Poverty, Micro-credit Program Membership and Domestic Violence in Bangladesh: A Study using Propensity Score Matching

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Abstract

This paper explores the relationship between women's participation in microcredit groups and domestic violence in Bangladesh. Several studies have raised concern about microcredit programs by reporting higher levels of violence among women who are members. These results, however, may be attributable to selection bias as members might differ from non-members in ways that make them more susceptible to violence to begin with. Using a sample of currently married women from the 2007 Bangladesh Demographic Health Survey (N=4,195), we use propensity score matching (PSM) as a way of exploring selection bias in this relationship. Results suggest that the previously seen strong positive association between membership and violence does not hold when an appropriate comparison group, generated using PSM, is used in the analyses. Multivariate analyses also suggest that levels of violence between members and non-members are not significantly different and instead could depend on context-specific factors related to poverty. Members for whom a match is not found report considerably higher levels of violence relative to non-members in the unmatched group. The background characteristics of these members and non-members who do not match suggest that they are more likely to be from relatively well-to-do households, are younger. As further support of selectivity of women who are vulnerable to violence into membership groups, a major difference between unmatched members and non-members is in the higher levels of poverty and lower female headship in member households.

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Introduction

This paper explores an important aspect of the relationship between poverty and domestic violence among women in Bangladesh by examining the role of women's participation in microcredit groups in influencing their risk of domestic (spousal) violence. In Bangladesh, where the microcredit revolution began with the founding of organizations such as the Grameen Bank, savings or credit group membership is among the most visible and common anti-poverty programs in the country. Affiliation to membership groups among the poor is widespread with approximately one in three households reporting some affiliation to the myriad of micro-finance institutions that operate in the country.

While much of the current popular and scientific literature has touted microcredit as a powerful agent of social change and an effective means out of poverty for the poor, the debate on whether or not microcredit is actually effective in reducing poverty has grown significantly in recent years (see Roodman & Morduch, 2009; Kabeer, 2001 for a detailed discussion). In an extension to this debate, researchers have also become interested in whether or not membership in microcredit programs, targeted primarily to women, enhances their status and autonomy. In the context of Bangladesh, one specific aspect of women's empowerment, domestic violence, has garnered a great deal of attention in these debates, particularly given the high levels of spousal violence that characterizes the largely patriarchal and impoverished society of Bangladesh (Schuler & Hashemi, 1994). These debates have been fueled further as studies that have addressed this topic have raised concern about microcredit programs by reporting higher incidence of gender based violence among women who are members (Koenig, Ahmed, Hossain & Mazumdar, 2003).

In this paper, we address this question by employing a research technique that helps highlight selection issues that might confound the relationship between microcredit membership and domestic violence. Studies that find higher rates of domestic violence among group members clearly contradict the objectives of most microcredit organizations that include raising women's status by empowering them. In this paper, we argue that the presence of a statistical association between membership and violence does not imply causality and a causal attribute of violence to membership is misleading if membership is selective of women who are vulnerable to violence. Members of microcredit organizations may differ from non-members in significant ways on other characteristics, most notably household poverty and vulnerability, potentially making them more susceptible to domestic violence (Steele, Amin & Naved, 2001). In this paper, we explore the association between microcredit and domestic violence by focusing centrally on the question of selection

bias. We utilize the technique of Propensity Score Matching (PSM) as a way of finding an appropriate comparison group of non-members who are not significantly different from members of microcredit groups.

Background

Microcredit, Poverty Alleviation and Women's Empowerment

Since the founding of Grameen Bank by Mohammad Yunus in the late 1970's in Bangladesh, microcredit, or the provision of small collateral free loans targeted primarily to poor women has grown exponentially and has come to occupy an important position in poverty alleviation strategies. In just 30 years, micro-finance institutions are estimated to have reached over 100 million women all over the developing world. Proponents of microfinance believe that it has contributed significantly to the reduction of worldwide poverty and has forwarded the cause of achieving the Millennium Development Goals (MDG) (Microcredit Summit Campaign). The efforts of Mohammad Yunus and Grameen Bank were recently awarded the Nobel Peace Prize for their role in reducing world poverty. In Bangladesh, where the microcredit revolution began, it has come to play a central and critical role in its poverty alleviation strategies.

Successes such as an achievement of near universal repayment, provision of effective financial services to the rural poor on a large scale, and in general its role in raising the status of women and households by raising income and consumption levels, have widely been touted as evidence of its effectiveness. Recently however, the debate on the actual effectiveness of microcredit programs in alleviating poverty or impacting women's empowerment has begun to gain traction, particularly given that the early evidence on this topic has almost entirely come from cross-sectional and non experimental studies. Much of this debate has risen as studies have begun to examine microcredit using more rigorous and robust methods, including using randomized control designs, with the goal of delineating causal relationships between microcredit and poverty outcomes. These studies have found contrasting results. There are several notable studies such as Pitt and Khandker (1998) and Khandker (2005), both using data from a survey from Bangladesh, that have reinforced the assertion that microcredit programs are effective in helping alleviate poverty. These studies are of particular note because they have made strong cases for causal identification and have been quite influential both within and outside of academia. Pitt and Khandker (1998) applied a quasi-experimental design to the 1991-92 data and concluded that microcredit successfully raised household consumption. They found that this was particularly true when the loans were given to women. Similarly, Khandker (2005) exploited the panel nature of the same data using the 1999 resurvey, finding similar results to Pitt and Khandker (1998), further suggesting that microcredit helps extremely poor segments of the population more

so than the moderately poor. These papers have exercised a great deal of influence beyond academia as well, with the US based Grameen Foundation describing Khandker (2005) as the most reliable evaluation of a microfinance program to date (Goldberg, 2005).

Despite their strong causal claims, these results have been contested, by Morduch (1998) and Roodman and Morduch (2009). Morduch's (1998) paper questioned Pitt and Khandker's (1998) assumptions in the quasi-experiment and their methods and used a simpler estimator to show that microcredit has no impact on the level of consumption, though finding that it does significantly reduce consumption volatility. Following Morduch's (1998) critique, Pitt (1999) produced a response, but both of them went unpublished and the inconsistent results were never reconciled. The debate has however continued, with Roodman and Morduch (2009) producing a replication study of Pitt and Khandker (1998) using the same two stage least squares methods and the same data, generating findings with opposite results. While Roodman and Morduch (2009) do not explicitly assert that microcredit does not reduce poverty, they do assert however that there is an absence of strong consistent rigorous evidence and notes that the instrumentation strategy in Pitt and Khandker(1998) is incorrect and that reverse causality or omitted variable bias might be driving their results.

More recently, the evidence-base has leaned towards randomized studies (Roodman & Morduch, 2009; Banerjee & Duflo, 2008). Karlan & Zinman (2009) studied a microcredit organization in the Philippines targeted towards small businesses using a field experiment and a follow up survey. In their experimental design, they randomized the approval decision for marginally credit worthy applicants and used household and business survey data to measure impacts on credit access and outcomes such as profits and business formation. They found that while profits rose, they only did so for men with higher incomes. The rise in profits was also only limited to smaller enterprises that had lower costs and that profits increased by shrinking businesses to shed unproductive workers. On the other hand, though not explicitly microcredit in the classic sense of the provision of small collateral free loans, Karlan and Zinman (forthcoming) studied payday loan services in South Africa using an experimental design, finding that such services benefit both genders on a range of economic outcomes. Banerjee, Duflo, Glennerster & Kinnan (2009) ran a randomized control trial of microcredit in the urban slums offering loans to randomly selected slum areas while withholding these programs from other slums of Hyderabad, India. After a year, there was no appreciable or significant effect of access to microcredit on the average monthly per capita expenditure in households, though spending on durable goods and the number of new businesses was seen to increase. The impact on other economic outcomes was also generally found to be mixed, finding differences in spending in durable and non durable goods based on the household's current ownership of or propensity to open businesses. No

significant impacts were found on health, education or women's empowerment. Though this study is the first randomized study to study microcredit as it is introduced to a new area, as Roodman and Morduch (2009) suggest, there are a number of randomized control trials that are being conducted currently in Mexico, Morocco and in Peru, the results of which are likely provide important insights on this debate when they become available. As relatively new studies, these have not yet been published in peer-reviewed journals and studies such as Pitt and Khandker (1998) and Khandker (2005) remain the highest profile published studies that attribute large program impacts of microcredit for poverty outcomes. However, the non-impact results are widely available through the internet and have already received a great deal of attention in the mainstream press and popular media, thus exercising considerable influence.

