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IZA DP No. 11819

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## ABSTRACT

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# Micro-Entrepreneurship and Subjective Well-Being: Evidence from Rural Bangladesh

Microcredit has long been hailed as a powerful tool to promote livelihoods and reduce poverty through entrepreneurship. However, its impacts on people's subjective well-being remain underexplored. We present a unified theoretical framework for analyzing the effect of microcredit-enabled entrepreneurship on overall life satisfaction – a key manifestation of subjective well-being. Empirically, we apply an instrumental variable approach to a unique census-like household survey conducted in three villages of Bangladesh in 2013. In spite of having no direct effects, we find that microcredit borrowing has an indirect negative effect on overall life satisfaction, through increased worry. On a positive note, we find that female micro-borrowers experience an increase in satisfaction with financial security and achievement in life. We also provide evidence that micro-borrowers with higher levels of assets experience an increase in satisfaction with financial security.

**JEL Classification:** I31, J16, L26

**Keywords:** microcredit, entrepreneurship, life satisfaction, happiness, depression, worry, female empowerment, Bangladesh

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## 1. EXECUTIVE SUMMARY

Entrepreneurship has been long hailed as an important tool to reduce poverty and promote economic growth in developing countries (United Nations, 2005; World Bank, 2016b). While developing countries abound with entrepreneurial energy, limited access to capital remains a major obstacle for starting business ventures (Panda and Dash, 2014). In this context, microcredit – lending small amounts of money to otherwise ‘unbankable’ people to start new businesses – emerged as an important mechanism to empower the poorest people, promote their livelihoods and, ultimately, reduce poverty (Montgomery, 1996).

Microcredit remains an influential policy tool to ‘graduate’ people out of poverty; however, its idealised vision may seriously clash with reality. Critics question the ability of microcredit to deliver prosperity, pointing to indebtedness, erosion of social capital and exacerbation of economic vulnerabilities as its major problems, especially in poor, traditional contexts such as rural Bangladesh (Banerjee and Jackson, 2017; Bateman and Chang, 2012; Cons and Paprocki, 2010; Kent and Dacin, 2013; Roodman and Morduch, 2014). Recent evidence suggests that the beneficial effects of micro-entrepreneurship on downstream outcomes such as income, consumption, child schooling and female empowerment are very modest at best (Banerjee et al., 2015). In the absence of clear positive effects of microcredit on these objective well-being outcomes, it is of interest whether microcredit changes subjective well-being: a positive effect would provide further basis for support of microcredit policies, while a negative effect would invite a reconsideration of such policies.

To date, little remains known about the subjective well-being effects of micro-entrepreneurship, with the existing studies (Ahmed et al., 2001; Becchetti and Conzo, 2013; Chindarkar, 2012; Fernald et al., 2008) mostly focusing on one type of subjective well-being (either evaluative well-being or negative affect). There is a lack of a unified theoretical approach along with an empirical counterpart analyzing the effects of micro-entrepreneurship on the different types of subjective well-being. Our study fills these knowledge gaps, focusing on the effects of micro-entrepreneurship on subjective well-being in rural Bangladesh, one of the world’s poorest and most densely populated countries, where the microcredit movement originated. In particular, we propose a unified model of subjective well-being, which explores the effects of microcredit on overall life satisfaction, including potential indirect effects through satisfaction with different life domains (financial situation, achievement, health, family and community) as well as positive and negative affect (feelings

of happiness, worry and depression). We test these relationships using data from a census-like survey conducted in three contiguous villages in Bangladesh. Since we are interested in causal effects of micro-entrepreneurship, we introduce and use a novel instrumental variable where one's micro-entrepreneurial status is predicted with the density of micro-borrowers among one's close neighbors.

Our main finding is that micro-entrepreneurship contributes to the feelings of worry and depression among micro-entrepreneurs; given that worry also reduces overall life satisfaction, we conclude that microcredit reduces overall life satisfaction through greater worry. Regarding the satisfaction with various life domains (standard of living, financial security, achievement, health, family and community), the effect of microcredit is statistically insignificant. At the same time, our results show that female micro-borrowers gain in satisfaction with financial security and achievement in life, and micro-borrowers who have higher levels of household assets experience gain in satisfaction with financial security.

Our study makes several contributions to the literature. At the theoretical level, it provides an integrated conceptual framework of the subjective well-being effects of micro-entrepreneurship, inspired by the life-domains model of overall life satisfaction (Cummings, 1998; van Praag and Ferrer-i-Carbonell, 2008) and the theory of procedural utility (Frey et al., 2004) rooted in self-determination (Deci and Ryan, 2000). This contrasts with the previous literature that has considered the effects of microcredit entrepreneurship on only one dimension of subjective well-being (Ahmed et al., 2001; Becchetti and Conzo, 2013; Chindarkar, 2012; Fernald et al., 2008).

At the empirical level, we seek to provide causal evidence for the effects of microcredit entrepreneurship on various components of subjective well-being, thereby addressing potential reverse causality (the selection into microcredit entrepreneurship on the basis on well-being characteristics) and omitted variable bias (effect of unobserved confounding variables such as personality). While reverse causality and other endogeneity concerns are routinely raised in the entrepreneurship literature (see e.g. Milanov et al., 2015; Stephan and Roesling, 2010; Uy et al., 2013; Wood et al., 2015), it is often difficult to find convincing mechanisms or data to address them. We argue that the instrumental variable technique is a suitable tool for uncovering causal effects of entrepreneurship on subjective well-being and introduce the novel instrument of the density of microcredit uptake among one's local neighbors. This also provides us with causal evidence for the moderating effect of gender and assets in our unified framework.

Overall, our study shows that microcredit borrowing can indirectly reduce entrepreneur overall life satisfaction through increased worry levels. This is a disturbing result, which calls for policies to mitigate the psychological costs of the microcredit-enabled entrepreneurship. At the same time, we show that microcredit-enabled entrepreneurship increases women's satisfaction with financial security and achievement in life – this provides hope that microcredit is delivering on its promises to improve the lives of women in developing countries.

## 2. INTRODUCTION

Despite a marked decline over the last two decades, global poverty remains unacceptably high: 767 million, or one in ten people worldwide, live on less than \$1.90 per day (World Bank, 2016a). Poverty reduction – the principal Millennium Development Goal – is still a top priority for national and international policymakers. Among the numerous efforts directed at reducing poverty, entrepreneurship has emerged as an influential policy prescription: there is a general belief that facilitating entrepreneurship will lift people out of poverty and promote economic development (Bruton et al., 2013; Cho, 2015; Naudé, 2010; United Nations, 2005; World Bank, 2016b).<sup>1</sup>

Developing countries abound with entrepreneurial energy and generally have higher self-employment rates than their wealthier counterparts (Gindling and Newhouse, 2014). Driven by poverty and lack of formal employment opportunities, people in poor countries often have no choice but to start small, informal businesses to sustain their livelihoods (Margolis, 2014). However, even such necessity-driven, low-productivity entrepreneurship is not within the reach of everyone: starting a business, however small, requires financial investment. With inefficient formal credit markets and high rates charged by local moneylenders, poor people willing to start or expand a business often find themselves unable to do so. Access to credit is widely acknowledged to be one of the biggest hurdles to entrepreneurship and SME growth across the developing world (Panda and Dash, 2014).

