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FEMALE PRIMARY EDUCATION AND FERTILITY REDUCTION IN INDIA

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Abstract

The launching of the Seventh Five-Year Plan provides an opportunity to initiate those "beyond family planning" measures which contribute to the overall objective of fertility reduction in India. At the 1974 Bucharest Conference on Population, the Indian delegation was instrumental in introducing the oft-repeated slogan "development is the best contraceptive." The actual experience in India since then has rarely reflected this theme, which requires that the potential impacts of developmental activities on fertility be taken account of in the design and implementation of development programs. In this article, the authors examine education sector policies and suggest modifications from the fertility reduction perspective.

By first analyzing the macro- and micro-level Indian data on education and fertility, the authors demonstrate that female education in India monotonically increases the use of contraception and age at marriage, both of which, in turn, decrease fertility. The authors then present strong arguments that the educational policy in India, as far as fertility reduction is concerned and perhaps other aspects of development as well, should give high priority to the increase of female primary education, particularly by reducing the currently high repetition and drop-out rates from primary schools. They also point out that the budget allocations of the education sector do not always reflect the same emphasis on female primary education as that reflected by Five-Year Plan documents.

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I. Introduction

Education, particularly of females, is generally recognized as one of the most powerful predictors of fertility decline at the national or regional level. At the level of individual couples, education has been found to be one of the most robust indicators of their fertility behavior. The purpose of this paper is to review the relationship between female education and fertility in India and to suggest the most effective strategy to reorient the Indian educational structure in order to have a significant impact upon fertility.

To better understand the relationship between education and fertility, it is useful to define the population eligible to give birth. It includes only the fertile couples with wives in the reproductive period, i.e., when they are between 15 and 49 years of age. In India, since almost all reproduction takes place within marriage, this event marks the beginning of the fertile reproductive period. Further, in almost all cases, women complete their education before marriage. Thus, education of women can affect their fertility by delaying their entry into the fertile reproductive period and by influencing the number of children borne by them while they are in their reproductive period. This effect of education on their <u>own fertility</u> is different from three other effects of education (Jain, 1982).

Fertility of women without education can be influenced by what is happening in the general environment, i.e., the behavior of educated women

can influence the behavior of women without education. We label this effect of education as demonstration effect. Education of women who are in their reproductive period now can also affect the fertility behavior of their own parents and of their children in ways other than the demonstration effect. The direct and indirect costs associated with education, for example, may have had some influence on the fertility of parents of women who are now educated. Educated parents, on the other hand, are more likely to send their children to schools. In this way, education of women who are in their reproductive period now can influence the education of their children and their subsequent fertility. The demonstration effect, and the effects of female education on the fertility of their parents and their children, are important to take into account while considering ways to enhance the effect of education policies and programs on fertility in India. However, since most of the literature on the effect of female education on fertility has focussed on the effect of women's education on their own fertility, we shall mainly deal with this effect in the present paper.

Female education rather than male education has been selected for two reasons. First, the education of the wife is usually lower than or, at most, equal to the education of the husband. Thus, with an improvement in female education, male education improves. The reverse, however, is not true. The level of female education in India, for example, still lags far behind that of male education. Moreover, in reviews of Indian (Mandelbaum, 1974) and international (Cochrane, 1979, 1983) literature on the subject, female education has been shown to be more important than male education in regard to its effect on fertility.

Two themes emerge in the international literature on female

education and fertility: (a) a small amount of education in least literate societies might initially increase fertility (Cochrane, 1979), and (b) the magnitude of the individual-level fertility effect of education varies from country to country (Hermalin and Mason, 1980). In the absence of a clear theoretical basis for the causal linkages between female education and fertility, a lack of uniformity in the empirical relationship increases the degree of uncertainty in predicting the potential negative fertility effect of advancement in female education and sometimes contributes to a skeptical view of the education and fertility relationship (Graff, 1979). When considering policy implications, one is faced with other nagging issues, such as whether or not the educational "lever" is attached to anything (McNicoll, 1978); whether or not investment in education is the most cost-effective way to reduce fertility in developing countries (Simmons, 1979); and whether investment in broad-based elementary education should be recommended over a narrower program of secondary education (Cochrane, 1979).

A lack of uniformity in the education and fertility relationship across countries is usually interpreted as reflecting the differences among countries in the average fertility of educated women. However, in a recent study based on World Fertility Survey data collected from 11 less developed countries, the cumulative marital fertility of educated women is shown to be similar in different settings (Jain, 1981a). This study demonstrates that the effect of education on fertility differs from country to country more because of the differences among countries in the average fertility of women with no education than because of the differences in the average fertility of women with relatively higher education. It also demonstrates that the curvilinear nature of the relationship between education and fertility is

attributable to the relatively low fertility of illiterate women with higher prevalence of fertility inhibiting factors such as breastfeeding. This means that the explanation for a curvilinear relationship between education and fertility should be sought in the factors which suppress fertility of women with no education.

II. Extent of Ambiguity in the Education-Fertility Relationship in India

The empirical information about education-specific fertility levels are quite limited at the all-India level. The results of two national surveys conducted by the Office of the Registrar General of India are summarized in Table 1.

It is evident that the total marital fertility rate (total number of children born per married woman throughout her reproductive period) estimated from both 1972 and 1978 data decreases consistently with the increase in educational level in the urban sector of India. In the rural sector, however, although the rate estimated from the 1979 data shows a linear decrease with the increase in educational level, the 1972 data show a curvilinear relationship between education and fertility. In 1972, the total marital fertility rate (7.1) of rural literate women (including those with any education less than matric) was slightly higher than that of illiterate women (6.9). A similar curvilinear relationship between education and fertility was found in a few other studies also. For example, in the National Sample Survey conducted in 1960-61, the average number of children born alive to women of 47 years or older was 6.6, 6.9 and 6.6 among women with no education, less than primary education, and primary education, respectively (India, N.S.S., 1967). Analysis of data on fertility collected

Table 1. Estimated total marital fertility rates (1972 and 1978) per woman in rural and urban India*

Level of Education	Total Marital Fertility Rate 1972 Rural	1972 Urban	1978 Rural	1978 Urban
Illiterate	6.9	6.3	5.5	4.9
Literate**	7.1	5.0	5.0	4.5
Primary			4.9	4.2
Matric & above	5.0	4.5	4.7	4.0
All women	6.8	6.0	5.4	4.6

*Data for 1972 and 1978 are not strictly comparable and thus these comparisons overestimate the magnitude of fertility decline during the 1970s.

**In the 1972 survey, women with primary school education were classified as literate, a category which also included women with less than primary school education.

Sources: India, RG (1976:7) and India, RG (1982:4-7).

in the 1971 Census also indicates a somewhat curvilinear relationship between female education and marital fertility (Sharma and Misra, 1978).

The state-level data from the 1979 survey (India, RG, 1982) show the existence of the curvilinear relationship between female education and marital fertility for a few states. Women who are literate but had not completed primary school education had higher marital fertility than either those who were illiterate or those who had completed primary school education in rural areas of Assam, Bihar, Madhya Pradesh, Orissa, and Uttar Pradesh; and in urban areas of Assam, Jammu & Kashmir, Karnataka, Orissa, and Punjab.

In a number of these cases, the difference between the total marital fertility of literate and illiterate women was less than 0.2. The magnitude of this difference, however, was quite substantial (higher than 0.5 children) for Assam, Jammu & Kashmir, Karnataka, and Orissa. Using 1971 Census data, Bhattacharjee (1984:5) has shown that indicators of marital fertility "of the illiterate women in Karnataka State are lower than those of literate women." In a recent sample survey of three Kerala districts the mean number of children ever-born as well as completed and desired family size were found to decrease linearly with increase in schooling, but the relationship between schooling and total marital fertility was curvilinear (Zachariah 1984:152-154). Similar findings have also been reported by other investigators, especially for rural areas.

