

Does Access to Family Planning and Health Services Improve Women's Welfare?

Evidence on Dowries and Intra-Household Bargaining in Bangladesh

Abstract

This paper demonstrates how the availability of family planning and maternal and child health services alters the structure of intra-household bargaining. Despite the intention of many family planning and health services programs to empower women through fertility control, I observe that when women obtain access to services only through marriage, there can be offsetting welfare changes in their bargaining power and in the dowries they are required to pay their husbands. To understand these effects, I develop a model that allows for the possibility of household adjustments to external shocks to occur along two margins simultaneously— both before marriage through a dowry payment as well as within marriage through a shift in the bargaining weights. I then examine the marriage market effects of a quasi-randomized family planning and health services program in rural Bangladesh using 1996 cross-sectional data on nearly 4,500 households. I find that women pay 14 percent higher dowries in order to obtain husbands with access to the program, and this result is confirmed in a difference-in-differences specification. Moreover, compared to women without program access, women in the treatment area are 33 percent less likely to be able to make large purchases without permission from their husbands or another household member. The fact that I observe adjustments both before and within marriage suggests that marital contracts in Matlab occur in a setting of limited commitment.

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1. Introduction

Programs to limit fertility and provide maternal and child care hold the potential to improve socioeconomic outcomes in developing countries. Evaluations of quasi-randomized family planning programs in Bangladesh and Colombia document large declines in fertility (Phillips et al. 1982, Koenig et al. 1992, Miller 2005). Other evaluations find evidence of secondary effects on household behavior, including increased human capital investments and reduced child labor supply (Sinha 2003, Joshi and Schultz 2007). In this paper, I demonstrate a further avenue through which family planning and health services programs can affect the welfare of individual members of the household: access to a program can alter marriage market behavior and change the dynamics of post-marriage intra-household bargaining.

Despite the intention of many family planning and health services interventions to empower women by giving them more control over the fertility decision, I observe that when men control access to the program, women may actually become worse off. I develop a model that unites the household bargaining literature with the development literature on dowries by allowing for the possibility of household adjustments to external shocks to occur not only within marriage through changes in bargaining weights but also before marriage through a dowry payment. The model predicts that when men control access to the program, their share of the marital surplus will increase at their wives' expense. I then test this prediction on the treatment and comparison groups of an ongoing quasi-randomized family planning program in Bangladesh. Using probit models for multiple measures of female decision-making power within the household, I find that women who reside within program treatment areas (i.e. treated women) are between 4 and 7 percentage points less likely (a 33 percent differential from the mean) than women in the comparison areas (i.e. untreated women) to be able to make large purchases without permission from their husbands or another household member. This paper is the first to

apply direct empirical measures of control over household resources to conduct a theoretically motivated test of this important but largely overlooked link between family planning and maternal and child health services and intra-household bargaining. Furthermore, a difference-in-differences model indicates that women who marry after the program begins pay 14 percent higher dowries in order to secure husbands within the treatment area.

I obtain my results using 1996 cross-sectional data on approximately 4,500 households in the nearly 150 villages of Matlab district, a rural agricultural area of Bangladesh 55 km southeast of Dhaka (see Figure 1). Since 1977, a maternal and child health and family planning program (the MCHFP) has been operating in randomly chosen but contiguous geographic blocks within Matlab. I show in this paper that the services provided by the program not only reduce fertility rates in the treatment area when compared with the control area, but they also enhance the health and survival rates of infants and children. Because geographic location determines eligibility for the program and women typically move in with their husband's family upon marriage, wives obtain access to program services only if their husbands reside in the treatment area. Thus, the MCHFP endows men with a new asset to bring to marriage that is highly desired by women—the enhanced child quality and reduced child quantity provided by the program.

Two distinct strands of the theoretical literature have implications for this endowment change on the marital contract, each of which depends on the assumption made about the level of commitment to the original contract. I first develop a simple bargaining model predicting that in a setting of non-commitment to the initial contract, a couple will revise their contract in light of the husband's new endowment to give decreased weight to the wife's preferences over the allocation of household resources. This change occurs regardless of whether the couple married before or after the program began, due to the husband's expanded options outside of marriage and the corresponding increase in his threat point. I then assume a setting of full commitment

and outline a model that expects a different margin of adjustment, where the change in the marital surplus due to the new program endowment will instead be transferred from wife to husband at the time of marriage through a dowry payment. In this case, increased dowries paid to treatment area men on the marriage market will negate any shift in bargaining weights after marriage. This change occurs only for women who marry after the program begins; there should be no significant differences in dowry payments among already-married women in the treatment and comparison areas.

Rather than follow the previous literature and restrict changes to only one of these margins of adjustment, I remain agnostic about each couple's choice of marriage contract revision. This allows the possibility that a couple on the post-program marriage market may in fact choose to adjust along both margins, partially increasing the dowry payment while simultaneously altering the sharing rule. My empirical results suggest just this mix—I separate the data sample by period of marriage to find that women in post-program marriages (i.e. those marriages occurring after the program begins) both increase their dowry payments to treatment area men and exhibit decreased bargaining power within the marriage. Meanwhile, women in pre-program marriages show a similar bargaining power differential but no differences in dowry payments.

More specifically, the data shows that the ability of treatment area women to independently make large economic purchases is between 4 and 7 percentage points lower than women in the control group for both pre-existing and post-program marriages. I interpret this result as indicating that the MCHFP induces a renegotiation of the sharing rule, which in turn implies that marital contracts in Matlab occur in a setting of partial commitment. I do not find significant differences in the level of independence over large purchases for the cohorts of women who are ineligible for direct participation in the program, including unmarried women in

their fertile years and married women who were past menopause before the program began. The bargaining power changes that I observe for treated cohorts are therefore likely related to the family planning and health services program itself and its effect on the intra-household dynamics of married couples.

Despite the many previous studies arguing that the comparison area villages are an appropriate control for the treatment villages, there may be some concern that my results merely reflect pre-existing or unobservable differences between the two groups. Although I am limited to a cross-sectional sample of these women and cannot look directly at pre-program outcomes, I can observe the pre-program cohort of women (i.e. women past menopause at the start of the MCHFP), and I find few substantial demographic differences between pre-program women living in the treated and untreated areas. I also look at descriptive statistics from a 1974 pre-program census of the Matlab population and perform several robustness checks on the main results, but like all other studies using this data, it is ultimately impossible to fully account for unobservable characteristics.

However, when estimating my second set of results on changes in dowry payments to treatment area males, I can apply a difference-in-differences style specification to control for such unobservables. In this case, the data records retrospective dowry information for all couples, which allows me to find the change in dowry payments over the pre and post-program periods for the treatment area, after accounting for the corresponding change in the control area. While there are no significant differences in either the levels or trends in dowry payments paid to treatment and comparison area men in pre-existing marriages, treatment area men in post-program marriages receive dowry payments that are 1,100 taka higher than their untreated counterparts (a 14 percent difference). These results are confirmed in a difference-in-differences set-up, which shows that treatment area males begin receiving higher dowries than untreated

males in 1977, the first year of the program (significant at the 10 percent level). Combined with my first set of results on bargaining power, these findings suggest that many couples negotiate with limited commitment and respond to shocks along multiple margins of adjustment.

Moreover, my findings also caution that when family planning and health services programs are administered such that men control access, they may appropriate the entire increase in marital surplus due to the program and consequently induce negative long-term welfare changes for women.

In the next section, I describe the Matlab family planning and health services program and its first-order impacts. I then develop a model that outlines the comparative static effects of the program endowment on female bargaining power (in a setting of non-commitment) and dowry payments (in a setting of full commitment). After I discuss the dataset used in my analysis, I present my empirical results and conclude.

2. The Matlab Maternal and Child Health and Family Planning Project

Sponsored by the International Centre for Diarrheal Disease Research in Bangladesh, the Maternal and Child Health and Family Planning Project began in 1977 and remains ongoing today (Aziz and Mosley 1994). The program administrators designated the treatment and control areas of the program by dividing Matlab into 6 geographic blocks chosen at random. For logistical reasons of managing the program, the blocks were then merged into treatment and control groups based on contiguity of the treatment blocks. This method carries the added benefit of minimizing program spillovers,¹ as long as there are not increasing returns to scale in program treatment externalities. Thus, 4 contiguous blocks form the treatment group (89,000

¹ Spillovers occur if women from control areas travel to nearby treatment village clinics for services.

people in 70 villages), while the other 2 blocks (85,000 people in 79 villages) are the control group.

At the beginning of the project, contraceptive use was low across the entire district, and fertility rates resembled those of pre-transitional demographic areas. A 1974 census reveals the Matlab area to be demographically homogenous before the project begins (Fauveau and Chakraborty 1994, Joshi and Schultz 2007), and Sinha (2003) backs up this finding using 1996 data. Although the large sample size of the 1974 census results in significant differences between the future treatment and control groups across several indicators, Table 1 shows most of these differences to be small in magnitude (with the exception of the proportion of each group that is Muslim, which the empirical specifications control for).

Descriptive statistics in 1996 for the pre-program female cohort (women already past menopause at the inception of the MHCFP) show few significant differences between women living in the treatment vs. comparison areas (see Table 2). Pre-program women in the treatment area have an average of 1/5 fewer male child deaths, and yet this statistic may be entangled with a program effect, since these families could still have taken advantage of intensive child health services despite no longer being fertile. Regarding labor force participation, when asked to recall any employment beyond housework twenty years earlier (1976, the year before the MCHFP begins), treatment area women were 14 percentage points less likely than control women to report having participated in outside work.² This trend between the experimental areas continues through 1996 (see Table 6), so I control for outside work in my empirical specifications.³

² I define labor force participation for women as claiming some job other than housework as their primary activity over the past month. Because *purdah* prevents women from leaving their bari often and participating in the public sphere, such jobs are done at home (Amin and Pebley 1994). Nearly half the women who currently work cite rearing hens and ducks as their job, with a further third husking paddy.

