factors for each person*.

The estimation results from the contraceptive use equation are shown in Table 11, under the column 'coefficients'. Also shown in Table

[21] The assumption that the ε_i are normally distributed results in an ordered probit model.

11 are the *marginal probabilities* of the three outcomes: these numbers show how the probabilities of being in the different categories of contraceptive use changed in response to a change in the value of one of the covariates. For each variable, these probabilities sum to zero across the three outcomes: 'no contraceptive use', 'use of spacing methods', and 'use of termination methods'. For discrete variables, the marginal probabilities refer to changes consequent upon a move from the default category for that variable to the category in question: for example from being Hindu (the default community) to being Muslim or from living in the North (the default region) to living in the South.

The marginal probabilities of Table 11 show that, in terms of changes in the probabilities of the different outcomes, most of the traffic was between 'no contraception' and 'termination contraception' with hardly any change in the probability of 'spacing contraception'. This was not surprising since – reflecting the fact that the main instrument of family planning policy in India has been sterilisation – as Table 11 shows, of the 29,837 women in the estimation sample, 57.7% did not use any contraception, 7.1% used spacing methods and 35.2% used termination methods.

The demand for contraception was hypothesised to depend on family size and composition: the number of daughters and of sons were important determining variables in the contraceptive use equation. Since one of the analytical planks of this paper is inter-community differences in 'son preference'/'daughter aversion', the effect of the number of daughters and of the number of sons on contraceptive use was allowed to vary by community. So, for example, the coefficient estimates in Table 11, associated with the variables 'number of daughters' (0.263) and 'number of sons' (0.740), represent the 'Hindu' coefficient estimates. The coefficient estimates associated with the *interaction* of the number of daughters (sons) with being Muslim[22] represents the estimated *change* to these coefficients as a consequence of being Muslim instead of Hindu. Ditto for the coefficient estimates associated with the *interaction* of the number of daughters (sons) with being Dalit.

In addition to the effects of community operating through the number of daughters and the number of sons variables, the effect of being Muslim (or Dalit) on the demand for contraception was allowed to vary by community, independently of all other determining variables, through intercept shifts. These effects were represented by the coefficient effects associated with the 'Muslim' and 'Dalit' variables in Table 11.

Table 11 shows that, for Hindu women, each additional daughter, and each additional son, would, on average, reduce the probability of no

[22] Number of daughters × Muslim in Table 11.

contraception[23] by, respectively, 6.4 and 17.9 percentage points and increase the probability of termination contraception by, respectively, 5.8 and 16.4 points. Consequently, for Hindu women, the increased likelihood of terminating fertility after the birth of a son was nearly three times the increased likelihood of terminating fertility after the birth of a daughter. By contrast, the increase in the likelihood of Muslim women terminating their fertility after the birth of a son (4.8 points[24]) - and of terminating their fertility after the birth of a daughter (2.0 points[25]) - was substantially lower than the corresponding values for Hindus. The marginal probabilities for Dalit women lay between that of Hindu and Muslim women: the increase in the probability of Dalit women adopting termination contraception after the birth of a son (13.6 points) or of a daughter (4.1 points) was smaller than the corresponding Hindu values but larger than the corresponding increases for Muslim women.

The community effect on the demand for contraception operated entirely through differences between Hindu, Muslim and Dalit women in the change in their demand for contraception, following an additional daughter or son. There were no significant community effects operating over and above these 'numbers based' effects: neither of the coefficients on the Muslim and the Dalit dummy variables were significantly different from zero.

The higher the infant mortality rate to a woman, the smaller would be probability of her adopting termination contraception: a point increase in the infant mortality rate would reduce the likelihood of adopting termination contraception by nearly five points.

There was a strong regional pattern to contraception demand: relative to living in the North (the default region), women in the Central and the Eastern regions would be *more* likely not use any contraception by, respectively, nearly 19 and 14 points and *less* likely to use termination methods by, respectively, nearly 17 and 12 points; on the other hand, again relative to living in the North, women in the Southern and the Western regions would be *less* likely not use any contraception by, respectively, nearly 8 and 9 points and *more* likely to use termination methods by, respectively, nearly 7 and 8 points. This may have had much to do with the proactive policies of the governments of the Southern and the Western states, these policies being manifest in better access to family planning facilities - coupled with the wider use of the media to promote family planning - in these states. Reinforcing this could have been a

[23] In the discussion of the results, the probabilities are taken as ranging from 0 to 100.
[24] 0.164-0.116, in Table 11 under the column showing the marginal probabilities of 'termination contraception.
[25] 0.058-0.038, in Table 11 under the column showing the marginal probabilities of 'termination contraception.

more general regional ethos which led to the desired family size in the South being smaller than, say, in the Central region. The collective of family planning facilities and attitudes towards family size in a region then yielded a 'regional effect' on contraception demand.