In this context, microcredit has been proposed as a mechanism to inject capital into income- and employment-generating entrepreneurial activities, thereby breaking the vicious poverty cycle of 'low investment-low income-low investment' (Montgomery, 1996). As a

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<sup>1</sup> Under certain conditions (favourable institutions, in particular) and in specific contexts (generally, higher income countries), entrepreneurial activity has indeed been shown to increase economic growth and employment, and reduce poverty and inequality (Galindo and Mendez, 2014; Kimhi, 2010; Kritikos, 2014; Samila and Sorenson, 2011; Si et al., 2015; Thurik et al., 2008). However, a negative impact of entrepreneurship on economic growth has also been documented, especially in poorer countries (Van Stel et al., 2005).

rule, microcredit institutions channel funds to otherwise ‘unbankable’ people: those with no access to mainstream banking services, no credit history and those unable to provide collateral (Armendáriz and Morduch, 2010). Microcredit loans tend to be distributed to women as well as groups of borrowers, who share the responsibility of repaying the money (social collateral); lending to both women and groups results in high micro-loan repayment rates (Aggarwal, 2015). Microcredit-enabled entrepreneurship<sup>2</sup> was, and still is, regarded as a powerful, bottom-up tool to ‘graduate’ people out of poverty, promote livelihoods and empower women – to the extent that the first microcredit institution, the Grameen Bank, and its founder, Muhammad Yunus, were awarded the Nobel Peace Prize in 2006. Recently, however, the ability of microcredit to yield sustainable development has been called into question (Bateman and Chang, 2012; Cons and Paprocki, 2010; Kent and Dacin, 2013; Roodman and Morduch, 2014). Critics point to the wide discrepancy between the idealised vision of microcredit, which rests on the assumption that everyone is willing and able to become an entrepreneur and support their peers, and the reality, where loans are often forced upon people by microfinance institutions and people uptaking microcredit are subject to extreme peer pressure instead of receiving peer support, divert funds to non-productive activities, fall into debt traps and, in extreme cases, commit suicide. An influential multi-country study of the effects of microcredit on socio-economic outcomes such as income, consumption, child schooling and female empowerment, reports very modest positive effects at best (Banerjee et al., 2015).

Notwithstanding the substantial body of evidence on the effects of microcredit on socio-economic outcomes (see e.g., Duvendack et al. (2011), Chliova et al. (2015) and Gopaldaswamy et al. (2016) for reviews of this literature), little remains known on how microcredit affects subjective well-being. We attempt to fill this knowledge gap by exploring the relationship between microcredit entrepreneurship and overall life satisfaction – a central measure of subjective well-being – as well as various other manifestations of subjective well-being that feed into overall life satisfaction: satisfaction with different life domains (satisfaction with financial security, standard of living, achievement in life, health, family, and community), and feelings of happiness, worry and depression. Our focus is on Bangladesh, one of the world’s poorest and most densely populated countries, which was at the origin of the microcredit movement in the 1970s.

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<sup>2</sup> In what follows, we use the terms “microcredit entrepreneurship”, “microcredit-enabled entrepreneurship” and “micro-borrowing” interchangeably.

There are several reasons why it is important to study the links between microcredit entrepreneurship and subjective well-being. First, objective measures of well-being, such as income and expenditure, are only partially related to how people experience and evaluate their lives. Positive and negative emotions, aspirations, social comparisons, and a sense of fulfilment, recognition and purpose are significant in how people feel about their lives; these are unlikely to be fully, or even partially, reflected in objective measures of well-being such as income (Nikolova, 2016). Therefore, focusing on subjective well-being measures, such as life satisfaction, happiness, worry, and depression, provides a more holistic view of the well-being effects of microcredit entrepreneurship. Second, there is increasing recognition among both policymakers and academics that subjective well-being can and should be used for evaluating policies and measuring societal progress (Helliwell et al., 2017; OECD, 2013; Office for National Statistics, 2013; Sgroi et al., 2017). In the absence of clear positive effects of microcredit on objective well-being outcomes (income, poverty, education), it is of interest whether microcredit changes subjective well-being: depending on whether the effect is positive or negative, the results of our study can provide grounds for a reinforcement or a reconsideration of further policy support for microcredit entrepreneurship. Third, studying subjective well-being is important in its own right, not least because of its positive spillovers into various life and work domains. It has been shown, for example, that higher levels of happiness and life satisfaction improve people's productivity, creativity and physical health (De Neve et al., 2013; Oswald et al., 2015). Happy and life-satisfied people are thus an asset for a society, and so it is crucial to understand whether microcredit-enabled entrepreneurship changes people's subjective well-being.

To answer our research question – how microcredit entrepreneurship affects subjective well-being – we first develop an integrated conceptual framework of the subjective well-being effects of micro-entrepreneurship, inspired by the life-domains model of overall life satisfaction (Cummings, 1998; van Praag and Ferrer-i-Carbonell, 2008) and the theory of procedural utility (Frey et al., 2004) rooted in self-determination (Deci and Ryan, 2000). We then test our hypotheses using a unique household survey, conducted in 2013 in three contiguous villages in the Tangail district of Dhaka, Bangladesh (Bhuiyan and Szulga, 2016). The survey included a range of questions on subjective well-being and microcredit use, which, along with detailed information on respondents' socio-demographic backgrounds, makes it well suited to pursue our research question. A rare feature of the survey is that all households in the three villages were interviewed, providing a census-like coverage of the population in a well-defined geographical setting.

Our study contributes to the literature in several ways. First, we contribute to the theoretical discourse of the relationship between microcredit and subjective well-being by introducing a unified framework that integrates various manifestations of subjective well-being. Generally, the literature distinguishes between two broad types of subjective well-being: 1) cognitive-evaluative (what people think of their lives), usually captured by overall life satisfaction, which further depends on satisfaction with specific life domains (finances, family, health, community etc.); and 2) hedonic-experienced (how people experience their lives), usually captured by feelings of happiness and joy (also known as positive affect) as well as stress, depression, anger and sadness (also known as negative affect).<sup>3</sup> The existing nascent literature on the effects of microcredit on subjective well-being (Ahmed et al., 2001; Becchetti and Conzo, 2013; Chindarkar, 2012; Fernald et al., 2008) has focused on a specific manifestation of subjective well-being and found that microcredit entrepreneurship lead to/was associated with either greater overall life satisfaction (Becchetti and Conzo, 2013; Chindarkar, 2012) or greater stress and depression (Ahmed et al. 2001; Fernald et al., 2008). In contrast, we draw on the life-domains approach to subjective well-being (Cummins, 1994; van Praag and Ferrer-i-Carbonell, 2004) to argue that we can unify the satisfaction with specific life domains with hedonic well-being (especially, worry and depression) under a common framework in studying how microcredit entrepreneurship feeds into overall life satisfaction. By doing so, we recognise and explore the multi-dimensionality of the concept of subjective well-being – an increasingly common approach across the spectrum of the social sciences (Stone and Mackie, 2014) – and the inter-relatedness between different manifestations of subjective well-being (Baron et al., 2016; Gouveia et al., 2009; Helliwell et al., 2018).

Our study also adds to the broader literature on the links between entrepreneurship and various manifestations of subjective well-being, which has so far concentrated on developed countries (e.g. USA, UK, Germany), while focusing on mostly single subjective well-being measures, such as stress and mental health disorders (Baron et al., 2016; Cardon and Patel, 2015, Stephan and Roesler, 2012), job satisfaction (Benz and Frey, 2008), overall life satisfaction and satisfaction with various life domains (Binder and Coad, 2013; Binder and Coad, 2016; Johansson Sevä et al., 2016), quality of life (Kautonen et al., 2017). Nonetheless, there are a few exceptions, such as Uy et al. (2013) studying psychological

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<sup>3</sup> Note that positive and negative affect capture different dimensions of subjective well-being rather than the opposite ends of one dimension.

well-being of entrepreneurs in the Philippines. Our study helps redress the imbalance by exploring the case of a developing country (Bangladesh) as well as the increasingly common yet under-researched type of entrepreneurship that is enabled by microcredit.

At the empirical level, we contribute to the literature by providing causal estimates of the effect of microcredit entrepreneurship on subjective well-being, based on the instrumental variable approach and in the process introducing a novel instrument to the literature. This method expands the range of empirical approaches used in the previous microcredit-wellbeing literature (either randomised control trials (Becchetti and Conzo, 2013; Fernald et al., 2008) or correlational regression analysis (Ahmed et al. 2001; Chindarkar, 2012)), thus enlarging and refining the evidence base on the question. It also helps address the routinely raised concern in the broader entrepreneurship literature that the observed entrepreneur outcomes reflect the selection of people into entrepreneurship rather than the effect of it (e.g., Milanov et al., 2015; Stephan and Roesling, 2010; Uy et al., 2013).

