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Exploring Multidimensional Poverty and Microfinance Programmes Impact: Poverty Alleviation In Rural Bangladesh.

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Abstract

This paper examines multidimensional poverty and the effectiveness of microfinance loans in alleviating it using household survey panel data on Bangladesh. Microfinance is an innovative method to financial development of the poor, yet controversial. Several studies investigate this subject matter from a single-dimensional perspective, although, it is generally known that the primary concept of poverty is multidimensional. Hence, this paper extensively contributes to the empirical literature by exploring a multidimensional poverty measure (HMP) using three main dimensions: living standards, education and health. HMP is generated as a binary dependent variable, therefore making maximum likelihood estimation with a logit model approach the appropriate estimation technique. The household fixed-effect findings from this study show that microfinance loans are positively insignificant on the odds that poor households in rural Bangladesh escape multidimensional poverty. Nonetheless, there is an enormous impact (2.4380 odds ratio equivalent to about 144%) on living standard deprivation, which comprises of per capita consumption, land and non-land assets: Increase in the probability that poor households will improve living standard conditions after acquiring the small loans.

Keywords: HMP, microfinance, microfinance loans, multidimensional poverty, poverty alleviation

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1. INTRODUCTION

In the World Development Report (2000/2001), a poor person from Kenya in 1997 laments: "*Don't ask me what poverty is because you have met it outside my house. Look at the house and count the number of holes. Look at my utensils and the clothes I am wearing. Look at everything and write what you see. What you see is poverty.*"

The Millennium Development Goals following the United Nations Millennium Declaration in 2000 was aimed at drastically reducing poverty by 2015. However, poverty levels are persistent in many developing countries especially in Sub-Sahara Africa, where individuals living in poverty increased from the 1990s until declining in 2002/2005. Poverty levels reached the highest in 2010, and then decreased by 2013 at 0.1% (World Bank - Poverty and Shared Prosperity, 2016, p.38). According to a report on the World Social Situation by United Nations (2010), China, some countries in East Asia and to a certain degree India have experienced moderately decreasing poverty levels. Poverty levels globally are stagnant in contrast to the increase in economic growth some developing countries such as China are experiencing. Economic growth is important but not sufficient to palliate poverty in all dimensions (United Nations, 2010). This has encouraged the adaptation of several poverty reduction programmes by governments, bilateral and multilateral institutions such as the World Bank, IMF and United Nations. Such programmes include cash transfers, microfinance, and rural employment guarantee schemes aimed towards households excluded from the formal market economy (United Nations - Rethinking Poverty part VIII, 2010).

Over the last four decades, microfinance has become dominant as the anti-poverty programme for tackling the problem of financial exclusion of the poor from formal financial institutions; comprising of microsavings, microcredits and microinsurances (Todaro & Smith, 2015, p. 793). This phenomenon is prevalent in developing countries such as Bangladesh, Bolivia, India and Indonesia, where commercial banks consider operations futile in rural areas (United Nations-Rethinking Poverty, 2010). Microfinance loans given to the poor can start as small as 75 dollars and it is paid back over several months or even a year (Morduch, 1999). The main assumption underlying this concept is that financial accessibility to the poor will increase self-employment, improve the welfare of households and in effect reduce poverty. Coleman (1999), Coleman (2005), Morduch (2000) postulate that microfinance will also positively affect households spending on education for children, health, improve housing and nutrition of the poor. However, in development economics, microfinance is notable as an innovative

but a debatable medium of financial access for the poor in fighting poverty. The effectiveness of microfinance as an anti-poverty programme has been criticised by a considerable amount (see, for example, Bateman (2010) and Hulme & Mosley (1996)). The main argument is the fact that loans are short-term and small, and do not have a large impact on poverty at the macro level. Borrowing at the micro level might redistribute income and not boost economic growth (Khandker, 2005). Accordingly, it is micro in the ability to eradicate poverty.

To examine the overall impact of microfinance on poverty alleviation, a Household Multidimensional Poverty measure (HMP)[1] is generated in this study to assess poverty. Impact analyses by Pitt and Khandker (1998), Roodman and Morduch (2014), Morduch (1999), Khandker (2005) and others have only considered poverty from a single-dimensional perspective, despite the fact that the primary concept of poverty is multidimensional. HMP in this study is inspired by the technical measure of the UN MPI[2] and to some degree the HDI.[3] Dimensions that are used to assess multidimensional poverty (HMP) include health, education and standard of living with associated indicators, detailed descriptions are provided in the empirical section.[4] The HMP is calculated in the form of binary outcomes; therefore, using maximum likelihood estimation with conditional logit model, following a logistic distribution error term and conditional probability in a logistic form is the appropriate econometrics method.

Using the HMP will contribute to previous studies by presenting the various deprivations poor households face. Poverty models attempting to capture various living conditions of poor people in many developing countries including Bangladesh has been lacking (Chowdhury & Mukhopadhaya, 2012). Essentially, arguing for the inaccuracies that might occur in impact analyses of microfinance when poverty is assessed as single-dimensional. In addition, generating the HMP measure in this paper gives a foundation into estimating poverty looking at its differing features even with limited data availability, yet credible and capable in approach when analysing such topics; in this case, anti-poverty programme (microfinance). As Ravallion (1998) proposes, a compelling poverty measure is essential in convincing policy makers to implement effective policies that will improve the circumstances of the worlds' poorest people. Furthermore, the HMP will help analytically to identify the most deprived

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[1] Measuring the odds that a household migrates out of poverty after microfinance loans.
[2] United Nations Multidimensional Poverty Index, visit website for a full technical measure:
http://hdr.undp.org/sites/default/files/hdr14_technical_notes.pdf
[3] Human Development Index.
[4] It is worth mentioning that indicators for the three dimensions are not the same as used for MPI, hence, not exact UN MPI measure but similar to that as much as possible.

households at the same time present the interrelatedness of impoverished households. One major benefit of looking at poverty from its multidimensional angle is that extremely poor households and not those who are better off amongst the poor can be effectively targeted for microfinance programmes; this is one of the key criticisms of Hulme and Mosley (1996). The issue of targeting is also one of the two principal questions that are frequently presented with regards to the effectiveness of microfinance: To what extent does microfinance reach the "core poor" and not the better off amid the poor? (United Nation - Rethinking Poverty, 2010).

This paper is the second on this subject matter that considers the impact of microfinance on multidimensional poverty in Bangladesh. Bangladesh is the country of investigation due to the fact that it is the origin of microfinance programmes: Grameen Bank is the first established globally. Also, Bangladesh has experienced a reduction in rural poverty by 8.8 per cent between 2010 and 2016 compared to urban poverty by 2.4 per cent (World Bank, 2017). Considering the fact that microfinance programmes are targeted towards rural households, the rural poverty decline as aforementioned makes this country an interesting case to study. As well as not neglecting the fact that extreme poverty in the country has declined from 41 to 18 per cent, from 1991 to 2010 (World Bank, 2013). This is partially attributed to the microfinance proliferation in the country (Khandker & Samad, 2016). Adding to this, data accessibility on programmes around many developing countries can be hard to obtain, unlike Bangladesh.

The first study by Chowdhury and Mukhopadhaya (2012) assesses comparatively the role of governmental-driven and non-governmental microfinance organisations on multidimensional poverty using own generated survey study; different data sets, design and method than in this study. According to a country study by World Bank (1999), non-governmental microfinance organisations in Bangladesh maintain that they contribute highly to poverty eradication. Nonetheless, there are no statistics present on the comparative performance of governmental and non-governmental organisations in poverty reduction (Chowdhury & Mukhopadhaya, 2012). Studies by Pitt et al. (2003), Khandker (2005), Pitt and Khandker (2012), Pitt (2014), Roodman and Morduch (2014) and Pitt and Khandker (1998) use the same household survey data sets by Bangladesh Institute of Development Studies (BIDS) supported by the World Bank. All studies use it on the basis of a cross section[5] but Khandker (2005) includes the data from the follow-up survey in 1998/99; making it a panel/longitudinal study as it is used in this paper. Detailed discussion of the two waves survey is presented at the data section. It is worth

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[5] Using 1991/92 household survey data

mentioning that all these studies do not use the data sets on the basis of multidimensional poverty; as a result, this paper is the first to give insight from that perspective.

In accordance with viewpoints discussed above, this study seeks to answer microfinance impact on poverty of rural households in Bangladesh by considering its differing features. One of the major guidelines for microfinance eligibility in poor countries is gender-based; thus, assessing gender to identify its impact is to a great extent efficient than otherwise (Khandker, 2005). For this reason, the role of gender in poverty alleviation through microfinance programmes is accounted for in this paper. Also, in tackling the inaccuracies that might have occurred with poverty measurement in previous studies, a single-dimensional approach is treated: The effect of predictor variables on health, education and living standard deprivations individually. Using the HMP, the household fixed-effects results show that microfinance loans have a positive but insignificant impact on multidimensional poverty alleviation in rural Bangladesh. Household random-effects, however, present a contrasting result such that there is a positive significant impact of microfinance loans on multidimensional poverty. When assessing the single-dimension poverty approach, living standards are the most impacted by microfinance loans. The likelihood that a household in rural Bangladesh improves living conditions after accessing microfinance loans increase by about 144%. Considering this huge impact, are improvements in living standards symptomatic of households escaping multidimensional poverty?

The remainder of this paper is organised as follows: Section 2 presents the theoretical and conceptual framework. At first, the concept of microfinance is carefully presented, followed by the concept of multidimensional poverty. The theoretical framework underpinning the relationship between microfinance and poverty (multidimensional) is clearly explained; the last part of this section. Previous literature in relation to this topic is described in section 3. The empirical specifications of this paper are presented in section 4. The empirical part presents a thorough description of data and variables, the summary of statistics, model specifications and estimation techniques. The results are presented in section 5 together with analysis/discussion of results. The final part of this paper is the concluding remarks and policy implication in section 6.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

This section highlights the importance of using the chosen variables to test the research question under investigation. The key concepts and theories that are relevant to this topic are elaborated in accordance with past literature. A comprehensive explanation of microfinance and multidimensional poverty are
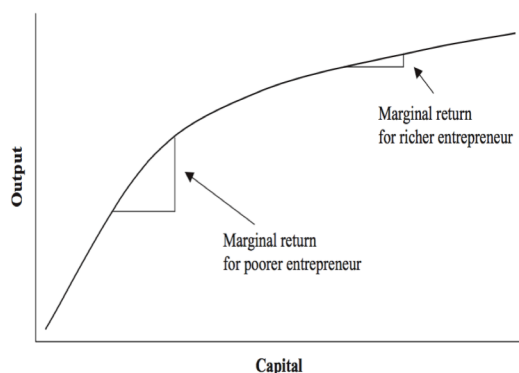
presented here. Also, the theories/frameworks central to the relationship between microfinance and poverty (multidimensional) are specified.

