# Declining Benefits to Membership in Micro Finance Programs: Theory and Empirical Evidence

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**Abstract**

This paper studies the benefits of participation in micro finance programs, and shows that although membership in these programs is an effective instrument in combating inter-seasonal consumption differences, there is a threshhold level of length of participation beyond which benefits begin to diminish. Returns from membership are modeled using an Euler equation approach. Fixed effects non-linear least squares estimation of parameters using data from twenty four villages of the Grameen Bank suggests that the maximum effect of participation occurs after three and a half to four years of membership. These estimates suggest that after seven to eight years of participation, membership no longer has a mitigating marginal effect on seasonal shocks to per capita consumption. Such non-linearities may underlie anecdotal evidence indicating that as compared to those who have recently joined, experienced participants are more likely to miss installment payments on outstanding loans.

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# 1 Introduction

Micro credit programs such as the Grameen Bank's in Bangladesh have innovatively tackled a major problem associated with poverty alleviation in less developed countries. In these countries, vast sections of the population are caught in a "poverty trap" because their lack of collateralizable assets precludes them from using formal credit mechanisms, which, in turn, ensures continued poverty. By targeting credit to those who have no collateral, and by utilizing innovative schemes to deliver that credit, micro finance has proven to be a means of deliverance (see Appendix for a description of these programs).

Despite the vast amounts of research on micro finance organizations, few studies have attempted to evaluate the long-run benefits of participation, or sought to understand how behavior of participants evolves over time. Although development programs provide aid in the immediate short run, their main objective is to ensure that benefits are self-sustaining, and that the participants are able to stand on their own in the future. Programs such as the Grameen Bank meet these objectives more effectively than others in two ways. First, the interest charged on loans is at market rates, and thus local banks have a chance to become self-reliant within a couple of years of operation. Second, Grameen teaches its members how to administer their resources more effectively, and how to obtain and manage working capital. By doing so, micro finance programs assist the poor in achieving the objectives of consumption smoothing and asset accumulation. Since loans are stipulated for use in non-agricultural self-employment activities, participating households are better able to smooth seasonal shocks to consumption. Additionally, through forced savings, these programs increase the assets of poor households.

The hypothesis in this paper is that experienced members are better able to withstand seasonal shocks to household per capita consumption. This enhanced ability to buffer consumption against shocks captures the household's long run capacity to survive independently without aid. There are two facets to consumption smoothing that are of interest. The insurance aspect emphasizes the ability to buffer consumption against exogenous shocks that are not perfectly foreseen. By stressing the importance of savings, micro credit programs develop the means of withstanding unexpected negative shocks. Furthermore, given the lack of storage and the low levels of income, poor households are unable to smooth consumption even in response to anticipated seasonality. By diversifying sources of income within the household (these programs target women) and by requiring that loans be used for non-agricultural activities, lending programs help to insulate the consumption of poor households against anticipated seasonal shocks.

Specific reasons for why participation might reduce the household's cost of borrowing (and thus facilitate consumption smoothing) are as follows: (1) Precautionary - experienced members would have accumulated assets over time, which may be used in a precautionary role to smooth consumption. Estimates from the data used here suggest that the average total assets for a household increase by approximately 17.2% after an average of 4.69 years of participation. (2) Accumulated assets may also be used as collateral for loans from other sources. (3) Membership leads to the formation of a "reputation" for more experienced clients. By demonstrating their ability to meet regular installment payments, experienced members signal their ability to be good credit risks for other lenders. (4) Since experienced members have assets that may be used as collateral, their demand for credit conditional on a particular source is more elastic. This implies that they are charged a lower interest rate (Iqbal 1988).

But such benefits of participation need not last indefinitely in a linear fashion. Anecdotal evidence suggests that experienced participants are more likely to miss payments on loans. Several researchers have addressed this issue in the literature. Using evidence from BRAC (Bangladesh Rural Advancement Committee) programs, Yaqub (1995) argues that long periods of participation may reduce repayment due to an "empowerment" effect. Through repeated borrowings, members develop greater skills, assets, and confidence, and thus identify less with the "group game" (Yaqub, 1995, p.5.). Factors such as education and land ownership are also linked to default behavior. Several studies argue that education improves bargaining positions within the village, and furthers individual decision making.[1] Others such as Von Pischke, Yaron and Zander (1999) argue that the unprofitable rates of return on more experienced members' assets are critical in explaining why repayment performance declines over time.

This paper argues that a reason for increasing default is diminishing returns to benefits from participation (reductions in annual per capita consumption fluctuations resulting from seasonal shocks is used as a measure of participation benefits)[2]. If experienced members develop the ability to survive without the assistance of credit programs, then given costs of

[1] See Mohan, Veerasamy, and Sivaraman (1985), Dadhich (1971), and Chowdhury (1992).

[2] Note that in these programs, the definition of "default" is quite relaxed. As per Grameen rules, a loan is considered to be in default if it remains unpaid one year beyond which it was due. Since in general loans have to be repaid within one year, loans in default are those that remain unpaid two years after the date of their disbursement.

membership[3] and the existence of alternative sources of loans (as noted above, participants of longer duration have accumulated savings and other assets that may be used as collateral to borrow from village shopkeepers, traders, and money lenders), missing payments may be optimal.

Parameter estimates of the model analyzed here indicate the presence of diminishing returns to consumption smoothing benefits, after a certain number of years of participation. The basic model follows Menon (2002) and builds on the following argument. Studies of consumption behavior show that Euler equations are rejected in the presence of borrowing constraints (Zeldes (1989), Lawrance (1991), Foster (1995)), thus implying that the cost of borrowing for the poor is often higher than that for the rich. This idea may be generalized through the formulation of a time varying, household specific interest rate, where the deviation of this interest rate from the average interest rate for households in the village captures the higher cost of borrowing faced by a poor household. The household specific interest rate reflects the shadow price of intertemporal resource transfer and may be affected by social costs and monetary costs, as well as the household's bargaining position in the village. It thus captures both the physical cost of borrowing as embodied in the actual interest rate faced by the household, and other social considerations that might affect how much this household can borrow in that village. Participation in micro finance programs is hypothesized to reduce the deviation of the household specific interest rate from the average village interest rate.