Finally, our study is related to the broader literature on the links between microcredit, entrepreneurship, and poverty reduction in developing countries. This literature has looked at whether microcredit, an innovative finance tool, has encouraged entrepreneurial activity (Bellavitis et al., 2017; Bruton et al, 2015; Chen et al., 2017; Chliova et al., 2015; George et al., 2012), with an additional emphasis on the role played by borrower and enterprise characteristics (Bradley, McMullen et al., 2012; Chakravarty and Shahriar, 2015; Moss et al., 2015) and the context in which micro-borrowers operate (Chliova et al., 2015; Kimmit et al., 2016). Another strand of this literature has looked at the effects of microcredit-enabled entrepreneurship on poverty (Banerjee et al., 2015; Duvendack et al., 2011; Chliova et al., 2015; Gopaldaswamy et al., 2016; Sutter et al., 2018; Vermiere and Bruton, 2016). We contribute to this body of knowledge by studying the effects of microcredit borrowing on subjective well-being – an outcome that is closely related yet distinct from poverty and other manifestations of objective well-being (Nikolova, 2016).

The remainder of the paper is organised as follows. Section 3 outlines conceptual channels through which microcredit entrepreneurship may affect the subjective well-being of different groups of people, and presents hypotheses to be tested in the empirical analysis. Section 4 introduces the dataset, variables and estimation strategy. Section 5 reports the results, followed by a discussion and conclusion in section 6.

### 3. THEORETICAL PERSPECTIVES, RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

In this section, we present and adapt existing theoretical models to understand how microcredit affects people's subjective well-being in the context of rural Bangladesh. Combining the theory of procedural utility (Frey et al. 2004) based on self-determination (Deci and Ryan, 2000) with the aggregated life-domains model of overall life satisfaction (Cummins, 1996; van Praag and Ferrer-i-Carbonell, 2004), we provide a unified theoretical basis for the empirical analyses that follows. In the process, we develop several testable hypotheses distinguishing between direct and indirect channels through which microcredit may affect subjective well-being. To better understand our unified approach, we start by discussing the differences and commonalities between the two most prominent subjective well-being measures (cognitive-evaluative and hedonic-experienced).

#### 3.1 Measures of Subjective Well-Being: Commonalities and Distinctions

As evident from the empirical results presented in the World Happiness Reports (Helliwell et al., 2017, 2018), the current happiness literature focuses on two primary types of subjective well-being: cognitive-evaluative (what people think about their life (e.g. general life evaluations, life satisfaction) and hedonic-experienced (how people experience life: e.g. feelings of happiness, worry and depression; see also Kahneman and Riis, 2005).<sup>4</sup> Both types are considered stable and distinct enough – to the extent that subjective well-being researchers often explore only one of them. When considering individual subjective well-being, the cognitive-evaluative measure of “life satisfaction” is by far the most popular candidate and is often considered a central measure of subjective well-being; in its guidelines for capturing subjective well-being in large surveys, the OECD recommend using life satisfaction as a core measure (OECD, 2013). Life satisfaction has been studied widely and various statistically significant correlates with potential causal relationships ascertained (Helliwell, 2003; Helliwell and Barrington, 2010; Veenhoven, 2013; Bhuiyan and Szulga, 2017). It reacts sharply to individual life circumstance changes (e.g. health, marital status, employment, etc.) and vary considerably between nations at different levels of economic and

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<sup>4</sup> A third distinct measure of subjective well-being is eudaemonic (usually captured purpose and meaning of life, as well as the realisation that things done in life are worthwhile). Following the Aristotelian philosophy of values, it is clear that one may be satisfied with their life and feel happy while not finding purpose in it. Overall, eudaemonic well-being is rarely analyzed in empirical studies and it is beyond the scope of our paper, hence we do not explore it further

social development (Veenhoven, 1994; Bjornskov et al., 2008; Bhuiyan and Szulga, 2017). At a macro-level, three-quarters of the cross-country variations in average life satisfaction can be explained by six variables such as income per capita, social support, healthy life expectancy, etc. (Helliwell et al., 2017).

Hedonic-experienced measures, commonly classified as negative and positive affect, record the experience of individuals covering a short time span, such as “today” or “yesterday” (questions eliciting affect measures about “yesterday” and “today” tend to correlate very highly). The short and relatively recent time span ensures that there is very little recall bias when recording the responses. This is significantly different from life satisfaction which is intended to cover a longer time span (“these days”, week, month). Empirical studies investigating negative and positive affect remain limited in numbers and the explanatory power of standard socioeconomic and demographic characteristics abysmally low.<sup>5</sup> In contrast to the average life evaluation measures, average affect tends to vary very little between countries (Helliwell et al., 2012, Helliwell et al., 2017).

Given our interest in overall subjective well-being, we focus on life satisfaction which records “how satisfied individuals are with their life in general these days.” In addition, following the life-domain approach to subjective well-being (Cummins, 1996; van Praag and Ferrer-i-Carbonell, 2004), we will consider several domain-specific satisfaction measures (e.g. satisfaction with family, health, financial situation, and etc.). Finally, given that there exists a close, if imperfect, relationship between hedonic well-being, on the one hand, and evaluative well-being, on the other (see e.g. Couveia et al., 2009), we will also integrate in our final theoretical model three frequently used hedonic-experienced measures: frequency of feeling happy, worried, and depressed.

### 3.2 Theoretical Relationship Between Microcredit and Subjective Well-being

We now present the theories behind how microcredit-enabled entrepreneurship may affect individual life satisfaction. After elaborating on the theory of procedural utility based on self-determination and on the aggregated life-domains model of overall life satisfaction, we present our synthesis of the two theories.

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<sup>5</sup> The significant correlates and determinants of these affect measures are often related to the events of the day that the experience of the respondent was being evaluated for. For instance, whether the hedonic experience was being reported for a vacation day matters for the reported affect while not for life evaluation measures (Stone et al., 2012; Helliwell and Wang, 2014, 2015; Ryan et al., 2010; Bonikowska et al., 2013). This should not be viewed as a problematic feature of the affect measure, rather as a distinguishing feature by design.

### 3.2.1 Procedural Utility and the Theory of Self Determination

Scholars have often used the concept of ‘procedural’ utility, as well as the theory of self-determination, to frame their analysis of the effects of entrepreneurship and self-employment on subjective well-being. Given microcredit is often used and mandated by the Bangladeshi lending institutions to be exclusively used in entrepreneurial activities, we apply the theory and predictions of procedural utility to microcredit here without loss of generality. This is not to imply that there are no additional considerations specific to microcredit in our context. Indeed the unified theoretical model presented in Section 2.2.3 includes a host of other channels through which microcredit affects subjective well-being in addition to the mechanisms of the procedural utility and self-determination models.

The theory of procedural utility, introduced by Frey and colleagues (see e.g. Frey et al., 2004), holds that what matters to people is not only final outcomes (or ‘instrumental’ utility) but also the conditions and processes that lead to those outcomes (or ‘procedural’ utility). For example, entrepreneurship and wage-employment may be generating the same income (the same instrumental utility) but different satisfaction and thus procedural utility, because the underlying processes and conditions of the two types of employment are not the same. The theory of self-determination (Deci and Ryan, 2000) is usually applied insofar as it helps identify specific employment characteristics that yield procedural utility. In general terms, the theory of self-determination posits that people’s well-being depends on the satisfaction of three fundamental, innate psychological needs: 1) autonomy (the need to act according to one’s will, values and interest), 2) relatedness (the need to feel belonging and connected to others), and 3) competence (the need to master the environment and feel competent).

