

# Social Insurance in Self Help Groups: A Generalized Propensity Score Approach\* (*Preliminary and Incomplete*)

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## Abstract

We use novel data from a primary survey conducted in two districts in West Bengal (India) to study the impact of joining an SHG on the social insurance enjoyed by members. In this paper, we judge social insurance by the amount a woman thinks she can raise in times of an emergency by borrowing from others. Propensity score matching is used to estimate results. Additionally, we use a generalized propensity score matching method to determine if the social insurance enjoyed by members changes with the length of their membership. We find that joining an SHG has a positive impact on our variable of interest. Additionally, the level of social insurance is a U shaped function of the length of SHG membership.

## 1 Introduction

Since credit constraints affect the lives of millions of individuals in developing countries, microfinance has received a lot of attention in the past decades, both from policy makers and researchers. In this paper, we use new data from a primary survey conducted in two districts of West Bengal (India) to shed some more light on two main questions. One, does being a member of a microfinance group provide an individual with additional social insurance? Two, is the level of social insurance a function of the length of SHG membership? Social insurance in any form is very important, especially for low income

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people who may be particularly vulnerable to shocks. Social insurance helps people pay back loans on time, smooth their consumption, and deal with emergencies/income shocks without losing all their savings and assets.

The earliest attempt to empirically assess the impact of microcredit is by Pitt and Khandker (1998) who find substantial positive effect of the Grameen Bank on poverty. Chemin (2008) uses the method of propensity score matching and the same data as Pitt and Khandker (1998) to show that microfinance had a positive impact on participants' expenditure, supply of labour and male/female school enrolment. Imai and Azam (2012a) shows that microfinance reduces poverty in Bangladesh.

However, the relationship between social insurance and microfinance has been less studied in the literature. Furthermore, most studies in the literature focus on whether social insurance leads to better repayment rates by groups and lower defaults. Wydick (1999) studies 137 lending groups in Guatemala and finds no clear evidence of a correlation between higher levels of social capital within the group and improved repayment rates. Sharma and Zeller (1997), who study credit groups in Bangladesh, and Ahlin and Townsend (2007), who study group loans given by BAAC in Thailand, find that groups with greater numbers of family members have higher default rates. There is a small and growing literature on how microfinance can affect households' response to shocks. Using data from Indonesia, Gertler et.al (2009) shows that microfinance institutions play an important role in helping households self-insure against health shocks. Islam and Maitra (2011) (using data from Bangladesh) show that households which have access to microfinance are better insured than those who are not. They show that those who have access to microfinance are less likely to sell livestock in the event of a health shock.

Our paper is most related to the last two papers mentioned above. In our survey, we ask women to report how much they think they can raise in an emergency by borrowing from others. We use this variable to judge the level of social insurance enjoyed by an individual (and her family by extension). We use propensity score matching estimators to show that members of SHGs can raise a much higher amount (the amount is roughly equivalent to the monthly income of the average woman in our survey) than non members in an emergency situation. We use a generalized propensity score matching model to show that the level of social insurance is a U shaped function of length of SHG membership. We conjecture that this U shape is due to the following reasons. One, new members of the group might be given more support than others and two, older members of the group may have forged strong social bonds over time so that they also enjoy a high level of social insurance. Group members who have been an SHG member for a 'medium' length of time are at a disadvantage on both these fronts.

The key assumption in propensity score matching methods is that once we have controlled

for observable selection variables, the assignment to treatment (or to treatment level in the case of generalized propensity score matching) is random. Thus, for this method to give us good estimates, it is vital that the important variables which affect selection into a self help group are used to match individuals. The empirical issue faced here is that selection into a self help group is usually an endogenous choice based upon a variety of unobserved characteristics. We spoke with several officers of the Paschim Banga Bank to get an insight into the factors which would most affect the choice of joining a self help group. It turns out that the selection into treatment may be less endogenous than it appears. The local government issues a list of potential members and only these individuals are allowed to form/become part of a self help group. While the exact characteristics used to come up with this list is not known to us, we conjecture that it must be the case that these lists are based on observable characteristics of the individuals like education, income, caste, religion, age etc. We use all relevant observable characteristics to match individuals.

Our data comes from a primary survey in the state of West Bengal in India (563 individuals who are part of a SHG and 235 individuals who are not part of a SHG) across 25 villages in two districts - Birbhum and Bardhaman. The survey collected detailed information about demographics, loans and their usages, data on whom individuals interact with etc. All the group heads were also interviewed regarding group details, and village characteristics for each village in the sample was collected.

The rest of the paper is organized as follows. Section 2 describes the relevant literature and section 3 describes our survey and dataset. In section 4, we present our main analysis. Section 5 concludes the paper.

## 2 Literature

The importance of microcredit has been well established in the literature and research on this topic on various aspects is now more than two decades old (Banerjee, 2013). In this paper, we are interested in the relationship between social insurance and microfinance. The literature on whether access to micro credit leads to better social capital or social insurance is relatively smaller. Wydick (1999) finds no clear evidence of a correlation between higher levels of social ties within the group and improved repayment rates in the context of 137 lending groups in Guatemala. In Bangladesh, Sharma & Zeller (1997), study credit groups and Ahlin & Townsend (2007), who study group loans given by Bank for Agriculture and Agricultural Cooperatives (BAAC) in Thailand, find that groups with greater numbers of family members have higher default rates. Karlan (2007) shows that groups that have a higher fraction of people living in the same neighborhood or are ethnically similar have a strong positive correlation with repayment rates. Feigen-

berg et al. (2010) provides more compelling evidence on the effect of social capital on borrower behaviour. They show that frequent meetings help build social capital which reduces defaults since members can bail each via an informal insurance mechanism. Most of these studies focus on whether social insurance leads to better repayment of groups and lesser defaults. Our paper on the other hand tries to measure the impact of SHG membership on vulnerability to emergency situations. Morduch (1999) argues that poor households often face substantial difficulties to cope with income shocks. Hence micro-credit holds a significant promise that can be one of the effective mechanisms through which poor households can reduce consumption variability and in addition being a SHG member also gives access to better social insurance as shown in this paper.

