

Microcredit and Domestic Violence in Bangladesh: An Exploration of Selection Bias Influences

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Abstract This article explores the relationship between women's participation in microcredit groups and domestic violence in Bangladesh. Several recent 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 because members might differ from nonmembers 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 (BDHS) ($N = 4,195$), 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. Additional analyses also suggest that levels of violence do not differ significantly between members and nonmembers 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 nonmembers in the unmatched group. The background characteristics of members and nonmembers who do not match suggest that they are more likely to be younger and from relatively well-to-do households.

Keywords Domestic violence · Microcredit · Propensity score matching · Selection/selectivity · Bangladesh

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Introduction

This article explores an important aspect of women's empowerment by examining the role of women's participation in microcredit groups in influencing 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 social protection programs in the country. Approximately one in three adult women report being affiliated to one of the many microfinance institutions in the country.

Although microcredit is widely considered a powerful agent of social change, there is a growing debate on how effective it has been in reducing poverty (see Kabeer 2001; Roodman and Morduch 2009). The debate on whether microcredit programs enhance women's status and autonomy has been growing as well and is a well-researched topic. In this regard, domestic violence garnered attention when Schuler and Hashemi (1994) reported higher incidence of gender-based violence among women who are members of microcredit groups, an effect later reproduced in another study (Koenig et al. 2003). As linkages between domestic violence and adverse reproductive health outcomes—such as unwanted pregnancy, sexually transmitted infections, pregnancy termination, and decision-making regarding fertility—and the inconsistent use of contraceptives have been increasingly documented in studies from around the developing world (see Kishor and Johnson 2006; also see Campbell 2002; Gazmararian et al. 1996), domestic violence has become a salient topic not only for researchers and policy-makers in the fields of gender and poverty reduction but also for demographers, with important implications for key demographic variables.

In this article, we explore the association between microcredit and domestic violence by focusing centrally on the question of selection bias. The presence of a statistical association between membership and violence does not imply causality, and a causal attribution of violence to membership is misleading if membership is selective of women who are more vulnerable to violence. Members of microcredit organizations may differ from nonmembers in significant ways on other characteristics, most notably household poverty and vulnerability, potentially making them more susceptible to domestic violence (Steele et al. 2001). We use the technique of propensity score matching (PSM) as a way of finding an appropriate comparison group of nonmembers who are not significantly different from members of microcredit groups.

Background

Microcredit and Poverty Alleviation

Providing small loans to women as a poverty alleviation strategy has about a 30-year history in Bangladesh, introduced initially in its current form by Grameen Bank. Initially heralded as an innovative use of group membership to serve as collateral, microfinance has come under scrutiny and criticism for having oversold its promise in terms of poverty alleviation. A recent Department for International Development (DFID) review (Duvendack et al. 2011) concluded that there is a near absence of evidence either for or against the effect of microcredit. On one hand, Pitt and Khandker (1998) and Khandker (2005) conducted quasi-experimental studies and argued that there are significant benefits for the poor,

particularly when credit is targeted toward women. However, the results of these studies, which address sample selection bias, have been contested by Morduch (1998) and Roodman and Morduch (2009), who questioned the reliability of their results by producing contradictory results using the same data but different statistical models.

More recently, the evidence base has shifted toward randomized studies, partly resulting from the criticism of evaluations that rely on observational data and methods (Banerjee and Duflo 2009; Roodman and Morduch 2009). Some studies (e.g., Banerjee et al. 2009; Karlan and Zinman 2010, 2011) have found mixed results, showing both positive and negative influences on outcomes such as household expenditures, business profits, and employment. Banerjee et al. (2009) studied the introduction of microcredit in the urban slums of Hyderabad, India. Loans were offered to households in randomly selected urban slum areas while being withheld from other areas that served as controls. After one year, there was no appreciable or significant effect of access to microcredit on the average monthly per capita expenditure in households, although spending on durable goods and the number of new businesses did increase. The effects on other economic outcomes were also generally found to be mixed. No significant effects were found on health, education, or women's empowerment. Similar studies in progress in Mexico, Morocco, and Peru should provide further critical evidence. Until then, the verdict on microcredit as an antipoverty tool remains uncertain.

Microcredit and Women's Empowerment

Studies that have examined microcredit influences on women's empowerment have been mostly observational or qualitative. In a comprehensive review, Kabeer (2001) found the evidence to be mixed. Rahman (1986) found that participant women have greater decision-making roles in their households and that member households have higher income and consumption compared with nonparticipating households, regardless of the gender of the borrower. Pitt and Khandker (1998) explored effects of microcredit programs on women's ownership of nonland assets, hours worked in cash-earning occupations, fertility levels, children's education, and consumption expenditure. Results showed that households that received loans were more gender-equitable than households that did not, and that women's preferences held more weight when women themselves received loans than when men received loans or when no loans were received. Hashemi et al. (1996) examined a similarly extensive set of empowerment outcomes, finding 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 enhance a combined index of these empowerment indicators, including those that were not significant individually.

