

Microfinance Impact on Poor Rural Women Empowerment:
A Household–Level Bargaining Analysis
(The DECSI¹ Case: Tigray State, Northern Ethiopia)

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Abstract: This paper attempts to investigate empirically whether DECSI microfinance access to credit can help poor rural women in improving their intra-household level bargaining power towards empowerment. The empirical measures of women’s bargaining power and hence empowerment used in this paper are underpinned by a household bargaining model, and gender and empowerment analysis framework. By using randomly collected cross section data on both DECSI microfinance programme participant and non-participant eligible households in Tigray region of northern Ethiopia and by adopting a methodology that allows for the possibility of self-selection, this study confirms that the linkage between DECSI microfinance intervention and women empowerment through intra-household bargaining power is weakly significant and have positive effect on some spheres of economic empowerment dimension within a household, but insufficient to address non-economic empowerment dimensions that can reduce intra-household gender inequality. The primary policy implication is the importance of integrating the region’s finance accessing programmes with interventions targeting on mainstreaming gender equality promotion to community norms and values. Further investigations should question a programme actual achievements, impact, in terms of capital formation beyond access and use right of an intervention by a client. Intra-household related studies should underpin household theoretical frames to reduce inconsistencies emanating from study approaches.

Key words: *poor rural women, empowerment, DECSI microfinance*

Introduction

Little analytical research has been carried out in the area of microfinance impact on poor rural women household-level empowerment through bargaining analysis of a game-theoretic approach. Even though most of the related studies lack strong theoretical background, some (Kurey, 2005; Terefe, 2002; Wubet, 2006; Borcgrevink, et al, 2005; Bavaiah and Rao, 2006; Haymanot, 2007; WABEKBON, 2006; Fredu, 2006, and Zaid, 2008) have been conducted that directly or indirectly touch upon issues of gender or women empowerment. Context specific measurement approaches that lack theoretical foundation encountered discrepancies (World Bank, 2005) of study findings and created controversies in microfinance and empowerment linkages. Some descriptive studies(WABEKBON, 2006; Haymanot, 2007; Wubet, 2006 and Borcgrevilnk,et al, 2005) ensure that participation of women in microfinance service has brought about significant impact on the livelihood and enhanced women’s household decision making, and improvement on other direct and indirect outcomes of women’s empowerment. Kabeer (2001) and Shetty (2004) identified some

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reasons for inconsistencies of findings linking microfinance and women empowerment: multidimensional concept of empowerment, heterogeneous category of women, time dimension of empowerment and methodological differences (cited in Osmani, 2007). Similarly, World Bank (2005) identified differential expectations and assessments, the investigator's orientation and emphasis, and contextual differences in the impact of micro credit programs as contributing factors for deviations in outcome assessments. However, diversified studies for program and empowerment linkages as well as the reviews criticizing the weakness of past studies wrapped household bargaining analysis as an alternative approach. The present study believes household bargaining analysis of a game-theoretic type appropriate analytical tool for program impact analysis on empowerment. In turn, poverty analysis through empowerment, which has remained silent approach, flourishes attention. Neglecting the empowerment aspect of poverty analysis, non-monetary one face of the same coin, resulted most of rural development policies designed and implemented in many developing countries, handed down from one generation to the next, averse a concerted effort to engage individuals and communities towards eradicating poverty through active and prolific participation and the willingness to face up to the root causes of poverty. This is often an outgrowth of historic and contemporary social divisions that cut the poor out of opportunities to share power, equal opportunities and, in the end, hope. But, empowerment approach requires changing beliefs and local institutions both formal and informal that retard development or restrict it from benefiting the poor.

In the midst of empowerment approach to poverty analysis, the diverse aspects of women empowerment either as the outcome of interest or as the intermediary factor touching other development outcomes weakly share common indicators and methods due to lack of supporting theoretical frameworks. However, for studies like the current, using household bargaining analysis and benchmarking the studies in the context of empowerment and gender analysis frameworks increases accuracy of empirical findings and respective inferences. By reducing the discrepancies through keystone theoretical frameworks and using robust estimation strategies, this study assesses DECSI microfinance programme impact on poor rural women empowerment in Tigray region. Specifically, this paper investigates micro credit impact on improving indices of women breakdown position in a household for the implication of women's feeling of powerfulness through generating, owning and controlling household assets by themselves, examines DECSI loan programme interaction with empowerment, via dimensions and levels, enlightens institutional (formal and informal) structures enhancing or hindering women's participation in income-earning activities

(strategic life choices). This study therefore attempts to fill the gap by investigating microfinance and women household-level empowerment linkage in terms of household bargaining model and gender and empowerment analytical tools. Many impact indicators are considered to calculate ATT and estimate propensity scores for households and the relationships and findings are generally applicable to rural poor households and women in Ethiopia and others in developing countries. The analysis of the objectives is based on rural household survey from a typical region, Tigray in northern Ethiopia. Matching based on propensity score and econometric and statistical tools are used for analysis. The scope is limited to the study of poor rural women empowerment through DECSI loan program participation when compared to eligible non-participants.

The paper is organized as follows. Section 2 reviews the extant literature relevant to empowerment conceptualizations, and linkages between microfinance and poor rural women empowerment. Section 3 discusses theoretical approaches. In section 4, the data setting and estimation strategies are presented. In section 5, ATT calculations and related discussions, empirical estimations of propensity scores, are presented. Section 6 summarizes the main result with some insights of the study in the end.

Review: Is empowerment an end or a means?

Looking intra-household empowerment through household models and empowerment and gender analysis framework sharpens the multidimensional aspects of empowerment conceptualization, demarcation of its indicators and the measurement approaches. It is controversial to relate microfinance and empowerment naively without further questioning the strength and direction of their linkages. A game-theoretic type of household bargaining analysis is a growing and firm approach to assess gender and household level empowerment where gender bias and undermining of equality is second burden next to women's severe vulnerability to poverty. Scholars, researchers, institutions and practitioners have been weighting up the views on empowerment as either outcome or a means for other outcomes, but the evaluations have been dependent on specific development schema.

By criticizing top-down approaches to development, the new watchwords have been "participatory" or "community-led" development (Mansuri and Rao, 2004; Uphoff, 1996) and, more recently, "empowerment." There has been a great deal of debate and discussion on empowerment and in particular on areas related to its conceptualization, measurement and evaluation in development processes as well as the associated outcomes. Is empowerment an end of a development process or a means to other development outcomes? For popular

women movements in Latin America and Caribbean, and the feminist movement, empowerment was conceived as an improvement of self-esteem and self-confidence as well as the ability to choose what direction individual life should take for the collective power to change gender relations in the economic, political, legal and socio-cultural spheres (Dooren, 2007). It is underscored that empowerment is the need for increasing poor people's access to opportunity, security, and empowerment for economic growth and poverty reduction (World Development Report, 2001). The Beijing Declaration, as pointed out in Dooren (2007), *“women's empowerment and their full participation on the basis of equality in all spheres of society, including participation in the decision-making process and access to power, are fundamental for the achievement of equality, development and peace”*.

The Microcredit Summit Campaign launched for achieving development goals in 2015 ensures to reach 175 million of the world's poorest families, especially the women of those families, with credit for self-employment and other financial and business services to lift 100 million families above the US\$1 a day threshold (Harris, 2007). However, the development of instruments and indicators with which to monitor and evaluate empowerment processes and outcomes is still at an early stage (Alsop and Heinsohn, 2005) because the term empowerment itself is often poorly conceptualized (Gurumurthy 1998; Kishor and Neitzel 1996; Mason, 1986) and yet imprecise. In the minds of some, economic empowerment implies entitlement to a share of wealth or income (Gergis, 1999), however, international understanding suggests that entitlements do not breed economic empowerment rather creates an attitude of dependency, undermine the power of positive thinking of one's own ability and nurture the feeling of helplessness and disempowered. Narayan (2005) relates it to terms such as agency, autonomy, self direction, self determination, liberation, participation, mobilization, and self confidence and defines in Narayan(2002)³ as the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control and hold accountable institutions that affect their lives.

Its implication is a participatory bottom-up approach to working towards development objectives (Ibrahim and Alkire, 2007)⁴ and characterized as a group's or individual's capacity to make effective choices to make choices and then to transform those choices into desired actions and outcomes (Alsop, 2006) by challenging the forms of operation which compel millions of people to play a part in their society on terms which are inequitable, or in ways which deny their human rights (Oxfam, 1993)⁵.