There is a small and growing literature on how microfinance can affect households' response to health shocks. Gertler et.al (2009) shows that microfinance institutions in Indonesia play an important role in helping households create assets which help them to self-insure against health shocks. They show that households that are closer to financial intuitions are better able to insure consumption. Islam and Maitra (2011) using data from Bangladesh shows that households having access to microfinance are better insured than those who are not. They show that those who have access to microfinance are not required to sell livestock in order to insure consumption. In our paper, we alternatively show that being a member of SHG leads to fostering of informal insurance among the group members.

This paper also has a novel contribution to the literature in terms of methodology. Apart from showing whether being a SHG member leads to greater social insurance, we also try to investigate whether being a SHG member for a longer time leads to greater social insurance or not. To evaluate this, we use the generalized propensity score (GPS) method. The GPS methodology is developed in Hirano and Imbens (2004) and Imai and van Dyk (2004). Similar to the binary treatment developed by Rosenbaum and Rubin (1983) and multivalued treatment propensity score methods (Imbens, 2000; Lechner 2001), it is assumed that—conditional on observable characteristics—the level of treatment received can be considered as random. <sup>1</sup> Flores et.al (2011) and Kluve et.al (2012) implement GPS for continuous treatments in the context of active labor market programs. The PSM for binary treatment has been used in the microfinance literature in different contexts. (For details, see Mazumdar and Lu (2015), Weber and Ahmad (2014), Imai and Azam (2012), Imai et. al (2010)) To our knowledge, this is the first paper to use GPS method to evaluate the impact of longer participation in SHG on social insurance. <sup>2</sup>

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<sup>1</sup>Hirano and Imbens (2004) shows that the GPS has a balancing property that is similar to the balancing property of the 'classic' propensity score.

<sup>2</sup>Swain and Varghese (2009) show that longer participation in Indian SHGs leads to greater asset creation where members move away from pure agriculture as an income source toward other sources such as livestock income. They however do not use GPS method.

There is a huge literature on the impact of microcredit on poverty reduction. The earliest serious attempt to empirically assess the impact of microcredit is by Pitt and Khandker (1998) who find substantial positive effects of the Grameen Bank on poverty. Khandker (2005) found microcredit contributed to reducing poverty among poor borrowers and within the local economy using data from Bangladesh. The impact appears to be larger for those households who were initially extremely poor compared to moderately poor households. These findings are further supported by case-study evidence (Farashuddin and Amin, 1998). Chemin (2008) uses the method of propensity score matching and the same data as Pitt and Khandker (1998) showed that microfinance had a positive impact on participants' expenditure, supply of labour and male/female school enrollment. Imai and Azam (2012) shows that microfinance reduces poverty in Bangladesh by applying different household fixed effects models, and difference in difference and propensity score matching (DID-PSM) to a sample of participants and non-participants of microfinance programs. Imai et. al (2010) shows that in India, loans for productive purposes, such as investment in agriculture or non-farm businesses have a positive impact on household poverty levels using treatment effects model and PSM. However, some studies have shown that MFIs have not reached the poorest of the poor in Asian countries (Weiss and Montgomery, 2005) or in Bolivia (Mosley, 2001). In Bangladesh, Rutherford (2003) found that despite the widespread presence of MFIs, their share of total money management activities is relatively small.

### 3 Details of Survey and Data

The data for this study comes from a survey of a random sample of Self Help Groups (SHGs) registered with the Paschim Banga Grameen Bank (PBGB) in the state of West Bengal in India. PBGB is a regional rural bank (RRB) and was established by the amalgamation of three erstwhile regional rural banks i.e., Howrah Grameen Bank, Bardhaman Grameen Bank and Mayurakshi Grameen Bank in 2007. As of 31st March 2017, PBGB has a total of 230 branches spread across four districts- Bardhaman, Birbhum, Hooghly and Howrah.

A typical SHG consists of 10 female members in the village. There are no members from the same household in one group. Once a group is formed, a group name is assigned and a group leader is chosen by its members.<sup>3</sup> The group leader maintains the financial records of the group and also convenes group meetings. Credit by PBGB is not immediately

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<sup>3</sup>PBGB often takes the help of the farmers club in the formation of the groups. Farmers' clubs are grass root level associations and have strong links with the local community. These farmer clubs enjoy the status of Self Help Group Promoting Institution (SHPI) or business facilitators (BF) to help in formation of groups, link them to the bank with proper monitoring and guidance and also help the bank to recovers loans.

extended to the group. A group initially opens a savings account with PBGB and formed groups are encouraged to build a credit discipline by first saving a certain amount every month. A group can also decide to lend money to its members out of the group's savings and charge an interest rate on such loans. PBGB encourages such internal loans to build the financial discipline before providing a loan to the group. The group also decides on its basic rules like the frequency of meetings, its location, minimum amount of savings of the group members each month. PBGB provides loans to the groups atleast after six months from its initial formation. The loan given by the bank is against no collateral and is joint liability. The minimum size of a loan extended to a SHG is Rs.1.5 lakhs (US\$ 2084). Overtime with the performance of the group and timely repayments, the group can access greater amount of loans. At present, PBGB has around 2000 SHGs who have taken loan above Rs. 5 lakhs (US\$ 6946.32). After the bank disburses the loan to the group, the group leader decides to manage the loan according to the needs of individual group members. A credit linked SHG is one, which has received credit from PBGB whereas a savings linked SHG is one which has a savings account with the bank but has not received credit yet. As of 31st March, 2016 the number of credit linked SHGs with PBGB were 39731 and number of savings linked were 52916.<sup>4</sup>

Repayment of the loan is done monthly at the group meetings. Since the loans provided by PBGB are joint liability loans, peer pressure ensures that the default rate is low and loans are effectively repaid on time. There is a literature on microfinance which shows how joint liability lending works and mitigates some problems that arise by lending to the poor (see Ghatak and Guinnane, 1999). Moreover when a member within a group faces any difficulty in repaying, others in the group help to repay back. Some groups also charges their members an additional interest rate over and above the interest rate charged by the bank. The income that is generated from this additional interest is deposited in the group's savings account.