On the other hand, a few studies have also found negative effects on women's empowerment. Goetz and Sen Gupta (1996) examined an index of managerial control over loans for women and found that most married women exercised little or no control over their loans. Their study also suggested that when men were expected to participate in loan repayments and were unable or unwilling, there was conflict in the household. Montgomery et al. (1996) found that only a very small percentage of women who receive loans exercise full control over them compared with when men borrow from microcredit groups, who retain full control.

Microcredit Membership and Domestic Violence

Studies of the influence of microcredit on domestic violence suggest that there may be a range of conditional effects, contingent on additional services offered as well as duration of membership. A three-year randomized trial conducted among poor women and adolescents in South Africa by the Intervention with Microfinance for AIDS and Gender Equity (IMAGE) study found that microfinance reduced domestic violence when offered along with HIV education. Women who received microcredit loans with gender and HIV education reported lower physical and sexual violence by 55 %, relative to women from control villages where the intervention was not run (Pronyk et al. 2009). Schuler et al. (1996) found similar results showing that women's membership in microcredit organizations is associated with reduced risk of domestic violence over time by as much as two-thirds among members when compared with women who did not have microcredit programs in their villages. These positive effects also extended to women who were nonmembers but lived in villages with microcredit programs along with general improvements in their economic well-being. Koenig et al. (2003), citing findings from a number of studies, noted that such beneficial effects could be a manifestation of factors such as reduced economic scarcity in the household, women's increased access to and control over money, women's increased self-reliance and status within the household, or the possibility that husbands may become less abusive against their wives for the fear of losing a loan that their wives brought in (Hashemi et al. 1996; Kabere 2001; Schuler et al. 1996). Similarly, the additional support networks and the exposure that women gain through their participation could also work in ways to reduce violence from husbands (Hashemi et al. 1996; Schuler et al. 1996, 1998).

On the other hand, membership may exacerbate domestic violence (Schuler et al. 1998). Schuler and colleagues suggested that a husband's perceived loss of authority as well as greater financial independence and autonomy of women may lead to greater marital and household conflict. Rahman (1999) found that a majority of women who had joined microcredit groups (more than 70 %) had experienced an escalation in violence, whereas only about 20 % reported having experienced a reduction. Other studies, including Jewkes (2002) and Koenig et al. (2003), found short-term escalations in violence among members as well. These studies noted that such escalations are likely only in the short run as reactions to the initial shock that such membership poses to traditional gender norms. In highly patriarchal societies where violence and male dominance norms are strongest, such escalations of violence, at least in the short term, are the most likely; and protective effects of empowerment are unlikely to predominate until critical changes in social and gender norms take effect (Jewkes 2002). As Koenig et al. (2003) noted, these negative effects are likely to dissipate in the longer run as women's empowerment and autonomy gain acceptance and become more commonplace, and group participation is ultimately likely to be protective from gender-based violence in the long run (World Bank 2009).

Poverty, Domestic Violence and the Self-selection of Women Into Microcredit Groups

Much of the evidence on microcredit membership and its effects on women's empowerment to date has been based on cross-sectional data and has not been able to adequately address the self-selection of women into credit groups (Steele et al.

2001). The self-selection of highly empowered women into microcredit groups might make them an already more resilient group to domestic violence. To the extent that group membership allows empowered women to challenge traditional gender norms within their households, membership can result in marital conflict and spousal tensions (Schuler et al. 1996). Women who become members of microcredit groups are more likely to have characteristics that might make them innately more vulnerable to domestic violence. One characteristic that has most consistently been linked with higher levels of domestic violence is poverty (Ellsberg et al. 1999; Heise 1998; Jewkes 2002). Because microcredit programs are primarily targeted toward poor rural populations, microcredit members are typically women who come from households in the lowest socioeconomic strata. If poor women are more likely to experience domestic violence than nonpoor women, then microcredit group members already belong to 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 suggesting that families who live in poverty have higher levels of stress and have fewer resources to combat domestic violence than do nonpoor families, and that stress mediates the relationship between poverty and domestic violence, thus making poor women more prone to family violence (Jewkes 2002; Kishor and Johnson 2006). Thus, a higher level of violence among microcredit members cannot be unequivocally attributed to program effects because of these preexisting differences. The differences in levels of violence are thus more likely a manifestation of this selection bias. Although some disagreement in this literature still exists, suggesting that the influence of poverty maybe fully mediated by factors such as education or area of residence (Diop-Sidibe 2001), Kishor and Johnston (2006) suggested that such inconsistencies are likely a result of the variability of defining household poverty and 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 domestic 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 and Persson (2005) for Bangladesh-specific context). These factors—including prior personal and intergenerational exposure to violence, marital relationship conflict and power dynamics, and family structure, as well as societal factors 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.