A natural method to test this hypothesis is to examine the ability of participants to smooth per capita consumption across seasons. Following Zeldes (1989) and Foster (1995), an Euler equation incorporating the cost of borrowing faced by the household, is adopted to study inter-seasonal consumption differentials. The deviation of the household interest rate from the average village interest rate is a function of the length of membership in a credit program. If the change in per capita household consumption between seasons is negatively correlated to the length of membership, it follows that experienced members are better able to smooth seasonal shocks. To allow for non-linear effects in the returns to participation, a quadratic approximation is used to model the length of membership in a credit program.

A fixed effects non linear least squares estimation of an equation that relates changes

[3] Costs of membership are not insubstantial. 5% of a loan has to be deposited into a "Group Savings Fund", and 1% of the loan goes to the "Emergency Fund". Additionally, there are large transactions costs involved in making weekly installment payments.

across seasons in household per capita consumption expenditure last week to length of membership, changes in prices, preferences, and the cost of borrowing, demonstrates that membership length is inversely related to the change in seasonal per capita food consumption. Data from twenty four villages of the Grameen Bank indicate that although participation does have a mitigating effect on seasonal shocks to consumption, such effects do not persist over time. Estimates from the model suggest that the effects reach a maximum after three and a half to four years of membership, and that after seven to eight years, length of participation has little or no dampening effect on seasonal shocks.

The layout of the paper is as follows. Section 2 provides details on the model that is estimated. Section 3 summarizes the data, and section 4 discusses issues involved in the estimation. Results are reported in section 5 and section 6 provides further support for the estimates obtained. Section 7 concludes with policy implications.

## 2 Model

The presence of credit constraints is tested by deriving an Euler equation from a dynamic utility maximization model (development of the model closely follows Menon (2002)). This Euler equation relates consumption changes to changes in prices and the interest rate, under the assumption that no borrowing constraints exist.

Consider a household that maximizes the expected value of a time separable lifetime utility function. In each time period $t$, household $i$ in village $j$ chooses the quantity of per capita consumption $C_{ijt}$ to solve the following problem:

$$Max\ E_t \sum_{k=0}^{T-1} \beta^k U(C_{ijt+k})$$

subject to an asset update:

$$A_{ijt+k} = (1 + r_{ijt})(A_{ijt+k-1}) + Y_{ijt+k} - P_{jt+k}C_{ijt+k} \quad \forall k$$

where i indexes the household and j, the village, $\beta$ is the discount rate, $E_t$ is the expectations operator conditional on information available as of time $t$, $T$ is the end of the household's horizon, $r_{ijt}$ is the interest rate faced by the household, $A_{ijt}$ are household assets, $Y_{ijt}$ is household income, and $P_{jt}$ are prices in village $j$ at time $t$. The first order conditions for the above problem are Euler equations of the following form:

$$E_t\ \frac{U'(C_{ijt+1})}{U'(C_{ijt})} = \frac{1}{\beta(1 + r_{ijt})} \frac{P_{jt+1}}{P_{jt}} \qquad (1)$$

or

$$\frac{U'(C_{ijt+1})}{U'(C_{ijt})}\beta(1+r_{ijt})\frac{P_{jt}}{P_{jt+1}} = 1 + e'_{ijt+1} \tag{2}$$

where under rational expectations, $e'_{ijt+1}$ is the expectational error, and is uncorrelated with information known at time $t$. Assuming a CRRA utility function of the form:

$$U(C_t) = \frac{C_t^{1-\alpha}}{1-\alpha}$$

and substituting its first derivative into equation (2) yields,

$$\left(\frac{C_{ijt+1}}{C_{ijt}}\right)^{-\alpha}\beta(1+r_{ijt})\frac{P_{jt}}{P_{jt+1}} = 1 + e'_{ijt+1}$$

defining $R_{ijt} = (1 + r_{ijt})$ and substituting into the above implies:

$$ln\ \left(\frac{C_{ijt+1}}{C_{ijt}}\right) = \frac{1}{\alpha}\left[ln\ (\beta R_{ijt}) + ln\ \left(\frac{P_{jt}}{P_{jt+1}}\right) - ln\left(1 + e'_{ijt+1}\right)\right] \tag{3}$$

Define $(1 + e'_{ijt+1}) = (1 + e^a_{jt+1})(1 + e_{ijt+1})$, where $e^a_{jt+1}$ is the aggregate component of the expectational error and $e_{ijt+1}$ is the idiosyncratic component. Using a second order Taylor expansion, it can be shown that (Zeldes 1989):

$$ln(1 + e'_{ijt+1}) = ln(1 + e_{ijt+1}) + \frac{1}{2}\sigma^2_{e_{ijt+1}}$$

Let

$$\epsilon_{ijt+1} = -\left(ln(1 + e_{ijt+1}) + \frac{1}{2}\sigma^2_{e_{ijt+1}}\right)$$

Substituting $\epsilon_{ijt+1}$ into (3) we arrive at:

$$ln\left(\frac{C_{ijt+1}}{C_{ijt}}\right) = \frac{1}{\alpha}\left[ln\ (\beta R_{ijt}) + ln\ \left(\frac{P_{jt}}{P_{jt+1}}\right) + \epsilon_{ijt+1}\right] \tag{4}$$