The survey was conducted across two districts - Birbhum and Bardhaman in the latter half of 2016. The survey was carried out across 14 villages in two blocks in Bardhaman district-Burdwan-II and Galsi-II and across 11 villages in two blocks in Birbhum district-Murarai-I and Nalhati-II. The census of all SHGs under PBGB in these four blocks were obtained from the bank and a random sample of 57 SHGs were chosen across these 25 villages with 28 groups in Bardhaman and 29 groups in Birbhum. Each group member in a SHG was interviewed using a detailed questionnaire. A total of 563 SHG members were interviewed, with 281 members in Bardhaman and 282 members in Birbhum. In order to assess the impact of being a member of a SHG, we also surveyed a random sample of women residing in these sample villages who are not members of SHGs. A total of 235 (with 116 individuals from Bardhaman and 119 from Birbhum) such non-members were

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<sup>4</sup><https://www.pbgbank.com/micro-finance/shg/>

interviewed using a detailed questionnaire.

### 3.1 Descriptive Statistics

In this section, we look at the descriptive statistics of some of the important demographic variables and financial literacy variables of the entire sample. We also look at the descriptive statistics of the loans taken from PBGB by SHG members and their group interaction and social insurance.

#### 3.1.1 Demographics and Income

Table 14 in the appendix provides detailed descriptive statistic of some of the important demographic variables. Since the survey was carried out in rural areas of West Bengal, the level of education is low. 273 SHG members (50.4 percent) have zero years of education, and 160 out of 259 (62 percent) among non-SHG members have zero years of education. Majority of the women interviewed were married and as reported in Table 14, 85 percent of the women were married among SHG members and 83 percent married among non-SHG members. Among the SHG members, 61 percent of them are Hindus and rest are Muslims while among the non-SHG members, 63 percent are Hindus and rest are Muslims. The majority of the respondents in the sample are from the backward castes and tribes. 75 percent and 77 percent of the SHG members and non-SHG members respectively are from backward castes (Scheduled Caste(SC)/Scheduled Tribe(ST)/Other Backward Classes (OBC)).

The average annual income of SHG members is significantly higher than that of non-SHG members while the husband's annual income for both the groups is statistically not different. The average annual income of SHG members is US\$357 and that of non-members is US\$233. The average annual income of husband of SHG members is US\$965 and that of non-members is US\$834. <sup>5</sup>

In terms of occupation, women in SHGs in Bardhaman are primarily agricultural labourers (53 percent), bird/animal farming (13 percent) and housewife(10 percent) while women who are non-members are primarily housewives (37 percent) and agricultural labourers (35 percent). In Birbhum, women belonging to SHGs are primarily housewives (31 percent), Tobacco/puffed rice maker (17 percent) and agricultural Laborers (15 percent) and women who are non-members are primarily housewives (69 percent) and tobacco/puffed rice maker (7 percent).

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<sup>5</sup>1 US\$ = 71.96 INR.

### **3.1.2 Financial Literacy**

Table 15 reports that 95 percent of the SHG members and 97 percent of non-SHG members have never approached a commercial bank for a loan. Most of the respondents didn't know the interest rate paid on fixed deposits and the interest rate charged by the commercial bank on a loan. Thus, there is a serious concern regarding the level of financial literacy among both the SHG members as well as non-members. This shows that individuals have very limited access to formal credit in rural areas. Hence SHGs can play a very important role in easing the credit constraints to a large extent.

### **3.1.3 Loans and its usage**

In this section we provide descriptive statistics of the loans taken by the SHG members. The group takes the loan from PBGB and then distribute it among its members. We collected data on the loan amount each member then took. Table 16 in the appendix provides the details for the last three loan amount that each SHG member took. The average loan size of the most recent loan taken is 22991 INR (US\$319) which is almost equal to the average annual income of a SHG member. The monthly repayment generally is around 500-600 INR (US\$6.95-8.34). The interest rate that they pay depends upon the additional interest rate that a group decides to charge its members on top of the bank's interest rate. Members of SHGs mostly take these loans for their own business (98 percent), for meeting family expenses (1 percent) and for some other purposes (1 percent). Out of the total 563 respondents who belong to SHGs, 31 have defaulted at least once. 10 women could not repay the loan once. The primary reasons for defaulting, as stated by them, are own and family health issues, and natural calamity.

The groups also lend money to its members from its own savings account. The average size of these loans are lower as compared to the average loan size when borrowed from the bank. The average loan size from group savings is 1916 INR (US\$26.62). Members generally take these loans for their own business (90 percent) and the remaining take the loans for meeting family expenses (7 percent) and some for other purposes (3 percent).

Very few members belonging to SHGs take loans from money lenders, relatives/friends, other microfinance institutions (MFIs) and commercial banks. These loans are taken infrequently and at most once in a year or for some members once in 2 or 3 years. Non-SHG members mostly take loans from local money lenders and commercial banks when required.

