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Women's Role in Household Productive Activities and Fertility in Bangladesh

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ABSTRACT

Female status may not be directly observable, although its various indicators are. However, the distinction between the endogenously and exogenously determined indicators of female status is important. When female labor force participation is an indicator of female status, simple correlations between female status and fertility should not be interpreted as causal. Both are choice variables; hence we do not know what causes what. However, if female status is predetermined by variables such as woman's education, the association between woman's education and fertility may indicate causality between woman's status and fertility.

In a rural setting where women are involved in a variety of productive activities both inside and outside home, women's time-use patterns in general may be good indicators of women's status both in terms of women's participatory role in household decision-making and the extent of their control over economic resources. However, the linkage from time-use to fertility through female status is not causal, but is jointly determined by a common set of exogenous variables.

An analysis of data from Bangladesh suggests that there are normal effects of assets, income, and prices on a woman's time allocation and her fertility decisions, thereby suggesting that these outcomes are not totally preordained by society but are affected by economic constraints on the individual household. Human capital variables, such as woman's education, have a strong effect on woman's fertility and work decisions, and are, therefore, potentially important policy instruments. Market interventions which raise wages, however, appear to have little immediate effect on fertility decisions, although they raise the return to education, which may affect female status over a longer time horizon.

Introduction

The present study seeks to identify the factors that may affect the role of women in the rural areas of a developing country and the possible impact of these factors on fertility. A voluminious literature has explored the underlying relationships between female labor supply and observed demographic characteristics, such as fertility, in the context of developed countries (Smith, 1980). The opportunity cost of mother's time in rearing children appears to be one of the major variables that predicts fertility. Thus, the increasing use of female time in market income-earning activities outside of the home (i.e., non-family labor market participation) may be one of the major variables that will be associated with lower fertility in developed countries[1].

This body of literature suggests also that female participation in market activities may affect fertility in the developing countries. However, contrary to expectation, in some LDC-context studies, birth rates are found to be positively correlated with female economic activity (McCabe and Rosenzweig, 1974; Mason and Palan, 1981). The major drawback involving associations between observed fertility and female labor force participation is that simple correlations do not tell us what causes what; in fact, both these variables are choice variables (McCabe and Rosenzweig, 1976)[2].

As an alternative, the present study will focus on the role of women, both inside and outside the household, in terms of time allocation and its relationship to fertility. This is useful to the extent that (i) the use of women's time in different economic activities is a manifestation of female status in the household and (ii) time allocation of women is of particular

interest because it may influence and be influenced by demographic characteristics, such as fertility. However, this linkage from time-use to fertility through female status is not causal, but is jointly determined. Although attempts have been made to identify factors that determine the particular pattern of time allocation of household members for agrarian economies (Evenson, 1978), no study to my knowledge has yet explored women's time-use patterns, fertility and female status in the same framework.

The paper is organized in the following order. Section two briefly discusses the possible linkages between female status, fertility, and time-use patterns of women in a developing country, such as Bangladesh. Section three briefly reviews the literature concerning the hypotheses discussed in section two. Section four examines data that have recently been collected from Bangladesh which will be used to test empirically the hypotheses of this paper. Section five outlines the economic framework that will be utilized to test the hypotheses. Section six reports the results of econometric estimates of the model. Finally, the policy prescriptions inferred from the empirical results are discussed in the concluding part of the paper.

Relationship Between Female Status, Fertility, and Time-use Pattern:

A Conceptual Framework

The paper argues that female time-use patterns may be a manifestations of women's status in the family and society, since the allocation of time to different activities is an indication of how women are involved in a hierarchy of productive activities, which in turn may imply their participatory role in household decision-making and control over economic resources. The contention is that since there are many ambiguities involved in defining "female status" (Mason, 1984), measures such as housewife's time-use patterns and the character of her productive role in the family may be reasonable proxies for female

status in society. Moreover, observed fertility may be considered another manifestation of woman's status in the family, one that is influenced by her ability to plan and control her childbearing.

Time-use and fertility, although two different dimensions of women's status, are likely to be interelated and perhaps linked to a common set of exogenous constraints that characterize the environment and endowments of the family and community. In other words, if the time-use pattern of a housewife is determined by background characteristics such as landholding, schooling, and household composition, then her fertility, another dimension of female status in the society, may also be explained by the same household and community characteristics. The hypothesis that the choice variables are jointly determined rests on the assumption that changes in some exogenous variables will have the same qualitative effect on female time-use patterns such as female participation in market work and fertility, although simple correlations between the two may be positive or negative. It is in this sense that I am trying to link fertility, female status, and women's time-use patterns in the same framework to a common set of exogenous observable factors. Although I cannot here present a systematic review of the large literature relating to fertility, women's time allocation, and female status[3], I would like to present a brief summary of findings I consider essential for expecting family endowments and local community constraints to influence these relationships between fertility, female status and women's time-use patterns.

Women's Status, Fertility, and Time-use Patterns: An Overview

This section briefly reviews the literature that examines the causal relationships between different aspects of female status, women's time allocation, and fertility, especially in the context of Bangladesh[4]. The essential assumption underlying such relationships is that woman's status is a possible cause of fertility outcomes and her time allocation to different activities, although exactly what constitutes female status is much debated. I shall discuss first the issues involved with fertility and female status and then turn to the implications of woman's status on her time allocation.