A study by Steele et al. (2001) that explored how the self-selectivity of women into microcredit groups in Bangladesh affects contraceptive use indicated that selection bias may exist at multiple levels. At the individual level, only women who have been identified as poor using certain eligibility criteria, such as landholding, can enter microcredit groups. There is, of course, the self-selection of highly empowered, more-educated, forward-thinking, and more-liberal women into such groups given that membership is voluntary. The study also found that the placement of the microcredit program in areas that are less conservative and have access to or are more open to contraceptives contributes to selection bias. Results 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 woman's status measures such as mobility that are observed to be positively related to participation, a woman's treatment by her husband showed the strongest correlations with group membership (Steele et al. 2001). 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 attribute domestic violence purely to program effects.

Data and Measures

The 2007 Bangladesh Demographic Health Survey (BDHS) is a cross-sectional, nationally representative sample survey of 10,996 women aged 15–49 and 3,771 men aged 15–54 from 10,400 households in Bangladesh. The data came from 361 sampling areas in both rural and urban areas in Bangladesh and are part of the 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 related to population and health in countries around the developing world. The analysis in this study uses data from a subsample of ever-married women aged 15–49 from the BDHS who were selected for the Domestic Violence Module. From each household in this subsample, one woman was randomly chosen as a respondent to the module ($N = 4,467$). The module was conducted in keeping with the ethical guidelines of the World Health Organization (Kishor and 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 socioeconomic 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 about whom information on the incidence of violence in the last 12 months is available ($N = 4,195$).

Dependent Variable

The key dependent variable of interest in this study is the incidence of domestic violence reported by women. The DHS Domestic Violence Module measures spousal violence as 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). This measure is a significant improvement on previously used measures of domestic violence. 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. Our dependent variable is a multidimensional measure of domestic violence and indicates whether a woman has experienced any form of violence from her husband in the 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:

- (1) Having been pushed or shaken, or had something thrown at her
- (2) Was slapped
- (3) Having had her arm twisted or hair pulled
- (4) Was punched
- (5) Was kicked, dragged, or beat up
- (6) Was choked or burned on purpose
- (7) Was threatened with a gun or knife
- (8) Was physically forced to have sexual intercourse

First, the woman is asked whether she has *ever* experienced any of these forms of violence. If the woman answers "no" to all these questions, our dependent variable is coded as 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 past 12 months. If the woman answers "often" or "sometimes" to any one of the forms of violence listed, 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. By asking distinct questions about different acts of violence, this measure 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 domestic violence against women. Given that our sample consists only of married women, we use the term "domestic violence" to represent spousal violence in the remainder of the article.

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 for whether the woman is a member of a microcredit organization. Bangladesh is home to an array of microcredit organizations. The BDHS specifically asks questions about membership based on whether the respondent belonged to the following organizations at the time of the survey: Grameen Bank, Bangladesh Rural Advancement Committee (BRAC), Association of Social Advancement (ASA), Proshika, or any other organization with a microcredit component to its operations.

We code this dummy variable indicating microcredit membership as 1 if women indicated membership in any one of the organizations. Participation in Mother's Clubs, which is also asked as a part of the set of questions outlined earlier, does not explicitly have a microcredit component and is thus excluded from the microcredit measure. Following Steele et al. (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. This is in contrast to the approach in some studies examining program participation that have defined

membership based on the amount of loan taken (e.g., Pitt et al. 1999). As Steele et al. (2001) noted, such a measure may be too limited a specification of membership because it is likely to account only for economic pathways, which could confound the analysis in a study such as ours that addresses a non-economic outcome.

Other Explanatory and Control Variables

We employ a host of other sociodemographic variables in the examination of the relationship between microcredit membership on domestic violence in Bangladesh in this study. The rationale for the specification of each explanatory and control variable is described in detail in the next section, where we outline our empirical strategy. In terms of the variables, we employ a measure of the respondent's age in years. A measure of the respondent's spouse's age is not used because of missing data in the spouse's age measure and the inconsistency with which men's age has been known to be measured in surveys with female respondents. 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*). Respondent's age at first marriage is also measured in years. We 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. Partly because of 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 distinction is measured using a set of four mutually exclusive dummy variables indicating whether the respondent lived in a large city, small city, or town, or in a rural community. These variables are also incorporated into measuring the socioeconomic status (SES) of each household.