### **3.1.4 Social Insurance and Group Interaction**

In this subsection we study how being part of a SHG leads to higher social insurance and interaction among its group members. Table 17 depicts that SHG members can approach



3.8 members on average in a group for a medium size loan and 2.7 members on average for a large size loan. A medium size loan is considered equivalent to half the monthly family income and large size loan is considered as equivalent to their monthly family income. These loans are mostly interest free and helps the individuals in smoothing consumption when they are faced with shocks. Before joining the SHG, they could on average approach only 1.74 individuals and 1.12 individuals for a medium size and a large size loan respectively.

Individuals interact on an average with 8.8 members outside group meetings and exchange gifts, attend social gatherings, perform prayers etc. with 7.7 members on average. This indicates that there is social capital that gets built by being part of a SHG. Also, in times of emergency, a SHG member expects to raise Rs. 2721.46 (US\$ 37.81) from group members and Rs.1704.29 (US\$ 23.68) from people outside group members on average. Hence, on average, a member expects to raise Rs.4425.75 (US\$ 61.49) in times of an emergency. The amount that non-SHG members expect to raise is lower by Rs.1938 (US\$ 26.93) in times of emergency. If we compare what the members could raise before and after joining the self help help groups, we find that on average the women believe that they can raise about Rs.2083 (US\$ 28.97) more than what they would have before joining the self help group<sup>6</sup>. 83 percent of SHG members responded that the number of persons who can help them during an emergency have increased after joining the SHG.

## 4 Analysis

Joining a SHG can help women and her family by increasing their level of social protection. Since group members are financially interlinked, and may have more social interactions as a result of being in the same SHG, members could enjoy higher<sup>7</sup> informal insurance. The idea is that group members insure each other towards financial shocks.

To identify the effect of joining a SHG on informal insurance, we asked a simple question which reveals information about the level of vulnerability faced by SHG members as compared to non members. Our question was: *“In times of an emergency, how much money can you raise by borrowing from other people?”* While, this question is about the subjective beliefs of people<sup>8</sup>, it none the less reveals, at the very least - the eased mental state of women who are in self help groups compared to those who are not, at best - the actual level of social protection enjoyed by members of self help groups. We also asked women in SHGs to recall how much money they could have raised from others in an emergency *before joining the SHG*. Additionally, we asked members of self help

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<sup>6</sup>Figures are in nominal prices.

<sup>7</sup>Compared to non-members.

<sup>8</sup>We ask them how much they *think* they can raise in an emergency, not how much they actually raised in an emergency that has occurred in the past.

groups to report separately - how much money they can raise in an emergency from other group members, and how much money they can raise in an emergency from non-members. Generally, we will add these two numbers to get how much a member can raise in an emergency. However, we will also provide more conservative numbers by using only what group members can raise within their group and compare this to what non-members can raise in an emergency.

First, let us consider simple summary statistics. If we compare what the members could raise before and after joining the self help help groups, we find that on average the women believe that they can raise about *Rs*2083 more than what they would have before joining the self help group. Comparing members and non-members currently, the average amount that an SHG member believes she can raise in an emergency is about *Rs*1938 more than the women who are not in any SHG. Even if we use the more conservative amount for SHG members (amount they can raise in an emergency by borrowing only from other group members), on average an SHG member can raise *Rs*574 more than a non member. To put these numbers in perspective, the average monthly income of women in our survey was about *Rs*1966 and the average monthly expenditure on food for the household is about *Rs*2500.

Adding weight to the story of social insurance, we spoke to members who, in the past, had lent money to those fellow group members who were in need of funds. We asked them if they would have lent the money had the recipient not been a fellow group member? About 43% replied 'no'. Furthermore, we spoke to those group members who had received monetary help from other group members in the past and asked them if they would have even asked that particular group member for help if that person had not been in the same group? About 46% of the respondents said 'no'. When we asked SHG members if the number of sources who may help in an emergency has changed after joining the SHG, about 83% women said that they had increased.

The above statistics encouraged us to investigate more rigorously the question of whether joining an SHG leads to better social insurance. The main empirical challenge here is selection bias as stated earlier - those who did not join an SHG may be systematically different in some unobserved characteristic from those who did join SHGs. Thus, our result that SHG members enjoy better social protection could be driven by these unobserved variables. Furthermore, it is possible that those who have been a self help group member longer than others, enjoy more social insurance.

To limit the impact of selection bias, we use propensity score matching (subsection 4.0.1) to estimate the impact of joining an SHG on the amount an individual can borrow from others in an emergency. Subsequently, we also calculate this effect using a generalized propensity score matching method to allow for the fact that impact of different duration

of treatment (time in self help group) may be different. In the appendix, we provide a list of all variables used in regressions and their explanation in table 13. First, we start with a simple OLS estimation.

Table 1: OLS, Outcome variable - *Amount withdraw in Emergency*

<b>Variable</b>	<b>Coefficient</b>	<b>(Std. Err.)</b>
1.timeinSHGcateg	2341.010	(538.782)
2.timeinSHGcateg	1864.625	(377.933)
3.timeinSHGcateg	1666.315	(364.241)
4.timeinSHGcateg	1890.469	(374.638)
age	102.923	(162.355)
agesq	-2.582	(3.466)
agecub	0.022	(0.023)
presentearningmonthown	0.230	(0.063)
presentearningmonthhusband	0.015	(0.023)
1b.groupcategory	0.000	(0.000)
2.groupcategory	254.887	(442.852)
3.groupcategory	-374.447	(486.073)
4.groupcategory	418.808	(424.897)
completedyearsofeducation	81.476	(43.745)
completedyearsofeducationofyourh	25.420	(38.471)
2.religion	559.970	(395.056)
diffageatmarriage	-77.220	(37.158)
ageatthetimeofmarriage	17.143	(54.678)
bplcard	-72.801	(279.682)
numerichomestead	-13.358	(24.715)
NoofHH	0.501	(0.543)
1.Distance to Bank	644.237	(334.249)
2.Distance to Bank	508.184	(412.283)
3.Distance to Bank	-13.772	(612.967)
closest_branch_dist	36.037	(29.377)
Intercept	-1043.052	(2594.152)

This regression indicates that being in an SHG increases the level of social protection. Compared to those who are not in self help groups, women in self help groups believe they can raise, on average, about *Rs*2000 more in case of an emergency. The most optimistic members are those who have been self help group members for 3 years or less (timeinSHGcateg=1). However, this regression does not address the problem of selection bias. We assuage this problem with results from the propensity score matching estimation in subsection 4.0.1.