There are a number of "intermediate " determinants of fertility that are thought to be influenced by female status-related variables (Mason, 1984). One such intermediate determinant is woman's age at marriage. Evidence suggests that in many developing countries women's age at first marriage is inversely correlated to completed fertility, presumably because it reduces women's exposure to the risk of pregnancy (Caldwell, 1983; Chaudhury and Ahmed, 1980). Most studies suggest that "women's opportunities for economic self-support," which are influenced by women's education, are important in the determination of women's age at marriage. Although female education may be an endowment, there are community factors such as schooling facilities and non-familial income earning opportunities which also influence women's opportunities for economic self-support.

Among other intermediate determinants of fertility, factors such as costs of children, value of children, and sex preferences, are important, because they may also be influenced by a number of socio-economic constraints that directly or indirectly have implications for female status (Mason, 1984).

In rural Bangladesh where the roles of women are mostly domestic and may be determined by social customs, religion, and above all "patriarchal structure", the opportunity costs of children in terms of female wage income forgone are negligible. Direct costs, however, are not. Evidence suggests that the economic value of children, particularly male children, in terms of their return to the family as adults tends to offset the cumulative costs incurred by parents in raising them (Cain, 1977). This suggests that it is not the costs of children per se but the value of children as perceived by parents that is important for the demand for children. Husband and wife, however, may not demand children for the same reasons but for reasons that may promote his or her self-interest.

In rural Bangladesh, "male dominance is grounded in control of material resources and supported by interlocking and reinforcing elements of the kinship, political, religious, and economic systems" and "powerful norms of seclusion extend to labor markets, severely limiting women's opportunities for independent income generation" (Cain, 1984: p.26). Women's economic dependence on men is the ultimate consequence of what Cain coined "patriarchal structure". In such a setting, a woman may demand children for reasons related to her economic dependence on men, something in turn related to her status in the family and in the society.

More generally, children may have value to women as a form of "risk insurance" which may arise due to "patriarchal risk", a risk embodied in the economic dependence of women on men (Cain, 1980; 1982; 1984). Under the possible events of widowhood, divorce, separation, or incapacitating illness of the husband that threaten women with the loss of support of her husband, and when women are excluded from other sources of income, the woman's only apparent insurance against such potential risks is children, especially sons. Women's son preferences is thus also rationalized (Cain et al, 1979; Cain, 1980).

However, as Mason(1984) pointed out, since men have similar son preferences (Arthur and McNicoll, 1978), women's son preferences may have little value in explaining the persistence of high fertility in such a patriarchal society. Evidence, however, suggests that fertility regulation, use of contraception, female participation in the labor force, or better communication with the husbands depends on factors such as wife's education and husband's education (Chaudhury and Ahmed, 1980). This implies that wife's own endowments can affect her status in the family, which may come through her education. It follows, therefore, that female status and fertility are not fixed by the community constraints alone but may vary also according to individual and family endowments.

Similarly, women's time allocation to different productive activities is not fixed entirely by society. There are reasons to believe that individual factors (such as woman's education) and family endowments (such as household assets) may also influence these time allocation decisions. In many traditional societies, women provide not only unpaid services in the home such as child care, food preparation, and fetching water, but also work to generate household income[5].

Time allocation studies from different developing countries show that women work as much or even more than men, but mostly in household activities (Farouk and Ali, 1975; King and Evenson, 1983). Efforts are made to value women's work in home production that has no apparent market value by referring to wages received by women in similar activities outside home. However, market wages observed for women working in non-familial activities may be poor indicators of why other women predominantly work in the home in what have been called expenditure-saving activities. The reason for this is that sex segregation may exist in the labor market which may depress women's wages so

that women will devote an inefficiently large amount of time to home production (Buvinic, 1983). Thus, patriarchy[6], which sets a high cultural value on housework in many traditional societies, may be the determining factor for women's time allocation (Hartmann, 1976; Cain et al, 1979). This suggests that a woman's time allocation is determined not by her choice but by the choices of her husband and the society.

The above argument need not be a universal one when even in rural Bangladesh there are cross-sectional variations in time-use patterns of women involved in productive activities[7]. I assume that patterns of women's work in terms of their time allocation to different productive activities (including housework) can be categorized into several "occupational" groups which may be indicative of their status. I argue that women's time allocation to productive activities is not entirely determined by the society nor alone by market forces such as women's wages, but by a variety of factors, including (1) woman's own endowments, such as education and earning potential, (2) family endowments, and (3) local markets and community-level variables. Thus, the hypothesis is that both fertility and women's time allocation, which are two dimensions of female status in the family, may be jointly explained by the same individual, household, market, and community factors. The idea behind this hypothesis is that human capital as well as community variables can explain cross-sectional variations in women's time-use patterns and fertility in Bangladesh. Having discussed the motivation that has led to this paper, let me turn now to the data that will be utilized to empirically test these hypotheses.

Data Sources and its Characteristics

The data on which this paper is based is drawn from 500 sample survey questionnaires I recently (1983-84) administered in eight Upazilas[8] in Bangladesh with financial support from the Ford Foundation. The sample comprises households both from farming populations and non-farming populations. The eight Upazilas were selected from regions north, east, west of Dhaka as well as from a central part of Bangladesh (Table 1). About 20 Unions were included in this survey.

Almost half the sample, 246 households, is drawn from two Upazilas where the predominant role of women is in the household. These two Upazilas are respectively Baidyerbazar (recently been renamed Sonargaon) in the Dhaka district, and Ghatail in the Tangail district. These households were chosen, because they were surveyed during 1981-1982 in connection with my Ph.D. dissertation (Khandker, 1982)[9]. During the 1983-84 resurvey, however, 14 households out of an original sample of 250 could not be surveyed, because they either refused or had moved away. However, 10 new households were picked randomly from these sampling areas to increase the total number of households interviewed from 236 to 246. Upazila Baidyerbazar is mainly a rainfed area where traditional crops are grown and people have access to non-farm activities such as trading. Ghatail, in contrast, is a upazila where recently introduced irrigation facilities have enabled farmers to adopt modern crop varieties, especially paddy, and this population has limited access to non-farming activities.