Table 11 shows also that maternal literacy exercised an important effect on the demand for contraception: compared to the default case, in which both parents were illiterate, a literate mother was *less* likely not to use contraception (by slightly over 8 points) and *more* likely to use to use termination methods (by just under 8 points); even an illiterate mother, albeit with a literate husband, was *less* likely not to use contraception (by slightly under 6 points) and *more* likely to use to use termination methods (by just over 5 points) than an illiterate mother with an illiterate husband.

Another factor impinging on the demand for contraception was whether or not women worked: relative to women who were unoccupied, or who worked in non-manual occupations, women who worked as labourers or as cultivators were *less* likely not to use contraception (by 6 points for labourers and nearly 8 points for cultivators) and *more* likely to use to use termination methods (by just under 6 points for labourers and 7 points for cultivators).

The last factor shown in Table 11 affecting the demand for contraception was the level of village development. On the basis of their general level of facilities[26], the 1,758 villages in the NCAER Survey were classified as (a) low-development villages; (b) medium-development villages; (c) high-development villages. Relative to women in low-development villages, mothers in medium and high development villages were *less* likely not to use contraception (by just over 5 points for medium, and nearly 7 points for high, development villages) and *more* likely to use to use termination methods (by nearly 5 points for medium, and over 6 points for high, development villages).

6. Conclusion

Lakshmi, a village woman in rural South India, when questioned in a survey about her personal preferences for children, said that she wanted two children – "a girl for the *aarti* (lighting the camphor lamp for prayer) and a boy for *keerti* (family prestige)".[27] Her comment reflects the distinct preference for sons compared to daughters that pervades much of scriptural Hinduism. This paper has attempted to link the literature on religious differences in fertility behaviour in India with the existing literature on son preference and gender bias. It has done so by examining,

[26] For example: quality of roads; presence of transport, educational, health care, financial and commercial facilities.

[27] As quoted in Iyer 2002.

qualitatively and then quantitatively, the implications of different degrees of son preference and daughter aversion, for fertility decisions in India. The analysis of fertility was supported by a discussion of infant mortality and the demand for contraception by religious groups.

This qualitative information about son-preference and daughter aversion in Hinduism compared to Islam is evident in the scriptures of these religions. A careful examination of this material shows that while son preference is common to both Hinduism and Islam, the theological literature shows lower degrees of daughter aversion within Islam compared to Hinduism. This conclusion is also supported by the quantitative analysis. The econometric study undertaken here shows that in the sample, Muslims had statistically the same degree of son preference as Hindus but a significantly lower degree of daughter aversion. These facts were shown theoretically to be sufficient to result in a larger average (equilibrium) family size for Muslims than for Hindus. The curious paradox about religion and reproduction in India is that groups which have higher fertility, such as the Muslims, also display lower degrees of daughter aversion. The thrust of the econometric analysis went on to explain the number of sons and daughters to these women in terms of their personal and household characteristics. Another important point to emerge from the analysis was that, after controlling for other factors, Muslim women had a smaller number of both male and female infant deaths compared to Hindus. For Hindu women, the increased likelihood of terminating fertility after the birth of a son was nearly three times the increased likelihood of terminating fertility after the birth of a daughter. By contrast, the increase in the likelihood of Muslim women terminating their fertility after the birth of a son or daughter was substantially lower than the corresponding values for Hindus. This suggests empirically as well, that there is lower daughter aversion among Muslims.

The demand for contraception was influenced by a range of economic characteristics. But the community effect on the demand for contraception operated entirely through differences between Hindu, Muslim and Dalit women in the change in their demand for contraception, following an additional daughter or son. An important finding of the present study is that there were no significant community effects operating over and above these ‘numbers based’ effects.

The study concludes that notions of son-preference and daughter aversion are significant in explaining, theoretically and empirically, inter-group differences in fertility by religion and caste in India. This is reflected also in infant mortality trends and in the demand for contraception. Muslim fertility in India may be higher than Hindu fertility, but we argue that an important, albeit neglected, issue is not that

Muslims have more children than Hindus, but that they treat them better on account of significantly lower levels of daughter aversion. Lakshmi's 'one for *aarti* and one for *keerti*' contains many lessons yet to be learned for development policy towards minorities in pluralistic societies such as India. These are that fertility behaviour is the outcome of a complex set of factors that may derive possibly from religion, but is more likely to be addressed by targeting socio-economic characteristics such as education. Moreover, the reason for the higher fertility of Muslim, relative to Hindu, women may lie in daughters being more welcome in Muslim than in Hindu families and *ipso facto* in the relatively better treatment that girls receive at the hands of Muslim parents. More research is needed on the complex interactions between religion, gender bias, and fertility behaviour, both in India and elsewhere.