#### 4.0.1 Propensity Score Matching - Social Insurance

The key assumption in propensity score matching methods is that once we have controlled for observable selection variables, the assignment to treatment (or to treatment level in the

case of generalized propensity score matching) is random. Thus, for this method to give us good estimates, it is vital that the key variables which affect selection into a self help group are used to match individuals. The issue faced here is that selection into a self help group is usually an endogenous choice based upon a variety of unobserved characteristics. We spoke with several officers of the Paschim Banga Bank to get an insight into the factors which would most affect the choice of joining a self help group. It turns out that the local government issues a list of potential members and only these individuals are allowed to form/become part of a self help group. While the exact characteristics used to come up with this list is not known, it must be the case that these lists are based on observable characteristics of the individuals like education, income, caste, religion, age etc. We use all relevant observable characteristics to match individuals. The average treatment effect on the treated (ATT) results from different propensity score matching methods are provided in table 2.

Table 2: Propensity Score Matching Estimates, No. of Obs = 613

<b>Kernel biwt</b>	<b>Kernel Normal</b>	<b>Kernel epan</b>	<b>LLR</b>	<b>Neighbour(1)</b>	<b>Neighbour(5)</b>
1869.95*** (254.77)	1770.62*** (251.08)	1845.88*** (254.17)	1962.24*** (298.34)	1873.82*** (398.34)	1896.24*** (267.56)

Table 2 clearly shows that had the SHG members not joined the SHG, they would have been able to raise about Rs1800 less than what they are now able to in an emergency. The average monthly income of SHG members is about Rs1966, so Rs1800 is roughly equivalent to about 92% of a month's earnings - a significant amount.

The estimates from the first stage logit model (outcome variable is a dummy variable called *ingroup* which takes the value 1 if the individual is in a SHG and zero otherwise) are presented in table 3. We match based on the log odds of the propensity score to attenuate bias originating from the fact that our ratio of treated to non treated individuals is different from the one in the actual population. For variables influencing selection, we choose those which are likely to have affected selection into treatment (joining SHG) *at the time at which the decision was made*. Though we are impaired by our lack of knowledge of the value taken by different variables when the decision to join (or not join) a SHG was taken, we address this problem by using those variables which are consistent across time and are not influenced themselves by treatment.

The test for balanced variables is shown in table 4. As desired, this table reveals that we cannot reject the hypothesis that the selection variables have the same mean in the treated and the control sample.

Table 3: Logit: First Stage, outcome variable: ingroup

Variable	Coefficient	(Std. Err.)
age	0.762	(0.129)
agesq	-0.014	(0.003)
agecub	0.000	(0.000)
2.groupcategory	0.339	(0.378)
3.groupcategory	0.249	(0.411)
4.groupcategory	0.178	(0.359)
completedyearsofeducation	0.031	(0.037)
completedyearsofeducationofyourh	-0.028	(0.032)
2.religion	0.119	(0.332)
diffageatmarriage	-0.030	(0.031)
ageatthetimeofmarriage	-0.049	(0.045)
bplcard	-0.406	(0.233)
numerichomestead	0.027	(0.021)
NoofHH	0.0002	(0.0004)
1.Distance to Bank	0.035	(0.274)
2.Distance to Bank	-0.167	(0.357)
3.Distance to Bank	-0.040	(0.469)
closest_branch_dist	-0.012	(0.022)
Intercept	-10.438	(2.099)

Table 4: Balance: Propensity Score

Variable	Treated	Control	t
age	39.20	38.75	0.7
agesq	1631.5	1594.8	0.65
agecub	71981	69686	0.55
2.groupcategory	0.141	0.151	-0.45
3.groupcategory	0.161	0.154	0.27
4.groupcategory	0.21	0.24	-1.12
completedyearsofeducation	3.18	3.34	-0.61
completedyearsofeducationofyourh	3.87	4.12	-0.88
religion	0.35	0.35	-0.01
diffageatmarriage	6.68	6.91	-1.07
ageatthetimeofmarriage	16.33	16.16	1.07
bplcard	1.26	1.27	-0.38
numerichomestead	7.75	7.73	0.06
NoofHH	563.97	543.74	1.06
1.Distance to Bank	0.47	0.46	0.28
2.Distance to Bank	0.15	0.17	-0.64
3.Distance to Bank	0.07	0.08	-0.81
closest branch dist	5.57	5.62	-0.13

#### 4.0.2 Robustness

Next, we provide a robustness test for our result by using a more conservative measure for the amount group members can borrow in times of an emergency. In particular, we use *conservativeemergency* as the outcome variable of interest. For members of SHGs, this variable depicts what an individual member can raise in an emergency by borrowing from *only other group members*, while keeping the variable value the same as before for non-members. The average treatment effect on the treated (ATT) results from different propensity score matching methods are provided in table 5.

Table 5: Propensity Score Matching Estimates, No. of Obs = 614

<b>Kernel biwt</b>	<b>Kernel Normal</b>	<b>Kernel epan</b>	<b>LLR</b>	<b>Neighbour(1)</b>	<b>Neighbour(5)</b>
466.59**	367.26	442.52*	558.88**	470.46*	492.88**
(235.53)	(231.53)	(234.88)	(282.09)	(282.09)	(249.30)

As we can see from table 5, even when we compare what group members can raise in an emergency *within* their group to what non-members can raise in an emergency, we find that group members are better off.

