

# **Microcredit, Macro Change: The Impact of Credit Programs on Women's Fertility in Bangladesh**

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## **Abstract:**

*When surveyed about their fertility, women in Bangladesh have indicated that they are having more children over their lifetimes than what they express as their ideal family size. This presence of "excess fertility" has severe consequences for these women and their children, as well as for broader economic and social development goals. The recent invention of microcredit may be an effective strategy to help these women achieve their lower desired family size earlier in the development process. This study first looks at the theoretical pathways through which credit can work to change fertility and then presents an empirical analysis of the impact of credit on excess fertility for a sample of women in Bangladesh. The results indicate that credit does have an effect on lowering the excess fertility of a woman, and thus credit programs are an effective way of helping women to achieve a more desired family size, both according to their own preferences and in terms of a broader development standpoint.*

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## I. Introduction

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According to United Nations estimates, world population is predicted to surpass 9 billion by the year 2050. This figure reflects an increase of over 2.5 billion people in the next 43 years assuming a significant decline in the fertility rates of developing countries. If, however, fertility were simply to remain at its current levels, world population would increase by an *additional 2.7 billion people*, an increase roughly equivalent to the total world population in 1955 (UN *World Population Prospects: 2006 Revision*).<sup>1</sup>

Astounding as these figures are, even more alarming is the fact that an estimated ninety-nine percent of predicted population growth will be concentrated in developing countries. This rapid population growth poses serious problems for developing countries not only at an individual and household level, but also for society and the development process as a whole. In short, high fertility and subsequent population growth seriously hinders economic and social development. As populations grow in developing countries, more scarce resources are consumed to provide for basic human needs for the new young population, draining them away from potential investments in the capital and technology required for economic growth. Given the potential consequences, researchers have tried to explain why fertility remains high in developing countries, and what in turn can be done to reduce fertility rates to a more sustainable level.

Although a great deal of research has been done on fertility, little attention has been paid to the desires or views of the women themselves. Most of the existing economic literature tends to equate actual fertility with demand for children, but a simple

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<sup>1</sup> See *Figure 1* for a graphical representation of UN projections for world population growth depending on the path that future fertility takes.

analysis of a sample of women in one of the world's least developed countries, Bangladesh, shows that what Bangladeshi women want in terms of their expressed ideal number of children diverges from the number of children they are actually having. Rather than simply assuming that fertility rates remain high because women are demanding a large number of children, a comparison of expressions of desired fertility and actual fertility would be of significant value to obtaining a better understanding of current fertility levels. Factoring in women's preferences in the discussions about fertility is a crucial, yet often overlooked piece to understanding fertility behavior and what can be done to change the existing social and economic conditions that sustain a higher fertility rate than desired.

Since women are already expressing a desire for fewer children than they are having, helping women to implement their fertility preferences provides an obvious policy prescription for reducing overall fertility rates and thus controlling future population growth. The importance of improving the economic and social status of women is widely recognized as a means for reducing fertility in the developing world, and thus any effective policy aimed at helping women to achieve their lower fertility preferences should focus on these areas. One such strategy is the recent invention of microcredit as a form of financing for the poor. Microcredit has been hailed as one of the most promising strategies for reducing poverty in developing countries, yet equally important are the impacts microcredit programs have on a wide range of social development factors including nutrition, education, health, women's empowerment, and fertility. This paper will first examine the ways in which microcredit can work to change fertility behaviors and ideals, and then presents an empirical analysis to test whether

microcredit has any effect on helping women to better approximate their desires for smaller families.

## **II. Background and Literature Review**

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### ***Excess Fertility***

Many analyses on fertility have been conducted using standard demographic measures such as the total fertility rate or crude birth rate; however, this leads to an incomplete measure of fertility, as women's desires or views on their own fertility are not taken into consideration. These viewpoints are especially important to consider in developing countries where women may not have perfect control over their fertility and thus excess fertility is likely to be high. Data on fertility preferences is gathered in almost all recent fertility surveys, and there are a number of different indicators that can be derived from responses to these questions to measure wanted or unwanted fertility (Bongaarts, 1990). One such indicator is "excess fertility", or the birth of a larger number of children than a mother expresses as her ideal family size. For the purposes of this paper, excess fertility will be defined as the difference between actual and desired fertility following Pritchett (1994).

The presence of excess fertility in developing countries can have numerous consequences for the women themselves, their children, and broader development goals. Given that women have indicated that they are having more children than their ideal, they must believe they could improve their well-being if they were able to have fewer children. One reason for this is the health risk associated with excess fertility. The lifetime risk of maternal mortality is a function of the number of pregnancies that a

woman has and the quality and likely use of available health care. Thus for poor women in particular, excess fertility implies a higher risk of health complications including the risk of death associated with pregnancies and deliveries (Montgomery and Lloyd, 1997). If women are expressing a desire for a smaller number of children, and are subsequently able to translate these preferences into behavior by having fewer pregnancies, unnecessary risk could be avoided.

Perhaps the most visible consequence of excess fertility concerns straining already limited resources in poor families. The more children a family has the more scarce resources get siphoned away from potential investment in human capital per child, as they are instead used to provide for the children's basic human needs, such as food, clothing, and shelter. If a woman takes into consideration how many children she and her husband can effectively provide for in her statement of ideal number of children, any children greater than this number are likely to drain resources away from the others, causing a lower individual investment in each of her children. Studies have shown that children in large families receive less schooling, poorer quality healthcare, and less sufficient nutrition than children in small families. Girls in particular seem to be at a disadvantage. One study concluded that the more siblings young girls have, the less likely they are to enroll in secondary school and the more likely they are to drop out (Lloyd and Gage-Brandon, 1994). This problem is particularly insidious as education for women is continuously cited as a crucial means to lowering fertility. Helping women to achieve their preferences for fewer total children would reverse these negative consequences.

If excess fertility could be eliminated, substantial reductions in fertility and population growth could be made. In 1994, Bongaarts estimated that if the gap between actual and desired fertility could be eliminated entirely, fertility in the developing world would drop nearly in half, from what was an average of about 3.5 births per woman to the replacement level of just over 2, and future population growth would be cut by nearly 2 billion (Bongaarts, 1994). Given the consequences of excess fertility, not only would this decline in fertility rates bring a higher utility to the women who prefer to have smaller families, but a strong development objective is promoted here as well. Families that are not burdened with excess fertility can invest in better nutrition, education and healthcare for the children they do have. This will lead to greater well-being in both the short run and long run, as greater investments in human capital are a central pillar for economic growth. These improvements are critical to successful development and have long been cited as a way to decrease fertility rates and change existing social and economic circumstances that sustain high fertility practices (Meier, 1989).

It is important to re-emphasize here that excess fertility only measures the fertility that a mother declares is greater than her ideal family size. It is assumed that a mother considers both the economic costs of having children as well as the many immeasurable benefits that parents receive from their children in her statement of an ideal number of children. This is important to keep in mind when researchers begin to talk about reductions in excess fertility, as these hypothetical reductions are only in the portion of the family size that women have declared are in excess of a hypothetical ideal number of children.