Equation (4) forms the basis of the structural model. In order to analyze the cost of borrowing faced by a household, the term that captures the difference between the household interest rate and the average interest rate in the village needs to be incorporated. This is done by approximating the term $\frac{1}{\alpha}ln\ (\beta R_{ijt})$ to its first order Taylor series expansion about the village average interest rate $R_{jt}$, yielding,

$$ln\left(\frac{C_{ijt+1}}{C_{ijt}}\right) = \frac{1}{\alpha}\left[ln\ (\beta R_{jt}) + (r_{ijt} - r_{jt})\frac{1}{R_{jt}} - ln\ \left(\frac{P_{jt+1}}{P_{jt}}\right) + \epsilon_{ijt+1}\right]$$

where $r_{jt}$ is the average interest rate in village $j$ at time $t$, and $r_{ijt}$ is the interest rate faced by household $i$ in village $j$ at time $t$. The incorporation of this term, allows us to analyze the household's cost of borrowing. Rewriting the above, we obtain:

$$\Delta ln\ C_{ijt+1} = \gamma_0 + \gamma_1(r_{ijt} - r_{jt}) + \gamma_2\Delta ln\ P_{jt+1} + \nu_{ijt+1} \tag{5}$$

where $\gamma_0 = \frac{1}{\alpha} ln \ \beta R_{jt}$, $\gamma_1 = \frac{1}{\alpha R_{jt}}$, $\gamma_2 = -\frac{1}{\alpha}$, and $\nu_{ijt+1} = \frac{1}{\alpha}\epsilon_{ijt+1}$. Those households that are better able to engage in credit based consumption smoothing (that is, with small $(r_{ijt} - r_{jt})$) do not experience large deviations in their cost of borrowing (relative to the rest of the village). Thus for them, changes in per capita consumption are primarily governed by changes in prices, preferences, and the average village interest rate.

Theory suggests that the deviation between the average village interest rate and the household interest rate depends on the length of time the household has been a member of a credit program. Membership reduces the cost of borrowing since those who have been participants for longer periods of time would have accumulated the means to minimize the effect of seasonal shocks[4]. The $(r_{ijt} - r_{jt})$ term captures how the household specific interest rate differs from the average village interest rate, where the average village interest rate reflects the effect of average village/time shocks. For those who do not participate,$(r_{ijt} - r_{jt})$ picks up the full effect of average village/time shocks. For those who do participate, the effect of the average village/time shock is dampened by the length of membership variable. In order to model this effect, the following specification is adopted:

$$\gamma_0 + \gamma_1(r_{ijt} - r_{jt}) = \mathcal{F}(D_{ijt})\mu_{jt} \tag{6}$$

$\mathcal{F}(D_{ijt})$ denotes that the household's cost of borrowing is a function of $D_{ijt}$, where $D_{ijt}$ represents the duration of membership (of household $i$ in village $j$ at time $t$) in a credit program and $\mu_{jt}$ is a village season dummy that captures average interest rate change. Where[5]

$$\mathcal{F}(D_{ijt})\mu_{jt} = \left(e^{\delta_t D_{ijt}}\right)\mu_{jt}$$

we obtain,

$$\gamma_0 + \gamma_1(r_{ijt} - r_{jt}) = \left(e^{\delta_t D_{ijt}}\right)\mu_{jt} \tag{7}$$

Substituting equation (7) into equation (5):

$$\Delta ln \ C_{ijt+1} = \left(e^{\delta_{t+1} D_{ijt+1}}\right)\mu_{jt+1} + \gamma_2 \Delta ln \ P_{jt+1} + \nu_{ijt+1} \tag{8}$$

Variables such as characteristics of the household head as well as the quantity of land owned by the household also play a role in reducing deviations in the cost of borrowing. These

[4]As noted before, given a poor household's inability to cope with either kind of shock, there is no differentiation being made in the model between the effects of exogenous unforeseen shocks and anticipated shocks from seasonality.

[5]Note that for those households that face a below average cost of borrowing, $(r_{ijt} - r_{jt})$ may be negative. But since there are few such households in the data, the exponential functional form (which constraints effects to be positive) is adopted.

may be included in (8) in a similar manner to the inclusion of $D_{ijt+1}$. Note that in equation (8), the village level fixed effects that capture village specific seasonal shocks (the $\mu_{jt+1}$)[6] are estimated simultaneously with the $\delta_{t+1}$ and $\gamma_2$ parameters.

## 2.1 Diminishing returns to participation

This paper argues that a reason for why experienced participants may miss payments on outstanding loans is because of the existence of non-linearities in the returns to membership. If marginal returns to membership decline over time in the program, then experienced participants benefit to a lower extent than those who have recently joined. If such returns drive self-selection into these programs, then strategic default may result when marginal returns begin to diminish.

The measure of returns to program participation in this paper is the household's ability to minimize fluctuations in per capita consumption expenditure across seasons. Hence, diminishing returns to participaton may be incorporated by defining:

$$\mathcal{F}(D_{ijt+1})\mu_{jt+1} = \left(e^{\delta_{1t+1}D_{ijt+1}+\delta_{2t+1}D^2_{ijt+1}}\right)\mu_{jt+1} \tag{9}$$

This quadratic approximation allows consumption smoothing benefits to decline over time[7]. Incorporating other variables that are thought to influence changes in seasonal consumption, we have

$$\Delta ln\ C_{ijt+1} = \left(e^{\delta_{1t+1}D_{ijt+1}+\delta_{2t+1}D^2_{ijt+1}+X^C_{ij}\beta_C}\right)\mu^C_{jt+1} + \gamma_2\Delta ln\ P_{jt+1} + \nu_{ijt+1} \tag{10}$$

The above equation may be estimated using fixed effects non-linear least squares. The coefficients $\delta_{1t+1}$ and $\delta_{2t+1}$ are the marginal effects of interest. A negative value for $\delta_{1t+1}$ would confirm the idea that experienced participants are better able to smoothe consumption. The diminishing returns hypothesis is supported if $\delta_{2t+1} > 0$.

[6]The $\mu_{jt+1}$ are estimated for two seasons of the year in the data. Since they are not being estimated for annual data, they are not really "shocks" in the generic sense. One can think of them as village/time parameters that capture the effect of largely anticipatable seasonal shocks to village consumption within the year. Their primary purpose is to pick up the effects of such shocks on the household's cost of borrowing, and thus on inter-seasonal consumption differentials.

[7]A cubic functional form was initially estimated, but the quadratic model was adopted since the effect of the cubic term in the cubic functional form was insignificant.

# 3 Data

The data used in this analysis were collected from rural Bangladesh during 1991-1992. The estimation sample was drawn from eight Grameen thanas (Grameen is the only program that operates in these thanas), and participants from three villages in each of these eight thanas were interviewed. These villages were selected on the basis of their having had a Grameen program in operation for three or more years. Since Grameen does not lend to households that own more than half an acre of cultivable land, this rule is used to classify households in each of the twenty four villages as "target" or "non-target". Participants and non-participants among the target households are then separately identified, and target non-participants as well as participants are oversampled in the data. The data has information on a total of 479 households, of which 420 are target households (own less than half an acre of cultivable land). Of the 420 target households, 297 are participants.