The nature of the empirical relationship between female education and marital fertility in India is not different from what has been observed outside India. Female education is inversely related to marital fertility, but the relationship is not universal. Education below the primary level in a small number of cases is associated with higher marital fertility. Two issues related to this lack of consistency in the observed empirical relationship between female education and marital fertility are: (1) what are its causes and (2) how should it be interpreted as far as its implications for education policies are concerned? We will first discuss the causes of this ambiguous relationship and will return to its interpretation while discussing the policy implications.

One reason for observing the curvilinear relationship between female education and fertility has to do with the quality of data. It is well known that data on the number of live births or births which take place

in a specified period of, say, one year prior to interview collected retrospectively are affected by recall errors. The magnitude of these errors among respondents without any education is likely to be higher than among literate respondents. If so, it would differentially underestimate the fertility level for the illiterate group and would give an erroneous impression of higher fertility for the literate group. Another reason has to do with the classification of women with little education. In some cases, women who do not complete primary level education (grade 5), i.e., who drop out from primary school, are included with illiterates, and in other studies they are included with those who completed primary school education. These women are different from those who have no education, as well as from those who completed primary school education and, therefore, should be classified separately. These reasons can explain small differences in the marital fertility of literate and illiterate women. However, to better understand why this can happen, one has to learn the mechanisms through which education can influence fertility behavior. These mechanisms are discussed in the next section.

III. Causal Links between Education and Fertility

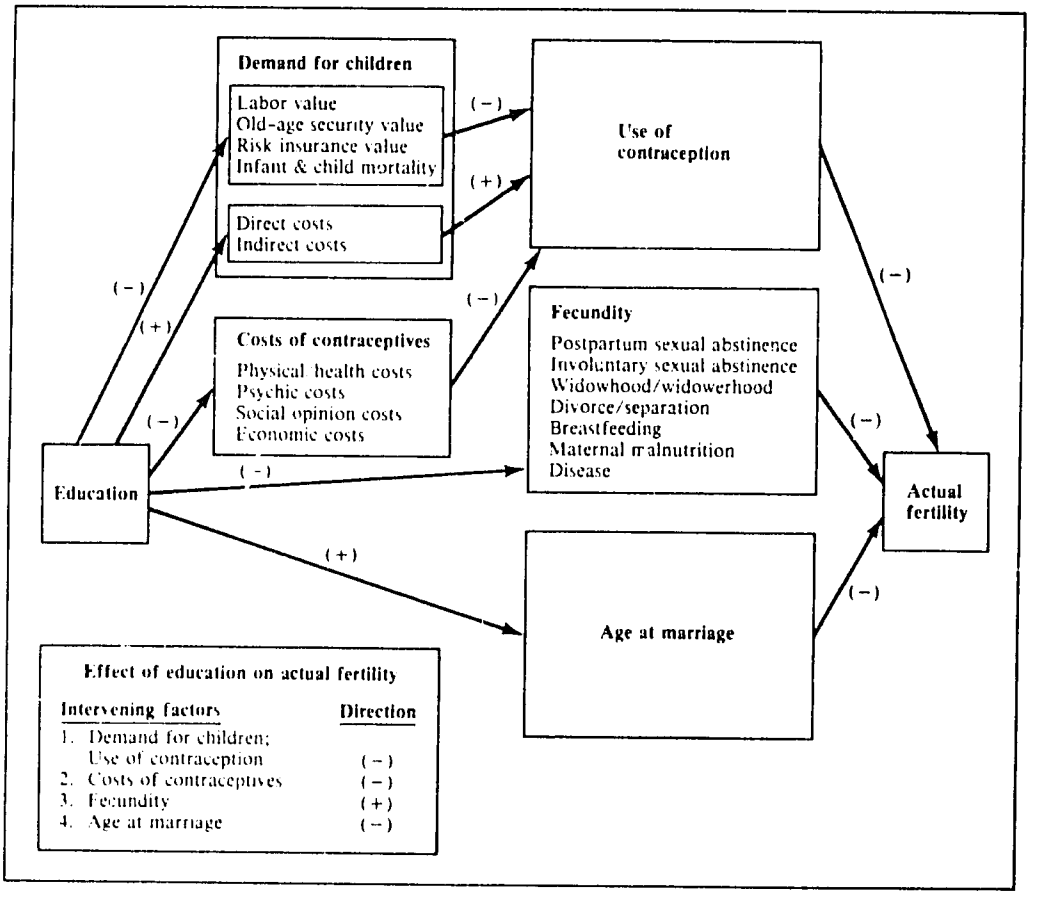
Fertility behavior of women is influenced by a complex set of demand and supply factors. In the "intermediate" and "proximate" fertility variable approaches, fertility is seen as determined by a set of intervening factors, with education, in turn, operating only indirectly on fertility through these socio-biological intervening variables (Davis and Blake, 1956; Bongaarts, 1978). This approach, commonly adopted by social demographers, stresses the "supply" (or "production") aspect of fertility, whereas the

approach of economists, who are concerned with explaining why individuals want or do not want to limit family size, tend to stress the "demand" aspect of fertility.

The understanding of causal links between education and fertility requires the identification of appropriate intervening variables which cover both "supply" and "demand" aspects of fertility. In this respect, the "synthesis" framework developed by Easterlin (1978) is very helpful. In this framework, fertility is measured by the number of living children whereas, in most of the literature related to education and fertility, fertility is measured by the number of live births. It is important to maintain this distinction and we have done so by using the term actual fertility to denote the number of live births. The synthesis framework, with modifications to incorporate proximate factors identified by Bongaarts (1978) and intervening variables between modernization and fertility (Nag, 1983), is used in this paper to explain the causal links between female education and actual fertility (number of live births).

As shown in Figure 1, actual fertility is seen as determined by use of contraception, fecundity, and age at marriage. The use of contraception is seen as determined by demand for children and costs associated with the use of contraception. Education is seen to affect fertility by influencing the demand for children, costs associated with contraception, fecundity, and age at marriage.

FIGURE 1 Schematic representation of causal links between education and actual fertility



We now turn to the discussion of each of the intervening variables based on the experiences in the Indian and other contexts. In each case we first review the relationship between the intervening variable and desired family size and actual fertility and then review the available information about the effect of education on that variable.

3.1 Demand for Children

Why people want a large or small number of children is a very difficult question to answer. It involves economic, social and psychological dimensions which cannnot be easily disentangled and which vary among societies and individuals within societies. However, the research done so far indicates that economic dimensions are more important than others, at least in explaining the shift from the desire for a large number of children (six or more) to the desire for a small number (three or fewer). Changes in the following three economic variables are commonly relevant to this shift: (1) labor value of children, (2) children's value as old-age security and risk insurance, and (3) economic costs of children. Another crucial variable affecting the demand for children is infant and child mortality. The brief discussion below on these four variables will include the extent of their effect on desired family size or fertility and the interaction between education and each variable.

3.1.1 Labor Value of Children

From the national point of view, large families are economically disadvantageous in most less developed countries. But many couples, particularly the poor ones in the rural areas of these countries, desire a large number of children, especially sons, because of their contribution to the household production and domestic help. There is some empirical evidence to demonstrate that the fertility levels of societies structured to make children an economic asset to their households are higher than those structured so that children are an economic liability. In an analysis of the

data available for 49 countries for 1960 and 1969, it has been found that the percentage of the population under age 15 who were economically active has a significant positive relationship with both crude birth rate and child-woman ratio (Kasarda, 1971). A few recent surveys and in-depth village-level investigations in Chile (DaVanzo, 1972), the Philippines (Harman, 1970), Bangladesh (Cain, 1977), Nepal and Java (Nag et al., 1978) have indicated positive correlations between measures of child labor force participation and motivation for a large family. The surveys conducted in seven less developed and two developed countries under the Value of Children (VOC) project show that the percentages of wives and husbands mentioning "help with housework" or "financial, practical help" as advantages of having children declined in salience across countries as fertility fell (Bulatao, 1979).