2.1 The Concept of Microfinance

Anterior to the dominance of microfinance in international development, finance to the rural poor has long being in existence in different forms, for instance, the "susus" of Ghana, "cheetu" in Senegal, chit funds in India, pasanaku in Bolivia and other forms of rotating savings and credit associations (ROSCA), (Bouman, 1994). A priori, microfinance is to help poor households to generate income through small-scale entrepreneurial activities, which will ultimately relieve them from poverty (Bateman, 2010). It is well known that the origins of microfinance can be traced to Bangladesh starting with the Grameen Bank established in the 1980s spearheaded by Muhammad Yunus (see, for instance, Khandker, 2005). The successes achieved by Grameen Bank inspired the importance of microfinance in international development where the rules and regulations surrounding its services are modelled in over 40 countries (Pitt & Khanker, 2002). Nonetheless, failure of one key basic economic concept remains: Why do poor households need microfinance considering the principle of diminishing marginal returns specifies the return on investments to be higher in areas where there is low capital than otherwise? That being the case, poor countries, regions, should experience an influx of capital investments, which will eventually better the impoverished situations in such areas. Banks should serve poor households and generate higher interest rates in returns using the deposits of richer households (Armendáriz & Morduch, 2010).

The concavity of the production function accentuates this principle; investing in a poorer entrepreneur will yield higher marginal returns on the next unit of capital and can present higher interest rates than a richer one. This is represented in figure 1 below. The concept of diminishing marginal returns, however, do not account for differing non-capital factors such as education attainments, social networks, standard of living between the rich and poor. In this regard, the concavity of the production function may not hold as assuming all but capital constant cannot be maintained. Figure 2 portrays this argument.

Figure 1: Production Function when Non-Capital Factors are Constant

Marginal return for richer entrepreneur

Marginal return for poorer entrepreneur

Output

Capital

Figure 2: Production Function when Non-Capital Factors are Considered

Marginal return for richer entrepreneur

Marginal return for poorer entrepreneur

Output

Capital

Source: Armendáriz and Morduch, 2010
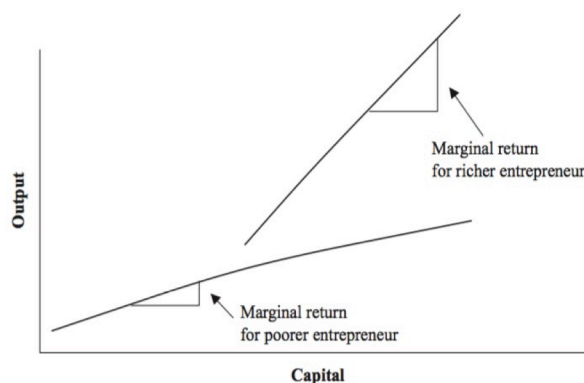
Poor households, unfortunately, face barriers that hinder their entrepreneurial activities, for instance, low savings, no or few assets that can be used for collateral, unable to afford start-up costs, and others (Rudd, 2011). The eventual failure of this basic economic concept is the puzzle with risk according to the findings of economist Robert Lucas Junior in his 1990 study on the capital flow between rich and poor countries. Even if higher returns means poor households can afford higher interest rates to accommodate the risk factor, this concept still fails due to regulations by governments intercepting on interest rate levels. Therefore, finance for the poor is solely stunted politically as Armendáriz and Morduch (2010) specify. The risk factor is heightened by market imperfection such as asymmetric information present in credit markets in poor countries. Incomplete information obstructs lenders willingness to borrow to the poor with no or minimal collateral to secure the exchange to lessen the risk of default. Adding to this uncertainty is the high transaction cost associated with such exchange.

Naturally, financial marketers will want to distinguish between poor borrowers, price discriminate and charge differently for riskier ones. The theory of adverse selection limits this possibility, deterring the attractiveness of borrowing (Stiglitz & Weiss, 1981). One can argue that a bank can charge overall higher interest rates, but that will force out safer customers from the financial market, inhibiting safe borrowers ability to fund entrepreneurial activities in escaping poverty (see, appendix A.3, for graphical presentation of such effect). Even if credit is provided to the poor, the presence of moral hazard becomes apparent, as entrepreneurial activities cannot be observed to see if borrowers are entirely committed into making sure projects succeed. These economic difficulties are ultimately weakened by poor institutions (judicial systems), which incapacitate contract enforcement in poor

countries.[6] Subsequently, financial marketers in the formal market economy are unwilling to provide services to the poor.

One major aspect of microfinance is the innovative lending mechanisms, especially group lending[7] (Rudd, 2011). According to Morduch (1999), group lending encourages programmes development based on social assets other than physical assets. In order to maintain repayment rates, collateral substitutes, progressive lending[8] possibilities and regular repayment schedules are used to incentivise participants. Group lending mechanism such as peer selection, enforces that similar types of borrowers join the same group (sorting of borrowers), limiting the problem of adverse selection as previously discussed. Eventually, default rates are minimised, social welfare and repayment rates are improved (Ghatak, 1999). Stiglitz (1990) presents peer monitoring another mechanism, can increase the profitability of lenders as borrowers are discouraged from taking risky actions, thus, tackling moral hazard. Dynamic incentive (progressive lending) is the only mechanism under group lending but also individual based that is used to counteract the imperfect information and to improve effectiveness. A peculiar advantage using this mechanism is gender-based; repayment rates amongst women are higher than men. Goetz and Gupta (1996) exemplify this: Grameen Bank and Bangladesh Rural Advancement Committee (BRAC) increased women borrowers to 94 and 74 per cent respectively in 1991/92 compared to 39 and 34 per cent in 1980/83.

2.2 The Concept of Multidimensional Poverty

Room (1995), Whelan and Whelan (1995), Kohl (1996) and Vranken (2001) postulate that although poverty is widely seen as multidimensional, it is not used as a primary concept for the measurement of poverty. Over recent years, poverty assessments have progressed, ranging from basic needs, physiological, human rights, human poverty, social exclusion, participatory and social deprivation approaches. Basic need approach includes all factors that are relevant to boost health and prevent malnutrition of households (Streeten et al., 1981). Researchers over the years use variables such as education, child and maternal health, mortality to determine the basic needs deprivations of households (Chowdhury & Mukhopadhaya, 2012). UNDP (1997) coining the human poverty approach adds lack of opportunities for living a moderately good life to the basic needs one; not only material well-being is deemed essential, access to clean drinking water, goods and services, infrastructures such as sanitation,

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[6] See Armendáriz and Morduch (2010) for further discussion on the economics of microfinance.

[7] Interesting anecdotal evidence on the limitations can be seen in Aminur Rahman (1999), Imran Matin, (1997).

[8] Progressive lending is a term by Hulme and Mosley, (1996) to explain dynamic incentives for possibilities of borrowers to access larger amounts in future if previous loans are paid back accordingly.[6]

electricity and others are vital.

Organisations such as the World Bank define poverty as the deprivation of wellbeing: Measuring it by income, health, nutrition, education, housing, and others (World Bank, 2000). To an extent, this combines the basic needs and human poverty approaches. Prior to this, the World Bank in 1990s measure poverty by an absolute income approach, poverty line based on per capita income such as less than one dollar per day (World Bank, 1990). An empirical weakness with the below poverty line (BPL) method is evident in India following censuses in 1992/97 and 2002. According to Alkire and Seth (2008), criticisms by several researchers[9] highlight methodological (identification and aggregation), data quality and corruption as major drawbacks of this BPL method. On another hand, researchers (Lipton (1983); MacPherson & Silburn (1998); Wodon (1997)) use nutrition, food consumption as a vital indicator of poverty; poverty is the lack of income amount needed to purchase the lowest level of calorie intake, a minimum basket of consumption goods and services, or utility for basic life necessities.

Although these measures present varying ways of assessing poverty, they are single-dimensional and do not clearly show who is poor or not. Sen (1982) earlier on criticises that the traditional way of measuring poverty by income means is narrow and disregard political, social, psychological and cultural factors (see also, Dreze & Sen, 2002). Adding to this criticism, Ravallion (1998) proposes that not only money metric or economic but also non-economic indicators are equally important. It is, therefore, necessary to admit that deprivations of all kinds are to be included in a general comprehensive framework for measuring poverty. Thus, multidimensional poverty assessment is a sufficient measure of human poverty and deprivation (Anand & Sen, 2000). Currently, the focus on multidimensional assessment of poverty is heightened. A new analysis in 2013 by a group of researchers at the World Bank on MPI concludes that 51.3% of multidimensionally poor people live in South Asia compared to 29% in Sub Sahara Africa. Chowdhury and Mukhopadhaya (2012) define multidimensional poverty in their study relevant to Bangladesh as the inability to be involved in the society economically, socially, culturally and politically. Following the UN Human Development Reports (2016), MPI is first introduced in 2010 adding to the money metric measurements. A descriptive figure on the details of the MPI is presented below in Figure 3.

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[9] Hirway, (2003); Jalan and Murgai, (2006) and others.

Figure 3: Multidimensional Poverty Index (MPI)
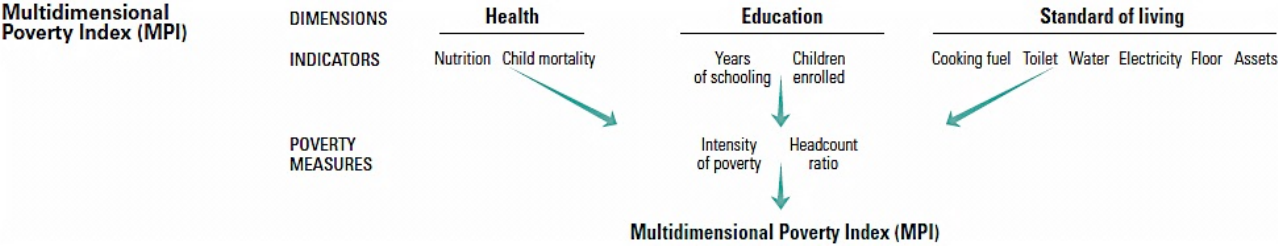
Source: UN MPI, Human Development Report (2014)

Households are therefore classified as multidimensional poor if they are deprived of 33 per cent or more of the 3 dimensions with weighted indicators.[10] The MPI shows the intensity and headcount ratio measure of poverty, which is the most common measure. Multidimensional poverty frameworks consist of three main approaches; union, intersection and intermediate. The union approach identifies subjects who are deprived in at least one dimension as multidimensional poor (Permanyer & Hussain, 2017). Intersection approach is used to determine deprivation if all household members fall below a certain line for all dimensions (Duclos et al., 2006). One argument against such an identification method is by Alkire and Foster (2011), who propose that this might lead to the under/overestimation of deprivations and ultimately poverty. Following this, Atkinson (2003) counting approach is recommended, where households are regarded as poor if deprived in an intermediate number of the dimension being measured decided by the researcher; that is, the intermediate approach.[11] For the indicators that are used in assessing dimensions in this study, this intermediate approach is applied where needed to assess that households are deprived below a chosen poverty threshold.[12] On the aggregate level, the union approach is the identification strategy followed in this study to generate HMP, similar to the MPI.

Alkire and Santos (2014) present that living standards are the pervasive form of deprivation faced by households in over 50 countries; it measures the accessibility to basic needs of households, human capital and human rights and linked to health and income generation and mobility of households. The importance is seen in the strong focus on living standard researches in development economics (see, for instance, Sahn & Stifel, 2000). In conceptualising multidimensional poverty, three main measurement approaches are assessed, from economic deprivation, capability and social exclusion perspectives. The

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[10] Another difference between HMP in this paper and MPI is that there are no weights on the 3 dimensions.