The rest of the sample is drawn from the other six Upazilas. These Upazillas were chosen on the basis of a programme recently implemented to promote a productive role for women in rural industries. A study called the Rural Industries Study Project conducted during 1979-80 in 11 Upazilas of

Bangladesh where non-crop, non-farm activities are concentrated, found that almost two-thirds of workers working in these activities are females and children who, however, mostly work in family enterprises or enterprises owned by others (BIDS, 1981)[10]. Thus, as a follow-up, the "Women's Entreprenurial Development Project"(WEDP) was implemented in 1982-83 by the Bangladesh Small and Cottage Industries Corporation and funded by the Bangladesh Krishi (agricultural) Bank and USAID, Dhaka, to promote women's entrepreneurship in non-farm activities, initially in eight Upazilas of Bangladesh. I have sampled from three of these eight Upazilas exposed to the WEDP programme, including 149 households who were chosen randomly but selected because both household head and housewife were available and willing to be interviewed by the interviewers during a single data collection period. From the remaining three Upazilas, which were not exposed to WEDP, 105 households were sampled randomly, again on the basis that both husband and housewife were willing to be interviewed during the interview period. The distribution of sample households by Upazila is shown in Table 1.

The sample collection procedure may allow investigation of whether the WEDP programme has had any effect on the patterns of women's work in Bangladesh. However, one should note that WEDP acts as a catalyst in identifying activities and women to be financed, but it is the bank (the Krishi Bank) which does the actual financing. However, the role of banks as a whole in the rural areas in the recent years lies in providing low interest credit to rural households to undertake more intensive farming or non-farming activities to increase their income. It is in this sense that one may include the bank instead of WEDP as a relevant variable to measure the impact of government introduced innovative programmes to promote increased participation of rural population in income-generating activities.

Assuming that housewives in rural Bangladesh play a "double role" in the household, their time allocation data has been classified under two major categories, primary role and secondary role, based exclusively on the criterion of how much time a woman spent in each activity[11]. Time-use data according to this classification generates the distribution of woman's time allocation in Table 2.

Table 2 indicates that women who named housework as their primary occupation account for 68% of the respondents. When asked about their time allocation to other productive activities, about 92% of these women said that they spend some of their time in activities which generate household income, either in kind or cash. The remaining 8% are primarily involved in housework and do not consider their time allocated to other productive activities as income-generating. There are four broad categories of economic activities that women in rural Bangladesh can do: (1) housework, (2) family farming, (3) family non-farming, and (4) non-agricultural work outside of the family. Housework is house chores such as cooking, cleaning, fetching water and firewood, caring for the children and the old, washing and serving food to the family members, which, of course, does not include leisure. Researchers call this category of work as quasi-productive or expenditure-saving activity. Family farming is working on the family farm, not necessarily in the field, but possibly in operations done at home after harvesting, such as threshing, drying, winnowing, and sifting paddy. This work falls under the rubric of food processing, food preservation, and storing and is considered to be unpaid productive work. These activities may also include kitchen gardening, tending domestic animals or raising poultry on a commercial basis. Family non-farming includes those activities done primarily by the family at home where a woman can work as a partner or an unpaid family worker, such as self-employed in a family business,

Table 1. Distribution of Households by Upazila and District

District	Upazila	No. of Unions	Old samples	New samples	Total
Dhaka	Baidyerbazar(NonWEDP)	2	91	8	99
Tangail	Ghatail(Non-WEDP)	1	145	2	147
Rangpur	Kownia(WEDP)	2	0	25	25
Jamalpur	Sherpur(WEDP)	6	0	96	96
Comilla	Laksam(WEDP)	2	0	28	28
Rangpur	Kotwali(Non-WEDP)	3	0	50	50
Pabna	Ishardi(Non-WEDP)	2	0	28	28
Bogra	Gabtali(Non-WEDP)	2	0	27	27
Total	8 Upazilas	20	236	264	500

Table 2. Distribution of Women According to Time Allocation Patterns

Primary role	Secondary role							Total obs
	Housework	Family-farming	Self-emp. business	Handicrafts	Poultry-raising	Non-agr. wage	Sewing	
Housework	26	251	8	34	6	15	2	342
Self-employed business	3	0	0	0	0	0	0	3
Salaried services	92	0	0	2	0	0	1	95
Handicrafts	30	2	0	0	0	0	0	32
Teaching	21	0	0	0	0	0	0	21
Non-agricultural casual wage work	3	0	0	0	0	0	0	3
Rice husking*	1	0	0	0	0	0	0	1
Sewing*	1	0	0	0	0	0	0	1
Total obs.	176	253	8	37	6	15	3	498

*Rice husking and sewing can be part of housework women do for their families; however, these are treated as separate income-generating activities when women do them on a commercial basis for earning income.

sewing, handicrafts, or rice husking. Finally, <u>non-agricultural work outside</u> <u>the home</u> or simply <u>market work for cash</u> include those activities that require women to work outside the home, such as teaching, non-agricultural casual wage work, and other salaried services available because of rural development programmes.