The labor force participation data collected in censuses and surveys indicate clearly that as countries become industrialized and economically developed, the enrollment of children in school increases and their labor contribution declines. There is a two-way causation between labor value and schooling of children. High value placed on child labor by parents contributes to low enrollment in and high drop-outs from schools. Accessibility to schooling in combination with increase in demand for educational skills, on the other hand, contributes to a decline in the labor value of children. The schooling of children reduces their potential for work inside and outside the home not merely because certain hours are lost due to school attendance and homework, but also because it changes the value system of children, aspirations of parents regarding children, and authority pattern within the family (Caldwell, 1980). In their recent study of nine villages in Karnataka state of India, Caldwell et al. (1985:33-34) found that

in the village where schools are more easily accessible and awareness of nonagricultural job opportunities requiring educational skill is greater, the parents are less likely to make their children do farm or household work for long hours. In another study of 45 villages in Karnataka, Kanbargi and Kulkarni (1984) have shown an inverse relationship between child schooling and child labor. In a Punjab village where in 1970 the farmers commonly cited the labor value of children, particularly sons, in agriculture as the prime reason for having large families (Mamdani, 1972), the green revolution along with a few other institutional changes has reduced the labor value of children and increased their school enrollment within a short period of a decade or so. These changes have a significant effect on the use of contraceptives in the village (Nag and Kak, 1984).

3.1.2 Old-age Security and Risk Insurance Value

The theories linking economic development and fertility recognize that one main reason for high fertility in less developed countries is parents' expectation of support from their surviving children, especially sons, in their old age. The interview responses from parents generally show that the perceived importance of children as old-age support is a strong motivating force for having children (Arnold et al., 1975). A striking illustration of correspondence between fertility and expectation of support from children is provided by two surveys conducted in Japan, where fertility declined rapidly in the 1950s. At the beginning of the decade 55 percent of a national sample expected to depend on children in old age, but in 1961 only 35 percent did so (Kobayashi, 1977).

The interactional effect between education and old-age security value of children is relevant for the fertility behavior of children who are educated and also for that of parents who may be uneducated themselves but whose children are educated. Educated children, as a reward for their skills, are likely to be employed in organized sectors, many of which have provisions for some social security in old age, so that they do not have to depend on their children for old-age support and hence are not likely to desire large families. The parents who are themselves uneducated may send their children to school if the economic and social environment makes them aware that fewer children with educational skills will be more valuable to them in their old age than a large number of children with no educational skill. This type of effect is more evident beyond primary school education. It is precisely what is happening in the Karnataka villages studied by Caldwell et al. (1985:34) and the Punjab village mentioned above (Nag and Kak, 1984). These villages are already on the way to an economic, social and demographic transition.

In addition to expectation of support from children in old age, parents in less developed countries are also motivated to have children as a source of insurance against risks of various kinds, such as drought, flood, earthquake, illness, death of spouse, or loss of job. Cain (1981) found that the functioning of credit cooperatives and public relief employment schemes in Maharashtra and Andhra Pradesh states of India, along with relatively greater access of women to production activities made their inhabitants, particularly widows, less vulnerable to risks from natural disasters (e.g., flood and drought)--and, consequently, less dependent on children as risk insurance than the villagers in Bangladesh.

The population in the Karnataka villages mentioned above (Caldwell et al., 1985:33) is deeply conscious of the risk from periodic drought-induced disasters in agricultural production. An important security strategy has been to seek, for some of the family, local off-farm employment or full-time urban occupations which require some educational skills. The increase in local school facilities has helped in acquiring such skills. The strategy for some other families has been to marry daughters to men with such jobs, and this is rendered more likely if the daughters themselves have received some schooling.

3.1.3 Economic Costs of Children

As direct and indirect costs of children increase as a consequence of modernization, fertility is likely to decline. The financial burden of direct costs (e.g., education, food and clothing) of children is commonly cited by respondents in less developed countries when they are asked about their resons for not wanting any more children or for limiting their family size (Arnold et al., 1975). Caldwell and Ruzicka (1978) cite the increasing cost of education of children as the primary factor in the rapid decline of fertility in Australia during the last quarter of the 19th century. Among all types of direct costs of children to their parents, the greatest increase associated with industrialization in western countries may have been on educational expenditure (Espenshade, 1977; Minge-Kalman, 1977). In urban India the increasing aspiration of middle class parents for education of their children in private schools and colleges and rapidly rising costs in these institutions relative to their income are primary reasons for their motivation towards small families.

Mueller (1972) has distinguished three types of opportunity costs of children: (1) certain consumption expenditures foregone in order to be able to afford children; (2) reduction of ability to save and consequent reduction of opportunities to make investments (e.g., in children's education, farm operations); (3) foregone opportunities by (usually) the wife to earn income. The relative importance of the three kinds of opportunity costs is likely to vary according to the level of economic development. Large segments of the population in many less developed countries do not perceive any of the three opportunity costs as high enough to affect their family size desire because either the "opportunities" are not very relevant to them or are beyond their reach for reasons (social and economic) other than demographic.

3.1.4 Infant and Child Mortality

The mortality level of a society is known to be related to its fertility level and generally declines as the society is modernized. A World Bank study (King et al., 1974) shows that out of 21 socioeconomic and family planning input variables, the mortality rate can explain more than anything else the variation in the birth rates of Indian states. There is also evidence that insofar as decline in fertility is concerned, reduction of infant and child mortality is more pertinent than other components of mortality. In a cross-national regression analysis, Heer (1966) found infant mortality to be one of the strongest and most consistent predictors of fertility level. A state-level analysis found a positive association between the 1978 infant mortality rate and the 1981 birth rate. There is a potential for two-way causation because infant mortality also increases with parity.

This analysis, however, has shown that infant mortality has an independent effect upon fertility (Jain, 1985).

At the individual level, the reduction in infant and child mortality can cause a decline in fertility mainly in two possible ways: (1) when the parents become reasonably assured of the survival of their children (there is a time lag between actual and perceived reduction of infant and child mortality), they are more likely to adopt the small family norm and use contraceptives; (2) the increased survival of children prolongs the period of breastfeeding, thereby reducing the probability of postpartum conception (see, for example, Potter et al., 1965, for the effect of child survival on lactation and postpartum amenorrhea in eleven Punjab villages). Infant and child mortality has been considered a demand factor rather than a fecundity factor on the assumption that the former may be more important in reducing fertility in most contemporary less developed countries. This effect of infant mortality on fertility operates through increased use of contraception (Jain, 1985). Using data from the survey conducted by the Operations Research Group in 1970, Jejeebhoy (1984) has shown that in ten states in India, infant and child mortality among users of contraceptive methods was much lower than among nonusers. It should be remembered, however, that all couples are not motivated to replace a deceased infant or child with another birth (Preston, 1975; Heer, 1983).

Although the mechanisms that link education and mortality are not well known, recent evidence from several less developed countries suggests that maternal education plays a major role in determining the level of infant and child mortality (Caldwell, 1979; D'Souza and Bhuiya, 1982; Preston, 1980). A study of state-level variation of infant mortality rate in India

shows that the female literacy rate along with high family planning program inputs is the most powerful variable in explaining the variation (Roy et al., 1979). Ruzicka and Kanitkar (1972) found education to be one of the most important factors in determining the infant mortality rates in Greater Bombay and Lucknow. The 1979 survey showed that at the all-India level, the infant mortality rate among rural women without education was 145 deaths per 1000 births in comparison to 71 among rural women with at least a primary school education. This type of differential persisted in almost all states (India, RG, 1983). In the Karnataka villages studied by Caldwell et al. (1982), the largest differentials in the infant mortality rate were by mother's education, with a level of 130 per thousand where the mother had not been to school, 80 where she had only primary schooling, and 70 where she had some secondary schooling.

One important mechanism through which education of women affects infant and child mortality is greater awareness among educated women of the need to use modern health facilities and, consequently, higher utilization of the facilities by them than by noneducated women. A multivariate analysis of the 1979 state-level data have shown that adult female literacy affects infant mortality because of better utilization of preventive medical care (Jain, 1984). A comparative study of mortality in Kerala and West Bengal states of India shows that one primary reason for lower mortality in Kerala is the higher utilization of health facilities by Kerala women, among whom the literacy rate is far higher than among women in West Bengal (Nag, 1981). Other mechanisms through which female education affects infant and child mortality include raising their status in the household and generation of modern attitudes regarding health, disease, nutrition, personal hygiene, and sanitation.