[11] Also known as the counting approach; dual cut off approach or the AF identification method

[12] Dependent variable - The generation of the HMP in the empirical section of this paper employs this approach in identifying households' deprivations statuses.

first two is at the core of poverty analyses[13] and social inclusion centres on the relationship part of the quality of life. Earlier acclaimed researches by Morris (1979) and others use economic development and quality of life such as literacy, life expectancy, mortality, and others to measure poverty. At the core of economic deprivation is the concept of absolute poverty, which is the lack of basic necessities; also relative poverty, which is indicated by the general distribution of income, consumption or welfare over a period of time across societies (Wagle, 2008).

2.3 Theoretical Framework - The Relationship Between Microfinance and (Multidimensional) Poverty

It is crucial for poor countries to achieve sustainable economic growth, which strengthens financial systems development (Hassan et al., 2011). Financial development is linked to the rate of physical capital accumulation and growth of real per capita GDP (King & Levine, 1993). Microfinance affects the physical capital accumulation through smoothing and allocating income and savings, levels of education and employment. Additionally, Lopatta and Tchikov (2017) propose that microfinance impacts the economic and financial development in poor countries via the allocation of capital, investments, consumption, productivity and entrepreneurship. Basically, financial markets are central to economic development, as lending to entrepreneurs encourages innovation in accordance with the *Theory of Economic Development* by Schumpeter (1955). Following the rural development postulation, entrepreneurial activities by means of microfinance can transform poor rural societies (Acs, 2006). King and Levine (1993) agree with Schumpeter (1955) on the importance of financial development as the level of it can decide economic growth of a country for about 10 to 30 years.

The direct link between microfinance and poverty alleviation is the positive effects on income and consumption. This theoretical connection has been proving empirically, as entrepreneurial activities (micro-enterprises) increase when poor households have access to small loans, reducing poverty. Hulme and Mosley, however, emphasise the positive effects on income is greater for the better off amongst the poor households than otherwise. In actuality, some poor households are worst off after microfinance loans due to the risk of business failures; suicide rates increase as some are peer pressured to repay failed loans (Hulme & Mosley, 1996). Some savings and credit schemes on the contrary positively impact the situations of poor households than microfinance loans by equipping them to manage seasonal income fluctuations (Montogomery, 1996). According to Khandker, (1998) and Morduch (1998), intertemporal consumption smoothing after small loan acquisitions also demonstrates

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[13] Economic deprivation is the focus of this paper.

the positive effects microfinance loans have on poverty. The framework rationalising households' use of small loans (credit) to smoothing consumption is the life cycle-permanent income hypothesis (LC-PIH). According to this hypothesis, a representative household determines consumption today considering lifetime income potential. Poor households face stochastic income process, which are often negative; during a negative income shock, microfinance loans can be used to reallocate future credits for today's consumption purposes. Dreze and Sen (1991) propose that this encourages economic security during cycles and crises that aid in poverty reduction. However, credit and cash constraints faced by the poor due to reasons presented under the concept of microfinance violates this theorem. This exacerbates the poor's inability to cope with such negative shocks to income, which is rampant in many poor countries (Alderman, 1996). When credit constraints are binding, $C_t = A_t + Y_t$, the consumption for a representative household is made of the income and assets in a given time period. Additionally, lack of credit limits firm growth; credit constraints are responsible for the high volume of very small firms in many poor countries (Banerjee & Duflo, 2005). The marginal product of capital is determined by access to credit in a constrained household; thereby, credit accessibility is very important for the poor.

Furthermore, there exists a linkage between microfinance and non-financial development for instance on health, education, nutrition, food security, housing, employment, social solidarity, agricultural productivity, empowerment of women and general welfare. Many times, poverty results from lack of economic growth, uneven distribution of resources and high population growth, which leads to unemployment and low productivity of the poor (Khandker, 1998). Consequently, job creation is one of the most important mechanisms in reducing poverty, thus, the point of microfinance. Developing human capital through education is also a mechanism for alleviating poverty to increase the productivity of the poor and increase income. A study by Njong (2010) on Cameroon concludes that the likelihood that an individual will be poor is related to educational attainment, as there exists a negative relationship between high education levels and poverty. Access to credit means that poor households are able to afford health insurances, and increase health expenditure, improving the overall health status of household members; empirically established by Adjei et al., (2009) and Brannen (2010) on Ghana and Tanzania respectively. In the latter, there is a positive impact of small loans on children's health as the purchase and use of mosquito nets for household children increase. Quality of food[14] and food security of borrowers are improved after the small loans, exemplified in Tanzania (see also Barnes et al., (2001) on Zimbabwe). Nutrition of children also improves for microfinance borrowers compared

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[14] Poor households increase their consumption of meat and fish.

to non-participants in Ethiopia (Doocy et al., 2005). It is vital to mention that the positive impact on children's nutrition is primarily when females are the participants of microfinance programmes. As discussed above, the positive impact on health means that poor households are able to reduce the number of absent days due to sicknesses such as malaria or malnutrition, children are able to attend schools; eventually, human capital is positively impacted: This is a cycle towards poverty reduction cumulatively.

A priori, gender is important in microfinance programmes, the goal being female empowerment/equality as a poverty alleviation mechanism. The connection between women and the small loans theoretically are expected to be positive, but empirically results are mixed. Participation means that women who are most vulnerable in poor households will be included in the financial market, claiming independence, boosting their economic, social and political standings in rural societies. The immediate effect of financial independence is that women will have their own bank accounts, mobility, and ability to contribute to household income increasing household expenditure and consumption propensities, which will elevate poor households. Generally, women spend their income on their children and families as empirically exemplified previously, which improves the overall welfare of households. Consequently, financial resources for women are major in reducing poverty in the grand scheme of microfinance. The linkage between microfinance and poverty is established individually, but looking at these on the aggregate level showcases the varying effects of these dimensions. The aggregate effect is vital in effectively alleviating poverty at all levels, making microfinance assessment on multidimensional poverty crucial.

3. PREVIOUS LITERATURE

Microfinance's role in poverty reduction is not without controversy: Whereas some studies consider the positive impact it has made, other researchers do not commend its efforts in dealing with this global issue. Several studies that will be discussed briefly are mainly on impact analyses, as this is the scope of this paper and for brevity, presenting differing methodologies, empirical designs, and ultimately mixed findings on the effectiveness of microfinance programmes. According to Khandker and Samad (2016), Pitt and Khandker (1998) are arguably the most mentioned of studies regarding impact analyses of microfinance. Pitt and Khandker (1998) use a cross-sectional data, a household survey by BIDS-World Bank 1991/92[15] together with a quasi-experimental survey and village level fixed effect method with instrumental variables in order to solve endogeneity issues due to self-selection participation of

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[15] Based on 87 rural villages in Bangladesh.

members and planned placement of programmes (Khandker, 2005). The model is designed in a maximum likelihood framework to examine gender effect in relation to microfinance participation in employment, assets, education and household expenditure in rural Bangladesh. The results show that female participation is important, exemplified by 18-taka[16] rise in household consumption expenditure relative to men at 11-taka when females get access to around 100 taka loans (Pitt and Khandker 1998).

However, Roodman (2012), Roodman and Morduch (2014) criticise the conclusion from this study including its empirical framework. Morduch (1998) using the same data sets as Pitt and Khandker (1998) and even uncomplicated empirical methods detects no impact on household consumption expenditure or education. Similarly, no evidence is discovered in relation to improvement in children education enrolments. Households who get access to microfinance loans mostly use it for large land purchases. In doing so, this disregards the intended purposes of microfinance if not agricultural. Pitt and Khandker (2012) responding to the criticisms prove that the earlier study can be replicated easily and that critics use a defected approach in recreating their study. Roodman and Morduch (2014) continue to criticise Pitt and Khandker (1998) conclusions because of non-normality from second stage errors. Again, Pitt (2014) responds to this criticism as a misunderstanding of their econometric methods by Roodman and Morduch (2014).

Khandker (2005) uses the data from 1991/92 with a follow-up survey in 1998/99,[17] making their data a panel. Using household fixed-effect for the panel data helps to get robust results to counteract endogeneity problems, which can be problematic in cross-sectional studies. The design of this study involves assessing dynamic consumption and village level effects on poverty alleviation. A visible increase in household per capita consumption levels even for non-borrowers is discovered. Generally, poverty reduction amongst 1998/99 borrowers is however found to be lower (2 percentage points) than in 1991/92 (5 percentage points), due to diminishing marginal returns of borrowing. Real consumption is increased for both borrowers and non-borrowers across study periods: 31 and 8 per cent lower than the poverty line in 1991/92 and 1998/99 respectively. Therefore, microfinance is responsible for greater than half of the 3 percentage points decrease in yearly poverty rates amongst borrowers in rural Bangladesh. This is consistent with the inference by Khandker and Samad (2016) that microfinance is partially responsible for the decrease in rural poverty in Bangladesh. On gender, female borrowers experience an increase in average returns of aggregate amounts borrowed around 21 and 18 per cent for

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[16] Monetary Unit of Bangladesh.

[17] Impact study on 1,798 rural Bangladeshi households; the same data used in this paper.

1998/99 and 1991/92 respectively. The positive effect for females and consumption is consistent with the findings of Pitt and Khandker (1998), even though panel data and different methodology are applied here. A contradicting argument is by Roodman and Qureshi (2006, p. 38) such that the benefits for women are relatively small, as 250 dollars per annual loan only increase revenue by 12.50 dollars per annum or around 0.03 dollar per day, thus, minimal benefits from microfinance. Microfinance decrease poverty of households including the local communities, although slowly. All studies presented above use household survey data to assess the impact of microfinance on poverty; however, some studies that will be discussed shortly have employed randomised controlled trials.

A recent randomised controlled study by Banerjee et al. (2015) on microfinance impact in India, based on 52 randomly selected areas presents that there is no impact on education, health, women and the decision making of poor households who had access to the small loans. The heterogeneous effect from this randomised evaluation, however, shows increase investments in durable goods for households with already existing small businesses but no change in consumption. Conversely, an increase in consumption of durable goods for households that have a lower likelihood of venturing into a business is observed; and higher investments for households that had a higher probability of opening a business. In the end, microfinance loans only aid households in making differing intertemporal consumption decisions. Attanasio et al. (2015) present a contradicting conclusion following a similar random controlled study on Mongolia. When group based microfinance programmes are assessed, there exists a positive impact on female empowerment through entrepreneurship, consistent with some of the findings aforementioned using household survey data. The entrepreneurial aspect of microfinance is evident in another random study by Crépon et al. (2015) in Morocco, as it encourages participants to start businesses and make profits. Again, entrepreneurship driven mainly by microfinance loans is seen in another random study by Augsburg et al. (2015) in Bosnia and Herzegovenia, where self-employment activities became rapid. Positive profits effects are observed for microfinance participants although consumption, other employment forms such as wage ones and savings decreased.[18] Eventually, the impacts of microfinance using randomised controlled studies give mixed results.