The empirical findings of the effect of entrepreneurship on subjective well-being through the channels remain mixed. Benz and Frey (2008) find that entrepreneurship/self-employment leads to greater autonomy and, through it, greater job satisfaction. Markussen et al. (2017) find that self-employed farmers report greater life satisfaction in Vietnam, arguing that self-employment in farming leads to greater procedural utility through gains in relatedness (because self-employed farmers typically work where they live and are therefore surrounded by family members) and competence (because farmers were typically brought up as farmers and therefore feel more competent in what they do than people doing other jobs). It is important to note that the subjective well-being enhancing effects of entrepreneurial activities through the self-determination channels are context dependent. In particular, several

studies based on developed countries (e.g. Germany, the UK) find that entrepreneurship is associated with greater life/job satisfaction only among opportunity entrepreneurs and not necessity entrepreneurs (Binder and Coed, 2013; Binder and Coed, 2016; Block and Koellinger, 2009). These studies identify necessity entrepreneurs by the transition of individuals from unemployment to self-employment. Evidence from developing countries, where necessity entrepreneurship is the norm, points in the same direction. For example, entrepreneurs are not happier/more life-satisfied than those wage-employed in Latin America (Graham and Petinatto, 2001) and in countries with less developed financial systems (Bianchi, 2012). These findings are usually explained by the conjecture that people appreciate autonomy less when they are forced into entrepreneurship because of a lack of formal job opportunities.

Thus, on the surface, the theory of procedural utility seems to suggest that microcredit loans will improve the borrowers' life satisfaction through the facilitation of entrepreneurial activities involving greater autonomy, relatedness and competence. While this may hold true for opportunity entrepreneurs, for the necessity entrepreneurs in poor countries such as Bangladesh,<sup>6</sup> the realities are quite different. In the context of rural Bangladesh, the gains in subjective well-being from the competence channel is expected to be limited since these mostly necessity borrowers have low human capital and often depend on strong guidance from others for their newly adopted trade. As mentioned before, gains from autonomy do not seem to be the norm for necessity entrepreneurs either. Finally, given the high density of population in rural Bangladesh and most work, entrepreneurial or paid, conducted close to home amongst strongly knit communities, it is not clear whether there will be any meaningful improvement in the relatedness aspect as individuals take microcredit loans. This said, social interactions within the newly formed loan groups could lead to relatedness gains.<sup>7</sup>

Next, we describe the aggregated life-domains model which offers a holistic framework for studying the effect of self-determination and other channels on life satisfaction.

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<sup>6</sup> While one may assume that most microcredit-enabled entrepreneurship in developing countries is driven by necessity, it does not have to be the case. See e.g. Bradley, Artz and Hullett (2012) for the discussion of opportunity-driven micro-entrepreneurship in the Dominican Republic.

<sup>7</sup> See also Milanov et al. (2015) showing that reciprocal relationships with microcredit groups positively influences firm performance, especially among men.

### 3.2.2 Aggregated Life-Domains Model

The aggregated life-domains model, pioneered by Cummins (1996) and van Praag and Ferrer-i-Carbonell (2004), connects satisfaction with specific life domains with overall life satisfaction. In particular, overall life satisfaction is presented as an aggregation of different domain-specific satisfactions. Some important domains include satisfaction with family, living standard, health, etc. (Praag and Ferrer-i-Carbonell, 2004). For empirical purposes, van Praag and Ferrer-i-Carbonell (2004) posit the life satisfaction of individual  $i$  as a linear combination of (a) satisfaction with  $n$  different domains ( $DS_1, DS_2, \dots, DS_n$ ), (b) socioeconomic, demographic and other individual level characteristics ( $X_i$ ), and (c) the error term ( $u_i$ ).<sup>8</sup> Thus, equation (I) describe life satisfaction as:

$$LS_i = \alpha_1 DS_{1,i} + \alpha_2 DS_{2,i} + \alpha_3 DS_{3,i} + \dots + \alpha_n DS_{n,i} + \beta X_i + u_i \quad (\text{I})$$

where  $\alpha_1, \alpha_2, \dots, \alpha_n$  are constant coefficients. One may also imagine the negative and positive affect as an important component of life satisfaction; indeed, both the conceptual and empirical relationship between positive and negative affect, on the one hand, and overall life satisfaction, on the other, has been previously acknowledged in the literature (see e.g. Baron et al. (2016) and Gouveia et al. (2009)). Therefore, we consider negative and positive affect as additional determinants of overall life satisfaction (similar to life satisfaction domains), which gives us equation (II) below:

$$LS_i = \alpha_1 DS_{1,i} + \alpha_2 DS_{2,i} + \alpha_3 DS_{3,i} + \dots + \alpha_n DS_{n,i} + \beta X_i + \rho_1 NA_i + \rho_2 PA_i + u_i \quad (\text{II})$$

where  $\rho_1$  and  $\rho_2$  are constant coefficients and  $NA_i$  and  $PA_i$  stand for positive and negative affect respectively.<sup>9</sup> The aggregated life-domains model broadly differentiates between two types of channels through which microcredit loans may affect life satisfaction. It may either directly affect life satisfaction if it is a relevant variable in  $X_i$  or indirectly do so by affecting the domains (including positive and negative affect). In other words, it offers a setup that is conducive to empirical testing via mediation models assuming one believes that the causal

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<sup>8</sup> Van Praag and Ferrer-i-Carbonell (2004) augment their model in the panel data setting with a procedure for extracting and including in their regression an individual level time-invariant personality trait variable. This is expected to reduce omitted variable bias. Given our dataset is cross-sectional, we do not elaborate on this here.

<sup>9</sup>It is sometimes useful to expand this model further to distinguish between control variables that specifically affect some domains and not others. For our model, we err on the side of caution by not eliminating any control variable as a potential determinant of these domains.

links run from microcredit to the domains and overall life satisfaction. Figure 1 shows a simple diagram illustrating such links.

< Insert Figure 1 here >

We now turn to providing the connections between microcredit and life satisfaction using this aggregated life-domain model and building on theories such as procedural utility via self-determination, intra-household bargaining model, and other potential channels based on the literature and our contextual observations.

### 3.2.3 Microcredit and Overall Life Satisfaction: A Unified Model

Among the different important life-domains identified by van Praag and Ferrer-i-Carbonell (2004), we believe the most pertinent ones for microcredit are satisfaction with standard of living, health, social support, and family.<sup>10</sup> Standard of living, satisfaction with health, and social support are some of the few most robust and statistically significant predictors of life satisfaction globally at both a macro (e.g. Bjornskov et al., 2008; Helliwell et al, 2017) and micro level (e.g. Bhuiyan and Szulga, 2017). Satisfaction with family is included based on studies that indicate on the one hand, beneficial effects of microcredit loans, such as improvement in the borrowers' intra-household bargaining power and harmful effects, on the other, such as increased domestic violence (particularly against women). Following the literature on the effect of microcredit on subjective well-being we include the two additional domains of experienced affect and satisfaction with achievement. The former has not only been recognised as a significant contributor to life satisfaction (e.g. Gouveia et al., 2009) but there is empirical evidence suggesting a high level of negative affect associated with taking microcredit loans (Guerin et al., 2014, p.296). Satisfaction with achievement has been included to capture the sense of autonomy and competence (discussed in section 2.2.1) that may be associated with undertaking entrepreneurial activities using microcredit.

Overall, we consider six distinct life domains (living standard, financial security, achievement in life, health, family, and community), positive affect (happiness) and negative affect (worry and depression) in our version of aggregated life satisfaction model.<sup>11</sup> It is

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<sup>10</sup> We exclude certain domains (e.g. satisfaction with environment) suggested by the van Praag and Ferrer-i-Carbonell (2004) since we do consider them to be unimportant in our context.

<sup>11</sup> We include satisfaction with financial security which relates to the temporal expectations of satisfaction with living standard.

important to note that unlike the procedural utility theory based on self-determination, the aggregated life-domain model does not provide actual reasons for why microcredit loans may affect the various life-domains. It offers a useful way to organize our thoughts and classify the various channels, that different theories and considerations provide, into direct and indirect effects. For the rest of this section, we elaborate on empirical evidence and reasons for potential indirect effects through the aforementioned life-domains, as well as through positive and negative affect, and fit the three aspects of self-determination into these domains.