³ There do not appear to be any differences in 1974 between labor force participation rates of married women in the treatment and control areas (see Table 1). I am unsure why the 1974 census results vary from the labor force results shown by the smaller MHSS sample in 1976 and 1996; consequently, I am careful to control for it.

In the treatment villages, local community health workers visit all fertile, married women in their households fortnightly, offering a range of contraceptives,⁴ immunizations for pregnant women, and child nutritional and health advice⁵ (Fauveau and Chakraborty 1994). In 1982, half the treatment area also began receiving expanded services, consisting of prenatal care and immunizations for all women and children, with these services later being diffused throughout the rest of the treatment villages.⁶ Since 1989, then, community health workers have been providing the entire treatment group with comprehensive immunization services, nutritional education, help with childhood dysentery diseases, and extensive maternity care.

In contrast, women in the control villages have access only to the government-sponsored health program, which began in 1965 but remains much less intensive than the MCHFP program. While women treated by the MCHFP receive regular home visits from local female trained health workers, women in the control group receive very infrequent visits from government workers⁷ and must travel to the nearest government clinic to obtain services. These clinics are often dirty and unsterile, the government workers are usually male, and counseling is not typically done in private (Foster 1994, Piet-Pelon and Rob 1997, Joshi and Schultz 2007). Moreover, restrictions on female mobility outside the bari⁸ severely limits their access to the services available at these clinics. *Purdah* (female seclusion) ensures that the MCHFP area with its in-home services becomes something that women will actually pay to marry into, rather than

⁴ Contraceptive types include IUD, injections, sterilization, oral birth control pills, and condoms.

⁵ Initial health services included tetanus toxoid immunizations for pregnant women, neonatal vitamins, maternal and child nutritional advice, and oral rehydration for diarrheal diseases.

⁶ These expanded services included tetanus toxoid immunizations for all women of reproductive age, measles immunizations for children, and prenatal care and safe delivery kits for pregnant women. From 1986 on, all treatment blocks received complete immunizations against EPI diseases, vitamin A supplements, and nutritional rehabilitation (Fauveau and Chakraborty 1994).

⁷ Each control area household should receive a visit by government workers every two months, but the average number is actually 3.6 visits per year (Janowitz et al. 1997).

⁸ A bari is a group of often inter-related households that share the same courtyard, living and working closely together.

simply trading a longer travel time to services for the relatively lower dowries required by the control area.

Regardless, because untreated women may still be using contraceptives and obtaining limited services, either through participation in the government program or through spillovers from the treatment area, some concern might exist regarding experiment contamination (Phillips et al. 1988). Although such contamination should only understate the true effects of the MCHFP project, I perform a robustness check on the main results that limits the sample to border villages (i.e. treatment villages that share a border with a control village, and vice versa). The potential for spillovers is greatest along these border areas, yet the observed bargaining power effects become even stronger in that sample (see Table 14).

Though the treatment and control areas had similar fertility rates before program implementation, the intensive nature of the family planning services caused fertility rates in the treatment villages to experience a 25 percent drop relative to the control villages within the first two years of the program. Over time, fertility has continued to fall in both areas, and yet treatment area rates remain 33 percent lower on average than control area rates (Fauveau and Chakraborty 1994). Moreover, program evaluations continue to cite significant declines in infant, child, and maternal mortality rates starting in the first year as a result of the health education components of the project (Aziz and Mosley 1994, Fauveau and Chakraborty 1994). By 1982, treatment area children were 40 percent less likely to die than their untreated counterparts (Bhuiya and D'Souza 1994).

Table 3 outlines the first-order effects of the Matlab family planning and health services program on the fertile married women in my data sample. In 1996, women living in the program area had 20 percentage point higher rates of contraceptive use and significantly fewer numbers of child deaths. They spaced their births by nearly 5 months more on average than untreated

women and were 3 percentage points less likely to have a stillbirth. In addition, the number of births for treated women who had completed their fertility cycle was 1/5 child lower than those for women from untreated villages (a 3 percent differential, although it is likely to increase as women who have been treated for longer periods begin to complete their fertility cycle). These differences are statistically significant and can be traced back to the family planning and health services program by graphing their values in 1996 according to five-year birth cohorts (see Figures 2a-2b). Beginning just before the 1940-1945 cohort (the earliest full cohort of women to still be fertile when the program began), treated and untreated women began to diverge in contraceptive use and child mortality trends.

The impact of the MCHFP on child health is further illustrated through a 1996 vaccination rate that was over 30 percentage points higher (significant at the 1 percent level) for treated 0-5 years olds than for untreated ones. Treated children under 15 also missed 0.2 fewer days of school due to illness in the month of the survey (significant at the 10 percent level). Moreover, the body mass indices of both infants and children under 5 years were higher in the treatment area, although the differences are not statistically significant. Overall, these statistics point to substantial and significant first-order impacts of the program on both family planning and maternal and child health trends.

3. A Transferable Utility Model with Adjustments along Two Margins

By virtue of being born in a treatment area village, husbands can attract wives with the promise of contraceptive access and of raising their future children under the MCHFP. Thus, the nature of Matlab as a patrilocal society grants treatment area men an increased endowment through the program. The labor literature on intra-household bargaining provides a guide to

examining the effects of this endowment on female power within the household.⁹ In these models, bargaining weights determined by distribution factors¹⁰ govern intra-household resource allocations, with the outcome being dependent on the marital threat point (the allocation that occurs if couples cannot agree). This threat point is typically defined as divorce or remaining single, thereby hinging intra-marital bargaining power on the opportunities available to partners outside of their marriage.¹¹ Even though only 7 percent of my data sample ever gets divorced, it may still be the relevant threat point for the Matlab population (it is just rarely reached).

An unanticipated shock like the MCHFP may induce a renegotiation of the bargaining weights for all couples in pre-existing marriages in order to appropriately reflect the husband's new endowment (and the increase in his threat point). To specify this change, I develop a model with transferable utilities between the husband and wife. Marriages in Matlab are usually arranged by the couple's families, and I follow Anderson (2000) and Mobarak et al. (2007), among others, in combining the utilities of the bride and groom with their families.¹²

Assume that the household maximizes the following welfare function:

$$U^f + U^m = QC$$

$$\text{where: } C = c^f + c^m$$

⁹ Bargaining can be cooperative, in which case it is assumed that marital agreements are costlessly enforceable and the outcome is always efficient (Manser and Brown 1980, McElroy and Horney 1981), or it can be non-cooperative, in which case the outcome may or may not be efficient (Lundberg and Pollak 1993). Recent examples relating to fertility decisions include Oreffice (2007), Chiappori and Oreffice (2005), Rasul (2005), and Iyigun and Walsh (2007).

¹⁰ Examples of distribution factors could include income earned by each spouse, unearned income endowments, sex ratios determining relative scarcity of each gender, or control over fertility decisions and availability of fertility control technology (Chiappori et al. 2002, Oreffice 2007, Chiappori and Oreffice 2005). These factors are often assumed exogenous, but a few recent papers have endogenized the marital bargaining weights, as in Basu (2006) and Iyigun and Walsh (2007), where the consequence may be an inefficient outcome.

¹¹ Alternatively, when marriage involves some cooperative behavior, bargaining power may instead hinge on non-cooperative options of behavior that may make at least one spouse better off (Lundberg and Pollak 1993).

¹² Over 75 percent of marriages in my sample are arranged directly by the couples' parents, while less than 8 percent are chosen by the couples themselves. For simplicity, I assume fully benevolent parents who, despite arranging the marriage, do not consider any utility other than their child's when making decisions.

$$Q = \begin{cases} q & \text{if untreated household} \\ hq & \text{if treated household} \end{cases}$$

There are two private consumption goods in marriage (c^i), where i indexes male (m) or female (f), and one public good, quantity of children (q). A household that is treated by the family planning and health services program receives an exogenous endowment of h ($h > 1$ for treated households, $h = 1$ for untreated households). I choose a complementary utility function in order to ensure an interior solution to the maximization problem.

The household is also subject to a budget constraint,

$$c^m + c^f + pq = y^f + y^m = Y,$$

where p is the price of children, y^i are exogenous private wealth endowments, and the price of consumption is set to 1. Using the budget constraint to substitute for C , the household maximization problem expands to:

$$\text{Max}_q (hq)(Y - pq).$$

From the first-order condition, I solve for q^* and substitute back in to find the couple's utility:

$$U^f + U^m = \frac{hY^2}{4p}. \quad (1)$$

A higher h increases total household utility. Since h is acquired solely through marriage to a treatment area male, it therefore becomes a positive trait for males on the marriage market.

If this hypothesis is true, then the new endowment given to treatment area males should be represented by an increase in their outside options on the marriage market (i.e. an expansion in their pool of potential mates). I find that between the pre and post-program periods, the prevalence of inter-area marriages (e.g. marriages between a treatment area person and a control person) increases from 7 percent to 16 percent (t-test significant at the 1 percent level, this sample includes all marriages between 1975-1976 for the pre-program period and 1978-1982 for

the post-program period). I also apply a difference-in-differences specification that uses retrospective census information on birthplaces and marriage years, finding that treated males on the post-program marriage market are 37 percent less likely than treated males on the pre-program market to choose a wife from within the treatment area (a 35 percentage point decrease, significant at the 1 percent level, see Table 4). These results suggest that treated males are in fact able to attract mates from a larger pool.

In contrast to their utility when married, the maximization problems of the male and female who remain single are:

$$\text{Max}_{c^i} c^i \quad \text{s.t. } c^i \leq y^i, \text{ for } i=m,f.$$

Children are a public good that can only be had in marriage and do not enter the single's problem. The solutions delineate the reservation utilities of the male and female, such that

$$\begin{aligned} \bar{U}^f &= y^f \\ \bar{U}^m &= y^m \end{aligned}$$

The marital surplus, or the gains from marriage, is then found by subtracting the reservation utilities from the couple's utility (1):

$$(U^f + U^m) - (\bar{U}^f + \bar{U}^m) = \frac{hY^2 - 4pY}{4p}. \quad (2)$$

I assume this surplus to be nonnegative so that there will be no divorce, which is a reasonable assumption given the undesirability and infrequency of that outcome in Matlab. Due to limited education and the widespread practice of *purdah*, Matlab women have few opportunities outside of marriage. Divorced women also lack strong legal or social institutions to ensure financial support by their ex-husbands, and as a consequence, they usually return to their parents' household as dependents (Bhuiya et al. 2005). Such a return is viewed unfavorably, and those women (and their children) with no male guardian are looked down upon.