There are several studies that examine influences on women's empowerment, though much of this literature is observational or qualitative. In a comprehensive review, Kabeer (2001) finds, on one hand, there are studies that have painted a decidedly positive picture of the impact of microfinance in the lives of women. For example, Rahman (1986) found that participant women have larger decision-making roles in their households in addition to member households having higher income and consumption when compared to non participating households regardless of the gender of the loanee. Pitt and Khandker (1995), explored gender differentiated impacts of microcredit programs on a wide range of empowerment outcomes such as women's ownership of non land assets, hours worked in cash earning occupations, fertility levels, children's education and consumption expenditure. The results showed that households that received loans were more gender equitable than households that did not finding that women's preferences held more weight in households when women themselves received loans compared to when men received loans or when no loans were received. Hashemi, Schuler and Riley (1996) examined a similarly extensive set of empowerment outcomes including women's income contributions, mobility, ability to make large and small purchases or own productive assets, involvement in household decision making, political awareness and how they are associated with access to microcredit. Their study found that having access to microcredit significantly increased contributions to household income, likelihood of owning assets, political awareness and decision-making in purchases large and small. Access to microcredit also appeared to significantly increase the value of the component index of all of these empowerment indicators, including those that were not significant individually. The results of this study also suggested that a pathway to higher empowerment could be through the higher contribution of women to their family income.

On the other hand, a few studies have also found negative impacts on women's empowerment. Most of these studies have focused on women's control over loans. Goetz and Sengupta (1994), who examined an index of

managerial control over loans for women, found that most married women exercised little or no control over their loans. Their study also suggested that this has a negative influence on repayment of loans particularly since the responsibility of repaying the loans go to men, which could negate the developmental objectives of providing loans to women or the men may be unable or unwilling to repay the loan leading to conflicts in the household. In another study, Montgomery, Bhattacharya and Hulme (1996), found similar results suggesting that only a very small percentage of women who get loans exercise full control over them compared to when men borrow from microcredit groups.

Microcredit Membership and Domestic Violence

As discussed earlier, in the debate on micro-credit programs and women's empowerment, domestic violence is an issue of critical importance in Bangladesh, where severe gender disparities in a rigid patriarchal society has caused domestic violence to become an accepted and even institutionalized practice (Koenig et al., 2003). In fact, according to the Demographic and Health Surveys, which collects standardized data on domestic violence in many countries in the developing world, domestic violence rates in Bangladesh are among the highest in the world with recent figures from the 2007 DHS, showing that over 52% of ever-married women had experienced some form of violence from their husbands in their lives. Microcredit membership in Bangladesh also is widely prevalent, with recent figures showing membership rates as high as one in three households. In the 2007 BDHS domestic violence module, the representative subsample of women that we use in this study, the proportion of women who are members of groups with a microcredit component was as high as 38%.

As in the larger literature on women's empowerment, there appears to be no clear consensus in the current evidence on whether the microcredit groups reduces or exacerbates spousal violence either. Some studies have found clearly positive influences on domestic violence. For example, Schuler et al. (1996) found unambiguous results that suggest that women's membership in microcredit organizations is associated with reduced risk of domestic violence. Their study found a reduction in levels of violence of as much as two thirds among members when compared to women who did not have microcredit programs in their villages. These positive effects also extended to women who were non-members but lived in villages with microcredit programs. As Koenig et al. (2003) note, these beneficial effects could be a manifestation of a number of factors. First of all, it could be a result of the reduction in economic scarcity in the household resulting from the woman's membership in such organizations which brings in a loan and thus additional resources into the household. The access to loans and the subsequent control of a resource as valuable as money that membership in a microcredit group enables a woman to have could increase self-reliance and elevate their

status within the household. The threat of losing a loan as a result of violence could also induce husbands to become less abusive against their group member wives (Hashemi, Schuler & Riley, 1996; Kabeer, 2001 & Schuler et al. 1996). Similarly, the additional support networks and the exposure that women gain through their participation in such groups could also work in ways to reduce violence from husbands (Hashemi et al 1996; Schuler, Hashemi, & Badal, 1998; Schuler et al., 1996).

On the other hand, in depth qualitative studies on microfinance and domestic violence have found more ambiguous results. For example, a qualitative study by Schuler et al. (1998) found evidence that microcredit might exacerbate domestic violence. Their study found that violence in households may worsen if group membership encourages women to challenge traditional gender roles and to secure control over resources that are typically seen to be under the husband's domain. If a husband perceives that he is losing authority over his wife because of her group membership, it might provoke increased violence. Similarly, the greater financial independence and autonomy that women gain from microcredit membership could lead to lesser passivity in household decision-making and pose challenges to male authority, thus providing grounds for greater marital and household conflict. Similarly, a study by Rahman (1999) also found that a majority of women who had joined microcredit groups, over 70%, had experienced an escalation in violence whereas only around 20% reported having experienced a reduction. Other studies including Jewkes (2002) and Koenig et al. (2003) have however noted the possibility that escalations of violence resulting from microcredit membership may only be short term reactions to the initial shock that such membership poses to traditional gender norms. These negative effects are likely to dissipate in the longer run as women's empowerment resulting from group participation tends to be protective from gender-based violence in the long run (World Bank, 2009). The verdict on how microcredit affects domestic violence based on this evidence thus remains largely unresolved.

Poverty, Domestic Violence and the Self Selection of Women into Microcredit Groups

Even though the literature on the influence of microcredit and domestic violence remains largely unresolved and the evidence almost entirely non-causal, both advocates and opponents of microcredit have used this associational evidence to qualify their arguments for or against the effectiveness of microcredit in uprooting poverty or enhancing women's empowerment and autonomy. The opponents of microcredit in particular have raised concern regarding microcredit organizations particularly by citing the higher levels of violence seen among members in some studies that we review above. In the 2007 DHS data in Bangladesh, bivariate statistics show that women who are members report higher levels of domestic violence relative to women who are not members. Given that domestic violence has emerged as a central issue for women and

development for its role in impeding women's economic and social development and their capacity for self determination (Koenig et al., 2003), results from studies that have shown higher levels of violence for women who join microcredit groups have raised alarm regarding the influence of microcredit organizations, particularly in its empowering effects on women, and has understandably generated a significant amount of interest on this issue.

Since most studies that have examined microcredit membership and its effects on women have been based on studies that use cross-sectional data and do not adequately address self selection of women into credit groups these results can be misleading (Steele, Amin & Naved, 2001). As our review suggests, on one hand, the self selection of highly empowered women into microcredit groups might make them an already more resilient group to domestic violence. On the other hand, one way in which the selection of empowered women into credit groups might make women more prone to domestic violence is that, as studies such as Schuler et al. (1996) suggest, their high levels of empowerment and the resulting challenges that they pose to traditional gender norms could result in marital conflict and spousal tensions, subsequently resulting in an escalation in the level of violence against them, at least in the short term. While factors such as high empowerment and education may seem to be protective against domestic violence, cross-cultural research, as Jewkes (2002) notes, suggest that in societies where ideologies of male dominance are the strongest, domestic violence also tends to be the highest and societal and institutional structures are such that women with more liberal ideas and views are more at risk to become victims of violence from their husbands or other males in society. These risks persist up until a point where their empowerment has reached a high enough level for protective effects to predominate.

