

The Microfinance Puzzle: Intrahousehold Allocation and Seasonality in Labour Supply*

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Abstract

Using a relatively new, large and unique panel dataset collected from rural households in Bangladesh between 1997 and 2005 this paper evaluates the impact of micro finance on intra-household and inter-sectoral distribution of labour supply. Detailed information covered in the dataset also allow us to study seasonal changes and analyse the impact of the duration of participation in such microcredit programs on the sectoral distribution of labour supply both at the household and individual level. The main distinguishing feature of our analysis is that no other study, to the best of our knowledge, has made an attempt so far to systematically measure the impact of access to micro loans on so many different aspects of household and individual level labour supply. We find evidence that microcredit affects both incidence and intensity of labour supply in each of the different sectors differently and the benefits accrued from program participation are not symmetrical across both male and female individuals from the same household.

Keywords: microfinance, labour supply, inter-sectoral, intra-household.

JEL Classification: J01, J16, J22, J82.

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1 Introduction

The historical segregation of men and women in Bangladesh has had a long lasting effect on the participation of women in market oriented labour market. Rural employment opportunities in Bangladesh ranges from household based farm and nonfarm activities to participating in the labour market as a wage labourer or through self employment based activities, but in the absence of access to institutional capital the labour market in rural Bangladesh seem to be segmented across gender lines. While women tend to be clustered in home based agricultural or other traditional work, men tend to be mostly involved in on farm or other wage and self employment activities. Even when willing to participate in off farm non agricultural activities the opportunities for these women are limited given the socio-cultural barriers that dictate their inheritance and participation in the labour market. Women in this patriarchal society are excluded from inheriting the family's productive assets, mainly arable land and as such accessing credit from formal institutions without putting credible material possessions as collateral is difficult for them. Socially secluded and culturally separated they have been restricted to household based agricultural work, therefore naturally playing a "secondary role" in the household decision making.

Microcredit makes an attempt to bridge this gap left behind by the formal institutions by providing financial capital to households who would otherwise be either ineligible to access credit or at most locked into the informal credit system delivered by moneylenders at exorbitant interest rates. Microcredit programs since its inception has mostly targeted landless and assetless rural women as they are highly represented among the world's poorest people, considered credit constrained and found mostly active in household based on farm or off farm activities. Access to microcredit in rural Bangladesh has been argued to significantly contribute to generating self employment activities by providing clients with micro loans which help them to start their own business enterprises, thereby resulting in higher income and better livelihoods (BIDS, 1990; Khandker, 1998; Zohir et al, 2001; Rahman et al, 2002). This is of particular interest to us as credit given to the program participants may induce different labour market outcomes across genders and change the internal dynamics of the labour market and family hierarchy.

We realize that there already exists a large literature that evaluates the impact of microfinance on different aspects of social and economic well-being, like poverty, income, wealth and health (Khandker et. al., 1998; Pitt et. al., 2006) but no attempt has been made so far to assess the effect of participation

in such microcredit programs on occupational choices of the household or their distribution of labour supply across sectors, seasons and individual members of the household. It is believed that participation in microcredit programs increase women's participation in nonfarm activities by providing credit which was previously not available to them due to their lack of sufficient collateral. However, the better outcomes achieved by the household (Pitt and Khandker 1998; Pitt et al. 2003) are not sufficient evidence to establish claims that credit program participation has a positive impact on time and effort dedicated to nonfarm activities by the female members of the households. To examine this question we need to examine the relationship between access to microcredit and its impact on the distribution of labour supply both at the household and individual level.

While the improved economic conditions of the participating households are well documented now, the channel through which microcredit affects these households is still unclear. Given the vast literature on microfinance and labour supply separately it is quite surprising that hardly any attempt has been made to understand the impact of microcredit on the distribution of labour supply, particularly due to the lack of appropriate detailed data required to undertake such an ambitious endeavour. To this end, we use a new and unique dataset to explore the impact that participation in the microcredit program has on labour supply at the household level, especially on female's labour supply pattern across both sectors, and seasons to assess if microcredit has indeed succeeded in reaching out to the target groups. The main distinguishing feature of our analysis is that no other writing in the literature to the best of our knowledge has made an attempt¹ to systematically measure the impact of micro loans on so many different aspects of household labour supply. This paper in no way attempts to undermine the positive accomplishments of the microfinance institutions, instead we make an effort to understand the origin of such changes using an alternative approach, which focuses on labour market outcomes to understand the impact of program participation on rural households.

The questions that we address in this paper particularly refer to four different aspects of household and individual level labour supply. For the purpose of our analysis we study the effect of participation in such microcredit programs on intra-household labour substitution or the distribution of burden within the household, i.e. male to female or female to male labour substitution and on inter-sectoral distribution of labour supply between the three major occupational choices. In addition, we also

¹Pitt (2000) has examined the role of microcredit on the distribution of agricultural labour supply (own cultivation as opposed to agricultural wage labour), but his analysis has been restricted to the analysis of male time use without considering female labour supply. Moreover it only considers the distribution of labour supply at the household level. This paper also differs from Pitt and Khandker (2002) in both our analysis as well as results as we find no evidence of labour supply smoothing.

analyse the role that microcredit have on the distribution of labour supply across the seasons and the effect that duration of participation have on labour supply at the household level. Due to the scarcity of sufficient data on out-migration from the rural areas we were however unable to study the effect of the program on another very interesting phenomenon, the inter-regional distribution of labour supply.

We test the hypothesis if participation in microcredit programs increases female labour force participation or more specifically encourages self employment activities among women? whether it affects male and female, adults and children of the same household differently? More importantly whether access to institutional capital reinforces women's traditional roles or promotes gender equality within the household? eliminates vulnerability by smoothing seasonal variation in labour supply? Finally, we discuss if the experiences of long term participants are different from those of short to medium term or non participant households.

The paper will be structured as follows. The next section provides background information on the microcredit program and discusses the collection and coverage of the data. Section 3 then describes the important aspects of the data and present the salient features necessary for our study of the labour market participation both in terms of incidence and intensity for both program participants as well as non participants. This is followed by a discussion of the alternative estimation strategies that has been adopted in this study to evaluate the effects of participation in such programs in a more in depth analysis. It examines the intra-household and inter-sectoral distribution of labour supply, analyses the seasonal variation in labour supply at the household level and assesses the impact of the length of participation on the same by disentangling the short and medium run effects of participation from the long run effects. A brief conclusion is finally presented in the last section of the paper.

2 The Program and the Data

The household survey was designed to collect information about every household member and contain questions relevant to the respondent's personal characteristics, educational background, employment situation, health status, children's education, social and family relationship, major life events, income and expenditure, housing and living conditions, and labour supply. The richness of the data also allow us to study the seasonal distribution of labour supply in all the three major occupations that provide livelihood to the rural households.

The paper uses three waves of household panel data covering the period 1997-98 to 2004-05. The data covers both treatment and control groups of microcredit households. While four rounds of the sur-

vey were conducted (in 1997-98, 1998-99, 1999-2000 and 2004-05), in this paper we use data only from the first, third and fourth round because the second round did not collect comprehensive information on outcome variables such as labour supply². The data was collected by BIDS for Bangladesh Rural Employment Support Foundation with financial assistance from the World Bank. The first author was also personally involved in the data collection, monitoring and report writing. All surveys took place during December to April. Covering about 3000 households selected from 91 program and control villages spread over 23 thanas or sub-districts of 13 of Bangladesh's 64 districts tracked regularly over a span of seven years, this dataset is one of its kind and supposedly the largest microfinance survey ever conducted in Bangladesh or worldwide. The first survey was administered after a census of all households in the 91 villages during October 1997. One aim of survey was to capture a representative sample of microfinance households that reflects the overall microcredit operations in Bangladesh. The participating households were drawn from 13 different sizes of MFIs, each from separate districts, all members of PKSF³ (so as to be representative of MFIs in Bangladesh).

These MFIs have similar types of program activities and provide loans in a similar way to the Grameen Bank. Most of the clients in our sample are women, and credit is not offered to a mixed group of men and women together. Of the 13 selected MFIs, two were deliberately chosen from the four largest MFIs in Bangladesh. The survey was designed initially to have two control villages and six program villages from each of the areas where microfinance was operating. However, since not enough control villages could be found in all areas, only a total of 11 control villages were included in the first round. Subsequent rounds of the survey revealed that some of the control villages turned into program villages, and in the final round of survey there were 8 control villages⁴.

2.1 Data Specification and Summary Statistics

The survey has separate modules dedicated to collect detailed information on different aspects of the lives of the households, their village level information, information about the microcredit institutions, extent of their participation, the amount of funds borrowed, purpose of the loan and how it was

²One reason to have a follow-up survey in 2004-05 after a gap of more than 4 years was to obtain impact estimates for those dropped-out and participated newly. So, an effort was made to obtain detail information on participation status during this interval. We have year-to-year information about household participation status for other years when there was no survey

³PKSF stands for Palli Karma-Sahayak Foundation (PKSF), which translates to the Rural Employment Support Foundation. PKSF works as a regulatory organization for the MFIs. The microlending community regards it as a regulatory agency and it exercises authority over the MFIs. PKSF mobilizes funds from a wide variety of sources and provides these funds to its members for lending as microcredit.

⁴Khandker (2005) also highlights the limitation of getting control villages in his survey data.

used, etc but it is the socio-economic condition of the family module that records detailed information about the days, and hours worked by each male and female member of the household in different categories of work covered under three major occupation choices: household based farm and non-farm activities, agriculture and non-agriculture wage employment and self employment and non agricultural work. In addition, other individual level information like age in years, educational attainment, marital status, and household level information like participation status in microcredit institutions, duration of membership, possession of assets, land ownership, income from different sources and consumption of different food and non food items were also covered in the surveys.

The dataset comprises of 3026 households from the first wave, 2939 from the third wave and 2729 households⁵ from the fourth and last wave. For the purpose of our analysis we do not impose any strict restriction and use an unbalanced panel of 2691 households from the first round, 2657 from third and another 2575 households from the last round based on the availability of all the variables of interest. The dataset that we use in this paper is perhaps the largest of its kind and contains detailed information on labour allocated to different occupations by each individual of the household during different agricultural seasons of the past year.

Given the richness of the current dataset we have a panel dataset of 32835 seasonal observations for each of the three occupations from 6567 individuals in the first round, 31600 observations from 6320 individuals in the third round and 30040 observations collected from 6008 individuals in the fourth round. Thus we have a total of 283,425 individual seasonal observations covering 94475 individuals active in three different occupation choices, during each of the five seasons of the three rounds of survey.

Detailed and extensive information on the contribution of each member of the household towards all the three different occupation categories has been collected separately during every round of the survey for each of the five major agricultural seasons in the Bengali calendar. There is no one to one correspondence between Bengali seasons and English months, and there is also large variation across regions, with some level of overlapping between the cropping pattern of rice in Bangladesh, but the five seasons mentioned in the questionnaire can be sorted into the following Bengali and English calendar months to some extent. Ograhayan-Poush in the Bengali calendar is equivalent to November-January in the English calendar and can be classified as Season 1. Ashwin to Kartik (September-November) then will be Season 2, Ashar-Bhadra-Shrabon (June-September) will be equivalent to Season 3, Baishak

⁵The attrition between the beginning, 1997 and the end of the survey in 2005 was less than 10 percent or about 1.2% per year.

and Jaishta (April and June) to Season 4 and Magh-Falgun-Chaitra (January to April) to Season 5.