³ Cited in Empowerment and Poverty Reduction: A sources book, World Bank (2002)

⁴ World Bank (2007): Available at www.worldbank.org/empowerment.Washington

⁵.Cited in Alsop(2005)

A review of the many definitions of empowerment by Ibrahim and Alkire (2007)⁶ classify empowerment into both expansions of agency (the ability to act on behalf of what you value and have reason to value)⁷ and the opportunity structure (those aspects of the context that determine their ability to transform agency into effective action: formal and informal institutions)⁸. The various definitions are generally consistent with empowerment as “an intentional ongoing process centred in the local community, involving mutual respect, critical reflection, caring, and group participation, through which people lacking an equal share of valued resources gain greater access to and control over those resources”⁹ or “simply a process by which people gain control over their lives, democratic participation in the life of their community”¹⁰ and “ a critical understanding of their environment”¹¹ (cited in Perkins and Zimmerman,1995). However, “the variation in nature and importance of empowerment across contexts poses a challenge in terms of both consistencies and comparability in measurement schemes” (Malhotra, Schuler and Boender, 2002), besides the grounding of “theories of empowerment on both processes and outcomes, suggesting that actions, activities, or structures may be empowering and that the outcome of such processes result in a level of being empowered” (cited in Perkins and Zimmerman, 1995)¹². Despite the differences in context and purpose of empowerment among practitioners, researchers and policy maker upshot diversity in conceptualization, it has become a common practice to categorize its conceptualization into “an objective of program (an end in itself) or an instrument for achieving an objective (a means to an end)” (World Bank, 2007).

In general, empowerment processes and/or outcomes can be assessed in relation to different domains (state, market and society) and sub-domains of a person’s life and at different levels (local, intermediary and macro). At the intersection of domains and levels, people experience different degrees¹³ of empowerment. The extent of linkage between empowerment and development programmes is one of the determinants for the degree of empowerment. However, the link between microfinance and women empowerment has been perceived by many as weak (Mayoux, 2005 and 2009a). The present study investigates this linkage for DECSI microfinance programme.

⁶ World Bank(2007)

⁷ *Ibid.*

⁸ *Alsop(2005).*

⁹ *Cornell and Empowerment Group(1989)*

¹⁰ *Rapparot(1989)*

¹¹ *Zimmerman, Isreal, Schulz,and Checkaway(1992)*

¹² *Switf and Levin(1987) and Zimmerman(in press)*

¹³ *Existence, use achievement*

Theoretical approaches

Household bargaining models and gender and empowerment frameworks: A cooperative bargaining model of marriage begins with a married couple and assumes that each spouse has utility function that depends on his or her own consumption. If spouses fail to reach agreement, both husband and wife receive the utilities associated with a default outcome. These default utilities are usually depicted as the “breakdown position”, but sometimes correspond to the “disagreement point”, or “fallback position”. In some models, the threat is interpreted as divorce, in others as a non-cooperative equilibrium within the marriage. Nash (1953) bargaining provides the leading solution concept in cooperative bargaining models of marriage. In Nash bargaining solution, the utilities received by husband and wife depend upon the threat point: the higher a spouse’s utility at the threat point, the higher the utility that spouse will receive in the Nash bargaining solution. Figure (1) depicts an implication of the breakdown position in Nash bargaining solution (Mas-Collel et al, 1995:842).

Suppose there are two individuals in a household: M (Male) and F (Female). Each person has a certain amount of resources at his or her disposal. If they try to use those resources separately, without entering into any cooperative arrangement, they can reach the welfare level (W_m^o, W_f^o) , denoted by a point such as B in figure 1, in which the man’s welfare level is W_m^o and the woman’s welfare level is W_f^o .

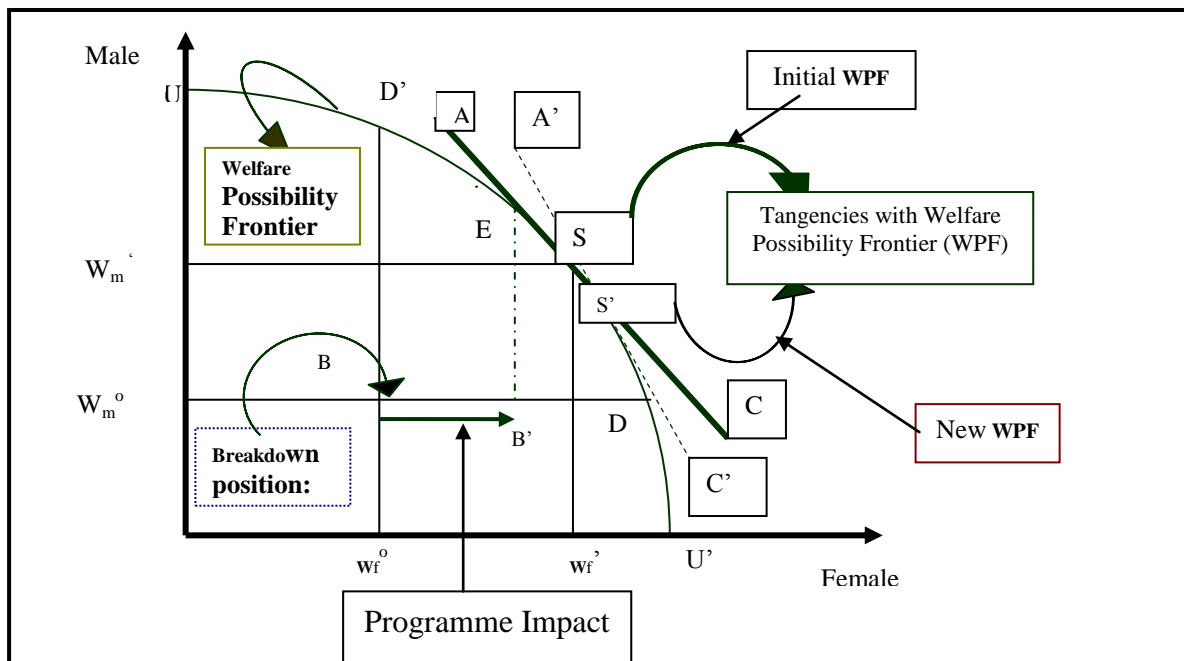


Figure 1: An implication of Breakdown position in Nash Bargaining Solution (N)

It is also called the fallback position or the breakdown position, because if cooperation happens to breakdown for some reason, then both parties can fallback to this position. If the two parties can agree to cooperate, they would be able to achieve higher levels of welfare, subject to the limits imposed by resource constraints as depicted by the welfare possibilities frontier UU' in figure 1. Cooperation can lead to any point on this curve, but exactly which point will be reached depends on the assumptions about a bargaining process. It is safe to assume that the final outcome will lie on the segment AC , because outside the segment one of the parties is worse off compared to the status quo (B).

To pin down the point on AC where the final outcome lies, we need further assumption. The most common approach is to adopt the Nash bargaining solution. Let the two individuals attain the welfare levels W_f' and W_m' after cooperation, so that their gains from cooperation can be denoted by $(W_m - W_m^0)$ and $(W_f - W_f^0)$, respectively. Then the Nash bargaining solution (N) is defined as those levels of final welfare (W_m', W_f') which maximizes the product of the two individual welfare gains:

$$N = (W_m - W_m^0) * (W_f - W_f^0) \quad (1)$$

In figure 1, if we draw a tangent on AC such that the midpoint of the tangent contained by the extended lines BD' and BD coincides with the midpoint of tangency (S), then the welfare levels represented by the point S constitutes the Nash solution (Mas-Collel et al, 1995:842). The location of the point S i.e. the distribution of final welfare depends crucially on the relative strength of the breakdown position. If the breakdown position (B) of one party becomes stronger, the final outcome will also move in his or her favour. Suppose the female's breakdown position improves while that of the male remains, so that the breakdown point moves from B to B' in figure 1, the final outcome will then lie on $A'C'$, and the Nash solution will be given by the new point of tangency S' which is also the mid-point of the tangent contained by the extended lines $B'E$ and $B'D$. It is obvious that the new outcome S' must be to the right of S i.e., more favourable to the female.