Data Appendix

The data used for estimating the econometric equations were obtained from the NCAER survey, referred to earlier. The salient features of this data are set out in this section. The data from the NCAER survey are organised as a number of 'reference' files, with each file focusing on specific subgroups of individuals. However, the fact that in every file an individual is identified by a household number and, then, by an identity number within the household, means that the 'reference' files can be joined – as will be described below – to form larger files.

So, for example, the fertility, infant mortality and contraceptive choice equations were estimated on data from the 'individual' file. This file, as the name suggests, gave information on the 194,473 individuals in the sample. From this file, data were extracted for 10, 548 women on fertility-related variables and associated with this information was data on: the educational attainments and occupation of the women; the income and size of the household to which the woman belonged; the state, district and village in which she lived; her caste/tribe (scheduled or non-scheduled only); her religion etc.

Another file – the 'village file' – contained data relating to the existence of infrastructure in, and around, each of the 1,765 villages over which the survey was conducted. This file gave information as to whether *inter alia* a village: had *anganwadis*, primary schools, middle schools and high schools and, if it did not, what was the nature of access to such institutions. The village file could be joined to the individual file so that for each individual there was information not just on individual, family and household circumstances but also on the quality of the educational facilities – and general infrastructure - in the village in which the individual lived.

The sample of individuals was distinguished by three *mutually exclusive* subgroups: Dalits[28]; Muslims; and Hindus. In effect, the Hindu/Muslim/Dalit distinction made in this paper is a distinction between: non-Dalit Hindus; Muslims; and Hindus from the Dalit community. These subgroups are, hereafter, referred to as 'communities'. Because of the small number of Christians and persons of 'other' religions in the Survey, the analysis reported in this paper was confined to Hindus, Muslims and Dalits.

[28] Those castes and tribes – also known as Scheduled Castes/Tribes - recognised by the Indian Constitution as deserving special recognition in respect of education, employment and political representation.

The Survey contained information for each of sixteen states. In this study, the states were aggregated to form five regions: the *Central* region consisting of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh; the *South* consisting of Andhra Pradesh, Karnataka, Kerala and Tamilnadu; the *West* consisting of Maharashtra and Gujarat; the *East* consisting of Assam, Bengal and Orissa; and the *North* consisting of Haryana, Himachal Pradesh and Punjab.

The equation relating to fertility, infant mortality and contraceptive use was estimated on data from the NCAER Survey's 'Individual' file', described above, for 10, 548 currently married women who had terminated their fertility: 6,523 Hindus, 549 Muslims and 3, 476 Dalits.