### 4.1 Generalized Propensity Score Matching

Hitherto, in doing the propensity score analysis, we have assumed that the impact of being an SHG member on social insurance is independent of the length of membership. In this section, we are interested in determining whether the impact of membership is different depending upon the length of SHG membership. To do this, we utilize the method of generalized propensity score (GPS) matching for multi-valued treatment. The key assumption for this analysis is that once we control for observable individual characteristics, the selection into different levels of treatment is random.

Our method for implementing GPS is derivative of the method used by Jochen Kluge , Hilmar Schneider and Zhao (2012). We divide our treatment in four categories. Women who are not in any SHG are in  $timeinSHGcateg = 0$ , women who are in an SHG and have been an SHG member for 3 or fewer years are in  $timeinSHGcateg = 1$ , women who have been an SHG member between 4 and 6 years are in  $timeinSHGcateg = 2$ , women who have been an SHG member between 7 and 9 years are in  $timeinSHGcateg = 3$ , and women who have been an SHG member for 10 or more years are in  $timeinSHGcateg = 4$ . We are interested in determining the average amount a woman in each of these categories think they can raise in times of an emergency. We accomplish this in three steps.

In step one, we determine the propensity score of each woman to be in each  $timeinSHGcateg$ . This is obtained with an ordered logit regression where the outcome variable is  $timeinSHGcateg$

(see table 6). To show that our covariates are balanced, we show that once we control for the distribution of the propensity scores, the actual treatment is uncorrelated with each of the explanatory variables (see appendix section A.2.1). Next, we determine the conditional expectation of the amount raised in times of an emergency by each woman (conditional on actual treatment level and propensity score for that level of treatment). We do this using a linear regression model where the outcome variable is the amount a woman thinks she can raise in an emergency and the explanatory variables are *timeinSHGcateg*, propensity score, higher order terms of the previous two and an interaction term (see table 7). Finally, we estimate the average amount a woman in each of the *timeinSHGcateg* categories think they can raise in times of an emergency by averaging the predicted outcome in the previous regression over each treatment category of interest (see table 8)

As we can see, it is clear that while there is a significant gain from joining a SHG on social insurance, it is not constant over the length of SHG membership. We observe that the relationship seems to be *U shaped* with women who have recently joined the SHG and women who have been members for over 10 years being the one who believe they can raise the most money in times of crisis. This could be because new members are offered more help, and older members have developed strong relationships over time so that they are also able to raise more money compared to members who have been in the group for a ‘medium’ amount of time. This U shaped relationship is born out by our robustness check as well.

Table 6: ologit

Variable	Coefficient	(Std. Err.)
Equation 1 : timeinSHGcateg		
age	0.636	(0.106)
agesq	-0.011	(0.002)
agecub	0.00005	(0.00001)
2.groupcategory	-0.222	(0.278)
3.groupcategory	0.111	(0.298)
4.groupcategory	0.453	(0.266)
completedyearsofeducation	-0.020	(0.028)
completedyearsofeducationofyourh	-0.003	(0.024)
2.religion	-0.354	(0.240)
diffageatmarriage	-0.046	(0.023)
ageatthetimeofmarriage	-0.091	(0.034)
bplcard	-0.033	(0.187)
numerichomestead	0.013	(0.015)
NoofHH	0.001	(0.0003)
1.DistanceToBank	0.134	(0.203)
2.DistanceToBank	-0.511	(0.265)
3.DistanceToBank	-1.527	(0.360)
closest_branch_dist	0.114	(0.018)
Equation 2 : cut1		
Intercept	8.700	(1.741)
Equation 3 : cut2		
Intercept	9.098	(1.745)
Equation 4 : cut3		
Intercept	9.992	(1.751)
Equation 5 : cut4		
Intercept	11.261	(1.759)



Table 7: Step 2 cubic formulation

	(1)
	amountwithdrawinEmergency
timeinSHGcateg	3163.9*** (0.001)
timeinSHGcategsq	-1464.7** (0.013)
timeinSHGcategcub	197.8** (0.036)
r	-12396.7* (0.060)
rsq	30258.3 (0.105)
rcub	-20641.1 (0.164)
rtimeinSHGcateg	118.8 (0.762)
Observations	614

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 8: Amount raised in emergency averages over different time in SHG categories

Variable	Obs	Mean	Std. Dev.
timeinSHGcateg=0	614	1994.65	391.84
timeinSHGcateg=1	614	4426.66	283.75
timeinSHGcateg=2	614	3967.06	300.92
timeinSHGcateg=3	614	3443.79	254.65
timeinSHGcateg=4	614	3885.88	371.88

Table 9: conservative cubic step 2

	(1)
	conservativeemergency
timeinSHGcateg	431.0 (0.557)
timeinSHGcategsq	-163.9 (0.724)
timeinSHGcategcub	25.55 (0.732)
r	-10386.0** (0.047)
rsq	25323.2* (0.086)
rcub	-17021.3 (0.147)
rtimeinSHGcateg	37.04 (0.905)
Observations	614

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 4.2 Robustness for GPS

We provide the following robustness check for our results. We provide a conservative estimate of the average amount raised by a woman in a treatment group using only the amount a woman thinks she can raise in an emergency by borrowing *within* the SHG group (for members).

### 4.2.1 Conservative Estimates

The conservative robustness results are given in table 9 and table 10. We provide an additional robustness estimate here by using a quadratic formulation in step 2 (rather than a cubic one). The robustness results for a quadratic formulation (of step 2) are presented in table 11 and table 12. The *U shaped* relationship between SHG membership and social insurance persists. The conservative estimate of the gain in social insurance from SHG membership is between  $Rs300$  and  $Rs600$  in the amount that is believed to be raised in times of an emergency.