The time-use data in Table 2 may be classified under these four categories with the expectation that these broader classifications may measure women's status as reflected in their time-use patterns. Although there are a maximum four categories of economic activities in which a woman can work, the survey questionnaire limited responses to two categories of work for each woman. Treating all secondary roles as part of housework under the categories of non-housework primary roles (which are negligible in number anyway), Table 3 reports five categories of women's time-use patterns which may be defined in terms of combinations of primary and secondary roles as stratified in the Table 2 and also the mean number of children ever born (NCEB). The categories as constructed do not imply an ordering, but they are organized in ascending order from exclusive housework to exclusive market work.

Table 3. Time-use Patterns of Women and Fertility in Rural Bangladesh

Time-use category	Primary job	Secondary job	Obs.	Mean NCEB
1	Housework	Housework	26	5.77
2	Housework	Family farming	257	5.48
3	Housework	Family non-farming	59	4.22
4	Family non-farming	Housework	36	3.89
5	Market work (cash)	Housework	120	3.10

However, to the extent that many households in my sample are predominantly agriculturists, women who reported no work other than housework are combined with those in category 2 to form a new category of time-use pattern for women engaged in family farming in addition to the traditional housework role. Similarly, for women who work in family non-farming enterprises (category 3) in addition to housework, it may be difficult even for the women to identify in which of two activities—housework and non-farming income earning—they devote more of their time, because both activities are done in the household and may be compatible. Therefore, it is logical to group 3 and 4 together to form a new category of women's family non-farming time use. Under the assumption that housework and work outside home for cash may be incompatible, I retain the fifth category. Thus, there are three categories of women's time-use patterns as compared to five categories initially classified. I assume that these three categories of time-use patterns are the relevant time-use patterns of women that I am going to analyse in the context of fertility and female status[12]. Moreover, I assume that while female status is not directly observable, it is reflected in the time-use patterns which underlie these three categories of women's work in rural Bangladesh[13].

Table 3 also shows that birth rates and women's economic activity have negative partial correlations. However, as indicated in the beginning of this paper, this simple association does not indicate causality. Since both female economic activity and fertility are choice variables, one need to formulate the problem in a framework where both these variables are jointly determined by a common set of exogenous variables. The household production model employed in the analysis of fertility and related investment behavior can provide such a framework[14].

The Model and its Specifications

The model developed, for instance, in Ben-Porath(1973) and Willis(1973) can be adopted to examine the relationship between female economic activity and fertility for housewives in rural Bangladesh. The model postulates that the household derives utility from two service flows: commodity services(S) and child services(N). These services are produced at home using time inputs of wife and husband, and market-purchased inputs. The money prices of these inputs (both time and market goods) used in the home production of these services are predetermined and will determine factor proportions in home production activities. The household faces a time constraint for each member that describes how each member allocates his or her time in different activities such as market and non-market work and a "full" income constraint which is equal to the "total" time (allocated in market and home work) of each member multiplied by his or her money wage rate, plus non-labor income. The shadow price of household-produced goods is equal to the sum of the money prices weighted by the factor inputs required to produce a unit of household commodity. Maximizing utility subject to the full income constraint implies that the time of household members will be allocated to home production and market work in such a way as to minimize the shadow cost of producing the desired commodity flows and child services.

This maximization problem leads to reduced-form demand equations for home produced goods, such as desired number of children and time allocation to each market and home activities. Quantities of commodities consumed and time allocation decisions are determined by exogenous market prices for inputs, including wages, by household endowment, and by community conditioning variables. It follows, therefore, that fertility and woman's time allocation

to market and non-market activities are jointly determined by a set of exogenous variables, although specifying exogenous variables may appear arbitrary. Different reasons can justify the inclusion of individual, household, market, and community variables in the list of explanatory variables used to explain the joint determination of fertility and woman's time-use patterns, and these are briefly explained below.

Individual characteristics that I treat as explanatory variables in the time allocation and fertility regressions are woman's education and the amount of resources she brought to her marriage, which may indicate her earnings or wealth potential. It is my contention that events before or at marriage may partially determine a woman's current time-use pattern at home and her fertility. For similar reasons, husband's education and amount of resources he brought to the marriage may affect woman's current time-use pattern. In addition to education and resources brought to marriage, I include woman's age to see if this demographic characteristic has any effect on women's time-use patterns in Bangladesh.

Household variables affecting women's time use include the household's one income-earning asset--livestock[15]. This important factor of agricultural production may or may not be jointly controlled by husband and wife. This variable may act as a proxy for an asset effect or non-labor income effect on women's time-use as well as fertility in rural Bangladesh.

Market and community factors include wages and other prices determined by market forces or community characteristics. The latter include household's proximity to community services (schooling, health, and banking services) on the assumption that access to these services and community markets determines implicit prices of many goods and services the household uses for home production and consumption. However, these prices should be measured at a

level of aggregation above the household to ensure that they are exogenous to the household's behavioral outcomes (Schultz, 1984). Market-determined prices in my study are community wage rates of three categories of labor: adult male, adult female, and child labor[16]. Household residential characteristics that represent household accessibility to private and public services will proxy price variation that may be considered exogenous to the household. The data in this category primarily consist of household distance(s) to the nearest health center and family planning unit, educational institution, and financial institution (bank). Women's time use patterns and fertility are thus assumed to be affected by the public health delivery system, the schooling system, and government credit programmes for rural advancement.