Thus, men require higher dowry payments to marry divorcees (Bhuiya et al. 2005). The divorcee's parents, who might believe their obligation to pay dowry was fulfilled by her first marriage, may be reluctant to welcome her home for the fear of having to pay another dowry in the future.¹³

Not surprisingly, then, when divorce does occur, it is often initiated by the husband rather than the wife (Bhuiya and Chowdhury 1997). The exogenous shock of the family planning and health services program will not be enough to trigger divorce among Matlab women, because the gains to marriage for them remain so large (Weiss 2001). Rather, Matlab women are likely to tolerate many unfavorable changes within their own marriage (such as decreased bargaining power) before accepting divorce.

3.1. No Commitment: Bargaining Power within Marriage

Suppose there exists some sharing rule θ ($\theta \in [0,1]$) to divide the marital surplus between the husband and wife, such that the wife receives θ and the husband receives $(1-\theta)$. This parameter will be a function of their reservation utilities (which describe their options outside the marriage), any dowry payment (d) made before marriage from the bride's family to the groom's, and other exogenous determinants of bargaining power ω (e.g. cultural norms, the population sex ratio, etc.). Each partner's share of the surplus is received on top of their reservation utilities, making the utility of the female when married:

$$U^f = \theta \left[\frac{hY^2 - 4pY}{4p} \right] + y^f. \quad (3)$$

Similarly, the utility of the married male is:

¹³ It can be difficult to enforce the repayment of even a portion of the dowry upon divorce in Matlab, and so it is typically not returned.

$$U^m = (1 - \theta) \left[\frac{hY^2 - 4pY}{4p} \right] + y^m. \quad (4)$$

It is easy to show that for a given θ , a wife who marries a husband living in the treatment area achieves a higher utility:

$$U^f = \begin{cases} \theta \left[\frac{Y^2 - 4pY}{4p} \right] + y^f & \text{if husband untreated} \\ \theta \left[\frac{hY^2 - 4pY}{4p} \right] + y^f & \text{if husband treated} \end{cases}$$

If instead, θ is allowed to vary in order to keep utility constant across treated and untreated women, I find:

$$\begin{aligned} \theta^{untreated} \left[\frac{Y^2 - 4pY}{4p} \right] + y^f &= \theta^{treated} \left[\frac{hY^2 - 4pY}{4p} \right] + y^f \\ \Rightarrow \frac{\theta^{untreated}}{\theta^{treated}} &= \left[\frac{hY - 4p}{Y - 4p} \right] > 1. \end{aligned} \quad (5)$$

Equation (5) is the program premium. Before the program begins, $\theta^{treated} = \theta^{untreated}$, because $h = 1$ for all couples. After, $\theta^{treated} < \theta^{untreated}$ (because the premium is greater than one), and women give up some of their power over the marital surplus.

Proposition 1: $\left(\frac{\partial \theta}{\partial h} \right) < 0$. When there is no binding commitment to the initial marriage contract,

the introduction of the family planning and health services program will decrease the bargaining power of the wife of a treated husband relative to the power of the wife of an untreated husband.

The intuition behind this result is simple. Due to the increase in total utility that follows from participation in the program, women will place a premium on being able to marry treated males. They should be willing to sacrifice some of their bargaining power over the marital surplus in order to hold onto (or obtain) these men.

3.2. Full Commitment: Dowry Payments before Marriage

In contrast to the bargaining literature that enables adjustments to shocks to occur within marriage (thereby requiring no binding commitment to the division of the marital surplus), a second prevailing strand of the literature assumes a setting in which the extra marital surplus attained through this endowment will be appropriately transferred before marriage, such that households designate a point on the ex-ante Pareto frontier.¹⁴ These full commitment models, in which household resource allocation is credibly committed to through pre-marital negotiations, have been widely applied in the development literature under the assumption that utilities are easily transferable in dowry payments (Becker 1981, Rao 1993, Deolalikar and Rao 1998, Anderson 2000, Arunachalam and Naidu 2006). In this case, if women on the marriage market after the program begins desire to ensure the original $\theta^{untreated}$ that they would receive in absence of the MCHFP, then they must change their dowry payment to a treated male by the difference between his utility after the program begins at his new $(1 - \theta^{treated})$ and his utility prior to the program at $(1 - \theta^{untreated})$. This constraint will bound the minimum level of dowry acceptable to the male as compensation for remaining at $(1 - \theta^{untreated})$. Substituting the program premium (5) for $\theta^{treated}$ in equation (4), the increase in dowry becomes:

$$\Delta d = U_{post-program}^{m,treated} - U_{pre-program}^m = \frac{Y^2(h-1)}{4p} > 0. \quad (6)$$

Proposition 2: $\left(\frac{\partial d}{\partial h}\right) > 0$. In a setting of full commitment to the initial marriage contract, the

introduction of the family planning and health services program will increase the dowry paid to a treated husband.

¹⁴ See Oreffice (2007), Lich-Tyler (2004), and Mazzocco (2006) for tests of the full commitment vs. no commitment models. See Udry (1996), Lundberg et al. (1997), and Browning and Chiappori (1998) for empirical tests of the unitary (a special case of full commitment) vs. bargaining models.

Again, the intuition is straightforward. The family planning and health services program provides males with an extra endowment that increases the payoff to the female of matching with a treated male. This endowment generates a division between $\theta^{treated}$ and $\theta^{untreated}$. For women not yet married, they have the option to buy more bargaining power within the marriage via an increased dowry payment.

Recent work by Arunachalam and Naidu (2006) relies on this possibility of full commitment to the marriage contract to explain the increase in dowry payments paid to treated men after the Matlab program begins. They (along with Rasul 2005) argue that the introduction and continued supply of female-controlled contraceptives to the household empowers wives to make fertility choices independently of their husbands. Since any married woman living in the treatment area can access contraception within her home and perhaps even without her husband's knowledge, the program may result in increased weight being given to her preferences over her husband's in the fertility decision, and so she must compensate him for this change up-front. Ex-ante, there is no reason to favor my story (where husbands control an endowment of child quality) over theirs (where women pre-pay for a decrease in the price of contraception), since both are consistent with the increased dowry payments observed in the data.

However, the model of Arunachalam and Naidu (2006) makes the crucial assumption that husbands and wives disagree over fertility preferences, which implies that they face separate trade-offs between child quantity and quality. Otherwise, the wife cannot use access to contraceptives to threaten (either explicitly or implicitly) unapproved changes in fertility and increase her power in the fertility bargain. In contrast, my model remains agnostic about the nature of fertility preferences between men and women; it merely requires that women desire to use program services.

Using data on fertile married couples in 1996, I find that fewer than 1 out of 5 Matlab couples actually disagree over the desired number of additional children (see Table 5). This number is constant across both treatment and control areas, and its insignificance does not vary according to birth cohort.¹⁵ Moreover, Freedman (1997) and Koenig et al. (1987) find no evidence that the program has altered the fertility preferences of women (it merely enabled the expression of already-existing demand for fewer children). Thus, not only do husbands and wives exhibit similar fertility preferences, but the program does not appear to have exacerbated or ameliorated any potential couple disagreements.

In addition, Arunachalam and Naidu (2006) limit their focus to the fertility aspect of the program, ignoring the substantial child quality improvements that are also targeted by the MCHFP. They restrict their data sample to dowry payments made before 1982 in an attempt to avoid effects caused by child health interventions that occur afterward, and yet, as discussed in Section 2, the MCHFP had maternal and child health components even at its inception in 1977. These health components would be attractive to husbands as well as wives, such that even if men did not approve of the family planning portion of the program, their overall feelings regarding program participation might remain ambiguous.

In fact, Table 5 shows that husbands are largely willing participants in the program; in 1996, only 1 percent of women in the treatment area were prevented from using contraception due to husband or other family member disapproval, and only 7 percent of women were using contraception despite such disapproval. A 1990 program evaluation reports a similar finding—81 percent of treatment area women and 74 percent of control area women believed their husbands approved of family planning practices, and 85 percent and 70 percent, respectively,

¹⁵ Probit models with additional control variables further indicate that treated couples are no more likely than untreated couples to disagree over fertility decisions, suggesting that the preferences of treated couples have not been affected by the MCHFP itself.

believed that their relatives approved as well (Koenig et al. 1992). This result is intuitive; the male must receive some benefit from the family planning and health services program, or he would not allow his wife's participation in the first place. My model explicitly incorporates this willingness to participate in its assumption that the MCHFP improves the quality of each child, which subsequently increases total household utility. Overall, therefore, the ancillary evidence available within the data is more consistent with the assumptions and predictions of my model rather than the story of information advantage developed by Arunachalam and Naidu (2006).

3.3. Adjustments along Both Margins

Thus, two separate strands of the literature predict different adjustments to the program endowment. First, the bargaining literature suggests that the bargaining power of treatment area women will decline relative to untreated women. On the other hand, the full commitment literature insists that the marriage market can completely offset any potential change in bargaining weights due to the MCHFP endowment, since women will pay increased dowries. However, forcing all changes to occur solely along one dimension may be too restrictive. The application of bargaining models within a developing country context allows for adjustments to occur along two margins simultaneously—women may choose to pay only some portion of that increased dowry in return for some smaller change in bargaining power. This option may be chosen if utilities are only partially transferable between husband and wife. Moreover, the husband may force this option if the bargaining power of the female within the marriage will already be so low as to make further downward adjustments impossible (this may be especially relevant in many developing countries, where wives traditionally have had little control over household resources). In that case, he will require at least a portion of the surplus to be transferred at the outset through dowry.