*Satisfaction with living standards and financial security:* One of the most publicized quotes of Nobel Laureate Prof. Muhammad Yunus regarding microfinance is its promise to put “poverty in museums.” A core selling point for proponents of microcredit has been the claim that the credit-constrained poor can improve their livelihoods significantly by engaging in entrepreneurial activities using these loans. The fact that millions of poor individuals worldwide voluntarily accept microcredit loans along with the claims of high repayment rates by microfinance institutions (often in excess of 90 percent), arguably makes it reasonable to expect that microcredit boosts the borrowers’ stable income and in turn their satisfaction with living standards and financial security. However, the empirical evidence is inconclusive (Roodman and Morduch 2009; Karlan and Zinman 2009, 2011; Banerjee et al., 2015). For example, in their influential recent multi-country study Banerjee et al. (2015) find that access to microcredit does not lead to a significant increase in consumption or income.

One explanation for the absence of improvements in living standard is that not everyone has the skills and talent to become a successful entrepreneur (Deininger and Liu, 2013). In particular when it comes to poor individuals, the low human capital, inexperience with financial bookkeeping, lack of entrepreneurial know how, and mistaken perceptions about the rate of return on investments given costs, may result in not very successful entrepreneurial ventures leading to modest or no meaningful improvements in income. Even if microcredit entrepreneurs manage to set up a production process, there is no guarantee that there will be sufficient demand for the product, especially in low income environments, such as rural Bangladesh, meaning that business profitability and household income gains will be limited and difficult to sustain.

In cases where the borrowers living standard has improved through microcredit-fueled business, it is not necessary that they will be any more “satisfied” with their living standards. For instance, individuals may experience an increase in their internal and external reference

points for their living standards when they take the microcredit loan. There is a long literature in the social sciences about interpersonal comparisons and aspirations that supports this possibility (e.g. Duesenberry, 1949; Frank, 1985; Easterlin, 2001; Luttmer, 2005; Stutzer, 2004; Bhuiyan, 2017). In terms of internal reference points, the borrowers may be overly optimistic about their future living standards when taking the microcredit loan. This may be a product of, but not limited to, how well the microcredit opportunity was sold to them, the examples of microcredit borrower success they were exposed to (through their social network or the microfinance institutions), or simply an initial optimism experienced for being part of a group of community members that endorses the idea. However, the subsequent increase in income may find it difficult to keep up with the lofty expectations. In terms of external comparisons, it is possible that the reference group changes for the microcredit borrowers. They may compare themselves to other borrowers who may be experiencing similar improvements in living standards brought about by microcredit. Thus, it is possible to experience an even lower satisfaction with living standards as income and consumption rises via microcredit loans. The culprit would be overly optimistic internal expectations or improvement in the living standards of the external reference group.

The life domain of satisfaction with living standard is intended to capture the current living standard and not that of the future. A closely related but distinct life domain related to the satisfaction with living standard is that of financial security. Whether microcredit will improve satisfaction with financial security depends on, among other things, the opportunity cost of the entrepreneurial activity undertaken using the loan and related expectations. For instance, if the outside option is relatively much less secure, then we can expect microcredit to improve satisfaction with this domain. However, for reasons explained earlier, some borrowers may not excel at entrepreneurship and thus may become financially less secure as a result of taking the microcredit. Also, the level of household assets may have an effect on the micro-entrepreneurs' satisfaction with financial security. More asset-rich borrowers are not so much concerned about poverty and probably seek additional funds to expand existing businesses; from this perspective, they can be viewed as opportunity entrepreneurs, and an additional source of credit could add to their financial security. In contrast, asset-deprived borrowers – the poorest of the poor, which can also be classified as necessity entrepreneurs –

will have less skills to establish successful businesses, with little expected improvement in financial security and living standards.<sup>12</sup>

It should also be noted that, in the context of Bangladesh, microcredit has been strongly geared towards improving the lives of poor women. Until recently Grameen Bank (the largest microcredit lending institution in Bangladesh and started by Prof. Yunus) gave credit to women only. Women continue to comprise the major share of the current Grameen borrowers. A lot of these poor rural women, who are necessity borrowers, are expected to see an increase in satisfaction with financial security since their outside opportunities in a traditionally patriarchal society with widespread poverty is extremely limited. These women frequently have no work available and their future is very uncertain in terms of available work and income. While it is not clear that the living standards of women will improve drastically because of microcredit as is the case for all borrowers with low human capital and entrepreneurial experience, it should be noted that microcredit offers some much needed certainty into their financial future. Thus, we expect satisfaction with financial security to be higher for women who receive microcredit.

*Satisfaction with achievement in life:* Another major objective of microcredit, perhaps as important as improving living standards, is offering the borrowers a sense of autonomy, empowerment, and competence. Not working under another entity (e.g. a boss or a firm); having greater control and flexibility over one's income generating activities and working conditions; and the sheer satisfaction of competence achieved in developing one's own business, is expected to strongly increase the life domain of achievement in life. As discussed in section 3.2.1, the theory of self-determination states that autonomy and competence are two very important aspects related to entrepreneurial activities such as those financed by microcredit. These two channels of self-determination (autonomy and competence) should be adequately captured via the life domain of satisfaction with achievement.<sup>13</sup>

Additionally, we expect satisfaction with achievement in life to tease out a sense of empowerment brought about by microcredit related entrepreneurial activity. If successful, microcredit entrepreneurship should translate not only into financial gains for the household

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<sup>12</sup> See also Bradley, McMullen et al. (2012) for the links between necessity and opportunity entrepreneurship, and poverty in a developing country context.

<sup>13</sup> We believe these two channels also operate through other life-domains. For instance, higher living standard associated with an expansion of individual budget constraint may allow individuals to choose from a wider set of alternatives and as such exercise more autonomy.

but also an increased sense of empowerment and achievement in life. The reality, unfortunately, may not support this view, at least in the context of rural Bangladesh: for example, Karim (2008, 2014) reports that, in Bangladesh, microcredit entrepreneurs prefer to be wage-employed – if there was such a choice – and the wage-employed feel more empowered than people taking out microcredit loans; Awaworyi Churchill (2015), Ganle et al. (2015) and Garikipari (2008) also show that access to microcredit does not lead (or does not always lead) to (women) empowerment. These findings reflect the shortage of regular employment opportunities in developing countries, and the risks associated with doing business in such contexts, as well as the fact that microcredit providers, following their own agendas (e.g. profit-generating or expanding market share), ‘push’ people into microcredit entrepreneurship without a proper screening of their entrepreneurial skills. That said, in the context of Bangladesh, we expect the improvement in terms of satisfaction with achievement to have a gender-wise divide.

Women borrowers who are the most marginalised individuals and the least likely to have any form of employment, due to limited work opportunities and social norms, are expected to enjoy the highest return in terms of satisfaction with achievement due to microcredit related entrepreneurial activities. In other words, women, who have undoubtedly been the primary focus of microcredit in Bangladesh, are most expected to experience a higher satisfaction of achievement as many of them for the first time enter the workplace, step outside the house to attend group meetings, enjoy a certain degree of autonomy, and start their own business.

*Satisfaction with family:* As explained by the theory of self-determination, in addition to greater autonomy and competence, microcredit is expected to be associated with higher relatedness with regards to one’s family. Flexible work schedules may allow borrowers to spend more time with family members, pay more attention to the needs of children, and etc., which would lead to greater satisfaction with family life. Assuming there is higher income generated in the process, there is less need for compromises in intra-household decision making, which also potentially leads to higher satisfaction with family life. However, the relationship between microcredit and satisfaction with family is a much more complicated issue for women in terms of cultural norms and traditional roles. Microcredit borrowing women could face more of a challenge in reconciling the new role of entrepreneur with the expectation, common in societies with traditional gender norms, that they will stay at home and care for the family (Lee Siew Kim and Seow Ling, 2001; Parasumaran and Simmers,

2001). Fueled by mixed empirical results, the effect of microcredit on life satisfaction for women continues to be debated in the literature.