3.2 Costs of Using Contraception

If the demand for children is very high in a society, that is, if couples want a family size as large as possible, they are not likely to use any contraception. The reverse, however, is not necessarily true. Even when couples want small families and spacing of births, they do not always use contraception. The reasons for such nonuse are usually designated as costs of using contraception. If the costs are weighted by couples as too high compared to the benefits of a small family size or adequate birth spacing, they are likely to end up with what is known in demographic literature as "unwanted children." A review of the literature suggests four broad categories of the costs of contraception: (1) physical/health; (2) psychic; (3) social opinion; and (4) economic (Nag, 1985).

3.2.1 Physical/Health Costs

All modern contraceptive methods involve some cost to their users in the form of minor side effects bearing on physiological function. Some methods are known to have potentially serious or long-term adverse health consequences. The disruption of the menstrual cycle is a widely reported response to the use of certain contraceptives by women. In India, such disruption significantly contributed to the nonuse of intrauterine devices during the late 1960s and early 1970s. In the developed countries, side effects, which are known to have no health implications or only minor and temporary implications, do not appear in themselves to be important determinants of contraceptive use. By contrast, the use of contraceptive methods in less developed countries is determined more by their side effects

than by their potentially serious and long-term health hazards. One important reason for this difference is that couples in less developed countries are less educated and less informed about the possible side effects of contraceptive methods. Progress in education, particularly of women, can increase the use of contraception by reducing unrealistic fears not only of the side effects of contraceptives but also of the beliefs about potential health hazards based on ethnic concepts of anatomy and physiology that are scientifically invalid.

3.2.2 Psychic Costs

The available literature suggests the following categories of psychic constraints on the use of contraception: (i) sacrifice of sexual pleasure in practicing coitus-related methods (rhythm, withdrawal and barrier contraceptives); (ii) violation of sexual modesty and human dignity (e.g., arising out of lack of privacy and examination of women by male physicians, digital manipulation of genitals in using barrier methods); (iii) conflict with religious belief of one or both partners (existing, for example, more among Roman Catholics than among Protestants). Categories (i) and (ii) of psychic costs are not likely to be affected by education, but there is some evidence that education affects negatively the conflict with religious belief and thus increases the use of contraception. The magnitude of difference in contraceptive use between educated Catholics and non-Catholics is generally less than between uneducated Catholics and non-Catholics. In Kerala the use of contraception is higher among both the Syrian Christian and Latin Christian than among Hindu caste groups and the Muslim (Zachariah, 1984:185): one reason is the higher educational level of the Christian group.

3.2.3 Social Opinion Costs

When one partner of a couple is in favor of using contraception and the other is not, or when a couple is in favor of using contraception but some members of its social influence group are not, the actual use of contraception involves the cost of challenging the spouse or the social influence group. Fertility and contraceptive surveys have indicated that this is not a negligible reason for nonuse of contraception. It is quite likely that an educated spouse or couple can face the challenge more successfully than the uneducated, but no empirical data on the topic are available.

3.2.4 Economic Costs

Economic constraints on the use of contraception have two primary dimensions: (i) costs of the contraceptive method (if the method chosen needs to be purchased) and costs of method-related services, if necessary; and (ii) costs of gaining access to the method and services. When the sources of family planning are mostly in the public sector or managed by voluntary agencies, as in India, most of the economic costs are borne by government or voluntary agencies. The impact on use of condoms of a substantial reduction in its price through the Nirodh Marketing Program in India has been clearly demonstrated (Jain, 1973). Even in such situations, however, individuals or couples have to incur some costs of their own in gaining access to contraceptive supplies and services. Besides travel and opportunity costs, the dimensions of accessibility include knowledge about sources and methods (Chayovan et al., 1984). Since educated persons are expected to be more

knowledgeable than uneducated persons, their cost for gaining access is likely to be less and hence the probability of their using contraception higher.

3.3 Use of Contraception

The foregoing two sections give a picture of how and to what extent education affects the use of contraception through the demand for children and costs of contraception variables. In summary, education decreases the demand for children by reducing the labor value, old-age security value and risk-insurance value of children as well as by reducing infant and child mortality and by enhancing the direct and indirect costs of children. Decrease in the demand for children through these processes increases the use of contraception. Out of four categories of costs of contraception, the only one which is significantly affected by education is the physical/health costs. Education increases the use of contraception by reducing physical/health costs. Thus the net effect of education on the use of contraception through both demand for children and costs of contraception variables should be negative. Also, the relationship between education and demand for children on the one hand and between education and use of contraception on the other should be both linear. The empirical data collected in a national sample survey conducted by the Operations Research Group in 1970 (presented in Table 2) corroborate these relationships (Sarma and Jain, 1974).

In Table 2, the "mean ideal number of children" and the "living plus mean additional desired number of sons" reflect the demand for children, as expressed by currently married women. In both of these measures, the

Table 2. Ideal and desired number of children and proportion using contraception among married women 20-39 years by level of education, India, 1970

	Illiterate	Primary	Secondary	College	Total
Mean ideal number of children	3.8	3.5	3.2	2.7	3.7
Living plus mean additional desired number of sons	2.3	2.2	2.0	1.4	2.2
Percent currently using contraception including sterilization	7.8	19.4	34.1	53.9	12.2

Source: Sarma and Jain (1974).

demand decreases, as expected, monotonically as the level of education increases, in contrast with the ambiguity observed in the relationship between education and fertility. The percentage of women using contraception also increases monotonically, as expected, with the increase in the level of education. The differences in this respect are much sharper than in the demand for children. Only 7.8 percent of illiterate women were using contraception compared to 19.4 percent among primary-, 34.1 percent among secondary-, and 53.9 percent among college-educated women. A similar relationship between educational level and use of contraception has been

found in another survey conducted by the Operations Research Group in 1980 (Khan and Prasad, 1983). In the 1980 survey conducted in Kerala, the use of contraception was found to increase with female education; 31.2 percent of currently married women with no schooling were using contraception (25.2 sterilization and 6.0 conventional methods) in comparison to 53.1, 55.0 and 59.8 percent of women with 1-4, 5-9, and 10+ years of schooling (Zachariah, 1984:153). At the state level, the use of contraception has been shown to increase with an increase in the extent of adult female literacy; the correlation coefficient between the two was found to be 0.63 (Jain, 1985).

3.3 Fecundity

Out of the seven fecundity variables which are shown to affect fertility directly in Figure 1, the following three are noteworthy in terms of their effect on fertility and the effect of education on them: breastfeeding, voluntary sexual abstinence and widowhood.

3.3.1 Breastfeeding

A number of recent investigations have confirmed that prolonged and frequent breastfeeding reduces the chances of pregnancy by delaying the return of menstruation as well as the return of ovulation in women after childbirth. The data for developing countries from the World Fertility Survey have indicated a negative relationship between the duration of breastfeeding and fertility (Jain and Bongaarts, 1981). At least up to 1974, the contraceptive protection provided by breastfeeding in less developed countries is estimated to have been greater than that achieved through family planning programs (Rosa, 1975). Hence a decline in the practice of

breastfeeding can increase fertility, if it is not controlled by other means (Nag, 1980). Based on an analysis of Taiwanese data, Jain et al. (1970:269) estimated that in a high fertility society where lactation is virtually universal "the prevalence of lactation may prevent as many as 20 percent of the births that would occur if there were no lactation."

A number of recent surveys in less developed countries, including the World Fertility Survey, have indicated a negative relationship between education and breastfeeding even after controlling income and other variables (Jain and Bongaarts, 1981; Butz and DaVanzo, 1981). In a recent WHO survey of middle-income women in an urban area of India, 72 percent of secondary-educated women were breastfeeding their children at 6-8 months compared to 90 percent of primary-educated women (WHO, 1979). A more recent survey in India showed that infants of 68 percent of educated mothers in the Bombay metropolitan area, 32 percent in the Calcutta area and 44 percent in the Madras area were being exclusively breastfed until they were three months old as against 80 percent, 57 percent and 61 percent in the corresponding poorly educated groups (Gopujkar et al., 1984). Specific mechanisms by which education affects breastfeeding remain a subject requiring further study.