Figure 3 depicts the indifference curves of women in the (θ, d) plane, illustrating the corner solutions and the corresponding range of possible intermediate cases. For treatment area women, a higher value of h shifts their isoquants in the northwest direction. The bargaining literature restricts program adjustment to a horizontal movement from $\theta^{untreated}$ to $\theta^{treated}$, while Arunachalam and Naidu (2006) restrict it to a vertical movement from $d^{untreated}$ to $d^{treated}$. However, rather than pin down one specific equilibrium point, I choose to avoid imposing further constraints on the choice set of women. I simply outline a set of possible equilibriums for the model ranging from points a to b in Figure 3, remaining agnostic about each female's particular combination of increased dowry and decreased bargaining power. Note that there is no ex-ante reason to assume that either of the corner solutions is any more desirable than the intermediate equilibriums.

3.4. Empirical Estimation

My model suggests that the MCHFP can induce adjustments along two margins within marriage— increased dowry payments to treated men and lower bargaining power of treated women. For treated women in pre-program marriages who can only adjust along one margin, I expect to observe that they accept lower bargaining power over household resources relative to untreated women in exchange for retaining their treated husbands. Women in post-program marriages, however, may choose either to adjust fully along one of the two margins or to adjust along both, depending on the level of commitment. I first use a hedonic difference-in-differences model to estimate the dowry payment as a function of the program endowment of the male, the year of marriage (to account for inflation), the interaction of the endowment with marriage year, and other variables controlling for age, education, and socioeconomic status of both partners.

I then estimate a probit model for the bargaining power of the female in a given match. According to my model, bargaining power within marriage is determined by the program endowment, the reservation utilities of the couple (which in turn are a function of individual traits and endowments), any dowry payment made to secure the match, and exogenous social factors and cultural gender norms.

4. Data

For the empirical estimations, I use the Matlab Health and Socioeconomic Survey (MHSS) administered in 1996 to a random sample covering 4,364 households in 2,687 baris. This sample comprises approximately 33 percent of the total number of Matlab baris. This cross-sectional dataset holds several advantages over those previously used in measuring bargaining power. First, the methodical implementation of the family planning and health services program within Matlab creates a geographically proximate control group for comparisons with households receiving contraceptive supplies and intensive maternal and child care. In addition, the detailed nature of the survey questions in my dataset makes possible direct empirical tests of the effects of the program on intra-household resource allocation. Finally, because the MHSS records retrospective information on dowries paid in the year of marriage (as reported by the wife interviewed separately from her husband), I can apply a difference-in-differences specification to estimate changes in dowry payments to treated males across the pre and post-program periods.

Table 6 outlines the demographic statistics of married women who are fertile in 1996.¹⁶ Most measures are not significantly different between either treated and untreated women or

¹⁶ This sample, which is used in the empirical specifications, excludes the 22 women reporting employment in ICDDR,B hospitals (the MHC FP sponsor), whose average 1996 earned income is 47 times the average earned income of other women and therefore represent clear outliers.

their spouses (with the exception of spousal years of education, which is a third of a year higher for treated women). Treated women do, however, receive significantly greater amounts of transfers from other households (measured in both monetary and in-kind transfers), and this results in a total household income that is nearly 5,000 taka higher than untreated households (an 11 percent differential).¹⁷ Labor force participation rates for fertile married treated women are 5 percentage points lower than rates for untreated women, but as noted earlier, this difference reflects the continuation of a pre-program trend (see Table 2).

Table 7 looks at the extent of female power over economic resources. Specifically, I measure the percentage of women who do not need permission from their husband or another household member to make purchases. I follow Williams (2005) in categorizing the purchases as large (items at the daily market, betel leaf, saris for themselves, and children's clothing) or small (kerosene or cooking oil for the family, bangles or soap for their own use, and sweets or ice cream for children). Women treated by the program are on average 5.5 percentage points less likely to be able to independently purchase any of these items (a differential of 9 percent for small purchases and 39 percent for large purchases).

The cross-sectional sample used for the probit estimations of bargaining power over purchases consists of all married women surveyed by the MHSS dataset who are fertile for some period after 1977 (the first year of the program). A small number of these women are missing spousal information; thus, I lose some observations depending on the particular control variables used. Because the family planning and health services program was an unanticipated exogenous

¹⁷ I am unsure whether the differences in unearned income existed before the MCHFP began or in fact resulted from the program. Using the MHSS dataset, Anderson and Eswaran (2005) observe that unearned income is positively associated with increased bargaining power over household resources. Thus, the fact that treatment area women have higher levels of unearned income should only bias my empirical results upwards toward zero. Regardless, I control for unearned income in my specifications.

shock for already married couples in the treatment area, reverse causality is not a concern in those regression results.¹⁸

However, endogeneity due to unobservables that differ between the treatment and control areas may be an issue. To that end, I include several control variables in my specifications, beginning with information on the individual herself (the percentage of her married years she has been fertile, total births, years of education, current age, age-squared, whether she has a job, whether she is Muslim, earned income over the past year, and unearned income as measured by the value of help received from family or friends in the past year). I control for the individual's spouse as well, including spousal years of education, current age, age-squared, earned income, and unearned income. Finally, I control for the socioeconomic status of the individual's household in the form of household income, household income-squared, and the amount of land owned by the household head.¹⁹ Because my model in Section 3 allows dowry payments to be correlated with both the MCHFP and household bargaining weights, I also add an indicator for whether or not a dowry was part of the marriage contract. Further variables included in the model control for the female's relationship to her household head (wife, daughter, mother, son's wife, or self) and whether or not she is currently co-residing with her husband.²⁰

5. Results

5.1. Dowry Payments

There does not appear to be any differential change in the overall likelihood of receiving dowry for men living in the treatment area vs. those living in the control area across program

¹⁸ The exception to being exogenous to female choices occurs if there are program spillovers with untreated women seeking services, but as discussed earlier, these exceptions should only bias the results towards zero.

¹⁹ All income and land variables are logged and scaled in tens of taka or decimals.

²⁰ I also cluster all regression errors by the six program blocks, thereby allowing for the errors to be dependent within blocks while assuming they remain independent across blocks.

periods (see Table 8). Furthermore, after restricting the sample to only those observations that report having received some form of positive dowry, I do not find significant differences for pre-program marriages between the dowries paid to treatment or control males. Since these women married before the MCHFP began, I do not expect any dowry payment differential between the two groups. Moreover, the first and fifth columns of Table 9 show that there are no significant pre-existing trends in dowry payments across the treatment and control areas for pre-program marriages (as indicated by the coefficient on the interaction between treatment status and marriage year for pre-program marriages). If anything, the pre-program trend in dowry payments finds men from the treatment area receiving *lower* dowries than control men, which means that the significant positive program effect found in my difference-in-differences specification for all marriages is distinguished not only from the zero effect but from its pre-existing trend as well.

Looking at post-program marriages, I find that treated men obtain dowries over 1,100 taka higher than untreated men (a 14 percent difference over the mean payment of 7,855 taka, and significant at the 10 percent level). I also apply a difference-in-differences specification to tobit models that estimate the value of dowry payments to men. Men in the treatment area begin receiving higher dowries (significant at the 10 percent level) than untreated men in 1977, the first year of the family planning and health services program. All of these dowry results are robust to restricting the sample to first marriages only (see Table 9).

In addition, I carry out a falsification test modeled after Aghion et al. (2005). This test replaces the actual program treatment and control groups with false groups and then re-estimates the difference-in-difference specifications first with the false groups only and second with the false groups alongside the actual ones. The first false group consists of northern and southern villages (determined by drawing an imaginary horizontal line across Matlab district), while the

second false group uses households on either side of a flood protection embankment built in the area (dividing households into protected vs. unprotected groups). In both cases, I find no evidence of a statistically significant program effect where I do not expect to see it, and the effect of the actual MCHFP on dowry payments is always greater than the effect of any false program (see Table 10). These results provide further support in favor of the MCHFP as the true driving force behind changes in dowry payments to treatment area males.

5.2. Female Bargaining Power

I also test the impact of the MCHFP on different measures of economic decision-making power, finding that treated women possess significantly less control over household resources than their untreated counterparts.²¹ For these specifications, I limit the sample to all married women who are fertile in 1996, the year of the survey. Women who are treated are more likely than comparison women to require permission for large purchases, with estimates ranging from 5 to 7 percentage points (a 35 percent differential from the mean and significant at the 1 percent level, see Table 11). These results remain robust to excluding the youngest cohorts (women born in 1970 or after) from the sample. The significant effects do not extend to the ability to make small purchases, perhaps because the amount of resources required for them are simply too small to matter in daily life (see Table 12).²²

²¹ I focus on measures of decision-making power over purchases because they are reflective of the allocation of resources within the household. There are several other measures of female empowerment (Malhotra et al. 2002, Williams 2005), including freedom of movement outside the bari and preferences over modesty in the public sphere (i.e. the use of head coverings or burqas). However, because these measures may be governed largely by individual preferences or perceptions of status rather than control over the allocation of household resources, I do not necessarily expect the MCHFP to induce any relative changes in these measures. Accordingly, probit models that I estimate using these measures as dependent variables do not show strong differences between treated and untreated women.

²² In addition, Williams (2005) observes that several papers have argued that the ability to make small purchases is not adequately reflective of female power in the rural Bangladeshi setting.

This change in favor of the husband suggests that the program's effect on bargaining power does indeed operate through providing an increased endowment to the male. Because this channel depends on a woman's marital status rather than just whether or not she is currently fertile, I expand the estimation sample to include all married and single women who are fertile at some period after the program begins, which allows me to interact the variable for treatment area status with an indicator for marital status. After including control variables, women in the MCHFP area who are married are 4 percentage points less likely to make large independent purchases than MCHFP women who are single (a 25 percent differential, see Table 13). Although this result is certainly consistent with the predictions of my model, it is important not to interpret it too strongly, since it may also reflect the fact that unmarried women living with their parents are likely to retain more autonomy than married women living with in-laws.