The SES of households is derived from the widely used wealth index available for all households in the BDHS. This measure is constructed 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. To account for urban–rural 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 group households in each quintile ranking from all four regions of residence (households from the first quintile in the large city category are grouped with first quintile households in the small city, town, and rural categories; and households in the second quintile in the large city category are grouped with households from the second quintile in other residence categories, and so on) to create a composite quintiled-based wealth-index SES variable that accounts for urban–rural differences.

To account for community-level effects of where respondent women live that may determine their likelihood of joining microcredit organization or their susceptibility to domestic violence or lower status, we also measured means of the prevalence of microcredit membership, of women working outside their homes, and of women's ever-attendance of school at the district level. The district of residence is defined as a

community-level variable following spatial sociodemographic research by Amin et al. (1997, 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 eliminating the possibility of any bias that the response of the individual might contribute in calculating the district-level prevalence. In the estimation of the propensity scores to measure the probability of joining a microcredit organization, factors such as functional landlessness and whether the husband's occupation involves any form of labor are included because they 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 landlessness if the household owns less than 50 decimals of land, which is the standard threshold for entering a microcredit group. The spouse's labor-based occupation is determined by whether the spouse has an occupation that includes activities such as working as an agricultural worker, in animal husbandry, as a brick layer, as a rickshaw driver, or as a domestic servant, among others.

Empirical Strategy

One of the key goals of this article is to disentangle the ongoing debate surrounding the evidence on microcredit and domestic violence in the current literature, which at best is contradictory in its findings (Kabeer 2001; Koenig et al. 2003). These contradictory findings, which are not limited to the domestic violence research (reviewed in Kabeer 2001), have fueled a growing skepticism 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, some evidence appears to link membership in microcredit organizations to higher levels of violence (e.g., Rahman 1999; Schuler et al. 1998). 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 nonmembers (21.48 %). This difference persists in multivariate analysis of domestic violence on microcredit membership, using a binary logistic regression model controlling for key sociodemographic characteristics. The results from this regression, illustrated in Table 1, show that microcredit membership is associated with a significantly higher incidence of violence among women even after we control for a range of variables (odds ratio = 1.243, $p < .01$)

Selection Bias in Microcredit Membership and Domestic Violence

As discussed earlier in the review, the problem of selection bias arises when program participants nonrandomly "select" into a program 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. A significant source of such selection bias in our study is likely at the individual level. Microcredit programs in Bangladesh generally have a set of eligibility

Table 1 Naive logistic regression of microcredit group membership predicting domestic violence among married women in Bangladesh

Any Domestic Violence in Past 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)
Household Wealth Quintile (adjusted for urban/rural region):	
1st (ref.)	
2nd	0.856 (0.093)
3rd	0.694** (0.079)
4th	0.573** (0.069)
5th	0.393** (0.056)
Region	
Rural (ref.)	
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)

Table 1 (continued)

Any Domestic Violence in Past 12 months	Odds Ratio
Constant	3.729** (1.596)
Number of Observations	4,195
Log-Likelihood	-2,160
Degrees of Freedom	18
Chi-Square	305.8

Note: Standard errors, shown in parentheses, are clustered on the sample set clusters.

† $p < .10$; * $p < .05$; ** $p < .01$

criteria that target poor women. Therefore, women who are eligible to join microcredit groups are more likely to be poor and come from socioeconomically 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 socioeconomic strata, also comprise a group already susceptible to experiencing higher levels of violence. In addition, because 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. For example, in addition to the possibility that these women comprise a more empowered and assertive group, the findings of Steele et al. (2001) suggest that women may join such groups as protective measures against violence from their spouses. Microcredit members may therefore include vulnerable women who are already in violent relationships and those who are looking for support and security in case their marriage fails. Microcredit programs may also be nonrandomly placed, affecting a woman's propensity to join, although this source of selection bias is less likely to be strong in our sample because we consider nearly all forms of microcredit programs in Bangladesh, where programs are quite widely available. The widespread availability of such programs is clear: on average, 40 % of women in each of the districts in our sample were members of at least one program.

Table 2 compares characteristics of member and nonmember women to explore selection bias. Group members show significantly higher levels of violence, have lower levels of education, marry at earlier ages, come from families with significantly lower levels of income, and 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. Given these differences between members and nonmembers, we conclude that nonmembers are more advantaged, wealthier, and a potentially more-empowered group.