3.3.2 Voluntary Sexual Abstinence

Voluntary sexual abstinence—particularly the prolonged period of abstinence by women after childbirth—has traditionally served as a fertility control mechanism in many nonindustrial societies (Nag, 1962). However, education has caused a decline in the practice of sexual abstinence in India and elsewhere through changes in family structure, social customs and attitude toward sex. Such a decline, however, is not expected to cause any

significant increase in fecundity, and hence in fertility, of Indian women, since the actual average period of postpartum abstinence in most sections of the Indian population was perhaps at no time longer than that of breastfeeding.

3.3.3 Widowhood

By analyzing Indian census data from 1901 to 1941, Davis (1951) concluded that the custom of nonremarriage of widows among Hindus was the main reason their fertility had been consistently lower than that of Muslims. Processes of modernization, including education, have generally led to a decline in the proportion of widows in India. In the decade 1931-41, Indian women on the average lost 8.0 years of fertile union because of the incidence of widowhood; this was 23.0 percent of the total mean length of fertile unions. By 1951-61, their loss had been reduced to an average of 1.9 years or 5.5 percent of the mean duration (Agarwala, 1968). The incidence of widowhood has historically been high in India; but evidence that it is declining is provided by the intercensal increases in the proportion of women currently married at ages above 25 years. For example, the proportion of women currently married in the 45-49 age group increased from 64 percent in 1951 to 78 percent in 1971 (Jain and Adlakha, 1982:593). The decline in widowhood in India has occurred as a result of two different processes. First, the gradual improvement in income, education and other processes of modernization has increased the longevity of men, thus delaying widowhood of women. Second, the gradual relaxation of the ban on widow remarriage (particularly among upper-caste Hindus)--an outcome of educational progress and other social changes--has led to an increasing number of widows being remarried.

3.4 Age at Marriage

There is a consensus that fertility decline in Western countries, and in those less developed countries that have experienced considerable decline during recent decades, is generally associated with an increase in age at marriage and proportions never-married. The most important reason for the association is that later marriage reduces the total duration of fecund exposure to sexual activity and shifts it to the older ages of lower fecundity. Other reasons include the demographic reality that when marriage is later, a greater fraction of each cohort will not survive to marry (Smith, 1983).

A review of studies done in India generally confirms the negative association between age at marriage and fertility (Sharma and Misra, 1978). In the Mysore Population Study conducted in the early 1950s it was found that women who married between age 14 and 17 gave birth to 5.9 children on the average, while the corresponding average for those marrying between age 18 and 21 was 4.7 (United Nations, 1961:83-86). Roughly 31 percent of the fertility decline in Kerala during 1965-80 (from a total fertility rate of 5.9 in 1965-70 to 3.7 in 1975-80) is estimated to be due to decline in the proportion married (Zachariah, 1984). Agarwala estimated in the mid-1960s that if the proportion of currently married women in all-India would change to that obtaining in Kerala, corresponding to the marriage age of 19 to 20 years, the reduction in the birth rate would be on the order of 29 percent, but research done by other investigators has shown that he overestimated the reduction (Talwar, 1967; Basavarajappa and Belvalgidad, 1967). At the state level, female age at marriage has been shown to have a negative influence on

the birth rate independent of the effects of other factors (Jain, 1985).

The effect of age at marriage on fertility is evident from the comparisons shown in Table 3, of the total marital fertility rate and total fertility rate by educational level, as estimated from the 1978 sample survey data collected by the Office of the Registrar General of India. The total fertility rate (total number of children born per woman throughout her reproductive period) is considerably lower than the total marital fertility rate for each educational level. The difference is attributable to the effect of age at marriage and of nonmarriage on fertility, since for the calculation of the total marital fertility rate nonmarried women of reproductive age are excluded.

Table 3. Estimated total marital fertility rates and total fertility rates per woman (1978) in rural India

Level of Education	Total Marital Fertility Rate	Total Fertility Rate
Illiterate	5.5	4.7
Literate	5.0	3.9
Primary	4.9	3.6
Matric and above*	4.7	2.5
All women	5.4	4.6

Source: India, RG (1982:4:7).

*Includes those who have passed matriculation examination (after Grade X) and/or those who have been enrolled in higher-level institutions.

In less developed countries the average age at marriage tends to increase with education, employment of women and urbanization. These are the processes which affect the role of women, familial relationships, kinship structure and religious beliefs in ways favorable toward delayed marriage. Education of women is perhaps the most important factor in this respect. The average age at marriage of women generally is found to be higher in societies with a higher proportion of literate teen-age girls (Dixon, 1971, 1973).

Several surveys in India have confirmed that educated girls tend to be married at a later average age, some of them late enough to have fewer children. For example, the 1961-62 National Sample Survey data show that among couples living in urban areas, the average age at marriage of illiterate wives was 16 years while that of college graduates was 22 years (India, CS, 1970:7). In a 1980 survey conducted in three districts of Kerala, which ranks highest among Indian states in both literacy rate and age at marriage, it was found that average ages at marriage were 17.5, 18.3, 19.1 and 21.8, respectively, for women with no schooling, educated for 1-4 years, 5-9 years and 10+ years. This study also showed that the effect of education on age at marriage has decreased over time because of an increase in age at marriage among women with no education. Perhaps, with a trend towards later marriage in Kerala, women with no education have also started to assimilate the behavior of the educated women. The standardization for year of marriage did not remove all differences; the standardized averages showed a difference of 0.6 years between women with no schooling and those eduated for 5-9 years (18.1 vs. 18.7 years; Zachariah, 1984:152). At the state level, average age at marriage has been shown to increase with an increase in adult female literacy; the correlation coefficient between the two was found to be

0.81 (Jain, 1985). Schooling may be a direct cause for delayed marriage in that girls are not usually married while they are still attending school or college. But it is quite likely that the difficulty of finding appropriately qualified grooms for educated girls, dependence of parents on educated girls who are employed, higher demands for dowry and a modern attitude among girls who are educated and also among parents who want their children to be educated are important reasons for the delayed marriage of educated girls.

IV. Primary versus Higher Education

The discussion above of all the intervening variables between education and fertility shows that female education reduces fertility by decreasing the demand for children and also by decreasing the costs of contraception, associated particularly with the side effects of modern contraceptive methods. Changes in both the demand and costs of contraception variables increase the use of contraception, thereby reducing fertility. Female education also decreases fertility by raising the age at marriage. Education increases fertility only by diminishing the fertility-inhibiting effect of two fecundity variables, namely, duration of breastfeeding and extent of widowhood. If all three of these effects are taken into consideration, the net effect of female education, in theory, at any particular point of time, can be positive, negative or zero. In India, empirical evidence shows that the net effect is mostly negative because female education decreases desired family size, and monotonically increases female age at marriage and use of contraception. Thus in most cases, the positive effect of female education on actual fertility that operates through fecundity factors, especially breastfeeding, is compensated by the negative

effects that operate through the use of contraception and age at marriage. In a few cases, however, especially when the negative effect of age at marriage is not taken into account, the marital fertility of women with some schooling is found to be higher than that of women who have no schooling or who have completed primary school education. How should this lack of consistency be interpreted? Does it follow that for the purpose of fertility reduction, the educational policy in India should give priority to higher education? These issues are considered next.

4.1 Individual's Perspective

From the individual's perspective, a small amount of education may indeed lead to somewhat higher marital fertility, at least in the short run. As argued elsewhere (Jain, 1981a), this increase does not necessarily reflect the pronatalist effect of education per se. First, there is no theoretical justification for expecting that a small amount of education will increase the demand for children. Second, marital fertility does not incorporate the negative effect of advancement in age at marriage on fertility. Once this is done, as shown in Table 3, the total fertility rate even in rural areas at the all-India level in 1978 was found to decrease monotonically with increase in female education. Similar state-level data also show that the total fertility rate decreases with education in both the rural and urban areas of each state except Orissa (India, R.G., 1982). Third, it is possible that the apparent pronatalist effect of education up to a level less than primary reflects the time lag involved in the shift from traditional behavior such as breastfeeding to more modern behavior such as the use of contraception to regulate fertility. This time lag between the two may not reflect the effect

of education per se but may simply be due to the unavailability of contraceptive methods. From the individual's perspective, therefore, schooling is likely to decrease fertility. The magnitude of this decrease is likely to increase with the level of education completed. Any increase in marital fertility is likely to be a short-term phenomenon.