Given the consequences of excess fertility, it is important to understand how differences between desired and actual fertility arise. The demographic transition model provides some insight to explaining excess fertility (Bongaarts, 1997). Demographic transition theory describes the traditional evolution experienced by all currently industrialized countries from high birth and death rates to low birth and death rates brought about by economic development. Initially, at low income levels, a country has both high birth and death rates that fluctuate according to natural events. As the country develops, it progresses into the second stage of the demographic transition where death rates drop, brought about by improvements in food, sanitation and basic healthcare that increase life expectancy. Without a corresponding fall in birth rates, countries at this stage experience a large increase in population and excess fertility will be high. Birth rates will be at historically high levels as women continue to have the traditional number of births, but now more children live to adulthood, resulting in family sizes that begin to exceed preferred levels (Bongaarts, 1997).

It is also likely during these intermediate stages that women will start to alter their perceptions about desired family size to favor a fewer number of children. As the country develops economically, some of the old rationales for having so many children begin to disappear. Women and their husbands begin to develop higher aspirations for their children and realize that a smaller family will lead to a higher investment per child, and thus a better opportunity for each (Lloyd and Gage-Brandon, 1994). As the ideal number of children falls, indicating a desire for smaller family sizes, excess fertility will increase until women actively take on measures such as contraception to avoid pregnancies. A characteristic of this stage is that while women may prefer a smaller

family size, they cannot, or choose not to, regulate their fertility effectively, yielding high excess fertility (Bongaarts, 1997).

In the third stage of the demographic transition, the death rate drops even more, spurred by modern medicine and sanitation. In this stage, birth rates finally fall and population growth begins to decline, due in part to access to contraception, increases in wages, urbanization, as well as social development factors such as an increase in the status of women and greater investments in education for all children. As actual fertility rates begin to fall, excess fertility is likely to fall as well, as women's actual behaviors begin to reflect their preferences for smaller family sizes. Of note here is the strong role that contraception plays in reducing actual fertility and achieving ideal fertility. At some point, the costs associated with contraceptive measures are greatly reduced and couples have better knowledge and ability to achieve fertility regulation. Along with these changes must come a general social acceptance of controlling one's fertility, which is often contrary to traditional values and cultural norms. Kulkarni (1998) argues that most unwanted fertility results from couples who do not want to have any more children but do not use contraceptive methods. Still, even when couples do decide to use contraceptives to try to reduce unwanted pregnancies, Bongaarts (1997) observed that since control over reproduction is not perfect, there still might be some unwanted fertility.

Finally, in the last stage of the transition, both birth rates and death rates remain low. At high-income levels populations begin to stabilize and may even decline. At this point couples have nearly complete control over their fertility, and thus unwanted or excess fertility is likely to be insignificant. This is supported by research that shows that

the proportion of excess births is low in countries with very low or very high fertility rates and highest in countries with intermediate levels of fertility (Kulkarni, 1998).

Evidence from Bangladesh suggests that child mortality rates have fallen and women have begun to express desires for fewer children (Cleland, 1994). Therefore, given the demographic transition theory, the gap observed between actual and ideal fertility is eventually expected to fall during the process of development. With effective programs or policies, the demographic transition might be pushed ahead to later stages of falling birth rates and stable populations quicker, enabling women to achieve their desired family size earlier in the development process. Microcredit is one possible strategy that could work to push the development process along and help bring actual fertility down to a more desirable level due to a number of social and economic impacts that credit programs have on women participants. If this could be accomplished, it would help the women, their children, and the economic development process itself.

### ***Microcredit: An Overview***

*“Microcredit is a critical anti-poverty tool -- a wise investment in human capital. When the poorest, especially women, receive the credit, they become economic actors with power. Power to improve not only their own lives but, in a widening circle of impact, the lives of their families, their communities, and their nations.”*

-Kofi Annan, Secretary General, UN

Founded on the basic belief that the poor can benefit from access to financial services from which they are traditionally excluded, microcredit has emerged in the past

few decades as a critical strategy for relieving poverty and transforming economic and social structures in developing countries. A part of the broader category of microfinance, microcredit is an innovation that enables the world's poorest people to generate income on their own. Microcredit programs extend very small, collateral-free loans to the poor, allowing them to engage in self-employment activities and earn a return on their initial loan based investment. These programs have proven to be extremely effective at reaching poor individuals, especially women. Women have been the center of many microcredit institutions because of a general acknowledgement that they are a better credit risk, typically poorer, more credit-constrained, and more severely restricted in the wage labor market than men (Mahmud, 2000). In addition, extending loans to women tends to benefit the entire family more than loans given to men. Given that the expenditures from the extra income women earn are likely to get invested in the entire family, credit extended to women appears to be an effective strategy for improving current well-being and also contributing to national development by increasing the resources of both present and future generations (Panjaitan-Drioadisuryo and Cloud, 1999).

The leading model for credit programs worldwide is the Grameen Bank established by Muhammad Yunus. In the late 1970s, Yunus realized that the existing banking system in Bangladesh was inefficient since the poor had skills that were not being utilized merely because they had no capital and no one to lend it to them at a fair rate (Yunus, 2003). Recognizing this, Yunus himself loaned out a total of \$27 to 42 different people. From this mere \$27, the Grameen Bank grew into the model for over 3,000 group-lending programs worldwide. Grameen has received tremendous

recognition for its successes in reducing the poverty level in Bangladesh, as noted by its award of the 2006 Nobel Peace Prize. As of February 2007, the bank had loaned about \$6.1 billion to over 7 million borrowers, 97% of whom were women. The bank is extremely effective at reaching the rural poor, as an estimated 90% of the total villages in Bangladesh are serviced by Grameen Bank programs. Starting at just \$12, and averaging about \$310, the loans typically go to self-enterprise activities such as rice processing, livestock raising and traditional crafts (Grameen Bank, 2007). Yunus strongly believes that lending programs for the poor are the key to improving the poverty situation not just in Bangladesh but worldwide.

To understand the effects that credit and credit programs can have on women borrowers, it is helpful to describe first the ways in which a typical credit program such as Grameen works. A central component of these programs is group lending which serves both as a form of social-collateral for the bank, since the poor have few assets, and facilitates group solidarity among the women, which is key to the social impacts that the credit programs have. To be eligible for credit women must first form groups of five, and while loans are made to individuals, everyone in the group is held responsible for loan repayment. If any one member defaults, everyone in the group is denied subsequent loans. Group pressures and the high motivations of borrowers have resulted in this method being extremely effective, as payback rates on loans are about 98%. The groups meet together on a weekly basis with seven other groups and a representative from Grameen. While providing loans is the primary function and business of the Grameen Bank, a social development agenda is also promoted in the “Sixteen Decisions” which borrowers agree to memorize and adopt into their lifestyles. These encourage better

housing, sanitation, education for children, family planning, and similar social objectives (Grameen Bank, 2007).