Labour supply data for each of the rounds was collected by trained and reliable enumerators by asking each of the respondents from the household to give their best recollection of their activities during the past agricultural seasons: to recall in detail the total days and hours⁶ they have worked in each of the different sectors in the last one year. Rest assured about the data collection method and the reliability of the data we expect there to be “little evidence of any significant and large recall bias” in the data (Beegle et. al., 2011) as they reported total days worked and mean hours worked in a day in just the past year (Gibbs et. al., 1986). Even if there remains any potential for recall bias after this it will be symmetrical across both participants and non-participant households, thus not overreporting or under reporting the difference between the treatment and control households, thereby not affecting the overall results of our paper in any way.

In this analysis we define participant households as households who were microcredit members (treated) as of that round of survey while non-participants are households who were not members (control group) of any MFIs and so did not have access to micro loans and other benefits offered by those institutions. Classifying the clients of the MFIs as the treatment group and the non-participants as the control group in our analysis allow us to attribute the effects directly to the participation status. In the subsection on the effect of duration of participation on labour supply, however, we compare the impact of participation on different groups of MFI clients categorized according to their duration of participation when compared with the strict non-participants.

The study is restricted to all individuals of participant and non participant households who were 7-60 years old at the time of the survey and individuals are further classified as adults if they are in the 15-60 age group and as a child if they are less than 15 years old following the internationally accepted definition of child labour⁷. This is of interest to us as work by children is illegal or restricted by law but they remain intensively used in the agricultural and wage employment sectors which remain beyond the realm of the formal sector benefits. Even though we initially use the 15 year cutoff to categorize individuals into adults and children, we also use an alternative definition to check the robustness of the results. As the second alternative we use a stricter definition to label adults as anyone who lie in

⁶For family labour in household based farm and non-farm activities we have data on total days worked in each season, hours worked per day on average and total minutes worked per day while for others answers has been provided in just days per season and hours per day which necessitates better comparability.

⁷The ILO Minimum Age Convention, 1973 (No. 138) specifies in law that the minimum age for admission into employment cannot be less than 15 years and every child should have the right to education and finish compulsory level of education. However countries without access to educational facilities can under certain conditions initially specify a minimum age of 14 years. However, the minimum age at which children can start work in hazardous industries remain fixed at 18 years of age.

the 18-55 bracket and children who are less than 18 year old, using the age at which individuals are legally allowed to enter work in hazardous industries.

In this paper we focus on the impact of access to microcredit not only on incidence of participation but also on the intensity or extent of labour market participation. An individual is defined to be employed in household based farm and non-farm activities measured in terms of hours worked if he reports to have worked strictly positive hours in that particular sector. The same definition of incidence has also been adopted for the other sectors which generate employment for individuals from the rural households. Thus we distinguish between just participation and the extent of participation in each of the different occupation choices.

[Table 1]

From the descriptive statistics of active participation of adults in different occupations we get a pretty good idea that while active participation between male and female is not significantly different, it is a comparatively new phenomenon. Adult women's participation rate (PR) has increased from about 75-80% during the first round to about 90-93% during the last round, however, there is sufficient evidence of clustering of men and women around gender specific roles. It is here that we emphasize that while women are mostly engaged in household based farm and non farm activities, most men tend to be employed in more market oriented activities⁸, their participation in the labour force is significantly higher, as they seek employment either as wage labourers or remain self employed in the non agricultural sector. While about 13-15% of our sample of female aged 15-60 were engaged in the labour force, labour force participation rate (LFPR) for men stood at about 75%, about five times higher. Another very intriguing feature is that while men from both treatment and control groups are simultaneously working in a number of different sectors at the same time, women continue to be active mostly in household based activities⁹. Thus, male to female ratio is lowest in household based activities which seemed to be dominated by women given their historical predominance in this sector but we find it to be significantly higher in other sectors. Over the years, there has been a decline in the male-female ratio in both household based and wage employment, but a prominent increase in male participation in self employment compared to women's participation, what is even more interesting is

⁸We can distinguish between active in household based work and market oriented labour force participation rate (LFPR) which is comprised of non farm labour in self employment and working as wage labourers.

⁹This is very clear from table 1: It can be seen that while women's activity rates in all the three sectors add up to more or less their total participation, the sum of the three male activity rate is significantly higher than their participation in terms of total labour supply, which is clear evidence of diversified participation portfolio of men.

that overall participation rate in self and wage employment has increased only marginally while there has been a small decline in household based activities.

[Figure 1]

[Figure 2]

As incidence of participation does not give a complete picture of the extent of participation or the contribution of both genders towards the different occupation choices available in rural Bangladesh, we also focus our attention to the hours of labour supplied by each adult individual in each of the different sectors. We consider three types of occupation choices in our analysis and use them to arrive at the total labour supplied by each individual of the households. As data on each and every work categorized under household based farm and non-farm activities was recorded in terms of days worked per season and average hours and minutes contributed per day, while agriculture and non-agriculture wage employment and self employment and non agricultural work was measured in days per season and hours worked per day we had to normalize them before it could be deemed comparable. To increase the comparability of labour supply in all the three sectors of rural employment we convert all time invested into a single unit of measurement: hours worked per season, which has been reached by converting all the minutes worked in a day into hours and then multiplying the average hours worked in a day by the number of days per season. Then we add up the contribution of each individual of the household in each item under each of the occupation category to get the total labour supplied towards each of the major occupational sector. Finally, we arrive at the total individual level labour supply by adding all the individual level labour supplied under each of the three major occupation categories.

[Table 2]

While there is a very high participation of women in the agricultural sector giving an idea of feminization in household based farm and non farm activities, their contribution to each of the different categories of occupations is significantly lower than that of their male counterparts for both participants as well as non participants. The hours worked by male individuals in household based activities fell significantly over time but increased slightly for female. The same is also true for wage employment, moreover, when we look at the male to female ratio and the share of each sector in the total labour supplied by both men and women we find a very similar story. Male to female ratio was lowest in the

agricultural sector and higher in self employment and non agricultural sector and increased twofolds between round one and four, while it fell in the other two sectors. Women continued to focus a large share of their total time in household based activities as per the traditional social norms of the nation, while men specialized in off farm self employment activities. The questions that seem very important at this stage are: microfinance institutions emphasize upon providing credit to women so as to generate self employment activities for them then why has there been a two fold increase in male to female activity in the non-farm sector? Why is it that men still dominate the off farm activities while women the household based? Has microfinance affected the labour supply of women in any way?

[Figure 3]

[Figure 4]

[Table 3]

Finally, table 3 presents the summary statistics of some of the important individual as well as household level demographic characteristics for both the treatment as well as the control groups separately for different rounds of the survey.

3 Estimation Methodologies

In this current section we use the valuable information collected by the survey to compare the labour market participation of individuals from households who participated in the microcredit programs with those from non-participant households. We present separate estimates for individuals employed in household based activities v/s those in market oriented activities in the past year as the dependent variable. Thus, we will be running separate regressions for hours worked in household activities, as wage labourer, as self employed in off-farm sector and total hours worked for both male and female individuals, for different age groups using the panel data approach (Khandker, 2005) and another alternative approach which combines propensity score matching with the panel data approach. Both of the estimation strategies that we use in this section resolves the problem of endogeneity or self selection into the program that is inherent in our model. Estimating the impact of program participation on household level labour supply by comparing individuals in non participant households directly with their counterparts in participants without controlling for the selection bias unequivocally results in

biased estimates of the impact. The regression results presented over here seem to address the effect of participation in the MFIs on intrahousehold, intersectoral distribution of labour supply, seasonal variations and the role that participation in the program play in smoothing labour supply and at last focus on benefits from the duration of participation.

3.1 Panel Data Approach

It is important to note over here that there is a possibility of a potential selection bias when program placement is endogenous and not allocated randomly and participants from eligible households themselves have the choice to participate or not participate in the credit programs. There could be individual, household and village level unobservable characteristics that could influence the household's decision to participate in the program. It may be that unobserved individual, household and village level characteristics like ability, and attitudes are more likely to self select into the credit programs thereby leading to a biased estimation of the impact of participation if we fail to control for this endogeneity. Luckily for us, the availability of a panel dataset allow us to address the issue of selection bias which is inherent in such studies and let us consistently estimate the average treatment effects.

The empirical specification that we have adopted in this section to estimate the impact of access to microcredit through the microfinance institutions on labour market outcomes can be written as follows:

$$L_{ijt} = \alpha_i + \beta_1 X_{ijt} + \beta_2 H_{ijt} + \gamma D_{it} + \theta S_j + \lambda \tau_t + \vartheta(S_j \times \tau_t) + \varepsilon_{ijt} \quad (1)$$

where L_{ijt} is the outcome of interest, the amount of labour hours contributed by individual i in season j at time t ; X_{ijt} is a vector of individual specific control variables (for example, age, marital status, and education level); H_{ijt} is a set of household level characteristics which are distinct from the individual level characteristics but is same for all the individuals of the household. ε_{ijt} is the individual specific error term which is non-systematic and vary across individuals. On the other hand, θS_j represent seasonal fixed effects, $\lambda \tau_t$ represent the year fixed effects while $\vartheta(S_j \times \tau_t)$ can be interpreted as a seasonal-year interaction effects. The parameter of interest in this paper is the sign γ on the treatment variable D_{it} which is the participation status of the household that individual i belong to in round t .

As we estimate the impact of program participation using fixed effects model to control for the selection bias, we only control for a subset of all individual and household level characteristics that

seem to affect our variable of interest and that do not get eliminated due to our choice of the estimation strategy. To account for any correlations in errors across villages and year, we compute clustered–robust standard errors at the village-year level.

[Table 4]

We find a similarity in the results from table 4 and table 5, access to microcredit made possible through participation in the program affects both incidence as well as extent of participation in the same manner. While participation leads to significant decline in wage employment, increase in self employment, and an overall increase in labour force participation among participant households compared to the non participants, it seem to affect male and female individuals very differently. Adult men benefit disproportionately from participation in such programs, it significantly increases their activity in off farm self employment activities and reduces their participation in work where they have to work as wage labourers, but we find no effect on their overall LFPR. On the other hand, microfinance significantly increases the LFPR of women, most of which is brought about by significant increases in self employment and non agricultural work. We do not find any sectoral substitution of women labour like that observed in men labour, instead the impact on women’s labour supply is a pure increase rather than a redistribution of labour supply between sectors. It is strange is that male members from the participating households experience significant increases in self employment activities through sectoral reallocation of labour supply, an increase which is significantly higher than their female counterparts, who actually receive the loans¹⁰ from the MFIs. No such significant effect can be found on children’s participation rates irrespective of the gender of the child, i.e. microfinance do not increase incidence in child labour in any of the occupational categories.

[Table 5]

The estimates of the impact of participation that we obtain from the regressions with hours of labour supply as the dependent variable also tell a similar story, though different in certain respects. Microfinance increases labour supplied towards self employment activities, decreases hours dedicated to working as wage labourers and total labour supplied, but there is stark differences across gender and age groups. While both men and women labour supply increase for the participating household, men

¹⁰Palli Karma-Sahayak Foundation (PKSF) till date has lent about US\$ 1534.16 million (at present value) through its 268 Partner Organization (POs) and covers more than 8.23 million borrowers of which more than 91% are women (PKSF Annual Report, 2011). The focus of the MFIs has always been women because of their over-representation among the poorest of the poor and their high repayment rates.

experience a redistribution of labour supply across sectors while women experience an increase in total labour supply from about by increased participation and more hours contributed to market oriented self employment activities. Thus, not only is men's LFPR significantly higher than women measured both in terms of incidence and extent of participation, program participation tends to favour the men of the participating household as their non agricultural sector labour supply increases significantly compared to the women. But there are a few interesting things to note over here: just like the results in table 4, the effect of participation seem to be significantly higher for men than women, moreover, even 7-14 year old children from participant households seem to experience significant increase in LFP in terms of more hours dedicated to non farm activities, which is higher than the boost in women's labour supply in that sector. But access to these loans definitely bring about a decline in hours contributed by the boy child of the household towards wage employment, which is definitely a positive sign as most of the children working in the wage employment sector are employed as bonded labourers without pay trying to pay off the family debt.

