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JOINT VERSUS INDIVIDUAL LIABILITY IN MICROFINANCE - A COMPARATIVE IMPACT EVALUATION THROUGH NATURAL EXPERIMENT**

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Abstract:

In this paper we want to do a comparative impact evaluation among the participants of two separate types of microfinance system; a microfinance system operated through individual liability microcredit contract represented by VSSU and a microfinance system under SGSY scheme of the Government of India which is operated through joint liability microcredit contract through forming Self-Help Group among the rural people mainly married women. This impact evaluation is done through Natural experiment whose time span is two years. It was observed that in the base line period the participants of VSSU are comparatively in better economic position than the participants of SGSY scheme and non participants who are treated as control group in our experiment. It is established that increment of monthly income among the member households of VSSU is more than the member households under SGSY scheme but when we consider the outcome variable as increment of monthly per capita consumption expenditure we see the reverse picture. There is no significant difference on expenditure for human development purposes is observed among the participants of two different types of microfinance system and even at the end line period both the member households still consider expenditure for health and education is luxury. When we consider intra household decision making power through constructing Women's Empowerment Index as an outcome variable then the change is maximum among the female SHG members under SGSY scheme. We have also estimated the optimum size of micro credit which is helpful for all types of rural participants to improve their economic conditions within a short span of time.

Key words: Individual Liability, Joint Liability, Income, Consumption Expenditure, Human Capital Expenses, Women's Empowerment

JEL Classifications: C21, C43, G21, I30, O16, O53

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Introduction:

Microfinance is emerging as a popular instrument towards the main objective of financial inclusion to the growing share of poor households who have not yet reached directly to the bank. Microfinance programme is operated either under joint-liability or under individual-liability credit contract. The group-lending method is based on joint liability credit contract when the borrowers linked by joint liability have to help through repaying the debt of any one of the group (s)he belongs who fails to repay. Actually under group lending microfinance scheme, loans are sanctioned individually to the group members but all in the group will have to face consequences if the borrower member runs in to serious repayment difficulties. Hence non-borrower co-members of the group will have to constantly monitor the borrower group-members which can be done most efficiently and at very minimum effort. Under joint liability micro-credit contract the loan size is limited by what the group can jointly guarantee. Sometimes heterogeneity in loan size can result in tension within the group as clients with smaller loans are reluctant to serve as a guarantor for those with larger loans. So clients dislike the tension caused by group liability. Excessive tension among the members is also responsible for voluntary dropout. So clients with growing business and those well ahead of their co-members in the economic activity may find that the group contract bogs everyone down. In recent years some micro lenders such as the Association for Social Advancement in Bangladesh or the Bank of Rakyat Indonesia, have expanded rapidly using individual liability loan contract. In case of individual liability, each borrower is only responsible for her own loan. Here loan should be dearer, because the lender has to bear good amount on monitoring and that type of loan recovery is much more uncertain. But we cannot ignore microcredit under individual liability, which looks no less successful particularly after observing the performance of Bank of Rakyat in Indonesia. The basic objective of this paper is to do comparative impact evaluation among the participants between these two types of microfinance system with the help of a Natural experiment. Here Vivekananda Seva Kendra-O-Sishu Uddyan (VSSU) represents the microfinance organization offering microcredit to its clients on the basis of individual liability loan contract and Self-Help

Group under SGSY scheme under government of India represents the microfinance programme under joint liability microcredit contract. In this paper in Section-II , we want to give a brief overview of existing literatures, in Section-III we shall discuss about the operating procedure of VSSU and Self-Help Group (SHG) under SGSY scheme, in Section-IV we shall mention the research questions and will also narrate about the sampling procedure and in Section V, we shall discuss about the results of our natural experiment.

Section-II: Overviews of Some Existing Literatures:

The success of microcredit programme has captured the interest of many researchers in broad areas. One group of studies (Hashemi, Schular and Railey, 1996 Puhazhendi and Badatya, 2002) mentioned that microfinance scheme is very beneficial from socio-economic point of view on the rural participants when Gotez and Sengupta (1996), Amin, Rai and Topa (2003) were not so much optimistic about the programme. Hulme and Mosley (1996) had shown that the microfinance does not assist the ultra-poor. Ghatak (1999) had shown that a safe borrower always choose identical borrowers at the time of group formation. All the above mentioned literatures are based on joint liability microcredit contract.

Repayment is the only outcome of interest to the lender because of its ability to retain good borrowers. With this attract new ones is also equally important to access the overall profitability. Madajewicz (2008) established in her theoretical model that group liability loan is only desirable for the poor borrowers. In her model, below a certain level of wealth, group liability dominates individual liability. But above a certain wealth, individual liability will be preferred by rural households. Moreover she find that business funded with individual loans grow more than those funded with group loans. Lehner (2008) theoretically established that microfinance institutions offer group loans when size of credit is quite large. With a rather small loan size, all microfinance institutions offer individual loans. Empirical research on group versus individual liability borrowing has not provided policymakers and institutions the clear evidence needed to determine the relative merits of the two methodologies. The empirical literature instead has focused on related questions: which group characteristics lead to higher repayment (Ahiu, Townsend 2007). Lenders who use individual liability loans look no different than same under joint