### ***Microcredit and Fertility***

Participation in microcredit programs has been suggested to have many important social and economic impacts for women such as increasing economic status, empowerment, increasing mobility and social interaction outside of the home, increasing access to information about contraceptive methods, exposure to different worldviews, and support and guidance from program staff (Amin, 1996). All of these impacts can have significant effects on changing reproductive behaviors and reducing fertility for women in developing countries. Since Grameen Bank and other similar programs do not provide direct family planning services, if credit programs have any effect on reducing fertility, they most likely do by strengthening women's demand for fertility regulation such as contraception, or increase women's ability to overcome obstacles that do not allow them to practice such behavior. These obstacles would include a perceived lack of mobility, lack of money, lack of information about how to limit fertility, and opposition from their husbands or other family members (Schuler, 1994). Recognizing this, several studies have suggested potential pathways through which credit can work to change fertility.

Many of the social changes that result from the participation in microcredit programs are brought about by increasing the value of women's economic roles within the family. In a review of nine studies of various credit programs, all of the findings indicated that credit had an overall positive impact on household income, although the

size of increases varied (Sebstad and Chen, 1996). To analyze these potential income-related effects of credit on fertility, economic theory can be used. First, because the women are earning additional income, there should be an income effect observed in which both the women and their families are able to consume more. If all else remains the same, demand for children will rise along with children's education, health care, and nutrition, as these are all normal goods for which consumption is likely to increase with additional income. Opposing this income effect will be a substitution effect. Now with employment and a new income-generating activity that demands her time, having more children is costlier to a woman as the economic returns on her time spent outside of raising children have increased. Thus, if increased income and employment opportunities brought about by credit will have any effect on decreasing fertility it will be through this substitution effect as credit will increase the opportunity costs of childbearing, thereby lowering fertility (Pitt, 1999).

One of the biggest impediments to reducing fertility in developing countries is the traditional view that children are the means of providing security for parents as they age. As a result, the demand for children in developing countries where people lack economic security is very high. With the start of microfinance programs however, financial markets are beginning to change as credit programs and other financial services allow the poor to save for the future. This will give an alternative to needing a large amount of children as risk insurance and the demand for children will decrease as well as fertility (Steele, 2001). This is an example of a long-term, macro-level change of credit that counteracts one of the principal reasons fertility remains high in developing countries.

By enabling women to contribute more to their families' incomes, credit programs may have numerous empowerment effects on women. One such example is enabling women to increase their bargaining power within the household relative to their husbands', as the males in the household are traditionally the sole or main decision makers for the family in traditional societies. An increased sense of empowerment brought about by credit may translate into a greater degree of actual decision-making ability and allow women to take a more active and informed stance in decisions about their own fertility (Steele 2001). Several studies have focused on the effect of credit on empowerment and decision making within the household. Researchers Rositan D.M Panjaitan-Driadisuryo and Kathleen Cloud (1999) found that in a study of the impact of a microcredit program in Indonesia, members in the credit programs were 50% more likely to make decisions about fertility on their own or jointly with their husbands than were women in a control group, for whom others made decisions without them. The results of this and other similar findings suggest that credit can empower women to have a greater influence in important decisions, one of which is their own fertility. If women already want smaller families, they may now be better able to make decisions that reflect these desires.

Another important aspect of woman's empowerment that arises from participation in credit programs is greater mobility and social interaction. Group membership is central to the formation of credit programs such as the Grameen Bank and the impacts of attending regular group meetings are immense for these normally rather sheltered and immobile women. By being required to attend group meetings to receive loans, women are forced out of their homes and into conversation with bank workers and other women

like themselves. In addition, as a result of their economic activities, these women receive increased interaction with people outside of their families. This interaction gives women access to additional resources, which will result in a spreading of knowledge and ideas that may encourage new behaviors such as contraception (Amin, 1996). Previous studies suggest that credit programs can bring about positive social changes not only for women who are the direct recipients of credit, but also for those who live in villages where these credit programs are set up, by altering perceptions and practices of the village as a whole (Schuler and Hashemi, 1994).

Another way credit can potentially affect women's fertility is directly through requirements in credit programs. For example, one of the Sixteen Decisions of the Grameen Bank is "we shall plan to keep our families small" (Grameen Bank, 2007). Prospective members of the credit program are required to study all of these Decisions and are tested on them before receiving any loans. In addition, in meetings with bank representatives, there is usually recitation of these Decisions. While the requirement is only memorization of these Decisions, and they are not actually enforced, the hope is that a change can be made in the women's perceptions and ideals that will empower them to change their behaviors to reflect these new worldviews. It seems highly plausible that through all of these various mechanisms that credit can help encourage behaviors in women that help them control their fertility and better reach a lower desired fertility level earlier in the development process.

There is some criticism in the microcredit research regarding the issues of credit on women's empowerment and fertility. Pitt (1999) points out that even if credit programs can empower women and alter their perceptions about fertility and

contraception, this might not be enough to actually modify behavior if their husbands or families refuse to let them. While credit may bring about a sense of empowerment for women, it might be too idealistic to think that this is directly translatable to any actual changes. Change is certainly not automatically a result of credit, but rather subject to strong existing cultural and societal norms that may resist fertility reductions and thus limit any potential impact of credit. In addition, a study by Goetz and Gupta (1996) concluded that while credit is initially extended to women, most programs cannot ensure that women will be the ultimate benefactors of the loans or have any control over their uses. Women may volunteer, or be forced, to turn over the loans to a family member. However, even if control of the loan is turned over after receiving it, women still become an integral part of the family's economic activity. Women are the channel through which the credit is provided, and others must turn to them for additional loans. Even these small changes can be empowering in a setting such as Bangladesh, where women rarely have an opportunity to participate in income-generating activities (Amin, 1996.)

Several studies have directly tested the impact of microcredit on fertility. In particular, past researchers have focused on the relationship between credit and contraceptive use. In their study on the effect of credit on reproductive behavior, Schuler and Hashemi (1994) found that participation in the Grameen Bank credit program increases contraceptive use among credit members. In addition, they found that nonprogram women in Grameen villages were more likely to use contraceptives than women in nonprogram villages. In another study, Amin (1996) also found a strong positive relationship between participation in credit programs on contraceptive use and this effect increased with the duration of membership as well as with the number of times

the loans were received. If credit does increase contraceptive use as these studies suggest, and contraceptive use is a means in which women can better achieve their family size ideals, one would expect that women who receive credit have lower excess fertility in part due to an increased contraceptive use brought about by credit membership.

### ***The Case of Bangladesh***

Nowhere is the impact of credit programs more impressive than in Bangladesh, a predominantly Muslim, conservative, male-dominated country where the Grameen Bank credit program was established. Studies and commentaries on the economic, social and demographic problems of the world's least developed countries often focus on the Bangladesh case. Since its independence from Pakistan, Bangladesh has made some progress in improving education levels and growing economically, however these improvements have been small and it still remains among the world's poorest countries due in part to its overpopulation (Cleland, 1994). According to United Nations estimates for the period 2005-2050, nine countries will account for at least half of the total increase in world population, and Bangladesh will be one of them (*UN World Population Prospects: 2004 Revision*).<sup>2</sup> With a population of approximately 145 million people, Bangladesh is among the 10 most populous countries in the world, which is of considerable concern, given that the country is roughly the size of the state of Iowa. The need to limit fertility should be of top concern to policymakers in Bangladesh, as the country clearly cannot afford to sustain such high levels of population growth and be able to achieve any substantial economic development.