[Table 6]

When we use the alternative definition of adult and child labour, few of the results obtained previously changes even though the overall results remain more or less similar. The use of this definition significantly increases the magnitude of all the estimates, but now we lose the significant decline in wage employment among the boys, instead we notice a significant increase in hours worked in self employment activities and total hours worked among the boys of the participating households.

3.2 Propensity Score Matching: As a Robustness Check

To check the robustness of the results estimated in the last subsection using our primary estimation methodology, we control for the selection bias in this model by using an alternative strategy that combines the propensity score matching (PSM) of Rosenbaum and Rubin (1983) to the fixed effects model. As intial treatment status may be non-random we first estimate propensity scores for each individual using a standard logit model that regresses the participation status as of the first round of survey on a set of household and village level observable characteristics, thereafter matching the individuals based on these propensity scores, thereby taking care of the dimensionality problem. To estimate the propensity score for each and every household we control for a wide range of household

and village level characteristics that influence the decision of the household as a whole to participate or not participate in the program. It may be that households with no or little land, more supportive of women's role in the family or with lower opportunity cost of time spent towards the program measured in terms of average wages may be more likely to participate in the program. (see the appendix for a discussion of the variables that affect the propensity score matching).

If participation in a credit program was truly random, we could have easily calculated the average treatment effect by comparing the outcome variable of the treated group with that from the control group but given that the decision to participate is endogenous we tend to overcome the selection bias by applying this propensity score matching technique. By matching the treated and control groups based on propensity scores calculated from household and village level observable characteristics which are independent from the participation status, this method ensures that the outcome variable is independent of the treatment status conditional on a set of observable characteristics like land holding and a vector of other relevant covariates. In addition, as we restrict our attention to observations that lie within the common support or overlapping region following Caliendo and Kopeinig (2008), both the conditional independence assumption (CIA) as well as the overlapping conditions are satisfied and so we can obtain unbiased estimates of the treatment effect .

[Table 7]

Even though the PSM estimators of ATET may vary with the technique used and the choice of the neighbourhood chosen, we choose to use the nearest neighbour (NN) matching¹¹ estimator over here. In this method the outcome of each treated individual is matched with the average outcome of individuals from the control group that is in close proximity to it in terms of propensity score to compute the treatment effect. The propensity score matched results presented in table 7 is very similar to the results from table 5 but now we observe that disproportionate increase in labour market participation among adult men and a decline in hours worked in household based farm and non farm activities (though not significant) has pushed the children to working an increasing number of hours in household based activities. Then in table 8 we use the balancing tests to check whether the distribution of the set of covariates used in PSM is the same for both the treatment and comparison groups at every value of the propensity score (Becker and Ichino, 2002). The results for the balanced test is provided

¹¹We present the results from the NN matching method over here as it is the most straightforward, the easiest estimator to implement and above all provides the best results for the balanced test of all the methods available. Moreover, we chose to use 5 neighbours in our analysis.

in the appendix: both the t-test for equality of means for the treated and non-treated groups as well as the standardized bias test suggest that it is well balanced. The t -test suggest that the difference between the two group is non-significant and bias before and after matching (Rosenbaum and Rubin, 1985) is less than 5% for each and every variable of interest.

[Table 8]

4 Discussion of the Results

In this section of the paper we present the results obtained by using the estimation methodologies discussed in the last section in detail. We assess the impact of participation in microcredit programs on all four aspects of labour supply:

4.1 Intrahousehold and Intersectoral Distribution of Labour Supply

As decisions are usually made at the household level, we consider participation status at the household level as the unit of study and then discuss the role that provision of microcredit made possible through the MFIs play in the intra household decision making and how roles and activities are allocated to each and every individual from within the household's portfolio of activities.

There are two alternative paths (Pitt et al., 2006) which could eventually affect women's participation or gender reallocation at the household level: through empowerment effect either directly or indirectly (Johnson and Rogaly, 1997; Simanowitz and Walker, 2002; Hashemi et al. 1996) which could increase their participation in market based activities by increasing their bargaining power in the household brought about by their increased control over the loan amount. The second mechanism emphasizes on the substitutability of female and male labour at the household level which depends on the relative importance of income effects (Maloney, 1987; Prieto and Rodriguez, 2000) and substitution effects (Ashenfelter, 1980; Lundberg, 1985; Maloney, 1987) brought about by increasing the opportunity cost of working in the agricultural sector in terms of forgone income.

The role of secondary earners from credit constrained families trying to smooth household income and consumption in times of adverse shocks (Mincer, 1962; Lundberg, 1985; Cullen and Gruberg, 1996; Finegan and Margo, 1994; Garcia-Escribano, 2003; Malapit et. al., 2006; Serneels, 2002 and Kochar, 1999) have been studied in much detail but how does the household adjust to access to microcredit

provided by the financial institution? This is a question that we address in this subsection. While a number of papers have focussed on changes in female labour supply in response to temporary shocks, other papers like Serneels, 2002 and Kochar, 1999 focus on the role that other family members (like children) play in smoothing (Jacoby and Skoufias, 1997; Dehejia and Gatti, 2002). It is important that we stress over here that our focus is not only on participation of men or women but also of children in the labour market when offered with an opportunity for employment in the non agricultural sector.

A strong inverse relationship exist between household income and women's labour force participation in countries like India, Pakistan and Bangladesh; which is more relevant among married women (Azid et. al. 2001 for Pakistan; Ofer and Vinokur, 1983; Polachek and Robst, 1997). Using the 1992 Household Survey of Bangladesh, Amin (1994) found that female labour force participation is inversely related with income and is more prevalent in societies where gender norms of respect curtails women labour force participation or glorify the "purdah". An increase in access to microcredit has a positive impact on household income and so results in only limited increase in women's participation in the non agricultural self employment sector, thereby indirectly reinforcing their traditional roles in the society. Increasing participation of women in household based agricultural work in the developing countries is of particular interest and a matter of great concern as it is usually unpaid or relatively low paid (UNIFEM, 2005). The question that we will be answering in this subsection is whether access to institutional capital reinforces women's traditional roles or promotes gender equality within the household?

[Table 9]

Microcredit facilitates women's access to micro loans but from table 9 it is quite evident that even these availability is unable to reduce the share of household based activities, and paid employment in women's total labour supply. While we observe substitution between sectors for men to a large extent, there is little evidence of any substitution between sectors for women. There is no radical change in the traditional division of labour along gender, instead women are not active in traditional roles like crop processing, poultry raising (Kabeer, 2001), etc but also increasing their participation in off farm activities, which puts a lot of burden on their shoulders as they also have to fulfill their other household duties in addition to these income generating activities ¹². Women therefore involve

¹²Apart from the income generating household based activities mentioned over here, women in developing countries like Bangladesh are also heavily involved in three other roles like reproductive role, productive role and community managing role. For more information, see the definitions of Moser, C., at the website: <http://www.ilo.org/public/english/region/asro/mdtmanila/training/unit1/groles.htm>

themselves in multiple activities simultaneously while men tend to specialize in self employment activities. This is a puzzle that we attempt to address over here: the loan is provided to the women by the MFIs then why is it that the effect is significantly higher for male members from the participating household?

4.2 Seasonal changes in Labour Supply

The rural economy has become increasingly diversified over the years with the growth of off farm activities but agriculture still remains the primary occupation of the population affecting the lives of about 65 percent of the population in Bangladesh (World Bank, 2008; Yu et al., 2010). Rice is the most important crop of Bangladesh and covered about 80% of the total cropped area as of 2008-09. While Aman occupied about 48.74% of the total rice cultivated land, 9.45% and 41.81% of the land was occupied by Aus and Boro respectively. After rice, wheat was the second most important crop in Bangladesh grown on 2.74% of the total cropped area (BBS, 2010).

Even though the rice crop calendar varies slightly across the country depending on physiography and land type of the region, and there is also an overlapping of the seasons to some extent, the cropping pattern can be seen to have a substantial effect on the seasonal effects of labour supply both at the household and individual level. The seasonal distribution of labour supply in rural Bangladesh is mostly driven by the three major rice seasons¹³: aus, aman, and boro, which in itself is largely organized around the local rainfall variability (BRRI, 1999). Aman is the most important rice in Bangladesh, planted in April-May, harvested in November-December and is completely rainfed. Aus on the other hand is the second most important rice crop sown in April-May and harvested in July-August, requiring supplementary irrigation in the initial stages even though its is primarily rainfed compared to the completely irrigated (Mahmood, 1997) Boro rice which gets planted during December-February and reaped during April-May (MacLean et al., 2002). Wheat on the other hand is cultivated only as a winter crop in the months of Nov-Dec and harvested during March to mid April. Thus, while season 1 can be referred to as the Aman cropping season based on and around the time of harvesting, season 3 and 5 will be the Aus and Boro season respectively. As Boro rice is grown during the dry season and is mainly dependent on irrigation, agricultural labour demand is significantly higher during

¹³The calendar months are not uniformly distributed across the five seasons but as our objective is to assess the impact of participation in microcredit institutions on seasonality of labour supply and the sorting of months into seasons are symmetrical across both the treated and control groups the results of the analysis do not seem to be biased. It is important to note that this is not a study of seasonality in labour supply but an analysis of difference in seasonal variation across the groups.

season 3 and 5 compared to the Aman crop of season 1 which is primarily rainfed and the partly irrigated Aus rice cultivated during season 3.

Demand for agricultural labour varies widely across seasons¹⁴, affecting the lives of the millions of rural households who rely on employment opportunities in the agricultural sector for their livelihoods (Muqtada, 1975; Hossain, 1990). Poverty and food deprivation is thus most severe during the lean seasons of the year in March-April (fourth season) and September to November (the second season of every round), right after the Boro and Aman crops are planted. This annual phenomenon of seasonal hunger driven by the strong seasonality of crop production is often referred to as “monga” or “mora kartik” meaning “the season of death” and is relatively widespread in the northwest region of the country. From figure 5 we can clearly identify the two lean seasons in the household based farm and non farm labour supply. In addition to that, while we are able to see an increasing trend in the non agricultural self employment sector, labour supply in self and wage employment sectors seem to comove closely with the household based activities.

[Figure 5]

[Table 10]

Two questions are worth considering over here: does households have seasonal variations in off farm activities that counteract the agricultural seasonal variations faced by them in the farms and is there any significant seasonal differences between participant and non participant households across both genders and occupation choices.

$$L_{ijt} = \alpha_i + \beta_1 X_{ijt} + \beta_2 H_{ijt} + \gamma D_{it} + \theta S_j + \phi(S_j \times D_{it}) + \lambda \tau_t + \vartheta(S_j \times \tau_t) + \varepsilon_{ijt} \quad (2)$$

Our specification in equation 2 not only captures the seasonal variation inherent in labour supply due to the seasonality in agricultural productivity but also studies the seasonality in labour supply brought by the participation of the household in the microcredit programs. If labour supply varies across seasons, then θ will be significantly different from zero and the interaction term between the treatment status and the seasonal dummy will then capture the excess seasonality that participation in microcredit program bring to variations in labour supply, captured by the sign of the interaction term ϕ . This gives an estimate of the potential effects of microcredit on seasonality in labour supply.