The model describing the reduced-form equations for completed fertility and time allocation when applied to our three categories of time-use patterns can be written in matrix form as follows.

$$
(1) \quad
\begin{bmatrix} N \\ T_1 \\ T_2 \\ T_3 \end{bmatrix}
=
\begin{bmatrix}
a_{10} & a_{11} \cdot & \cdots & a_{112} \\
a_{20} & a_{21} \cdot & \cdots & a_{212} \\
a_{30} & a_{32} \cdot & \cdots & a_{312} \\
a_{40} & a_{42} \cdot & \cdots & a_{412}
\end{bmatrix}
\begin{bmatrix} 1 \\ A \\ E_w \\ E_m \\ R_m \\ D \\ I \\ S \\ H \\ B \\ W_m \\ W_w \\ W_c \end{bmatrix}
+
\begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \end{bmatrix}
$$

where N = completed fertility adjusted by woman's age[17]

T_1= 1 if time-use in family farm and home, 0 otherwise

T_2= 1 if time-use in family non-farm and home, 0 otherwise

T_3= 1 if time-use in market work and home, 0 otherwise

A = age of the wife

E_w = years of completed schooling of the wife

E_m = years of completed schooling of the husband

R_m = premarriage assets of the husband

D = dowry to husband from the wife's parents

I = Non-labor income (value of livestock)

S = distance to school

H = distance to health center

B = distance to bank

W_m = community-level agricultural wage for adult male labor

W_w = community-level agricultural wage for adult female labor

W_c = community-level agricultural wage for child labor

a_{ij} = coefficients to be estimated, i= 1, 4; j= 1, 12

e_i= relevant error terms, i= 1, 4

The effects of these exogenous variables on time allocation and fertility are a priori ambiguous (i.e., in which direction they affect the choice variables), because the substitution and income effects produced therein often tend to work against each other. For example, an increase in women's market wage rate may lead to an increase in time allocation of housewife to market income-earning activity if the positive income effect dominates the negative substitution effect. Its effect on the desired number of children, however, depends on the intensity of wife's time in child services relative to

other commodity services. This has a number of implications for LDC context studies in terms of the compatibility between market work and childcare (McCabe and Rosenzweig, 1976). In particular, an increase in women's market wage may lead to an increase in female participation in the market work without any or even with positive effect on fertility, because of the possibility that market employment and childcare may be compatible[18]. Having specified the model, the next stage is to implement the framework.

The Results

The means and standard deviations of the variables used in empirical implementation of the above framework are presented in the Table 4. The equations for fertility and time-use patterns in (1) can be estimated by Ordinary Least Squares (OLS). This estimation technique, however, will yield inconsistent estimates for the standard errors of the time-use equations, since the time-use variables are dichotomous. Moreover, choices in time-use patterns are mutually exclusive which implies that the predicted probabilities of falling into the three groups must sum to 1. Consequently, the multiple logit technique will be applied to obtain the efficient estimates for time-use equations[19]. The results of the multiple logit technique for the three time-use equations and the OLS estimates of fertility equation are reported in the Table 5.

Table 5 shows that many of the explanatory variables in the time-use regressions have significant power in predicting the probability of a woman being in a particular group with the specified characteristics, although fewer of them have significant effects on fertility. I will discuss these estimates one by one in the following paragraphs.

Table 4. Means and Standard deviations of Variables

Variable name	Sample	Mean	Standard dev.
Number of children ever born	498	4.67	2.43
Completed fertility adjusted by age	498	1.03	0.44
Time-use in family farm and homework	498	0.56	0.50
Time-use in family non-farm and homework	498	0.20	0.40
Time-use in market work and homework	498	0.24	0.43
Age of the housewife (years)	498	34.5	10.31
Wife's education in years	498	3.86	4.54
Husband's education in years	498	6.15	5.10
Value of resources brought by husband('000)	498	40.2	69.95
Dowry received by husband ('000 Taka)	498	4.35	9.59
Value of livestock ('000 Taka)	498	4.04	3.95
Distance to the nearest school (Km)	498	1.37	2.42
Distance to health β family planning (Km)	498	3.87	3.13
Distance to financial institution (Km)	498	3.27	2.75
Adult male agrl. wage rate (Taka)	498	17.95	2.70
Adult female agrl. wage rate (Taka)	498	8.40	1.45
Child (under age 15) agrl. wage rate (Taka)	498	9.22	2.75

Note: Agricultural wage rates are the community level wages observed during the period prior to the data collection period.

Table 5. Estimated Coefficients for Time-use and Fertility Equations, with t-statistics in Parentheses[a]

Exog. variables	ln(NFRM/FRM)[b]	ln(MKT/FRM)[c]	ln(MKT/NFRM)[d]	Fertility[e]
Intercept	7.286 (3.31)*	0.214 (0.09)	-7.072 (-3.51)*	1.68 (7.02)*
Woman's age	-.076 (-3.50)*	.006 (.23)	.082 (2.96)*	- - - -
Woman's educa.	.017 (0.21)	.527 (5.94)*	.510 (5.76)*	-.031 (-3.82)*
Husband's educa.	-.096 (-1.58)*	-.167 (-2.34)*	-.071 (-0.99)	.002 (.23)
Husband's premarriage assets	-.007 (-1.84)*	-.011 (-2.02)*	-.004 (-0.73)	.001 (3.02)*
Dowry to husband	.061 (3.31)*	.031 (1.20)	-.03 (-1.76)*	.012 (.63)
Livestock value	-.13 (-2.49)*	-.30 (-4.80)*	-.17 (-2.46)*	.014 (.91)
Distance to sch.	.332 (3.38)*	.299 (2.54)*	-.033 (-.31)	.013 (1.06)
Distance to health center	.194 (1.68)*	.048 (0.35)	-.146 (-1.10)	.003 (.19)
Distance to bank	.005 (0.43)	.005 (0.35)	-.050 (-.29)	.002 (.11)
Male agrl. wage	-2.230 (-7.20)*	-1.624 (-4.91)*	.606 (1.88)*	-.047 (-1.31)*
Female agrl. wage	3.372 (6.35)*	2.685 (4.93)*	-.687 (-0.91)	-.037 (-.82)
Child agrl. wage	.592 (2.64)*	.489 (1.92)*	-.103 (-.40)	.056 (2.14)*
R^2				.19**
Chi-square	515.38***			