4.2 Implications for Educational Policies

The picture becomes clearer when we consider the implications for the educational policies which focus on the aggregate (group) level rather than the individual level. Here the basic issue is whether the educational policies should be intended to improve middle and secondary level education or to expand broad-based primary level education? We assert that for the purpose of fertility reduction, the educational policies in India should give highest priority to expanding and improving the broad-based primary level education. This seemingly anomalous situation between individual and aggregate-level effects can be clarified by considering a cohort of women (all those born during a specified period) whose average fertility is determined by their education-specific fertility behavior and their composition (distribution) with respect to different education categories.

In simple arithmetic formulation:

$$\text{Average fertility} = \frac{\sum N_i F_i}{\sum N_i} = \sum W_i F_i$$

Where N_i = Number of women with educational level of completed grade i.

W_i = Proportion of women with educational level of completed grade i.

F_i = Fertility level of women with educational level of completed grade i.

Estimates of W_i and F_i are required to estimate the average fertility of a group of women. It can be easily seen that, with the same values of F_i, the average fertility of a cohort of women will depend upon their educational distribution, i.e., the values of W_i. The policies and programs of the education sector can influence average fertility by changing the educational structure of a society. The effect of instructions would be reflected by differences in fertility levels among women with different levels of education, i.e., between education-specific fertility levels (F_i). On the other hand, the effect of low admissions to schools, and the effect of high wastage (repetition and drop-out rates) will be reflected through the proportion of women completing primary or secondary school level education (W_i).

The estimates of W_i can be obtained by using a projection model based on the rate of admission to the school system, the probability of repeating a grade, and the probability of dropping out of a grade (see Jain, 1981b, for the details of this projection model). A number of assumptions can be made concerning the improvements in the school system through changes in the three primary determinants of educational achievement: the rates of admission, repetition, and drop-out. It is quite likely that changes in these determinants are compensatory and, therefore, changes in one might induce compensating changes in other determinants without increasing the educational attainment. For example, a decision to rapidly expand primary

school systems by opening new schools could increase admissions in schools. At the same time, this rapid expansion might also increase repetition and drop-out rates if pupils with varying degrees of motivation and ability to learn are admitted into the school system without adequate preparation and training of the staff in dealing with a very diverse group. Consequently, the education attainment of children entering the school system may not increase as rapidly as would be expected on the basis of an increase in the admission rate alone. Similarly, changes in promotion and repetition criteria would not only affect repetition rates but might also affect drop-out rates.

Another dimension through which the school system can increase the proportion of children completing a particular level of education is to decide whether to improve the repetition and drop-out rates up to primary or beyond the primary level of schooling. Out of numerous combinations of improvements in the rates of admission and grade-specific rates of repetition and drop-out, Jain (1982) selected about 22 alternatives including status quo or no change in any of the three parameters and compared their potential direct effects on educational attainment, implied workload and costs, and their indirect effects on the average family size.

In order to illustrate the effect of the curvilinear relationship between education and marital fertility on average fertility, Jain (1982) used the 1972 education-specific marital fertility rates for rural and urban areas of India shown in Table 1. It may be recalled that in rural areas, the 1972 marital fertility rate showed a curvilinear relationship with education: 6.9 children for illiterate, 7.1 for literate, and 5.0 for women with at least matric-level education. If all women in a cohort complete at least

high school education, their average marital fertility would be 5.0 and 4.5, depending upon rural or urban marital fertility schedules observed in 1972. In comparison, if this cohort of women is exposed to the current conditions of the educational system, its average marital fertility would be 6.73 and 5.83, respectively. This implies that the maximum decline in average marital fertility attributable to improvements in education attainments would be about 23 percent. The following points briefly summarize the results of comparing the 22 alternatives in terms of their potential impact upon marital fertility.

1. In comparison to "no change," any improvement in the current system of education would decrease marital fertility of the entire cohort. It is important to note that the marital fertility is expected to decline even in rural areas, where the relationship between education and marital fertility was observed to be curvilinear.

2. Improvements in all three parameters are more likely to produce higher decline in marital fertility than improvements in any two of the three, which in turn is likely to produce a higher decline than the improvement in any one of the three parameters. If, however, a choice has to be made, priority should be assigned in decreasing order to decreasing drop-out rates, decreasing repetition rates, and increasing admission rates.

3. Improvements, in terms of decrease in repetition and drop-out rates, at all grades, would produce a decline in marital fertility. But, if a choice has to be made between improvements up to grade 4 and similar improvements beyond grade 5, the former appears to be a superior approach. For example, fifty percent reduction in drop-out rates with or without automatic promotion up to grade 4 is likely to produce a higher decline in

marital fertility in comparison to similar improvements beyond grade 5.

These comparisons illustrate that, although women with little education may have higher marital fertility than illiterates, concentrating efforts to improve the situation at the lower level is likely to be a better strategy than neglecting the situation at the lower level and concentrating efforts to improve it beyond the primary level. This makes sense because women who do not complete primary education are different from those who do complete it. The implication of the curvilinear relationship between education and fertility at the individual level for educational policies, therefore, is to reduce the number and proportion of women who drop out of primary school and to increase the proportion of women who complete primary-level education.

V. Government Policies on Education and Their Effects

It is clear from the above discussion that primary education, particularly of women, deserves the highest priority among all the educational sectors, if fertility reduction is considered a worthwhile objective for national welfare. The framers of the Constitution of India did not, however, consider fertility reduction when they thought it desirable to provide free and compulsory education for all children up to the age of 14 years by 1960; there were many other worthy reasons. It is only in the Sixth Five-Year Plan (India, Planning Commission, 1981:375) that the role of education, especially female education, in reducing fertility was recognized. The recommendation that followed from this recognition did not, however, include an emphasis on primary education, but on increasing the enrollment in the high schools. The specific focus was on education in health and

reproductive biology rather than the broader objective of education in increasing the awareness and widening the outlook of students.

All the Five-Year Plans of the central and state governments, however, stressed the importance of making primary education universal as early as possible. In all of them, targets set up for the end of the Plan period were higher than the percentages of enrollments actually achieved by that time. Although the absolute numbers of boys and girls enrolled increased substantially every year, the rapid rise of the population in the 6-11 age group did not allow a corresponding increase in the percentage figures. Table 4 shows the actual increase in the primary school enrollment percentages of boys and girls in India as a whole from 1950-51 to 1979-80 and also the variation among four selected states in 1979-80.

Enrollment percentages are conventionally used to indicate progress of education, but they do not indicate the level of educational attainment because of a high wastage rate in the education system. The percentages shown in Table 4 are also overestimated because the numerator includes children who are outside the age group included in the denominator. Thus children of more than 11 years of age enrolled in primary school are included in the numerator but not in the denominator of the enrollment percentages. These percentages indicate a gradual increase in the enrollment percentages of both boys and girls in the primary schools from 1950-51 to 1979-80. The rate of increase in the enrollment of girls is slightly higher than that of boys, but since the girls' enrollment ratio (25 percent) was considerably lower than boys' enrollment ratio (60 percent) in 1951, it remained far behind (66 percent) the boys' in 1979-80 when the latter achieved virtually universal enrollment. Obviously, efforts to increase the

enrollment of girls in primary schools have to be strengthened substantially to achieve the target of universal primary education among them.