I also decompose the effect of treatment access by the time of marriage for all women fertile during some period of the program (see Table 13). Treated women in both pre-existing and post-program marriages are between 4 and 6 percentage points less likely than untreated women to be able to make large purchases independently of their husbands in 1996 (a 30 percent differential from the mean). Comparing the two marriages types directly, the data suggests that the effects of access to program treatment differ little based on the period of marriage, with treated women in post-program marriages exerting slightly less economic power than pre-program women over purchases (a 2 percent differential). The fact that adjustments are able to be made both before and within marriage in response to exogenous shocks to the sharing rule implies that pre-marital contracts are negotiated in a setting of limited commitment in Matlab.

Female labor supply is also strongly correlated with household bargaining power. Fertile married women with primary jobs other than housework in 1996 are between 3 and 6 percentage

points more likely to be able to independently make purchases of any size (see Table 11).²³ In addition, female unearned income (transfers received from friends or relatives) also carries a small but positive link to her control over resources. As noted earlier, the value of help received by treatment area women in 1996 is twice as much as that received by control women (see Table 6), so this effort may partially offset the negative program effects on treated women.

A female's choice of spouse does not have much consequence for her bargaining power within the household, with the exception of spouse age, which is associated with a 1 to 2 percentage point increase in female control over resources. Household income also matters little, as indicated by larger but mostly statistically insignificant marginal effects. In addition, the payment of a dowry has an overall indeterminate effect on decision-making power within marriage, although this indicator measures only whether dowry was received and not its value.

5.3. Robustness Tests

I conduct further sensitivity analyses on these results. Since program treatment status is a village-level indicator, I cannot incorporate village fixed-effects to control for unobservable village-specific characteristics. However, the results remain robust to controlling for several observed village characteristics, including travel time in minutes to the nearest large market, travel time in minutes to the nearest small market, the proportion of households with electricity, whether the village is protected by the Meghna-Dhonogoda flood embankment, and dummy variables for whether the village has a credit institution, irrigation for crops, some type of cottage industry, or some type of other industry (including a mill, factory, or workshop; see Table 14).

The results are also robust to restricting the sample to treatment villages sharing a border with a control village, and control villages sharing a border with a treatment village (e.g. border

²³ Anderson and Eswaran (2005) share this finding, using the MHSS data to show that all types of female controlled income empower women, although earned income has a greater impact than unearned income.

villages). In fact, the magnitude of the difference between the relative bargaining power of treated and untreated females becomes even greater with this sample (see Table 14). Such a finding is consistent with the program endowment effect of my model— Matlab women yield bargaining power to obtain or hold onto treated men. Those women living near the program border search for mates on a marriage market with a mixed supply of treated and untreated males. As a consequence, they are relatively more likely to be stuck with an untreated man when compared with women living in the far reaches of the treatment area (where all men on their local marriage market are treated). Thus, I expect border women to be willing to sacrifice more for treated men than their neighboring treated women near the edges of Matlab. The observation of this result in the data further distinguishes my model from that of Arunachalam and Naidu (2006), who would predict that compensation to treated husbands for having fewer children should be similar throughout the program area, rather than varying based on village location.²⁴

5.4. Further Evidence: Unaffected Cohorts

If the family planning and health services program is driving the observed changes in female decision-making power within the household, then this effect should be absent for those groups of women who are not impacted by the program. Thus, there should be no difference between the bargaining power of women in the treatment and control areas if they are unmarried

²⁴ A remaining econometric issue may be the potential selection of women into post-program marriages with treatment area men, which could confound the estimates for those marriages. However, it is extremely difficult to find a suitable instrument for a selection model, because it must be correlated with a female's choice to marry a treated male while remaining independent of her subsequent bargaining power within that marriage, which is itself a function of her outside options for any potential future marriage. Instead, I applied a technique recently developed in Altonji et al. (2005) that estimates the extent of selection on observable variables and uses it as a proxy for the extent of selection on unobserved variables. Even after accounting for selection, fertile married women in treatment areas are on average at least 2 percentage points less likely to make large purchases independently (a difference of 3 percentage points from estimates in Table 10), and women in post-program marriages are at least 4.5 percentage points less likely to do so (a difference of 2.5 percentage points from Table 12). Thus, it does not appear that any bias resulting from selection into post-program marriages with treated men is likely to be large enough to fully account for the difference in bargaining power observed between treated and untreated women.

or infertile. Estimating the models for the sample of unmarried women who are in their fertile years in 1996 shows no differences between the power of treatment and control area women over resources (see Table 15).²⁵ Similarly, I find no differences among the pre-program cohort of currently married women who were past menopause by 1977, the first year of the program. These results point to the ability to participate in the family planning and health services program as the true source of decreased bargaining power for treated women.

Some members of the cohort of currently separated or divorced women may potentially still participate in the child health portion of the program (regardless of fertility status), making expected differences in bargaining power harder to predict. However, if marriage to a treated man is the key reason for the decreased bargaining power of women, then any woman outside of that state should not show such a change. Although the magnitudes of the marginal effects indicate that separated and divorced women in the treatment area may be less likely than control women to independently make large purchases, the differences are not statistically significant.²⁶ This lack of significant differences is consistent with the endowment effect of the MCHFP as being the underlying cause of decreased power for treated cohorts.

6. Conclusion

The Matlab family planning and health services program provides households with access to contraceptive methods and increases child quality. I outline models of full-commitment (based on the development literature on dowry) and non-commitment (based on the labor literature on intra-household bargaining) in order to illustrate how this program endowment both shocks the intra-marital allocation rule for pre-existing marriages and alters the division of

²⁵ Never-married women comprise half of this sample, widows another fourth, and separated and divorced women the rest.

²⁶ Lack of statistical significance may be a result of the small sample size (40-50 observations), so it is important to use caution when interpreting this result.

the marital surplus in future marriages. Because these shifts appear to stem from (perhaps unintentionally) determining treatment access based on location of the husband, the results of this paper underline the importance of carefully targeting whether the husband or wife will control access to such a program.

I show that in order to obtain access to program services, women in post-program marriages are willing to pay dowries to treatment area men that are 14 percent higher than payments to men in the comparison area, and this result is corroborated through a difference-in-differences specification. Using cross-sectional data on married couples who are fertile during some period of the program, I further show that the program decreases female independence over large economic purchases by 4 to 7 percentage points when compared to women in the comparison area (a difference of 33 percent). This shift in bargaining power is exhibited by women in both pre-existing and post-program marriages. The observation of marginal adjustments to the program endowment both before and within marriage suggests that marital contracts occur in a setting of only partial commitment.

The MCHFP has reduced fertility rates and child mortality in addition to increasing birth spacing for the women it treats. This paper presents evidence that the program has also caused significant declines in female power over the allocation of household resources. This shift in bargaining power occurs not merely for the direct participants of the program, but it covers all potential participants (all fertile, married women) residing in the treatment area. Thus, the MCHFP may have induced some unintended negative welfare effects for women that have long-term consequences for household behavior across even non-participant households.

Figure 1: MCHFP Treatment and Control Areas

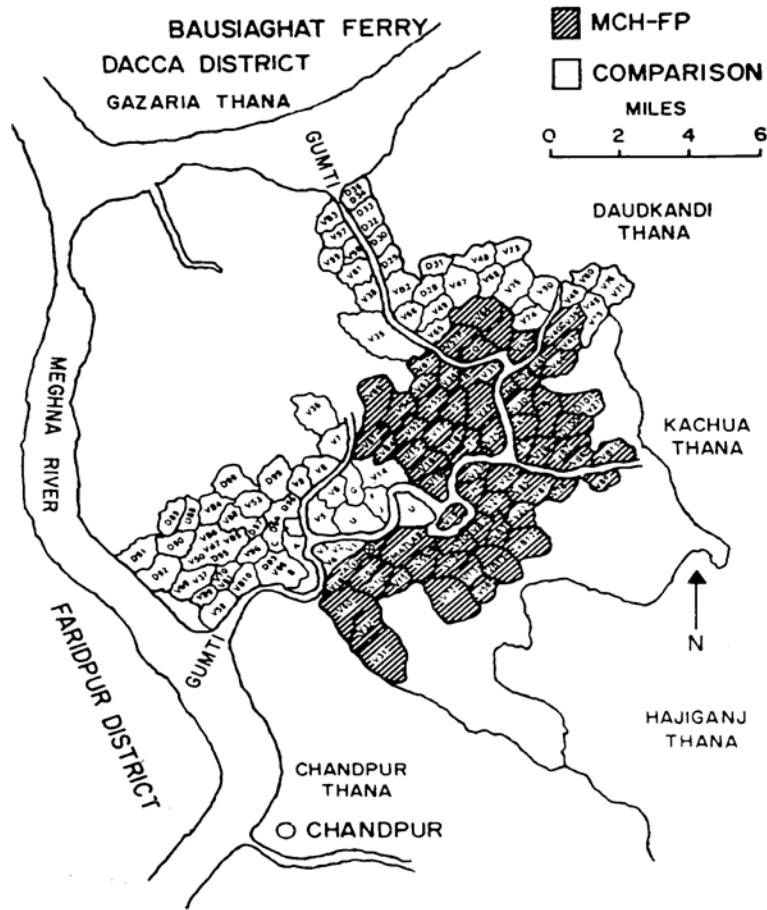
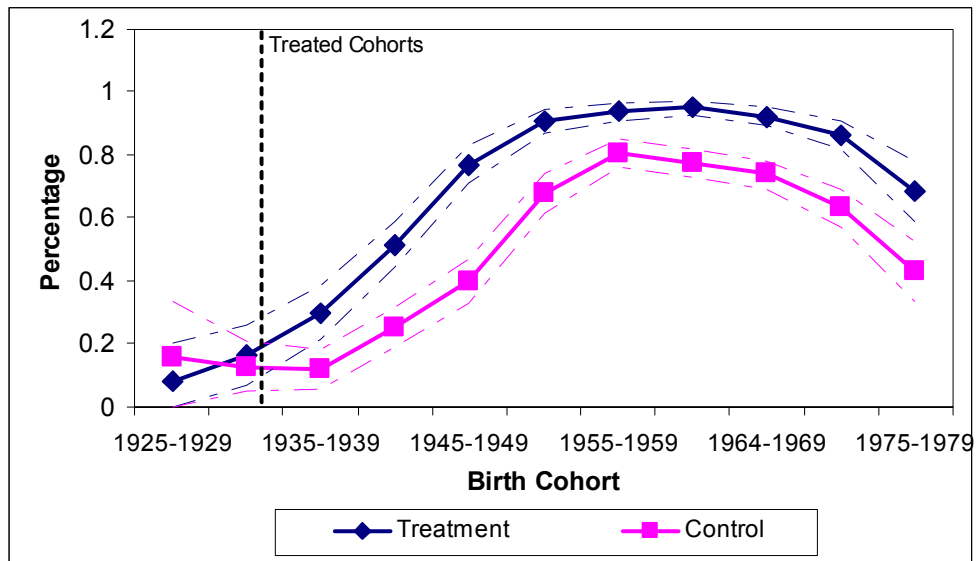
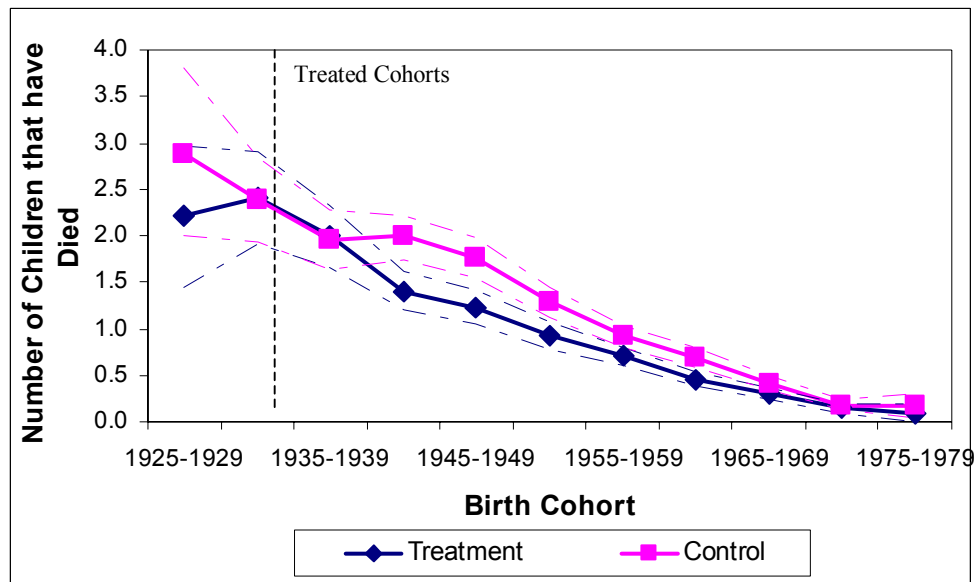