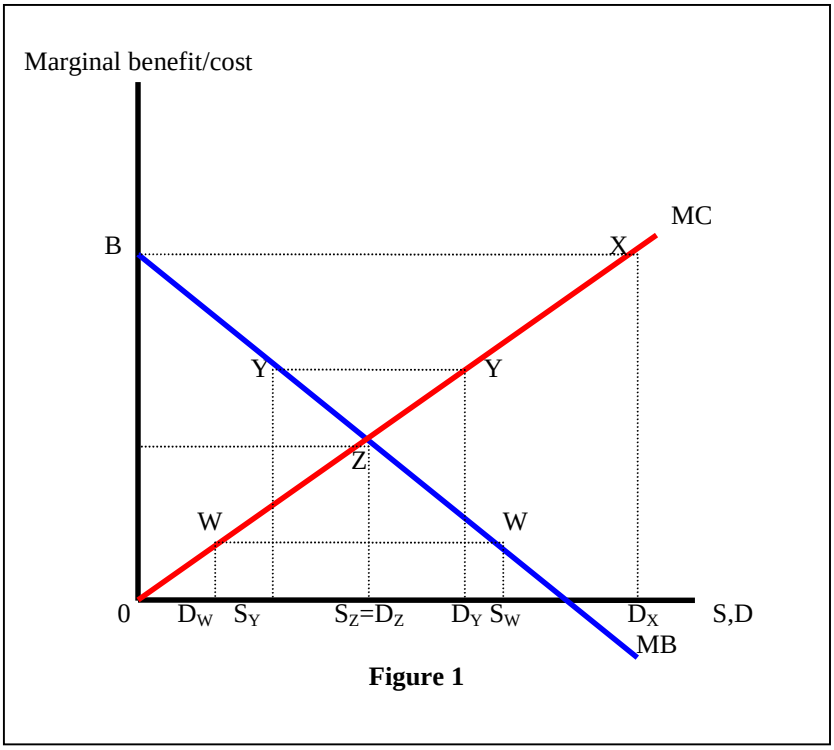

Figure 1

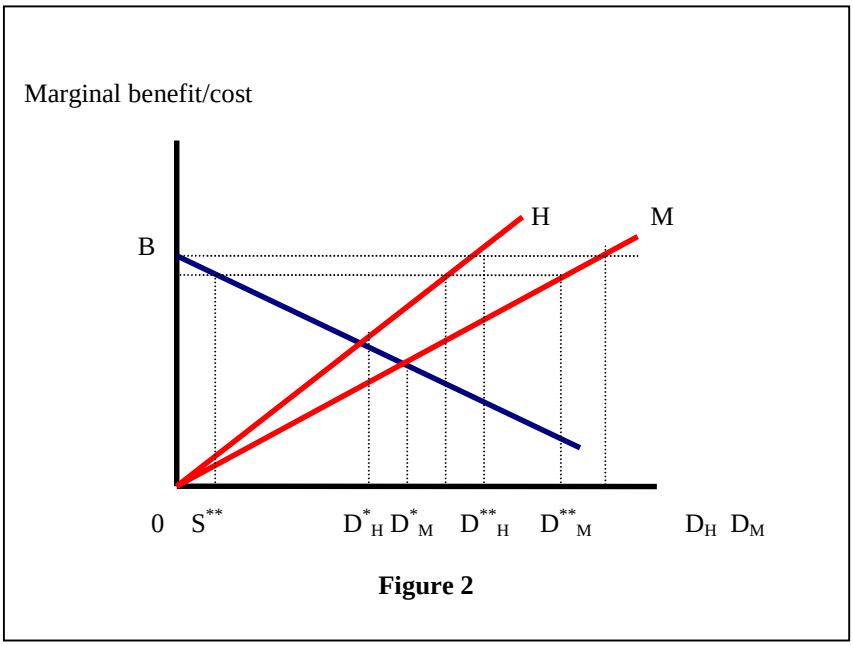

Figure 2

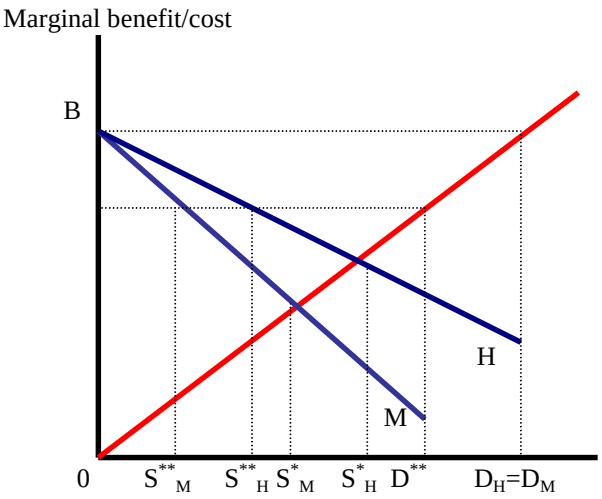

Figure 3

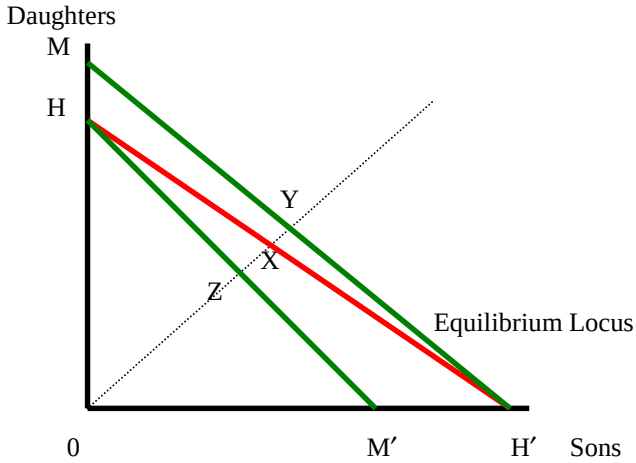

Figure 4

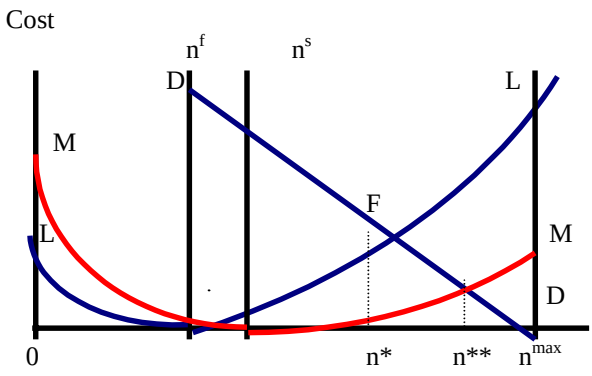

Figure 5
The Demand for Contraception

Table 1
Number of Living Sons of Currently Married Women Who Terminated Their Fertility