liability when judged by repayment rates. The better lender both joint liabilities as well as individual liability in enjoying repayment rates as high as 95%. The repayment rate in each and every financial year of Bangladesh Grameen Bank and Bank of Rakyat establishes the fact. Gine and Karlan (2006) conducted a field experiment in Phillipines. They found that by offering individual loans, a microfinance institution can attract relatively more clients. Yet both types of lending schemes do not differ in repayment rates. Mitra and Kundu (2009) have shown that rural households with larger size of land are more prone to take direct membership of Primary Agricultural Credit Society so that when required they can easily take microcredit from the society under individual liability credit contract. But marginal farmers or landless households are more prone to take membership of Self-Help group operated by Primary Agricultural Credit Society to take credit when required under joint liability loan contract. Kundu (2010) again proved that wealthier among the not so affluent rural households prefers to join microfinance system operating on the basis of individual liability loan contract, comparatively less wealthy prefers to join microfinance system operating on the basis of joint liability loan contract and ultra poor is less likely to any type of microfinance system. But the comparative impact evaluation among the participants of group versus individual liability microcredit contract remains unanswered because almost all micro credit lenders offer only one type of contract either through joint liability or through individual liability and in a particular locality only one type of microcredit system is generally observable and most of the times that is under joint liability. But borrowers should have a choice of joining microfinance institution offering credit contract between individual liability and joint liability. If that is available, then only taking the participants of both types of system simultaneously we can make comparative impact evaluation of two types of micro-finance system on its participants. That can be done through 'Natural experiment'. Before proceeding to the above mentioned study, we initially have to develop few basic ideas about the operating procedure of two different types of microfinance systems considered here.

Section-III: Operating Procedure of VSSU and Self-Help Group under SGSY Scheme:

Vivekananda Sevakendra–O-Sishu Uddyan (VSSU) is a microfinance institution operates the microfinance programme on the basis of individual lending in nine blocks of

South 24 Parganas district of West Bengal, India without taking any financial assistance from the government. The covered blocks are Kulpi, Mandir Bazar, Pathar Pratima, Kakdeep, Sagar, Diamond Harbour, Mathurapur -1 and 2 and Raichak. Total number of members under VSSU in 2006-07 had crossed 45000. It is involved in the provision of small scale savings and loan to rural individuals and business enterprises. VSSU collects savings of its clients from their doorsteps through his employees called '*motivators*'. The savings can be daily savings, weekly savings or monthly savings. In daily savings scheme, each client can save at least Rs.10 daily. The rate of interest against savings deposit is 4% per annum. After accumulation of certain amount of savings regularly that individual can get credit from the micro-finance institution at least six months after becoming member of VSSU. The repayment period is generally one to three years depending on the size of loan. The loan has to be repaid in installments where monthly interest rate varies between 2% to 2.5% provided the size of borrowing is more than the amount of his savings deposits in the financial institution. But if the size of borrowing is less than the amount of his savings deposit, then the interest rate charged by the financial institution is 1.5% per month. As reported, most of the borrowers from VSSU borrow more than their savings deposit provided he has good amount of assets with high collateral value and he can present a guarantor during the time of application for loan. So the borrower is monitored not only by the motivators of VSSU but also by the guarantor. At the time of sanctioning individual loan by VSSU no specific preference is given to the female members of the households.

In those same blocks we also observe the existence of government supported microfinance programme under Swarnajayanti Grameen Swarojgari Yojana (SGSY) scheme operated by the Central government with the help of local panchayet and District Rural Development Centre (DRDC). This programme is motivated by the concept of joint liability micro credit contract. Here each group consists of not more than 15 members. The members are almost homogeneous in nature from the socio-economic point of view. It is operating like ROSCA (Besley, Coat, Loury, 1993). Self Help Group is formed mainly on the basis of self-selection mechanism. They initially have to contribute a minimum amount in their respective groups regularly and on monthly (and sometimes on weekly) basis. The total collected amount is deposited in to nearby

commercial bank. Each group has a group leader and a treasurer who are selected democratically by the group members. After accumulation of certain amount of group corpus, a member can take credit from the group she belongs. At the time of demanding loan she has to explain clearly in which purpose loan is required in front of other co-members of the group. If her explanation satisfies other group members, then only loan is granted where written consent of all the members is necessary. The credit has to be repaid within stipulated time period. Most of the times, the rate of interest is 2% per month¹. After six months of group formation, the commercial bank, DRDC officials and a representative of the panchayat will examine the performance of the group. If it is satisfactory, then that group will be qualified as Grade-1. After that, the group can get refundable financial help from DRDC and cash credit from the attached commercial bank. The group has to repay the cash credit with interest but the contribution of DRDC is an interest free loan. Sum total of the two above mentioned fund is called revolving fund, which totally depends on accumulated group corpus prior to gradation test. So micro-credit under SGSY scheme is based on '*Progressive lending*' which enables the lender to 'test' borrowers with small loans at the initial stage in order to screen out the worst prospects before expanding the loan scale. The revolving fund makes the financial condition of the group healthy and the group can then disburse larger amount of credit to its members so that more members can now invest the credit in different income generating activities. It is expected that higher investment means higher return and that can help the borrower to improve the livelihood of his (her) family.

SECTION IV: Research Questions and Sample Designs:

1. We shall try to do a comparative impact assessment through Natural Experiment about the effectiveness of those two separate types of microfinance system to uplift different socio-economic indicators of the rural microfinance participants. Here the chosen outcome variables are changes of monthly income, changes of monthly per-capita adult equivalent consumption expenditure and changes of expenditure on education and health.
2. We shall also want to make a comparative study about the role of two different types of micro-finance system for enhancement of women's empowerment (intra-household decision making power) after constructing Women's Empowerment Index (The method of calculating the index is described in the Appendix).

We initially have chosen three-gram panchayets Gabberia, Ghateswar, Krishnapur of *Mandirbazar Block* of South 24 Parganas district of West Bengal, India where we observe simultaneous existence of both types of microfinance systems. South 24 Parganas district itself is an economically backward district and the sample gram panchayets are also economically backward. The sample villages are Gabberia, Tajpur, Raghunathpur, Raipur and Bhagirathpur of Gabberia gram panchayet, Ghateswar, Polerhat, Bijoygaunj, and Baidyapara of Ghateswar Gram panchayet and Krishnapur and Madhabpur of Krishnapur Gram panchayet. The block, gram panchayets and villages under the sample gram panchayets were chosen randomly. In our sample villages the rural household has a choice and he (she) can either join VSSU or form SHG under SGSY scheme. The household even fails to participate in any above-mentioned type of microfinance programme. Here it has to be mentioned that from each household only one member can participate in any of the two microfinance programme.