Each household is surveyed for three rounds, corresponding to the three major rice crop seasons in Bangladesh. Data in the first round were collected in December/January 1991 - the post harvest time of the *Aman* rice crop. The second round corresponds to the post harvest time of the *Boro* crop (April/May 1992), and the third round corresponds to the post harvest time of the *Aus* rice crop (August/September 1992). The *Aman* rice crop is the largest of the year, and the *Aus* harvest is the smallest. Food prices and wage rates in Bangladesh fluctuate greatly in the course of a year. Price of coarse grain rice is usually the lowest in December after the *Aman* harvest, and highest in the month of September/October (Chaudhury (1981)).

In this paper, round 1 refers to the *Aman* season (season 1), round 2 to the *Boro* season (season 2), and round 3 to the *Aus* season (season 3).

Table 1 (all tables are at the end of the paper) provides the weighted means and standard deviations of all the independent variables used in the analysis. Length of membership is measured by the number of years the participant has been a member of Grameen's lending program. Two households had members belonging to a program other than the Grameen Bank, thus for each household, the maximum value for length of program membership is used in the estimations. In order to account for the choice based sampling of the data, the means of the variables are adjusted by weights that correct for the difference between the actual distribution of households in the villages surveyed, and the distribution of households in the sample.

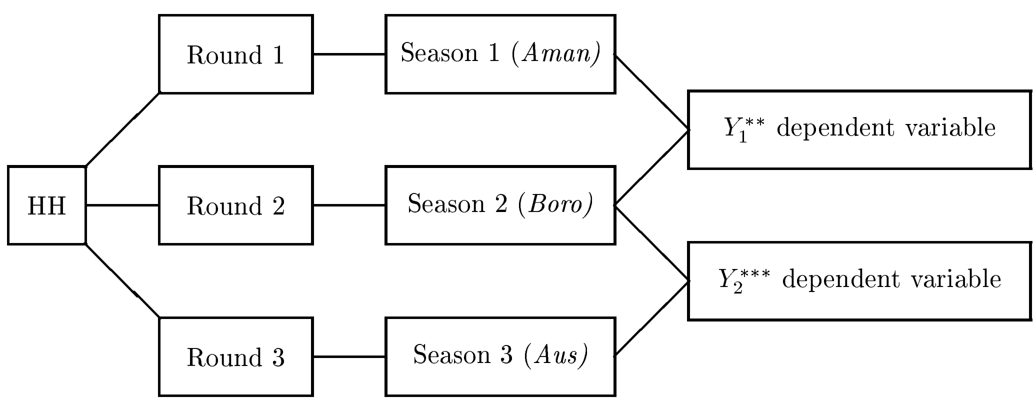
The dependent variable consists of two sets of differences in per capita consumption - between seasons 2 and 1, and between seasons 3 and 2. Per capita consumption is measured by per capita food expenditure in the week previous to the survey. In these data, expenditure on food constitutes almost 80% of total expenditure at the household level, and the variable is constructed from a single question in the survey. Round 1 data are excluded from the estimation (although round 1 level *variables* are still present) because the model above implies that:

1. Difference in per capita consumption between season 2 and season 1 is a function of round 2 data.

2. Difference in per capita consumption between season 3 and season 2 is a function of round 3 data.

Table 2 reports the weighted mean and standard deviation of the dependent variables. The following flowchart depicts the structure of the data.

Figure 1: **Structure of the Data**




$Y_1^{**}$ is the difference of log per capita food expenditure last week between season 2 and season 1 (expenditure in taka per week).

$Y_2^{***}$ is the difference of log per capita food expenditure last week between season 3 and season 2 (expenditure in taka per week).

## 4 Estimation

In Menon (2002), identification of the effect of an endogenous variable such as membership duration was achieved by using the quasi-experimental nature of the data.[8] The main aim of micro lending programs is to alleviate poverty. If programs are deliberately placed in areas that are relatively poorer than others, then estimates of the effects of program participation are necessarily biased. The use of village level fixed effects that capture systematic differences in attributes across villages, aids in removing this bias. But without further variation, it is impossible to identify length of membership effects separately from the village fixed effects. Identification of the length of membership effect becomes possible if the sample includes households in villages that have the program, but that are excluded from participating due to some exogenous rule. Micro credit programs only lend to those who own less than half an acre of cultivable land, or in the absence of land ownership, those who own assets whose value equals or is less than that of one acre of medium quality land in that area. This rule provides the random assignment which is necessary for identification.

Individual heterogeneity also needs to be taken into account since those who choose to participate could be systematically different from non-participants. Once a credit program is established in a village, participants self-select into groups to become members of the program. If those who join are more able at managing self-employment activities, or have higher than average entrepreneurial skill levels as compared to non-participants, then the estimation of participation effects is biased. Individual and household level heterogeneity of this type could confound results and incorrectly attribute to the program those effects that arise from differences in the nature of household unobservables.

In Menon (2002) equation (8) was estimated using a maximum likelihood technique. Both a pooled estimation and a gender disaggregated estimation (allowing for differential impacts by gender) were conducted. In the gender-stratified model, correlations between errors in the female and male equations and the behavior equation were insignificant. This was true in both rounds for which the equations were estimated. The correlation coefficients in the pooled model were also insignificant. The insignificance of these correlations is not surprising since the dependent variable is the *difference* in per capita consumption between rounds. Since most of the individual and household level heterogeneity is time invariant between rounds, taking differences across rounds eliminates much of this heterogeneity. Tests of exogeneity were also conducted. The null hypothesis that the correlations in the

[8] Pitt and Khandker (1998) describes the nature of the quasi-experiment.

gender-stratified model are jointly equal to zero could not be rejected ($\chi^2$ value = 3.05, p-value=0.45). Similarly, the null hypothesis that the correlations in the pooled model are jointly equal to zero could not be rejected (($\chi^2$ value = 2.51 p-value=0.71). If differentiating across rounds eliminates most of the correlation between the endogenous variable and the outcome equation, length of membership may be treated exogenously. Hence, equation (10) is estimated using a fixed effects non-linear least squares technique that treats length of membership exogenously.