Another related and plausible source of selection bias, and the one that we consider in our analysis, is that women who become members of microcredit groups are likely a select group with certain other socio-economic background characteristics that might make them innately more vulnerable and susceptible to domestic violence. One characteristic that has most consistently been linked with higher levels of domestic violence is poverty (Jewkes, 2002; Ellsberg et al., 1999; Heise, 1998). As microcredit programs are primarily targeted towards poor rural populations, microcredit members are typically women who come from households in the lowest socio-economic strata. If this notion that poor women are more likely to experience domestic violence than non-poor women is to be accepted, then microcredit group members are already a group that is inherently more vulnerable to being in violent relationships. The consistent link between poverty and domestic violence is primarily explained by an influential theory that suggests that families who live in poverty have higher levels of stress and have fewer resources to combat it than non poor families, and

that stress mediates the relationship between poverty and domestic violence, thus making poor women more prone to family violence (Jewkes, 2002; Kishor & Johnson, 2006). Thus a higher level of violence among microcredit members cannot unequivocally be attributed to program effects because of these pre-existing differences. The differences in levels of violence are more likely a manifestation of this selection bias. There is still some disagreement in this literature on the nature of this relationship, where some studies have found that the poverty connection becomes insignificant after factors such as education and residence is considered (Diop-Sidibe, 2001). According to Kishor and Johnston (2006) however, this inconsistency in the effects of household economic status on domestic violence may lie in the variability of defining household poverty, wealth and in varying definitions of domestic violence. This notwithstanding, poverty still appears to be the most strongly and consistently linked factor to domestic violence in the current literature.

Poverty also appears to be inherently tied to a number of factors that are considered to be related to domestic violence risk for women. As outlined in Heise's (1998) conceptual framework on the determinants of spousal violence against women, there may be a string of other individual, relational, familial, societal and cultural factors that determine this risk (see Heise, 1998 and Naved & Persson, 2005 for Bangladesh specific context). These factors which include prior personal and intergenerational exposure to violence, marital relationship conflict and power dynamics, and family structure and societal factors discussed earlier such as male dominance ideologies in society, societal tolerance of domestic violence and perceptions about gender equality, all may result in differential risks for women to experiencing violence. While a review of the relationship of each factor with poverty and socio-economic status is beyond the scope of this study, the general evidence would suggest that poverty has strong influences on each of these factors, which in turn may potentially determine risk factors related to spousal violence. Thus socio-economic status of women is likely to be a strong contributor to the selection bias in the relationship between microcredit membership and domestic violence.

A study by Steele, Amin and Naved (2001) that explores self selectivity of women into microcredit groups in Bangladesh, where the use of contraception is explored as the outcome of interest, authors note that selection bias exists at three different levels. At the individual level, women only from a certain social strata can enter microcredit groups, primarily due to the eligibility criteria that must be met by all prospective members. As noted in their study, these criteria are mainly geared towards targeting the poor by only allowing women of lower income households and those who are functionally landless to join such groups. There is of course the self selection of highly empowered, more educated and forward thinking and more liberal women into participating in such groups since membership is voluntary. The study also finds that non random placement

of the microcredit program contributes to selection bias through differential attitudes towards, access to, and uptake of family planning and contraceptive services in different areas. Results from this study suggest that certain attributes of women related to past experience of domestic violence and discord in marital relationships may make women more likely to choose to participate in microcredit groups. Alongside characteristics such as age and women's status measures such as mobility that are observed to be positively related to participation, women's treatment by her husband showed the strongest correlations with group membership (Steele, Amin & Naved, 2001). Results show that a poor and conflict-filled relationship with the husband, characterized for example by threats by the husband to marry another wife, indicating an emotional form of violence, had the strongest associations with a woman's likelihood to join a microcredit group. Verbal or physical abuse on the other hand showed a negative relationship with membership. Overall, however, the results suggest that women may join microcredit groups as protective measures against their marital and the resulting financial insecurities. Thus, women who join microcredit groups may do so *as a result* of their prior experience of violence and not the other way around. In the presence of such evidence indicating the potential for reverse causality from unique panel data and using robust quasi-experimental techniques, it would be imprudent to purely attribute domestic violence to program effects.

While it is important to highlight problems of selection bias, it must be noted however that domestic violence is a complex issue with cumulative effects. Any evidence that is purely cross-sectional will have limitations. Extremely detailed longitudinal data on the experience of spousal violence and related background information are essential to truly gain an understanding of how program participation might affect domestic violence. In the absence of such data, we utilize the most extensive and detailed data available on domestic violence, albeit cross-sectional, from the Bangladesh DHS to examine this question employing robust quasi-experimental methods. In the following sections, we describe the data, empirical strategy and results, and reflect on the findings of the analyses. While it may not be completely possible to elucidate causal program effects on levels of domestic violence in this paper, we do however highlight selection bias as a key issue that must be considered in understanding issues related to this topic and in interpreting the evidence in this debate.

Data & Measures

Data for this study comes from the 2007 Bangladesh Demographic Health Survey (BDHS), a cross-sectional, nationally representative sample survey of 10,996 women aged 15 to 49 and 3,771 men aged 15 to 54 from 10,400 households in Bangladesh. The 2007 BDHS collected data from 361 sampling areas in both rural and urban areas in Bangladesh and is part of USAID's global Demographic Health Surveys program

that collects information related to fertility, mortality, family planning, maternal and child health and nutrition, HIV/AIDS, and other issues in population and health in countries around the developing world. The analysis in this study uses data from a sub-sample of ever married women aged 15-49 from the BDHS who were selected for the Domestic Violence Module. From each household in this sub-sample, one woman was randomly chosen as respondents to the module (N=4467). The module was conducted by a group of trained interviewers and in keeping with the ethical guidelines of the World Health Organization (Kishor & Johnson, 2006). This module has been implemented in the DHS in several countries since its development and is the main national population-level source of quantitative data on this topic, allowing for the examination of linkages between domestic violence and a host of socio-economic variables available in the survey. The subsample of women is representative of the entire population of women of reproductive age in Bangladesh (BDHS, 2007). Analyses are conducted on a subset of women from the Domestic Violence Module who are currently married and have information on the incidence of violence in the last 12 months (N=4,195).

Dependent Variable

The key dependent variable of interest in this study is the incidence of domestic violence among women in Bangladesh. In much of the previous literature on domestic violence (e.g. Koenig et al., 2003), the measure of the incidence of violence has been derived from the *single question threshold* approach (Kishor, 2005). In this method, a single question on whether a woman "has ever experienced violence" is used to measure domestic violence. Only women who give a positive response are then asked follow up questions on who the perpetrators were or on the frequency of violence. Women are thus only provided one chance of reporting any violence. As Kishor (2005) notes, this can be problematic, particularly when addressing violence in cross-cultural research contexts such as in the DHS, where measures of violence may be affected by differential understandings of violence among women from different cultural backgrounds. The DHS Domestic Violence Module on the other hand measures spousal violence as a multidimensional measure of the occurrence of physical and sexual violence against women by their husbands by implementing a subset of eight questions from the Conflict Tactics Scale (CTS) (Straus, 1990). Our dependent variable is a dummy variable that indicates whether a woman has experienced any form of violence from her husband in the last 12 months preceding the interview. This variable is based on the woman's answer to a set of two part questions on whether she has experienced the following forms of violence:

a) being pushed, shook, or thrown something at
b) being slapped

c) having had her arm twisted or hair pulled
d) being punched
e) kicked, dragged or beat up
f) choked or burned on purpose
g) threatened with a gun or knife
h) being physically forced to have sexual intercourse

First women are asked whether she has *ever* experienced any of these forms of violence. If the woman answers "no" to all of these questions, our dependent variable is coded "0". If she answers "yes" to having ever experienced these forms of violence, she then is asked about how often it has happened in the last 12 months. If the woman answers "often" or "sometimes" to any one of the forms of violence listed above, we code our domestic violence variable as "1". If she answers "not at all" to all of them, we code it as "0", grouping these women with those reporting never having experienced any of these forms of domestic violence. Given that this variable measures domestic violence in the last year, the sample is limited to currently married women (N=4,195). By asking distinct questions about different acts of violence, this measure also is less likely than the single question measure to be confounded by cultural differences or personal perceptions in the conceptualization of what constitutes violence, thus making it a much more advantageous measure than previously used conceptualizations of spousal violence against women. Given that our sample consists only of married women, the terms domestic violence and spousal violence are used interchangeably in the remainder of the paper.