The technique of 'Natural experiment' is applied to study the impact of any economic programme mainly taken by the government. It is expected that a developmental programme may change some economic indicators of a particular group of people where it is implemented. The basic objective of 'Natural Experiment' is to compare the reaction of group affected by the change of those of another group having similar characteristics but is untouched by the change. The first group is called 'Treatment group' and the second group is called the 'Control group'. To do the experiment we have to depend on 'panel data of two periods for *before versus after comparison*'. The basic objective to use the two period data is that the presence of common effect from both observable and unobservable factors can be removed through modeling the differences between the outcomes of the two period primary data. Initially we have to draw samples of the rural households of those sample villages from its voter list randomly. After that each representative of the sample household is asked whether he (she) a member of VSSU or Self-Help Group (SHG) under SGSY scheme or not. If the household belongs to any microfinance system then he (she) is asked whether he (she) has joined in any of the above microfinance institution around August to October 2006 (which is here represented as t^{th} time period as well as the *base line* period of our experiment)ⁱⁱ. If the household has joined in any microfinance system during that specific time period then he (she) was

asked his details socio-economic conditions during the time of joining the programme considering previous one month as reference period. As in this experiment we consider the time gap of two years we have to ask the same households with same set of questions about their socio-economic conditions between August-October 2008 (which is here considered as $(t+1)^{\text{th}}$ period or the *end line* period of our experiment). The time gap of two years is considered in order to minimize the recall period and to use direct observations as much as possible.

Now the total sample is divided in to three following groups.

1. The sample respondents joined in VSSU in the t^{th} period.
2. The sample respondents who have formed SHG under SGSY scheme of the government in the t^{th} period.
3. A non-participants household in any type of microfinance programme belongs to almost same socio-economic background and have failed to join in any type of microfinance system between the base line and end line period but have the eligibility criterion for joining any type of microfinance system.

The first two categories of samples belong to the *treatment group* while the last category of samples belongs to the *reference group*. During the time of considering the treatment group, we have to consider sample households belong to both types of group separately. Total sample size of the treatment group is 244. Out of which 121 belongs to first treatment group, 123 belongs to second treatment group (drawn randomly from 22 Self-Help Groups under SGSY scheme where 18 are totally women groups and 4 are male groups). Total sample size of control group is 90. During the time of drawing samples of the treatment group we ignore the households who are involved in both types of microfinance programme though total number of such households in those three gram panchayets is very few. If that happens, then there is a possibility that the borrowers will become over indebted and they may have the intension through paying one lender's installment by taking a loan from another.

SECTION V: The Results of our Natural Experiments:

In order to evaluate the impact of a certain policy, we have to compare the outcomes between what has happened to individuals' participation in the programme and what would have happened to them without it. As the outcome of what would have happened

to the same individual without programme is not observable it would be not possible to observe the same person in different states at the same time. In other words it would not be possible to observe the outcomes regarding what would have happened without the programme for those who are not in the programme. Thus for a programme participant, we can only observe the outcome variable with the programme and for a nonparticipant outcome without the programme. Identifying a control group is critical since there are chances of selection bias in such type of evaluation study. Selection bias here is mitigated by using Longitudinal data for ‘before versus after’ comparison and using ‘Difference in Difference’ (Double Difference) method over time. The data requirement for this design is observations during t^{th} period and $(t+1)^{\text{th}}$ period. We consider the value of outcome at constant price of both the treatment group and control group in both the time periods considering t^{th} period as base year. Several outcome variables are considered in the study. It is divided in to three parts: a) basic household welfare measures such as average monthly income (MINCOME) and monthly adult equivalent per-capita consumption expenditure (MPCE), b) expenditure on human capital investment such as expenditure on child’s education and health and c) enhancement of women’s empowerment or enhancement of intra- household decision making power of the participating woman or the wife of the participants. All the outcome variables are assumed to be continuous in nature. During the time of calculating MPCE of the sample households both in the t^{th} and $(t+1)^{\text{th}}$ period we following NSSO technique considered mixed reference period. Here we considered the information on consumption expenditure based on 30 day uniform recall period for all items and also by 365-day recall period for four less frequently consumed items like institutional medical care, durables, clothing and foot wear.

Table – 1 and Table-2 shows the distribution of the all the sample households in terms of monthly income and monthly per-capita consumption expenditure both at t^{th} and $(t+1)^{\text{th}}$ period.

Table-1: Distribution of the sample households in terms of Average Monthly Income (Constant Price)

Income (Rs)	VSSU		SGSY		NON-MEMBER	
	t th period	(t+1) th period	t th period	(t+1) th period	t th period	(t+1) th period
< 500	0	0	0	0	0	0
500-1000	1	0	1	1	4	4
1001-2500	12	6	66	49	62	57
2501-5000	66	57	44	56	17	22
5001-7500	23	32	09	13	4	4
7501-10000	19	24	03	4	3	3
Total	121	121	123	123	90	90

Source: Calculated from the data collected from field survey.

Actually 118 VSSU members, 119 Self Help Group members under SGSY scheme and 86 non-members could improve monthly income in constant term in the (t+1)th period if we compare that with tth period after considering tth period as base period.