# 5 Results

Table 3 reports the results from the non-linear fixed effects estimation of equation (10) in round 2 (estimates in round 3 were insignificant). Table 3 shows that membership has a significant effect on smoothing inter-seasonal consumption changes in both the gender-stratified and pooled models. Note that although the coefficient on the linear term is negative (in keeping with the hypothesis that experienced members face smaller deviations in seasonal consumption), the coefficient on the squared term is significant and positive, indicating the presence of diminishing returns. Estimates from the gender-stratified model suggest that the maximum effect of participation is at 3.63 years, whereas estimates from the pooled model suggest that the maximum effect of participation is at 3.9 years. After 7.25 years of participation in the gender-stratified model and after 7.8 years of participation in the pooled model, the length of membership variable has no further dampening effects on seasonal shocks. Figures 2 and 3 plot the relationship between the change in per capita consumption between seasons 2 and 1 and length of membership in the gender-stratified and the pooled models, respectively.

While the squared term included in the estimation helps to capture diminishing returns, the quadratic form is just an approximation, and it is likely that at the tails, the fit is less precise. Additionally, equation (10) includes other exogenous variables such as the quantity of cultivable land owned by the household, and age and sex of the household head. Thus, even though the length of membership variable produces no dampening effect on shocks after 7.8 years (7.25 years in the gender-stratified model), the household's cost of borrowing need not increase since other exogenous variables still play a mitigating role. Furthermore, only one household out of 479 Grameen households has a pooled value for membership length that makes $(r_{ijt} - r_{jt}) > 0$. There are no households with female participants that have values for membership length that amplify the effect of shocks. Note also that duration of membership is not endogenous due to drop out. In these data, only 2 out of the 479

Figure 2: **Non-linear Model - Gender Stratified w/ unit shock**

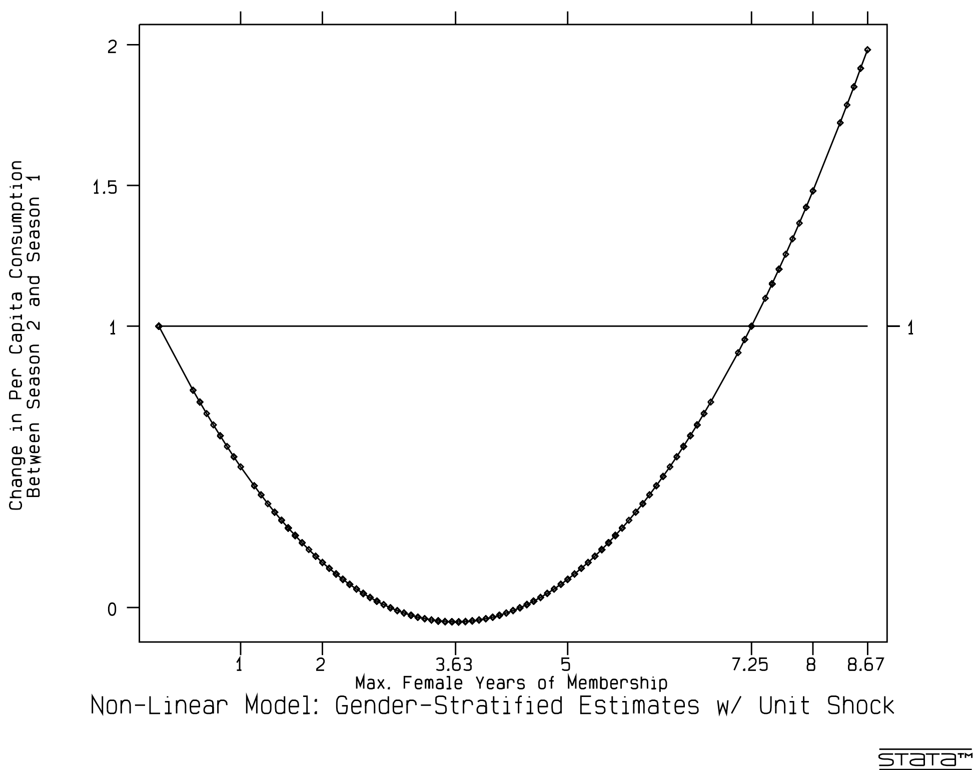
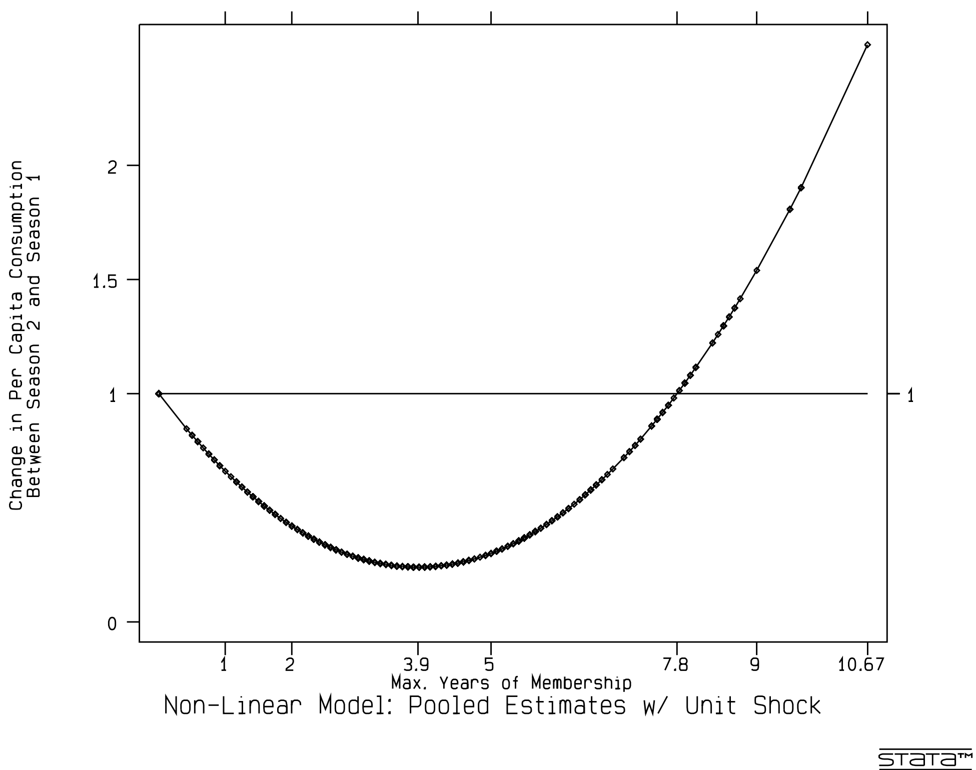