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<sup>2</sup> See *Figure 2* for UN projections of population growth in Bangladesh.

The level of fertility in Bangladesh has already started to decline since the 1970s, but researchers suggest the total fertility rate has reached a plateau, as it has remained around three births per woman since the mid-1990s (Center for Policy Dialogue Bangladesh, 2001). In 1975, the total fertility rate was 6.3, and recent 2006 estimates place this number at 3.11 births per woman (World Factbook, 2006). This is certainly a significant decline; however, the fertility rate remains well above what would be considered replacement fertility. Cleland (1994) argues that the decline in fertility was not a result of any significant change in the economic or social development of Bangladesh, but rather due to a strong family planning program. Credit might help explain the increase in contraceptive prevalence observed in Bangladesh, as research on the effect of credit on increased contraceptive use in Bangladesh reveals a strong positive relationship (Schuler and Hashemi 1994, Amin 1996, Steele, 2001). In addition, by increasing the income of these women and helping them to contribute positively to the economy of Bangladesh, credit may be an effective strategy to push the fertility rate down through this observed plateau level of fertility. Credit not only may affect fertility through contraceptive prevalence, but it also works to contribute to the economic and social development of Bangladesh, which may be required in order to see further fertility declines.

Several analyses have identified economic and social institutions in Bangladesh that are believed to sustain high fertility and hold back development. The simultaneous effects of poverty, the patriarchal society, the social security value of children, poor health conditions, high mortality risks, and low levels of female education present in Bangladesh are often cited as factors contributing to high fertility rates (Cleland, 1994).

Women in particular are most affected by these factors. It is argued that in Bangladesh a women's life is marked by a continuous dependency on men; first on her father, then her husband and finally her son. Given the lack of her own independence, large divides in female and male education, exclusion from paid employment, and a general culture of male dominance, Cleland (1994) argues that high fertility is likely to be a rational choice for such a woman. Without the ability or real incentive to get an education or work outside the home, there is no real opportunity cost of raising children. Without assets of her own, she must rely on others to provide for her, and those who are most likely to do so are her children, particularly her sons. However, with the invention of microcredit these traditional obstacles are changing. Women are now able to work outside the home, earn their own income, and are becoming more empowered. In other words, credit is working to break down the traditional social and economic barriers that sustain high fertility and inhibit women from reaching a lower ideal number of children. One would therefore hypothesize that with credit, women will be better able to reach fertility levels that better approximate their lower ideal number of children. This contention is tested in the next section.

### **III. Methodology**

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#### ***Hypothesis***

A look at a representative sample of women in Bangladesh indicates that on average women are expressing that they are currently having more children than they consider ideal, indicating the presence of excess fertility. The main objective of the empirical part of this paper is to test whether credit can have any impact on helping these

women to better achieve their desired number of children and thus lower this excess fertility. There are numerous theoretical pathways through which credit could help women bring their actual and desired fertility into balance, and previous studies have documented increased use of contraception associated with credit programs indicating a possible relationship between credit and excess fertility. This analysis will test the hypothesis that seems to be supported in the relevant research that credit can lead to better fertility outcomes for women according to their preferences.

### ***Model***

A standard multivariate regression model of the following form was used:

$$ExcessFertility_t = \beta_0 + \beta_1 CreditMember_t + \beta_2 (X_t) + U \quad (1)$$

where excess fertility is the dependent variable, measured as the difference between total and ideal fertility, all regressors besides the variable credit member are included in the term X (a vector of all other explanatory variables),  $\beta$  is the coefficient on the explanatory variables, and U is the error term. This equation is used to estimate the effect that credit has on excess fertility, controlling for all other standard variables that affect total and ideal fertility.<sup>3</sup> Variables used to estimate equation 1 are discussed in detail below and presented in *Table 1*.

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<sup>3</sup> Since excess fertility is measured as the difference between total and ideal fertility, separate regressions were estimated using total fertility and ideal fertility as dependent variables and including the same independent variables used in equation 1. This was done solely for obtaining a better understanding of the impact that each variable has on excess fertility.

## *Data*

The data set used for this analysis was taken from the 2004 Bangladesh Demographic and Health Survey (DHS). The Demographic and Health Surveys are nationally-representative household surveys that collect information on issues such as marriage, fertility, family planning, and maternal and child health on “ever married” females aged 10-49. Importantly for this analysis, the data set also includes a question of whether or not the women are members of any credit program. DHS data is cited by many researchers to be the best recent source of data for large populations in developing countries.

The DHS project is the third consecutive world research project initiated by the United States Agency for International Development (USAID) to provide data and analyses on the population, health, and nutrition of women and children in developing countries. It was designed as a follow-up to the World Fertility Survey and Contraceptive Prevalence Surveys. The 2004 survey is the fourth and most recent phase of the DHS program. Women are the focus of this survey and are identified first through a random sample of households given the Household Questionnaire. Here, basic information about the woman’s age, sex, education and relationship to the head of the household are collected. The main purpose of this questionnaire is to identify women eligible to be given the Women’s Questionnaire. For the Women’s Questionnaire, a standard core model of questions is used so that data collection is comparable across countries, but country-specific information is also added, which is why the data set on Bangladesh has a question about credit membership. Specifically, the Women’s Questionnaire covers the areas of background characteristics, reproductive history,

knowledge and use of contraceptive methods, antenatal/delivery/postnatal care, infant feeding practices, immunization, child health and nutrition, marriage and sexual activity, fertility practices, knowledge about HIV/AIDS, husband's background and respondent's work.

A total of 11,440 female respondents were included in the original data set. The sample for the purposes of this analysis was restricted to currently married women of reproductive age (15-49). Currently married women were used because those who were not married did not answer any questions surrounding fertility preferences or practices. Respondents declared infecund were also taken out of the sample for the same reason. After adjusting for missing values and women who did not answer all the relevant questions, the final number of women included in this analysis was 5,689. Of these, 29% (1,631 women) of them were members of a credit program, and the rest were not members of any credit program (4,058 women).

## ***Variables***

### **A. Dependent Variable:**

Several different measures of reproductive behavior were considered to measure fertility in a way that would be the most significant given the impact that credit could have on fertility. Excess fertility was chosen as the dependent variable, measured as the difference between the total number of children ever born, and the total ideal number of children that a woman reports she would like to have over her lifetime. This variable is named *ExcessFertility*.

The women were asked to report how many total children they gave birth to in their lifetimes so far and this is reported as total children ever born, or actual fertility. To obtain ideal fertility, the survey asks a hypothetical question of each woman. The question is; “if you could go back in time when you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?” This is considered the simplest way to measure desired fertility, as it is easy to understand. An alternative measure asks respondents how many of their total births had been “wanted” and how many were “unwanted”. Although this essentially gets at the same effect, when Bongaarts (1990) reviewed various methods that estimate this sort of fertility gap, many biases were pointed out with this method as women have to look back and declare their children wanted or unwanted. By comparing actual fertility to a hypothetical ideal number of children by contrast, these biases are reduced. Women are not asked to comment on which children they wanted or not, but rather answer a hypothetical question. One potential problem with using the actual and ideal method noted by Bongaarts (1990), was that women may respond to the question not by stating the number they believe as ideal for themselves, but rather a number that they think, or have been told, is ideal for the population as a whole. This would bias the results in the direction of a lower ideal fertility.