There is empirical evidence suggesting that, in addition to increasing women's participation in the labor force, microcredit gives women greater control over household income and thus higher bargaining power within the household, offers greater independence (autonomy), and reduces spousal abuse (Koenig et al. 2003; Hashemi et al. 1996; Kabeer 2001; Schuler et al. 1996). To the latter point, husbands may be worried about losing the loan if they continue to be abusive while the microcredit borrowing women experience an expanding support network and awareness for dealing with domestic violence (Hashemi et al 1996; Schuler et al. 1996, 1998).

Unfortunately, the literature has also documented evidence that is counter to the ones just stated. An increase in women's autonomy and bargaining power within the household may be seen as a threat to the husbands' authority and bargaining power, particularly in highly patriarchal societies such as rural Bangladesh. This may lead to short-term and longer-term escalation of violence towards their wives as they seek out microcredit loans. Several studies thus empirically link higher domestic (spousal) violence towards women in response to microcredit (Schuler et al. 1998; Rahman 1999; Jewkes 2002; Koenig et al. 2003).

It is worth noting that some recent studies have found that once selection bias for married women who are more likely to take microcredit (usually the relatively poorer women who are prone to higher domestic violence) is taken into account, the statistically significant relationship between domestic violence and microcredit for women tends to disappear (e.g. Bajracharya and Amin, 2013). Additionally, a significant portion of women, as is the case in rural Bangladesh, pass on their microcredit loans to their husband without using it for any entrepreneurial activities (Ashraf Ali, 2014; Karim, 2008; Karim, 2014; Montgomery et al., 1996). This is likely to reduce domestic violence that stem from greater participation of women in entrepreneurial activities. However, Goetz and Sen Gupta (1996) find that in these cases where women pass on the loan to their husbands, there is greater household conflict when it is time for loan repayment. Taken together, we expect limited subjective wellbeing gains for microcredit entrepreneur women.

*Satisfaction with health:* Microfinance institutions that are not-for-profit frequently use their microcredit platform to inform clients about safe hygiene practices, family planning, eating healthy, sending children to school etc. In the context of rural Bangladesh, the largest microcredit providers are not-for-profit (e.g. Grameen Bank, BRAC, etc.) and most employ

such awareness pledges at the beginning of their bi-weekly or monthly group meetings. For instance, Grameen Bank begin their group meeting with the borrowers after orally repeating 16 decisions, a number of which are aimed at healthy living (e.g. “We shall drink water from tube wells. If it is not available, we shall boil water or use alum”). To the extent that such awareness will improve health through successfully enhancing health benefitting practices, it is possible that microcredit may improve satisfaction with health. However, we expect the effect of microcredit on satisfaction with health to be limited since there are other concurrent health initiatives (from both the government and the development institutions) whose sole purpose is to concentrate on these health issues in a much more involved way making no distinction between microcredit borrowers and others. Also, it is possible that spillover effects will improve everyone’s satisfaction with health in the village which may result in no discernible empirical difference in satisfaction with health between borrowers and non-borrowers.

*Satisfaction with community.* Access to microcredit sends a signal to people in a local community that someone can be trusted (Becchetti and Conza, 2011; Becchetti and Conza, 2013), which, in turn, may improve relationships within that community and satisfaction with community life; using the language of the self-determination theory, the satisfaction of both the relatedness and competence needs of microcredit entrepreneurs may increase. If microcredit entrepreneurship has positive spillovers onto community life (e.g., by resulting in lower poverty through provision of extra job opportunities), microcredit entrepreneurs satisfaction with the community life may increase further.

This said, microcredit may also exacerbate economic and social vulnerabilities at the local level, erode local social capital, and generate hostility against microcredit entrepreneurs. It has been shown, for example, that the advent of microcredit has sustained and expanded the operations of local moneylenders (loan sharks), displaced existing community-level safety nets and coping strategies, such as local food banks, and inflated dowry prices – a practice that microcredit was meant to combat (Cons and Paprocki, 2010). Through the ‘economy of shame’, micro-finance institutions have been shown to “instrumentally violate the local norms of cohesion and community” (Karim, 2008, p.7) and erode local social capital (Banerjee and Jackson, 2017). Such adverse community-level changes generate opponents of microcredit, whose hostility towards microcredit recipients (Cons and Paposki, 2010) may reduce the subjective well-being of all the members of a community, including microcredit entrepreneurs themselves.

*Negative and positive affect: worry, depression and happiness.* High interest rates, the frequency with which micro-loans have to be repaid, the inability to repay debts, over-indebtedness and debt traps are major critiques of microcredit (Guerin et al., 2014; Sandberg, 2012), and has been shown that these debt issues contribute to greater negative affect (experienced feelings of worry, stress, depression) of microcredit entrepreneurs. Put under pressure by both micro-finance institutions and loan group members, microcredit entrepreneurs often take extra credit from other micro-finance institutions and local lenders (Kamath et al., 2008; Kazmin, 2010) – a process that easily results in debt spirals, dependency, insecurity and reduced self-sufficiency (Cons and Paprocki, 2010). The mental health consequences of such overindebtedness can be devastating, as demonstrated by numerous reports of suicides committed by microcredit borrowers (Biswak, 2010; Buncombe, 2010).

Importantly, this distress can be caused not only by high financial burdens, but also by the social costs of debt. It has been shown that the relationship between microcredit lenders and borrowers often involves negative feelings, such as “shame, humiliation, anxiety, anger, revenge” (Guerin et al., 2014, p.296). Karim (2008) argues that, in Bangladesh, microfinance lenders instrumentally deploy various forms of shaming to recover loans, and refers to the relationship between lenders and borrowers as ‘political economy of shame’. Cons and Paprocki (2010), also drawing on the example of Bangladesh, state that the microcredit movement, with debt at its centre, has generated new forms of “exploitation, misery and control” (p.642). Overall, ‘degrading debt’ can erode borrowers' social standing, reputation and dignity, which, in turn, is likely to result in higher levels of negative affect (worry, anxiety, anger, depression).

One should also add that the day-to-day actions and experiences of microcredit entrepreneurs are embedded in the contexts of their loan groups, the dynamics of which can further amplify the negative affect experiences of entrepreneurs. Loan group members act as guarantors of individual loan repayment – members cannot receive further loans if at least one member has not repaid a previous debt. In an idealised world of microcredit, loan group members provide solidarity and support for those in difficulty. It could therefore be argued that the subjective well-being of microcredit entrepreneurs should benefit from frequent encounters with group members, socialising, sharing and discussing concerns, supporting and acting as mentors for others; in terms of the self-determination theory, this would mean a boost in satisfaction of the relatedness need and, thus, greater well-being. In reality, however,

micro-finance institutions' staff pressure often translates into peer pressure within groups, increases the perception of default risk and erodes mutual trust and support (Montgomery, 1996). Evidence from Bangladesh suggests that conflicts within loan groups are common, and loan group members can go as far as shaming the defaulting member in public and repossessing their belongings, including productive capital and property (Karim, 2008; Montgomery, 1996). Such punitive collective action from peers would undoubtedly further reduce the experienced well-being of micro-borrowers.

We are not aware of any theoretical studies that focuses on the relationship between microcredit and feelings of happiness (positive affect). One may extend the theory of self-determination to suggest that higher autonomy, relatedness and competence may manifest themselves in the form of higher positive affect. However, this is speculative in that we have no reasons to believe this will be case. Nonetheless, the literature does suggest that positive affect in general is positively related to overall life satisfaction (Helliwell et al., 2017).