Table-2 : Distribution of the sample households in terms of MPCE (Constant Price)

MPCE (Rs.)	VSSU		SGSY		NON-MEMBER	
	t th period	(t+1) th period	t th period	(t+1) th period	t th period	(t+1) th period
<417	1	1	22	07	26	22
418-500	2	2	17	14	18	16
501-600	13	7	19	25	16	18
601-700	5	10	26	23	15	13
701-800	18	16	20	22	10	15
801-900	15	13	05	11	2	3
901-1000	13	18	03	6	2	2
>1000	54	54	11	15	1	1
Total	121	121	123	123	90	90

Source: Calculated from the data collected from field survey

Official rural poverty line of each state for 1999-2000 was updated for each state using CPIAL (Consumer's Price Index of Agricultural Labourers) of that particular state. In 2004-05 that updated rural poverty line of West Bengal was Rs.382.82 (Himanshu, 2007)

and in August, 2006 that became Rs.417ⁱⁱⁱ. Table-5 shows that only 1 VSSU member was below poverty line in the base-line period and he could not cross that poverty line even in the (t+1)th period. But 22 SHG member households were below the official poverty line in the tth period but in the (t+1)th period, only 7 member households were still lying below the poverty line. So 15 SHG member households could cross the poverty line through SGSY scheme between the experimental time periods. But the performance of the households belong to control group are not satisfactory. 26 sample households belong to control group were lying below the poverty line in the tth period and in the (t+1)th period 22 sample households were remain below the poverty line. Actually 96 VSSU members, 116 SHG members and 78 non-members could improve their adult equivalent monthly per-capita consumption expenditure between the base line period and end line period. Now during the time of implementing Double-Difference Method in our Experiment, we shall have to follow the following procedures: The notations used in the technique of Double – Difference Method is explained in the following tabular form (Table-3):

Table-3 : The ‘method of calculation of Double-Difference Method

Group	Base Year	Current Year	First Difference	Second Difference
Treatment Group	$\overline{MINCOME}_{Tt}$ \overline{MPCE}_{Tt}	$\overline{MINCOME}_{T(t+1)}$ $\overline{MPCE}_{T(t+1)}$	$\overline{\Delta MINCOME}_T$ $\overline{\Delta MPCE}_T$	$\overline{\Delta MINCOME}_T -$ $\overline{\Delta MINCOME}_C$
Control Group	$\overline{MINCOME}_{Ct}$ \overline{MPCE}_{Ct}	$\overline{MINCOME}_{C(t+1)}$ $\overline{MPCE}_{C(t+1)}$	$\overline{\Delta MINCOME}_C$ $\overline{\Delta MPCE}_C$	$\overline{\Delta MPCE}_T -$ $\overline{\Delta MPCE}_C$

Here $\overline{MINCOME}_{Tt}$ and $\overline{MINCOME}_{T(t+1)}$ explain average monthly income of all the sample respondents belong to each treatment group at tth period and at (t + 1)th period respectively. Similarly $\overline{MINCOME}_{Ct}$ and $\overline{MINCOME}_{C(t+1)}$ explains average monthly income of all the sample respondents belong to control group at tth period and at (t+1)th period respectively. Again \overline{MPCE}_{Tt} and $\overline{MPCE}_{T(t+1)}$ explain average monthly adult equivalent per capita consumption expenditure of all the sample households belong to each treatment group at tth period and at (t+1)th period respectively. Similarly \overline{MPCE}_{Ct} and $\overline{MPCE}_{C(t+1)}$ explains average monthly adult equivalent per capita consumption expenditure of all the sample households belong to control group at tth

period and at $(t+1)^{\text{th}}$ period respectively. $\overline{\Delta\text{MINCOME}_T}$ and $\overline{\Delta\text{MINCOME}_C}$ indicate mean difference of monthly income between the t^{th} period and $(t+1)^{\text{th}}$ period of all the sample households belong to treatment group and control group respectively. Similarly $\overline{\Delta\text{MPCE}_T}$ and $\overline{\Delta\text{MPCE}_C}$ indicate mean difference of monthly per capita consumption expenditure between t^{th} period and $(t+1)^{\text{th}}$ period of the sample households belong to treatment group and control group respectively. Now we have to test the following hypotheses:

$$H_0: \overline{\Delta\text{MINCOME}_T} - \overline{\Delta\text{MINCOME}_C} = 0 \text{ or } \overline{\Delta\text{MPCE}_T} - \overline{\Delta\text{MPCE}_C} = 0$$

$$H_1: \overline{\Delta\text{MINCOME}_T} > \overline{\Delta\text{MINCOME}_C} \text{ or } \overline{\Delta\text{MPCE}_T} > \overline{\Delta\text{MPCE}_C}$$

Initially we have to establish whether there exists any significant difference between the mean income or mean per-capita consumption expenditure of the sample households of the prospective VSSU members and non-members or prospective SHG members under SGSY scheme and non-members in the base line period. It is obvious that $\overline{\text{MINCOME}_{\text{VSSU}t}}$, $\overline{\text{MINCOME}_{\text{SGSY}t}}$ and $\overline{\text{MINCOME}_{\text{NON-MEMB}t}}$ all are independently distributed and same thing also happens for MPCE_t among the two types of participants and non-participants. Statistical test establishes the fact that $\overline{\text{MINCOME}_{\text{VSSU}t}} > \overline{\text{MINCOME}_{\text{NON-MEMB}t}}$ as well as $\overline{\text{MPCE}_{\text{VSSU}t}} > \overline{\text{MPCE}_{\text{NON-MEMB}t}}$ and both are significant at 1% level where the value of test-statistic are 6.94 and 6.50 respectively. Statistical test also establishes the fact that difference between $\overline{\text{MINCOME}_{\text{SGSY}t}}$ and $\overline{\text{MINCOME}_{\text{NON-MEMB}t}}$ or $\overline{\text{MPCE}_{\text{SGSY}t}}$ and $\overline{\text{MPCE}_{\text{NON-MEMB}t}}$ is insignificant at 1% level where the value of test statistic are .64 and .92 respectively. So in the base line period, the average monthly income or average monthly per-capita consumption expenditure of the entire sample households belong to VSSU were higher than that of all the sample households belong to control group. But there was no significant difference is observed among the participants of SGSY scheme and non-members in the base-line period.