Propensity Score Matching

To address selection bias arising from these differences, we use propensity score matching (PSM) (Rosenbaum and Rubin 1983; see also Dehejia and Wahba 2002; Jalan and Ravallion 2003; and Leuven and Sianesi 2003), which is widely used to estimate program

Table 2 Characteristics of women by microcredit group membership

Variable	Microcredit Members		Nonmembers		Significant Difference? <i>t</i> Test
	Obs.	Mean	Obs.	Mean	
Any Violence in Past 12 Months	1,634	0.280	2,561	0.215	**
Age	1,634	30.735	2,561	29.982	**
Age of Spouse	1,631	39.898	2,554	39.596	no
Age at First Marriage	1,634	15.019	2,561	15.729	**
Number of Years Married	1,634	15.437	2,561	13.932	**
Ever Attended School	1,634	0.626	2,561	0.716	**
Spouse Ever Attended School	1,634	0.590	2,561	0.712	**
Muslim	1,634	0.881	2,561	0.920	**
Household Size	1,634	5.230	2,561	5.526	**
Age of Household Head	1,634	41.958	2,561	44.119	**
Household Head Is Female	1,634	0.043	2,561	0.102	**
Currently Working	1,634	0.379	2,561	0.237	**
Spouse's Occupation Is in Labor	1,634	0.340	2,561	0.215	**
Functionally Landless	1,634	0.813	2,561	0.658	**
Household Wealth Quintile (adjusted for urban/rural region)					
1st	1,634	0.245	2,561	0.166	**
2nd	1,634	0.239	2,561	0.175	**
3rd	1,634	0.215	2,561	0.188	*
4th	1,634	0.191	2,561	0.211	†
5th	1,634	0.110	2,561	0.260	**
Region					
Rural	1,634	0.647	2,561	0.617	*
Large city	1,634	0.119	2,561	0.172	**
Small city	1,634	0.089	2,561	0.071	*
Town	1,634	0.144	2,561	0.140	no
District Average of Microcredit Membership	1,634	0.423	2,561	0.364	**
District Average of Ever Attending School	1,634	0.662	2,561	0.669	*
District Average of Female Labor Force Participation	1,634	0.325	2,561	0.297	**
District Average of Domestic Violence	1,634	0.246	2,561	0.237	**

† $p < .10$; * $p < .05$; ** $p < .01$

effects in non-experimental settings. (For the conceptual framework of the PSM method and technical details regarding its implementation, see Online Resource 1.) The main goal of this technique is to estimate a causal program effect on the outcome by finding an appropriate comparison group of nonmembers that is most similar to the group of members based on a set of key observable characteristics. Members and nonmembers are matched based on a one-number summary for each individual—the “propensity score”—calculated by using a simple logit or probit model, irrespective of whether they actually join a microcredit group. The most popular and intuitive matching scheme is one-to-one nearest-available matching,

in which members are matched with nonmembers with the most similar propensity score. To ensure that members and nonmembers with vastly different propensity scores aren't matched, which would result in inflated estimates of the program effect, matching is confined to individuals who fall within a reasonable bound of propensity scores in the overall distribution of scores, known as the "region of common support." One key critical assumption of this method is that the selection into microcredit membership is purely a function of observed characteristics. The assumption that selection is based only on observed variables is quite strong and a limitation of this method. It is conceivable that unobserved characteristics (e.g., good citizenship or personal attributes) affect both propensities to join a microcredit group and violence. To test for the influence of unobservable characteristics, we conducted a Heckman selection model (see Online Resource 1 for results), which indicated that selection on unobserved variables is not a significant source of bias in the relationship between microcredit membership and domestic violence. Thus, we rely on the results of the PSM analysis to estimate the program effect. The metric that we estimate, the average effect of treatment on the treated (ATT), essentially measures the true program impact by estimating the effect of microcredit membership on domestic violence among members. The matching algorithm used is one-to-one nearest-neighbor matching with no replacement and applying the common support restriction. (See Online Resource 1 for details.)

Results

Propensity Score Matching Estimation of ATT

We implement PSM using the *psmatch2* function in Stata (details of the procedure in Online Resource 1). These results are presented in Tables 3 and 4. Table 3 shows the logit regression used to estimate the propensity score of membership in microcredit groups.

Table 4 presents post-matching results of the estimation of the ATT. The first row of the table presents the mean difference in level of domestic violence from the unmatched (or full) sample of 4,195 women. The effect size on this unmatched sample is simply an estimate of the difference in levels of violence between microcredit members and nonmembers without any manipulation on the original sample. This estimate, which doesn't account for selection bias, is 6.6 percentage points, indicating that members generally experienced a level of violence that was 6.55 percentage points higher than did nonmembers. This result, which is highly significant, is an analog to the results that have been seen in the general literature.

The second row of Table 4 shows the ATT estimated using the matched sample of 596 individuals who fell within the region of common support. Here the results are starkly different. The magnitude of the ATT is negligible ($ATT = 0.018$) and statistically insignificant. We conclude that rates of violence experienced by women who participate in microcredit groups are no different from those of women who don't join when the comparison is made with a group of women with similar propensities to join such groups.