Key Explanatory Variable

The central independent variable of interest in this study is the participation of women in microcredit groups in Bangladesh. We measure our independent variable using an indicator variable that indicates whether or not the woman is currently a member of a microcredit organization. Bangladesh, widely known as the birthplace of the microcredit revolution, is home to an array of microcredit organizations. The BDHS specifically asks questions about membership based on whether or not the respondent belonged to the following organizations at the time of the survey:

a) Grameen Bank
b) Bangladesh Rural Advancement Committee (BRAC)
c) Association of Social Advancement (ASA)
d) Proshika

e) Any other organization with a microcredit component to its operations

We code this dummy variable indicating microcredit membership as "1" if women answered yes to any one or more of these questions. Participation in Mother's Clubs, which is also asked as a part of the set of questions outlined above, but does not explicitly have a microcredit component, is excluded from the microcredit measure. Following Steele, Amin and Naved (2001), we employ the concept of membership in a microcredit organization in the broadest sense of simply belonging to an organization such as Grameen Bank regardless of whether the respondent took a loan or not. This is in contrast to the approach in some studies that examine program participation that have defined membership based on amount of loan taken (e.g Pitt, Khandker, McKernan, & Latif, 1999). As Steele, Amin and Naved (2001) note, such a measure may be too limited of a specification of membership as it is likely to account only for economic pathways, which could confound the analysis in this study that addresses a non-economic outcome.

Other Explanatory and Control Variables

We employ a host of other socio-demographic variables in the examination of the relationship between microcredit membership on domestic violence in Bangladesh in this study. The propensity score matching technique that we use in this paper to address potential selectivity problems requires the specification of various sets of explanatory variables in a several multivariate models.We fully describe these specifications, the choice of variables employed in each model, and the rationale for each specification in detail in the next section where we outline our empirical strategy. In this section, we briefly describe the variables that are employed in empirical specifications of both the computation of the propensity scores and in the post-matching multivariate analyses. First we employ a measure of the respondent's age in years. We refrain from simultaneously employing a measure of the respondent's spouse's age mainly due to missing data in the spouse's age measure and the inconsistency with which men's age has been known to be measured in female respondent surveys. We measure the respondent's and her spouse's educational attainment by a simple dummy variable that indicates whether they have ever attended school. This measure includes all formal and informal forms of schooling (e.g. *Madrasas*). Age at first marriage of the respondent is also measured in years.We also measure the characteristics of the household by measuring household size in number of persons, the age of the household head in years and the household head's gender via a variable that indicates whether the household head is female. Due in part to the nature of the distribution of microcredit organizations in Bangladesh, which tend to be differentially concentrated in rural or semi-rural areas, we use a more refined measure of the residence of the respondents. The urban-rural divide is measured using a set of four mutually exclusive dummy variables indicating whether the respondent lived in a large city, a small

city, a town or in a rural community. These variables are also incorporated into measuring the socio-economic status of each household.

The socio-economic status of households is derived from the widely used wealth-index developed by Filmer and Pritchett (2001) which is available for all households in the BDHS. In the absence of reliable consumption measures which are most commonly used as income proxies, as is the case in the DHS surveys, the asset index poverty-wealth measure have been used widely as a high quality substitute since its development. This measure is constructed in the DHS using information on household assets and the quality of the dwelling by employing principle components analysis (see Filmer and Pritchett, 2001 for a detailed description of the construction of this measure and the BDHS (2007) for Bangladesh specific construction details). We use this measure in the conventional form of quintiles, ranked from 1(poorest) to 5(richest) and create a set of five mutually exclusive variables denoting the household's economic status. In order to account for rural-urban differences in the ownership of assets and quality of housing, we first rank households in each of the four categories of region of residence into quintiles separately. We then combine households in each quintile ranking from all four regions of residence (households from the first quintile in the large city category are combined with first quintile households in the small city, town and rural categories) to create a composite wealth- index socioeconomic status variable that accounts for urban-rural differences.

In order to account for community level effects of where respondent women live that may determine their likelihood of joining microcredit organization or their susceptibility to spousal violence or lower status, we also measured means of the prevalence of microcredit membership, women working outside of their homes and of women's ever attendance of school at the district level. The district of residence are defined as community level variables following spatial socio-demographic research by Amin, Diamond and Steele (1997) and Amin, Basu and Stephenson(2002). Means at the district level are calculated as non-self means . Non self means essentially calculate the average of the responses of all individuals in a particular district for an individual excluding only the response of that individual from the mean. This effectively removes the individual's contribution to the average, thus essentially eliminating the possibility of any bias that the response of the individual might contribute in calculating the district level prevalence. Given that these variables are dummy variables, the non-self means essentially represent an unbiased measure of the prevalence of each in the district in percentage terms.

In the estimation of the propensity scores, in which the probability of joining a microcredit organization is determined, measures such as functional landlessness and whether the husband's occupation involves any

form of labor is measured as well, since these measures are part of the criteria that determines eligibility to join a microcredit organization in Bangladesh. The functional landlessness measure is simply measured as a dummy variable indicating being landless if the household owns less than 0.5 decimals of land, which is the standard threshold for entering a microcredit group. The spouse's labor based occupation is determined based on whether the spouse has an occupation that is deemed a labor-type activity which could include activities such as working as an agricultural worker, animal husbandry, working as a brick layer, rickshaw driver or even a domestic servant etc.

Empirical Strategy & Results

One of the key goals of this paper is to disentangle the ongoing debate surrounding the evidence on microcredit and domestic violence in the current literature, which at best is ambiguous in its findings (Kabeer, 2001; Koenig et al. 2003). This ambiguity, which is not limited only to the domestic violence research (and reviewed in Kabeer, 2001), has fueled the growing speculation among researchers regarding the effectiveness of microcredit programs in alleviating poverty or raising women's empowerment. In terms of domestic violence specifically, as the earlier review suggests, there appears to be some evidence that links membership in microcredit organizations to higher levels of violence (e.g. Schuler et al., 1998; Rahman, 1999). Not surprisingly, in our cross-sectional sample in the BDHS, we find some preliminary figures that support this assertion. First a simple bivariate cross tabulation of domestic violence by microcredit group membership in our sample shows that microcredit group members reported a significantly higher level of domestic violence in the previous year (28.03%) than non-members (21.48%). This difference persists in a naïve yet multivariate specification of this difference in which we regress domestic violence on microcredit membership using a binary logistic regression model controlling for key socio-demographic characteristics. The results from this regression, illustrated in Table 1 shows that microcredit membership is associated with a significantly higher incidence of violence among women even after controlling for a range of variables (Odds Ratio=1.243, $p<0.01$)

Selection Bias in Microcredit Membership and Domestic Violence

At first glance, the logistic regression results appear to corroborate much of what the current evidence on microcredit and domestic violence suggests, fueling the speculation on impacts of microcredit programs further. However, one must be cautious in interpreting these results as causal. When analyzing impacts of a program such as microcredit on outcomes, researchers have to be mindful that these results might be driven by various sources of selection bias. As discussed earlier in the review, the problem of selection bias arises

when program participants "select" into a program in a non-random fashion and are sufficiently different from non-participants that a comparison between these groups does not yield an estimate of the actual effect of the program. Instead, it yields an estimate that is biased and that is a function of the pre-existing difference in these characteristics between participants and non participants. We therefore speculate that the frequently observed positive association between membership in microcredit groups and domestic violence that observed in the literature might be a result of selection bias.

A significant source of such selection bias in our study likely is at the individual level. Microcredit programs in Bangladesh generally have a set of eligibility criteria which targets poor women. Therefore, women who are eligible to join microcredit groups are more likely to be poor and come from socio-economically disadvantaged backgrounds. As noted in our review, the consistent links between poverty and the experience of domestic violence (Ellsberg et al., 1999; Heise, 1998; Jewkes, 2002) would suggest that group members, who typically come from the lowest socio-economic strata, are a group that is already susceptible to experiencing higher levels of violence. These positive associations therefore might be a reflection of such potentially pre-existing differences in women's vulnerability of being in violent relationships. On the other hand, since program participation is voluntary, eligible women who actually join microcredit groups themselves are likely to be innately different from women who do not join or are not members. In addition to the possibility of these women being a more empowered and assertive group, the findings of Steele, Amin and Naved (2001) suggest that women may join such groups as protective measures against violence from their spouses instead. Microcredit group members may therefore be a group who are already in violent relationships and those who are looking for support and security in case their marriage fails. This assertion that a woman's experience of violence itself might affect the decision to join microcredit groups furthers the possibility that selection bias might be operating at various levels in this relationship. Microcredit programs may also be non-randomly placed, affecting a woman's propensity to join, though this source of selection bias is less likely to be strong in our sample as we consider nearly all forms of microcredit programs in Bangladesh, where programs are quite universally available.