Thus, a better breakdown position leads to a better bargaining outcome. This model thus suggests that women's bargaining power within the household depends on the strength of her breakdown position-the stronger her breakdown position the greater is her bargaining power. This implies that any thing that strengthens a women's breakdown position also empowers her. This paper thus, assesses the hypothesis that participating in micro credit (i.e., DECSI's Microfinance programme) is become an important factor towards empowering poor rural women in Tigray, by strengthening women breakdown position in an intra-household sphere. The relationship can be expressed as:

$$B = B \odot D, X_i \quad (2)$$

Where, B= Women's breakdown position; D=Participation in DECSI micro credit programme; D=1 if a woman participate in the credit programme; D=0, otherwise; Xi= vector of other observable individual-level and household characteristics that may affect women's breakdown position. For empirical investigation of this relationship, D is a binary variable used to test the hypothesis that conditional on other variables women's participation in DECSI's micro credit programme improves their breakdown position:

$$B \odot = 1 | X \quad \succ \quad B \odot = 0 | X \quad (3)$$

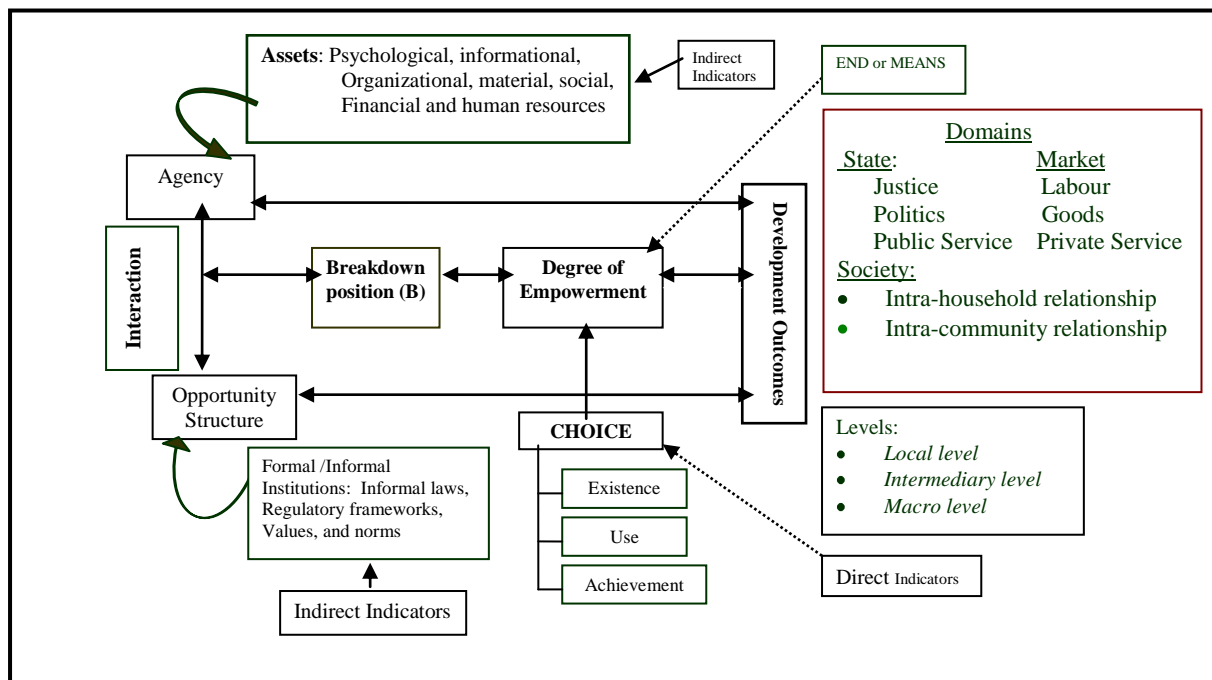


Figure 2: The relationship between outcomes and correlates of empowerment

In the process of estimation, the attempt is using some alternative empirical measures of women's breakdown position as indicator (figure 2) of their bargaining power and test the hypothesis for each of the indicators. Figure 2 indicates the relationship between outcomes and correlates of empowerment. Possible intra-household empowerment indicators are drawn from the framework (figure 2) that coincide and beyond the variables indicated in the household bargaining models. Next discussions concentrate on the measurement issues for the relationship drawn from the underpinned theoretical approaches.

Materials and methods

The Data Setting

Tigray state, located in the northern part of Ethiopia, is one of administratively sub-divided nine regional states in the country. In this state, six major zones are constituted with their

respective proportion of population and woredas: northwestern (17%) (8 woredas), central (29%) (13 woredas), eastern (18%)(9 woredas), south eastern(23%)(11 woredas), eastern(8%)(4 woredas) and Mekelle (5%). The latter is the capital city of the state and considered as self administering zone while covers two woredas. Administrative hierarchies are sub-divided from district to the lowest as *tabias*, *kushets* and *gotts* respectively. The percentage distribution of population by region in the two consecutive census, 1994(5.9) and 2007(5.8), remained nearly the same. With the fourth biggest percentage of population, the region has annual growth rate of 2.5% in the period, nearly below country level 2.6%. Out of 4.3 million people in the region, female population (50.8%) is slightly higher than male (49.2%) complements. The proportion of urban residents (19.5%) in the region is relatively larger than the proportion within the total national population (16.3). In both urban and rural areas, the female population exceeds the male counter parts (CSA, 2008). The total land size of the region is 50078.4sq.km (CSA, 2008). The landless individuals form specific marginalized group in the rural areas (Borchgrevink et al., 2005). Due to the fact that land is scarce in the highlands, those who have not migrated have at most been able to obtain a share of the land from their parents-as inheritance after the death of the parent, or upon establishing one's own household.

For this study, sample cross sectional data is randomly drawn from a rural family in four *tabias* in the state. Microfinance research sub-team collected the data based on structured questionnaires prepared by the project for rural areas: Arato, Rubafeleg, Siye and Tsenkanet, which are within and around Geba catchments, and hence representative of the region. Each of these *tabias* is located in a different woreda¹⁴. Arato is located within Enderta woreda of the Southeastern zone that covers an area of 1339.93 Sq.Km with a total population of 152182. Rubafeleg is located within Atsbi-Womberta woreda of the eastern zone containing an estimated population of 119357 in an area of 885.32 Sq.Km. Siye is located within the Abergelle woreda of the central zone that has an estimated population of 81595 with an area of 5705.34 Sq.Km. And Tsenkanet is located in the Hawzen woreda of the eastern zone that has an estimated population of 130473 in an area of 805.95 Sq.Km.

In sample selection process, nearly hundred households were interviewed from each *tabia*. Households interviewed from each *kushet*, *tabia* sub-divided, were determined proportional to its population size and then randomly selected from the list of households in each *kushet*. Accordingly, households from Arato (*kushets*: Endabashalema, Mielate, Quien, and Shiguala); Rubafeleg (*Kushets*: Afenjiwo, Agewo, Debreselam, and Hintalo); Siye (*Kushets*:

¹⁴ CSA (2008)

Gomenge, Hidmo, Teklemekerna); and Tsenkanet (kushets: Agona, Awelo, Berikaziban, Mongolhats) were interviewed using structured questionnaire. Thus, the sample size for the study was 363 households. Additional information was drawn from focus group discussion and local administrative documents (secondary) in order to capture qualitative sides of the study. In the study area, crop production is the main stay of the economy, but owning land is a serious challenge. While keeping animals on common grazing areas is still an option, one will be more limited in securing feed than those who can collect straw from their fields after harvest. And cultivation is only possible through renting. Thus, being landless and living in rural areas leads to significant limitations in terms of the household's economic opportunities. In line with the underlining fact of poverty in the region, a few programmatic interventions, including microfinance are at the heart of striving poverty alleviation role. The failure on the part of formal financial institutions in Ethiopia to serve the poor in general and rural poor in particular is now a truism. MFIs (DECSI) were (and still being) promoted with the hope to fill the gap (Borcgrevink,et al,2005). In Tigray Regional state, the only microfinance institution operating in the area is DECSI, which dates back to 1994(for details: Zaid, 2008).

Programme Impact Estimation

Matching Using Propensity Scores (PSM): Causal inference faces a problem of estimating treatment effects in observational studies, where no systematic methods of experimental design are used to maintain a control group (Rajeev H. D. and Sadek W., 2002). The estimate of a causal effect obtained by comparing a treatment group with a non-experimental comparison group could be biased due to participants' self-election, endogenous program placement by administrators or some systematic judgment by a researcher in treatment and control group identification.

Traditional impact studies using with and without approach has a problem of missing data. Consequently, the impact of an intervention cannot be accurately estimated by simply comparing the outcome of the treatment group with the outcome of the control group (Heckman et al., 1998). Statistical matching¹⁵ proposed by Rosenbaum and Rubin (1983), endogenous models (2SLS) and/or sample selection approaches (Heckman: Two-step) are commonly used to compensate the problem of sample selection bias or the endogeneity associated with household access to intervention (eg. microfinance).

The propensity score matching, using the predicted probability of an individual receiving the treatment of interest (e.g. financial services, such as loans or savings in our case) to make comparisons between individuals with the treatment and those without, involves first

¹⁵ *Matching involves pairing treatment and comparison units that are similar in terms of their observable characteristics.*

specifying a function matching the proximity of one household to another in terms of household characteristics and then grouping households so as to minimize the distance between matched cases. Empirically, the propensity score is the conditional probability of receiving a treatment given pre-treatment characteristics, X (individual and/or household level characteristics).

$$P(X) = \Pr \{D = 1/ X\} = E \{D/ X\} \quad (4)$$

where $D = \{0, 1\}$ is the binary variable indicating whether a household has access to microfinance (1) or not (0) and X is the multidimensional vector of pre-treatment characteristics or time-invariant or relatively stable household characteristics in our context.