Exploring Characteristics of Both Matched and Unmatched Observations

In the analyses in this article, we go a step further and also explore characteristics of women who did not match in the PSM analysis. PSM estimates treatment effects

Table 3 Logit regression from *psmatch2* command in Stata to estimate propensity scores of membership in microcredit groups

Membership in Microcredit Organization	Coefficient
Age	1.014** (0.004)
Ever Attended School	0.979 (0.080)
Spouse Ever Attended 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)
Region	
Rural (ref.)	—
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)
Number of Observations	4,195
Log-Likelihood	2,587.79
Degrees of Freedom	10
Likelihood Ratio Chi-Square	433.39
Prob.> Chi-Square	.000
Pseudo- R^2	.070

* $p < .05$; ** $p < .01$

(ATT) only from a small subset of women who meet a stringent set of matching criteria (596 women), thus excluding a sizable proportion of the full sample of 4,195 women. Here, we maximize the use of our sample by including analysis on the sample of unmatched women, the characteristics of whom also offer important insights into the dynamics of the selection of women into microcredit groups and its relationship with domestic violence.

In Table 5, we report characteristics of unmatched members and nonmembers alongside their matched counterparts. The *psmatch2* routine creates a number of

Table 4 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 % (number of treated cases in common support = 596)

Variable	Sample	Treated	Controls	Difference	SE	t Statistic
Experienced Any Violence in Past 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 SE of ATT Calculated Using Bootstrap With 500 Repetitions in Stata	Observed	Bias	SE		Significant?	
	0.034	0.005	0.022		No	

Table 5 Table of means of key variables by matching status of microcredit group membership from PSM analysis

Variable	Matched Members N = 596		Matched Nonmembers N = 446		Unmatched Members N = 1,038		Unmatched Nonmembers N = 2,115	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Any Violence in Past 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
Number of Years Married	17.129	8.424	17.787	9.966	14.465	8.809	13.120	9.340
Ever Attended School	0.523	0.500	0.502	0.501	0.685	0.465	0.761	0.426
Spouse Ever Attended 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
Household Wealth Quintile (adjusted for urban/rural region)								
1st	0.319	0.466	0.334	0.472	0.202	0.402	0.131	0.337
2nd	0.265	0.442	0.244	0.430	0.224	0.417	0.160	0.367
3rd	0.174	0.380	0.186	0.390	0.238	0.426	0.188	0.391
4th	0.178	0.383	0.141	0.349	0.198	0.399	0.226	0.418
5th	0.064	0.245	0.094	0.292	0.137	0.344	0.295	0.456

Table 5 (continued)

Variable	Matched Members N = 596		Matched Nonmembers N = 446		Unmatched Members N = 1,038		Unmatched Nonmembers N = 2,115	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Region								
Rural	0.638	0.481	0.691	0.463	0.652	0.476	0.601	0.490
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
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 Participation	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

variables that identify treatment and control observations, whether individuals fall within the common support region, each individual's propensity scores, and a number of other variables, allowing identification of a set of four mutually exclusive variables that indicate whether each individual was a matched member, a matched nonmember, an unmatched member, or an unmatched nonmember. These categories exhaustively cover the entire original sample of 4,195 currently married women responding to the Domestic Violence Module. Preliminary analysis using the regression framework (not shown) suggests that unmatched groups (both members and nonmembers) are significantly different from their matched counterparts. Table 5 shows the differences in characteristics across these groups.

First, we find that compared with the group of matched women, unmatched women (members and nonmembers) display notable advantages in their characteristics on a number of key domains. Women in this group are younger, married later, and are generally a more-advantaged group in terms of their educational attainment, occupational profile, and SES. Most notable, however, is the stark contrast in the profile of unmatched nonmembers in their characteristics in these key domains compared with the three other groups, including unmatched members. Unmatched nonmembers were not only least susceptible to domestic violence among all four groups, but their level of advantage in their SES and domains including educational attainment and occupational status was also significantly higher than those of the other three groups. These figures reinforce our hypothesis that selection into microcredit groups as it relates to domestic violence is largely driven by poverty and that the relative advantage in SES of these unmatched nonmembers may provide significant protective influences over domestic violence for these women.

Second, a very notable contrast can be observed in the levels of domestic violence among members and nonmembers in this relatively socioeconomically advantaged unmatched group, providing a key insight into selection of women into microcredit as it relates to domestic violence. Despite their affluent backgrounds compared with both matched members and nonmembers, microcredit members from the unmatched group experience violence at a level that is markedly higher in magnitude than that experienced by unmatched nonmembers (by more than 15 percentage points). It is increasingly apparent from this disparity that the source of the selection bias that drives the relationship between microcredit and domestic violence goes beyond their poverty profiles.