Given this discussion, we next explore the existence of selection bias due to observable characteristics in our sample in Table 2 by comparing characteristics of member and non-member women using a simple bivariate cross tabulation of means of key socio-demographic characteristics of women including levels of the experience of spousal violence. In Table 2, we can clearly observe evidence of selection bias. We find that group members not only show significantly higher levels of violence (as discussed earlier) but that they also have lower levels of education, marry at earlier ages, and come from families with significantly lower levels

of income and families that are more likely to be landless. Microcredit group members are also less likely to live in urban areas and display some notable regional variation among the six divisions in Bangladesh in terms of their distribution. A majority of the differences on these variables noted in Table 2 are statistically significant at the 1% level (based on a two-tailed t-test). Given these statistically significant differences between groups, to attribute the higher rates of violence to membership in microcredit organizations would be misleading since the group of non-members that members are being compared to is a significantly more advantaged, wealthier and potentially more empowered group who also display lower levels of violence and can be considered better off than members in many respects.

Propensity Score Matching

In order to address selection bias in this study, we approach this question by utilizing the method of Propensity Score Matching (PSM) (Rosenbaum & Rubin, 1983; see also Dehejia & Wahba, 2002; Jalan & Ravallion, 2003 and Leuven & Sianesi, 2003). This technique has become increasingly popular in the estimation of causal estimates of program effects using observational data in non-experimental settings. Borrowing from the language of experiments, in the presence of selection into treatment (microcredit membership) as we observe in our sample, the main goal of this technique is to find an appropriate comparison group of non-members that is most similar to the group of members based on a set of key characteristics. The true treatment impact then can be calculated based on the differences in levels of the outcome (violence) between these two groups, for whom the treatment assignment is now ignorable. Addressing selection bias in this paper, the PSM technique proceeds as follows. First, a propensity score, a one number summary for each individual, is estimated using a standard logit or probit technique, which essentially estimates the probability that and individual with observed characteristics Z_i joins a microcredit organization such that:

$$\mathbf{P(Z_i) = Prob\ (T=1 \mid Z_i)}$$

An assumption that treatment assignment is purely a function of the observed Z_i's, and hence the selection is purely on observables, is generally essential. If this assumption is to hold, then conditional on the Z_i's, the assignment to treatment is random with respect to the outcome (Winship & Morgan, 1999). This allows for the subsequent estimation of treatment effect of interest, which here is the Average effect of Treatment on the Treated (ATT), without any potential source of additional bias. After the propensity scores are estimated for each individual, then a pool of non-treated individuals is selected as the control group for which the distribution is as similar to the distribution of the treated group as possible. This generally refers to an area of

overlap between treated and untreated propensity scores called the *common support* region. When the common support restriction is applied, treatment observations that fall outside of the range of the upper and lower bounds of the distribution of propensity scores of the control observations are eliminated. After this step, matching is performed over the common support region between observations in the treatment and control groups. Matching can be implemented using a variety of techniques, primarily differing on three issues: whether to match with or without replacement, how many comparison units to match with each treated unit and most importantly which matching method to choose (see Dehejia & Wahba, 2002 for a useful discussion). After treatment and control observations are matched, the effect of microcredit membership on the dependent variable is then estimated either using differences between average outcomes (level of violence) between groups or using multivariate regression techniques on the resulting balanced sample. It is important to note that in the former application of PSM, unmatched comparison units are not used in the estimation of the ATT, the elimination of whom might be seen as a disadvantage, In our multivariate analysis however, as we will describe in the forthcoming section, we present analyses using these unmatched individuals as well.

Propensity Score Matching Results using psmatch2 in STATA

We conduct the matching procedure and the subsequent analyses using the *psmatch2* routine in STATA developed by Leuven and Sianesi (2003). This routine implements PSM, performing both the calculation of the propensity score and the subsequent matching, and then the estimation of the ATT. In our sample, owing to a substantial overlap in propensity scores between treatment and control groups (shown later as a part of the *psmatch2* procedure), we opt for one-to-one nearest neighbor matching with replacement, without any caliper restrictions and applying the common support restriction[1]. In this method, matching is performed on treatment and control individuals that are only within the common support region. Treatment individuals are first listed in random order and then the first treatment individual is matched with the control individual with the closest propensity score and both individuals are removed from their respective lists. This process is repeated until all treatment individuals are matched. The *psmatch2* routine implements this procedure in its

[1] ATT was estimated using a host of other PSM matching methods including matching without replacement, one to many (k-nearest neighbor) matching, radius matching with caliper etc. Majority of the estimated ATT were qualitatively similar. While varying in magnitude, differences between treatment and control groups were consistently statistically insignificant in all specifications. Results available upon request

entirety. The results from this implementation are presented in Table 3. In the top half of Table 3, the logit regression that is used to estimate the propensity score is shown. Here, microcredit membership is shown as a function of a set of variables Z_i. The following variables represent Z_i:

> **P (Microcredit or T=1)** ~ **f** (**Z_i** =respondent's age, respondent and spousal school attendance, spousal occupation, functional landlessness, region of residence: urban/rural, district level prevalence of microcredit)

The selection of these variables is based on either the economic theory or the eligibility criteria of microcredit membership in Bangladesh. Wealth index variables are excluded from the estimation of the propensity score in order to address endogeneity of wealth variables to a variety of outcome variables. The bottom half of Table 3 presents results post-matching of the estimation of the ATT. The table can be read in two parts. The first set of results presents the mean difference in level of domestic violence from the unmatched (or full) sample. The effect size on this unmatched sample is essentially an estimate of the difference in levels of violence between microcredit members and non-members without any manipulation on the original sample. This estimate, that doesn't account for selection bias, is 6.55 percentage points, indicating that members generally experienced a level of violence that was 6.55 percentage points higher than non-members. This result, which is highly significant, is an analog to the results that have been seen in the general literature. The second part of Table 3 shows the ATT estimated on the matched sample. Here the results are starkly different. The ATT remains positive, however the magnitude of the ATT is negligible (ATT=0.018), and more importantly, the effect is statistically insignificant. The statistical significance is calculated more precisely by further calculating *bootstrap errors* using 500 repetitions (following Leuven & Sianesi, 2003) which confirm the statistical insignificance of this result. This result strongly indicates that there is no statistically significant difference in the rates of violence experienced by women who participate in microcredit groups compared to women who don't when the comparison is made with a group of women with similar propensities to join such groups. This result is rather striking, considering the significant amount of evidence that has dominated the literature, and our own results from naïve specifications, that suggests the contrary.

Multivariate Analysis using PSM Results

In Table 4, we explore these relationships in a multivariate framework, utilizing parameters created by *psmatch2* in STATA to identify and use in a regression framework, not only matched members and non-members, but also their unmatched counterparts, that are otherwise excluded into the estimation of the ATT.

The *psmatch2* routine, in its implementation of the PSM, creates a number of variables that identify treatment and control observations, whether individuals fall within the common support region, each individual's propensity scores and various other variables. These variables allow for the identification of a set of 4 mutually exclusive dummy variables that indicate whether each individual was a matched member, matched non-member, unmatched member or unmatched non-member, the combination of which covers the entire original sample of 4,195 currently married women in the Domestic Violence Module. On this inclusive sample, we fit a binary logistic model where the likelihood of experiencing spousal violence is estimated for different groups, using matched members as the reference category. We use the same set of control variables as used in Table 2. The only exception is that after a series of sensitivity analyses (not shown but available upon request), we only use the community level variable for women's school attendance instead of using all three community level variables used earlier. The results from this estimation show that unmatched non-members are a significantly different group in terms of their likelihood to experience of spousal violence compared to matched members (Odds Ratio=0.766, $p<0.001$). This result further strengthens our initial argument that members and non-members of microcredit groups differ significantly in their experience of violence, perhaps because of their pre-existing characteristics. Matched non-members and unmatched members on the other hand did not appear to be significantly different compared to matched members in this respect. Other characteristics such as higher age at first marriage, and having attended school appear to significantly predict lower odds of being in a violent relationship. Socioeconomic status appears to matter as well, as being in each of the higher wealth quintiles appears to significantly reduce the odds of experiencing violence compared to the poorest quintile. Odds ratios show steady decline as individuals move up each quintile, decreasing incrementally up to the richest quintile. All of these results appear to support the expectations set by our review of the literature regarding these relationships. The only result that contradicts expectation is the finding that women who live in communities with higher rates of female school attendance are more vulnerable to experiencing violence.