If exposure to intervention (in present case, microfinance) is random within cells defined by X , it is also random within cells defined by $p(X)$ or the propensity score (Rosenbaun and Rubin, 1983). In this study, households who participate in microfinance program are the treatment group and households who do not participate, but entitled to participate in the program, are a comparison group. The latter group is used to evaluate the impact of microfinance on the treated group. The question is how far women get improvement and favour in terms of breakdown position indicators as a result of participating in microfinance program (DECSI only) relative to their husbands when compared to what would have happened if they had not participated.

Let W_{1i} and W_{0i} be the amount of outcome (welfare) when a household (or woman) is exposed to microfinance treatment and the outcome when a household (or woman) is not exposed to treatment, respectively. The difference between treated and control group is represented as:

$$\Delta_i = W_{1i} - W_{0i} \quad (5)$$

Where, W_{1i} : Outcome of treatment, when household participates in microfinance. W_{0i} : Outcome of the untreated individuals, when household does not participate in microfinance.

Let equation (5) be expressed in causal effect notational form by assigning D_i as a treatment variable taking the value 1 if individual i receives the treatment (microfinance) and 0 otherwise. Then, the Average Treatment Effect of an individual (i) can be written as (Ravallion, 2005):

$$ATE = E \left[W_{1i} \mid D = 1 \right] - E \left[W_{0i} \mid D = 0 \right] \quad (6)$$

Where, ATE : Average Treatment Effect, which is the effect of treatment . $E \left[W_{1i} \mid D = 1 \right]$: average outcome for individual, with treatment, if household would participate in

microfinance ($D = 1$). $E(W_{0i} | D = 0)$: average outcome of untreated when household would not participate in microfinance program, or absence of the treatment ($D = 0$). To measure the Average Effect of Treatment on the Treated (ATT) for the sample population of the survey, which is used for this study, then equation (6) can be reformulated as:

$$ATE = E(W_{1i} - W_{0i} | D = 1) = E(W_{1i} | D = 1) - E(W_{0i} | D = 1) \quad (7)$$

The fundamental evaluation problem in estimating (equation: 7) the impact is that it is impossible to observe a person's outcome for with and without treatment at the same time.

While the post-intervention outcome is possible to observe, however, the counterfactual $E(W_{0i} | D = 1)$ outcome i.e. the effect of the treatment on the i^{th} household when an individual does not participate is not observable in the data and the evaluation problem is characterized by missing data (*ibid*). Accordingly, estimation of ATE using equation (5) by comparing simply between $E(W_{1i} | D = 1)$ and $E(W_{0i} | D = 0)$ can give a seriously biased result. The fact is that the population of treated household differs from the comparison group not only in terms of treatment status but even in terms of other characteristics. Participants and non-participants usually differ even in the absence of treatment (Holland, 1986). This problem is often referred to as the “fundamental problem of casual inferences”. A solution to this problem is to construct the unobserved outcome which is called the counterfactual outcome $E(W_{0i} | D = 1)$, i.e., the outcome the participants would have experienced, on average, had they not participated (Rosenbaum and Rubin, 1983), and this is the central idea of matching.

According to Rosenbaum and Rubin, the effectiveness of matching estimators as a feasible estimator for impact evaluation depends on two fundamental assumptions: conditional independence assumption (CIA) and common support region ($0 < P(D = 1) < 1$). In matching, the CIA states that treatment assignment, D_i , conditional on attributes, X_i , is independent of the post programme outcome: $(W_{1i}, W_{0i}) \perp D | X_i$. This implies that non-participant's outcomes (counterfactual) approximate the outcome level of participants had they not participated. This is achieved by grouping households from the sample users of the treated individuals and non treated individuals which show a high degree of similarity in their variables (X_i). The approach isolates the impact of microfinance on the outcome of a household, given that the set of variables (X 's) contain all the variables that simultaneously influence the outcome and the selection for participation decision to treatment. As a result, a choice to participate in a programme is purely random for similar individuals and the

assumption excludes the familiar dependence between outcomes and participation that lead to a self selection problem (Heckman et al. 1998, 605-654). Thus, the conditional ATT can be expressed as follows:

$$ATE = E(W_{1i} - W_{0i} | D = 1, X) \quad (8)$$

The *ATE* in equation (5) can then be written as

$$ATE = E(W_{1i} - W_{0i} | D = 1, X) = E(W_{1i} | D = 1, X) - E(W_{0i} | D = 1) \quad (16)$$

The problem in equation (8) is that the number of conditioning variables (*X*'s) is high, and thus the degree of complexity for finding identical households both from treated and control groups become difficult. Instead of matching on the basis of *X*'s, propensity score matching (conditional probability of receiving the treatment given the value of *X*'s) reduces dimensionality problem in computing the conditional expectation (Rosenbaum and Rubin, 1983:41-55). This study uses the same approach to predict programme participation in microfinance and a logit model is used to estimate the propensity score *P*(*X*). In estimating propensity scores, all variables that simultaneously affect participation in microfinance and women breakdown position are included. Thus, the average treatment effect on those treated conditional on propensity score *P*(*X*) can then be written as:

$$ATT = E(W_{1i} | P(X), D = 1) - E(W_{0i} | P(X), D = 1) \quad (9)$$

The assumption of common support region ($0 < P(X) < 1$) implies that the test of balancing property is performed only on the observations whose propensity score belongs to the common support region of the propensity score of treated and control groups (Becker and Ichino, 2002). Individuals that fall outside the common support region would be excluded in the treatment effect estimation. This is an important condition to guarantee improving the quality of the matching used to estimate the ATT. Moreover, implementing the common support condition ensures that persons with the same *X*'s value (explanatory variables) have a positive probability of being both participant and non-participant (Heckman et al., 1999). This implies that a match may not be found for every individual sample. Rosenbaum and Rubin (1983) describe assumption one and two together as 'strong ignorability'. Up on estimation of the propensity scores, this study defines a matching algorithm in order to

¹⁶ Taking into consideration

$E(W_{1i} | D = 1) - E(W_{0i} | D = 0)$ by adding and subtracting $E(W_{0i} | D = 1)$ we can obtain

$= \{E(W_{1i} | D = 1, X) - E(W_{0i} | D = 1, X)\} + \{E(W_{0i} | D = 1, X) - E(W_{0i} | D = 0, X)\}$

If $E(W_{0i} | D = 1, X)$ is equal to $E(W_{0i} | D = 0, X)$, $E(W_{0i} | D = 0, X)$ can be taken as the counterfactual to the treatment, since $E(W_{0i} | D = 1, X) = E(W_{0i} | D = 0, X)$ (see Ravallion, 2005)

estimate the missing counterfactual outcome for each treated observation based on different matching estimators: the Nearest Neighbour matching, Kernel Matching, Stratification Matching and Radius Matching. Each matching estimator varies depending on the definition of a closeness criterion used. With replacement, each control individual in the sample is allowed to be used more than ones, this is done to minimize the propensity score distance between the matched control units and the treatment unit (Smith and Todd, 2001). If the above lemmas are satisfied, the policy effect can be estimated by the procedures described in Becker and Ichino (2002) and Smith and Todd (2001). Each procedure involves estimating:

$$\Pr\{D_i = 1 / X_i\} = \Phi(h(X_i)) \quad (10)$$

Where, Φ denotes the logistic (or normal) cumulative distribution function (cdf) and $h(X_i)$ is a starting specification. We use the probit or logit model whereby whether a household/woman has access to microfinance is estimated by household and socio-economic characteristics.

Results and Discussion

Results of impact estimation, *ATT calculation using propensity score matching*: Subject to the above frameworks and methods if the selected outcome indicating variables (Table 4.1) are favouring toward DECSI loan participant households when compared to non-participant ones and their differences are statistically significant, it is liable to conclude that participation is improving household level welfare. Given that spouses are in consent to generate assets from project finance, the implication is that participation has a signal of the impact on rural women intra-household level empowerment in corresponding empowerment dimensions. As a result, participant's new breakdown point moves forward the bargaining power position. The distribution of additional welfare created among intra-household spheres from per capita project finance investment depends up on a perceived individual bargaining power, determined by economic and non-economic factors. If a household participating in DECSI loan has improved the average outcome relative to control groups, the deduction is that those outcome indicators are consistent to spouses' breakdown point indicators in an intra-household bargaining model and their respective average enhancement implies improved bargaining power for women or spouses depending upon the target of intervention.

But, gender empowerment issues insist on further questioning: Who involves in project financed household income earning activities? Which component of empowerment is affected: *agency, opportunity structure or both*? How well are women or disadvantaged aware of their self-helping perception even they break cooperative household living situation? Do women say "I can lead my own life and my dependents even I break the

marriage or common life”? How far institutional factors (*norms*) determine women job market participation? The following table shows welfare comparison for project participants and non-participants.