Sons	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	4.6	5.1	4.5
1	29.3	25.4	27.1
2	45.9	40.4	42.1
3	14.9	19.5	19.2
4+	5.3	9.6	7.1
Mean	1.9	2.1	2.0
Median	2	2	2

6,523 Hindu, 549 Muslim and 3,476 Dalit women

Table 2
Number of Living Daughters of Currently Married Women Who Terminated Their Fertility

Daughters	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	19.6	13.4	17.4
1	39.1	35.8	38.5
2	25.1	25.6	26.2
3	11.0	15.8	12.2
4+	5.2	9.4	5.7
Mean	1.4	1.8	1.5
Median	1	2	1

6,523 Hindu, 549 Muslim and 3,476 Dalit women

Table 3
Number of Living Children of Currently Married Women Who Terminated Their Fertility

Children	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	0.6	0.8	0.8
1	2.2	1.8	2.6
2	23.4	13.8	18.9
3	35.1	32.1	31.4
4	22.3	25.4	26.1
5+	16.4	26.1	20.2
Mean	3.3	3.8	3.5
Median	3	4	3

6,523 Hindu, 549 Muslim and 3,476 Dalit women

Table 4
Number of Living Daughters of Currently Married Women Who Terminated Their Fertility Without Any Sons:
'No-Son' Equilibrium

Daughters	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	12.4	15.4	16.7
1	15.3	11.5	21.3
2	37.2	38.5	30.7
3	21.3	11.5	18.7
4+	13.8	23.1	12.6
Mean	2.1	2.2	
Median	2	2	

309 Hindu, 32 Muslim and 162 Dalit women

Table 5
Number of Living Daughters of Currently Married Women Who Terminated Their Fertility With the Same Number of Sons as Daughters
'Parity' Equilibrium

Daughters=Sons	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	2.4	3.3	3.2
1	48.2	32.3	41.9
2	44.5	48.8	47.0
3	4.7	14.1	7.4
4	0.2	1.5	0.5
Mean	1.5	1.8	1.5
Median	1	2	1

1,585 Hindu, 138 Muslim and 802 Dalit women

Table 6
Number of Living Sons of Currently Married Women Who Terminated Their Fertility Without Any Daughters:
'No-Daughter' Equilibrium

Sons	Hindus (%)	*Muslims (%)*	*Dalits (%)*
0	2.9	5.9	4.3
1	7.5	8.8	9.6
2	51.9	30.9	44.9
3	26.8	44.1	28.3
4+	10.9	10.3	12.9
Mean	2.4	2.5	2.4
Median	2	3	2

1,298 Hindu, 77 Muslim and 615 Dalit women

Table 7
Poisson Regression Model Estimates for the Number of Sons and Daughters to Currently Married Women Who Terminated Their Fertility

	Equation for Sons		***Equation for Daughters***	
Variable	**Coefficient**	***Marginal Effects***	***Coefficient***	***Marginal Effects***
Age of woman at marriage	-0.028	-0.053	-0.029	-0.043
	(7.4)	(0.01)	(6.9)	(0.01)
Muslim	0.134	0.271	0.207	0.335
	(4.3)	(0.07)	(6.1)	(0.06)
Dalit	0.043	0.083	0.046	0.068
	(2.7)	(0.03)	(2.5)	(0.03)
Central region	0.039	0.075	-	-
	(1.7)	(0.04)		
Southern region	-0.167	-0.307	-	-
	(6.8)	(0.04)		
Western region	-0.032	-0.061	-0.027	-0.040
	(1.28)	(0.05)	(1.3)	(0.03)
Eastern region	-0.061	-0.113	0.037	0.055
	(2.1)	(0.05)	(1.4)	(0.04)
Woman literate	-0.119	-0.223	-0.076	-0.111
	(6.3)	(0.03)	(4.1)	(0.03)
Woman illiterate/husband literate	-0.034	-0.065	-	-
	(2.0)	(0.03)		
Woman works as labourer	-0.051	-0.095	0.050	0.076
	(2.3)	(0.04)	(2.1)	(0.04)
Woman works as cultivator	-0.053	-0.099	0.052	0.079
	(2.1)	(0.05)	(1.9)	(0.04)
Woman works in non-manual occupation	-	-	-	-
Husband works as labourer	-0.052	-0.098	-0.09	-0.130
	(2.7)	(0.036)	(4.2)	(0.03)
Husband works as cultivator	-	-	-	-