Chowdhury and Mukhopadhaya (2012), the only study assessing microfinance impact on multidimensional poverty in rural Bangladesh as mentioned earlier criticises other impact studies. Impact analyses assess poverty alleviation through microfinance on the basis of outcomes, centred on the economic and social well-being of poor households, which is one-sided. In order to solve this

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[18] For other randomised controlled studies that find negative effects of microfinance see for instance Karla and Zinman (2011).

problem other models are added to the outcome base one in their study: process-based and institutional indicators for example borrowing amount, length of borrowing, default rate.[19] A single model is generated from the economic, social welfare and process based indicators. A major difference between this study and my paper is that it focuses on non-governmental and governmental microfinance organisations, hence, a comparative analysis study. Also, they customise a survey and generate own data in measuring multidimensional poverty unlike this paper, which I generate from an already existing household survey in the form of a panel data. The key conclusion is that governmental microfinance organisations are effective in regards to improving the living standards of poor households in the 78 villages examined in rural Bangladesh (Chowdhury & Mukhopadhaya 2012). Again, microfinance in Bangladesh seems to positively impact poverty, which is comparable to the overall findings of some of the studies presented previously.

Another criticism of impact studies is by Bateman (2010), who presents that most of these studies ignore certain aspects. One is the fact that researchers can be biased by the presumptions that microfinance is prosperous, which impact the design of studies. This encourages studies to be based on operational factors, which is solely alluding to the existence of programmes ignoring the sustainable and social development impact. Morduch (1998) also criticises the biasedness of impact analyses in his Bangladeshi study, suggesting correlations between unobserved borrower qualities, patterns of lending in terms of the magnitude of the amount borrowed and participation. David Hulme points out the complexity, time consumption when using households to assess the impacts of microfinance, although it provides an extensive coverage on the topic and shows the linkage between different units (Hulme, 2000). All studies but one as aforementioned have assessed the impact of microfinance from a single-dimensional perspective. This is the focal point of this paper (multidimensional); differing dimensions, education, health and living standards are considered in unison. Some conceptual issues when assessing multidimensional poverty is demonstrated: Bourguignon and Chakravarty (2003) present that income and education levels are strongly related indicators of poverty when these two are used in a multidimensional approach. It is worth to note that this study does not look at income, limiting such issues.

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[19] Note that such dimensions cannot be assessed in this paper due to data unavailability.

Table 1: Summary of Relevant Empirical Literature

Author(s)	Coverage	Measure of Poverty and Estimation Approach	Key Findings
Attanasio et al. (2015)	Randomised field experiment started in 2008 in rural Mongolia, including 1,148 poor women in 40 villages. Joint-liability lending: Group loans and individual loans (for women) are the two-credit types assessed here.	Household consumption as a measure of wellbeing. Intention to treat analysis (ITT); Instrumental variables methodology; Strata dummies in the form of province fixed-effects.	Positive impact of group loans on female entrepreneurship and household food and total consumption, but negative on household income and total working hours.
Banerjee et al. (2015)	Randomised evaluation of 52 slums in Hyderabad, India, including 6,850 households. Group based lending mechanism.	Consumption; new business creation; business income; human development measures: Education, health and women empowerment.	No impact on consumption and profitability of average businesses in treatment areas. Also, there is no impact on health, education and women's empowerment.
Chowdhury and Mukhopadhaya (2012)	Data collection through questionnaire survey of 562 on 78 villages in Bangladesh. A comparative analysis between government driven and NGO microfinance projects.	Multidimensional poverty model: Economic, social well-being outcomes and process based indicators. Exploratory and individual confirmatory factor analysis. Invariance of the model tested between government and NGOs participants.	Projects by governmental agencies effectively enhance the well-being, and improves living standards of the poor in rural Bangladesh. NGOs help in social aspects of wellbeing. Microfinance impact multidimensional poverty.
Khandker (2005)	Panel data using household surveys for 1991/92 and 1998/99 on Bangladesh comprising of 2, 599 sample households.	Household consumption is used as the poverty measure. Village level fixed- effect based on 1991/92 or 1998/99 cross section data. Households' fixed-effects using panel data.	Access to microfinance impacts poverty reduction through increases in per capita household consumption, particularly for female borrowers and extends to the village, improving local economy.
Morduch (1998)	Cross-sectional survey data (1991/92) covering 87 vilages and 1,798 households in Bangladesh.	Household consumption is the poverty measure. Difference-in-difference technique.	No clear impact is seen on household consumption and children education enrolments. Consumption smoothing is because of

			income smoothing not microfinance.
Pitt and Khandker (1998)	Cross-sectional survey data (1991/92) covering 87 villages and 1,798 households in Bangladesh.	Household consumption poverty measure. Quasi- experimental survey, village level fixed-effects with instrumental variables. Weighted exogenous sampling maximum likelihood - limited information maximum likelihood- fixed effects technique.	Positive marginal impact on household consumption and education but negative on labour supply. Higher marginal impacts on loans to women. Ultimately, microfinance reduces poverty.
Roodman and Morduch (2014)	Cross-sectional survey data (1991/92) covering 87 villages and 1,798 households in Bangladesh.	Per capita household consumption. Maximum likelihood estimation	Upon replicating the findings of Pitt and Khandker (1998), there is no such positive impact of microfinance loans on consumption and/or education.

Source: Own-elaborated

4. DATA AND EMPIRICAL SPECIFICATIONS

This section is to thoroughly present and describe the data, its strengths and weaknesses, and the summary statistics. Followed by these are descriptions of the dependent, independent and control variables. Lastly, the model specification including estimation methods with techniques and the regression models for testing the research question of this paper is presented.

4.1 Data

The data is a household survey data from the Bangladesh Institute of Development Studies supported by the World Bank, 1991/92.[20] The household survey is conveyed on three occasions on the basis of the three cropping seasons of the country. (1) is conducted from November to February, the Aman rice season of Bangladesh; (2) from March to June, during the Boro rice season; (3) from July to October, during the Aus rice season. 1,798 households are included in the survey, randomly generated from 87

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[20] Households that are participants during this survey period became members of programmes towards the end of 1980s or beginning of 1990s according to Khandker and Samad (2016).

villages of 29 thanas[21] in rural Bangladesh. Due to attrition[22] just 1,769 out of 1,798 households are obtainable by the third round. A second survey using the same households is repeated in 1998/99. 131 out of 1,769 households that are used in 1991/92 could not be tracked down in the second wave of the survey.

Attrition bias can influence the statistical power of the study; loss of statistical power can influence results. One way to solve the problem of attrition is to admit more participants in the survey or study than the required minimum sample size. Nevertheless, this might not entirely solve the problem, especially when dealing with some of the variables that could have affected the different households surveyed but is not eliminated or controlled. Attrition, thus, negatively impacts the validity of results. A study by Alderman et al., (2000), however, propose that attrition bias might not be that problematic given that the data or survey is random. Even so, Khandker and Pitt (2003) empirically tested for attrition and discovered that it can be disregarded in many cases. In the second survey, new villages are added to the existing old ones. 2,599 sample households are surveyed in 1998/99 with 2,266 from the old villages in the first round and 373 from new villages. Eventually, the study sample is limited to 1,638 panel households of both old and new ones in both periods. Microfinance programmes are present in 24 thanas, and 5 thanas had no programmes available, chosen from 391 out of 460 thanas. The three microfinance programmes available in these thanas are Grameen Bank, BRAC[23], and BRDB RD-12[24] projects. Below is a table presenting statistical overview of the microfinance programmes and participants of around 7-year period of the survey.

Table 2: Summary Statistics of Microfinance Programmes

Programmes	Number of Participants	Per cent
BRAC	853	15.96
BRDB	909	17.01
Grameen	934	17.47
Eligible Non-Member	1,871	35.00
Ineligible	778	14.56
Total	5,345	100.00

Source: Own-generated using data.

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[21] A thana was a sub district in the administrative geography of Bangladesh. Smaller than a district and comprises of a collective of villages.
[22] Attrition bias occurs when there exists unequal loss of participants in a randomised control study leading to a systematic error.
[23] Bangladesh Rural Advancement Committee
[24] Rural Development-12 program of the Bangladesh Rural Development Board

From table 2, the problem of poor households with eligible individuals who are not members of a programme (35 per cent) is heightened.[25] It is worth mentioning that participation records are not present for 2,584 subjects, so perhaps that could have affected these statistics. Even if that can be the case, Khandker (1998) presents that the poorest of the poor who are eligible for microfinance programmes may not join because they lack human capital; incapable of using the small loans effectively. Banerjee et al. (2015) finds that people in the 52 poorest areas in Hyderabad, India, prefer to borrow from other sources than microfinance, leading to around 70% of eligible households not part of such programmes. Three villages from one of the 3 programmes in the thanas are randomly selected from a list of villages with microfinance programmes. A requirement is that the programme should have been in operation for a minimum of three years. Each non-programme thana is also randomly selected from three villages following the census of the Bangladeshi government. Villages with more than 600 households are considered high and villages with less than 51 households are considered few, so, eliminated from the survey design.

Table 3: Overall Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	Max
Female Education Attainment	2.09	4.61	0.00	99.00
Male Education Attainment	3.55	4.64	0.00	36.00
Household Head Education Attainment	2.52	4.01	0.00	36.00
Per Capita Consumption Expenditure	88.13	67.58	16.41	1759.71
Per Capita Food Expenditure	62.09	24.03	14.80	282.50
Non-land asset	27747.26	64729.40	-10100.00	2029600.00
Total Microloans	6250.06	12004.01	0.00	112302.40
Total Female Microfinance loans	4564.76	10912.44	0.00	112302.40
Total Male Microfinance loans	1685.30	6049.82	0.00	77538.88
Land After Microfinance loans	89.67	1254.18	0.00	110123.00
Land Before Microfinance loans	59.49	232.63	0.00	10123.00

No. of Observation = 7929

n = 2749

T-bar=2.88

1,798 households are selected based on landholding. Households must have a landholding of less than half an acre[26] to be considered poor and eligible for microfinance loans. The table 3 presents just the overall statistics of relevant variables. The full descriptive statistics including the within and between is

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[25] See for example, Khandker (1998) for further discussion.

[26] 0.5 acre of land is equivalent to 50 decimals

presented in the appendix A.1 (table 9). As seen in table 3, the overall average amount of microfinance loans to females are relatively high, 4,564.76 taka compared to males 1,685.30 taka, despite the fact that households heads are predominantly men. Out of 7,929, 7,331 observations have male heads and 597 have female ones. This is not surprising as, under the concept of microfinance, the dynamic incentive mechanism makes it advantageous for lenders to borrow to women with the highest repayment rates. Furthermore, this is evident in the way microfinance is used to empower vulnerable members of poor households, which are usually women. For instance, Professor Yunus Muhammad custom built the activities of Grameen Bank around women purposefully to support self-employment activities, which is income generating, an eventual poverty alleviation mechanism. Data is missing for 1 household but it is assumed to be male-headed due to the high likelihood considering the trend of male heads. The effectiveness of this strategy is nonetheless still questionable taking into account that patriarchy continues to be key in rural Bangladesh societies.