Table 4.1: Summary of propensity score based matching

<i>Impact Indicators</i>	Matching methods	<i>(a) Matching</i> ¹⁷		<i>(b) Matching</i> ¹⁸	
		ATT ¹⁹	SE ²⁰	ATT	SE
Household and productive assets	Radius(r)	4309.9	(3746.3)	3003.0	(2620.8)
	Nearest neighbour(nd)	2000.4	(5677.3)	3539.0	(2709.5)
	Kernel(k)	196.5	(3400.8)	3305.9 *	(1982.6)
	Stratification(s)	626.2	(3162.8)	2062.6	(2344.9)
Livestock value	Radius(r)	-1409.4	(1075.3)	-137.1	(743.1)
	Nearest neighbour(nd)	-2760.1*	(1641.5)	-513.4	(970.6)
	Kernel(k)	-1849.1*	(845.2)	-203.6	(697.2)
	Stratification(s)	-1212.4	(1082.7)	-627.8	(619.0)
Productive assets only	Radius(r)	748.5*	(279.1)	597.6*	(228.6)
	Nearest neighbour(nd)	764.2*	(286.3)	561.3*	(234.8)
	Kernel(k)	762.9*	(258.8)	593.5*	(208.4)
	Stratification(s)	661.6*	(276.3)	587.6*	(226.6)
House and household Assets	Radius(r)	4070.8	(3276.5)	2542.5	(2274.8)
	Nearest neighbour(nd)	3996.3	(5004.7)	3491.2	(2291.7)
	Kernel(k)	4646.0*	(2374.0)	2915.9*	(1746.4)
	Stratification(s)	1813.7	(2804.3)	2102.8	(2065.1)
Household food Expenditure	Radius(r)	-866.9	(1013.5)	-250.4	(707.6)
	Nearest neighbour(nd)	-2429.5	(1703.9)	-821.3	(862.2)
	Kernel(k)	-914.6	(999.4)	-367.0	(601.6)
	Stratification(s)	-1764.0*	(793.9)	-489.6	(594.1)
Household non-food Expenditure	Radius(r)	-3904.9	(3857.6)	-529.0	(2482.3)
	Nearest neighbour(nd)	-1.48*	(6466.7)	-3502.3	(3365.5)
	Kernel(k)	-4603.9	(6286.4)	-1081.4	(3419.1)
	Stratification(s)	-3535.5	(2996.5)	-97.9	(2055.6)
Household crop output per tsimad	Radius(r)	68.5	(116.7)	-5.2	(253.6)
	Nearest neighbour(nd)	-27.9	(159.2)	321.6	(311.1)
	Kernel(k)	63.9	(134.7)	-23.6	(313.4)
	Stratification(s)	159.1	(104.2)	121.2	(212.3)
Household expenditure on education and health	Radius(r)	-31.7	(44.5)	11.3	(31.8)
	Nearest neighbour(nd)	-131.1*	(76.9)	-1.4	(30.7)
	Kernel(k)	-44.9	(55.2)	1.6	(32.1)
	Stratification(s)	-8.4	(34.9)	9.6	(26.5)
Household per capita food expenditure	Radius(r)	-144.2	(160.6)	-205.4	(130.8)
	Nearest neighbour(nd)	-319.9	(258.2)	-231.7	(180.3)
	Kernel(k)	-144.5	(120.4)	-215.1*	(107.7)
	Stratification(s)	-337.6*	(125.8)	-277.9*	(108.7)
Household items and jewellery purchase	Radius(r)	-19.4	(19.2)	-11.1	(16.4)
	Nearest neighbour(nd)	-84.1*	(33.8)	-30.3	(23.1)
	Kernel(k)	-41.6	(57.2)	-12.8	(13.7)
	Stratification(s)	-9.7	(14.8)	-13.7	(13.3)
Household per capita	Radius(r)	-2.8	(2.8)	-591.9	(446.5)
	Nearest neighbour(nd)	-11.7*	(4.9)	-810.8	(594.9)

¹⁷(a) Treated sample household size: 192; Control sample household size: 44(Family in couple-Two decision pillars exist together)

¹⁸(b)Treated sample household size: 238; Control sample household size: 74(All category of family: married, widows, divorce, separated)

¹⁹ ATT significant at 5%=*, 10% =**and 1% =*** level

²⁰ Robust standard error

non-food expenditure	Kernel(k)	-3.4	(5.6)	-653.4*	(371.0)
	Stratification(s)	-1.8	(2.1)	-628.5	(491.3)

Table 4.1: Summary of propensity score based matching (Continued)

Impact Indicators	Matching methods	(a) Matching		(b) Matching	
		ATT	SE	ATT	SE
Per capita household and productive assets	Radius(r)	377.5	(920.8)	-121.7	(614.9)
	Nearest neighbour(nd)	-162.1	(1537.6)	189.6	(814.2)
	Kernel(k)	493.0	(603.7)	2.7	(504.4)
	Stratification(s)	-178.6	(740.4)	-258.6	(526.6)
Household per capita total expenditure	Radius(r)	-643.9	(710.6)	-797.3	(527.3)
	Nearest neighbour(nd)	-2192.7*	(1128.7)	-1042.6	(712.2)
	Kernel(k)	-726.2	(963.3)	-931.4*	(437.1)
	Stratification(s)	-1063.3*	(553.8)	-843.6	(595.7)
Cumulative empowerment Index (CEI) ²¹	Radius(r)	0.01	(0.04)	0.06*	(0.03)
	Nearest neighbour(nd)	0.07	(0.08)	0.04	(0.04)
	Kernel(k)	0.02	(0.06)	0.06	(0.04)
	Stratification(s)	0.06	(0.03)	0.06*	(0.02)

Thus, the distribution of positive outcome of participants with respect to non-participants depends up on the degree of bargaining power among family spheres. Based on the four most common matching techniques (*see* Table 4.1), propensity score matching (ATT calculation) for outcome (household welfare) indicators are computed for DECSI microfinance participant and non-participant households. The following discussion focuses on statistically significant outcomes (ATT: positive, negative or constant).

In all comparisons, DECSI loan participants have *higher average household & productive assets* than non-participant households, but the difference is not statistically significant except under kernel approach for overall sample. In cases of sub-sample for husband and wife family composition, this outcome is not statistically significant to demonstrate the average difference between the two groups. In sample that takes account of households currently out of marriage, the kernel comparison has in average higher outcome value. In nearest neighbour and kernel comparison *household livestock value* is in average significantly lower for DECSI loan participant households relative to non-participants in a husband and wife family composition. In all comparison techniques, *household productive asset* is in average higher for DECSI loan participants when compared to non-participants for over all sample and sub-sample cases. Similarly, *house and household assets* are in average higher for participants than controls in kernel comparison in both sample categories. The outcome comparison for *household & productive assets* is broader and gross that may cover the effect. Thus, the next discussion decomposes this into particular asset components such as *house and household assets, livestock ownership and productive assets* so as to observe the specific

²¹ Computed from *access to resource sub-index, gender awareness sub-index, household decision making sub-index, coping capacity sub-index, contribution to household income sub-index and asset ownership sub-index*

average outcome difference between the participant and control groups. For this reason, in explicit comparison for the components (when *household & productive assets* splits into three sub-components: *productive assets*, *livestock ownership*, *house and household assets*), the average difference for participant relative to non-participants is significant and positive for *productive assets*, negative for *livestock ownership* and positive for *house and household assets* at least in one of the matching approaches.

Household food expenditure is in average lower for participants than non-participants in stratification comparison. The difference is statistically significant for husband and wife family composition. In *per capita* terms, *food expenditure* has shown in average lower outcome for participants relative to non-participants for couple family in the same comparison technique and significant difference further observed for overall sample in kernel comparison too, besides the stratification matching. The comparison is statistically sound. *Household items and jewellery* purchase is significantly lower for DECSI loan participants relative to non-participants in nearest neighbour comparison techniques. *Household non-food expenditure* is in average lower for participant relative to non-participant in nearest neighbour comparison for couples and the difference is statistically significant. Similar situation is observed for *household expenditure on education and health*. In nearest neighbour comparison, *per capita household non-food expenditure* is in average lower for participants than non-participants for sample in husband-wife family composition and slightly similar result observed for overall sample in kernel comparison. *Per capita household total expenditure* is in average statistically significantly lower for DECSI loan participants relative to controls in stratification and nearest neighbour comparison for sub-sample and slightly similar situation happened in kernel comparison for overall sample. In radius and stratification comparison for the whole sample, DECSI loan participants have in average higher *cumulative empowerment index (CEI)* relative to control groups. For sample households in husband and wife family composition, we haven't observed in average statistically significantly different *cumulative empowerment index (CEI)* outcome.