Figure 3: **Non-linear Model - Pooled w/ unit shock**



Grameen households are reported to have dropped out of the program. One of the reasons for why this might be the case is because very few households are close to the drop out threshhold (as estimated in the pooled model) in these data.

# 6 Support for Results

## 6.1 Cohort effects

If the earlier cohort of participants was more able as compared to later cohorts, then the onset of diminishing returns for experienced members (which is indicative of easier capital access, greater assets, and so on) could be driven by this characteristic. Given the nature of the data used in Table 3, conventional tests for cohort effects cannot be conducted (note that the estimation already controls for self-selection). But using the education of the household head as a proxy for ability, it is possible to study the relationship between ability and length of membership conditioning on village-level effects. A graph of the lag between program introduction and joining against the household head's schooling in Grameen villages that have had the program for more than 8.67 years (the upper 90% of length of time a program has been present in a village) and those that have had the program for less than 3.5 years (the lower 10%), provides evidence of ability bias if the distribution of participants who joined first in either case is higher than those who joined later. If the plot for the distribution of early participants is higher (as measured with respect to the household head's education), then this would suggest that regardless of when a program begins, able people are the first to self-select into the program. Figure 4 controls for village-level fixed effects and shows a lowess smoothed plot of log education of the household head (adjusted for differences in average schooling) and the lag between program availability and time of joining (separately for the two groups of villages mentioned above). The lag variable (plotted along the x-axis) is the gap between the time the program was set up in the village, and the time that a particular household in that village became a member. Figure 5 is a clearer view of Figure 4, and shows the data for participants who joined within the first three and a half years (lag <=3.5) of the program's operation in the two groups of villages mentioned above. From figures 4 and 5, it is evident that there is no consistent pattern in the data to support the claim that high ability people always join first. Thus diminishing returns to consumption smoothing benefits for experienced members are not being driven by the fact that earlier cohorts of participants were more able.

Figure 4: **Lag between Program Availability & Joining vs. Household Head's Schooling in Grameen Thanas**