On average, the overall education attainment in years for male household members is relatively high compared to females, 3.55 and 2.09 respectively. Both sexes fall short on average in regards to education considering that primary education in Bangladesh is usually 5 years. The fact that males' mean of education attainment is higher expresses the priority towards males in the rural societies compared to females. Again, reinforcing the importance of patriarchy as previously mentioned. Overall, the per capita consumption expenditure of households is higher on average than per capita food expenditure (88.13 and 62.09 in takas). The former represents the per capita non-saving expenditure, implying the surplus a member of household spends on consumption of durable and other goods, not food. If on average an individual spends less on food than other things, although poor, it can be attributed to self-food production (subsistence farming) in the rural societies, which is not captured in the average amount a person spends on food. The fact that the overall mean of land sizes in decimals before and after loans is higher is as expected. Again, 50 decimals of land size are the required eligibility for microfinance loans in Bangladesh. Households land size on average is seen to increase from 59.49 to 89.67 decimals after loans, emphasising that land acquisition is a poverty escaping mechanism for the poor who are usually rural farmers (agricultural activities are important).[27]

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[27] See also Khandker and Samad (2016), 27.5 per cent of overall loans are used for agricultural activities.

4.2 Variables

4.2.1 Dependent Variable - Generating Household Multidimensional Poverty (HMP)

Living Standard
A measure of living standard is usually based on consumption (expenditure) or income: monetary metric, and accessibility to essentials such as cooking fuel, toilet, clean water, electricity, floor and assets in MPI. Per capita consumption expenditure,[28] which is the surplus a household member spends on durable goods and others, is used as a proxy indicator in this study. Households that on average have relatively low per capita consumption expenditure of about 88 taka or less is deemed deprived. Also, assets indicators are added in assessing this dimension: Land and non-land assets. Land assets are in decimals and Non-land assets are measured in Bangladeshi taka. From the survey, households that have less than 50 decimals of land holdings are considered poor, eligible for microfinance loans. Extremely poor households have 20 decimals of land or less, comprising of 60 and 54 per cent in 1991/92 and 1998/99 respectively (Khandker, 1998). The cutoff point for land deprivation of households is maintained at 50 decimals of landholdings and/or less. The correlation statistics between land assets before and after microfinance loans (0.24 and 0.07 respectively) and non-land assets are relatively low although positive, therefore no index is created for assets in that regard. Also, households are characterised as deprived in the non-land asset indicator if assets are valued at 28,000 taka and/or less; mean asset holdings of poor households. There are no missing data present for these variables. Accordingly, a household is not deprived in living standard if it is not deprived in at least one of the indicators (per capita consumption, non-land asset and/or land asset).

Education
The maximum number of education years attained is used to estimate education. The data used is on a household female and male members. It should be noted that the individual education attainment levels is not observed for the reason of brevity and also this paper focuses on households. The importance of education on poverty reduction is one of the underlying reasons for the demands of microfinance programmes, also as per theory. This indicator, however, does not capture the quality of education and the level of knowledge attainment. Conventionally, a household is deprived of education if attainment level is less than 5 years of education, that is, poverty threshold of education (Permanyer & Hussain 2017). The duration of primary school in Bangladesh is 5 years. If both household males and females are deprived of education simultaneously according to the characteristics mentioned above, then that household is generally deprived of education. A household is not deprived of education if at least

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[28] This is also the non-saving expenditure of household members.

female or male members have education attainment of 5 years or more. There are no missing data for this variable. Education deprivation is predominant amongst female members of households compared to men, which is not surprising: Reflected in the overall summary statistics on education.

Health

Data difficulties make health one of the most challenging variables to measure as presented by researchers Permanyer and Hussain (2017).[29] From the UN MPI, a household is deprived of health, if it lacks basic nutritional intakes and also has a certain number of children dying due to poor health. That is, child mortality and nutrition are very important indicators of health. Many studies on assessing health use data from DHS[30] and anthropometric data. Usually, indicators used include health status, the quality of food, calories consumed and quality of healthcare services (Sahn & Younger, 2009). Since the data for this paper does not include exact health variables, a proxy for health is used. Per capita food expenditure of households is used to assess the nutritional levels. One challenge, however, is that food expenditure does not give any information on the nutritional contents of households' diets. Another disadvantage is the fact that some households may practice subsistence farming and produce homegrown foods; exemplified by a lower overall mean of this indicator compared to spending on durable goods. Thus, presenting a challenge to clearly assessing the actual expenditure spent on food. One way to solve this problem may be to distinguish between home-produced foods and expenses of food purchased in the village or market by households. There are no missing data on per capita food expenditure. A household is deprived in this case if per capita household food expenditure is below the average of households (62.09 taka) in the village. However, according to limitations as mentioned above, this may not entirely be representative of deprived households, but close to it as much as possible.

Also, the presence of village level health infrastructures is used as a proxy to measure the likelihood of child mortality: rural health centre, family planning centre and a midwife or Dai Ma[31] in the village. Using the village level infrastructures show the differences that might occur in local economic factors due to changes in time (Khanker, 1998). There are 2,584 missing data out of 7,929 observations. It should be noted that if data is missing for one it runs through the data record for the other two infrastructures of a village. Many villages do not have family planning centres, which is to a certain

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[29] Alkire and Santos (2014) finds the same problem with the health variable in their multidimensional poverty analysis, even though they used health data from DHS.
[30] Demographic and Health Survey
[31] A Dai Ma is the traditional midwife in rural Bangladesh who is in charge of child delivery services and also cares for pregnant women during pregnancies.

degree expected. Majority of the villages that are deprived of a traditional midwife have access to a rural health centre, which ensures to some extent safe maternity practices and childbirth. The opposite is accurate for villages with no rural health centres. A household is not deprived if it has at least one of these village level infrastructures present. Ultimately, health deprivation is determined by the lack of village level infrastructures and relatively low per capita food expenditure. Table 4 summarises all variables used in the HMP generation.

Table 4: Summary of Dimensions with Indicators of HMP

Dimensions	Indicators	Cutoff Point of Deprivation – Not Deprived if …
Living Standards	Per Capita Consumption Expenditure	Household members individually spend 88.13 taka or more on durable goods.
	Land Assets	Households have 50 decimals of land or more.
	Non-land Assets	Households non-land assets are worth 28,000 taka or more.
Education	Highest Education Attainment for Females /males	Female and/or male members of households have more than or at least 5 years of education.
Health	Per Capita Food Expenditure	Household members individually spend 62.09 taka or more on food.
	Village Level Infrastructure	
	Rural Health Centre	The village has rural health centre.
	Rural Family Planning Centre	The village has family planning centre.
	Midwife	The village has a midwife.

Source: Own-elaborated

In conclusion, the aggregate Household Multidimensional Poverty measure (HMP) is determined from these three dimensions such that households that are deprived in at least 1/3 are identified as multidimensional poor or not otherwise, in the form of binary outcomes (0 and 1 respectively). This follows a different identification strategy used for MPI, where weights are assigned to each dimension. It is worth noting that if a household is deprived, then all the members in the households are considered as such, similar to the MPI. In assessing impact methodologies of different studies, Hulme (2000) expresses that it might not be precise to assume that poor households in aggregate are equivalent to individual household members. However, considering that UN MPI inspires HMP generation in this paper, this identification strategy is maintained.

4.2.2 Independent and Control Variables

The main independent variables are the total amount of microfinance loans received by households from the three different microfinance programmes.[32] Due to the fact that many household heads are predominantly men in Bangladesh, but women are frequently at the receiving ends of many microfinance loans, a special focus is given to the relationship between microfinance and poverty when gender is considered. As mentioned in the introduction, gender theme when assessing microfinance impact is essential as eligibility for many of them aside being poor is gender-based. Households with females as heads are drastically low at only around 7 per cent compared to around 93 per cent for men. This indicates the importance of emphasising on gender issues in the quest to alleviate poverty in the context and outside the scope of this paper. Variables that are controlled for (exogenous) include sex, age and education of households' heads, number of household members and year. Subsequently, it is important to see the effect of household heads factors on HMP. A dummy variable is created such that a household headed by a male is 1 and female is 0. From the data description, poor households with too many or few members are excluded; yet, it is interesting to control for household size to see if the number of people will impact poverty reduction at any level. A dummy variable is created for the year such that 1991/92 is 0, which is the baseline and 1998/99 is 1.

4.3 The Empirical Model

Following from above, the empirical model for estimation will take two forms: (1) the single-dimension and (2) the multidimensional approaches: The latter is of main interest. While the multidimensional approach uses the HMP as a binary dependent variable, the single-dimension approach uses living standard, education and health deprivations as separate dependent variables. This is to compare the results of the two to see whether the multidimensional one is all encompassing and reduce the level of bias in the conclusion made for the impact of microfinance on poverty reduction by previous studies. Three models are generated for the approach (1) and two for (2), the main approach of interest. The regression model specifications for the approach (1) encapsulates a baseline regression model with a gender dimensional analysis by interacting the microfinance loans variable with gender of household head to capture the difference in female receiving loans versus the male counterpart; one model for each dimension as aforementioned. In the multidimensional approach, model 1 is the baseline regression model. In model 2, a gender dimensional analysis following a similar procedure as explained above using an interaction term is applied. In this regard, the following models are generated:

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[32] Grameen, BRDB, BRAC.

Single-dimensional Approach

$Living\ Standard_{it}$

$$= \beta_0 + \beta_1 Microfinance loans_{it} + \beta_2 Microfinance loans_{it} * Gender_{it}$$
$$+ \beta_3 Gender of HH_{it} + \beta_4 Age of HH_{it} + \beta_5 Educ HH_{it} + \beta_6 Size of H_{it} + \beta_7 Year + \varepsilon_{it}$$

$Education_{it} = \beta_0 + \beta_1 Microfinance loans_{it} + \beta_2 Microfinance loans_{it} * Gender_{it}$
$$+ \beta_3 Gender of HH_{it} + \beta_4 Age of HH_{it} + \beta_5 Educ HH_{it} + \beta_6 Size of H_{it} + \beta_7 Year + \varepsilon_{it}$$

$Health_{it} = \beta_0 + \beta_1 Microfinance loans_{it} + \beta_2 Microfinance loans_{it} * Gender_{it}$
$$+ \beta_3 Gender of HH_{it} + \beta_4 Age of HH_{it} + \beta_5 Educ HH_{it} + \beta_6 Size of H_{it} + \beta_7 Year + \varepsilon_{it}$$

Multidimensional (aggregate) Approach

Model 1

$$HMP_{it} = \beta_0 + \beta_1 Microfinance loans_{it} + \beta_2 Gender of HH_{it} + \beta_3 Age of HH_{it} + \beta_4 Educ HH_{it}$$
$$+ \beta_5 Size of H_{it} + \beta_6 Year + \varepsilon_{it}$$

Model 2

$$HMP_{it} = \beta_0 + \beta_1 Microfinance loans_{it} + \beta_2 Microfinance loans_{it} * Gender_{it} + \beta_3 Gender of HH$$
$$+ \beta_4 Age of HH_{it} + \beta_5 Educ HH_{it} + \beta_6 Size of H_{it} + \beta_7 Year + \varepsilon_{it}$$

ε_{it} is a composite error term consisting of u_i and v_{it}. The former is a fixed effect reflecting the time-invariant individual characteristics and the latter is the random noise. A priori, the study expects the following relationships per theory and general consensus in the literature: A significant positive relationship of microfinance loans on HMP (see, for example, Chowdhury & Mukhopadhaya, 2012). Looking at the fact that HMP is binary (0,1), and HMP dummy = 1, if a household is not deprived at the three dimensions, otherwise 0, this means that an expected increase in microfinance loans will lead to a high predicted probability of a household being elevated of multidimensional poverty. One should note that each deprivation dimension from the single approach is also measured as a binary dependent variable; HH stands for household head and H for household. It is worth mentioning that Stata 14 software is used for all empirical works and generating results in this paper.