In general, in this section matching comparison for most common techniques are undertaken. That is subject to authenticity of conditioning (control) variables²² predicting the DECSI loan participation dummy in propensity score estimation. Based on the comparisons so far in effect, impact indicators are positive for some and negative for others for DECSI loan

²² *Total land size, Wife's education, Husband's education, Husband's age, Wife's age, Husband and wife age difference, Household literacy rate, Household illiteracy rate, Husband's age square, Wife's age square, Arato tabia dummy, Thenkanet tabia dummy, Rubafeleg tabia dummy*

participants when compared to non-participant eligible households. Some of the outcome indicators remained unchanged. The next discussion focuses on a few possible explanations for welfare indicator variables.

As observed during this survey, part of sample households are more vulnerable to poverty and consequently in favour of decision to support their life and dependents through means like *safteynet*, microfinance and other life sustaining choices. Comparisons for *household and productive assets* in our data that include house and household assets, livestock and productive assets are indicators of family long-time perspective wealth accumulations in rural family. Thus, sample households in both groups are likely to own some of these assets starting from new and independent family formation. This may be true in rural dwelling because predominantly, for instance, assets at marriage also affect farm size distribution. That is the best proxy for rural family wealth and newlyweds during their own, separate farming schemes. But the allocation of land is either from grooms or/and brides family rather than in purchase from income earned from project participation. Except land service renting, marketing is not legally possible in Ethiopia. But, in the study area it is in short supply.

As studies by Fafchamps and Quisumbing (2002) in Ethiopian perspective witnesses, assets brought at marriage make up the principal form of start-up capital for new farms and most of them are fixed assets including land, house, jewellery, livestock and farm equipments. This may imply that asset formation and accumulation of household asset is a lifetime job for households in general and new weds in particular. However, project participation choices if successful can augment and step up household capital formation. Nevertheless, sufficiency of project finance and conditionality for clients to sustain in project is subject to individual multivariate factors and the project's overall goal. Household asset building may necessitate auxiliary finance away from the loan sources from projects. Rural poor are constrained with many legal, institutional and client forming conditionality when preferring to participate in this kind of programme intervention. In actual fact, households do not feel confident to invest project loan on long-term investment if they have no other means to repay the loan and finance capital cost. Household business creativity potential, motivation for outside income, household decision making pattern and individual sensitivity to existing norms regarding job market participation by and large matters for better performance of the project finance, let alone the project conditionality. Weaker labour force proportion in a household exacerbates the problem in a rural family. If a household remain more vulnerable to poverty, for instance, due to shocks like diseases, crop failure, animal death and other natural catastrophes, the

major portion of project finance is likely to answer livelihood sustenance question as the primary end and most likely deflect long run programme effect. However, finance access from project participation is likely help family investment on short term income earning activities such as livestock fattening for reselling, as seed capital in rural petty trade like local beer (*tella*) selling and in purchase of cereals and fertilizers if they use for productive activities, if not they spend on consumption. Households who consume from project loan have reported loan-trap on their current existence. Consequently, they borrow from other sources to repay programme loan.

As respondents informed both in focus group discussion and individual household interview, participation in other administratively introduced programmes (household packages, *safteynet*, agricultural extension) is allowed if an individual has participation and also good performance with less default in loan programme. This is very likely constraint for participant households not to show outcome difference for the most part of fixed assets when compared to non participants. Participants would have shown scaling up welfare effect for this asset outcome in short term productive activities, but the season was drought and households altered to consumption from project investment. Households from both groups perceive the same situation due to drought shocks and reported crop failure, animal death and household illness as their major life challenges and a household welfare change was scaling down.

A composite of six empowerment indicators (Cumulative Empowerment Index: CEI)²³ combining both quantitative and qualitative data collected from wife in a household is indexed in order to get a comprehensive feature of women's intra-household level empowerment for both DECSI loan participants and non-participants. CEI is weighted from sub-weighted individual responses from *access to resource sub-index*, *gender awareness sub-index*, *household decision making sub-index*, *coping capacity sub-index*, *contribution to household income sub-index* and *asset ownership sub-index*. To capture the multidimensionality aspects of empowerment, information is collected beyond the information required to measure a monetary version of poverty and vulnerability in a household. Many of the poverty analysis rely on income or expenditure based approaches or ingredients of economic empowerment. However, other empowerment dimensions like psychological, political, legal and social aspects at individual, household, community,

²³ Similarly, Daniel G. M. (1995) computed for measuring food insecurity. Food Consumption and Nutrition Division International Food Policy Research Institute. Washington, D.C. 20036-3006 U.S.A.

regional and national levels are significantly determining factors in gender analysis. In this intra-household level empowerment study CEI index attempts to capture economic, social and psychological dimensions of empowerment indicators. In this respect, a composite empowerment index is computed for those psychological and attitudinal responses from sample households for a wife and economic and social dimensions are measured from agency components of empowerment. Some of social dimensions of empowerment are categorized to opportunity structure components of empowerment. Most agency component of empowerment indicators shows no significant difference between participants and non-participants. However, cumulative empowerment index (CEI)²⁴ show significantly higher level for DECSI loan treated when compared in two of the matching techniques to non-treated. These differences are scaled up by responses related to psychological and some aspects of social dimensions of empowerment, which are mostly ignored in social and economic analysis relying only on income or expenditure approaches.

As focus group discussion²⁵ assures, most of the members having an attitudinal and psychological confidence in how to eradicate poverty, cope up vulnerability and other informational assets and all of their discussion points are included in six sub-indices. The discussants perceive that rural finance interventions have empowering capacity if intended for productive investment. This helps them develop non-monetarily measurable psychological asset component of empowerment. However, the group discussed that households headed by husband show existing higher power share for husband than wife or any other senior family members in the rural part of the region. As a norm in the society, husband is more respected in a family and moreover he is considered as major income earner and decision maker in his existence. Even though wife has a “say” in family issues, husband makes major decisions in consultation with wife or other senior family members. The situation of husband and wife power relationship in household level decisions in most cases depend on their level of literacy, income earning potential, relative access and ownership of household level asset control, use and accumulation potential and also on their respective family background. In marriage market, woman from more affluent family mostly deserves higher breakdown point and better bargaining power when compared to women from poor family. However, land and other long-term asset family heritage right for female when compared to male is less if not owned in marriage breaks due to divorce, widow or

²⁴ *The most important indicator in this study for household level bargaining power and then to warrant received degree of empowerment for women in our sample household*

²⁵ *Conducted to groups in each tabia comprising 8 members per group including men and women from loan participant and non-participant households for in-depth discussion related to major issues in computing CEI*

separation. Even in these cases, well-functioning of formal and informal institutions in a particular rural society highly determines woman's control and use of household resources. But, the male has formal right to inherit household assets. This is a kind of informal institution in opportunity structure version of empowerment and it is weakly addressed in bargaining models and measurements dependant on income or consumption only. But, its contribution to gender bias in a household is severe. Similarly, in components of CEI computation from questionnaire based information; responses from household inclines toward husband for household decisions, major household income contribution, household coping capacity, asset ownership and accessing resources; except gender awareness.

In general, positive outcome indicators are potentially a source for improving a fall back point between husband and wife if a wife has created awareness of belongingness, powerfulness, sense of gender equality in a household and also in a community. Once husband and wife have formed family and started to manage their farm and other businesses, it is legally binding to share ownership of household resources by decision pillars. If a wife is weak to improve her fall back point during cooperative welfare creation, the programme impact is weakly interlinked to intra-household level woman empowerment dimensions. Thus, household level economic empowerment is necessary, but weak to overcome gender bias. Therefore, assets such as psychological, social and cultural dimensions of empowerment are vital to overcome women gender bias and other barriers, besides economic empowerment. But, microfinance interventions including DECSI are not sufficient to reach these dimensions if not supported by other joint programmes that work in integration.

In this comparison tasks, propensity score which is based on observable predictors would not capture sample selection bias that can arise from unobservable and also from simultaneous equation type endogeneity bias. Further undertaking multivariate analysis can increase the efficiency of the outcome matching techniques for the same cross sectional data. One can also identify determinants of the above outcome (welfare) indicator variables by regressing individual, household and socio-economic level variables on those outcome variables through sample selection models or simultaneous-type endogeneity bias treating models.

Conclusion and recommendation

The paper is all about DECSI microfinance programme impact on rural poor women empowerment through improving their intra-household level bargaining power in Tigray region, Northern Ethiopia. The section aims to hit highlights of this study, underline the

findings inline with the study objectives, outlines outcome of the study, summarizes its link with previous research and forwards policy recommendation and further research tips.