Table 10: Time in SHG category averages - conservative cubic

Variable	Obs	Mean	Std. Dev.
timeinSHGcateg=0	614	1906.08	297.61
timeinSHGcateg=1	614	2634.46	201
timeinSHGcateg=2	614	2239.06	221.14
timeinSHGcateg=3	614	2235.79	212.6
timeinSHGcateg=4	614	2649.07	313.44

Table 11: conservative quadratic step 2

(1)	
conservativeemergency	
timeinSHGcateg	36.97 (0.882)
timeinSHGcategsq	20.49 (0.743)
r	-4373.2** (0.037)
rsq	4948.4** (0.035)
rtimeinSHGcateg	227.8 (0.424)
Observations	614

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 12: Time in SHG category averages - conservative quadratic

Variable	Obs	Mean	Std. Dev.
timeinSHGcateg=0	614	2077.74	370.59
timeinSHGcateg=1	614	2495.24	239.49
timeinSHGcateg=2	614	2262.29	270.7
timeinSHGcateg=3	614	2265.53	220.02
timeinSHGcateg=4	614	2536.99	247.43

## 5 Conclusion

This paper uses data from a new survey in West Bengal, India to show that women who are members of SHG have higher levels of social insurance as compared to women who are not members of SHG. The surveyed women were from rural areas and economically weak backgrounds and therefore vulnerable to various economic shocks. These shocks can arise either because of health emergencies in the family, or other economic reasons such as crop failure. SHG membership leads to better social insurance in terms of the amount of money they expect to collect in times of emergency, and this allows these families to smooth consumption and absorb these shocks. Additionally, we use the generalized propensity score matching method to show that the level of social insurance enjoyed by an SHG member is a U-shaped function of the time spent as SHG member.

We hope that we can use our primary data set to look at several other research questions in the future. For example, it would be interesting to map the social network as a graph and relate the level of social insurance to the centrality of the individual. Additionally, it is not quite clear if the pre-bank loan intergroup lending required of SHGs actually help them learn to be more financially organized and responsible. We hope to shed light on such questions in our future research.

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# A Appendix

## A.1 Appendix for Data Section

Table 13: Description of Variables

<b>Variable</b>	<b>Description</b>
amountwithdrawinEmergency	Amount that can be withdrawn in an emergency
annualincomeown	Own annual income
annualincomehusband	Husband's annual income
age	Age of the respondent
agesq	Square of Age
completedyearsofeducation	Completed years of education
diffageatmarriage	Difference in age with husband at the time of marriage
bplcard	Dummy =1 if household have a BPL card
earningmember	Number of earning members in the household
memberofhh	Number of members in the household
ingroup	Dummy=1 if SHG member
i.groupcategory	Dummy for group category = SC/ST/OBC
i.numericblock	Dummy for numeric block
i.religion	Dummy for religion



Table 14: Descriptive Statistic: Demographics

Variable	Mean	Standard Deviation	N
<b>Age (in years)</b>			
SHG members	39.06	9.67	544
Non-SHG members	33.18	13	241
<b>Difference in Age between Husband and Wife (in years)</b>			
SHG members	6.2	3.53	542
Non-SHG members	6.79	3.26	239
<b>Years of Education</b>			
SHG members	3.29	3.89	530
Non-SHG members	5.11	4.54	241
<b>Husband's Years of Education</b>			
SHG members	3.95	4.4	522
Non-SHG members	5.41	4.27	221
<b>Married Women</b>			
SHG members	0.85	0.36	564
Non-SHG members	0.83	0.38	241
<b>Age at the time of Marriage (in years)</b>			
SHG members	16.34	2.27	542
Non-SHG members	16.62	2.63	226
<b>Religion: Hindu</b>			
SHG members	0.61	0.49	564
Non-SHG members	0.63	0.48	241
<b>SC/ST/OBC</b>			
SHG members	0.75	0.4	564
Non-SHG members	0.77	0.41	241
<b>Housewife</b>			
SHG members	0.2	0.4	564
Non-SHG members	0.51	0.50	241
<b>Own Annual Income (in Rs.)</b>			
SHG members	25689.42	27256.6	516
Non-SHG members	16779.19	21823.8	198
<b>Husband's Annual Income (in Rs.)</b>			
SHG members	69467.91	197294	508
Non-SHG members	59995.45	86736.15	220
<b>Number of Children</b>			
SHG members	2.48	1.28	564
Non-SHG members	1.88	1.26	241
<b>Number of Female Children</b>			
SHG members	1.22	1.09	564
Non-SHG members	0.87	0.89	241
<b>Number of Members in the Household</b>			
SHG members	4.3	1.58	546
Non-SHG members	4.4	1.85	240
<b>Number of Earning Members in the Household</b>			
SHG members	1.97	0.77	546
Non-SHG members	1.66	0.85	239
<b>BPL card holders</b>			
SHG members	0.70	0.46	564
Non-SHG members	0.61	0.49	241

Table 15: Descriptive Statistic: Financial Literacy

Variable	Mean	Standard Deviation	N
<b>Approached a Commercial Bank for a loan</b>			
SHG members	0.05	0.22	564
Non-SHG members	0.03	0.18	241
<b>Do not know the interest rate paid on a fixed deposit with a commercial bank</b>			
SHG members	0.90	0.3	564
Non-SHG members	0.94	0.24	241
<b>Do not know the interest rate charged by a commercial bank for a loan</b>			
SHG members	0.82	0.39	564
Non-SHG members	0.76	0.42	241