4.4 Estimation Technique

Since the dependent variable, HMP is binary (0 and 1), ordinary least square method is no longer valid for estimation as it will present biased and inefficient results. The maximum likelihood approach via

conditional logit model becomes more appropriate, showing the linear relationship between HMP with the independent and control variables through logit transformed probability. By allowing for unobserved single effects, the model is stated as:

$$Probability\ (HMP_{it} = 1|x_{it}, u_i) = F(x_{it}'\beta + u_i + v_{it})$$

Where β is the set of estimated coefficients and X is the vector of explanatory variables (Microfinance loans, Gender, Age and Education of Household Heads, Size of Household, and the Time dummy). HMP = 1 if household is not deprived at the three dimensions, otherwise 0. u_i is household fixed effect and v_{it} is the logistically distributed error term. F stands for the logistic function taking on values strictly between 0 and 1 (0 < F (.) < 1). This addresses the problem of nonsensical or unbinding predictions by the linear probability model (LPM). The logistic function is estimated at:

$$F(x_{it}'\beta + u_i) = \frac{\exp\ (x'\beta + u_i)}{1 + \exp\ (x'\beta + u_i)}$$

This study adopts the fixed and random effect estimation technique to consistently estimate for the parameters. Fixed-effects estimates use only within-household differences, essentially discarding any information about differences between households. That is, there is a case for fixed-effect analysis if, during the about 7 year period of the survey, a household went from being in poverty to moving out of poverty; or else switched from out of poverty to being in poverty. Thus, the predictor or explanatory variables are expected to change over time for some substantial portion of households. An advantage of using the fixed effect is that if explanatory variables are exogenous, then the $\beta's$ can be consistently estimated without making any assumption about how u_i is related to x_{it} (Greene, 1993). The fixed-effect logit estimator of β automatically finds the effect of each explanatory variable on the log odd ratio (Wooldrigde, 2002). However, since the distribution of u_i is unknown, the partial effects cannot be estimated. Also, if the explanatory variables vary greatly across households (i.e. whether households are deprived or not) but have little variation over time for each household, then fixed effects estimate will be imprecise and have large standard errors (Williams, 2018). Since the gender variable does not change over time, and to ensure robustness and accuracy of results, random effect logit estimator is also used. Here, the assumption of strictly endogeneity for x_{it} and u_i must hold.

5. RESULTS

Odds ratios are more important for interpretation in this study as it explains the magnitude of the effect independent and control variables have on the binary HMP. Thus, odds ratios represent a lot more of the constant effect than just the coefficients in table 6, which just shows the expected change in the log of odds. The effect of predictor/explanatory variables on the HMP is of main concern in this study; therefore, one should expect a limited presentation of results on single-dimensional approach here.

5.1 Main Results

Table 5 and 6 present the results for the logit regression, effects of microfinance loans on single dimensions and the HMP measure. Before presenting the results for the multidimensional (aggregate) approach, table 5 shows brief results of the single-dimensional approach, but the full statistics can be found in appendix A.2; it is of a supporting interest, yet, there will be some comparisons made to understand the shortfalls of such an approach in relation to previous literature.

Table 5: Household Effect Estimates of the Impact of Microfinance on Single Poverty Dimensions in Rural Bangladesh

	Logit Fixed Effect			Logit Random Effect		
	Living Standard	Education	Health	Living Standard	Education	Health
Microfinance loans	0.8912*	-0.3526	-72.3646	0.8764***	0.2343	-6.5062
	(0.051)	(0.583)	(0.999)	(0.000)	(0.675)	(0.144)
Microfinanceloans*Gender	-0.8168*	-0.4586	71.1755	-0.5804***	-0.3144	6.7706
	(0.075)	(0.464)	(0.99)	(0.010)	(0.582)	(0.129)
Gender of HH	6.8715	1.7713	-785.388	5.2231**	-0.0906	-69.3459
	(0.111)	(0.749)	(0.999)	(0.012)	(0.986)	(0.120)

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. HH stands for Household Head.

On the multidimensional approach (table 6), estimates coefficients of the logit regressions are explained as the amount of increase in the predicted log odds of HMP = 1, (i.e. *if a household is not deprived at the three dimensions)* that would be predicted by 1 unit increase in the explanatory variables, holding all other factors constant. The household fixed-effect (FE) results show that at all models, microfinance loans have insignificantly positive relationship with multidimensional poverty (HMP) in rural Bangladesh; indicating very little impact at all 3 significance levels used here. This is unexpected as per theory a positive significant impact of microfinance loans on HMP is anticipated. The insignificant result here is partly comparable to Morduch (1998), who finds no impact on education or consumption from microfinance, but a positive impact on land acquisitions of households. Partly comparable such that poverty is measured using household consumption, a very simple way of

measuring poverty unlike in this paper where HMP considers several dimensions in unison. Conversely, Khandker (2005) study using similar data as this paper finds a positive significant impact of microfinance on household consumption, which is the poverty measure. Considering the single-dimension approach, microfinance loan is positively significant on living standard deprivation at 10% level (table 5) but negatively insignificant for education and health deprivations. The log odds for a household to escape living standard deprivation is 0.8912 when there is a taka increase in microfinance loans, holding all other variables constant. It is worth emphasising that this dimension consists of per capita consumption expenditure, land and non-land assets of households. The positive impact results on living standards may not be surprising considering this dimension contains the indicators (eg. land assets, consumption) that previous studies find positive impacts.

Table 6: Households Effects Estimates of the Impact of Microfinance on Multidimensional Poverty in Rural Bangladesh

	Logit Fixed Effect		Logit Random Effect	
	Model 1	Model 2	Model 1	Model 2
Microfinance loans	0.1044	0.486	0.2474***	0.3609
	(0.494)	(0.214)	(0.001)	(0.117)
Microfinance loans*Gender		-0.4106		-0.1240
		(0.294)		(0.601)
Gender of HH	0.0872	3.8271	-0.5501*	0.5881
	(0.910)	(0.298)	(0.055)	(0.789)
Age of HH	0.0198	0.0204	0.0387***	0.0389***
	(0.394)	(0.3799)	(0.000)	(0.000)
Education of HH	0.0879***	0.0919***	0.4077***	0.40775***
	(0.006)	(0.004)	(0.000)	(0.000)
Size of Household	-0.0385	-0.0354	0.0524	0.0517
	(0.647)	(0.671)	(0.175)	(0.182)
Time dummy	2.2742***	-2.2923***	2.6217***	-2.6270***
	(0.000)	(0.000)	(0.000)	(0.000)
No. of Observation	1358	1358	3713	3713
LR Chi^2	200.50	201.52		
Wald Chi^2			386.13	385.71
Prob > Chi^2	0.0000	0.0000	0.0000	0.0000
Log Likelihood	-397.1198	-396.6091	-1902.602	-1902.464
	Model 1		**Model 2**	
Hausman Test	472.14***		487.77***	

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. The dependent variable is HMP, which is the multidimensional poverty status of households in 1991/92 and 1998/99. HH stands for Household Head.

Furthermore, education attainment of the household head and time dummy are the only variables that have a positive significant impact on HMP under FE for model 1 and 2: All at a 1% significance level. Log odds for a household to escape multidimensional poverty given a year increase in education of household head and years are 0.0879 and 2.2742 respectively, holding all other variables constant at a fixed value. When gender is assessed, the interaction term with microfinance loans proves insignificant under FE (see table 6). Contrary, it appears to be negatively significant on living standard deprivations; log odd is -0.8168 at 10% significance level, although insignificant for education and health deprivations (see table 5). If a male household head receives microfinance loans, households are more likely to be deprived in living standards compared to a female receiving it. Again, considering the indicators as aforementioned, results of Pitt and Khandker (1998), Khandker and Samad (2016) on females' impact on household consumption after acquiring the small loans are somewhat consistent with this finding.

The random effect (RE) results on the contrary show that there is a positive significant relationship at a 1% level between microfinance loans and HMP for model 1, which is in accordance with expectation. This is partly comparable to Khandker (2005) that microfinance positively impacts poverty; household consumption is not a multidimensional poverty measure. Model 2, however, prove a positive insignificant relationship, at all three levels of significance. A positive significant relationship in RE model 1 indicates that log odds of elevating multidimensional poverty is 0.2474 given a taka increase in microfinance loans holding all other variables constant at a fixed value. Simply, households that access microfinance loans in rural Bangladesh are expected to more likely (probability) escape multidimensional poverty compared to households that do not holding all the other variables constant. Under RE, the gender of household head and the time dummy is negatively significant in model 1 at a 10% and 1% levels respectively; negative impact on HMP. The former is however insignificant in model 2 whereas the latter continues to be negatively significant. If the household head is a male, then the log odds that a household migrates out of multidimensional poverty is -0.5501, holding all other variables constant at a fixed value. Thus, it is more unlikely for a household to elevate from being multidimensional poor if the household head is male. The gender impact here is comparable to the single dimensional approach finding, regarding living standards. Education and age of household head are positively significant on impacting HMP. The first-mentioned at 1% significance level in model 1 and 2: The last-mentioned at 1% significance level at all models. A peculiar observation when analysing the FE results under single-dimensional approach is that more variables appear to have a significant relationship with solely living standard compared to education and health dimensions (see appendix A.2, table 12 for full results).

It must be noted that there are conflicting results in the FE and RE estimates for variables such as gender of household head, size of household, time dummy and others. To draw the right conclusion, Hausman test is used to specify which model sits well with the data. The Hausman test results select FE over the RE model. The probability>chi-squared is 0.000 for both model 1 and 2, proving this point. Household FE rectifies any time-invariant endogeneity issues, which arises as a result of self-selection of microfinance borrowers. The FE (within estimator) unlike RE (between estimator) checks for within households' differences, indicating that there are changes in poverty statuses of households' during the almost 7-year period of survey. Within household variations are more important in understanding the effects of poverty on the different households compared to the correlation between households' characteristics. For households that are surveyed in 1991/92, an expected change in their poverty status is anticipated after the small loans before the 1998/99 follow-up survey. For this reason, using the FE as the suitable model for this panel data seems comprehensible. The fixed effect model is also better at dealing with omitted variable bias (although not completely) and unobserved heterogeneity at the household as well as village levels.