¹⁴Even though there are other sources of seasonality in rural Bangladesh that may result in the seasonal pattern visible in income, consumption and labour supply, the weather induced cropping pattern among the rural farming households seems to be the most important (Clay, 1981).

[Table 11]

Econometric estimates not only reject the hypothesis of overall labour supply smoothing in favour of presence of significant seasonal effects but also find evidence that labour supply in each of the different occupation choices tend to comove with each other. So, we can say that seasonality in non farm self employment is not countercyclical to seasonality to household based farm and non farm activities. Group based credit provided by the program help participants finance off farm productive activities which do not seasonally covary with the weather induced seasonality in agricultural production, thereby smoothing not only household level labour supply across seasons but also insuring them against significant declines in income and consumption during the lean season (Pitt and Khandker, 2002) but still we find no evidence of such smoothing. Program participation significantly increases seasonality in self employment and non agricultural work, thereby making it procyclical instead of countercyclical and to some extent in household based farm and non farm activities, therefore leading to seasonality in total labour supply. There is also large gender differences in the seasonality of labour supply. Seasonality effect is significantly more for men individuals from the participating households compared to women employed in non agricultural self employment activities. Moreover, we can find seasonality among women from participating households employed in household based activities, while no such effect is visible for the men from the similar households.

With access to microcredit provided by MFIs rural households who were initially susceptible to seasonality in the agricultural sector can attain stability in income and consumption by engaging in off-farm income-generating activities. However, sometimes farmers in rural Bangladesh can also attempt to smooth household income by adopting High Yielding Varieties (HYVs) crops which they were unable to use earlier due to the lack of adequate credit (Government of Bangladesh 1999). These small loans offer the farmers the opportunities to buy land, use improved seeds, fertiliser and irrigation facilities, etc., which can significantly increase their productivity and reduce their dependence of seasonal factors. As productive work for women mostly comprises of crop processing concentrated during the post harvest period, increased productivity result in increases in the demand for agricultural labour, thereby leading to excessive seasonality in household based farm and non farm activities as well.

4.2.1 The Microfinance Puzzle: Where are the opportunities?

Access to microcredit provide households numerous opportunities for occupational diversification by inducing members to foray into nonfarm activities by relaxing the binding credit constraints¹⁵ which may have restricted intersectoral mobility in the absence of well functioning land and credit markets or initial assets which could be put down as collateral (Bardhan and Udry, 1999; Hoff and Stiglitz, 1990; Skoufias and Quisumbing, 2002). This behaviour may be considered a risk mitigation strategy developed to cope with variability in seasonal rainfall and demand for agricultural labour. Rural households with program participation are thus more likely to be self employed in non-farm activities which protect them against uninsured risks in the agricultural sector (Reardon et al., 2006; Ellis, 2004) instead we find no evidence of labour supply smoothing among participating households, instead microcredit significantly increased their labour supply seasonality. The results also show that the degree of occupational mobility is comparatively lower among women who actually receive the loans compared to their male counterparts. So, what is holding them back: Is it traditions, social norms, lack of control over the borrowed loan or lack of appropriate opportunities in the self employment sector for women?

While the role of social capital and peer monitoring in these group based programs ensure that time and funds are allocated specifically for the purpose stated in the application, the funds may be used by individuals other than those that these programmes specifically target. Women belonging to the rural households in Bangladesh are trapped in historically specified roles in the society which confine them to the private sphere, because of the strong ideology of purdah or other social norms and attitudes towards women's mobility. Sometimes they are held back by their responsibilities towards their families which involve non-income earning, quasi productive activities like cooking, cleaning, fetching water, child care, etc or due to lack of sufficient opportunities¹⁶ in the male dominated self employment sector that allow them to take care of the essential household based activities which involves long hours and is mostly unpaid as well as being active in the market oriented activities at the same time. Thus, even though these loans are intended to contribute to women's empowerment through participation in non agricultural activities, inter-sectoral mobility among women remain very limited and women may relinquish their control and it may be actually the male members of the household who actually decide

¹⁵Farmers may have limited information, less income, lack of access to credit, high transaction costs, and weak networks.

¹⁶There is a lot of stereotyping in the developing country labour markets, including in Bangladesh which is being relaxed with time but men and women still follow their specific gender roles to a large extent in order to be socially accepted. There are many activities under the "self employment" occupation choice which are not considered suitable for women, like mason, boatman, blacksmith, cobbler, rickshaw or van driver, car driver, etc.

the fate of the loans borrowed by the women (Goetz and Sen Gupta, 1996) and also use it¹⁷.

Quite contrary to popular belief we find that credit programs result in women diversifying into both activities while men tend to specialize in non farm self employment activities. However we do not agree that microcredit programs do not result in greater role in household decision making, lead to better household level outcomes or increase women's freedom of mobility, we only argue that access to credit may be unable to break free from the culturally defined gender roles specified for the households (Hashemi, Schuler, and Riley, 1996; Piit and Khandker, 1998; Pitt et al, 1999; Pitt, 2000; Pitt et al., 2003; Pitt et al., 2006).

Another explanation could be that uncertainty about future prospects in the new self employment activities prevent the households from completely leaving the household based and wage employment opportunities in the rural sector, therefore the women may diversify their portfolio of occupations to absorb any unforeseen shocks while men specialize in the other more productive activities.

4.3 Length of Membership and Labour Supply

In this subsection of the paper we sort the different groups of treated households into five broad sub-categories based on the same definitions used by Islam (2011) which uses their date of joining and leaving the program to measure the impact of length of participation on the outcome variable-labour supply. To begin with we have the

i) Continuing participants: these are the households who have been regular clients of the MCI during all the four rounds of surveys conducted between 1997 and 2005.

Out of the 1592 households that were clients of the MCIs at one point or the other, 47.2% were regular clients while 9% were newcomers¹, 5% newcomers² while 11.3% and 11% were leavers¹ and leavers² respectively. We estimate the effect of participation for each of the groups by comparing them with the benchmark group: the non-participants, those households that never participated in any of the microcredit program and include all ineligible households, eligible¹⁸ but non-participant households in the control villages and eligible households in the program village that chose not to participate.

¹⁷Most of the activities that women are involved in are often too small to absorb the amount of loans borrowed from the MFIs (Goetz and Gupta, 1996; Kabeer, 2001) and women may have to substitute some of their housework with self employment activities, if they have to use it themselves. Thus, it seems easier for the household to specialize along gender specific roles where most of the self employment activities are actually carried out by the primary bread earners of the family and the target group of the MFIs play a secondary role, engaging in self employment activities which can be undertaken mostly from home in conjunction with their household chores and moreover results in increased in household income.

¹⁸Eligibility is based on the possession of less than 50 decimals of land or equivalent.

The households which have not been regular participants of the program can be identified as the occasional clients of the MCI and are further classified into new participants, participants who were not members during the first round but joined later and into dropouts, who were regular clients as of 1997 but dropped out later to become occasional participants. We consider two groups of new participants: newcomers1 and newcomers2 and two groups of dropouts: leavers1 and leavers2 in addition to the regular participants to assess the impact of the duration and time of participation in the program on the household's labour supply.

ii) Newcomers1: households that were not clients of the MCIs as of 1997 but joined it after 1999.

iii) Newcomers2: these are the more recent participants of the MCIs, having joined them as late as after 2001.

iv) Leavers1: are the households who were clients as of 1997 but dropped out after 1998, and never participated in any other MCI again.

v) Leavers2: these are the most recent dropouts who participated until 2001 and then decided to drop out of the program.

vi) the rest of the occasional clients of the MCIs who were not classified as newcomers or leavers will be referred to as drifters henceforth.

Based on the following classifications we are able to observe the differences in outcomes between different groups of program participants with special focus on self employment as microcredit programs are particularly tailored to support or enhance such self-employment activities. While duration of participation seem to have no significant effect on household based activities, it definitely increases participation in non agricultural activities for almost all groups that we consider in this study. The results also show that larger involvement (in terms of incidence and intensity) in market oriented activities definitely accrue from long term participation in MFIs, with regular participants benefiting the most in terms of both increase in self employment activities and moving away from being engaged in wage employment. In fact, they also indicate that gains may continue even after the end of participation in a program but that such benefits are likely to be short-lived.

[Table 12]

[Table 13]

5 Summary and Conclusion

The main distinguishing feature of our analysis is that no other writing in the literature to the best of our knowledge has made an attempt to systematically measure the impact of micro loans on household labour supply. Particular focus on seasonal variations in all forms of labour supply enabled through such a detailed and extensive dataset is also a new contribution of this study. While previous research has focussed on the “added worker effect” that women and children of the households have on the household income when faced with an exogenous weather (Lim, 2000), income or other adverse shocks, the opposite has not been discussed so far in the literature. The credit provided by the program relaxes the constraints faced by the poor rural households allowing them to substitute nonagricultural for agricultural activities. We find that rural households in Bangladesh with access to institutional credit were more likely to diversify into off farm activities in an attempt to self insure themselves against seasonal variations in agriculture but they also play a significant role in the distribution of occupations across genders at the household level.

Even after access to capital, participant households maintained a diverse occupational portfolio comprising of both on and off farm activities both in terms of incidence and intensity made possible through a redistribution or reallocation of household level labour supply. Households were unwilling to give up their culturally inherited occupations and showed only limited inter-generational mobility away from agriculture. Compared to male members of the participating households, females showed even less mobility thereby using microcredit to top up their already existing occupational choices with some more off farm self employment activities.

The results suggest that participation in microcredit program is relaxing the liquidity constraints thereby helping rural households to foray into market oriented off farm labour market. They structurally change their income generating activities and change the distribution of labour within the household but males and females from the rural households in Bangladesh react very differently to access to microcredit made available through the MFIs. Because of the presence of socio cultural barriers to women’s participation in the labor market or biased preferences in favour of male labour, women may be unable to maintain control over their resources leading to disproportionate changes in male to female off farm labour supply at the household level.

Limited mobility away from agriculture in such a traditional society could be either because of lack of appropriate knowledge, opportunities or faith to completely specialize in the new occupation by giving up their occupational inheritance. As discussed earlier we do not dispute the positive accom-

plishments of microfinance in this paper, instead we make an effort to understand its impacts on labour market participation and suggest that better results from participation in these microcredit programs we need to ensure that women do maintain some control over their borrowed resources through improved bargaining power. Lack of control over the resources either directly or indirectly have failed to translate the credit into market based activities by breaking the strong sociocultural constraints that restrict women's engagement in the off farm labour market.