Another potential bias relating to the dependent variable has to do with the age of the women. Given that the average age in this sample is approximately 30, actual fertility is going to be underestimated because younger women report having less children than they are likely to have if their entire life span could be considered. Thus, the difference

between actual and desired fertility will be an underestimate of the excess fertility gap that would exist if all of the women's total childbearing years could be analyzed.

A simple look at the descriptive statistics shows that the mean difference between total and ideal number of children for all the women in the sample is 0.8 children, meaning on average the women have 0.8 more children than what they consider ideal, or an average excess fertility of 0.8 children. Thus, given that the mean number of total children ever born of women in this sample is 3.26, about 24% of an average woman's total children would be considered excess according to her preferences. If excess fertility could be eliminated entirely from this sample, substantial reductions in the fertility rate would result. The total fertility rate would fall from an average of 3.26 births per woman to 2.46 births per woman, and this would occur just by reducing the number of births that the woman herself declares are in excess of her ideal. This difference would lead to substantial reductions in future population growth as well.

When splitting this sample up into the credit and non-credit members, excess fertility is slightly higher for credit members, 0.89 children, than for non-credit members, 0.76 children (see *Table 2*). While both groups have approximately the same number of total children ever born, the non-credit members have a slightly higher ideal number of children (2.37) than credit members (2.49). This means that credit members on average have greater excess fertility than non-credit members. Although at first this statement appears to contradict previous expectations, it does make some sense. Credit is expected to have an impact on excess fertility in two stages. First credit is likely to help women change their attitudes to desire smaller families, and secondly credit is expected to help women implement these lower fertility desires and reduce actual fertility. The

descriptive statistics show that the first stage has already happened as credit members are showing a desire for smaller family sizes, which explains why the data shows a greater excess fertility for credit members. What the statistics do not show is what impact credit has on actual or ideal fertility, holding all else constant. When this is corrected for in a multivariate regression, the effect of credit on reducing excess fertility can be determined.

## **B. Independent Variables**

In addition to testing the impact of key variables such as credit, variables are included in this analysis to control for other potential differences between the women. In any study such as this, where there is likely to be a large array of heterogeneity, it is necessary to control for background characteristics that might lead to differences in the dependent variable. This is done to minimize the possibility that any observed differences between the fertility behaviors of the women are a result of sample selection bias. For example, past literature has shown that credit programs may attract women who are already more empowered and either already using, or more inclined to use contraception (Pitt and Khandker, 1999). Thus, the regression model controls for background and demographic characteristics that may be predictors of total or ideal fertility.

**Credit Membership** - To assess whether being a member of a credit program has any effect on excess fertility, the variable *CreditMember* is used. *CreditMember* is a binary variable equal to one if the woman is a member of any credit program at the time of the interview, and zero if she is not a member of any credit program at the time of the interview. The two most prominent microcredit programs in Bangladesh are Grameen

Bank and BRAC, both of which were recorded in the survey. Since the effects that credit programs have are assumed to be similar regardless of the organization, Grameen Bank and BRAC members are combined to form one variable, *CreditMember*, which indicates membership in either of these groups at the time of the interview.

Given that the raw data already show a lower desired fertility for women in credit programs, and theory suggests how credit could also reduce actual fertility, it is expected that the difference between total number of children and ideal number of children, or excess fertility, would be smaller for women who are members of credit programs. If the dependent variable approaches zero with credit, it can be said that women in credit programs are better able to achieve their fertility preferences.

**Empowerment**- Much research has been done on how women's status and empowerment can decrease fertility by increasing the demand for fertility regulation and adopting attitudes and behaviors to limit fertility and abandon high fertility practices (Amin, 1996). While recognizing the difficulty involved in trying to objectively define empowerment, one particular variable was chosen and used as a proxy for empowerment, the variable *GoesOutAlone*. Each woman was asked whether she goes outside of her respective area of residence alone, with her children, or whether she does not go out at all without her husband. This question was chosen because it is relatively simple and elicits either a yes or no response regardless of context. Responses were converted into a dummy variable to give a concrete measure of empowerment as a woman's right and ability to travel beyond her village. Although the survey asked respondents separately about travel with or without their children, these two responses were combined since the focus is purely on the women's ability to travel at all. It is expected that empowerment

will decrease the excess fertility gap, as a more empowered woman is likely to be more able to take measures to bring her actual fertility down to the desired level.

**Age and Age at first marriage-** Age is directly correlated with total number of children a woman has and thus in part will explain a woman's total fertility. As a woman gets older she has experienced more reproductive years, and for this reason an older woman is likely to have a higher number of total children ever born than a younger woman. The variable *Age* ranges from 15-49, and the average age of women in the sample is about 30 years old. Similarly, *AgeAtMarriage* is used as a predictor of fertility measuring the age at which a woman first gets married. A woman who gets married younger is assumed to have more childbearing years and thus will likely have more children. This variable is critical in the research as a variable that directly effects fertility and is considered a proximate determinant in fertility transition (Cleland, 1994).

*AgeAtMarriage* ranges from ages 10-39, with a mean age of about 15.

**Wealth-** A measure of the wealth of each of the women, relative to the rest, is also a likely indicator of fertility. The DHS survey developed a wealth index and identified five different quintiles. Women in the "richest" wealth quintile were removed from the sample since they were believed not to be comparable to the rest. Credit programs are established to reach the poorest members of the population and women who are of the richest wealth quintile are not an effective comparison group. Dummy variables were created for the remaining levels: *Poorest*, *Poorer*, *MiddleWealth*, and *Richer*. The percentage of women in each of these categories is similar for both the credit and non-credit group. After removing the richest group, the credit members were only slightly wealthier on average than the non-credit members. One explanation for this

might be the result of the credit program working to increase the income of the respondents. Since this analysis does not take into account when the women first entered the credit program, it is likely that some of the women started out in the poorest group and have moved up in relative wealth because of credit. Given the poverty level of a country like Bangladesh, one would expect that increases in wealth would be associated with a decrease in excess fertility.

**Female employment-** Female employment is believed to create more favorable attitudes and norms regarding fertility and may empower women in their decision-making ability. Therefore, it is predicted that female employment will lower excess fertility. The variable *Working* is a binary variable that indicates whether the respondent is currently working outside of her home or not.

**Education -** Female education is highly linked to lower fertility. The education of the respondent is included in this analysis to determine whether her education has any impact on lowering her actual fertility to ideal fertility, which is likely to occur for similar reasons as female employment. The variable *AnyEducation* is a dummy variable that indicates whether the respondent has had any formal education. Of all respondents, only about 54% of women answered that they had any education.