5.2 Odds Ratios

Since the coefficients estimates above are log-odds units, they become quite difficult to interpret the magnitude of the impact. Thus, for easier interpretation and to analyse the effect in more considerable details, especially with respect to the economic significance, the results are converted into odds ratios - an exponentiated form of the change in log odds. This means that all other things being equal, an increase in the explanatory variables by 1 unit changes the odds of HMP =1 vis-à-vis HMP = 0 by the exponent of their respective coefficient. For the same reasons as explained under the main results, table 7 presents brief odds ratios of the single dimension approach, full details of the odds ratios statistics for this approach is at the appendix A.2 (see table 13).

Table 7: Households Fixed-Effect Odds Ratios of Microfinance Impact on Single Poverty Dimensions

	Living Standard	Education	Health
Microfinance loans	2.4380*	0.7028	3.74e-32
	(0.051)	(0.583)	(0.999)
Microfinance loans*Gender	0.4418*	0.6321	8.15e+30
	(0.075)	(0.464)	(0.999)
Gender of HH	964.4828	5.8790	-
	(0.111)	(0.749)	

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. HH stands for Household Head.

For the multidimensional approach, table 8 presents the odds ratios following models 1 and 2 of the FE logistic regression estimates. The effect of microfinance loans on HMP is 1.1101 odds ratio in model 1, indicating that there is 11.01% increase in the odds that a household escape multidimensional poverty if there is a taka increase in microfinance loans received, assuming all other variables are held constant. However, it is a positive insignificant effect, also consistent in model 2. This is unexpected as access to microfinance loans by households is to increase self-employment activities. Self-employment activities are income generating for poor households, the direct effect of microfinance loans, propelling their abilities to access further basic needs: Boosting household consumption, education and health affordability. From this finding, even though household members may obtain the small loans, it will not affect living standards, education and health in unison.

Table 8: Household Fixed-Effect Odds Ratios of Microfinance Impact on Multidimensional Poverty in Rural Bangladesh

	Model 1	Model 2
Microfinance loans	1.1101	1.6252
	(0.494)	(0.214)
Microfinance loans*Gender		0.6632
		(0.294)
Gender of HH	1.0911	45.9320
	(0.910)	(0.298)
Age of HH	1.0199	1.0206
	(0.394)	(0.379)
Education of HH	1.0919***	1.0962***
	(0.006)	(0.004)
Size of Household	0.9622	0.9651
	(0.647)	(0.671)
Time dummy	0.1029***	0.1010***
	(0.000)	(0.000)
No. of Observation	1358	1358
LR Chi^2	200.50	201.52
Prob > Chi^2	0.0000	0.0000
Log Likelihood	-397.1198	-396.6091

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. The dependent variable is HMP, which is the multidimensional poverty status in 1991/92 and 1998/99 of households. HH stands for Household Head.

Conversely, when looking at the odds ratio for single-dimensional approach, microfinance loans greatly impact the living standards of poor households (table 7, the odds ratio is 2.4380, positively significant at a 10% level). This can be explained that there is about 144% increase in the probability that a household will escape living standard deprivation when there is a taka increase in microfinance loans, holding all other variables constant. The impact here is enormous and consistent with the inferences by

Alkire and Santos (2014) that living standard is the prevalent dimension when assessing poverty, explaining why small loans impact this dimension more than others. Per theory, improvement in living standards demonstrates that households are able to obtain basic needs, human capital and rights related to health and income generation. This is consistent with the study by Chowdhury and Mukhopadhaya (2012), who finds the governmental microfinance organisations in Bangladesh are able to improve the living standards of poor rural households. Note that microfinance loans have positive insignificant effect on education and health deprivations in the single-dimension approach. This is somewhat consistent with Banerjee et al. (2015) study on 52 randomly selected rural areas in India. The two most important variables on HMP are education attainment of the household head and the time dummy in both model 1 and 2, positively significant at 1% levels. The odds ratio for the former is 1.0919 in model 1, indicating that there is about 9.19% increase in the odds that a household elevates multidimensional poverty given a year increase in education of household head, assuming all other factors are constant. The reasoning here can be that literate household heads are able to make better decisions for households compared to an uneducated one. The odds ratio for model 2, 1.0962 can be explained similarly. With the time dummy, there is an indication that between the two waves of the survey[33] households significantly elevate from poverty. Assessing gender by interacting it with microfinance loans, age and gender of household head present an insignificant result.

Even though interacting microfinance loans with gender of the household head is insignificant from the multidimensional approach, it is positively significant at a 10% level from the single-dimension one on living standard deprivation. The odds ratio is 0.4418 on living standard deprivation. The explanation here is that when loans are provided to males (females=0), there is a decrease in the likelihood about 55.8% when there is a taka increase in the loan that a household will escape living standard deprivation. The reasoning here clearly supports the argument that females are important and more capable of elevating households out of poverty compared to males. This finding is consistent with the most cited study on this topic, Pitt and Khandker (1998), also, Khandker and Samad (2016). Although the impact is seen on living standard deprivation in this paper, it includes indicators such as per capita consumption, which is the variable that they use to assess the importance of females in poverty alleviation. Furthermore, the finding here may partially[34] correspond to Morduch (1998) findings that households who get access to microfinance loans use it for large land purchases; land asset indicator is included in the living standard dimension.

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[33] 1991/92 – 1998/99

[34] Partially because this impact relates to gender; when head of the house is female whereas Morduch (1998) clearly does not find gender differences in terms of land purchases after loans.

The positive linkage between females and microfinance loans is also seen in Khandker (2005) using the same data sets as I have used in this paper with different poverty measure. Sizes of households (appendix A.2, table 13) play a significant role on education deprivation, 1.5609 at 1% level; a 56% increase in the odds of a household not deprived of education if the size of the household increases by 1. This demonstrates that although too many or few households are not included in the data collection process, additional number of people improve the odds of education attainment levels. Perhaps, the marginal effect of education on a household is not to be undermined. All variables are insignificant on health deprivation. As mentioned in the earlier section 4.2.1, health is one of the most difficult variables to assess. Also, the village level infrastructures as proxy indicators contain many missing data, which can negatively affect the ability to accurately assess this dimension, affecting results. An accurate assessment of health is needed in the future in order to effectively capture impacts of microfinance loans on this dimension. On a general scale, the impact of microfinance loans on living standard deprivations (single-dimension) seems apparent compared to the HPM. All things considered, impact analyses proving the positive impact of microfinance on poverty might be mistaken if poverty is not viewed from all dimensions; if indicators present in living standard in this study are used.

5.3 Addressing Econometric Issues

Problems that might affect results can be measurement error, arising from time variations in unmeasured factors affecting microfinance loans records at household levels. This error can heighten when differencing across time, two waves of the survey. Khandker (2005) recommends using instrumental variables estimation even though the data is panel to account for such issues. Also, such a technique can be used to tackle time-varying heterogeneity. Using 2SLS estimation might not be helpful in this study considering that the dependent variable HMP is binary, and many of the predictors are not. Data unavailability in the case of this paper obstructs the use of good instrumental variables, which is crucial to effectively tackle such problems. Even so, Khander (2005) clearly outlines the importance of using a panel data and household fixed-effect model to solve endogeneity problems; that is, the method used in this study.[35] It ensures that unobserved factors at the household and village level is fixed, and resolves this problem at household levels, based on the assumption that variables are uncorrelated. This intuition is reflective in the pairwise correlation matrix presented in appendix A.4 (table 14) that even the highest correlation value is around 0.3. It is worth stressing that the correlation statistics are low overall even when positive, perhaps indicating endogeneity may not be problematic considering the method approach of this paper. Unlike using just a cross-sectional data, panel data

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[35] See Lalonde (1986) on why panel data sets are better dealing with endogeneity than cross section.

makes it plausible to assess greater than one observation for households such that $t > 1$. The reason why studies such as Pitt and Khandker (1998) accounts for endogeneity from non-random programme placement and self-selection participation is due to the reason that the empirical works are based on cross-sectional data (only 1991/92 survey). Additionally, they use a quasi-experimental survey together with instrumental variables and village level fixed-effect method to solve endogeneity issues.

6. CONCLUDING REMARKS AND POLICY IMPLICATION

The aim of this paper is to assess the impact of microfinance loans on multidimensional poverty in rural Bangladesh, considering that all studies but one has examined this subject matter from such perspective. Data used are two wave surveys: First in 1991/92 with a follow-up survey in 1998/99, from Grameen Bank, BRDB-12, and BRAC microfinance programmes. This panel data is appropriate as it helps to mitigate endogeneity issues, which are present in impact analyses of microfinance programmes especially when cross section data is used, as in studies discussed throughout this essay. From these, poor households are categorised into multidimensional poor or not using the HMP measure developed in this study. Are microfinance loans impactful on poverty alleviation in rural Bangladesh taking into account the various dimensions of poverty rural poor households face?

Considering the best-suited model from the Hausman specification test and for reasons explained previously, the household fixed-effect odds ratios present that microfinance loans have a positive insignificant impact on HMP. That is, microfinance loans do not necessarily lead to multidimensional poverty alleviation in rural Bangladesh. However, when assessing single-dimensional poverty approach, living standards of poor households are immensely impacted by microfinance loans. The two most important factors on the odds that poor households evade multidimensional poverty are education of the household head and the time dummy. Heads of households are predominantly men in Bangladesh as discussed, in combination with the role education play signals the importance of literate men in poverty alleviation. This connotes that although women are generally the most vulnerable in poor households and microfinance loans are mostly targeted at them, men should not be left out of the equation especially since patriarchy, a central part of cultural and social norms continues to be important in rural Bangladesh societies. Gender-based policies should reassess the role of men simultaneously whilst prioritising women. Insights by Goetz and Gupta (1996) support this view that women do not have the authority necessary to use their small loans to improve the situations of poor rural households. The time dummy significance representing the two waves of the survey indicates that

there are some odds that some poor households might have experienced a change in their poverty status between the 1991/92 and 1998/99 survey periods.

The main insight from this paper is that living standards are improved in rural Bangladesh; the probability that a poor household after obtaining a taka increase in microfinance loans escapes living standards deprivation increases by about 144%, indicating that microfinance loans increase per capita household consumption, land and non-land assets of poor households. From this perspective, it is consistent with the only multidimensional poverty study by Chowdhury and Mukhopadhaya (2012). The reason why living standards appear to be hugely impacted positively coincides with the reasoning by Alkire and Santos (2014). If poverty is measured using household consumption as in many studies presented in this paper, then microfinance appears to reduce it. Subsequently, a more comprehensive approach is needed to use varying measures of poverty than just consumption et cetera to grasp the actual effect of anti-poverty programmes as microfinance. Being able to buy a land, increase consumption of durable or other goods after benefitting from a programme, but not able to afford the education cost of household children/members above 5 years of primary schooling does not make any household better off in regards to permanently escaping poverty. Perhaps, the aftermath of microfinance loans can distort who appears to be poor or not in a rural setting. Households can receive microfinance loans and still face deprivations at other levels even if living standard is not one of them; improvement in living standards is not symptomatic of households escaping multidimensional poverty.

For future empirical method improvements, weights can be put on the dimensions of the HMP measure similar to MPI to assess any difference and/or similarities with current results. If data can be obtained, household fixed-effect with good instrumental variables to properly tackle econometric issues, such as measurement error and time-varying heterogeneity, when using panel data in this study is recommended. Also, data from Demographic and Health Survey or related to anthropometry aimed at capturing health can be used to improve the quality of this dimension in the HMP measure. Policies surrounding microfinance programmes should be based on strengthening local economies and entrepreneurial skills of borrowers. Policy makers, governments, organisations and institutions should focus on long-term poverty alleviation from various angles and not just improve living standards, which may not liberate the world's poorest households from all the faces of deprivations they experience.