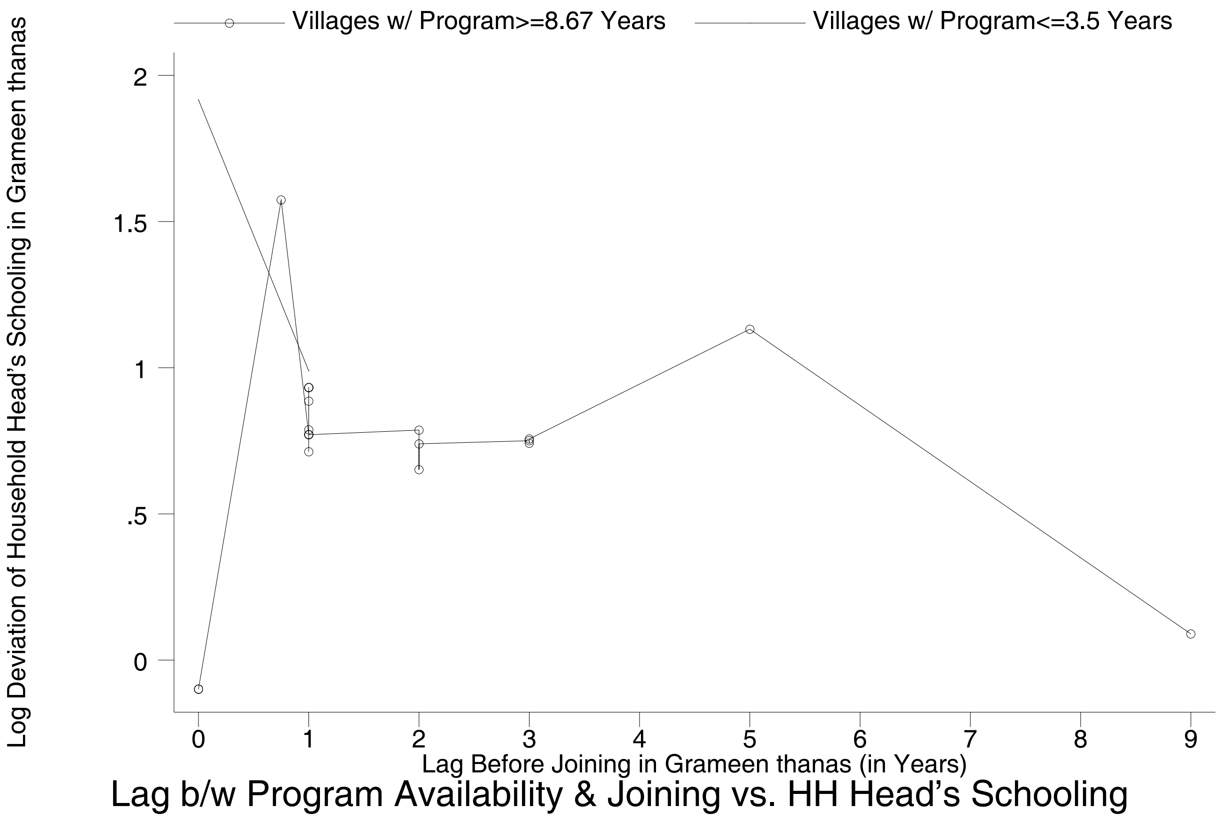
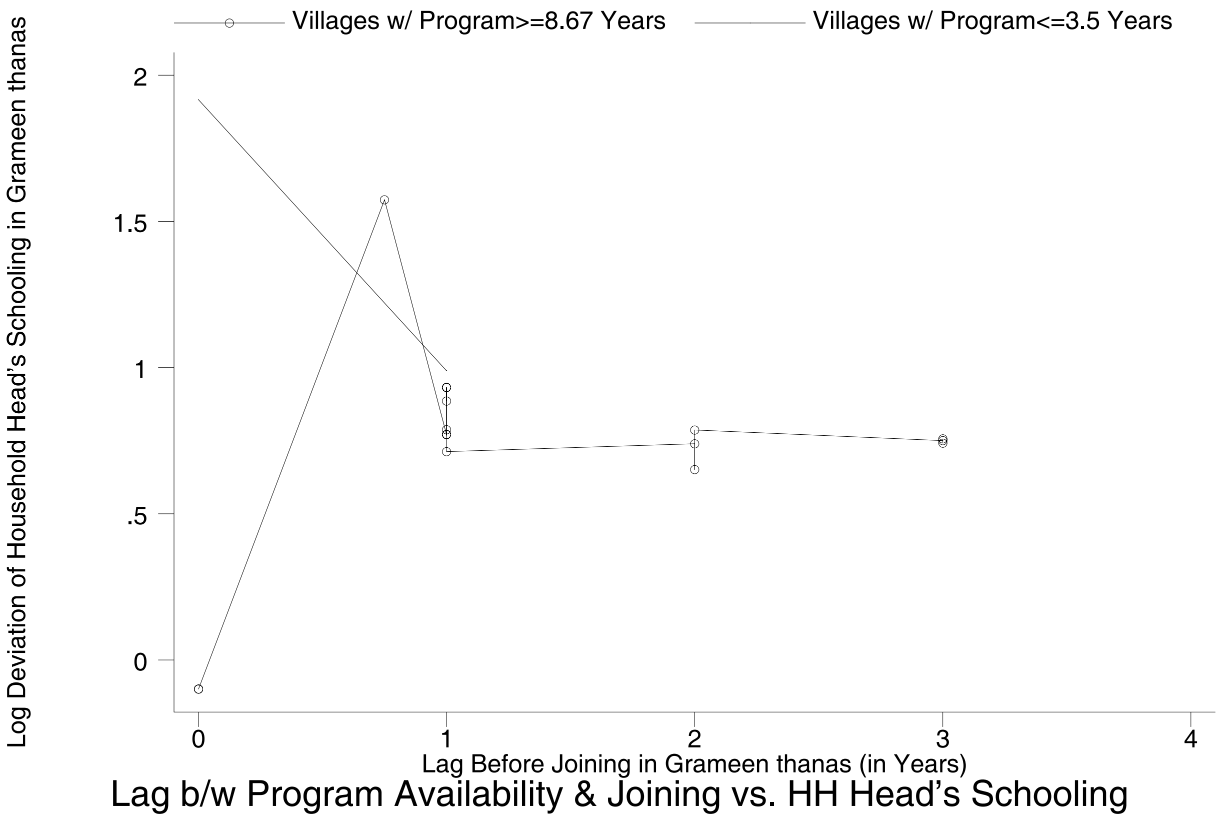


Figure 5: **Lag between Program Availability & Joining vs. Household Head's Schooling in Grameen Thanas**



## 6.2 Robustness checks

Length of membership is not endogenous due to drop out rates. In these data, only 2 households are reported to have dropped out of the program between the first and third rounds. Additionally, in order to ensure that results are being driven by length of membership as opposed to participation, several tests were conducted. A dummy for participation was introduced into the model above. With control for participation, both length of membership and the dummy for participation become insignificant. When the model is estimated with only the participation dummy, its effect is insignificant. Hence, results are being driven by the length of membership variable, and not by participation alone.

# 7 Conclusion and Policy Implications

This paper examines the presence of diminishing returns to consumption smoothing benefits for experienced participants of micro lending programs. In a previous paper (Menon, 2002), estimation of a structural model that related changes in consumption across seasons to length of membership, deviations in the household's cost of borrowing, and changes in prices and preferences, indicated that smoothing benefits were significant and that such benefits accrued differentially by experience of the participant. The analysis in this paper extends the original empirical framework (of Menon, 2002) by using a quadratic approximation for the length of membership variable. This allows for consumption smoothing benefits to vary by length of participation, and gives a better handle on analyzing the long run returns to membership in micro finance programs.

A fixed effects non-linear least squares estimation of data from twenty four villages of the Grameen Bank suggests that returns to membership do vary by length of participation. Estimates from a model that allows benefits to differ by gender of the participant suggest that the maximum dampening effect occurs approximately after three and a half years of participation. The corresponding number in the pooled model is approximately four years. These estimates suggest that after seven to eight years of participation, length of membership produces no reductions in the effects of seasonal shocks on per capita consumption fluctuations. The result that consumption smoothing benefits do not persist indefinitely into the future suggests a logical reason for why more experienced members may miss installments on outstanding loans. Given the presence of deiminishing returns to participatory benefits and the not insubstantial costs of membership in such programs, experienced members may find it optimal to skip payments. Hence, yes, there may be an optimal length of membership in micro finance programs.

The results have important implications for program structuring. If individuals select into micro lending programs due to consumption smoothing motives, then diminishing returns to such benefits may trigger strategic default behavior. Membership in these programs is not costless, and experienced participants may believe that missing installment payments is optimal once smoothing benefits no longer dominate. If experienced members face different incentives, then the lending and repayment terms for them might need to be different, as compared to those for less experienced members. Eligibility to join these program (wealth status) and to remain a participant needs to be reevaluated at regular intervals, instead of just once at the very beginning as is now the practice. Recognition of the fact that the nature of participants changes over time will help in making micro finance programs more cost-effective in the future. Anecdotal evidence exists to suggest that experienced members are indeed more likely to default on loans; this may be rational in an environment where participants are no longer that dependent on micro loans and where costs of membership are not insubstantial. In future research, we plan to use actual repayment data to analyze effects by participant's length of membership.