Figure 2a: Married Women Ever Using Contraceptives, by Treatment Group and Birth Cohort



Dashed lines indicate 95% confidence intervals.

Figure 2b: Average Number of Child Deaths Per Married Women, by Treatment Group and Birth Cohort



Dashed lines indicate 95% confidence intervals.

Figure 3: Margins of Adjustment

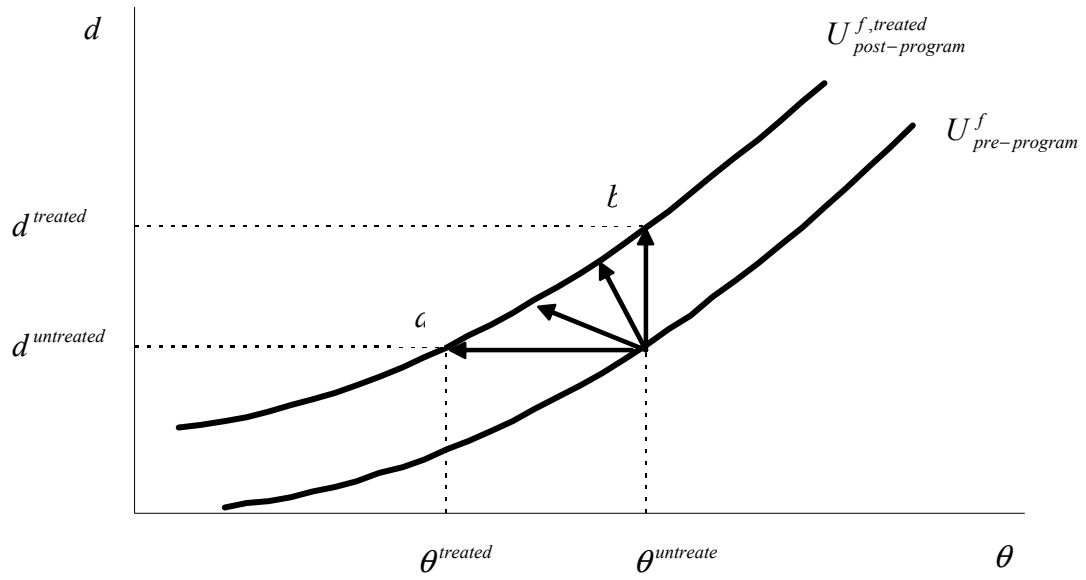


Table 1: Descriptive Statistics from a 1974 Pre-Program Census

1974 Census	Treatment	Control	Difference
Male Years of Education	2.14 (3.63)	1.93 (3.45)	.21*** (.03)
Female Years of Education	1.35 (.02)	1.45 (.02)	-.09*** (.01)
Household Head Yrs. Of Education	2.82 (3.38)	2.85 (3.21)	-.04 (.05)
Farming Household	.40 (.49)	.37 (.48)	.02*** (.01)
Agricultural Labor Household	.19 (.39)	.19 (.39)	.00 (.00)
Married Females with Jobs (%)	.04 (.20)	.03 (.18)	.01*** (.00)
Percentage Currently Divorced	.02 (.13)	.02 (.13)	-.00 (.00)
Percentage Muslim	.79 (.40)	.88 (.32)	-.09*** (.00)
<i>Households</i>	13916	13035	
<i>Total Obs.</i>	38780	31560	

*Standard deviations in parentheses (standard errors in parentheses for difference). *** indicates t-test significant at 1% level. Years of education measured for individuals over 14 years. Percentage of females with jobs measured for women between 14-45 years. Farming and agricultural labor households indicates occupation of household head. Data from 1974 ICDDR,B census of the Matlab population.*

Table 2: Descriptive Statistics from the MHSS for the Pre-Program Cohort

<i>Pre-Program Cohort</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Age at First Marriage	12.71 (3.87)	13.01 (3.11)	-.30 (.35)
Age at First Birth	18.10 (4.42)	18.80 (4.78)	-.71 (.46)
Ever Used Contraception	.11 (.31)	.09 (.28)	.02 (.03)
Spacing Between Births	2.96 (1.07)	2.83 (1.04)	.13 (.11)
Percentage having a Stillbirth	.17 (.38)	.17 (.38)	.00 (.04)
Number of Sons that have Died	1.07 (1.19)	1.27 (1.24)	-.21* (.12)
Number of Daughters that have Died	1.10 (1.14)	1.08 (1.10)	.02 (.11)
Completed Fertility	7.23 (2.58)	7.10 (2.55)	.13 (.25)
Obs.	193	217	
<i>Education and Income</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Years of Education	.56 (1.50)	.77 (1.73)	-.21 (.27)
Age at First Job	12.37 (4.35)	12.43 (2.51)	-.06 (.62)
Had Job in 1976	.82 (.38)	.96 (.19)	-.14*** (.05)
Current Job in 1996	.58 (.50)	.51 (.50)	.07 (.08)
Earned Income, 1996	429.82 (1521.74)	250.97 (1069.33)	178.85 (204.57)
Value of Help from Others, 1996	90.35 (232.12)	75.71 (207.21)	14.64 (35.51)
Household Income, 1996	24944.68 (27177.81)	32142.54 (40582.15)	-7197.87 (5992.26)
Land Owned by Household, 1996	103.55 (125.85)	137.67 (184.21)	-34.12 (27.31)
Obs.	57	106	

*Standard deviations in parentheses (standard errors in parentheses for difference). *** indicates t-test significant at 1% level; * indicates significant at 10% level. Pre-program cohort includes women past menopause in 1977 (beginning of program period). Some observations in this cohort are missing education and income information, resulting in the sample size differential.*

Table 3: First-Order Effects of the MCHFP

<i>Fertile Married Women</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Ever Used Contraception	.92 (.28)	.71 (.45)	.20*** (.01)
Current User	.76 (.43)	.54 (.50)	.22*** (.02)
Spacing Between Births	3.17 (1.16)	2.77 (1.09)	.40*** (.05)
Completed Fertility*	7.02 (2.50)	7.23 (2.55)	-.22* (.12)
Number of Sons that have Died	.29 (.59)	.34 (.65)	-.05** (.03)
Number of Daughters that have Died	.29 (.59)	.40 (.70)	-.11*** (.03)
Percentage having a Stillbirth	.09 (.29)	.12 (.32)	-.03** (.01)
Obs.	1275	1270	
Percentage having Children Vaccinated	.95 (.21)	.64 (.48)	.31*** (.02)
Obs. - Women with Children Under 5 yrs.	821	876	
Children Under 15 Years Old			
Sick Days in past Month	2.80 (4.75)	3.01 (5.03)	-.21* (.12)
Obs.	2997	3136	
Children Under 5 Years Old			
Body Mass Index	15.81 (14.36)	15.21 (6.91)	.59 (.64)
Obs.	580	631	
Infants			
Body Mass Index	16.44 (14.40)	15.63 (6.82)	.81 (1.30)
Obs.	123	157	

Standard deviations in parentheses (standard errors in parentheses for difference). ***indicates t-test significant at 1% level; **indicates t-test significant at 5% level; *indicates t-test significant at 10% level. Completed fertility measured for women have completed their fertility cycle by 1996. Vaccinations measured for those women with children under 5 years of age in 1996.