Both household bargaining models and empowerment and gender analysis frameworks are used as underlining theoretical approaches for the study. Household-level empowerment indicators and their theoretical and conventional relationships are firmly drawn from the frames. In terms of propensity score matching, ATT is calculated for household and productive assets, livestock value, productive assets only, house and households assets, household food expenditure, household non-food expenditure, household crop output per *tsimad*, household expenditure on education and health, household per capita food expenditure, household items and jewellery purchase, household per capita non-food expenditure, per capita household and productive assets, household per capita total expenditure and CEI. Statistically significant and positive outcome (ATT) indicates improvement of household welfare for participants with respect to non-participant. Statistically significant and negative outcome indicates household welfare loss for participants with respect to non-participant. Statistically insignificant outcome confirms lack of impact of the programme for participants when compared to non-participants in respective variables. Positive outcomes show the empowerment of women if two people ‘cooperate’ in order to improve each of their household level resource ownership and status as compared to a situation in which they do not cooperate at all (Sen, 1985). In the absence of a dictator, the differences in individuals’ utility function in a marriage are resolved through the bargaining process as if it were a cooperative game of two players (sub-sample case).

Most previous studies on microfinance impact targeting on women household level empowerment indicate weak programmatic attainment. Loan size registered by women name in a household was presumed as one of prominent indicators of impact of microfinance on women empowerment. It is criticized that microfinance programme become weak to improve women household bargaining power, because the final decision on loan finance is left for the male, it does not matter whom brings the loan into a household.

Firmly, in this study also poor and marginalized rural woman confront the capability deprivation due to economic and non-economic factors that holds back their ability to be responsible for their own lives and able to perform their own decision-making. In most of household capital formation variables, the impact compared between DECSI microfinance programme participant and non-participants remained the same or even negative. Some of the variables show positive ATT for participants. This study further suggests that the degree of

women empowerment from positive outcomes are subject to not only access and use of the project finance, but also the achievement of women from project financed income earning and capital formation activities. That ensures women improve their fallback position welfare and hence intra-household level empowerment.

Therefore, attempts should be made to improve the interventions targeting on both agency and opportunity structure components of empowerment. Weakly addressed economic dimension of empowerment observed in this study is not sufficient to improve intra-household gender bias and to push women use the economic resources in capital formation and income earning activities. Most of economic dimensions of empowerment are part of agency components, but opportunity structure components are equally important in existence of in-egalitarian intra-household power share family spheres. Programmes committed to the empowerment of women should question the nature of the link between access to the intervention and the development outcomes with respect to empowerment dimensions.

Further studies interested in evaluating programmatic impact on intra-household level empowerment should take into account the complementary benefits of bargaining models and empowerment frameworks. Only bargaining models will not be sufficient to underpin and demarcate the study scope related to intra-household bargaining power due to weakness to capture those many non-economic factors like customary laws and norms, which are sensitive to the context in varies society and community.

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Annex A

The algorithm in estimating the Propensity Score is summarized as follows:

1. Start with a parsimonious logit specification to estimate the score.
2. Sort data according to estimated propensity score (ranking from lowest to highest).
3. Stratify all observations such that estimated propensity scores within a stratum for treated and comparison units are close (no significant difference); for example, start by dividing observations into strata of equal score range (0–0.2, . . . , 0.8–1).
4. Statistical test: for all covariates, differences in means across treated and comparison units within each stratum are not significantly different from zero.
 - a. If covariates are balanced between treated and comparison observations for all strata, stop.
 - b. If covariates are not balanced for some stratum, divide the stratum into finer strata and re-evaluate.

- c. If a covariate is not balanced for many strata, modify the logit by adding interaction terms and/or higher-order terms of the covariate and re-evaluate.

Annex B

Table 5.1: ATT summary

Impact indicators	sub-sample	overall sample	Agency(A)/ opportunity Structure(OS)
Household and productive assets	the same	positive	Agency component
Household livestock ownership	Negative	the same	Agency component
Household productive assets	positive	positive	Agency component
House and household assets	positive	positive	Agency component
Household food expenditure	negative	the same	Agency component
Household non-food expenditure	negative	the same	Agency component
Household crop output per tsimad	the same	the same	Agency component
Household per capita non-food expenditure	negative	negative	Agency component
Household per capita food expenditure	negative	negative	Agency component
Household items and jewellery purchase	negative	the same	Agency component
Household per capita household and productive assets	the same	the same	Agency component
Household per capita total expenditure	negative	negative	Agency component
Household expenditure on education and health	negative	the same	Agency component
Cumulative Empowerment Index(CEI)	the same	positive	Agency & OS

Reference

- Agarwal, B. (1997). Bargaining and gender relations: Within and beyond the Household. Food Consumption and Nutrition Division International Food Policy Research Institute. Washington, D.C. 20036-3006 U.S.A. FCND discussion paper No. 27
- Alsop, R. and Heinsohn, N. (2005). Measuring Empowerment in Practice: Structuring Analysis and Framing Indicators. World Bank Policy Research Working Paper 3510
- Alter, C. M. & Dann, E. (1996). Assessing the impact of Micro enterprise services. USAID-funded project and publication.
- Ayalew, D. (2003). Risk-sharing networks among households in rural Ethiopia. Katholieke University Leuven, Belgium.
- Baltagi, B.H. (2005). Econometric Analysis of Panel Data, 3rd Ed., John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England
- Bardhan, P and Undry, C. (1999). Development microeconomics. Oxford University Press Inc., New York
- Baviah, M.D. and Rao, J.N. (2006). Women Empowerment and Microfinance. Association of Ethiopian Microfinance Institutions (AEMFI), Addis Ababa, Ethiopia
- Befekadu, B. K. (2007). Outreach and Financial Performance Analysis of Microfinance Institutions in Ethiopia. African Economic Conference United Nations Conference Center (UNCC), Addis Ababa, Ethiopia.
- Becker, S. and Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. The STATA journal, vol.2, No.4, pp.358-377.
- Black Economic Empowerment Commission (2003). Broad-Based Black Economic empowerment Bill. Republic of South Africa: Minister of trade and Industry. ISBN 0 621 33879 6.

- Borchgrevink,A., Tassew,W., GebrehiwotA., Woldeab,T.(2005). Marginalized Groups, Credit and Empowerment: The case of Dedebit Credit and Saving Institution(DECSI) of Tigray, Ethiopia. Association of Microfinance Institutions, Occasional Paper No.14.Swptember 2005, Addis Ababa, Ethiopia.
- Cameron, A.C and Trivedi, P.K. (2005). *Microeconometrics Methods and Applications*. Cambridge University Press. The Edinburgh Building, Cambridge CB2 2RU UK. PP. 695-740
- Chiappori, P. A. (1988a). Rational Household Labor Supply. *Econometrica*, 56, 63-89
- Chiappori, P. (1997a). Collective Models of Household Behavior: The Sharing Rule Approach in L. Haddad, J. Hoddinott and H. Alderman (ed.s) *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy* (London: The Johns Hopkins University Press).
- Chowdhury,J.(n.d). “Contested History of Neo-Classical Economic Models of Households in Development”
- Cochran W.G and Rubin D.B., (1973). Controlling bias in observational studies: A review." *Sankhya*, Ser: A, 35, 417{446}.
- CSA. (2008). National statistics. Available at <http://www.csa.gov.et>
- Daniel G. M. (1995). Measuring food insecurity: the frequency and severity of coping strategies. Food Consumption and Nutrition Division International Food Policy Research Institute. Washington, D.C. 20036-3006 U.S.A . FCND discussion paper NO. 8
- Dooren, M.V. (2007). The women empowerment approach: A methodological guide. Commission on Women and Development. Available at <http://www.dgcd.be>
- Ellis, F (1988) “Peasant Economics, Farm Household and Agrarian Development”, Newcastle, Oxford University Press.
- Ethiopia Central Statistical Agency (CSA),(2008). Summery and Statistical Report of the 2007 Population and Housing Census. FDRE Population Census Commision.
- Ethiopian Grass-root Empowerment(GE) Review (2005).Grassroots Empowerment Review of Progress and Prospectus: Ethiopia Institutional Governance Review Phase I, Draft Report.
- Evans, A (1989) “Women: Rural Development and Gender Issues in Rural Household Economics”, IDS Discussion Paper No: 254.
- Fafchamps, M. and Quisumbing, A. (2002). Assets at Marriage in Rural Ethiopia. CSAE WPS/2002-22.
- Fredu, N., Mathijs, E., Christiaensen,L.,Deckers,S., Mitku,H.,Nyssen,J.,Tollens,E.,(2006). Gender, Social Capital and Empowerment in Northern Ethiopia. MU-IUS Research and Development ollaboration Programme.
- Folbre, N. (1989). The Black Four of Hearts: Towards a New Paradigm of Household Economics” In Bruce and Dwyer (eds.). *A Home Divided: Women and Income in the Third World*. Stanford University press.
- Gaiha,R. and Thapa,G.(2006).A methodology for assessment of the impact of microfinance on empowerment and vulnerability. IFAD, Occasional Paper.
- Gergis,D.(1999). Citizen economic empowerment in Bostwana. BDR Discussion Paper No: 312
- Goez ,A.M.,& Gupta,A.S.(1996). Who takes the credit?Gender, Power,and Control Over Loan use in Rural credit Programs in Bangladesh. *World Development*,Vol.24,No.1,pp.45-63
- Greene,H.W.(2003).*Econometrics Analysis*,5th ed.,Pearson Education,Inc.,New Jersey