Notes to Table 7
The equations were estimated on observations for 10,548 currently married women (6,523 Hindus; 549 Muslims; and 3,476 Dalits) who had terminated their fertility by adopting termination methods of contraception.
Figures in parentheses under column 'coefficient' are z-values and under column 'marginal effects' are standard errors.
The marginal effects show the increase/decrease in the expected number of sons/daughters for a unit change in the relevant variables, the values of all other variables being set to their respective mean values.
The LR test statistics for imposing zero restrictions on some of the coefficients were: $\chi^{2(}(2)=0.79$, for the 'sons equation' and $\chi^{2(}(5)=2.4$, for the 'daughters equation'.

Table 8
Average Number of Infant Deaths and Infant Mortality Rates to Currently Married Women

	Hindus	*Muslims*	*Dalits*
Male Infant Deaths	0.132	0.136	0.170
Female Infant Deaths	0.156	0.164	0.194
Total Infant Deaths	0.253	0.229	0.315
Male Infant Deaths as a Percentage of Male Live Births	4.5	4.6	5.4
Female Infant Deaths as a Percentage of Female Live Births	6.2	4.5	7.6
Total Infant Deaths as a Percentage of Total Live Births	5.1	4.5	6.1

Mean Infant Deaths and Infant Mortality Rates were computed over currently married women *who had had at least one live birth*: and who had terminated their fertility: 6,505 Hindu, 545 Muslim and 3,469 Dalit women
Mean *Male* Infant Deaths and Male Infant Mortality Rates were computed over currently married women *who had had at least one male live birth* and who had terminated their fertility: 6,295 Hindu, 523 Muslim and 3,365 Dalit women
Mean *Female* Infant Deaths and Female Infant Mortality Rates were computed over currently married women *who had had at least one female live birth* and who had terminated their fertility: 5,422 Hindu, 489 Muslim and 3,009 Dalit women

Table 9
Poisson Regression Model Estimates for the Number of Male and Female Infant Deaths to Currently Married Women

	Equation for Male Infant Deaths		***Equation for Female Infant Deaths***	
Variable	Coefficient	*Marginal Effects*	*Coefficient*	*Marginal Effects*
Male live births	0.577	0.069	-	-
	(64.6)	(0.001)		
Female live births	-	-	0.488	0.062
			(56.6)	(0.001)
Age of woman at marriage	-0.031	-0.004	-0.040	-0.005
	(3.5)	(0.001)	(4.4)	(0.001)
Muslim	-0.371	-0.038	-0.145	-0.017
	(6.9)	(0.005)	(2.7)	(0.006)
Dalit	-	-	-	-
Safe water in village	-0.052	-0.006	-0.115	-0.014
	(1.6)	(0.004)	(3.4)	(0.004)
Anganwadi in village	-0.066	-0.008	-0.096	-0.012
	(2.1)	(0.004)	(2.9)	(0.004)
Hospital within 5km of village	0.052	0.006	-0.103	-0.0133
	(1.6)	(0.004)	(3.1)	(0.004)
Midwife in village	0.076	0.009	-	-
	(2.3)	(0.004)		
Poor housing conditions	0.101	0.012	0.193	0.025
	(3.1)	(0.004)	(5.7)	(0.004)
Household assets	-0.036	-0.012	-0.019	-0.002
	(5.0)	(0.004)	(2.6)	(0.001)
Woman literate	-0.259	-0.029	-0.336	-0.040
	(5.5)	(0.005)	(6.9)	(0.005)
Woman illiterate/husband literate	-0.053	-0.006	-0.099	-0.012
	(1.5)	(0.004)	(2.8)	(0.004)
Woman works as labourer	0.194	0.025	0.123	0.016
	(4.8)	(0.006)	(2.9)	(0.008)
Woman works as cultivator	-	-	-	-

Notes to Table 9
The male infant deaths equation was estimated on observations for the 25,796 currently married women who had had male live births; the female infant deaths equation was estimated on observations for the 23,646 currently married women who had had female live births.
Figures in parentheses under column 'coefficient' are z-values and under column 'marginal effects' are standard errors.
The marginal effects show the increase/decrease in the expected number of male/female infant deaths for a unit change in the relevant variables, the values of all other variables being set to their respective mean values.
The LR test statistics for imposing zero restrictions on some of the coefficients were: $\chi^{2(}(2)=2.2$, for the male infant deaths equation and $\chi^{2(}(3)=2.4$ for the female infant deaths equation.