[a] Multiple logit coefficients for time-use and OLS for fertility;
[b] Natural log of probability of being in non-farm and homework category relative to family farm and homework category;
[c] Natural log of probability of being in market work and homework category relative to family farm and homework category;
[d] Natural log of probability of being in market work category relative to family non-farm work category; this is derived from the other two;
[e] Fertility is defined as cumulative births divided by predicted births;
* refers to the estimates that are significantly different from zero at a ninety percent confidence level using one-tailed test.
** F ratio is 7.23 which is significant at a 1 percent level of significance.
*** Significant at a 1 percent level of significance.

The woman's age is significant in predicting that relatively younger woman is more likely to be involved in income-producing activity at home, while relatively older woman does either mostly housework or participate in market work for cash income. Participation of relatively older women in market work may indicate that there is a social taboo against relatively younger women working outside home for cash income in rural Bangladesh. Of course, there may be other explanations, such as labor market queuing, for this differences in age-specific job patterns.

Potentially the most important factor causing variation in women's status, as many social scientists have emphasized, is education level. Table 5 confirms that women's education plays an important role in determining participation in market work relative to family farm work and also to family non-farm work. In other words, the higher the education of a woman, the more likely it is that she will work outside her home for income. At the same time, education's negative effect on fertility is also notable. An increase of one year education of woman will reduce the age-adjusted fertility by 3.1 percent. The effect of education is to reduce family size, may be because it increases the probability of participating in work outside the home and it enables woman to plan and control her childbearing.

Conversely, the effect of husband's education has a negative effect on woman's work outside her home and a positive effect on fertility. These results show that the higher the level of husband's education, the more likely that the woman will work only at family farming and housework and the less likely that she will engage in income-producing non-farming activities, either at home or outside home. However, the negative husband's education effect on wife's participation in market work, relative to family non-farm work, is not significant. Its positive effect on fertility is also not significant. The effect of husband's education may reflect the effect of husband's earnings on

woman's time-use patterns, and hence the results are consistent with other findings (Gronau, 1977). The effect of the husband's premarriage assets on wife's time-use patterns has similar implications, although the effects are significant and positive for fertility. Since assets in rural Bangladesh are mostly land, its effect on women's time-use patterns is to increase the productivity of home production activities relative to off-farm activities. The effect of (land) assets on fertility is positive, implying that husbands who bring greater assets to their marriage have a larger family in rural Bangladesh. This can be interpreted as an income effect; if children are costly to rear, higher income increases the ability to raise more of them. It could also be a price effect: more family land and productive assests increase the marginal product of own children in a regime where child labor is not readily exchanged and monitored beyond the family farm.

To the extent that wife's dowry represents the social prestige of the bride's father in the society, it may partially measure the power of the wife to control her husband's actions later in married life or her influence in household decision-making. According to these estimates, a larger dowry increases the probability of working at home and on the farm and reduces the probability of market work. Thus, it operates as a wealth effect-- women with large dowries are less likely to engage in non-familial market activities. Its effect on fertility decision, although positive, is not conclusive.

The effect of a household asset such as livestock is clear-cut. Livestock, which includes both draft (bullocks) and non-draft (cows, goats, sheep) animals, increases the probability of women engaging in housework and family farming. This may be explained as a price effect, which raises home and farm productivity of women in rural Bangladesh. The effect of this non-labor income on fertility, although positive, is not significant.

Some of the community-context variables, which I assume measure implicit prices of goods and services households use for home and market production, seem to have significant effects on women's time-use patterns in rural Bangladesh. The effect of school distance on women's time-use patterns seems interesting, in particular its significant effects in increasing the probability of women's involvement in both family non-farm work and market work relative to family farm work. These patterns may have something to do with children's enrollment in schools. One possible explanation is that the greater the distance to school, the lower will be children's enrollment in schools because of the associated high price of schooling. These children in turn may help women participate either in family non-farming activity or free their time for market cash work. The positive effect of school distance on number of births, although not significant, is consistent with this particular patterns of women's work (i.e., work in family enterprises) that emerge as a result of increased price for quality of school-age children in Bangladesh. It is also consistent with the widely hypothesized substitutability of child schooling and fertility.

The distance effect of medical health center on woman's time-use patterns can be regarded as a proxy for the health effect of health services on child mortality and its effect on mother's time-use patterns in rural societies. It is in this sense that the effect of health services can be regarded as a reduction of the price of children's (and mothers) health, or a reduction of price of quality of preschool children. However, since most health centers do provide family planning services, this may also imply a reduction of the price of fertility regulation which is analogous to increased price of quantity of children. Thus, the effect of medical facilities has a two-fold price effect on the demand for children— one for quality and the other for quantity. However, if quality and quantity are substitutes, then these two

separate price effects are reinforcing. That is to say, an increase in price

of quantity and a decrease in price of quality will lead to a reduction in

quantity but an increase in quality of children. However, the availability of

modern health services might have increased survival rates of infants without

inducing a corresponding decline in birth rates (which is possible if rural

households do not know how to regulate fertility or there are incentives not to

do so), thereby increased the completed fertility of most rural women. This

interpretation is supported by the positive (although not significant) effect

of health services on fertility. In this case, woman will be preoccupied with

child care as more children survive and will consequently display a higher

probability of working in the home and in family enterprises, or activities

that do not interfere with taking care of her children and, on the other hand,

may provide employment opportunities for her young children. Thus, joint

production of market income and child services is possible.