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APPENDIX

A.1 OVERVIEW OF DATA

Table 9: Descriptive Statistics of Variables, 1991/92 - 1998/99

Variable		Mean	Std. Dev.	Min	Max
Female Education Attainment	overall	2.0856	4.6072	0.0000	99.0000
	between		4.6220	0.0000	99.0000
	within		2.7980	-22.6640	
					76.3350
Male Education Attainment	overall	3.5538	4.0641	0.0000	36.0000
	between		4.4570	0.0000	36.0000
	within		2.1440	-5.4460	30.5530
Household Head Education Attainment	overall	2.5199	4.0070	0.0000	36.0000
	between		3.9420	0.0000	36.0000
	within		1.7420	-7.2300	29.5190
Per Capita Consumption Expenditure	overall	88.1345	67.5770	16.4060	1759.7080
	between		61.4760	23.8320	1061.3060
	within		44.5880	-364.1980	1303.6350
Per Capita Food Expenditure	overall	62.0929	24.034	14.8000	282.5000
	between		21.5230	17.2410	250.4760
	within		14.8650	-19.1770	213.3430
Non-land asset	overall	27747.260	64729.4000	-10100.0000	2029600.0000
	between		62020.3300	-1077.5000	1273700.0000
	within		35870.2700	-445215.2000	1403067.0000
Total Borrowed Amount	overall	8364.8400	20085.8000	0.0000	550420.0000
	between		22313.4300	0.0000	544219.0000
	within		9541.6050	-367687.5000	169258.2000
Total Female Borrowed Amount	overall	4734.8800	11296.1000	0.0000	112837.1000
	between		12551.6400	0.0000	112302.4000
	within		5875.2930	-31749.3800	87255.4200
Total Male Borrowed Amount	overall	3629.9590	16981.6300	0.0000	550420.0000
	between		18596.2900	0.0000	544219.0000
	within		7548.1420	-372422.4000	164523.4000
Total Microloans	overall	6250.0590	12004.0100	0.0000	112302.4000
	between		12915.2000	0.0000	112302.4000
	within		6033.0600	-41267.0600	80910.5400
Total Female Microloans	overall	4564.7630	10912.4400	0.0000	112302.4000
	between		12043.290	0.0000	112302.4000
	within		5656.3180	-31919.4900	79225.2500
Total Male Microloans	overall	1685.2960	6049.8160	0.0000	77538.8800
	between		6049.3640	0.0000	70103.4900
	within		2385.3280	-39621.2100	41067.3400
Land After Microloans	overall	89.6690	1254.1770	0.0000	110123.0000
	between		558.9880	0.0000	27594.7500
	within		1072.1110	-27495.080	82617.9200
Land Before Microloans	overall	59.4874	232.6250	0.0000	10123.0000
	between		179.4526	0.000	5750.0000
	within		125.7600	-3404.0130	7590.2370

N = 7929
n = 2749
T-bar=2.88432

Table 10: Overview Of Districts In Bangladesh With The Three Microfinance
Programmes.

District	Number of households in each district the survey covered	Percent
Bagerhat	247	3,12
Bogra	255	3,22
Chittagong	126	1,59
Comilla	268	3,38
Dhaka	248	3,13
Dinajpur	253	3,19
Gaibandha	261	3,29
Gazipur	263	3,32
Habiganj	274	3,46
Jhenaidah	263	3,32
Khulna	248	3,13
Kishoreganj	246	3,1
Manikganj	483	6,09
Mymensingh	230	2,9
Naogaon	248	3,13
Narayanganj	284	3,58
Narsingdi	256	3,23
Nilphamari	306	3,86
Noakhali	63	0,79
Pabna	239	3,01
Patuakhali	313	3,95
Pirojpur	315	3,97
Rangpur	587	7,4
Satkhira	524	6,61
Sherpur	246	3,1
Sirajganj	279	3,52
Sylhet	284	3,58
Tangail	320	4,04
Total	7,929	100

Table 11: Divisions Within the Districts

Division name	Freq.	Percent
Barisal	628	7.92
Chittagong	457	5.76
Dhaka	2,576	32.49
Khulna	1,282	16.17
Rajshahi	2,428	30.62
Sylhet	558	7.04
Total	7,929	100.00

A.2 REGRESSION MODELS AND RESULTS FOR SINGLE – DIMENSIONAL APPROACH

Table 12: Household Effect Estimates of the Impact of Microfinance Loans on Single Poverty Dimensions

	Logit Fixed Effect			Logit Random Effect		
	Living Standard	Education	Health	Living Standard	Education	Health
Microloans	0.8912*	-0.3526	-72.3646	0.8764***	0.2343	-6.5062
	(0.051)	(0.583)	(0.999)	(0.000)	(0.675)	(0.144)
Microloans*Gender	-0.8168*	-0.4586	71.1755	-0.5804***	-0.3144	6.7706
	(0.075)	(0.464)	(0.99)	(0.010)	(0.582)	(0.129)
Gender of HH	6.8715	1.7713	-785.388	5.2231**	-0.0906	-69.3459
	(0.111)	(0.749)	(0.999)	(0.012)	(0.986)	(0.120)
Age of HH	0.0080	0.0346	-1.6469	0.0300***	0.1522***	-0.0160
	(0.673)	(0.436)	(0.151)	(0.000)	(0.000)	(0.348)
Education of HH	-0.0088	1.8652***	-35.2149	0.1437 ***	0.0879***	-0.0391
	(0.765)	(0.000)	(0.979)	(0.000)	(0.006)	(0.510)
Size of Household	-0.2946***	0.4453***	0.1076	-0.1809***	0.9074***	-0.0525
	(0.000)	(0.004)	(0.768)	(0.000)	(0.000)	(0.593)
Time dummy	0.5143**	3.1456***	-383.162	0.2360**	0.9793***	-54.4279
	(0.013)	(0.000)	0.998)	(0.041)	(0.000)	(0.962)
No. of Observation	1535	553	1243	3713	3713	3146
LR Chi^2	47.62	228.85	703.38			
Wald Chi^2				136.04	277.17	6.34
Prob > Chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.5008
Log Likelihood	-547.025	-78.4509	-85.9908	-2255.4289	-1017.8997	-580.9704

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. The dependent variable is HMP, which is the multidimensional poverty status in 1991/92 and 1998/99 of households. HH stands for Household Head.

Table 13: Fixed Effect Odds Ratios of Microfinance Loans Impact on Single Poverty Dimensions

	Living Standard	Education	Health
Microfinance loans	2.43803*	0.7028	3.74e-32
	(0.051)	(0.583)	(0.999)
Microfinance loans*Gender	0.4418*	0.6321	8.15e+30
	(0.075)	(0.464)	(0.999)
Gender of HH	964.4828	5.8790	-
	(0.111)	(0.749)	
Age of HH	1.0080	1.0352	0.1926
	(0.673)	(0.436)	(0.151)
Education of HH	1.0962***	6.4573***	5.09e-16
	(0.004)	(0.000)	(0.979)
Size of Household	0.9911	1.5609***	1.1136
	(0.765)	(0.004)	(0.768)
Time dummy	1.6726**	23.2332***	3.9e-167
	(0.013)	(0.000)	(0.998)
No. of Observation	1535	553	1243
LR Chi^2	47.62	228.85	703.38
Prob > Chi^2	0.0000	0.0000	0.0000
Log Likelihood	-547.0250	-78.4509	-85.9908

Notes: *, **, ***denotes significant at the 10%, 5% and 1% level respectively. The p-values in three decimal places are presented in parentheses. The dependent variable is HMP, which is the multidimensional poverty status in 1991/92 and 1998/99 of households.

A.3 THE EFFECTS OF HIGH INTEREST RATES ON TYPES OF POOR BORROWERS IN FINANCIAL MARKETS

Figure 4
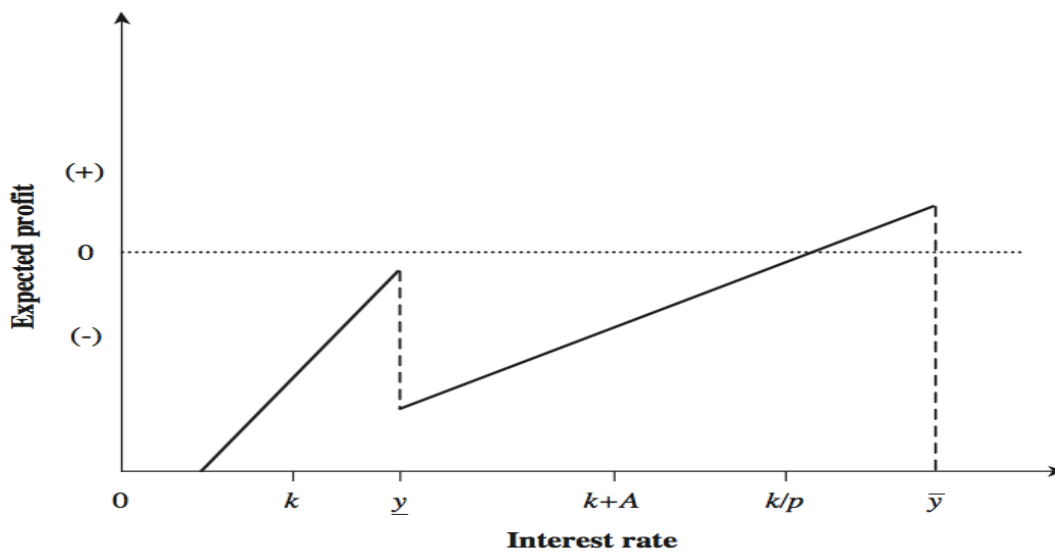
Source: Armendáriz and Morduch (2010)

Risky borrowers are riskier than usual, but safe borrowers cannot obtain loans from lenders who will only make negative profits at interest rate *y*. The lender will have to raise interest rates to *k/p*, only attracting risky borrowers. The risky borrowers will leave the market higher than ȳ. If interest rates are so high, it is still not beneficial to lenders considering the high likelihood for risky borrowers to default; it is better to have both safe borrowers and risky borrowers in the market than just have the latter.

A.4 CORRELATION MATRIX

Table 14: Pairwise Correlation of Variables

	HMP	Microloans	Micro*Gender	Gender of HH	Age of HH	Education of HH	Size of Household
HMP	1						
Microloans	0.009	1					
Micro*Gender	0.0143	0.3391***	1				
Gender of HH	0.0525***	-0.0227	0.9264***	1			
Age of HH	0.068***	0.1612***	-0.032*	-0.1031***	1		
Education of HH	0.3551***	0.0186	0.1044***	0.1229***	-0.0384**	1	
Size of Household	0.1086***	0.1339***	0.1657***	0.1629***	0.3271***	0.0881***	1

Note: *, **, *** denotes significant at the 10%, 5% and 1% level respectively. HH stands for Household Head.