Table 16: Descriptive Statistics on Loans

Variable	Mean	Standard Deviation	N
Last Loan Size (in Rs.)	22990.99	40794.98	520
Second Last Loan Size (in Rs.)	16593.83	19735.78	483
Third Last Loan Size (in Rs.)	14389.12	11428.7	359
Monthly Repayment Amount for Last Loan (in Rs.)	698.10	734.64	508
Monthly Repayment Amount for Second Last Loan (in Rs.)	580.33	642.85	491
Monthly Repayment Amount for Third Last Loan (in Rs.)	551.84	736.5	359
Internal Group Loan Size (in Rs.)	1916.22	5276.11	111

*Notes:* The loan amounts and the monthly repayment amounts are not inflation adjusted

Table 17: Descriptive Statistics on Social Insurance and Group Interaction

Variable	Mean	Standard Deviation	N
No. of individuals whom can be approached for a medium size loan within group	3.8	3.1	544
No. of individuals whom can be approached for a medium size loan before joining SHG	1.74	1.76	543
No. of individuals whom can be approached for a large size loan within group	2.7	2.8	544
No. of individuals whom can be approached for a large size loan before joining SHG	1.12	1.27	543
No. of individuals whom can be approached for a medium size loan outside group	1.74	1.65	541
No. of individuals whom can be approached for a large size loan outside group	1.15	1.47	543
No. of group members with whom one interacts outside group meetings	8.8	1.6	543
No. of group members with whom one exchange gifts, attend social gatherings, perform prayers etc	7.7	2.6	543
No. of group members one approaches for non-financial help (social occasions, illness etc.)	6.3	3.2	544
Amount of money that can be raised in case of an emergency from group members (in. Rs)	2721.46	3449.65	536
Amount of money that can be raised in case of an emergency from individuals not in group (in. Rs)	1704.29	2652.78	536
Amount of money that can be raised in case of an emergency from individuals before joining SHG (in. Rs)	1895.96	3449.79	542
<b>Amount of money that can be raised in case of an emergency (in Rs.)</b>			
SHG members	4425.75	4673.86	536
Non-SHG members	2550.42	7173.74	238

## A.2 Appendix for Analysis Section

### A.2.1 Balancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	AGE	agesq	agecub	EDUCATION	EDUCATION HUSBAND	diffageatmarriage	AGE AT MARRIAGE	HOMESTEAD	(No. of HH)	closest_branch_dist
timeinSHGcateg	0.353 (0.179)	24.76 (0.321)	1354.6 (0.497)	-0.0953 (0.377)	-0.0784 (0.525)	-0.0288 (0.768)	-0.000336 (0.996)	0.0980 (0.505)	3.036 (0.694)	-0.189 (0.147)
Pr(timeinSHGcateg==1)	-272.0* (0.051)	-19812.0 (0.134)	-1003708.2 (0.342)	-33.98 (0.552)	-32.77 (0.615)	19.87 (0.701)	49.08 (0.159)	13.26 (0.865)	3533.6 (0.387)	-0.00173 (1.000)
Pr(timeinSHGcateg==2)	193.5*** (0.008)	14241.1** (0.038)	828621.9 (0.132)	11.29 (0.704)	12.11 (0.721)	-0.0794 (0.998)	-12.31 (0.497)	3.318 (0.935)	-3446.3 (0.105)	44.23 (0.219)
Pr(timeinSHGcateg==3)	-17.17 (0.581)	-1865.6 (0.528)	-148337.5 (0.530)	-20.70 (0.105)	-17.67 (0.226)	-1.150 (0.921)	0.760 (0.922)	0.917 (0.958)	2118.4** (0.021)	-48.19*** (0.002)
Pr(timeinSHGcateg==4)	24.08*** (0.000)	1611.6*** (0.002)	98408.7** (0.018)	-6.029*** (0.007)	-5.254** (0.041)	1.783 (0.380)	0.810 (0.554)	3.968 (0.195)	-584.0*** (0.000)	36.39*** (0.000)
Observations	613	613	613	613	613	613	613	613	613	613

p-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 18: Estimation results : mprobit: groupcategory

Variable	Coefficient	(Std. Err.)
Equation 2 : 2		
timeinSHGcateg	0.059	(0.065)
pr1	-4.282	(36.739)
pr2	-4.285	(20.214)
pr3	4.624	(9.255)
pr4	-5.056	(1.800)
Intercept	0.131	(1.158)
Equation 3 : 3		
timeinSHGcateg	-0.005	(0.066)
pr1	-56.422	(33.936)
pr2	41.684	(18.600)
pr3	-21.046	(8.276)
pr4	-0.099	(1.403)
Intercept	0.646	(1.087)
Equation 4 : 4		
timeinSHGcateg	0.022	(0.059)
pr1	59.671	(32.877)
pr2	-30.897	(16.680)
pr3	12.506	(7.194)
pr4	-0.859	(1.300)
Intercept	-2.087	(1.218)

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	(1)
	BPL CARD
timeinSHGcateg	-0.0240 (0.712)
Pr(timeinSHGcateg==1)	-8.253 (0.803)
Pr(timeinSHGcateg==2)	5.122 (0.769)
Pr(timeinSHGcateg==3)	-5.283 (0.482)
Pr(timeinSHGcateg==4)	0.368 (0.775)
Observations	613

---

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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	(1)
	RELIGION
timeinSHGcateg	-0.00647 (0.919)
Pr(timeinSHGcateg==1)	-12.93 (0.695)
Pr(timeinSHGcateg==2)	12.46 (0.478)
Pr(timeinSHGcateg==3)	-8.775 (0.252)
Pr(timeinSHGcateg==4)	-0.390 (0.769)
Observations	613

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*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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	(1)
	(Distance to Bank)
timeinSHGcateg	0.0244 (0.660)
Pr(timeinSHGcateg==1)	62.55** (0.048)
Pr(timeinSHGcateg==2)	-44.73*** (0.009)
Pr(timeinSHGcateg==3)	28.05*** (0.000)
Pr(timeinSHGcateg==4)	-7.369*** (0.000)
Observations	613

---

*p*-values in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$