The effects of financial institutions in terms of financing rural

income-generating activities in which women can participate seem to increase

the probability of working in non-farm activities either at home or outside

home relative to family farm work, although these effects are not significant.

The effect of banks on fertility is also not conclusive, although the positive

(insignificant) effect on births seems consistent with this pattern of women's

work.

I turn next to the community wage regressors of three categories of

agricultural laborers[20]. The wage data in my regression is the union-level

average for each type of labor. The differences between the three categories

of wage rates as documented in Table 4 suggests that age-sex differences exists

in the rural labor market which is also consistent with other findings (Cain,

1977). However, the wage rates of female and child labors in agriculture will be influenced by the movement in male wage rate, to the extent that they are partial substitutes for each other in production. With knowledge of the risk of multicollinearity among these three wage measures, let me propose a tentative explanation of the wage effects.

The effects of adult male wage rate are to increase the probability of women undertaking more family farming activity than working for non-agricultural activities both inside and outside home. Thus, an increase in adult male wage rate may imply increased farm productivity of women in family farm which in turn may keep them busy in the farm and to release more of the men's time for off-farm activities at this high wage. It also implies higher income, so women do not need to work for off-farm activities (Gronau, 1977). Its positive significant effect on women's participation in market work relative to family non-farm work implies that if increased opportunities permit women to choose between these two activities, women are more likely to get involved in market work than in family non-farm work. The effect of male agricultural wage on fertility, which is negative, may imply the possibility of a negative association between increased female economic activity and fertility.

An increase in the female wage increases the probability of non-farm activities relative to farming activities. The higher the value of farm works the more likely women are to work off-farm, which may be rationalised on the ground that since an increase in the farm wage implies a corresponding increase in the non-farm wage, the more likely women are to be involved in off-farm rather than farm income-producing activities. The increased economic role of women should discourage fertility, which it does, but not significantly. The

effects of the child wage variable have similar implications for women's time-use patterns, although its effect on fertility is positive and significant. An increase in the productive role of children in the household's activities depresses the shadow price of children, which encourages fertility in rural Bangladesh. This finding is consistent with other studies in South Asia (Rosenzweig and Evenson, 1977).

Conclusions

The conclusions that emerged from this exercise are clear. Female participation in market-oriented activities tends to be negatively associated with fertility. It does not, however, follow that an increase in market wage that increases women's opportunities to participate more in market-oriented activities will reduce fertility. To examine these causal relationships, one needs to address the problem in a framework that treats these two variables jointly. Similarly, the simple association between female status and fertility cannot be viewed as causal, unless the measure of status is predetermined. Thus, when female status is defined in terms of women's time-use patterns, it is important to recognize that female status and fertility are not independently determined but rather jointly determined by a common set of explanatory variables.

The Bangladesh data show that there are normal effects of assets, income, and prices on a woman's time allocation and her fertility decisions: these outcomes appear not to be totally preordained by society, but are affected by economic constraints on the individual household. In particular, the effects of female education and women's wage on fertility deserve special attention, because concrete policy implications may follow from their influence on fertility and women's time-use patterns.

The results in Table 5 show that female participation in more formalized economic activities, which is facilitated by an increase in female education level, has a significant negative effect on fertility. But participation made possible by increased opportunities for women's gainful employment in economic activities, due to changes in labor market demand conditions, may or may not reduce fertility. The juxtaposition of these two causal effects on fertility may be understood in this way. Female education may help women participate in more formalized economic activities as well as enable them to plan and control their childbearing, while participation due to changes in labor market demand, with no gain in formal education, may not reduce fertility because it may not provide them with required control over their childbearing decisions. Moreover, female participation in market-oriented activities due to increases in market wages may occur mostly in family non-farm enterprises, activities that do not interfere with woman's childbearing role nor with her housework role. Non-farm enterprises may permit gainful involvement of also young children, which may increase incentives for higher fertility. These will be more clear if we examine the results reported in Table 6.

Table 6. Probability of Being in Particular Group When Changes Occur in
Woman's Education and Wage

Exogenous Variable	Change from Mean	Family Farm	Family NFRM	MKT Work
Woman's education	Increase by 1 yr	−.06	−.01	.07
Woman's wage	Increase by 10%	−.55	.43	.12

A one year increase of women's education from its mean value of 3.86 years reduces the probability of being in family farm by 6 percent and in family enterprise by 1 percent, while increasing the probability of being in non-familial market work by 7 percent. The same increase in education also reduces fertility by 3.1 percent. Thus, an increase in woman's educational level has significant impact both on women's participation in market work and fertility.

Moreover, a 10% increase of woman's wage from its mean value of Tk. 8.40 reduces woman's probability of being in family farm by 55 percent, while increasing her probability of being in family non-farm enterprises and in non-familial market work by 43 percent and 12 percent respectively. Thus, changes in labor market conditions in rural Bangladesh help woman participate mostly in familial non-farm activities, activities that are compatible with her on-job childcare and gainful involvement of also young children. This effect is reinforced by the finding of no significant effect of woman's wage on fertility reduction, as reported in Table 5.

Female education may be a crucial determinant for fertility as well as female status in rural Bangladesh. Female education helps improve female status both in terms of women's participation in household decision-making, such as decisions about family size, and in terms of their participation in more formalized economic activities. Thus, promoting formal education among the female population as well as providing off-farm income earning opportunities are likely to improve female status.