After applying Difference-in Difference (Double Difference) method it is established that $\overline{\Delta\text{MINCOME}_{\text{VSSU}}} > \overline{\Delta\text{MINCOME}_{\text{NONMEMB}}}$ and $\overline{\Delta\text{MPCE}_{\text{VSSU}}} > \overline{\Delta\text{MPCE}_{\text{NONMEMB}}}$ and that is significant at 1% level. So significant enhancement of monthly income and monthly per-capita consumption expenditure is observed between the t^{th} period and $(t+1)^{\text{th}}$ period among the participants of VSSU if we compare that with the non-participants. With this it is also established that

$\overline{\Delta \text{MINCOME}_{\text{SGSY}}} > \overline{\Delta \text{MINCOME}_{\text{NON MEMB}}}$ and $\overline{\Delta \text{MPCE}_{\text{SGSY}}} > \overline{\Delta \text{MPCE}_{\text{NON MEMB}}}$ and the first one is significant at 1% level and the second one is significant at 5% level. So it is also established that microfinance participation have made some differences in change of monthly income and monthly per capita consumption expenditure of the sample households under SGSY scheme between the t^{th} period and $(t+1)^{\text{th}}$ period if we compare that with the non-participants.

Now the question is whether microcredit plays any significant role among the microfinance participants to improve its monthly income and MPCE. Our data collected from field survey shows out of 121 sample households who had joined VSSU in the t^{th} period, 58 have taken credit within the experimental time period. The maximum and minimum size of credit was Rs.50000 and Rs.500 respectively and the average size of that was Rs.4492.56. Similarly out of 123 sample households of SHG members, 87 took credit from respective group within the concerned two years. Here the maximum, minimum and average sizes of credit are Rs.6500, Rs.400 and Rs.1585.31 respectively. So it is obvious that the average size of microcredit under joint liability loan contract is far less than the average size of microcredit in individual liability loan contract. No VSSU client took credit from non-institutional sources between the t^{th} and $(t+1)^{\text{th}}$ period. But 10 SHG members took credit from non-institutional sources within that time period though the size of credit is very small and varies between Rs.100 to Rs.200. They had to take it either because of the requirement of instantaneous loan or because of non-availability of credit from their respective groups. Only 23 households belong to control group had taken credit from non-institutional sources between t^{th} and $(t+1)^{\text{th}}$ period. Now to tackle the problem of selection bias in our Natural experiment we have followed the idea developed by Coleman (1999 and 2002) where the change of the value of outcome between the t^{th} and $(t+1)^{\text{th}}$ period is considered as explained variable and membership dummy, size of microcredit, size of non-institutional credit, change of dependency ratio between the t^{th} and $(t+1)^{\text{th}}$ period and whether the micro loan is repaid or not within $(t+1)^{\text{th}}$ period as explanatory variable. The control variables or individual specific characteristics such as age, educational level of the respondent, skill and any other unobserved heterogeneity can be avoided due to applying this First Differenced method in our experiment. As no sample household belong to treatment group or control group

have received any type of skill-training between the concerned time periods, this item is not considered in the following regression model.

To examine the role of micro-credit to enhance $\Delta\text{MINCOME}$ and ΔMPCE of the sample households belong to treatment groups if we compare them with control group we have to consider the following ANCOVA models.

$$\Delta\text{MINCOME}_j = \alpha_0 + \alpha_1\text{INDV} + \alpha_2\text{JOINT} + \alpha_3\text{MCREDIT}_j + \alpha_4\text{NCREDIT}_j + \alpha_5\Delta\text{DRatio}_j + \alpha_6\text{LRON} + u_i \dots \dots \dots (1)$$

$$\Delta\text{MPCE}_j = \alpha_0 + \alpha_1\text{INDV} + \alpha_2\text{JOINT} + \alpha_3\text{MCREDIT}_j + \alpha_4\text{NCREDIT}_j + \alpha_5\Delta\text{DRatio}_j + \alpha_6\text{LRON} + u_i \dots \dots \dots (2)$$

The explanatory variables are described below.

INDV =1 If the respondent is a member of VSSU and took credit from it between the concerned time period and = 0 otherwise

JOINT = 1 If the respondent took credit from her (his) Self-Help Group between the concerned time period or = 0 otherwise.

MCREDIT_j => Total size of micro-credit the jth household have taken from any of the two Microfinance institution between tth and (t+1)th period^{iv}.

NCREDIT_j => Total size of credit the jth household have taken from non-institutional sources between tth and (t+1)th period.

ΔDRatio_j => Change of dependency ratio of the jth household between tth period and (t+1)th period. Dependency ratio can be changed either due to the increase of adult equivalent family members or due to the change of the total earning members of the household. Out of 121 sample VSSU member households, the dependency ratio remains unchanged in 100 households and decreased in 9 households and increased in 12 households. Similarly among 123 member households under SGSY scheme, the dependency ratio even in the (t+1)th period remains unchanged in 96 households, decreased in 16 households and increased in 11 households. But in case of 90 sample households belong to control group, the dependency ratio remains unchanged in 85 households, decreased in 4 households and increased in only 1 household.

LRON = 1 If the micro credit has already been repaid within (t+1)th period or = 0 if it is not yet repaid or for the non-borrowers.