**Table 4: Effects of the MCHFP on the Pool of Mates for Treatment Area
Males**

	<i>Wife from Treatment Area</i>					
	All Marriages				Border Village Men Only	
	<i>Coeff.</i>	<i>ME</i>	<i>Coeff.</i>	<i>ME</i>	<i>Coeff.</i>	<i>ME</i>
Treatment Area	2.92***	.85	2.92***	.85	2.53***	.79
	(.09)		(.08)		(.06)	
Post-Program Marriage	.49***	.19	.49***	.19	.48***	.19
	(.03)		(.02)		(.03)	
Treatment Area * Post-Program Marr.	-.91***	-.35	-.91***	-.35	-1.07***	-.40
	(.06)		(.06)		(.08)	
Age at Marriage			-.01	-.00	-.00	-.00
			(.01)		(.02)	
Years of Education			.01	.00	.01	.01
			(.01)		(.01)	
Spouse Age at Marriage			.02	.01	.03	.01
			(.05)		(.05)	
Spouse Years of Education			-.01	-.00	-.01	-.01
			(.01)		(.02)	
<i>Further Controls:</i>						
<i>Age-Sq, Spouse Age-Sq</i>		No	Yes		Yes	
<i>R-squared</i>		.43	.43		.29	
<i>Obs.</i>		9635	9604		3265	

*Robust standard errors in parentheses are clustered by program treatment block. ***indicates significance at 1% level; **indicates significance at 5% level; * indicates significance at 10% level. All models estimated using probit. Sample includes all marriages in the Matlab area between 1975-1976 (pre-program) and 1978-1982 (post-program). Border village men reside in a village along the border of the treatment and control areas.*

Table 5: Family Approval of Contraceptive Use and Desire for Further Children

Fertile Married Women			
	Treatment	Control	Difference
Never Plan to use Contraception Due to Family Disapproval	.00 (.05)	.01 (.12)	-.01*** (.00)
Not Currently Using Contraception Due to Family Disapproval	.01 (.08)	.01 (.08)	.00 (.00)
Currently Using Contraception Despite Family Disapproval	.07 (.26)	.02 (.15)	.05*** (.01)
Obs.	1275	1270	
Fertile Married Couples			
	Treatment	Control	Difference
Percentage Disagreeing about Wanting More Children	.17 (.37)	.17 (.38)	-.01 (.02)
Obs.	937	874	
Out of the Disagreeing Couples:			
	Treatment	Control	Difference
Number of Further Children Wanted by Wife	.75 (.65)	.44 (.59)	.31*** (.07)
Number of Further Children Wanted by Husband	.39 (.61)	.71 (.73)	-.32*** (.08)
Obs.	146	143	
Out of the Disagreeing Couples:			
	Husband	Wife	Difference
Further Children Wanted by Treatment Area Couples	.39 (.61)	.75 (.65)	-.36*** (.10)
Couples		146	
Further Children Wanted by Comparison Area Couples	.71 (.73)	.44 (.59)	.27** (.10)
Couples		143	

*Standard deviations in parentheses (standard errors in parentheses for difference). *** indicates t-test significant at 1% level; ** indicates significant at 5% level..*

Table 6: Descriptive Statistics for Fertile Married Women

<i>Fertile Married Women</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Age at First Job	12.90 (4.23)	13.15 (4.64)	-.25 (.19)
Age at First Marriage	15.82 (3.21)	15.65 (3.23)	.17 (.13)
Age at First Birth	19.09 (2.96)	19.00 (2.98)	.09 (.12)
Years of Education	2.09 (2.88)	2.06 (2.78)	.04 (.11)
Current Outside Job	.69 (.46)	.74 (.44)	-.05*** (.02)
Earned Income	1389.45 (10709.41)	920.59 (6382.26)	468.86 (353.03)
Value of Help Received from Others	1254.73 (8434.52)	636.85 (2196.72)	617.89** (246.59)
<i>Their Spouses</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Spouse Years of Education	3.92 (4.11)	3.56 (3.90)	.36** (.16)
Spouse Earned Income	16264.06 (24974.4)	16754.75 (31810.29)	-490.70 (1147.03)
Value of Help Received from Others by Spouse	1137.02 (8720.05)	1928.32 (29217.07)	-791.31 (865.91)
<i>Their Households</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Household Income	47319.36 (75766.19)	42624.35 (55811.16)	4695.02* (2665.79)
Land Owned by Household	149.92 (1197.87)	135.15 (899.70)	14.76 (42.44)
Obs.	1239	1250	

Standard deviations in parentheses (standard errors in parentheses for difference). *** indicates t-test significant at 1% level; ** indicates t-test significant at 5% level; * indicates t-test significant at 10% level. All variables measuring income or value of help received are measured in taka.

**Table 7: Descriptive Statistics for Fertile Married Women
(Measures of Bargaining Power)**

Able to Make Large Purchases	Treatment	Control	Difference
Items at Daily Bazaar	.13 (.33)	.18 (.39)	-.05*** (.01)
Betel Leaf	.19 (.39)	.25 (.43)	-.07*** (.01)
Saris for Self	.11 (.32)	.16 (.37)	-.05*** (.01)
Children's Clothing	.11 (.31)	.16 (.37)	-.05*** (.01)
<i>Obs.</i>	1630	1569	
Able to Make Small Purchases	Treatment	Control	Difference
Kerosene or Cooking Oil	.49 (.50)	.54 (.50)	-.04** (.02)
Bangles or Soap for Self	.50 (.50)	.56 (.50)	-.06*** (.02)
Sweets for Children	.59 (.49)	.64 (.48)	-.05*** (.02)
<i>Obs.</i>	1630	1569	

*Standard deviations in parentheses (standard error in parentheses for difference). *** indicates t-test significant at 1% level; ** indicates t-test significant at 5% level.*

Table 8: Mean Value of Dowries Received by Males

	Percentage Receiving Dowry			Value of Dowry Received		
	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>	<i>Treatment</i>	<i>Control</i>	<i>Difference</i>
Pre-Program Marriages	.06 (.24)	.04 (.20)	.02** (.01)	3593.55 (3635.1)	3586.70 (5649.52)	6.84 (927.84)
<i>Obs.</i>	1277	1328		55	47	
Post-Program Marriages	.35 (.48)	.36 (.48)	-.01 (.02)	8408.23 (8444.05)	7302.94 (6434.71)	1105.29* (632.06)
<i>Obs.</i>	853	899		271	289	

*Standard deviations in parentheses (standard errors in parentheses for difference). ** indicates t-test significant at 5% level; * indicates t-test significant at 10% level. Dowry value is in taka and is conditional on having received a positive dowry.*

Table 9: Effects of the MCHFP on Dowry Received by Males

	Dowry Value					
	Any Marriage			First Marriages		
	Pre-Program Marriages	Post-Program Marriages	All Marriages	Pre-Program Marriages	Post-Program Marriages	All Marriages
Treatment Area	2029.87 (7037.20)	1191.55** (565.17)	-7385.27 (4699.46)	1977.33 (7552.65)	-441.91 (876.61)	-8542.36* (5075.32)
Marriage Year	106.43 (71.90)	435.57*** (62.09)	244.44*** (43.20)	92.24 (77.70)	76.00 (59.09)	245.48*** (46.29)
Treatment Area * Marriage Year	-39.04 (103.45)	(62.09)	97.05* (55.55)	-35.92 (111.38)	(59.09)	111.65* (59.93)
Age at Marriage	-367.63 (295.52)	-34.53 (389.06)	37.37 (288.35)	-428.60 (333.49)	-416.84 (331.44)	-569.54 (358.29)
Years of Education	311.86** (124.86)	303.98** (123.12)	525.90*** (86.47)	311.31** (132.29)	304.60** (130.65)	552.16*** (92.93)
Spouse Age at Marriage	-16.32 (15.03)	438.72 (439.68)	-113.45 (386.52)	493.90 (480.50)	510.68 (477.76)	-300.08 (433.43)
Spouse Years of Education	550.37*** (188.63)	551.19*** (188.67)	353.10*** (108.06)	576.21*** (203.55)	575.36*** (203.56)	261.11** (117.09)
Father-in-law Wealthier than Father	825.52 (775.16)	854.98 (771.49)	520.70 (487.18)	800.42 (877.71)	816.87 (876.44)	443.23 (530.82)
Further Controls:						
Age-Sq, Spouse Age-Sq		Yes	Yes	Yes	Yes	Yes
R-squared	.02	102	.01	.02	.02	.01
Obs.			672		91	501

Standard errors in parentheses. *** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level. All models estimated using tobit. Dowry value is in taka and is conditional on having received a positive dowry.

Table 10: Falsification Test—Placing the MCHFP in the Wrong Location

	Dowry Value
Percentage of specifications where:	
T-statistic for actual program coefficient greater than t-statistic for false program	100%
R-sq for actual program coefficient greater than R-sq for false program	100%
Actual program interaction coefficient is significant (10%) when included with false program	100%
False program interaction coefficient is significant (10%) when included with actual program	0%

All models estimated using tobit. Dowry value is in taka and is conditional on having received a positive dowry. These tests are based on Aghion, Burgess, Redding, and Zilibotti (2005). In the difference-in-difference regression specifications from Table 9, I either replace the actual program location with a false location, or add the false location alongside the actual location. The table summarizes how often the actual program effect “trumps” the false program effect on dowry payments.

Table 11: Bargaining Power over Resources, Large Purchases (Currently Fertile Married Women)

Treatment Area	Bazaar Items			Betel Leaf			Sarais			Kid's Clothes		
	Coeff.	ME	Coeff. ME	Coeff.	ME	Coeff. ME	Coeff.	ME	Coeff. ME	Coeff.	ME	Coeff. ME
Number of Births	-.23*** (.08)	-.05 (.11)	-.24* (.12)	-.22*** (.04)	-.07 (.04)	-.25*** (.05)	-.24*** (.06)	-.05 (.08)	-.03 (.02)	-.24*** (.06)	-.05 (.08)	-.22** (.09)
Percent of Married Yrs. Fertile												
Female holds Outside Job												
Female Age												
Male Age												
Female Yrs. of Education												
Male Yrs. of Education												
Any Dowry Paid												
Female Earned Income (ln)												
Male Earned Income (ln)												
Value of Help Received (Female, ln)												
Value of Help Received (Male, ln)												
Household Income (ln)												
Land Owned by Household (ln)												
Include Women born after 1970?	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Further Controls:												
Female Age-Sq, Male Age-Sq	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Muslim vs. Hindu Household	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Household Income-Sq (ln)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Coresident Household	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Relationship to Household Head	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R-squared	.01	.04	.03	.01	.04	.03	.01	.04	.03	.01	.04	.03
Obs.	3199	2478	2051	3199	2478	2051	3199	2478	2051	3199	2478	2051

Observations are married females fertile in 1996.