References

- [1] Amin, S. (1994). The Poverty-Purdah Trap in Rural Bangladesh. Women. Poverty and Demographic Change, Oaxaca, Mexico, October.
- [2] Ashenfelter, O. [1980] “Unemployment as disequilibrium in a model of aggregate labor supply”, *Econometrica* 48(3): 547-564.
- [3] Azid, T., M. Aslam and M. Omer (2001) “Poverty, Female Labor Force Participation, and Cottage Industry: A Case Study of Cloth Embroidery in Rural Multan.” *Pakistan Development Review* 40(4): 1105-18.
- [4] Bangladesh Institute of Development Studies (1990), “Evaluation of Poverty Alleviation Programmes in Bangladesh”, Mimeo, BIDS, Dhaka.
- [5] Bardhan, P., and C. Udry. *Development Economics*. Oxford: Oxford University Press, 1999. BBS (Bangladesh Bureau of Statistics), 2010. *Statistical Yearbook of Bangladesh*, Government of Bangladesh, Dhaka.
- [6] BBS (Bangladesh Bureau of Statistics). 2008. Bangladesh Bureau of Statistics Agriculture Wing [online]. In: <http://www.bbs.gov.bd>
- [7] Becker, S. and A. Ichino. (2002). “Estimation of Average Treatment Effects Based on Propensity Scores.” *Stata Journal*, 2(4), pp. 358-377
- [8] Beegle, Kathleen., Calogero Carletto, Kristen Himelein., [2012]. “Reliability of recall in agricultural data”, *Journal of Development Economics*, Volume 98, Issue 1, Pages 34–41.
- [9] BRRI (Bangladesh Rice Research Institute), 1991. *Rice Yield and Environmental Data*. BRRI, Dhaka, Bangladesh.
- [10] Caliendo, M. and S. Kopeinig. 2008. ‘Some Practical Guidance for the Implementation of Propensity Score Matching’, *Journal of Economic Surveys*, 22 (1): 31–72.
- [11] Clay, Edward, 1981, ‘Seasonal Patterns of Agricultural Employment in Bangladesh’, in Chambers, Longhurst and Pacey [1981].
- [12] Cullen, J. B. and J. Gruber [1996] “Spousal labor supply as insurance: does unemployment insurance crowd out the added worker effect?” NBER Working Paper No. 5608.

- [13] Dehejia, R. and R. Gatti [2002] “Child labor: the role of income variability and access to credit across countries”, NBER Working Paper No. 9018.
- [14] Ellis, Frank. 2004. “Occupational Diversification in Developing Countries and the Implications for Agricultural Policy” Programme of Advisory and Support Services to DFID (PASS).
- [15] Finegan, T. and R. Margo [1994] “Work relief and the labor force participation of married women in 1940”, *The Journal of Economic History* 54(1): 64-84.
- [16] García-Escribano, M. [2003] “Does spousal labor smooth fluctuations in husband’s earnings? The role of liquidity constraints”, Ph.D. diss., University of Chicago.
- [17] Gibbs, M., Linder, R.K., Fischer, A.J., [1986]. “Reliability of two survey techniques: A study of innovation discovery by farmers”. *The Statistician* 35, 429–439.
- [18] Goetz, A., and R. Rina Sengupta. 1996. “Who Takes the Credit? Gender, Power, and Control Over Loan Use in Rural Credit Programs in Bangladesh.” *World Development* 24, no. 1:45–63.
- [19] Government of Bangladesh. 1999. National Agriculture Policy. Dhaka: Ministry of Agriculture, Government of the People’s Republic of Bangladesh.
- [20] Hashemi, S., Sidney R. Schuler, and Ann P. Riley. 1996. “Rural Credit Programs and Women’s Empowerment in Bangladesh.” *World Development* 24, no. 4:635–53.
- [21] Hoff, K., and J. E. Stiglitz. "Imperfect information and rural credit markets – puzzles and policy perspectives." *World Bank Economic Review* 4(1990): 235-50.
- [22] Hossain, Akhtar, 1990, ‘Real Wage Determination in Bangladesh Agriculture: An Econometric Investigation’, *Applied Economics*, Vol.22, No.11, pp.1549–65.
- [23] Islam, A., 2011. "Medium- and Long-Term Participation in Microcredit: An Evaluation Using a New Panel Dataset from Bangladesh," *American Journal of Agricultural Economics*, Agricultural and Applied Economics Association, vol. 93(3), pages 843-862.
- [24] Jacoby, H. and E. Skoufias [1997] “Risk, financial markets and human capital in a developing country”, *Review of Economics and Statistics* 64: 311-335.

- [25] Johnson S, and Rogaly B. 1997. *Microfinance and Poverty Reduction*. Oxfam Poverty Guidelines. Oxfam: Oxford.
- [26] Kabeer, N., (2001) “Conflicts Over Credit: Re-Evaluating the Empowerment Potential of Loans to Women in Rural Bangladesh” *World Development* Vol. 29, No. 1, pp. 63-84.
- [27] Kabeer, N. (2005). “The Beijing Platform for Action and the Millennium Development Goals: Different processes, different outcomes”, United Nations Division for the Advancement of Women (DAW).
- [28] Khandker, S. R., Samad, H. A. and Khan, Z. H (1998) “Income and Employment Effects of Micro-credit Programs: Village Level Evidence from Bangladesh”, *The Journal of Development Studies*, Vol. 35, No. 2, pp. 96-124.
- [29] Khandaker, S (1998), “Fighting Poverty with Microcredit: Experience in Bangladesh”, Oxford University Press.
- [30] Khandker, S.R. 2005. ‘Microfinance and Poverty: Evidence Using Panel Data from Bangladesh’, *The World Bank Economic Review*, 19(2): 263–86.
- [31] Kochar, A. [1999] “Smoothing consumption by smoothing income: hours-of-work responses to idiosyncratic agricultural shocks in rural India”, *Review of Economics and Statistics* 81(1): 50-61.
- [32] Lim, J. [2000] “The effects of the East Asian crisis on the employment of women and men: the Philippine case”, *World Development* 28(7): 1285-1306.
- [33] Lundberg, S. [1985] “The added worker effect”, *Journal of Labor Economic* 3(1): 11-37.
- [34] MacLean JL, Dawe DC, Hardy B, Hettel GP, eds. 2002. *Rice Almanac*. 3rd eds, Wallingford, Oxon: CABI Publishing; Manila (Philippines): International Rice Research Institute.
- [35] Mahmood, R., 1997. Impacts of air temperature variations on the Boro rice phenology in Bangladesh: implications for irrigation requirements. *Agric. For. Meteorol.* 84, 233–247.
- [36] Malapit, Hazel. Jean, Redoblado, Jade. Eric., Cabungcal-Dolor, Deanna Margaret and Sumintrado, Jasmin. (2006), “Labor supply responses to adverse shocks under credit constraints : evidence from Bukidnon, Philippines”, PMMA Working Paper, 2006-15.

- [37] Maloney, T. [1991] “Unobserved variables and the elusive added worker effect”, *Economica* 58(230): 173-187.
- [38] Mincer, J. [1962] “Labor force participation of married women: a study of labor supply” in: *Aspects of Labor Economics*. Princeton, N.J.: Princeton University Press.
- [39] Muqtada, M., 1975. ‘The Seed-Fertilizer Technology and Surplus Labour in Bangladesh Agriculture’, *Bangladesh Development Studies*, Vol.3, No.4, pp.403–28.
- [40] Ofer, G. and A. Vinokur (1983) “The Labor Force Participation of Married Women in the Soviet Union: A Household Cross-Section Analysis.” *Journal of Comparative Analysis* 7(2):158-176.
- [41] Pitt, Mark M., S. R. Khandker, and J. Cartwright, 2006: *Empowering Women with MicroFinance: Evidence from Bangladesh*, *Economic Development and Cultural Change*, 791- 831.
- [42] Pitt, Mark M., & S.R. Khandker (2002): *Credit Programmes for the Poor and Seasonality in Rural Bangladesh*, *Journal of Development Studies*, 39:2, 1-24
- [43] Pitt, Mark M. 2000. “The Effect of Nonagricultural Self-Employment Credit on Contractual Relations and Employment in Agriculture: The Case of Microcredit Programs in Bangladesh.” *Bangladesh Development Studies* 26, nos. 2–3:15–48.
- [44] Pitt, Mark M., Shahidur R. Khandker, Signe-Mary McKernan, and M. A. Latif. 1999. “Credit Programs for the Poor and Reproductive Behavior in Low Income Countries: Are the Reported Causal Relationships the Result of Heterogeneity Bias?” *Demography* 33 (February): 1–21.
- [45] Pitt, Mark M., and Shahidur R. Khandker. 1998. “The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of the Participant Matter?” *Journal of Political Economy* 106:958–96.
- [46] Pitt, Mark M., Shahidur Khandker, O. Choudhury, and D. Millimet. 2003. “Credit Programs for the Poor and the Health Status of Children in Rural Bangladesh.” *International Economic Review* 44 (February): 87–118.

- [47] Polachek, S. W. and J. Robst (1997) "Review of Investment in Women's Human Capital." *Journal of Economic Literature* 35(2):1404-1406.
- [48] Prieto-Rodriguez, J. and C. Rodriguez-Gutierrez [2000] "Participation of married women in the labor market and the "added worker effect" in Europe", *iriss Working Paper Series* No. 2000-12.
- [49] Rahman, A et. al. (2002) *Early Impact of Grameen*, Grameen Trust, Dhaka.
- [50] Reardon, T., Julio Berdegué, Christopher B. Barrett, and Kostas Stamoulis [2006]. "Household Income Diversification into Rural Nonfarm Activities" in Steven Haggblade, Peter Hazell and Thomas Reardon, editors, *Transforming the Rural Nonfarm Economy*, Johns Hopkins University Press, Baltimore.
- [51] Rosenbaum, P. R., and Rubin, D. B., (1983), "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70, 41–55.
- [52] Rosenbaum, P. and D. Rubin. (1985). "Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score," *American Statistician*, 3, pp. 33-38.
- [53] Serneels, P. [2002] "The added worker effect and intrahousehold aspects of unemployment", *csae wps/2002-14*.
- [54] Simanowitz, A. and A. Walker, (2002) : "Ensuring impact: reaching the poorest while building financially self-sufficient institutions, and showing improvement in the lives of the poorest women and their families", unpublished background paper for the Microcredit Summit 5, New York, 10-13 November, available at <<http://www.microcreditsummit.org/papers/papers.htm/>>.
- [55] Skoufias, E. and A. R. Quisumbing (2002) "Consumption insurance and vulnerability to poverty: a synthesis of the evidence from Bangladesh, Ethiopia, Mali, Mexico and Russia", Unpublished manuscript.
- [56] UNIFEM. (2005). "Progress of the World's women".
- [57] World Bank (2008). *Poverty Assessment for Bangladesh: Creating Opportunities and Bridging the East-West Divide*. Report No. 44321-BD. Washington DC.

- [58] Yu, W., J. Thurlow, M. Alam, A. Hassan, A. S. Khan, A. Ruane, C. Rosenzweig, 2010
Climate Change Risks and Food Security in Bangladesh. London: EarthScan.
- [59] Zohir, S. et al. (2001), “Monitoring and Evaluation of Microfinance Institutions”,
Bangladesh Institute of Development Studies, August.

6 Appendix

Variables that we use in the Panel Data Approach are:

6.1 Individual and Household Level Variables:

Sex of the Household member, Age of the household member, Member is married, Education level of household members (illiterate, can read only, can sign only, can read and write), Age of household head, Number of working age people in the household, Size of the household, Highest education achieved by a member, Total arable land (in decimals), Number of children aged 6–15, Number of women in the household, Number of old people in the household, Sex of household head, Number of Married people in the household.

Variables that we use in the Propensity Score Matching are:

6.2 Household Level Variables:

Age of household head, Age of Household Head squared, Number of working age people in the household, Size of the household, , Education level of household members (illiterate, can read only, can sign only, can read and write), Member is married, Age of the household member, Sex of the Household member, Highest education achieved by a member, Total arable land (in decimals), Number of children aged 6–15, Number of women in the household, Number of old people in the household, Sex of household head, Number of Married people in the household.