In an additional set of analyses designed to reconcile these potential sources of bias, we use predicted probabilities of experiencing domestic violence for unmatched members and nonmembers. In Table 6, we examine the change in predicted probabilities when the entire distribution of unmatched members is substituted with that of unmatched nonmembers, 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 nonmembers only. Our goal is to test for whether substituting the distribution of the unmatched members with any particular aspect of the distribution of unmatched nonmembers 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 sociodemographic characteristics of unmatched members were changed to that of unmatched nonmembers, the predicted probability of experiencing domestic

Table 6 Table of predicted probabilities of experiencing domestic violence by unmatched members when they have the distribution of unmatched nonmembers

Type of Analysis	Predicted Probability of Domestic Violence
Unmatched Members Only: No Values Substituted (predicted probability of domestic violence for unmatched members from the original logit regression for unmatched members only)	.2587
Substituting Sets of Variables Stepwise With Values of Unmatched Nonmembers (predicted probability of domestic violence when values of the means of unmatched members are substituted stepwise with means of characteristics of unmatched nonmembers)	
Substitute wealth quintile variables	.2388
Substitute wealth quintile variables and female headship	.2314
Substitute wealth, female headship, and education of women and spouse variables	.2278
Substitute wealth, female headship, education, and region variables (urban/rural)	.2266
Substitute wealth, female headship, education, region, and district-level variables for microcredit, women's education, and women's work	.2296
All Values of Unmatched Members Substituted With Unmatched Nonmembers (predicted probability of domestic violence when <i>all</i> values of the means of unmatched members are substituted with the distribution (means) of unmatched nonmembers)	.2294
Unmatched Nonmembers Only (predicted probability of domestic violence for unmatched nonmembers from the logit regression of unmatched nonmembers only)	.1743

violence would be reduced from .2587 to .2294, a difference of 2.93 percentage points. A significantly larger difference exists when predicted probabilities are estimated for the two groups separately, with unmatched nonmembers 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 6, we examine these variables with special interest in our analysis of predicted probabilities. Not surprisingly, the substitution of the wealth quintile distribution accounts for the largest difference in the predicted probability of violence, although the magnitude itself was small (at about 1.99 percentage points). Female headship, interestingly, also appears to explain some portion of the difference (0.74 percentage points). In the sequential additions of education and urban–rural differences, the portion of the difference in predicted probabilities that is explained becomes gradually smaller. A large portion of the difference between unmatched members and unmatched nonmembers (when estimated separately), however, remains unexplained by the factors considered in these secondary analyses. We speculate on what could potentially help reconcile these unexplained differences in the next section.

Discussion and Conclusions

This article examines the association between microcredit membership and domestic violence to explore how the issue of the member selectivity explains whether higher levels of domestic violence may be attributed to membership. Several qualitative studies have speculated that microcredit membership could increase conflict between husbands and their newly empowered wives over control of loans or the challenges that membership poses to traditional gender norms. Our data, when not adjusted for potentially confounding selection bias effects of a variety of factors, also show that violence levels indeed were higher among member women. However, our analysis from the PSM analysis, adjusting for selection bias, reveals no significant differences between members and nonmembers, providing critical evidence to support our hypotheses. Our key assertion in this article is that membership in microcredit groups may be selective by some characteristics of disadvantage, particularly in their SES, alongside being selective of more empowered and capable women. Thus, higher levels of violence seen among members may not be attributed to program effects but instead to selection bias. We make this assertion primarily based on the evidence suggesting that domestic violence is more likely among people from poor backgrounds, the very same people who are targeted by and select into microcredit programs.

In further analyses, we also explore characteristics of women who did not match and thus did not figure into the estimation of program effects from the PSM analysis. The findings from these analyses show that unmatched nonmembers, who were relatively more advantaged than unmatched members in terms of their SES, experienced significantly lower levels of violence; these findings, thus, corroborate our assertion that the observation of higher levels of violence among members is a result of selection bias that is largely driven by poorer women selecting into microcredit groups. However, we also observe that among these women who did not match,

microcredit members—who were relatively more affluent than both members and nonmembers among matched women—experienced higher levels of violence compared with women in the unmatched group who were nonmembers. This observation, coupled with the finding from the predicted probability analysis that some variation in domestic violence remained unexplained by the various parameters examined, is also indicative that poverty may not be the only influence in women selecting into microcredit groups. This finding supports the possibility that women who are already in violent relationships, despite being relatively well-off, may self-select into microcredit groups largely as a protective measure against their abusive husbands.