(A) Robust standard errors in parentheses and are clustered by program treatment block. ***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. All income and land owned variables are logged and in tens of taka (tens of decimals for land).

Table 12: Bargaining Power over Resources, Small Purchases

	<u>Cooking Oil</u>				<u>Jewelry</u>				<u>Sweets</u>			
	No Controls		Controls		No Controls		Controls		No Controls		Controls	
	<u>Coeff.</u>	<u>ME</u>	<u>Coeff.</u>	<u>ME</u>	<u>Coeff.</u>	<u>ME</u>	<u>Coeff.</u>	<u>ME</u>	<u>Coeff.</u>	<u>ME</u>	<u>Coeff.</u>	<u>ME</u>
Currently Fertile Married Women												
Treatment Area	-0.10 (.11)	-0.04	-0.07 (.11)	-0.03	-0.15 (.11)	-0.06	-0.13 (.11)	-0.05	-0.12 (.13)	-0.05	-0.10 (.13)	-0.04
R-sq.	.00		.05		.00		.05		.00		.05	
Obs.	3199		2489		3199		2489		3199		2489	
Pre-Program Marriages												
Treatment Area	-0.16 (.10)	-0.06	-0.15 (.11)	-0.06	-0.19* (.10)	-0.07	-0.17 (.11)	-0.07	-0.20** (.10)	-0.07	-0.18** (.09)	-0.07
R-sq.	.00		.03		.00		.04		.00		.04	
Obs.	2170		1799		2170		1799		2170		1799	
Post-Program Marriages												
Treatment Area	-0.11 (.09)	-0.04	-0.08 (.07)	-0.03	-0.15 (.10)	-0.06	-0.15* (.08)	-0.06	-0.12 (.12)	-0.05	-0.13 (.10)	-0.05
R-sq.	.00		.05		.00		.05		.00		.06	
Obs.	1823		1351		1823		1351		1823		1351	

Table 11 note (A) applies. Observations for currently fertile married women are married females fertile in 1996; observations for pre-program marriages are women married before 1977 and fertile for some period after 1977; observations for post-program marriages are women married after 1977 and fertile for some period after 1977. Specifications with controls include the full set of control variables used in Table 13.

Table 13: Bargaining Power over Resources (Alternate Specifications)

	Bazaar Items		Betel Leaf		Saris		Kid's Clothes	
	No Controls Coeff. ME	Controls Coeff. ME	No Controls Coeff. ME	Controls Coeff. ME	No Controls Coeff. ME	Controls Coeff. ME	No Controls Coeff. ME	Controls Coeff. ME
Single and Married Women								
Treatment Area								
Married	-0.08 (.12)	-0.02 (.18)	-0.08 (.12)	-0.02 (.18)	-0.06 (.12)	-0.01 (.15)	-0.09 (.12)	-0.05 (.13)
Treatment Area * Married	-0.16*** (.04)	-0.02 (.05)	-0.13*** (.05)	-0.04 (.09)	-0.15* (.08)	-0.03 (.08)	-0.16** (.07)	-0.04 (.08)
R-sq.	-0.11* (.06)	-0.16* (.10)	-0.08 (.05)	-0.12 (.10)	-0.16* (.09)	-0.19** (.08)	-0.10 (.08)	-0.19*** (.06)
Obs.	.01	.16	.01	.12	.01	.14	.01	.14
	5138	4523	5138	4523	5138	4523	5138	4523
Pre-Program Marriages								
Treatment Area								
R-sq.	-0.12 (.08)	-0.22** (.09)	-0.20*** (.06)	-0.06 (.05)	-0.16*** (.05)	-0.03 (.05)	-0.15** (.06)	-0.23*** (.08)
Obs.	.00	.04	.00	.02	.00	.02	.00	.03
	2170	1776	2170	1792	2170	1776	2170	1776
Post-Program Marriages								
Treatment Area								
R-sq.	-0.29*** (.09)	-0.30*** (.11)	-0.20** (.08)	-0.05 (.09)	-0.31*** (.06)	-0.06 (.09)	-0.27*** (.06)	-0.28*** (.08)
Obs.	.01	.06	.01	.05	.01	.07	.01	.07
	1823	1340	1823	1340	1823	1340	1823	1340
All Marriages								
Treatment Area								
Post-Program Marriage	-0.12 (.08)	-0.21** (.09)	-0.20*** (.06)	-0.06 (.05)	-0.16*** (.05)	-0.03 (.05)	-0.15** (.06)	-0.22*** (.07)
Treatment * Post-Program Marriage	.10* (.05)	.16 (.10)	-0.21* (.11)	-0.06 (.16)	.07 (.05)	.02 (.07)	.11*** (.03)	.16 (.11)
R-sq.	-0.17** (.07)	-0.11*** (.04)	-0.00 (.12)	-0.07 (.11)	-0.15*** (.06)	-0.12*** (.05)	-0.12*** (.03)	-0.08 (.05)
Obs.	.01	.04	.01	.03	.01	.03	.01	.03
	3993	3135	3993	3151	3993	3135	3993	3135

Table 11 note (A) applies. Observations for single and married women are all women fertile during some period after 1977; observations for pre-program marriages are women married before 1977 and fertile for some period after 1977; observations for post-program marriages are women married after 1977 and fertile for some period after 1977; observations for all marriages are all married women fertile for some period after 1977. Specifications with controls include the full set of control variables used in Table 13, except for the single and married women sample, which uses the following controls: number of births, outside job, female age, age-squared, female years of education, Muslim dummy, female earned income, female unearned income, household income-squared, household land owned, and relationship to household head.

Table 14: Robustness Checks

	All Women Married And Fertile in 1996				Pre-Program Marriages				Post-Program Marriages			
	<i>Treatment Area</i>				<i>Treatment Area</i>				<i>Treatment Area</i>			
	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.
<i>Dependent Variable</i>												
Able to Make Large Purchases:												
Border Villages Only (villages on the border of treatment and control areas)												
Bazaar Items	-.50*** (.08)	-.07	.08	816	-.35*** (.12)	-.05	.05	562	-.71*** (.16)	-.09	.16	447
Betel Leaf	-.36*** (.12)	-.09	.06	816	-.27** (.11)	-.08	.04	569	-.52*** (.15)	-.10	.12	447
Saris for Self	-.46*** (.10)	-.07	.09	816	-.35*** (.07)	-.05	.06	562	-.80*** (.20)	-.09	.17	447
Clothing for Children	-.43*** (.09)	-.06	.07	816	-.40*** (.10)	-.05	.10	562	-.61*** (.18)	-.06	.14	447
Full Sample with Extra Controls for Village-Specific Characteristics												
Bazaar Items	-.25*** (.05)	-.04	.07	2105	-.18*** (.05)	-.03	.06	1499	-.28*** (.05)	-.05	.10	1144
Betel Leaf	-.21*** (.06)	-.06	.06	2105	-.24*** (.05)	-.07	.03	1513	-.15*** (.05)	-.03	.08	1144
Saris for Self	-.33*** (.04)	-.05	.07	2105	-.29*** (.05)	-.05	.06	1499	-.37*** (.06)	-.05	.12	1138
Clothing for Children	-.28*** (.04)	-.04	.07	2105	-.21*** (.08)	-.03	.06	1499	-.28*** (.06)	-.04	.10	1144

Table 11 note (A) applies. These specifications include the full range of control variables used in earlier specifications. Border village is defined as a treatment area village bordering a control area village, or vice versa. Village-specific characteristics controlled for include: travel time in minutes to the nearest large market, travel time to the nearest small market, proportion of households with electricity, whether the village is protected by the Meghna-Dhonogoda flood embankment, whether the village has irrigation for fields, whether the village has any industry or any cottage industry, and whether the village has a credit institution.

Table 15: Unaffected Cohorts

	<i>Unaffected Cohorts</i>											
	All Unmarried Women (Ages 13-45)				Currently Separated And Divorced Women				Married Infertile Women			
	<u>Treatment Area</u>				<u>Treatment Area</u>				<u>Treatment Area</u>			
	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.	<i>Coeff.</i>	<i>ME</i>	R-sq	Obs.
<i>Dependent Variable</i>												
Able to Make Large Purchases:												
Bazaar Items	-.01 (.16)	-.00	.50	246	-.82 (.81)	-.04	.57	47	-.25 (.56)	-.00	.31	91
Betel Leaf	-.01 (.11)	-.00	.55	246	-.95 (.75)	-.04	.62	51	-.11 (.50)	-.02	.22	83
Saris for Self	-.01 (.25)	-.00	.43	246	-.36 (.66)	-.01	.58	47	-.25 (.56)	-.00	.31	91
Clothing for Children	.07 (.28)	.01	.52	246	-.72 (.77)	-.02	.56	47	-.31 (.54)	-.00	.24	80
<i>Dependent Variable</i>												
Able to Make Small Purchases:												
Cooking Oil	.02 (.24)	.01	.42	246	2.52** (1.27)	.66	.53	39	-.27* (.15)	-.10	.10	89
Jewelry for Self	-.03 (.23)	-.01	.39	246	2.52** (1.27)	.66	.53	39	-.24 (.17)	-.09	.10	89
Sweets for Children	.07 (.22)	.02	.37	246	1.38* (.83)	.50	.41	39	-.34* (.18)	-.14	.11	89

Table 11 note (A) applies. Observations for married infertile women include all currently married women that were past menopause by 1977. These specifications include the full range of controls used in earlier specifications, with the exception of spousal and dowry information for unmarried women.

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