6.3 Village Level Variables:

Presence of primary school, secondary school or college, health facility, madrasah, Adult male and female wage, presence of brickbuilt road, Regular market, Frequent haat, Post office, Bus stand, Telephone office in village, Local government office, Youth organization, Distance to nearest Upazila (in kilometers), Share of landowners in share cropping (in percentage), Number of money lenders in this village, Large farmers/traders, Number of small credit/savings groups in the village, Number of Low Lift Pumps, Shallow Tube Wells, Hand Tube Wells in Irrigation, Hand Tube Wells in drinking water and Deep Tube Wells in the village.

6.4 Classification of work under each occupation category:

6.4.1 Household Based Farm and Non-farm Activities:

Cultivation in field, Crops processing, Cultivation of vegetables and nursery in homestead, Rearing of hens and ducks, Rearing of livestock, Cultivating fish in pond.

6.4.2 Agriculture and Non-Agriculture Wage Employment:

Agriculture farm work (season and contractual labour would be included), Crops processing, Porter/cooly, House repair, Digging earth, Road work, Guards, Cottage Industry labour, Brick breaking, Transport worker run by machine, Other transport labour, Bidi labour, Labour in small industry, Helper/Non-agricultural day labour, etc.

6.4.3 Self Employment and Non-Agricultural work:

Potter, Weaver, Mason, Fisherman, Boatman, Blacksmiths, Cobbler, rickshaw/Van driver, Car Driver, Other small business, Business (mid level/big.), Production oriented small business, Production oriented business (mid level/ big), etc.

Table 1: Summary Statistics for Adult Individuals Participation in Different Occupations (in percentage)

	1997-1998			1999-2000			2004-2005		
	Treat	Control	Diff	Treat	Control	Diff	Treat	Control	Diff
Agricultural labour	65.37	65.29	0.08	72.76	74.21	-1.45	59.95	64.93	-4.98
Male	54.23	56.9	-2.67	57.79	59.69	-1.9	42.55	50.07	-7.52
Female	75.98	72.59	3.39	89.36	89.28	0.08	84.55	85.08	-0.53
Male-Female ratio	0.71	0.78	-0.79	0.65	0.67	-0.02	0.50	0.59	-0.09
Wage labour	18.71	19.31	-0.6	19.09	19.16	-0.07	21.38	22.19	-0.81
Male	32.24	35.86	-3.62	31.27	32.7	-1.43	31.56	34.09	-2.53
Female	5.82	4.89	0.93	5.58	5.12	0.46	6.98	6.04	0.94
Male-Female ratio	5.54	7.33	-1.79	5.60	6.39	-0.78	4.52	5.64	-1.12
Self Employed	25.86	16.16	9.7	28.66	20.03	8.63	29.92	23.38	6.54
Male	42.48	29.85	12.63	44.47	33.91	10.56	45.68	36.46	9.22
Female	10.22	4.24	5.98	11.14	5.61	5.53	7.64	5.65	1.99
Male-Female ratio	4.16	7.04	-2.88	3.99	6.04	-2.05	5.98	6.45	-0.47
Total Labour	87.3	84.49	2.81	93.97	92.91	1.06	94.46	93.17	1.29
Male	94.89	94.72	0.17	94.41	93.42	0.99	95.87	95.23	0.64
Female	80.08	75.59	4.49	93.48	92.37	1.11	92.46	90.38	2.08
Male-Female ratio	1.18	1.25	-0.07	1.010	1.011	-0.001	1.04	1.05	-0.02

Figure 1: Seasonal Variations in Activity Rates in each Sector

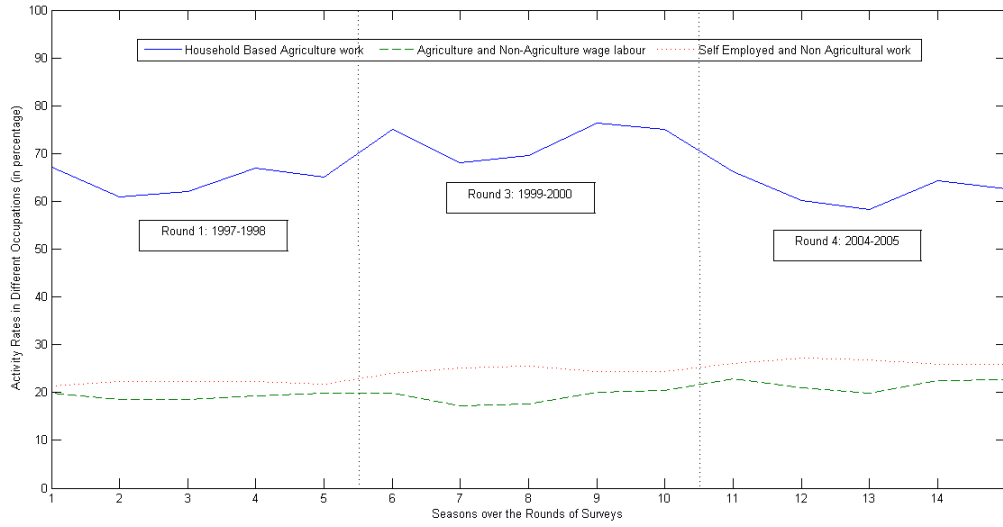


Figure 2: Seasonal Variations in Male to Female Activity Rates in each Sector

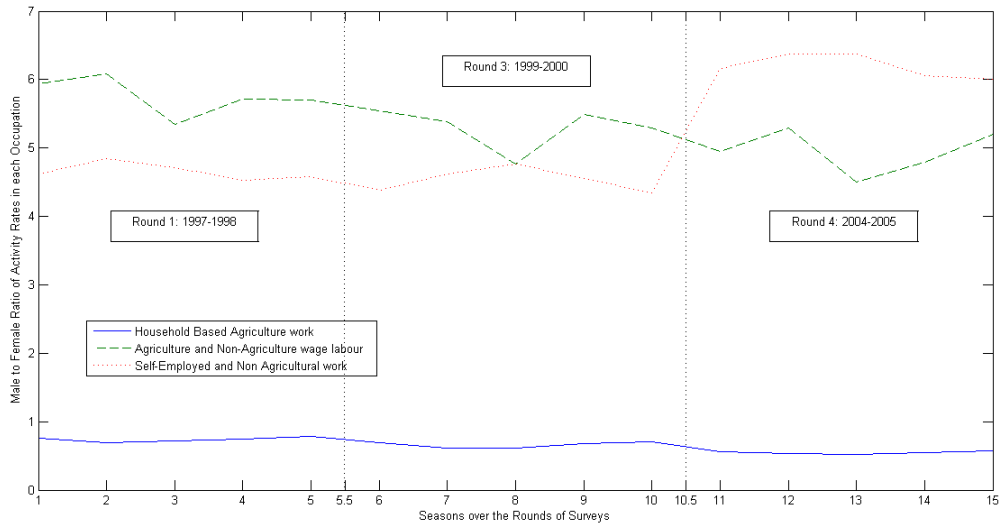


Table 2: Summary Statistics for Labour Supply by Adult Individuals (in hours worked)

	1997-1998			1999-2000			2004-2005		
	Treat	Control	Diff	Treat	Control	Diff	Treat	Control	Diff
Agricultural labour	68.81	74.41	-5.6	43.34	43.36	-0.02	57.89	63.73	-5.84
Male	89.81	105.19	-15.38	53.62	56.63	-3.01	63.18	71.47	-8.29
Female	48.81	47.61	1.2	31.95	29.59	2.36	50.43	53.22	-2.79
Male to Female Ratio	1.84	2.21	-0.37	1.68	1.91	-0.24	1.25	1.34	-0.09
Share in Total Male Labour	0.23	0.28	-0.05	0.16	0.18	-0.02	0.16	0.20	-0.04
Share in Total Female Labour	0.51	0.65	-0.14	0.47	0.54	-0.07	0.57	0.63	-0.07
Wage labour	71.71	76.74	-5.03	62.42	66.19	-3.77	76.04	76.19	-0.15
Male	127.87	147.63	-19.76	107.44	117.17	-9.73	114.98	119.73	-4.75
Female	18.23	15.02	3.21	12.51	13.30	-0.79	20.99	17.14	3.85
Male to Female Ratio	7.01	9.83	-2.81	8.59	8.81	-0.22	5.48	6.99	-1.51
Share in Total Male Labour	0.32	0.39	-0.07	0.32	0.38	-0.06	0.29	0.33	-0.04
Share in Total Female Labour	0.19	0.20	-0.02	0.18	0.24	-0.06	0.24	0.20	0.03
Self Employed	101.35	62.11	39.24	104.86	75.32	29.54	133.42	102.74	30.68
Male	177.01	121.08	55.93	178.15	136.78	41.37	215.20	168.16	47.04
Female	29.31	10.77	18.54	23.64	11.56	12.08	17.81	14.04	3.77
Male to Female Ratio	6.04	11.24	-5.20	7.54	11.83	-4.30	12.08	11.98	0.11
Share in Total Male Labour	0.45	0.32	0.12	0.53	0.44	0.08	0.55	0.47	0.08
Share in Total Female Labour	0.30	0.15	0.16	0.35	0.21	0.13	0.20	0.17	0.03
Total Labour	241.87	213.25	28.62	210.63	184.88	25.75	267.35	242.66	24.69
Male	394.70	373.90	20.80	339.22	310.59	28.63	393.36	359.37	33.99
Female	96.35	73.40	22.95	68.10	54.46	13.64	89.24	84.40	4.84
Male to Female Ratio	4.10	5.09	-1.00	4.98	5.70	-0.72	4.41	4.26	0.15

Footnote: Data over here is measured in terms of hours worked per season in that round of the survey.