Given the results that indicate that the group of unmatched non-members are a radically different in their likelihood to experience spousal violence, we fitted another binary logistic regression using this group as the reference category (also shown in Table 4), and found more confirmatory evidence of the same. In this specification, we see that while all three remaining categories: matched members and non-members, and unmatched members have significantly higher odds of experiencing domestic violence compared to unmatched non-members, unmatched members show the highest odds among the three (Odds Ratio=1.329, $p<0.001$), indicating that they show the most significant risk. In order to examine the characteristics of these markedly different groups, we examined their distributional differences in a set of analyses presented in

Table 5. Here, we find that the unmatched non-members are starkly different in their characteristics compared to all three other groups, but particularly so when compared to matched members and non-members. This group of women who were less susceptible to spousal violence were also younger, married at later ages and had been married for a fewer number of years. In terms of school attendance, their participation in schooling as well as their spouse's participation was significantly higher. This group of women however worked outside of the home at lower rates and their husbands were engaged in manual labor at lower rates as well. Predictably, almost all member women's households were considered to be functionally landless while a significantly lower proportion of the unmatched women were landless. The unmatched non-members also were a wealthier group, with near 30% of the group in the richest quintile compared to only 6% of the matched members. In sum, the descriptive statistics reveal that the unmatched non-members are indeed a relatively advantaged group, which we can speculate provides a protective influence over violence.

It is however in the differences in the levels of domestic violence between unmatched members and non-members that we see the most notable contrast. While the unmatched members are a relatively advantaged group compared to the both matched groups, they still have relatively unfavorable socio-demographic outcomes compared to unmatched non-members and most interestingly a significantly higher proportion that experience domestic violence, by over 15 percentage points. It is increasingly apparent in this contrast that the source of the selection bias that drives the relationship between microcredit and domestic violence might lie in the differences between certain characteristics of these two groups. In light of this observation, we ran one additional set of analyses to reconcile these potential sources of bias. In these analyses, the summary of which is shown in Table 6, we used *predicted probabilities* of experiencing domestic violence for unmatched members and non-members to examine where the differences in domestic violence levels might be originating from. In Table 6, the change in predicted probabilities is examined when the entire distribution of unmatched members is substituted with that of unmatched non-members, and when distributions are substituted stepwise and sequentially for different sets of individual variables. As a contrast, we also present results for the predicted probability of domestic violence obtained for unmatched non-members only. Our goal is to test for whether substituting the distribution of the unmatched members with any particular aspect of the distribution of unmatched non-members results in a significant decline in the likelihood of experiencing domestic violence or accounts for a portion of the difference. In these results we find that if the entire distribution of socio-demographic characteristics of unmatched members were to be changed to that of unmatched non-members, the predicted probability of experiencing domestic violence would be reduced from 0.2587 to 0.2294, a non trivial difference of 2.93 percentage points. A significantly larger difference

exists when predicted probabilities are estimated for the two groups separately, with unmatched non-members having a predicted probability of experiencing violence that is 8.44 percentage points lower than that of unmatched members. Owing to the significantly large magnitude differences observed in levels of the poverty profile, education and female headship variables from Table 5, we examined these variables with special interest in our analysis of predicted probabilities. Not surprisingly, the substitution of the wealth quintile distribution accounted for a largest differences in predicted probabilities of violence, though the magnitude itself was small (around 1.99 percentage points). Female headship, interestingly also appears to explain away a relatively non-trivial portion of the differences (0.74 percentage points). In the sequential additions further of education, urban-rural differences, the portion of the difference in predicted probabilities that is explained away became gradually smaller. A large portion of the difference between unmatched members and unmatched non-members (when estimated separately) however does remain unexplained by the factors considered in these secondary analyses. We speculate on what could potentially help reconcile these unexplained differences in the discussion section.

Discussion and Conclusions

One of the key goals of this paper was to examine the relationship between microcredit membership and domestic violence by paying special attention to the issue of the selection of members into membership groups. Despite being observational or qualitative, some evidence in the current literature has raised concern about microcredit membership by attributing higher levels of domestic violence to group membership. These studies have speculated that microcredit membership could be increasing conflict between husbands and their newly empowered wives over control over loans or the challenges that membership pose to traditional gender norms. Our data, when not adjusted for potentially confounding selection bias effects of a variety of factors, also showed that violence levels indeed were higher among member women. What is striking however is that despite the fact that the field of social science research has become increasingly aware of selection bias as a major impediment in causal analysis and program evaluation, much of the conversation on the influence of microcredit on domestic violence or women's empowerment in general, except for a few exceptions, has gone on without an explicit acknowledgement that members may be different than non-members in significant ways and may select into programs resulting in the incorrect and biased estimation of program effects. Our key assertion in this paper thus is that members in microcredit groups may be a uniquely disadvantaged group in terms of their background characteristics, particularly in their poverty profiles, that may make them more vulnerable to already being in violent relationships. Thus, we hypothesized that the higher levels of violence seen among members may not be attributed to program

effects but instead to selection bias, primarily based on evidence that suggests that domestic violence is more likely among people from poor backgrounds and these are the very same people that are targeted by and select into microcredit programs.

The results from our PSM analysis appear to confirm our hypothesis that selection bias might be driving the relationship between microcredit membership and domestic violence. The previously seen significant association between being a member of a microcredit group and higher levels of domestic violence, observed in naïve specifications, was no longer significant when comparable treatment and control groups from the PSM analysis were used. This suggests that if the profile of women in their background characteristics, poverty in particular in these analyses, is sufficiently similar between comparison and treatment groups, there is no appreciable difference in rates of domestic violence. This finding is particularly noteworthy because it contradicts the assertions of studies such as Schuler et al. (1998) that suggest that microcredit may exacerbate violence as a result of women challenging traditional gender norms, causing escalations in marital conflict and spousal violence. It is however also important to note that these findings do not corroborate the findings of studies such as Schuler et al. (1996) or Koenig et al. (2003) that posit positive effects on domestic violence either. These results do however suggest that when confounding and biasing factors related to selection are sufficiently equalized between members and non-members, microcredit membership might not have much of an influence on domestic violence at all.

Our analyses suggest, with a considerable degree of confidence, that naïve approaches that are the norm in this literature are estimating a spurious relationship between microcredit membership and domestic violence. Our use of PSM allows for the empirical examination of this relationship using a robust and selection bias sensitive technique allows for a much stronger argument about causality. One major limitation of these analyses however is we do not have detailed longitudinal and time ordered data on microcredit membership and on the pre and post experience of domestic violence relative to microcredit membership. Causality arguments are normally strengthened by the presence of such panel data and the ability to temporally order explanatory variables and outcomes to avoid simultaneity and reverse causality issues. In the absence of longitudinal data, and in using a robust method such as PSM using cross-sectional data, we have taken extra care in the estimation of the propensity scores to ensure that variables that predict membership in microcredit groups are those that are least likely to be confounded by simultaneity bias. A majority of the predictive variables in the equation that estimates the propensity to join a microcredit group are those that are likely to occur before a decision to enter a group and thus likely to influence it as oppose to simply co-occur. Ensuring that the prediction of membership is not simultaneous helps ensure that the estimation of the level

of domestic violence of members and non-members does not suffer from simultaneity as well, as the treatment and control groups are constructed based on their previous experiences such as schooling, age at marriage, spousal occupation etc. The only caveat is that we only have an outcome for experiencing violence in the last year. Variables that indicate current experience of spousal violence such as "past week" or "past month" and any past experience of domestic violence, preferably before joining such groups, would have strengthened the robustness of our results substantially.

One of the other key limitations of performing a PSM analysis is that in matching groups of members with non-members, depending on the type of matching procedure used, several restrictions have to be imposed in order to ensure the comparability between the two groups. This often limits the sample of individuals used in the PSM analysis to a small subset of the total sample that can be matched. In this paper, in using our common support restriction, we are limited to conducting our initial analysis using just under a quarter of all women in the domestic violence module. We countered this limitation however by conducting multivariate analyses using the full sample, utilizing observations of unmatched women that were excluded from the initial PSM analyses as well. The results of these multivariate analyses revealed some important insights into where the source of the selection bias might potentially lie. The most striking results were in the differences noted between the unmatched members and unmatched non-member groups, both in their likelihood, and their actual levels, of experiencing domestic violence. While analyses using predicted probabilities showed that factors such as poverty, education, and female headship explained away part of the difference between the domestic violence profiles between groups, a large portion of the difference remained unexplained in these analyses.