In summary, these findings suggest that human capital variables, such as education, have a strong effect on reducing woman's fertility and increasing the likelihood of working outside the home, and, are, therefore, potentially important policy instruments. Holding education constant, however, and simply increasing women's wages, has the effect of drawing women into familial non-farm enterprises, which although they may raise women's status and economic position are compatible with (and may actually encourage) higher fertility. Therefore, market interventions which raise women's wages appear to have little immediate effect on fertility decisions, although they raise returns to education, which may affect fertility and female status over a longer time horizon.

Footnotes

1   The negative association between observed fertility and female labor force participation assumes that childcare and market work are incompatible.

2   The drawback in applying this approach to developing countries is that a large proportion of the female labor force in many countries is employed in retailing and cottage-industry occupation in which incompatibility between childcare and work is limited.

3   See an excellent review on female status and fertility in Mason (1984).

4   It will be apparent later why it is difficult, if not impossible, to estimate empirically these causal linkages between fertility, woman's time-use and female status, unless the measure of status is fixed at the outset, like education, or exogenously varied such as occurs when aggregate labor markets change. A possible alternative to estimate these causal linkages between female status and fertility is the latent variable approach which may help identify systematic relations between various indicators of female status and female status itself and between female status and fertility.

5   This is the "double role" hypothesis of woman's work (Birdsall and Greevey, 1983). Woman's housework, which some researchers call quasi-productive activity, are unpaid family work which does not have market value because these services cannot be marketed.

6   Cain et al (1979; p. 406) define "patriarchy" as a set of social relations that "describe a distribution of power and resources within families such that men maintain power and control of resources, and women are powerless and dependent on men".

7   In fact, sex segregation patterns in labor markets that are cultural in origin may break down in the face of changes in labor market demand (Youssef et al, 1980). Thus, in many developing countries women are increasingly found to participate in market-oriented activities as development proceeds. Data collected recently from rural Bangladesh and used in this paper show such a trend in women's work patterns.

8   Upazilas are administrative units covering roughly an area of 100 sq. miles consisting of several unions. Unions in turn are collections of a number of villages.

9   During the original survey period, the households were selected randomly and interviews were conducted three times corresponding to three crop seasons (Aus, Aman, and Boro).

10   The Bangladesh Institute of Development Studies (BIDS) conducted this study which reported that more than one-third of all workers in the rural industries were found to be women, of which about 84 percent were unpaid family helpers (BIDS, 1981).

11   This does not exclude the possibility that women do not work in more than two activities at a time. The two-way classification is done on the basis of time devoted mostly to two activities.

12   Separate regressions for five categories of time-use patterns were run which showed that the data can be aggregated across activity groups along these lines without loss of explanatory power.

13   The time-use patterns organized in this way may imply some form of female status in terms of woman's control over economic resources and hence less economic dependence on man as she moves from complete unpaid family farm work (income generated therein mostly goes for family consumption) to more market-oriented activities. This pattern may also imply some degree of incompatibility between work and on-job childcaring.

14 The household production model approach has been criticised on the ground that it bypasses the problem of defining female status in the household by assuming that husbands and wives reach decisions without any conflict and that the wife's earned income is a component of family's budget irrespective of whether or not she has any control over the family's resources (Mason,1984). The mere existence of family units is itself an indication that husbands and wives at least aviod confrontation in household decision-making so that the household model may be applicable.

15 One may prefer to use land instead of livestock as a measure of non-labor income. However, to the extent that both these resources tend to be highly correlated, the effect of any of these measures will indicate the anticipated effect of this asset variable.

16 An alternative technique is to estimate earnings for the subsample of women working in the modern sector and on this basis predict a wage offer for women not working in the modern sector. This is precisely the Heckman type selection problem in estimating female labor supply to market activities (Heckman, 1974; 1979). This method will generate inconsistent parameter estimates if the two subsamples differ in unmeasured characteristics. Using community wage rates bypasses the selectivity problem by assuming that every woman faces these wage rates irrespective of her ability, education, and experience, thereby implying that the rate of return on human capital investment is zero.

17 Fertility is defined here as the cumulative births adjusted by the wife's age. It is computed by dividing the number of children ever born to the housewife by the number of children predicted according to her age. The predicted age-specific fertility is estimated by fitting a polynomial birth function of age of woman between age 15 to 49.

18 The extent of compatibility between childcare and work for market income depends on a number of factors such as possibility of rearing children by older children and or relatives, or by mother's surrogates such as maidservant, and possibility of occupation that renders some degree of compatibility between on-job childcare and work without any adverse effects on market productivity.

19 Statistical analysis of models in which the endogenous variables are qualitative is viewed as a problem of predicting probabilities for the possible responses of the qualitative dependent variables (Maddala, 1984). When the possible responses for the qualitative variable assume multiple values, the OLS method if applied will produce estimates that suffer from two possible errors: one is heteroskedasticity and the other is the probability that the predicted probabilities of falling into these multiple groups will be negative or greater than one. Thus, the econometric method required to estimate such multinomial functions where the responses are more than two, and the explanatory variables are continuous, is the maximum likelihood method as discussed in Nerlove and Press (1973).

20 Only agricultural wages and not non-agricultural wages are included on the assumption that both these wages move in the same direction. In fact, one study showed that agricultural and non-agricultural wages move in the same direction but with a lag (Papanek, 1984). Alternatively, one may use predicted wages based on the estimated wage offers for women working outside home. This approach may also be inconsistent, given my data characteristics (see footnote 16).

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