Table 4. Enrollment of boys and girls in primary schools (Grades I-V) in India, as percentages of the population in the age group of 6-11 years*: 1950-51 to 1979-80

	Boys	Girls	Total
1950-51	60	25	43
1960-61	83	41	62
1968-69	93	57	76
1979-80	100	66	84
	1979-80		
Kerala	103*	102*	103*
Rajasthan	88	30	60
West Bengal	104*	70	87
Uttar Pradesh	91	45	69

Sources: India, Planning Commission, 1973:194 for 1950-51, 1960-61, 1968-69; India, Planning Commission, 1981:362-366 for 1979-80.

*The percentage figures are above 100 since some students enrolled in Grades I-V are likely to be in ages other than 6 to 11 years. In official documents, 11-year-old children are included in the numerator for calculating enrollment ratios in primary as well as middle classes. Presumably, these children are included only once in the enrollment ratios of middle classes.

Large variations still exist in the state-level enrollment in primary schools. For example, while Kerala has reached universal enrollment

for boys and girls, Rajasthan is still far behind with 88 percent for boys and 30 percent for girls in 1979-80. In most of the states, the enrollment percentage of girls is still much lower than that of boys. States in which the girls' enrollment in primary schools is still less than 50 percent need special strategies to expedite progress.

The enrollment ratios in middle schools (V-VIII, ages 11-14) are far lower than in primary school. At the all-India level the percentages for boys and girls were 52 and 21 respectively in 1979-80. The percentage for boys and girls combined in 1979-80 was 40, demonstrating progress since 1950-51 when it was only 13. The progress, however, is much slower than what was expected by the framers of the Constitution when they envisaged universal elementary education (primary plus middle) for all children in India by 1960.

Table 4 shows that the enrollment proportion of girls in relation to that of boys in primary schools has always been lower, but in view of almost all the Five-Year Plans' declared emphasis on girls' education, it is worthwhile to examine the trend, if any, in the proportion during the last three decades. The relevant data for four selected years in India as a whole and for selected states in 1977-78 are presented in Table 5.

It is clear from Table 5 that there is an increasing trend in the female/male enrollment percentage in India during the last three decades for both primary (I - V) and secondary (VI - XI/XII) educational sectors, but the female enrollment ratio in relation to the male is still quite low. At the all-India level, in 1977-78 (latest year for which figures are available), the female enrollment in proportion to the male was only a little higher than one-third for the primary sector and a little lower than one-third for the secondary sector. Another disturbing fact is that although there were

significant increases in the female-male ratio in both primary and secondary sectors during the 1950s and the 1960s, the rate of increase seems to have slowed down in the 1970s, even though the policy and program documents of both the central and state governments have been stressing the priority of female education more strongly in the 1970s than in the previous decades. The deceleration of female enrollment in relation to male during the 1970s needs urgent investigation and action for improvement.

Table 5. Trends in female/male enrollment ratios in primary (I - V) and secondary (VI - XI/XII) schools: 1950-51 to 1977-78

	Primary	Secondary
1950-51	28	19
1960-61	33	23
1970-71	37	28
1977-78	38	31
	1977-78	
Kerala	48	47
Rajasthan	24	19
West Bengal	39	38
Uttar Pradesh	31	19

Sources: India, CSO, 1982:514.

The total expenditure on education has increased considerably during the last three decades: from Rs. 911 million in 1950-51 to Rs. 21,843 million in 1976-77. One way of assessing the priority actually given to different sectors of education is to examine the proportion of the educational expenditure that is actually spent in the specific sectors. Table 6 provides some relevant data.

Table 6. Percentages of direct expenditures on different levels of education in four selected years between 1950-51 and 1976-77

	Total direct expenditures (in millions of Rs.)	Primary school (I-V)	Middle school (VI-VIII)	High school (IX-XI/XII)	College/ University	Other
1950-51	911	40	8	25	18	9
1960-61	2,574	29	17	27	20	7
1970-71	9,611	24	18	28	27	3
1976-77	21,843	25	19	28	26	2
			1976-77			
Kerala	1,635	27	22	31	18	2
Rajasthan	963	28	24	24	22	2
West Bengal	1,459	34	5	34	24	3
Uttar Pradesh	2,627	28	10	33	26	3

Source: India, CSO, 1982:517-18.

The following statement was made in the Third Five-Year Plan covering 1961-66:

> "The constitution envisaged the provision of free, universal and compulsory education for children up to the age of 14 years. In view of the magnitude of the task, it was agreed early in the Second Plan that as a first step facilities should be created for the education of all children in the age group 6-11. This is one of the central aims of the Third Plan, to be followed by extension of education of the entire age group 11-14 during the Fourth and Fifth Plans."—India, Planning Commission, 1961:578

The expenditure figures in Table 6 indicate, however, that the primary sector of education actually received the least priority in terms of budget allocation during the 1960s, despite the Third Plan's (1961-66) avowed declaration that the creation of all facilities for the primary sectors is one of its central aims. Contrary to all good intentions to increase the priority of primary education, the proportion of expenditures on this sector came down significantly during both the 1950s and the 1960s (from 40 percent in 1950-51 to 24 percent in 1970-71) and the proportion on college/university sectors increased considerably during the same period (from 18 percent in 1950-51 to 27 percent in 1970-71). It is all the more disconcerting because the average annual cost per student in India rises quite sharply from one level of education to another. For example, the average annual cost per student in 1974-75 was Rs. 83 at the primary level and Rs. 508 at the general college level (India, Ministry of Education, 1978). Table 6 indicates some stabilization during the 1970s of the proportion spent on different levels of education in India. The proportions spent on primary and middle levels should, however, increase considerably in addition to other necessary changes, if the priorities set forth in the Five-Year Plans are to be met.

VI. Suggested Modifications in Educational Policies for Fertility Reduction in India

Since the fertility behavior of women has been shown to be influenced negatively by their level of education, it is important to incorporate this potential effect into educational sector policies and programs in India. Two basic questions are: (1) is investment in education the most cost-effective way to reduce fertility in India and (2) can the fertility effect of investment in education be enhanced? The answer to the first question is no, but the answer to the second question is yes—a disproportionately higher investment in female primary education with special attention to decreasing wastage (the rates of repetition and drop-out) from primary schools would enhance the education attainment of a cohort of females entering the school system in a given year. This in turn would reduce the average fertility of this cohort when they pass through their childbearing period. The arguments in support of these conclusions are briefly summarized in the following paragraphs (Jain, 1982).

6.1 Is investment in education the most cost-effective way to reduce fertility in India?

The answer to this question requires comparison of relative fertility effects of public investments among such sectors as agriculture and irrigation, education, health, and family planning. These comparisons are not always meaningful because of differences between the primary objectives of each of the specific activities. Moreover, except for the family planning program, the fertility effects of policies and programs in other sectors of development are indirect and involve varying lengths of time between the initiation of a program and the realization of its fertility impact.

From a limited time perspective--for example, during the next decade--the investment in education, perhaps, is not the most cost-effective way to reduce fertility in India. A significant reduction in fertility within the next decade in India cannot be achieved without a significant reduction in fertility of women who are already in the reproductive age groups or who would begin their reproduction shortly. Educational policies cannot change the educational achievement of such women except through adult education. Very little is known about the impact of adult education programs on improvement in educational achievements of adults and on their subsequent fertility. Advancement in female education, therefore, cannot be used as a primary means to decrease fertility during the next decade.

6.2 Can the fertility effect of investment in education be enhanced?

The answer to this question is yes. The effect of investment in education on fertility can be enhanced by substantially increasing the proportions of educational resources spent on primary school education and by sharing the cost of education beyond the secondary level increasingly with parents and students. These two points are further elaborated below.

6.2.1 Allocation of Resources

As mentioned above, the sixth Five-Year Plan for the first time recognized the role of female education for fertility reduction but stressed increasing the enrollment in high schools rather than primary and middle schools. This type of emphasis on narrow-based secondary school education is based on the importance of introducing reproductive biology in the curriculum. Additional support for this emphasis can be based on the consideration of the individual-level relationship between education and fertility rates, which shows a sharper drop in marital fertility of women

with at least a high school education. The emphasis on secondary school education, however, does not consider the effect of educational composition of women on the average fertility of the entire group. Once this effect is taken into consideration, an emphasis on improvements in the education system at the lower levels of education turns out to be more effective than an emphasis on improvements at the high level of education only. A disproportionately higher investment in primary education with special attention to decreasing the rates of repetition and drop-out from primary schools, would reduce the average fertility of a cohort of female children when they enter their childbearing period in about ten years.