We can only speculate on what may be causing these unexplained differences. First, it could be the case that these unmatched members, who are most susceptible to experiencing domestic violence compared to all other groups, might have a higher risk of being in violent marital relationships due to reasons that are unrelated to the factors analyzed here in this paper. Heise's (1998) ecological framework on domestic violence suggests that there may be a host of factors at a variety of levels in the social ecology that could be driving these differences; factors that we were not able to examine in our analyses either because they are unobserved, not easily measured or are beyond the scope of this study. Examples of such factors that might characterize these unmatched members could be, for instance, men's prior experience of witnessing domestic violence or being victims of abuse themselves earlier in their lives that might make them more likely to use violence against their wives. Alcohol abuse, a recurring theme in domestic violence studies, might also be higher among husbands in this group despite their relatively higher socio-economic status. This group may

simply have higher rates of marital discord due to interpersonal differences. In hypothesizing that poverty is a key source of selection bias in our analysis, we speculated that most of these factors are also inherently related to poverty status. While this assumption is likely not unfounded, it is conceivable that there are aspects of these other factors that might act in nuanced ways, so that they are not captured sufficiently by poverty measures in our analyses.

We found some evidence in the analysis of predicted probabilities to support the notion that poverty related factors bias the estimation of program effects on domestic violence as part of the difference between unmatched members and non-members were explained away by wealth quintile variables. In the same way, female headship explains away some difference between these groups and deserves some attention in this discussion as well. In Bangladesh, female headed households are typically those where husbands of the female have died. Such women, who do not have husbands, are also seen as riskier by organizations such as Grameen and BRAC for microcredit purposes and thus are less likely to be members of microcredit organizations or to have taken loans from them. The absence of a spouse also obviously makes them have no risk of experiencing spousal violence in the current time frame, and makes them perhaps less likely to report ever experiencing spousal violence as the perpetrators are no longer alive or the acts have been largely forgotten. Our distributional results appear to corroborate these assertions as both matched and unmatched non-members had higher proportions of female headed households and both non-member groups showed lower experiences of violence. It leads us to speculate that part of the reason that lower levels of violence are observed among non-members could be due to the fact that this risk is significantly lower in female headed households without a spouse to perpetrate such violence. A look into the distribution of household heads of in our sample however suggests that while a considerable proportion of women in the domestic violence module living in female headed households were themselves heads, thus potentially without a spouse, there were also a considerable number of women who did have spouses and had other women heading their households. Thus, this speculation may be unfounded, but deserves attention as it might be a source of bias that needs to be eliminated in order to arrive at accurate estimations of program effects.

One final possibility that may be considered is the notion that has been put forth in studies such as Koenig et al (2003) and Jewkes (2002) about higher levels of domestic violence occurring among new members. These studies suggest that high levels of violence might be confined to new members because of the immediate threats to gender norms membership causes in the short run, inciting knee jerk reactions from men who turn to violence. An examination of the distribution of microcredit membership in our sample by different age groups however fails to provide sufficient evidence to support this hypothesis. As the BDHS data we use is

cross-sectional, we are unable to ascertain the length of membership of members. We are however able to use age profiles of membership to partially capture membership duration. We find that levels of membership between older and younger women are not significantly different. While microcredit membership among older women, between the ages of 25 to 49 hovers around 40%, the proportion of microcredit membership among younger women aged 15 to 24 is not significantly smaller. Between approximately 30% of 15 to 19 year old women and 35% of 20 to 24 year old women are members of groups. This suggests that women with a certain propensity to join a microcredit group do so from an early age, suggesting that the likelihood that a majority of the women in our sample who are members, particularly those over the age of 20, have been members for a considerable amount of time is quite high. This negates the idea new members might be driving higher levels of violence among members as a majority of women in our sample appear to have endured long durations of membership and at the same time have also experienced domestic violence regardless of their membership duration.

In sum, in this paper, we have highlighted selection bias as a key factor in reconciling the contradictory evidence that has characterized the study of the influence of microcredit groups on influencing domestic violence women's empowerment in general. Our results suggest that the findings that are routinely seen in the literature that show that domestic violence may be exacerbated by microcredit membership, are likely a result of selection bias effects. While we would have preferred to have had detailed panel data to make the strongest claims about causality, our use of propensity score matching still allowed for us to make a strong case for our findings , particularly given our limitation of using a cross-sectional sample. While our results do not present a final verdict on the overall effectiveness of microcredit programs in improving the lives of women or helping them emerge out of poverty, it does however allow for us explore the potential sources of selection bias and provides important insights for future explorations of these relationships. More importantly, our findings bring us one step closer to better understanding the impacts of poverty alleviation strategies such as microcredit programs on important social outcomes such as domestic violence.

Table 1. Naïve Logistic Regression of Microcredit Group Membership predicting Domestic Violence among Married Women in Bangladesh

Any Domestic Violence in Last 12 months	Odds Ratio
Member of a Microcredit Group	1.243***
	(0.099)
Age	0.949***
	(0.005)
Age at First Marriage	0.964**
	(0.016)
Ever Attend School	0.827**
	(0.077)
Spouse Ever Attend School	0.927
	(0.082)
Household Size	0.959**
	(0.019)
Age of Household Head	0.998
	(0.003)
Household Head is Female	0.755*
	(0.120)
Wealth Quintiles (adjusted for urban/rural):	
HH is in 1st Wealth Quintile	Reference Category
HH is in 2nd Wealth Quintile	0.856
	(0.093)
HH is in 3rd Wealth Quintile	0.694***
	(0.079)
HH is in 4th Wealth Quintile	0.573***
	(0.069)
HH is in 5th Wealth Quintile	0.393***
	(0.056)
Rural	Reference Category
Large City	0.889
	(0.106)
Small City	1.048
	(0.148)
Town	0.785**
	(0.093)
District Level Prevalence Variables (Non Self Means):	
Microcredit Membership	1.015
	(0.339)
Female School Attendance	1.755
	(0.645)
Female Labor Force Participation	1.163
	(0.332)
Constant	3.729***
	(1.596)
Observations	4195
Log Likelihood	-2160
DF	18
Chi-Squared	305.8

Standard errors in parentheses clustered on sample set clusters
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Characteristics of Women by Microcredit Group Membership

Variable	Microcredit Members		Non Members		Sig Diff.?
	Obs	Mean	Obs	Mean	t-test
Any Violence in last 12 months	1634	0.280	2561	0.215	***
Age	1634	30.735	2561	29.982	***
Age of Spouse	1631	39.898	2554	39.596	NO
Age at First Marriage	1634	15.019	2561	15.729	***
No. of Years Married	1634	15.437	2561	13.932	***
Ever Attend School	1634	0.626	2561	0.716	***
Spouse Ever Attend School	1634	0.590	2561	0.712	***
Muslim	1634	0.881	2561	0.920	***
Household Size	1634	5.230	2561	5.526	***
Age of Household Head	1634	41.958	2561	44.119	***
Household Head is Female	1634	0.043	2561	0.102	***
Currently Working	1634	0.379	2561	0.237	***
Spouse's Occupation is in Labor	1634	0.340	2561	0.215	***
Functionally Landless	1634	0.813	2561	0.658	***
Wealth Quintiles (adj. for urban/rural):					
HH is in 1st Wealth Quintile	1634	0.245	2561	0.166	***
HH is in 2nd Wealth Quintile	1634	0.239	2561	0.175	***
HH is in 3rd Wealth Quintile	1634	0.215	2561	0.188	**
HH is in 4th Wealth Quintile	1634	0.191	2561	0.211	*
HH is in 5th Wealth Quintile	1634	0.110	2561	0.260	***
Region:					
Large City	1634	0.119	2561	0.172	***
Small City	1634	0.089	2561	0.071	**
Town	1634	0.144	2561	0.140	NO
Rural	1634	0.647	2561	0.617	**
District Average of Microcredit Membership	1634	0.423	2561	0.364	***
District Average of Ever Attending School	1634	0.662	2561	0.669	**
District Average of Female Labor Force Part.	1634	0.325	2561	0.297	***
District Average of Domestic Violence	1634	0.246	2561	0.237	***