The regression results are shown in Table-4:

Table-4: Factors responsible for Δ MINCOME and Δ MPCE

Independent Variables	Dependent Variables	
	Δ MINCOME	Δ MPCE
Constant	189.953*	41.826*
INDV	360.819*	15.091**
JOINT	233.530*	15.522**
MCREDIT	.0356**	.00576*
NCREDIT	.00024	.0000143
Δ DRatio	-129.055	-16.033
LRON	98.032	8.321**
$\overline{R^2}$.324	.345

*=> significant at 1% level and **=> significant at 5% level.

So from the above result it is clear that microcredit has played a significant role to enhance monthly income and monthly per-capita consumption expenditure of the participants within the experimental time periods. Types of loan contract also play a significant role to enhance MINCOME and MPCE among the participants. It is established that effectiveness of microcredit to increase MINCOME among the rural households within the concerned time period under individual liability loan contract is slightly better than under joint liability loan contract. But when we look at Δ MPCE, the change is slightly better among the participants of SGSY than VSSU. Comparatively better economic solvency among the participants of VSSU than the participants of SGSY and non-members at the baseline period is the major cause behind that. Due to this reason, the enhanced income is not reflected through enhanced MPCE among the participants of VSSU. LRON does not make any impact on Δ MINCOME but creates a positive impact on Δ MPCE. Actually if loan is not yet totally repaid within (t+1)th period then a part of the monthly income is spent on loan repayment and that negatively affects Δ MPCE but that is not happening here.

In our experiment we have not found any evidence of default among the micro-borrowers both under individual liability as well as under joint liability loan contract. It is also observed from field survey that out of 57 borrowers from VSSU, 44 invested their credit for income generating activities mainly for expansion of their own business and the out of

remaining 13 borrowers, 7 took credit for medical purposes and 6 took credit for repairing their own houses and for daughter's marriage. Again out of 87 borrowers from SGSY scheme, 71 invested the credit for income generating activities and the remaining 16 borrowers utilized the credit either for medical purposes or for other consumption purposes including daughter's marriage. As most of the times loan are invested in income-generating activities, micro credit plays an important role to enhance monthly income and as well as MPCE of the sample households belong to both types of treatment group relative to nonparticipants.

Possible Size of Microcredit:

Intuitively microcredit implies small size of credit. But what should be the size? Still no one has tried to estimate the possible size of microcredit which can maximize the welfare improvement of the borrowers with the help of the following two regression equations:

$$\Delta \text{MINCOME}_j = \alpha_0 + \alpha_1 \text{INDV} + \alpha_2 \text{JOINT} + \alpha_3 \text{MCREDIT}_j + \alpha_4 \text{MCREDIT}_j^2 + U_j \dots (3)$$

$$\Delta \text{MPCE}_j = \alpha_0 + \alpha_1 \text{INDV} + \alpha_2 \text{JOINT} + \alpha_3 \text{MCREDIT}_j + \alpha_4 \text{MCREDIT}_j^2 + U_j \dots (4)$$

The notations of the above two equations have already explained. We consider the OLS method with standard assumptions. The results are shown in Table-5

Table-5:

Name of the Variables:	$\Delta \text{MINCOME}$	ΔMPCE
CONSTANT	190.554*	36.144*
INDV	356.697*	14.970
JOINT	249.873*	22.425
MCREDIT	.03774*	.0061*
MCREDIT ²	-.000000372*	-.000000277*
\bar{R}^2	.258	.293
Value of Max MCREDIT*	Rs.50,725	Rs.11010
MCREDIT ⁺⁺	VSSU- Rs.114319	Rs.26876
(Beyond which the welfare becomes negative)	SGSY- Rs.112020	

So from Table-5 it is established that the changed values of outcome between the t^{th} and $(t+1)^{\text{th}}$ period is concave in nature with respect to the size of microcredit and in both the situations it is increasing at a decreasing rate. It is estimated that the change of the value of outcome is maximum if the size of microcredit is Rs.50,725 for $\Delta\text{MINCOME}$, and Rs.11010 for ΔMPCE respectively. The upper limit of Microcredit beyond which the change of the values of outcomes become negative are Rs.114319 for VSSU clients and Rs.112020 for SHG members if we consider the outcome as $\Delta\text{MINCOME}$ or Rs.26876 for any types of microfinance system when we consider the outcome as ΔMPCE . Now if we give more importance on ΔMPCE as an indicator of improvement of livelihood of the microfinance participants^v then the size of microcredit should be Rs.11010 if we want to get maximum increment of welfare. That is true for any type of microfinance system. But that should not exceed beyond Rs.26876 because higher size of microloan will create debt burden among the borrowers which will adversely affect his MPCE in the $(t+1)^{\text{th}}$ period.

Impact on Human Capital Investment mainly on Child’s Education and Health.

Microfinance institutions sometimes take the initiative to generate awareness on family health and education among its clients. This is very much observed under SGSY scheme (Kundu 2008) where NGO takes the main initiative. VSSU is also operating like a NGO and administration of VSSU claims that they always arrange campaign among its clients to improve their awareness on education and health. Besides that improved income as well as improved monthly per-capita consumption expenditure should always encourage the rural households to spend more on education (especially girl’s education) and health. Here the expenditure on education and health includes expenditure on purchasing books and exercise books and on private tuition fees. The expenditure on health includes mainly the out of pocket medical expenses including expenses on child health. As it is expected that the education of a member can significantly and positively influence the importance of education among the children, it is treated as an explanatory variable (Edu) in the following equation (equation: 5). High dependency ratio automatically indicates the existence of more children and aged persons in that household. So it is expected that dependency ratio should have an influence on expenditure on health and education. Hence DRatio_{jt} is here considered another explanatory variable. Now we shall investigate

if there is any significant change in consumption behaviour of the participants and non-participants on education and health is observed in the end line period of our experiment. To test that we have to consider the following linear model:

$$EDH_{j(t+1)} = \alpha_0 + \alpha_1 VSSU + \alpha_2 SGSY + \alpha_3 \text{LogMINCOME}_{j(t+1)} + \alpha_4 \text{DRatio}_{j(t+1)} + \alpha_5 \text{Edu}_j + u_i \dots \dots \dots (5)$$