- Gurumurthy, A. (1998). Women's Rights and Status: Questions of Analysis and Measurement'. Gender in Development Monograph 7.
- Harris, S.D.(2007). State of the Microcredit Summit Campaign Report.
Available at: <http://www.microcreditsummitcampaign/2007>
- Haymanot,N.(2007). The impact of microfinance on women's economic empowerment. The case of Amhara Microfinance Institution, Masters Thesis .Addis Ababa Unveristy.
- Heckman, J.J., Ichimura, H. and Todd, P.(1997). Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program. *The Review of Economic Studies* 64:4, pp. 605-654.
- Heckman, J.J.,H. Ichimura, and P.Todd.(1998). Matching as an econometric evaluation estimator, *Review of economic studies*, vol 65, No.2, pp.261-294
- Heckman, J.J. and Vytlacil, E. (1999) .Local Instrumental Variables and Latent Variable Models for Identifying and Bounding Treatment Effects,. *Proceedings of the National Academy of Sciences* (96) pp. 4730-4734.
- Holland, P. W. (1986). Statistics and causal inference. *Journal of the American Statistical Association* 81, 945-960.
- Hunt, J & Kasynathan, N, (2002). 'Reflections on microfinance and women's empowerment', *Development Bulletin*, no. 57, pp. 71-75.
- Jasjeet S.S. (undated) Multivariate and Propensity Score Matching Software with automated balance optimization: The Matching package for R. *Journal of Statistical Software*. Volume VV, Issue II. UC Berkeley. Available at <http://www.jstatsoft.org/>
- Kabeer, N (1994), "Reversed Realities: Gender Hierarchies in Development Thought", London, Verso.
- Kabeer, N.(2001). Conflicts over Credit: Re-Evaluating the Empowerment Potential of Loans to Women in Rural Bangladesh. *World Development* 29(1):63-84
- Kishor, S., and K. Neitzel (1996). 'The Status of Women: Indicators for Twenty-five Countries'. *Macro International*. DHS Comparative Studies No. 21.
- Kurey, B. (2005). Empowerment in Ethiopia: Issues and Options. Poverty Reduction Group, Poverty Reduction and Economic Management Network, World Bank, Washington, DC.
- Lundburg,S and Pollak, R.A (1993). Separate spheres bargaining and the marriage market: *The Journal of Politiacal Economy*. 202(6).988-1010.
- Maddala G.S.(1983).Limited dependent and qualitative variables in Econometrics. Cambridge University Press, P: 122.
- Malhotra , A., Schuler, S. R. and Boender, C. (2002). Measuring Women's Empowerment as a Variable in International Development. Background Paper Prepared for the World Bank Workshop on Poverty and Gender: New Perspectives
- Mansuri, G. and Rao ,V. (2004). Community-Based and -Driven Development: A Critical Review. Policy Research Working Paper 3209, World Bank, Washington, DC.
- Manser, M and Brown, M. (1980). Marriage and Household Decision-Making: A Bargaining Analysis. *International Economic Review*, 21: 31-44.
- Mason, K. (1986). 'The Status of Women: Conceptual and Methodological Issues in Demographic Studies'. *Sociological Forum* 1: 284-300.

- Mas-Collel, A. Whinston, M.D., and Greene, J.R. (1995). *Microeconomics Theory*. Oxford University Press, New York. p:842.
- Mayoux, L. (2005). *Micro-finance and the empowerment of women - A review of the key issues*. Geneva, ILO.
- Mayoux, L. (2009a). *Oxfam Novib's Women's Empowerment Mainstreaming and Networking (WEMAN) programme for Gender Justice in Economic Development*. Available at www.genfinance.info
- McElroy, M.B. and Horney, M. (1981): *Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand*. *International Economic Review*, 22: 333-349.
- Morduch, J. (2005). *The Economics of microfinance*. The MIT Press, 5 Cambridge Center, Cambridge, MA 02142.
- Narayan, D. (2005) *Measuring Empowerment: Cross-Disciplinary Perspectives*. Washington, DC: World Bank.
- Osmani, L N K. (2007). *A Breakthrough in Women's Bargaining Power: The Impact Of Micro credit*. *Journal of International Development*, 19, pp. 695–716
- Pathfinder International Ethiopia (2007). *Women's Empowerment in Ethiopia: New Solutions to Ancient Problems*.
- Pollak, A.K. (2005). *Bargaining Power in Marriage: Earnings, Wage Rates and Household Production*. Washington University in St. Louis. JEL Nos. D1, J1, J2.
- Perkins, D.D. & Zimmerman, M.A. (1995). *Empowerment theory, research, and application*. *American Journal of Community Psychology*, Vol.23, No5. Research Library Core p. 569
- Ravallion, M. (2005). *Evaluating anti-poverty programs*. *Hand book of agricultural economics*, Vol.4 September 2007.
- Rajeev H. D. and Sadek W. (2002). *Propensity score-matching methods for non-experimental causal studies*. *The Review of Economics and Statistics*, 84(1): pp.151–161
- Roberts, P (1991). *Anthropological Perspectives on the Household*. *IDS Bulletin*, Vol. 22 No. 1
- Rogers, B (1990) "The Internal Dynamics of Household: A Critical Factor in Development Policy", <http://www.unu.edu/unupress/unupbooks/80733e/80733E00.html>
- Rosenbaum, P.R., and Rubin, D.B. (1993). *The central role of the propensity score matching in observational studies for casual effects*, *Biometrika*, 70(1):41-55.
- Rosenbaum P.R and Rubin D.B. (1983) *The Central Role of the Propensity Score in observational studies for causal effects*. *Biometrika*, 70(1), 41 {55}.
- Rubin D.B., (1979). *Using multivariate sampling and regression adjustment to control bias in observational studies*. *Journal of the American Statistical Association*, 74, 318{328}.
- Rubin D.B., (1980). *Bias reduction using Mahalanobis-metric matching*. *Biometrics*, 36(2), 293{298}.
- Sen, A. (1999). *Development as Freedom*. Oxford University Press.
- Smith, J and Todd, P. (2001) *Reconciling conflicting evidence on the performance of propensity score matching methods*. *American Economic Review* 91:2. pp. 112-18.
- Stock, J.H. & Watson, M.W. (2003). *Introduction to Econometrics*, 2nd International Edition. Boston San Francisco, New York. p. 289-290.
- Terefe, H. (2002). *Violence against Women from Gender and Cultural Perspectives*. *Reflections: Documentation of the Forum on Gender 7*. Panos Ethiopia and Heinrich Boll Foundation, Regional Horn of Africa Office, Addis Ababa, Ethiopia.
- Todaró, M and Smith, S (2003) *Economic Development*. Singapore, Pearson Education, Inc

- UNDP (1995) "Population parameters of rural development". Available at <http://www.undp.org/popin/fao/faomod/mod1.html>
- Uphoff, N. (1996). Learning from Gal Oya: Possibilities for participatory development and post-Newtonian social science. London: Intermediate Technology publications.
- WABEKBON, (2006). Women Empowerment through delivery of microfinance in Ethiopia. Occasional paper No. 17. Association of Ethiopian Microfinance Institutions, Addis Ababa, Ethiopia.
- _____. World Development Report (2001)
- World Bank .(1999). Handbook for practitioners prepared for evaluating the poverty impact of Projects.
- World Bank.(2005). Measuring Empowerment in Practice: Structuring Analysis and Framing Indicators. World Bank Policy Research Working Paper 3510. Washington, DC.
- World Bank. (2007). Empowerment in practice: Analysis and implementation. A World Bank learning module. Available online: www.worldbank.org/empowerment. Washington, DC.
- Wooldridge, J.M. (2002). Econometric analysis of cross sectional and panel data, The MIT Press, Cambridge, London.
- Wooldridge, J.M. (2006). Introductory Econometrics: A modern Approach, 3rd Ed, Thomson South-Western, Mason, USA.
- Wubet K.(2006). Microfinance and Women's Empowerment: A case study in Sidama Microfinance Institution. Occasional paper No. 19. Association of Ethiopian Microfinance Institutions, Addis Ababa, Ethiopia.
- Zaid, N.(2008). Microfinance, Loan Delivery, Utilization and Impact: With special reference to Tigray, northern Ethiopia. PhD Thesis, Submitted to the K.L.Leuven.