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Logit Regression from *psmatch2* command in STATA to estimate Propensity Scores of Membership in Microcredit Groups

Membership in Microcredit Organization	Coeff.
Age	1.014***
	(0.004)
Ever Attend School	0.979
	(0.080)
Spouse Ever Attend School	0.793***
	(0.063)
Age at First Marriage	0.949***
	(0.012)
Spouse's Occupation is in Labor	1.333***
	(0.108)
Household is Functionally Landless	2.159***
	(0.181)
Rural	Reference Category
Large City	0.970
	(0.102)
Small City	1.307**
	(0.163)
Town	1.141
	(0.114)
District Level Prevalence of Microcredit Membership	40.260***
	(11.154)
Constant	0.133***
	(0.038)
Obs	4195

*** p<0.01, ** p<0.05, * p<0.1

Table 3 (contd.) PSM Estimate of the Average Effect of Treatment on the Treated (ATT) from the Matched Sample using *psmatch2* in STATA One-to-One Matching, With Replacement, Imposing Common Support with Trim at 2% (N of Treated Cases in Common Support=596)

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Experienced Any Violence in Last 12 Months	Unmatched	0.280	0.215	0.066	0.013	4.86
	ATT	0.290	0.273	**0.018**	0.038	0.46

Bias Corrected Standard Error of ATT calculated using Bootstrap with 500 repititions in STATA

	Observed	Bias	Std Error	Significant?
Std. Error Estimate of ATT	0.034	0.005	0.022	**No**

Table 4. Multivariate Logistic Regression of Microcredit Group Membership predicting Domestic Violence from PSM Analysis showing differences between Groups based on Matching

VARIABLES	Any Violence Odds Ratios	Any Violence Odds Ratios
Microcredit Membership:		
Matched Member	Reference Category	1.305**
		(0.154)
Matched NonMember	0.968	1.263*
	(0.139)	(0.165)
Unmatched Member	1.018	1.329***
	(0.124)	(0.124)
Unmatched NonMember	0.766**	Reference Category
	(0.090)	
Age	0.948***	0.948***
	(0.005)	(0.005)
Age at First Marriage	0.967**	0.967**
	(0.016)	(0.016)
Ever Attended School	0.830**	0.830**
	(0.077)	(0.077)
Spouse Ever Attended School	0.944	0.944
	(0.084)	(0.084)
Household Size	0.958**	0.958**
	(0.018)	(0.018)
Age of Household Head	0.998	0.998
	(0.003)	(0.003)
Household Head is Female	0.755*	0.755*
	(0.119)	(0.119)
Wealth Quintiles (adjusted for urban/rural):		
HH is in 1st Wealth Quintile	Reference Category	Reference Category
HH is in 2nd Wealth Quintile	0.862	0.862
	(0.094)	(0.094)
HH is in 3rd Wealth Quintile	0.701***	0.701***
	(0.080)	(0.080)
HH is in 4th Wealth Quintile	0.582***	0.582***
	(0.071)	(0.071)
HH is in 5th Wealth Quintile	0.402***	0.402***
	(0.057)	(0.057)
Rural	Reference Category	Reference Category
Large City	0.900	0.900
	(0.104)	(0.104)
Small City	1.028	1.028
	(0.146)	(0.146)
Town	0.781**	0.781**
	(0.093)	(0.093)
District Level Prevalence Variables (Non Self Means):		
Female School Attendance	1.674	1.674
	(0.596)	(0.596)
Constant	4.809***	3.684***
	(1.789)	(1.393)
Observations	4195	4195
DF	18	18
Chi-Squared	308.7	308.7
Log-Likelihood	-2159	-2159

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 5. Table of Means of Key Variables by Matching Status of Microcredit Group Membership from PSM Analysis

	Matched Members N=596		Matched Non Members N=446		Unmatched Members N=1038		Unmatched Non Members N=2115	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Any Violence in Last 12 Months	0.290	0.454	0.280	0.450	0.275	0.447	0.201	0.401
Age	31.676	8.281	32.137	9.497	30.195	8.409	29.528	8.823
Age of Spouse	40.916	10.525	42.318	11.945	39.313	10.353	39.024	10.309
Age at First Marriage	14.282	1.853	14.076	1.837	15.442	2.686	16.077	3.077
No. of Years Married	17.129	8.424	17.787	9.966	14.465	8.809	13.120	9.340
Ever Attend School	0.523	0.500	0.502	0.501	0.685	0.465	0.761	0.426
Spouse Ever Attend School	0.409	0.492	0.426	0.495	0.694	0.461	0.773	0.419
Muslim	0.928	0.259	0.926	0.262	0.855	0.353	0.918	0.274
Household Size	5.072	1.857	5.137	2.248	5.321	2.045	5.608	2.633
Age of Household Head	41.619	11.131	43.682	12.597	42.153	12.830	44.211	13.806
Household Head is Female	0.029	0.167	0.067	0.251	0.051	0.220	0.110	0.313
Currently Working	0.430	0.495	0.339	0.474	0.351	0.477	0.216	0.411
Spouse's Occupation is in Labor	0.542	0.499	0.491	0.500	0.224	0.417	0.157	0.363
Functionally Landless	0.982	0.135	0.971	0.168	0.716	0.451	0.592	0.492
Wealth Quintiles (adj. for urban/rural):								
HH is in 1st Wealth Quintile	0.319	0.466	0.334	0.472	0.202	0.402	0.131	0.337
HH is in 2nd Wealth Quintile	0.265	0.442	0.244	0.430	0.224	0.417	0.160	0.367
HH is in 3rd Wealth Quintile	0.174	0.380	0.186	0.390	0.238	0.426	0.188	0.391
HH is in 4th Wealth Quintile	0.178	0.383	0.141	0.349	0.198	0.399	0.226	0.418
HH is in 5th Wealth Quintile	0.064	0.245	0.094	0.292	0.137	0.344	0.295	0.456
Region:								
Large City	0.074	0.262	0.047	0.212	0.145	0.353	0.198	0.399
Small City	0.131	0.338	0.119	0.324	0.066	0.248	0.061	0.240
Town	0.158	0.365	0.143	0.351	0.137	0.344	0.139	0.346
Rural	0.638	0.481	0.691	0.463	0.652	0.476	0.601	0.490
District Average of Microcredit Membership	0.501	0.091	0.488	0.088	0.377	0.121	0.338	0.118
District Average of Ever Attending School	0.652	0.119	0.651	0.123	0.668	0.115	0.672	0.104
District Average of Female Labor Force Partic.	0.350	0.149	0.357	0.147	0.310	0.150	0.284	0.137
District Average of Domestic Violence	0.250	0.085	0.264	0.088	0.243	0.082	0.231	0.078

Table 6. Table of Predicted Probabilities of Experiencing Domestic Violence by Unmatched Members when they have the Distribution of Unmatched Non Members

Type of Analysis	Predicted Probability of Domestic Violence
Unmatched Members Only: No Values Substituted (Predicted Probablity of Domestic Violence for Unmatched Members from the original Logit Regression for Unmatched Members only)	**0.2587**
Substituting Sets of Variables Stepwise with values of Unmatched Non Members (Predicted Probablity of Domestic Violence when values of the means of Unmatched Members are substituted stepwise with means of characteristics of Unmatched Non Members)	
Substitute Wealth Quintile Variables	**0.2388**
Substitute Wealth Quintile Variables and Female Headship	**0.2314**
Substitute Wealth, Female Headship and Schooling of Women and Spouse Variables	**0.2278**
Substitute Wealth, Female Headship, Schooling and Regional Variables (Urban/Rural)	**0.2266**
Substitute Wealth, Female Headship, Schooling, Regional, and District Level Variables for Microcredit, Women's Schooling and Women'sWork	**0.2296**
All Values of Unmatched Members Substituted with Unmatched Non Members (Predicted Probability of Domestic Violence when ALL values of the means of Unmatched Members are substituted with the distribution (means) of Unmatched Non Members	**0.2294**
Unmatched Non Members Only (Predicted Probability of Domestic Violence for Unmatched Non Members from the Logit Regression of Unmatched Non Members only)	**0.1743**

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