Figure 3: Seasonal-Sectoral Distribution of Total Hours worked

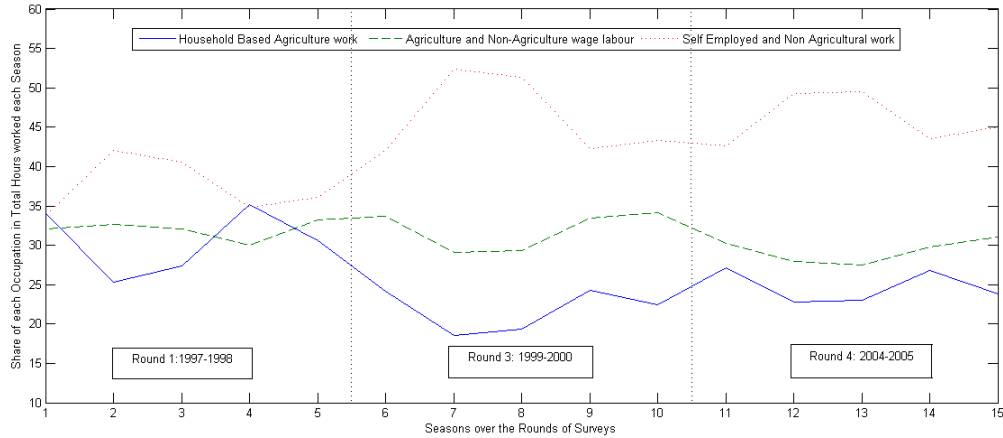


Figure 4: Seasonal Variations in Male to Female labour ratio across sectors

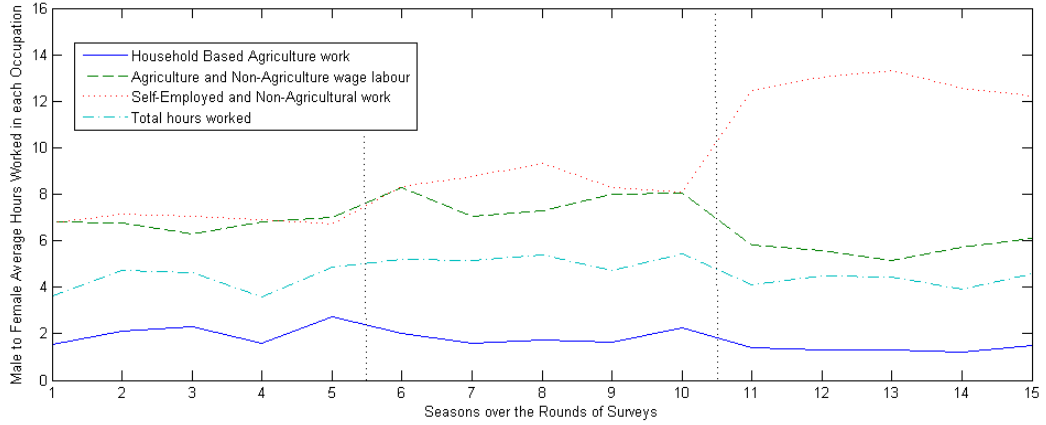


Figure 5: Seasonal Variations in Total Hours worked in each Sector

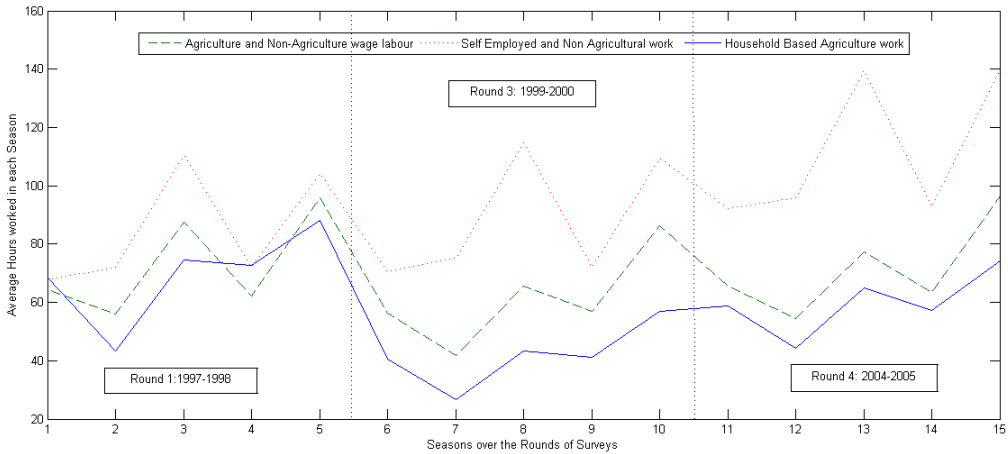


Table 3: Descriptive Statistics of Individual and Household characteristics by Participation Status

Demographic Variables	1997-1998			1999-2000			2004-2005		
	Treatment	Control	Difference	Treatment	Control	Difference	Treatment	Control	Difference
Individual level characteristics									
Individual is Male	0.49	0.46	0.03	0.53	0.51	0.02	0.59	0.58	0.01
Age of the Individual	32.87	32.82	0.05	32.62	32.88	-0.26	34.60	34.23	0.37
Individual is Married	0.758	0.751	0.007	0.734	0.735	-0.001	0.738	0.739	-0.001
Individual is Single	0.209	0.211	-0.002	0.234	0.229	0.005	0.231	0.234	-0.003
Individual is Illiterate	0.22	0.38	-0.16	0.22	0.29	-0.07	0.19	0.25	-0.06
Individual can sign only	0.40	0.20	0.20	0.36	0.23	0.13	0.34	0.24	0.10
Individual can read only	0.01	0.01	0.006	0.02	0.01	0.003	0.01	0.01	0.001
Individual can read and write	0.37	0.41	-0.04	0.40	0.47	-0.07	0.46	0.50	-0.04
Household level characteristics									
Age of the head	44.02	44.98	-0.96	46.22	47.07	-0.85	47.66	47.17	0.49
No. of working people	2.80	2.82	-0.02	2.99	3.09	-0.10	3.68	3.66	0.02
Household size	5.72	5.52	0.20	6.11	6.09	0.02	7.30	7.33	-0.03
Max education by any member	5.29	5.76	-0.47	5.91	6.62	-0.71	7.05	7.50	-0.45
No. of children	2.93	2.70	0.23	2.33	2.15	0.18	3.02	3.03	-0.01
No. of women	2.73	2.57	0.16	2.99	2.90	0.09	3.35	3.26	0.09
No. of old peoples	0.21	0.29	-0.08	0.34	0.41	-0.07	0.28	0.30	-0.02
If women is head	0.04	0.06	-0.02	0.05	0.06	-0.01	0.09	0.11	-0.02
No. of Married people	2.40	2.37	0.03	2.72	2.69	0.03	3.25	3.19	0.06
Area of arable land	57.80	83.08	-25.28	65.38	102.35	-36.97	55.42	92.90	-37.48

Notes: The table gives the summary statistics of the individual and household level characteristics. The reported p-values are from the two-tailed test with the null hypothesis that the group means are equal.

Table 4: Regression Estimates of Participation in Different Occupations at the Individual Level

Regression Adjusted Estimates of	(Estimation based on full set of covariates)			
	Household Based Farm and Non Farm Activities	Agriculture and Non Agriculture Wage Employment	Self Employment and Non-Agricultural Work	Total Individual Level Labour Supply
All Sample	-0.00594 (0.00717)	-0.0223*** (0.00643)	0.0668*** (0.00829)	0.0136*** (0.00391)
Adult Men and Women	-0.00665 (0.00712)	-0.0215*** (0.00658)	0.0683*** (0.00808)	0.0135*** (0.00385)
Adult Men	-0.0181 (0.0113)	-0.0495*** (0.00980)	0.0934*** (0.0115)	0.00432 (0.00362)
Adult Women	0.0102 (0.00772)	0.00304 (0.00622)	0.0434*** (0.00868)	0.0244*** (0.00694)
Child Labour	0.00106 (0.0343)	-0.0325 (0.0290)	0.0383 (0.0309)	0.0163 (0.0186)
Boy Child	0.0173 (0.0473)	-0.0547 (0.0405)	0.0553 (0.0417)	0.0337 (0.0252)
Girl Child	-0.0364 (0.0409)	0.0297 (0.0326)	-0.00326 (0.0397)	-0.0190 (0.0256)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression Estimates of the Impact of Participation in Microfinance

Regression Adjusted Estimates of	(Estimation based on full set of covariates)			
	Dependent Variable: Hours of Labour Supply at the Individual Level			
	Household Based Farm and Non Farm Activities	Agriculture and Non Agriculture Wage Employment	Self Employment and Non-Agricultural Work	Total Individual Level Labour Supply
All Sample	-0.810 (1.784)	-9.584*** (2.750)	25.97*** (3.352)	15.58*** (3.197)
Adult Men and Women	-1.117 (1.813)	-9.163*** (2.808)	26.50*** (3.410)	16.22*** (3.247)
Adult Men	-2.849 (2.699)	-20.56*** (4.528)	41.71*** (5.640)	18.30*** (4.880)
Adult Women	1.639 (1.430)	0.545 (2.090)	10.54*** (2.307)	12.73*** (3.064)
Child Labour	4.790 (3.945)	-13.39 (9.779)	16.91* (8.794)	8.314 (10.82)
Boy Child	6.422 (6.214)	-26.02* (14.91)	22.04 (14.60)	2.442 (16.40)
Girl Child	2.618 (2.263)	16.20 (12.68)	3.065 (6.909)	21.88 (13.89)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: Regression Estimates of the Impact of Participation in Microfinance (Robustness check with alternative definition for adult and child labour)

Regression Adjusted Estimates of	(Estimation based on full set of covariates)			
	Dependent Variable: Hours of Labour Supply at the Individual Level			
	Household Based Farm and Non Farm Activities	Agriculture and Non Agriculture Wage Employment	Self Employment and Non-Agricultural Work	Total Individual Level Labour Supply
All Sample	-0.810 (1.784)	-9.584*** (2.750)	25.97*** (3.352)	15.58*** (3.197)
Adult Men and Women	-1.614 (1.810)	-10.11*** (2.890)	28.24*** (3.500)	16.51*** (3.357)
Adult Men	-3.201 (2.719)	-23.23*** (4.734)	45.45*** (6.040)	19.01*** (5.045)
Adult Women	1.053 (1.540)	0.313 (2.253)	11.05*** (2.406)	12.41*** (3.267)
Child Labour	-3.493 (3.016)	2.113 (6.707)	18.54*** (6.544)	17.16** (7.354)
Boy Child	-5.837 (4.644)	0.318 (10.09)	27.65*** (10.24)	22.13** (10.95)
Girl Child	1.419 (1.695)	8.772 (7.078)	2.101 (5.101)	12.29 (7.794)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7: Matching Estimates of the Impact of Participation in Microfinance

Regression Adjusted Estimates of	(Estimation based on full set of covariates)				
	Dependent Variable: Hours of Labour Supply at the Individual Level				
Nearest 5-neighbour matching	Household Based Farm and Non Farm Activities	Agriculture and Non Agriculture Wage Employment	Self Employment and Non-Agricultural Work	Total Individual Level Labour Supply	
All Sample	-0.281 (1.787)	-9.745*** (2.823)	25.78*** (3.315)	15.75*** (3.141)	
Adult Men and Women	-0.632 (1.825)	-9.258*** (2.883)	26.31*** (3.369)	16.42*** (3.193)	
Adult Men	-2.204 (2.703)	-21.14*** (4.654)	41.16*** (5.560)	17.81*** (4.793)	
Adult Women	1.948 (1.450)	0.646 (2.136)	10.55*** (2.319)	13.15*** (3.104)	
Child Labour	6.416* (3.866)	-15.13 (9.967)	15.64* (8.962)	6.928 (11.17)	
Boy Child	8.027 (6.168)	-27.33* (15.21)	19.14 (14.74)	-0.164 (16.85)	
Girl Child	3.372 (2.287)	14.90 (13.18)	3.048 (7.074)	21.31 (14.30)	

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: Results of the Propensity score Matching Balance test