Table 10
Contraception and Currently Married Women

	Hindu	*Muslim*	*Dalit*
Number of Currently Married Women	16,100	2,951	10,786
% not using contraception	53	72	61
% using spacing methods of contraception	7	10	7
% using termination methods of contraception	40	18	32

Source: NCAER Survey

Table 11
Ordered Logit Estimates for Contraceptive Use by Currently Married Women

	Coefficients	***Marginal Probabilities***		
		No Contraception	***Spacing Contraception***	***Termination Contraception***
Age at marriage	-0.023	0.006	-0.001	-0.005
	(3.9)	(0.001)	(0.0001)	(0.001)
Number of daughters	0.263	-0.064	0.006	0.058
	(19.1)	(0.003)	(0.0003)	(0.003)
Number of daughters×Muslim	-0.169	0.041	-0.003	-0.038
	(4.8)	(0.009)	(0.001)	(0.008)
Number of daughters×Dalit	-0.075	0.018	-0.001	-0.017
	(4.0)	(0.005)	(0.0004)	(0.004)
Number of sons	0.740	-0.179	0.015	0.164
	(46.9)	(0.004)	(0.001)	(0.004)
Number of sons×Muslim	-0.523	0.127	-0.011	-0.116
	(15.0)	(0.008)	(0.001)	(0.008)
Number of sons×Dalit	-0.126	0.031	-0.003	-0.028
	(7.1)	(0.004)	(0.0004)	(0.004)
Muslim	0.121*	-0.029*	0.002*	0.027*
	(1.3)	(0.023)	(0.002)	(0.021)
Dalit	-	-	-	-
Infant mortality rate	-0.215	0.052	-0.004	-0.048
	(2.5)	(0.021)	(0.002)	(0.019)
Central region	-0.792	0.187	-0.018	-0.169
	(18.3)	(0.010)	(0.001)	(0.009)
Southern region	0.308	-0.076	0.006	0.070
	(6.9)	(0.011)	(0.001)	(0.010)
Western region	0.351	-0.087	0.006	0.081
	(7.2)	(0.012)	(0.001)	(0.012)
Eastern region	-0.588	0.136	-0.016	-0.120
	(12.1)	(0.011)	(0.002)	(0.009)
Woman literate	0.338	-0.083	0.007	0.076
	(10.1)	(0.008)	(0.001)	(0.008)
Woman illiterate/ husband literate	0.238	-0.058	0.004	0.054
	(8.0)	(0.008)	(0.001)	(0.007)
Medium development village	0.211	-0.051	0.004	0.047
	(6.4)	(0.008)	(0.001)	(0.007)
High development village	0.283	-0.069	0.005	0.064
	(7.7)	(0.009)	(0.001)	(0.008)
Woman works as labourer	0.246	-0.060	0.004	0.056
	(6.5)	(0.009)	(0.001)	(0.009)
Woman works as cultivator	0.304	-0.075	0.005	0.070
	(6.2)	(0.012)	(0.001)	(0.012)

Notes to Table 11
The contraceptive use was estimated on observations for 29,837 currently married women of whom: 16,100 were Hindu; 2,951 were Muslim; and 10,786 were Dalit. Figures in parentheses under column 'coefficient' are z-values and under column 'marginal probabilities' are standard errors

The marginal probabilities show the increase/decrease in the expected probability of contraceptive use for a unit change in the relevant variables, the values of all other variables being set to their respective mean values: the marginal probabilities sum to zero across the three outcomes
An * denotes a coefficient or a marginal probability that was *not* significant at 5% level of significance.

Bibliography

Anderson, S. (2003) 'Why Dowry Payments Declined with Modernization in Europe but Are Rising in India', *Journal of Political Economy*, 111(2), pp. 269-310

Aruga, K. (2003) 'Differences in Characteristics of Religious Groups in India: As Seen from Household Survey Data', *Centre for Energy Policy and Economics Working Paper* 26, Zurich.

Azim, S. (1997) *Muslim Women: Emerging Identity*. New Delhi: Rawat Publications.

Becker G. S. (1991) *A Treatise on the Family: Enlarged Edition*. Harvard University Press, Cambridge, MA.

Bhat, M and Zavier, F (2003), 'Fertility Decline and Gender Bias in Northern India', *Demography*, 40:4, pp. 637- 657.

Borooah, V. (2003) 'Illuminating the Politics of Demography: A Study of Inter Community Fertility Differences in India', *European Journal of Political Economy* (forthcoming).

Brien M. J. and Lillard L.A. (1994), 'Education, Marriage and First Conception in Malaysia', *Journal of Human Resources* XXIX.4, pp. 1167-1204.