**Son preference-** A preference for a son is often thought of as a strong motivator for many families to have numerous children in countries such as Bangladesh, mainly for reasons related to security in old age. The variable *SonPreference* is a dummy variable created to determine whether the respondent reported ideally wanting more male children than female children. About 20% of the women reported having a son preference.

**Husband's family size ideal-** The variable *Husband'sFSI* was included to measure whether the respondent's husband reported desiring more children than the respondent. This is a dummy variable equal to 1 if the husband wants more children and 0 if they both want the same amount or the husband desires fewer children. It is likely the coefficient on this variable is positive, meaning that if her husband wants more children than she does, she will likely have more children than she desires.

**Contraceptive Use-** Contraceptive use is a key intermediate step of bringing actual fertility and desired fertility into balance. The variable *UseContraceptive* measures whether or not the respondent or her partner is currently using any method of contraception. This includes modern, traditional and folkloric methods. *UseContraceptive* is a dummy variable equal to one if the respondent or her partner is currently using contraceptives or zero if neither of them is. It is predicted that if a woman uses contraceptives she will have lower excess fertility, as contraceptives can be used to achieve an ideal family size.

**Regional Controls-** The respondents in this study were divided up into six regions of Bangladesh and a dummy variable for each region was created: *BarisalReg*, *ChittagongReg*, *DhakaReg*, *KhulnaReg*, *RajshahiReg*, and *SylhetReg*. These variables were included as regressors to control for any effects that may differ across regions of Bangladesh such as cultural influences that are hard to control for otherwise. Two of these regions, *KhulnaReg* and *RajshahiReg*, did not prove to be significant in any of the analyses and thus were left out of the final regression.

Several other control variables were tested initially but later removed because they were not significant in any of the analyses. These were religion, husband's

education, presence of a health clinic in the village, whether the household owns a radio, and whether the spouses discussed family planning. *Tables 1* and *2* show descriptive statistics for all of the variables used in this analysis. *Table 1* includes all of the women in the sample, and *Table 2* compares the sample based on whether or not the women belong to a credit program.

## IV. Results

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OLS is used to estimate regression coefficients in equation (1) for the entire sample and the complete results are presented in *Table 3*. The coefficient on the variable *CreditMember* is  $-0.095$  and significant at the 5% level. This means that being a credit member on average decreases excess fertility per woman by  $0.095$  children, holding all else constant. Again, this coefficient is likely to be underestimated due to the average age of the respondents. While a reduction in excess fertility by a fraction of a child may not seem significant, given that the mean excess fertility observed in the descriptive statistics for all the women in the study was  $.8004$  children, a decrease in this mean by  $.095$  children is equivalent to a change of 11.9%. Thus, on average about 11.9% of the excess fertility that each woman experiences could be eliminated by participation in credit programs. In other words, women who receive credit will have a lower average difference between the number of children they have, and the number of children they want by about 11.9% as compared to women who do not receive credit. This number is certainly economically significant as a lower-bound estimate of excess fertility reduction.

Numerous predictions can be made based on the results of this analysis as to what effect credit could potentially have on reducing the fertility levels and population growth

of Bangladesh as a whole. A decrease in the excess fertility of a woman in this sample by 0.095 children translates into a 2.9% reduction in her total fertility. Using data gathered from the World Bank HNP statistics on fertility measures in Bangladesh for the year 2004, it can be determined that if the total number of births fell by 2.9% and the death rate was held constant, population growth could be reduced by 0.8%. This means that instead of the total population of Bangladesh growing at the estimated rate of 1.9%, it would grow at 1.82%. This decline would translate into about a 12.3 million decrease in the population by the year 2050 assuming nothing else changes. While these are just rough estimates, this figure is certainly significant considering that the decrease in population growth results only from reducing the number of children born to a woman that she declares as above her family size ideal. This would be significant both for the women who would now be more closely estimating their ideal family size, and also from a development point of view, as more resources that would have otherwise gone to provide for basic human needs of these children could now be spent on greater investments needed for economic growth to occur.

The regression results of the other variables are also important to understanding excess fertility. The coefficient on the empowerment variable is negative as expected and significant at the 5% level. The measure of empowerment, the variable *GoesOutAlone*, has a strong impact on reducing excess fertility. On average a woman who responded that she went outside of her village without her husband had lower excess fertility of 0.25, holding all else constant, than a woman who did not. Assuming this variable is a good proxy for women's empowerment, this result supports the existing literature on women's empowerment indicating that there is a relationship between a woman's ability

to be more autonomous and her fertility behavior. Clearly then, programs such as microcredit that empower women and improve their social status should be promoted as a means to reduce excess fertility.

The other variables that decreased the difference between total and ideal number of children, or excess fertility, were *AgeAtMarriage*, *SonPreference*, *Working*, *Any Education*, and the higher wealth quintiles (*MiddleWealth* and *Richer*). The signs of these coefficients are all as predicted. A one-unit increase in the age of a woman when she decides to first get married will decrease the excess fertility by 0.159 children, which was significant at the 5% level. This supports existing evidence of the importance of delaying marriage for young women as a means to reduce fertility levels.

The variable *SonPreference* has a strong impact on this difference as well; on average, if a woman prefers a son to a daughter, her excess fertility fell by 0.377 children, and this is significant at the 5% level. This is because the variable *SonPreference* has a strong positive effect on a woman's ideal number of children. Women who have son preferences desired a greater number of children on average as they are likely motivated by social security value of sons. Thus, these women are likely to keep having children until they reach their ideal number, so their excess fertility is going to be low. This does not imply her fertility level will be low, just that she is reproducing at a level she sees as desirable.

The variable *Working* was also significant at the 5% level. This can be interpreted as a woman who works outside the home will have a lower excess fertility by 0.099 children than a woman who does not work outside of the home. This was expected due to primarily the higher opportunity cost of childbearing for working women as well

as a greater sense of empowerment and mobility that can result from working that may contribute to a more desired level of fertility. The variable measuring whether the woman had any education was negative, however small in magnitude and not significant at the 5% level. This is not consistent with other studies or widely accepted theories on education and fertility that consider education a strong factor in lowering both total and ideal fertility. It is possible that the impact of female education was picked up in other variables, for example female employment or the richer wealth group. Further study is needed to explain these effects.

The upper two wealth quintiles (*MiddleWealth* and *Richer*) both decreased excess fertility by 0.15 and 0.25 children respectively. This is to be expected as these women most likely have access to better knowledge about means to achieve their desired level of fertility and are better able to translate their preferences into behavior.

The variables that increased the difference between total and ideal number of children, or excess fertility, include *Age*, all the regional variables, *UseContraceptive*, *Husband'sFSI*, and *Poorest*. These variables are all significant at the 5% level. A one-unit increase in a woman's *age* will increase a woman's excess fertility by 0.155 children, as is expected. The strong positive coefficients on all of the regional variables suggest cultural or social impacts particular to a given region increase the differential between how many children a woman has and how many she wants. It would be interesting to research these regions further to see why some are higher than the others and what some of these factors may be. The variable measuring the poorest wealth quintile has a higher excess fertility. These women probably lack access to and the ability to achieve their desired number of children.