### 3.4. Hypotheses

Based on the theoretical and empirical literature on the relationship between microcredit and subjective well-being discussed above, we have five primary hypotheses:

*H1: Compared to non-borrowers, microcredit borrowers will experience no greater satisfaction with living standard, financial security, achievement in life, community, family, and health.*

*H2: Microcredit borrowers will experience greater feelings of worry and depression compared to non-borrowers.*

*H3: The six life satisfaction domains (living standard, financial security, achievement in life, community, family, and health) and feelings of happiness, worry and depression are statistically significant predictors of the overall life satisfaction.*

*H4: Microcredit borrowing women experience higher satisfaction with achievement and financial security compared to microcredit borrowing men and non-borrowers.*

*H5: Microcredit borrowers with higher levels of household assets (opportunity entrepreneurs) experience higher satisfaction with living standard and financial security than microcredit borrowers with lower levels of household assets (necessity entrepreneurs).*

## 4. METHODS

### 4.1. Estimation strategy

Our empirical analysis proceeds in several steps. First, to establish the general profile of microcredit entrepreneurs, we report the raw differences in the socio-economic and demographic characteristics as well as subjective well-being between microcredit borrowers and non-borrowers. Second, we apply the instrumental variable approach to look for any causal effect of microcredit on six subjective life-domains and three experienced affects (Estimation of Model 1 will allow us to test hypotheses *H1-H2*). Formally, we are interested in estimating the following model:

$$SD_i = \alpha + \beta X_i + \Gamma MC_i + \varepsilon_i \quad (1)$$

where, for individual  $i$ ,  $SD$  is a measure of satisfaction domains,  $MC$  is the binary variable capturing the use of microcredit,  $X$  is a vector of the individual-/household-level control variables including village-fixed effects, and  $\varepsilon$  is the idiosyncratic error term.<sup>14</sup>

Potential endogeneity issues such as simultaneity or omitted variable bias makes the identification of  $\beta$  using least squares problematic. For instance, causality may run from subjective well-being to micro-credit borrowing or unobserved characteristics such as personality may be driving both. To deal with such potential endogeneity, and move closer to causal effects, we employ a two-stage instrumental variable approach (Wooldridge, 2010).<sup>15</sup> The method relies on the availability of an instrument – a variable highly correlated with the endogenous regressor ( $MC$ ) and affecting the outcome ( $SD$ ) only through the endogenous regressor. We use the density of microcredit borrowers in the vicinity of the respondent household as an instrument for  $MC$  assuming people will be more likely to become microcredit borrowers if the uptake of microcredit among their neighbors is high. This is because neighbors will directly or indirectly convey information about microcredit and probably influence others to join – a type of peer effect. Having said this, the presence of microcredit entrepreneurs in the immediate neighborhood may directly affect subjective well-being through other channels (e.g. income comparison with neighbors). To deal with this concern, we exclude from our definition of ‘vicinity’ the closest neighbors, with whom social

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<sup>14</sup> We use robust standard errors in all regressions ran in this paper except for the bootstrapping conducted in the mediation model.

<sup>15</sup> It is worth noting that although our outcome variables are ordinal, it is common practice to analyse them with linear models, effectively assuming cardinality of subjective well-being measures (Ferrer-i-Carbonell and Frijters, 2004). Our findings are robust in ordered probit/logit models.

comparisons are more likely to be made. Specifically, we calculate the average uptake of microcredit among 10<sup>th</sup> to 29<sup>th</sup> closest neighbors where closest is defined by the Euclidean distance between households. The outer boundary (29<sup>th</sup>) of this neighbor was chosen to maximize the strength of the instrument (the value of the Cragg-Donald Wald F statistic). The inner boundary (10<sup>th</sup> neighbor) is more arbitrary; we have experimented with other values (e.g. 5<sup>th</sup> to 9<sup>th</sup> neighbors) and found little difference in the results.

Third, we estimate the aggregated life-domains model (see equation (II) from section 2.2.2) as follows:

$$LS_i = \alpha_1 DS_{1,i} + \dots + \alpha_6 DS_{6,i} + \rho_1 NA_{1,i} + \rho_2 NA_{2,i} + \gamma PA_i + \zeta X_i + \eta MC_i + u_i \quad (2)$$

where, for individual  $i$ ,  $LS$  is life satisfaction,  $DS$  is a measure of life domain,  $NA$  is a measure of negative affect,  $PA$  is a measures of positive affect,  $MC$  is the binary variable capturing the use of microcredit,  $X$  is a vector of the individual-/household-level control variables including village-fixed effects, and  $u$  is the idiosyncratic error term. As in our previous estimation, we continue using the same instrumental methods strategy and also reports the OLS results. This model allows us to check for H3.

Fourth, we present a mediation model (Preacher and Hayes, 2008) to illustrate any significant indirect effect of  $MC$  on life domain satisfaction or experienced affect. In particular, we focus on mediators of life satisfaction that were identified to be statistically significantly affected by  $MC$  and affecting  $LS$  in our estimation of (1) and (2), respectively.

We check for gender- and asset- based heterogeneous effect of microcredit on the different subjective life-domains and experienced affects (H4 and H5). We accomplish this by augmenting our model in (1) with appropriate interaction of  $MC$  with gender and asset index (economic status) interactions.

#### 4.2. Data

Our empirical analysis is based on the Tangail Survey, a census-like survey of all households in three contiguous villages (Bankina, Roail and Shatihhat) in the Tangail district of Dhaka, Bangladesh. The survey was conducted in 2013, in two stages. First, a geographic information system map was prepared, identifying the location of every household in the three villages. The second stage involved recruiting local college students to interview these households with long form questionnaires and smart pens which audio-taped every survey.

Bhuiyan and Szulga (2016) provide a detailed account of the survey methodology and implementation.

The coverage of the Tangail Survey is consistent with the 2011 Population Census data collected by the Bangladesh Bureau of Statistics, according to which the total number of households in Bankina, Roail and Shatihati in 2011 was 423, 294 and 948. The Tangail Survey identifies 486, 304 and 876 households in these three villages. Of these 1,666 households, 96 had no residents living in them for more than six months within the last year and 31 households refused to take part in the survey. Furthermore, 52 households were not surveyed predominantly due to scheduling conflicts, and data collected from another 59 surveys were not usable due to its poor quality. Usable data are thus available for 1,430 households.

The survey collected information about the household's living conditions and the socio-demographic characteristics (marital status, employment, age, gender, etc.) of all household members (in total, 4,094 individuals aged 18 and over). Whenever possible, these questions were answered by the head of the household (or another knowledgeable person present in the household). The survey also included a range of questions on subjective well-being, answered by the main respondent only (usually, the head of household).

### 4.3. Variables

#### 4.3.1. Subjective well-being

Respondents were asked a range of questions on subjective well-being. The first question, “Overall, how satisfied are you with life as a whole these days?”, is used to capture overall life satisfaction. Possible answers included “not at all satisfied”, “somewhat unsatisfied”, “satisfied”, “quite satisfied” and “completely satisfied”, and they are assigned values 1 to 5 respectively. In addition, respondents were asked to assess their satisfaction with a number of different life domains, which had the same possible answers as in the overall life satisfaction question. Satisfaction with the standard of living, financial security, achievement in life, health, family, and community are of particular interest to us. We therefore created six variables capturing satisfaction with of these domains and coded them in the same manner as the overall life satisfaction.

Next, respondents were asked if they experienced specific feelings – happiness, worry, and depression – in the day prior to the interview, with answers to each question ranging from “have not experienced the feeling at all” (1) to “experienced all the time” (5).

We use this information to form three variables capturing the experienced feelings of happiness, worry, and depression (hedonic well-being/ positive and negative affect).

#### 4.3.2. Microcredit use

Microcredit use is captured by the question “Are you a member of microcredit?” We construct a binary variable equal to 1 if a person is a microcredit borrower and 0 otherwise.