Caldwell J.C., Reddy P.H. and Caldwell P. (1983), 'The Causes of Marriage Change in South India', *Population Studies* 37 (3), pp. 343-361.

Coulson, N. and Hinchcliffe, D. (1978), 'Women and Law Reform in Contemporary Islam', in *Women in the Muslim World*, edited by L. Beck and N. Keddie, Cambridge: Harvard University Press, pp. 37-49.

Deolalikar, A. B. and Rao V. (1998), 'The Demand for Dowries and Bride Characteristics in Marriage: Empirical Estimates for Rural South-Central India', in *Gender, Population and Development*, edited by Krishnaraj, M., Sudarshan, R. and Shariff, A. Delhi: Oxford University Press, pp. 122-40.

Deshpande, C. R. (1978), *Transmission of the Mahabharata Tradition. Vyasa and Vyasids.* Simla: Institute of Advanced Study.

Dreze J. and Murthi, M. (2001) 'Fertility, Education and Development: Evidence from India', *Population and Development Review* 27(1), pp. 33-63.

Gellner, E. (1981) *Muslim Society*. Cambridge: Cambridge University Press.

Ghallab, M. (1984) 'Population Theory and Policies in the Islamic Model' in *Geography and Population: Approaches and Applications*, edited by J. Clarke, Oxford: Pergamon, pp. 232-241.
Iyer S. (2002) *Demography and Religion in India.* Oxford University Press, Delhi.
Jeffery R. and Jeffery P. (1997), *Population, Gender and Politics: Demographic Change in Rural North India.* Cambridge University Press, Cambridge.
Kapadia, K. (2000) 'Every Blade of Green: Landless Women Labourers, Production and Reproduction in South India. In. Institutions, relations and outcomes: A framework and case studies for gender-aware planning', edited by N. Kabeer and R. Subrahmanian, London and New York: Zed Books, pp. 80-101.
Kinsley, D. R. (1997) *Hindu Goddesses.* Second edition. Berkeley and Los Angeles: University of California Press.
Krishnaraj, M., Sudarshan, R. and Shariff, A. (1998) *Gender, Population and Development*. Delhi: Oxford University Press.
Moulasha, K and Rao, G. R. (1999) 'Religion-Specific Differentials in Fertility and Family Planning', *Economic and Political Weekly*, 34 (42), pp. 3047-51.
Mukhopadhyay, M. (2000) 'Brother, There Are Only Two Jatis--Men and Women: Section 125 Criminal Procedure Code and the Trail of Wifehood.', in *Institutions, Relations and Outcomes: A Framework and Case Studies for Gender-Aware Planning*, edited by N. Kabeer and R. Subrahmanian. London and New York: Zed Books, pp. 147-65.
Murthi, M., Guio, A-C, and Dreze, J. (1995) 'Mortality, Fertility, and Gender Bias in India: A District-Level Analysis', *Population and Development Review*, 21(4), pp. 745-82
Obermeyer C. M. (1992) 'Islam, Women and Politics: The Demography of Arab Countries', *Population and Development Review* 18 (1), pp. 33-60.
Omsted, J. C. (2002) 'Assessing the Impact of Religion on Gender Status', *Feminist Economics* 8(3), pp. 99-111.
Qureshi, S. (1980) 'Islam and Development: The Zia Regime in Pakistan', *World Development* 8, pp. 563-575.

Radhakrishnan, S. (1947) *Religion and Society.* London: George Allen and Unwin.
Ragab, I. A. (1980) 'Islam and Development', *World Development,* 8, pp. 513-521.
Rao V. (1993) 'The Rising Price of Husbands: A Hedonic Analysis of Dowry Increases in Rural India', *Journal of Political Economy* 101, pp. 666-677.
Sen, B. (1998) 'Why Does Dowry Still Persist in India? An Economic Analysis Using Human Capital', in *South Asians and the Dowry Problem,* edited by Menski, W., Trentham Books; London: University of London, School of Oriental and African Studies, pp. 75-95.
Sen, A.K. (2001) 'The Many Faces of Gender Inequality', *Frontline*, vol. 18, October 27- November 9.
Tambiah S. J. (1973) 'Dowry and Bridewealth, and the Property Rights of Women in South Asia' in Goody J., Tambiah S. J. (eds) *Bridewealth and Dowry,* Cambridge: Cambridge University Press, pp. 100-110.
United Nations. (1961) *Mysore Population Study.* Department of Social and Economic Affairs, New York.
Youssef, N. H. (1978) 'The Status and Fertility Patterns of Muslim Women' in *Women in the Muslim World,* edited by L. Beck and N. Keddie, Cambridge: Harvard University Press, pp. 69-99.