One major limitation of these analyses and the PSM method is that they assume that selection occurs only on observed variables. As we note earlier, this assumption is rather unreasonable given the vast number of potentially confounding, unobserved characteristics that may affect both membership into microcredit groups and domestic violence. Our confidence in the PSM results is, however, strong; a test of whether selection on unobservable characteristics is a contributing factor to the results did not show significant results from a specification of the Heckman selection model (shown in Online Resource 1). Note, however, that the success of the Heckman selection model in generating an accurate test for selection on unobserved characteristics is predicated on the choice of an appropriate instrument(s) in the selection equation that determines selection into membership but not on the outcome. Finding such an instrument is a challenging task. Although our instruments, the proportion of women who are microcredit group members in the district (measured as a non-self mean), spousal occupation, and functional landlessness—all of which also were used in the estimation of the propensity score—are intuitive and reasonably strong, they still may not produce the most precise test for selection on unobserved characteristics. Insofar as these instruments are of sufficient strength and the assumptions of joint normality of errors in the models in the Heckman selection model hold, then the results of the model suggest that selection on unobservable characteristics should not affect our estimate of the program effect on the outcome, and the results of the PSM method should generate appropriate member and nonmember samples to accurately estimate an unbiased program effect.

Another limitation that prevents us from confidently making causal arguments regarding these explanations is that 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. In the absence of longitudinal data, we have taken extra care in the estimation of the propensity scores to avoid simultaneity by ensuring that variables that predict membership in microcredit groups do not co-occur with the decision to join such groups. A majority of the predictive variables in the propensity score estimation equation are those that would have preceded the decision to enter a group and thus are likely to influence it as opposed to occur simultaneously. Our outcome variable, which measures only experiencing violence in the past 12 months, presents yet another limitation in the analyses. Variables that indicate current experience of domestic violence such as “past week” or “past month” and any past experience of domestic violence relative to the timing of joining such groups would have strengthened the robustness of our results substantially. Similarly, we are unable to address the issue of the membership duration dependence of domestic violence, which is frequently cited in the literature to explain

higher levels of domestic violence among new members (Jewkes 2002; Koenig et al. 2003). Both analyses suggest that although joining groups may initially lead to more intimate partner violence as gender norms are shaken, these effects dissipate either because membership becomes more acceptable or because the additional benefits of membership have a compensating effect. Although the BDHS did not collect information on length of membership, the age profiles of membership and violence, both reasonably unvaried by age, suggest that higher violence is unlikely to be explained by duration of membership. Sensitivity analysis conducted by excluding the youngest women who might be disproportionately representative of new members because of their age does not significantly alter our results.

Further analyses of the unmatched group using predicted probabilities provide additional insights into the source of bias among unmatched women. Beyond expected factors such as poverty and education, we find that female headship accounts for a portion of the difference in the domestic violence profiles between members and nonmembers as well. In Bangladesh, female-headed households are typically those in which husbands of the female have died. Women who do not have husbands may be viewed as less credit-worthy by organizations such as Grameen Bank and BRAC and thus are less likely to be members. The absence of a spouse also obviously means that they have no risk of experiencing spousal violence in the current time frame, and makes them perhaps less likely to report ever experiencing spousal violence because the potential perpetrators are no longer alive or because any violent acts may have been largely forgotten. Our distributional results appear to corroborate these assertions: both matched and unmatched nonmembers had higher proportions of female-headed households, and both nonmember groups showed lower experiences of violence. These characteristics of nonmembers lead us to speculate that the lower levels of violence observed among nonmembers could be due to the fact that this risk is significantly lower in female-headed households without a spouse who could potentially perpetrate such violence.

A large portion of difference in domestic violence between unmatched groups in these analyses remains unexplained. We speculate on what may be causing these unexplained differences. First, perhaps these unmatched members, who are the most susceptible to experiencing domestic violence compared with all other groups, have a higher risk of being in violent marital relationships for reasons that are unrelated to the factors analyzed in this study. 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 beyond the scope of this study. Some possibilities are the male partner's prior experience of witnessing domestic violence or being a victim of abuse himself. Alcohol abuse, a recurring theme in domestic violence studies, might also be higher among husbands of women who report high levels of violence. These couples may simply have higher rates of marital discord arising from interpersonal differences. Future research on this topic would benefit from the further exploration of these factors.

In sum, in this article, we highlight selection bias as a key factor in reconciling the contradictory evidence that has characterized the study of the role of microcredit groups on influencing domestic violence and women's empowerment in general. Our

results suggest that the routinely seen findings suggesting that domestic violence may be exacerbated by microcredit membership are likely a result of selection bias effects. Although analyses on detailed panel data would have allowed for the strongest claims about causality, our use of PSM allows us to make a robust case for our findings even while using a cross-sectional sample. Although our results are not the final verdict on the impact of microcredit programs on poverty or of its association with domestic violence, they do identify potential sources of selection bias. As such, the analysis suggests avenues for future explorations of associations such as those between microcredit programs and domestic violence. Highlighting the complex interrelationships among poverty alleviation strategies, poverty itself, and domestic violence can have far-reaching policy and programmatic implications. As the links between domestic violence and demographic variables become increasingly clear, these results may help women achieve better sexual and reproductive health and rights and overall.

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