The variable *UseContraceptive* was positive, contrary to predictions. While this study hoped to show that the impact credit had on reducing excess fertility could be attributed in part to contraceptive use among credit members, there seems to be other factors in place that may be stronger than this effect. When assessing the impact of contraceptive use on total and ideal fertility separately it was found that while using contraceptives decreases a woman's ideal fertility, it has a very small impact on decreasing total fertility. This accounts for the positive number obtained when the difference between these total and ideal coefficients was taken. This might be suggestive of the fact that contraceptive use does nothing to change excess fertility that a woman already has prior to using contraceptives, or that methods that women are using are imperfect, which will also result in excess fertility.

Adjusted R squared for the estimated equation is .504, meaning that 50% of the variation in the difference between total and ideal fertility is explained by the regressors in this model. Given the large variation in women's decisions about family size, combined with cross-sectional data, this R squared value is quite respectable.

## **V. Conclusion**

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The current fertility levels of women in Bangladesh reflect inefficient outcomes both for the women who are expressing a desire to have fewer children, and for the country as a whole since high population growth hinders economic and social development. History and research have shown that reducing fertility primarily has to be a conscious choice, and since the desire is present for smaller families, the next step needs to be finding effective policies or programs that focus on helping women to

translate their desires into actual behavior. This can only be done by acknowledging and focusing on the social and economic barriers that prevent women from achieving their desires to limit fertility. The invention of microcredit has proved to be extremely successful in this regard. Credit has been shown to have a tremendous impact on reducing poverty, increasing education and health care, empowering women and effecting similar social improvements that are critical to successful development and have long been cited as ways to change the existing social and economic circumstances that support high fertility practices.

This analysis provides support for the hypothesis that microcredit is an effective strategy for reducing excess fertility. Given that desired fertility levels are lower than current actual fertility, this achievement appears to be a key intermediate goal to reaching long term fertility decline, as it is indicative of the fact that women are starting to take measures to effectively limit their fertility and get to a smaller, ideal number of children. Long-term fertility decline is a process that requires effective changes in both the social and economic structure of a developing country. However, assuming that with credit women are now better able to reach a lower ideal number of children, it can be suggested that these credit programs will help push along the fertility decline faster. Credit will not only allow these women to reach the fertility levels they want now, but also decrease fertility rates overall since these programs reinforce fertility reducing behaviors for the long run.

## Appendix

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Figure 1: World Population, 1950-2050