Here $EDH_{j(t+1)}$ is average monthly budget share of the j^{th} household in $(t+1)^{\text{th}}$ period on education and health, VSSU and SGSY are used as dummy variables and equals to 1 if the respondent is a member of VSSU or SHG under SGSY scheme respectively, otherwise zero and the notations of the other explanatory variables have already explained. We consider the regression equation only for the end line period to investigate the influence of microfinance institutions on the consumption behavior of expenditure on health and education among its clients. The result is shown in Table-6:

Table-6:

	Explanatory Variables						
Period	Constant	VSSU	SGSY	LogMINCOME	DRatio	Edu	\bar{R}^2
$(t+1)^{\text{th}}$ Period	.027	.0051	.0047	.0111*	.02432*	.00076	.247

*=> significant at 1% level.

So it is established from Table-6 that there is no significant difference in expenditure behaviour on education and health of the sample households of two different types of microfinance programme observed in the end line period. It is just established that higher dependency ratio is responsible for higher expenditure on education and health because high dependency ratio of a household reflects the presence of school going children and aged members. So campaign by VSSU and local Panchayet about the importance of education among the children and health and change of MPCE or MINCOME between the concerned time period do not make any significant improvement in expenditure share on human capital among the participating member households of both the types of microfinance system between the concerned time periods.

Next we have to investigate whether expenditure on health and education becomes necessary for the sample households after joining microfinance institutions particularly in the end line period because it is established that within the experimental time period the

change of the outcome variables i.e. MPCE and MINCOME are more among the sample households belong to treatment groups if we compare that with control group.

To test that we have to consider the following Engel’s expenditure model:

$$EHCAPITAL_{(t+1)} = \alpha_0 + \alpha_1 \text{LnMPCE}_{(t+1)} + \alpha_2 \text{DRatio}_j + \alpha_3 \text{EDU}_j + U_i \dots \dots \dots (6)$$

Here $EHCAPITAL_{(t+1)}$ explains the proportion of total expenditure of the sample households spent on education and health at $(t+1)^{\text{th}}$ period^{vi}, $\text{LnMPCE}_{(t+1)}$ is log of monthly per-capita consumption expenditure at constant price, $\text{DRatio}_{j(t+1)}$ is the dependency ratio of the j^{th} household in $(t+1)^{\text{th}}$ period, and EDU_j is the education level of the j^{th} respondent. Now if $\alpha_1 > 0$ then expenditure on education and health is still luxury from the point of view of the sample household and if $\alpha_1 < 0$ then expenditure on education and health becomes necessary for the household after joining microfinance programme. The regression results are shown in Table-7 where each sample group is considered separately:

Table-7: Dependent Variable $EHCAPITAL_{(t+1)}$

Independent Variables	VSSU	SGSY	Non-Member
$\text{LnMPCE}_{(t+1)}$	226.018*	260.082*	182.163*
$\text{DRatio}_{j(t+1)}$	- 4.316	-2.960	-7.971
EDU_j	16.196	4.836*	10.636*
Constant	-1501.858	-1876.432	-1313.665
$\overline{R^2}$.337	.549	.353

So it is clear that even after joining microfinance programme, at the end line period both types of rural participants still consider expenditure on health and education is luxury. It is also established that an increase in MPCE at 1% on average leads to about 2.26 rupees increase in the expenditure on health and education of the VSSU clients. Similarly the increase is Rs.2.60 for SHG members under SGSY scheme and Rs.1.82 for non-members. So the change of expenditure on health and education between t^{th} and $(t+1)^{\text{th}}$ period is maximum among the SHG members under SGSY scheme if we compare them with VSSU members or non-members. Actually the SHG member households were almost at the bottom of an economic pyramid in the base line period. But as the information about health, education and nutrition are channeled in the member household

through the main woman member, some parts of enhanced income is utilized as expenses of different human development factors of the household. But the change was not so high for the member households of VSSU where the member is not the female but male.

Effects on Women’s Empowerment:

Few studies in recent past have attempted to establish the relationship between credit program participation and some notion of Women’s empowerment. Hashemi, Schuler and Railey (1996) found that membership in Grameen bank and BRAC has a significant positive effect on Empowerment of the participants. Holvoet (2005) carried out one of the most carefully designed studies of the impact on decision making in the context of Tamil Nadu. She found that channeling loan through women’s group rather than to individual women substantially increased the likelihood of female decision making and bargaining relative to male decision making. However Rahman (2001) provided quantitative and qualitative evidence to this effect. He reported that out of 120 women borrowers with Grameen bank in one village 18% reported a decrease in violence while 70% reported increase of violence within the households as a result of their involvement with the bank. Pitt, Khandker and Cartwright (2006) established that participation in microcredit program enhances the index of empowerment which leads to women taking a greater role in household decision making, having greater access to financial and economic resources, greater social network, and greater bargaining power with their husband and greater freedom of mobility. But this paper is based on the members of Grammen bank and BRAC where most of the members are female and their microfinance program was operating on the basis of joint liability loan contract. Here we consider two different types of microfinance system simultaneously where not all the participants are female. It has already been told that most of the participants of VSSU are male and of SHGs under SGSY scheme are female. So in this situation we have to investigate whether intra-household decision making powers of the women have improved in their own house after she herself or any other male member of the household she belongs (mainly the husband) had joined any type of microfinance programme. We also try to investigate whether any significant difference is observed among the participants of VSSU and SGSY scheme. To test that we have to depend on the following Analysis of Variance model:

$$\Delta WEMP_j = \alpha_0 + \alpha_1 VSSU + \alpha_2 SGSY + \alpha_3 FVSSU + \alpha_4 FSGSY + u_i \dots \dots \dots (10)$$

Here $\Delta WEMP_j$ implies change of Women's Empowerment Index of the j^{th} household between t^{th} period and $(t+1)^{\text{th}}$ period.