Variable	Individual level				Household level			
	Mean		p-value		Mean		p-value	
	Treated	Control	%bias	p>t	Treated	Control	%bias	p>t
Age of Household Head	43.893	43.785	0.8	0.806	43.888	43.684	1.5	0.64
Age of Household Head squared	2075.5	2067.3	0.6	0.842	2075.8	2055.9	1.5	0.63
Working age people in Household	2.7859	2.7911	-0.4	0.914	2.7821	2.7604	1.5	0.65
Household Size	5.6559	5.7118	-2.4	0.501	5.6481	5.6167	1.4	0.694
Max Education of Household Member	5.2675	5.2162	1.2	0.724	5.2577	5.2159	1	0.772
Total Arable land owned in decimals	55.8	59.148	-2.3	0.39	55.721	59.47	-2.5	0.336
Number of Children in Households	2.9042	2.8893	0.9	0.798	2.8994	2.8755	1.4	0.684
Number of Women in Households	2.6855	2.7284	-3.1	0.405	2.6827	2.6745	0.6	0.869
Number of Old people in Households	0.20836	0.2117	-0.7	0.837	0.20897	0.20615	0.6	0.861
Women is Household Head	0.04502	0.04463	0.2	0.959	0.04615	0.04333	1.2	0.703
Number of Married people in household	2.3781	2.4132	-3.2	0.387	2.3763	2.3777	-0.1	0.971
Health facility in village	0.17621	0.15859	4.7	0.188	0.17564	0.16	4.1	0.243
Madrasha in village	0.89775	0.89672	0.3	0.925	0.89744	0.89859	-0.4	0.915
Primary school in village	0.85981	0.85093	2.6	0.482	0.86026	0.85679	1	0.782
Secondary school in village	0.33698	0.33942	-0.5	0.886	0.3359	0.34538	-2	0.576
Adult Male wage	56.932	57.041	-0.6	0.866	56.903	56.842	0.3	0.924
Adult Female wage	32.636	32.891	-2	0.573	32.641	32.798	-1.2	0.728
Presence of Pucca Road in village	0.34791	0.34071	1.5	0.673	0.34808	0.35282	-1	0.781
Presence of grocery market in village	0.23087	0.23203	-0.3	0.939	0.23077	0.22808	0.6	0.858
Presence of frequent haat (big market)	0.32283	0.34289	-4.3	0.235	0.32244	0.34231	-4.2	0.239
Presence of bus stand in village	0.15048	0.14341	2	0.578	0.15	0.14654	1	0.786
Presence of post office in village	0.19678	0.20051	-0.9	0.794	0.19615	0.19385	0.6	0.871
Presence of telephone office in village	0.06238	0.05273	3.8	0.248	0.06218	0.05359	3.4	0.305
Presence of Union Parishad office	0.13826	0.14238	-1.2	0.741	0.13782	0.14	-0.6	0.86
Youth organization in village	0.15048	0.14341	2	0.578	0.15	0.14654	1	0.786
Distance to nearest Upazila (in kms)	7.1887	7.1129	1.2	0.719	7.1923	7.1321	1	0.777
Share of landowner in share-cropping	47.561	47.554	0.1	0.977	47.569	47.558	0.2	0.964
Number of moneylenders in this village	8.0206	8.1174	-0.9	0.803	7.9968	8.1479	-1.4	0.698
Large farmers/traders in village	3.7846	3.7977	-0.2	0.96	3.7808	3.8442	-0.9	0.807
Small credit/savings groups in village	0.8045	0.76875	2.6	0.476	0.80192	0.80026	0.1	0.974
Number of Low Lift Pump	0.42894	0.33363	3.9	0.221	0.42756	0.34705	3.3	0.299
Number of Shallow Tube Wells	12.744	13.254	-2.7	0.452	12.767	13.571	-4.3	0.243
Number of Hand Tube Wells in Irrigation	2.2945	2.4976	-2.1	0.581	2.2897	2.5187	-2.4	0.531
Number of Hand Tube Wells in drinking water	80.513	81.48	-1.2	0.733	80.616	82.695	-2.6	0.469
Number of Deep Tube Weels	0.28746	0.28592	0.3	0.924	0.28654	0.28782	-0.3	0.937

Table 9: Regression Estimates of Share of Different Occupations at the Individual Level

Regression Adjusted Estimates of	(Estimation based on full set of covariates)		
	Dependent Variable: Share of each occupation in Total Labour Time		
	Household Based Farm and Non Farm Activities	Agriculture and Non Agriculture Wage Employment	Self Employment and Non-Agricultural Work
All Sample	-0.0237*** (0.00806)	-0.0209*** (0.00600)	0.0582*** (0.00747)
Adult Men and Women	-0.0259*** (0.00792)	-0.0200*** (0.00607)	0.0594*** (0.00729)
Adult Men	-0.0327*** (0.00977)	-0.0456*** (0.00905)	0.0825*** (0.0106)
Adult Women	-0.0148 (0.0101)	0.00244 (0.00571)	0.0367*** (0.00771)
Child Labour	0.0157 (0.0364)	-0.0344 (0.0278)	0.0351 (0.0301)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 10: Average Seasonality in Adult Labour Supply in Rural Bangladesh

Variable of Interest	Agrahayan-Poush	Aswin-Kartik	Ashar-Srabon	Baishakh-Joishtha	Magh-Choitra
Household Based Agriculture Work					
Total	57.05	38.56	61.89	58.14	74.3
Male	68.32	46.86	77.19	67.35	98.28
Female	44.72	29.48	45.15	48.07	48.07
Agriculture and Non-Agriculture Wage Labour					
Total	64.37	52.58	80.34	62.96	95.97
Male	109.83	89.37	135.75	107.36	164.15
Female	14.64	12.34	19.75	14.4	21.4
Self Employed and Non Agricultural Work					
Total	79.4	83.63	125.93	81.86	121.99
Male	137.69	145.61	219.58	142.05	211.22
Female	15.66	15.84	23.52	16.03	24.41
Total Labour Supply					
Total	200.81	174.77	268.16	202.96	292.26
Male	315.84	281.85	432.52	316.77	473.65
Female	75.02	57.66	88.42	78.5	93.89

The summary statistics shown over here are the average of that season from all the three rounds of surveys

Table 11: Adult Participants Labour Supply Seasonal Effects in All Occupational choices

Seasonal Effects	Household Based Farm and Non Farm Activities					Agriculture and Non-Agriculture Wage Employment						
	Benchmark Case	All Sample	Male Sample	Female Sample	Benchmark Case	All Sample	Male Sample	Female Sample	Benchmark Case	All Sample	Male Sample	Female Sample
Season 2	-19.04*** (0.958)	-19.93*** (1.153)	-22.54*** (1.441)	-17.08*** (1.361)	-11.82*** (0.835)	-11.90*** (1.002)	-20.77*** (1.814)	-2.238*** (0.497)				
Season 3	5.133*** (0.968)	3.470*** (1.131)	8.847*** (2.131)	-2.382 (1.504)	16.21*** (1.555)	16.04*** (1.944)	26.61*** (3.395)	4.534*** (0.989)				
Season 4	1.057 (1.363)	0.405 (1.563)	-1.662 (1.981)	2.654* (1.573)	-1.350** (0.655)	-1.865** (0.904)	-3.236* (1.654)	-0.372 (0.408)				
Season 5	16.95*** (1.360)	16.27*** (1.720)	29.89*** (2.552)	1.436 (1.714)	31.63*** (1.336)	32.93*** (1.758)	57.66*** (3.035)	6.020*** (0.926)				
Participants*Season 2		1.546 (1.152)	0.883 (1.500)	2.368* (1.391)		0.128 (1.042)	0.516 (1.859)	-0.0331 (0.645)				
Participants*Season 3		2.896** (1.266)	1.230 (2.169)	4.595*** (1.605)		0.302 (1.907)	-0.348 (3.276)	0.703 (1.205)				
Participants*Season 4		1.137 (1.540)	0.810 (1.884)	1.566 (1.790)		0.897 (1.067)	1.504 (1.958)	0.260 (0.620)				
Participants*Season 5		1.196 (1.704)	-0.911 (2.523)	3.132* (1.730)		-2.260 (1.803)	-5.863* (3.156)	1.009 (1.168)				
Self Employment and Non-Agricultural Work												
Season 2	4.023*** (0.673)	3.972*** (0.786)	7.587*** (1.500)	0.0375 (0.258)	-26.84*** (1.402)	-27.86*** (1.660)	-35.73*** (2.537)	-19.28*** (1.514)				
Season 3	45.98*** (1.786)	38.32*** (2.027)	68.71*** (3.699)	5.238*** (0.895)	67.32*** (1.999)	57.82*** (2.302)	104.2*** (4.135)	7.389*** (2.023)				
Season 4	2.146*** (0.656)	1.580** (0.695)	2.931** (1.293)	0.110 (0.401)	1.854 (1.567)	0.120 (1.898)	-1.967 (2.676)	2.391 (1.698)				
Season 5	42.79*** (1.508)	35.68*** (1.848)	63.79*** (3.274)	5.089*** (0.791)	91.37*** (1.887)	84.88*** (2.574)	151.3*** (3.698)	12.54*** (2.246)				
Participants*Season 2		0.0896 (0.938)	0.00731 (1.721)	0.0700 (0.421)		1.763 (1.663)	1.407 (2.608)	2.405 (1.582)				
Participants*Season 3		13.34*** (2.102)	20.56*** (3.781)	4.333*** (1.306)		16.54*** (2.674)	21.44*** (4.585)	9.631*** (2.508)				
Participants*Season 4		0.986 (1.008)	1.502 (1.821)	0.367 (0.548)		3.019 (2.070)	3.816 (2.938)	2.193 (2.016)				
Participants*Season 5		12.38*** (2.060)	16.88*** (3.452)	6.469*** (1.343)		11.31*** (2.586)	10.11*** (3.823)	10.61*** (2.551)				

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 12: Impact of Participation in Microfinance on Newcomers and Leavers Activity Rates

	Regular Participants	Drifters	Newcomer1	Newcomer2	Leavers1	Leavers2
Household Based Farm and Non-Farm Activities						
Whether Participate or not	-0.0104 (0.00949)	0.00121 (0.0111)	-0.00894 (0.0312)	-0.0260 (0.0467)	-0.0202 (0.0286)	0.0166 (0.0146)
Agriculture and Non-Agriculture Wage Employment						
Whether Participate or not	-0.0308*** (0.00858)	-0.00947 (0.00857)	-0.0286 (0.0272)	0.00130 (0.0297)	0.00963 (0.0210)	-0.0169 (0.0122)
Self Employment and Non-Agricultural Work						
Whether Participate or not	0.0930*** (0.00979)	0.0429*** (0.0110)	0.0722** (0.0363)	0.0148 (0.0288)	0.0521* (0.0293)	0.0457*** (0.0156)
Total Individual Level Labour Supply						
Whether Participate or not	0.0202*** (0.00468)	0.00767 (0.00631)	-0.00183 (0.0133)	-0.00555 (0.0251)	0.00950 (0.0153)	0.0215*** (0.00749)
Observations	62,550	52,600	27,245	27,045	30,790	34,595
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Seasonal Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year*Seasonal Effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 13: Impact of Participation in Microfinance on Newcomers and Leavers Labour Supply

	Regular Participants	Drifters	Newcomer1	Newcomer2	Leavers1	Leavers2
Household Based Farm and Non-Farm Activities						
Whether Participate or not	-1.557 (2.381)	-1.907 (2.373)	6.764 (5.161)	3.812 (11.74)	-5.194 (6.921)	-2.900 (3.163)
Agriculture and Non-Agriculture Wage Employment						
Whether Participate or not	-12.52*** (3.664)	-4.740 (3.500)	-12.16 (10.25)	2.178 (12.74)	8.123 (9.195)	-5.831 (5.466)
Self Employment and Non-Agricultural Work						
Whether Participate or not	37.43*** (4.045)	13.83*** (4.814)	14.40 (12.96)	1.552 (13.70)	17.39 (12.94)	14.42** (6.373)
Total Individual Level Labour Supply						
Whether Participate or not	23.35*** (3.981)	7.182 (4.619)	9.009 (11.27)	7.541 (19.00)	20.32* (10.77)	5.685 (6.802)
Observations	62,550	52,600	27,245	27,045	30,790	34,595
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Seasonal Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year*Seasonal Effect	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