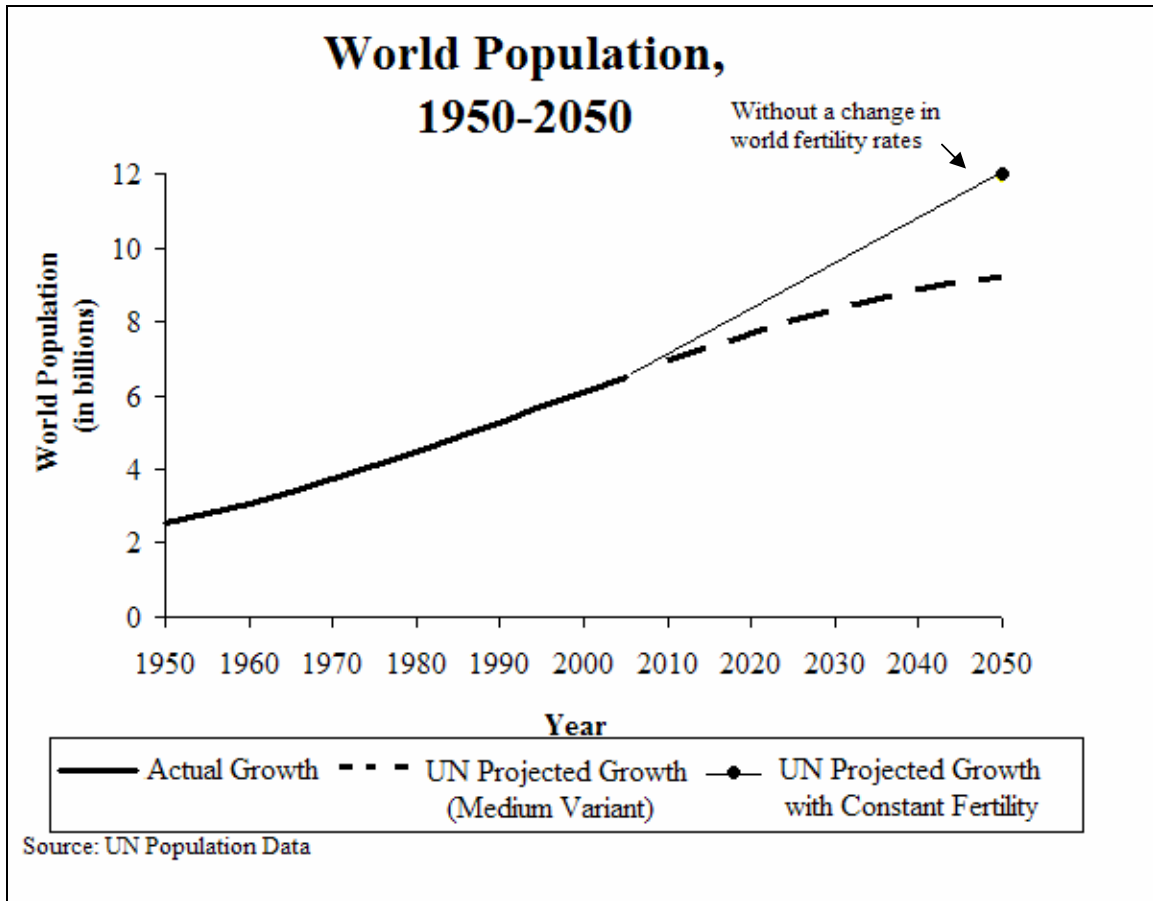


Figure 2: Population of Bangladesh, 1950-2050

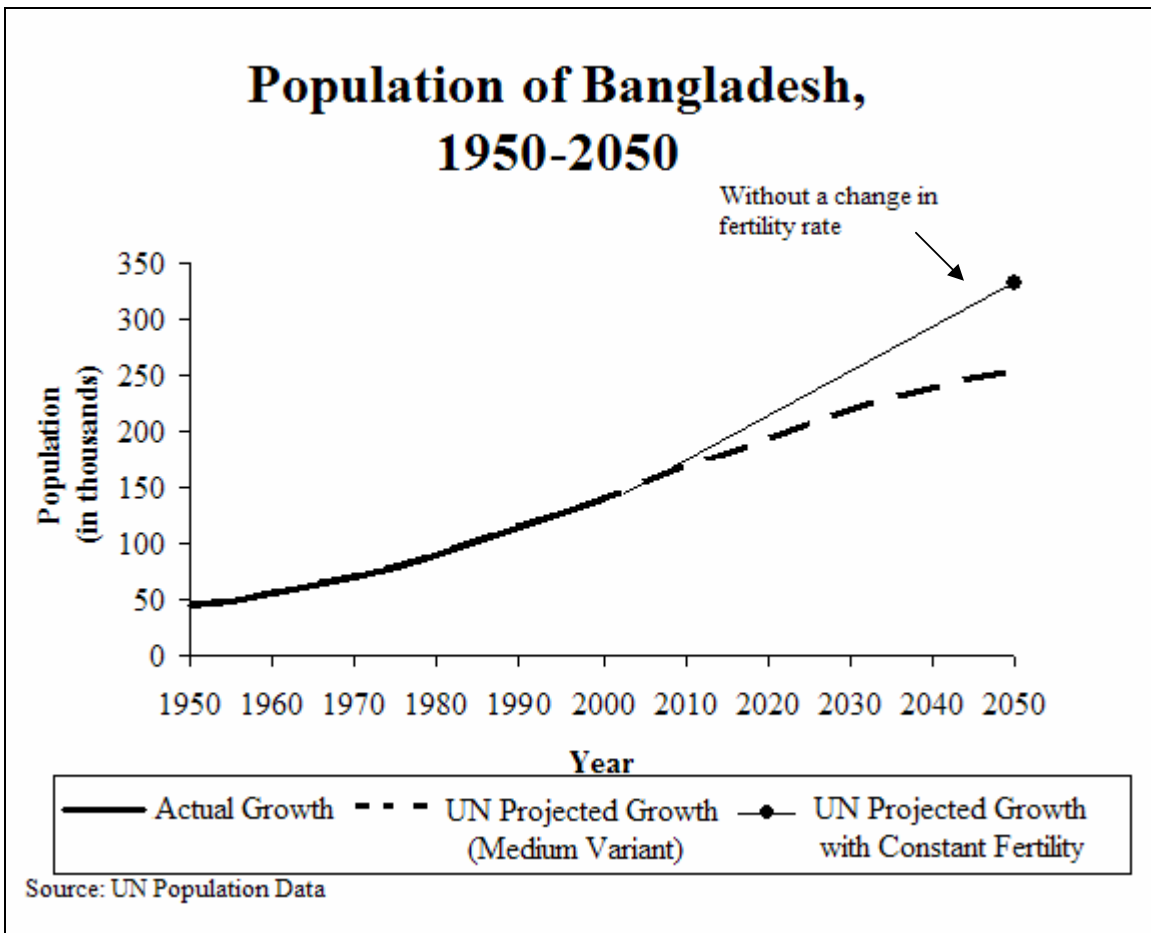


Table 1: Descriptive Statistics

Variables	Description	Mean	S.D	Min	Max
<i>Excess Fertility</i>	=Total children ever born - ideal number of children	0.800	2.044	-6	11
	Total children ever born	3.258	2.137	0	15
	Ideal number of children	2.458	0.764	1	8
<i>CreditMember</i>	=1 if member of a credit program as of interview date	0.287	0.452	0	1
<i>GoesOutAlone</i>	=1 if travels beyond her village without her husband	0.276	0.447	0	1
<i>Age</i>	Current age in years	29.686	8.621	15	49
<i>AgeAtMarriage</i>	Age at which respondent was first married	14.626	2.350	10	39
<i>Poorest</i>	=1 if of the poorest wealth quintile	0.232	0.422	0	1
<i>MiddleWealth</i>	=1 if of the middle wealth quintile	0.253	0.435	0	1
<i>Richer</i>	=1 if of the richer wealth quintile	0.280	0.449	0	1
<i>Working</i>	=1 if currently working outside of home	0.225	0.417	0	1
<i>AnyEducation</i>	=1 if has had any formal education	0.548	0.498	0	1
<i>SonPreference</i>	=1 if ideally wants more male children than female	0.200	0.400	0	1
<i>Husband'sFSI</i>	=1 if husband's family size ideal > than respondent's	0.212	0.409	0	1
<i>Use contraceptive</i>	=1 if couple currently using any contraceptive method	0.629	0.483	0	1
<i>BarisalReg</i>	=1 if resides in Barisal region of Bangladesh	0.127	0.333	0	1
<i>ChittagongReg</i>	=1 if resides in Chittagong region of Bangladesh	0.186	0.389	0	1
<i>DhakaReg</i>	=1 if resides in Dhaka region of Bangladesh	0.219	0.414	0	1
<i>SylhetReg</i>	=1 if resides in Sylhet region of Bangladesh	0.076	0.264	0	1

Table 2: Descriptive Statistics based on credit membership

Variable	Credit Member		Non-member	
	Mean	S.D	Mean	S.D
<i>ExcessFertility</i>	0.893	1.839	0.763	2.120
<i>Total children ever born</i>	3.267	1.894	3.254	2.227
<i>Ideal number of children</i>	2.374	0.705	2.491	0.785
<i>GoesOutAlone</i>	0.216	0.412	0.300	0.458
<i>Age</i>	30.589	8.217	29.323	8.752
<i>AgeAtMarriage</i>	14.517	2.321	14.670	2.360
<i>Poorest</i>	0.114	0.318	0.132	0.338
<i>MiddleWealth</i>	0.132	0.339	0.208	0.406
<i>Richer</i>	0.249	0.433	0.207	0.406
<i>Working</i>	0.210	0.407	0.213	0.409
<i>AnyEducation</i>	0.252	0.434	0.253	0.435
<i>SonPreference</i>	0.547	0.498	0.548	0.498
<i>Husband'sFSI</i>	0.260	0.439	0.288	0.453
<i>Use contraceptive</i>	0.233	0.423	0.231	0.422
<i>BarisalReg</i>	0.052	0.221	0.085	0.279
<i>ChittagongReg</i>	0.176	0.381	0.210	0.408
<i>DhakaReg</i>	0.305	0.460	0.192	0.394
<i>SylhetReg</i>	0.712	0.453	0.595	0.491

Table 3: Regression Results, Dependent Variable is Excess Fertility

Variable	Coefficients (Standard Error)	t
<i>Constant</i>	-1.482 (.151)	-9.8
<i>CreditMember</i>	-.095 (.043)	-2.21
<i>GoesOutAlone</i>	-.252 (.046)	-5.47
<i>Age</i>	.155 (.003)	61.79
<i>AgeAtMarriage</i>	-.159 (.008)	-18.89
<i>Poorest</i>	.110 (.057)	1.95
<i>MiddleWealth</i>	-.150 (.055)	-2.73
<i>Richer</i>	-.247 (.055)	-4.51
<i>Working</i>	-.099 (.047)	-2.12
<i>AnyEducation</i>	-.062 (.044)	-1.42
<i>SonPreference</i>	-.377 (.048)	-7.80
<i>Husband'sFSI</i>	.153 (.047)	3.26
<i>Use Contraceptive</i>	.124 (.041)	2.99
<i>BarisalReg</i>	.311 (.063)	4.93
<i>ChittagongReg</i>	.353 (.056)	6.33
<i>DhakaReg</i>	.235 (.051)	4.60
<i>SylhetReg</i>	.516 (.078)	6.58
R-squared	.505	
Adjusted R-squared	.504	
Mean of dependent variable	.80	

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