# Appendix

In order to understand some of the key features of the system, consider the Grameen Bank. Only those owning less than half an acre of cultivable land are eligible to participate in such programs[9], and loans are given to groups of five members at the same point in time. These loans are marked for use in non-agricultural self-employment activities. Since default by any one member disqualifies other group members from access to future loans, women in a group become co-signatories for each other. Joint lending leads to peer monitoring, which, in turn, ensures low default rates.

Another unique facet of such programs is that general loans have to be repaid within one year, in equal weekly installment payments. Grameen also dispenses housing and seasonal loans that follow a different schedule. Housing loans, given their size, can be repaid over the course of several years, whereas seasonal loans have to be repaid within six months. Collection of these installment payments occurs at weekly village meetings which are public. Thus, inability to meet that week's installment cannot be kept hidden from other people in the village. Given the large transactions costs of weekly collection, Grameen is considering moving to a fortnightly schedule such as that followed by the Bangladesh Rural Advancement Committee (BRAC).

In addition to dispensing loans, Grameen also inculcates values of cleanliness, hygiene, and the importance of education. These values are embodied in the "Sixteen Decisions", also called the "Social Development Constitution". Other micro credit programs such as those run by BRAC and ASA have similar features, although they do differ slightly in terms of when installments are collected and in their overall approach. For example, BRAC invests in rural development projects in addition to having a lending program. Grameen is more of a "pure" lending organization, but it has branched out into providing subsidized electricity and telecommunications in the recent past.

[9]In the absence of land ownership, only those households whose assets are less than or equal to the value of one acre of medium quality land in that area are eligible to participate.

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Table 1: **Weighted Means and Std. Deviations of Independent Variables**

| **Independent Variable** | **Full Sample** | **Target Participants** | **Target Non-Participants** |
|---|---|---|---|
| Household cultivable land (in decimals**) | 64.24 | 43.66 | 10.49 |
| | (100.62) | (99.30) | ( 22.45) |
| Highest educational level completed by household head (in years) | 2.24 | 1.93 | 1.73 |
| | (3.29) | (2.68) | (3.15) |
| Sex of household head (male = 1) | 0.93 | 0.94 | 0.89 |
| | (0.25) | (0.24) | (0.32) |
| Age of household head (in years) | 39.89 | 42.33 | 37.07 |
| | (12.53) | (11.88) | (12.77) |
| Highest educational level completed by any female household member (in years) | 1.51 | 1.26 | 1.12 |
| | (2.86) | (2.15) | (2.53) |
| Highest educational level completed by any male household member (in years) | 2.64 | 2.45 | 1.98 |
| | (3.53) | (3.03) | (3.42) |
| No adult male in household | 0.032 | 0.02 | 0.06 |
| | (0.18) | (0.15) | (0.25) |
| No adult female in household | 0.02 | 0.01 | 0.03 |
| | (0.12) | (0.09) | (0.18) |
| No spouse present in household | 0.12 | 0.10 | 0.18 |
| | (0.33) | (0.30) | (0.39) |
| Nontarget household | 0.31 | - | - |
| | (0.46) | - | - |
| Difference in log price of coarse grain rice between season 2 and season 1 | -0.01 | -0.02 | -0.01 |
| | (0.08) | (0.08) | (0.09) |
| Difference in log price of coarse grain rice between season 3 and season 2 | -0.13 | -0.12 | -0.13 |
| | (0.08) | (0.08) | (0.07) |
| Household max. years member program* | 1.44 | 4.69 | - |
| | (2.46) | (2.09) | - |
| Household max. female years member program* | 1.01 | 3.25 | - |
| | (2.02) | (2.42) | - |
| Household max. male years member program* | 0.44 | 1.43 | - |
| | (1.69) | (2.80) | - |
| Observations | 479 | 297 | 123 |



* Denotes endogenous variable.
** 1 Decimal = 1/100th of an acre.
Standard errors in parenthesis.

Table 2: **Weighted Means and Std. Deviations of Dependent Variables**

| | **Difference in the log of per capita food expenditure last week between season 2 and season 1 (expenditure in taka per week)** | **Difference in the log of per capita food expenditure last week between season 3 and season 2 (expenditure in taka per week)** |
|---|---|---|
| **Target participant (Grameen areas)** | -0.08<br>(0.31)<br>N = 297 | -0.10<br>(0.24)<br>N = 297 |
| **Target non-participant (Grameen areas)** | -0.03<br>(0.40)<br>N = 123 | -0.11<br>(0.26)<br>N = 123 |
| **Target (total) (Grameen areas)** | -0.05<br>(0.36)<br>N = 420 | -0.11<br>(0.25)<br>N = 420 |
| **Full sample (Grameen areas)** | -0.08<br>(0.36)<br>N = 479 | -0.09<br>(0.26)<br>N = 479 |

Standard errors in parenthesis.

Table 3: **Dependent Variable: Change in Food Expenditure**
**Grameen Bank Thanas: Duration of Membership Measured in Years**

| Explanatory Variable | Gender-Stratified | Pooled |
|---|---|---|
| Maximum household years of membership x season 2 | - | -0.39 (-2.77) |
| Square of household years of membership x season 2 | - | 0.05 (2.62) |
| Maximum household female years of membership x season 2 | -0.58 (-2.39) | - |
| Square of max. household female years of membership x season 2 | 0.08 (2.07) | - |
| Maximum household male years of membership x season 2 | -0.16 (-0.87) | - |
| Square of max. household male years of membership x season 2 | 0.02 (1.01) | - |
| Log household cultivable land | -0.01 (-0.21) | 0.01 (0.23) |
| Highest educational level completed by household head | 0.01 (0.56) | -0.02 (-0.90) |
| Sex of household head | -0.75 (-2.47) | -0.40 (-0.66) |
| Age of household head | -0.03 (-3.74) | -0.03 (-3.41) |
| Difference in log price of rice between season 2 and 1 | 0.34 (0.85) | 0.13 (0.36) |
| N = 479 HHs. | | R=0.32 |

T-statistics in parenthesis.