The explanatory variables are explained as follows:

VSSU = 1 if the sample household is a member of VSSU within the concerned time period and = 0 otherwise.

SGSY = 1 if the sample household is a member of Self-Help Group under SGSY scheme and = 0 otherwise.

SEX is here treated as Dummy variable and = 1 if the respondent is female or = 0 if the respondent is male.

So FVSSU = 1 if the female member of the household had joined VSSU in the t^{th} period and = 0 if the male member of the sample household had joined VSSU in the t^{th} period.

FSGSY = 1 if the female member of the household has joined SGSY scheme in the t^{th} period and = 0 if the male member of the sample household has joined SGSY scheme in the t^{th} period.

The regression result shows the following result:

$$\Delta WEMP_j = .256 + .765 * VSSU + .975 * SGSY + .843 * FVSSU + 1.243 * FSGSY + e_i$$

Here $\overline{R^2} = .274$ and * => significant at 1% level.

The above regression shows average change of Empowerment Index of the female member of a household when she herself have joined VSSU is 1.864 and if the male member of the household joined VSSU then that average change of his wife is 1.021. Similarly average change of Empowerment Index of the main female member of a household when she herself joined SGSY scheme is 2.474 but if the male member of the sample household joined SGSY scheme then that change of his wife becomes 1.231. But among the non-participants that average change is only .256.

So intra household decision making power has definitely improved after a rural household joined microfinance system but the improvement is maximum if the female member of the household herself joins microfinance system under SGSY scheme through forming Self-Help Group.

Participation in a microfinance programme is hypothesized to increase empowerment in at least two ways: by placing more financial resources in women's hand and by increasing women's bargaining power within the household because of increased

financial contribution and by building solidarity and self-esteem through group activity with other women. It is already established that most of the households who have joined SGSY scheme have come from less affluent family background where male members of the family are the principal earning members. So empowerment of the female members of those families is not so high in the tth time period. Actually a female member of the household after joining SHG becomes much more aware about her rights. Apart from that few have improved their financial contribution within their family either through becoming an earning member or through improving her income after taking credit from her respective group. This automatically help them to improve their intra-household decision making power within the family and so the value of Women's Empowerment Index of those women have improved.

Conclusions:

At the base line period the prospective members of SHG under SGSY scheme are comparatively less affluent than the prospective members of VSSU. Most of the times the VSSU members took credit for income generating activities mainly to expand their existing business where microcredit was used as working capital and the size of credit are also quite large if we compare that with the borrowers under SGSY scheme whose members took credit both for income generating as well as non income generating activities. The increment of MINCOME after utilizing microcredit (whose estimated maximum value should be Rs.11000) is more for the borrower member households of VSSU if we compare that with the member households under SGSY Scheme which itself much higher than the non-institutional borrower member households belong to control group but in terms of MPCE we observe the change of MPCE is much better among the SHG members than VSSU members. Actually the member households of VSSU did not spend their major portion of their enhanced income for consumption purposes but the members of SGSY have saved little and have spent the major portion of their enhanced income for consumption purposes. It is also observed that the increase of income in both the situations is not reflected in the increase of expenditure on human capital. Still both the participant households consider expenditure on health and education is luxury. The intra-household decision making power of the rural woman has been improved much better among the female participants of under SGSY scheme of the government if we

compare them with the women of the member households of VSSU and of households belong to control group. So from this Natural experiment we can conclude that joint liability credit contract is comparatively more effective than individual liability microcredit contract for socio-economic up gradation of the poor rural households where the members of the SHG should be the main female member of the household.

Appendix-1

Calculation of Women's Empowerment Index: (Asked either the member or wife (mother) of the member

Name of the Variable	Points
1. Decision about utilization of Micro-credit	Female:-2, Both:-1, Male:-0
2. Decision on purchase of daily food items	Female:-2, Both:-1, Male:-0
3. Decision on purchase of live stock	Female:-2, Both:-1, Male:-0
4. Decision on purchase of utensils and other household items	Female:-2, Both:-1, Male:-0
5. Decision on child education, child vaccination and other health related matters	Female:-2, Both:-1, Male:-0
6. Does she earn regularly and contribute in her family?	Yes:- 2, No:-0
7. Can she participate in different gram sabhas according to her will?	Yes: -1, No:-0
8. Can she spend for consumable goods (cosmetics) according to her will?	Yes: -1, No:-0
9. Can she go outside without taking permission from her husband or elder son?	Yes: -1, No:-0
10. Can she cast her vote according to her will?	Yes: -2, No:-0
11. Can she protect herself against domestic violence?	Yes: -1, No:-0
12. Decision on Family Planning	Female:-2, Both:-1, Male:-0

Maximum point is 20 and more point indicates more Empowerment of Woman or more intra-household decision making power of the main woman of the sample household.

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ⁱ So the rate of interest charged against credit in both types of microfinance system are more or less same.

ⁱⁱ The survey was conducted between August to December in 2008. This time period was considered in order to minimize the recall period of each respondent.

ⁱⁱⁱ Calculated by the author.

^{iv} Here all the borrowers took credit only once between the two time periods.

^v Because in India, poverty is measured through Monthly Per Capita Consumption Expenditure.

^{vi} The calculation is done on monthly basis.