The average fertility of a cohort of women is the weighted average of education-specific fertility levels--with weights being the number of women in different educational categories. Changes in educational policies can alter the education distribution of females and thus reduce the average fertility of the entire cohort.

Female children who would be entering their childbearing period around 1995 have already been born and will be eligible to enter the school system around 1985. Thus, changes in the education system must be introduced now; otherwise the realization of their effects on fertility levels is likely to be delayed beyond 1995.

Given the high wastage in the school system, a reduction in repetition or drop-out rates at all grades is likely to be more cost-effective than reduction in these rates at selected grades. However, if a choice has to be made between 50 percent reduction in drop-out rates and automatic promotion up to grade 4 and similar improvement beyond grade 5, the former appears to be superior to the latter approach in terms of the average

number of school years per graduate, the average cost per graduate, and the anticipated fertility decline. For example, 50 percent reduction in drop-out rates and automatic promotion up to grade 4 would reduce the average cost per pupil completing primary school education by 42 percent and the average cost per pupil completing middle school education by 36 percent. In comparison, 50 percent reduction in drop-out rates and automatic promotion beyond grade 5 would not reduce the average cost per pupil completing primary school education and would reduce the average cost per pupil completing the middle school education by only 22 percent. Thus, the former approach is more cost-effective even in terms of reducing the average cost per pupil completing middle school. In addition, the former approach, by keeping an examination at the end of grade 5 (primary school), also has a built-in safeguard against lowering of the education standards of the primary school graduates.

Obviously, a larger proportion of pupils going through primary schools would require more resources to be allocated to primary school education. This can be done through reallocation of resources within the education system and by allocating a much higher share of additional new resources to primary school education. Reallocation within the education sector is likely to vary between states because 90 percent of the resources allocated to education are met from states' own resources. Reallocation within the education sector could be difficult because 85 percent of the direct expenditure represents fixed costs of salaries of teachers and other personnel. Whether or not reallocation within the education sector is feasible, additional resources allocated to education from the central government should be mainly allocated to primary school education. Some of

these resources should be allocated to better understand determinants of admission, repetition, and drop-out rates and to study the effectiveness of specific programs to reduce high magnitudes of repetition and drop-out rates from primary schools. The economic rate of return (social and private) on investment in primary education is estimated to be higher than for secondary education, which in turn is higher than for general tertiary education in India (Heyneman, 1979). A proportionately higher allocation of additional resources for primary education in India would, therefore, make sense in economic terms. This would help the country to move toward the national objective of universal primary education and would have additional benefits to the society in terms of suppressing fertility of future generations.

6.2.2 Sharing the Cost of Higher Education

Will schooling of children during the next decade affect the fertility of their parents? Under the current circumstances this negative feedback is likely to be negligible but the situation can be changed by modifications in sharing the cost of higher education with parents.

The negative feedback effect is substantial only for those parents who want to maximize the welfare of their children rather than their own welfare. Some of these parents may have realized at an early stage of childbearing that there is a trade-off between quality and quantity of children and controlled their fertility in the interest of providing better education to their children. The proportion of such parents is apparently quite low in rural India.

For high-fertility societies such as India, it is usually assumed that a majority of parents maximize their own welfare rather than the welfare of their children. For those parents who do maximize their own

welfare, children's education might nevertheless affect parents' fertility under three conditions: (1) if laws about compulsory education and prohibition of child labor are strictly followed either due to legal pressure or due to social sanctions, (2) if a major part of the total cost of education is met by parents, which would increase the cost of education and thereby the cost of raising children, and (3) if parents realize that the potential return from education would be absorbed not by themselves but by their children.

The first two conditions are not met in India. Laws about compulsory education and against child labor are not and cannot be legally enforced. There are no social sanctions against child labor. Almost all the direct cost of education is met by the government; the education of children, therefore, does not increase the direct-cost side of the equation for parents. On the question of who receives the returns from education, if parents perceive that benefits to themselves from children's education are lower than the corresponding cost, they are unlikely to send their children to school. The outcome in this case is likely to be no education for children rather than education for children and lower fertility for parents. In the alternate case, when parents perceive benefits from children's education to be higher than the related cost, it is unlikely to lower parents' fertility because, from their perspective, more children implies higher benefits. Thus, for those parents who are assumed to maximize their own welfare, children's education is unlikely to lower parents' fertility.

The policies of the education sector, to some extent, can influence the balance between the cost and benefits of children's education to their parents. This is especially important for education beyond the

secondary school level. At present, almost all of the direct cost of education is met from the government's resources. Consequently, pressure to expand higher education has been increasing every year, and so is the budgetary allocation and expenditure. If the actual cost of higher education is distributed among students and their parents, it would reduce pressure for a continuous expansion of higher education and would have a negative feedback effect on fertility of parents and their peer groups. Certain measures, in terms of loans and scholarships for bright students from poor families, would have to be taken so that they do have opportunities for better education.

VII. Concluding Remarks

The existing literature on the relationship between education and fertility is more simplistic than the complexities of the relationship deserve. Often facile conclusions are drawn from statistical correlations between measures of fertility and educational indicators (in some cases, without controlling for other confounding factors, such as income and age), using data of doubtful reliability and without a proper understanding of the cause-effect relationships. This is partly due to the fact that the theories regarding social and biological determinants of fertility were until recently very weak. In this paper we have suggested a conceptual framework regarding the relationship between education and fertility in the light of the latest developments in theories of fertility determinants and then have analyzed the relevant Indian data using this framework.

Our framework includes the following four categories of intervening variables through which and only through which education can affect actual fertility: (1) demand for children, (2) costs of using

contraception, (3) fecundity, and (4) age at marriage. By decreasing the demand for children and decreasing the costs of using contraception, education increases the use of contraception, which, in turn, has a negative effect on fertility. Education also has a negative effect on fertility because it increases the age at marriage. Only through its effect on fecundity variables does education increase fertility. Hence it is not surprising that the net effect of education on marital fertility is sometimes found to be "ambivalent" or "inconsistent."

We have identified in this paper the specific intervening variables under the above four categories which are more relevant than others for India. The analysis of Indian data through our suggested framework, we believe, can explain clearly the apparently ambivalent and inconsistent findings. The following five findings in this paper are, according to us, significant from theoretical and policy standpoints:

1. Female education in India monotonically increases the use of contraception and age at marriage, both of which, in turn, decrease fertility.

2. Under some circumstances, women with some education, particularly if they do not complete primary school education, may have marital fertility that is higher than those who have no schooling, but female education has a negative effect on fertility once the negative effect of age at marriage is also taken into account. Female primary education, in the long run, is expected to influence fertility negatively.

3. The educational policy in India, as far as fertility reduction is concerned and perhaps for other aspects of development as well, should give high priority to increasing female primary education.

4. The Five-Year Plan documents of the central and state governments in India have often emphasized the urgency of making female primary education universal in all states, but the budget allocations of different educational sectors do not always reflect this emphasis. A stronger political commitment is needed to achieve this objective within the period covering the seventh and eighth Five-Year Plans, that is, by 1994.

5. Educational policies can reduce fertility and this effect can be enhanced by allocating disproportionately greater resources to female primary education, emphasizing the reduction of currently prevalent high repetition and drop-out rates from primary schools, and by increasingly sharing the direct cost of education beyond the secondary level with parents rather than by absorbing most of it in the government budgets.

The findings of this paper also lead us to hypothesize that primary education, by providing basic functional literacy and numeracy, enhances women's status within and outside their immediate family and increases their exposure to the information and ideas disseminated through printed material. This brings changes in their general behavior involving breastfeeding, use of contraception, and fertility. In addition, staying longer in school increases their age at marriage. In other words, advancement in female education can be expected to influence fertility behavior even without simultaneous changes in other factors such as increased opportunities in the paid labor force.

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