#### 4.3.3. Control variables

Following the literature on the determinants of subjective well-being (see e.g. Dolan et al., 2008; Bjornskov et al., 2008; Helliwell et al, 2017; Bhuiyan and Szulga, 2017) and to isolate the effect of microcredit entrepreneurship on subjective well-being from potential confounders, all our regressions will include the following control variables: age and its square, gender, marital status, being the head of the household, household size, education, and subjective religiosity. We also include an economic status index, which is constructed by extracting the first principal component from the information on 1) the quality of household construction material (1 “kacha” (low quality), 2 “semi pucca”, and 3 “pucca”(high quality)); 2) the number of main rooms; whether the household has 3) electricity; 4) a cell phone; 5) a television; 6) a refrigerator; and 7) whether the household owns land.<sup>16</sup>

#### 4.4 Descriptive statistics

Table 1 reports the correlation coefficients between the subjective well-being outcomes. As expected, satisfaction with different life domains is highly correlated with overall life satisfaction. Positive affect (feeling happy) is also positively and significantly correlated with the overall life satisfaction and satisfaction with life domains, and negatively associated with the feelings of worry and depression. The correlation between the two measures of negative affect (feelings of worry and depression, which are highly correlated between themselves) and overall life satisfaction is negative and statistically significant at the 99% level, although it is lower relative to the correlation between life domains and overall life satisfaction. We also notice relatively low and statistically insignificant levels of correlation between the negative affect and satisfaction with some life domains.

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<sup>16</sup> The Eigenvalue of the first principal component is equal to 2.78, and the Eigenvalues of the following components are all lower than 1.

< Insert Table 1 here >

Table 2 reports the summary statistics of the socio-demographic characteristics and the subjective well-being outcomes for the full sample of respondents (for consistency, we focus only on main respondents, i.e. those who answered the well subjective well-being questions and will therefore be included in the empirical analysis), as well as for the sub-samples of microcredit borrowers (39% of the sample) and non-borrowers (61% of the sample). Relative to non-borrowers, borrowers are more likely to be married and less likely to be widowed/divorced/separated; they are also somewhat less likely to be heads of households. In terms of socio-economic status, borrowers have lower levels of education and lower levels of the economic status index. This is consistent with the main aim of the microcredit movement of channeling funds to poorer households. Microcredit borrowers also consider themselves less religious.

In terms of the subjective well-being outcomes, microcredit borrowers are on average less satisfied with their lives and are more likely to say that they felt worried the day before the interview. Overall, these descriptive statistics suggest that microcredit borrowers differ from non-borrowers on a number of characteristics (they tend to be poorer, less educated, less religious) and, if anything, have on average lower levels of subjective well-being. It is therefore possible that the relationship between microcredit use and subjective well-being is driven by individual and household characteristics (e.g. poorer people may be more likely to take up microcredit and feel worried), which is why all our further regression analysis includes the socio-demographic characteristics as controls.

< Insert Table 2 here >

## 5. RESULTS

Table 3 reports the instrumental variable results for the effect of micro-borrowing on the satisfaction with six life domains, as well as positive and negative affect. We first note that the instrument – the average micro-borrowing rate among 10<sup>th</sup> to 29<sup>th</sup> neighboring households – is a strong predictor of participation in a microcredit program: the Cragg-Donald F statistic exceeds 10 (the commonly accepted threshold value) in all specifications, confirming that the instrument is relevant. The instrumental variable results suggest that becoming a micro-borrower increases worry and depression (Table 3, Columns 8 and 9; H2): the second-stage coefficients are positive and significant at the 5% and 1% level, respectively. In terms of size,

becoming a micro- borrower raises worry by 1.45 points and depression by 2.48 points, on a scale of 1 to 5. These effects are large in magnitude, pointing to a major adverse effect of microcredit uptake on negative affect and supporting H2. At the same time, the coefficients of the micro-borrower variable in the life domains and happiness specifications are statistically insignificant, meaning that participating in a microcredit program does not have a causal effect on these measures of subjective well-being. This supports H1 (Table 3, Columns 1-7).

Regarding the coefficients of control variables, older respondents are somewhat less satisfied with family life. Women generally report greater satisfaction with living standard, financial security and achievement, but also lower satisfaction with health and greater levels of worry than men. Relative to married respondents, the single are less satisfied with living standard and achievement, less likely to report the feelings of happiness and more likely to report the feelings of worry and depression. Respondents in the broad category of widowed/divorced/separated are less satisfied with living standard, financial security, and achievement. Heads of household report lower satisfaction with health, while those with primary education are less likely to be satisfied with family life and feel happy. Higher economic status position (i.e. more household assets) is associated with greater levels of satisfaction with all six life domains and feelings of happiness, but is not significantly correlated with the feelings of worry and depression. Finally, religious people are more satisfied with all life domains except achievement in life and, at the same time, they are more likely to report feelings of worry.

< Insert Table 3 about here >

Table 4 reports the determinants of the overall life satisfaction, where the latter is regressed on the microcredit borrower status with and without satisfaction domains. The instrumental variable results in Column 1 show that there is no causal effect of micro-borrowing on the overall life satisfaction (the coefficient is statistically insignificant). In Column 2, we augment the estimated model with the two measures of negative affect (feelings of worry and depression; we start with these two measures as they are the only well-being dimensions that are causally affected by micro-borrowing, see Table 3). We first notice that both worry and depression are negative and significant predictors of overall life satisfaction. Once we control for worry and depression, the coefficient of micro-borrowing stays insignificant. Finally, in Column 3, we add the life domains and positive affect, thus

estimating the full model. Conforming to our expectations, satisfaction with most life domains – living standard, financial security, achievement and family – are positive and significant predictors of the overall life satisfaction; the coefficients of the satisfaction with family and community are positive but statistically insignificant. Feeling of happiness and worry also feed into the overall life satisfaction (with expected signs), while feelings of depression become statistically insignificant once the life domains are included. These results lend partial support for H3 (Table 4, Column 3).

In the full model, the coefficient of micro-borrowing also remains statistically insignificant implying no direct effect of micro-borrowing on overall life satisfaction when the satisfaction with different life domains and positive and negative affect are taken into account. Based on the results in Tables 3 and 4, we conclude that although microcredit does not affect life satisfaction directly, it does so indirectly through increased feeling of worry. In addition to the discussion in section 2, our use of instruments suggests there is a causal indirect effect (Figure 2).

< Insert Figure 2 here >

The control variables in the restricted model (Column 1) comply with the literature: age exhibits a U-shaped relationship with the overall life satisfaction, with the inflection point occurring at the age of 51, and women, the married, the better-off and the more religious are more satisfied with life overall. Noteworthy, these controls, with the exception of age and gender, become statistically insignificant in the full model (Column 3), suggesting that satisfaction with life domains and positive and negative affect embody much of influence of marital status, economic position and religiosity.

<Insert Table 4 about here>

Table 5 reports the instrumental variable results for estimations testing the effect of gender (Panel A) and economic status (Panel B) interactions. For the interaction with gender, micro-borrowing leads to a greater satisfaction with financial security and a greater satisfaction with achievement in life among women and not men – the interaction terms are positive and significant at the 5% level; this supports H4 (Table 5, Panel A, Columns 2 and 3). For interaction with the economic status, micro-borrowing leads to greater satisfaction with financial security when the household economic position is high (the interaction term is

significant is significant at the 10% level); the interaction term is statistically insignificant in all other specifications. H5 is thus supported for the satisfaction with financial security outcome (Table 5, Panel B, Column 2), but not the satisfaction with living standards.

< Insert Table 5 here >

## 6. DISCUSSION

Entrepreneurship has long been hailed as an effective way to lift people out of poverty in developing countries, and microcredit – providing small loans to people who would otherwise lack access to formal finance – emerged as a practical tool to facilitate entrepreneurship in such contexts. While there is mixed evidence micro-borrowing significantly improves entrepreneurs' objective well-being outcomes, such as consumption and income (Banerjee et al., 2015), and a common criticism that micro-borrowing leads to over-indebtedness and associated problems (Guerin et al., 2014; Sandberg, 2012), broader well-being effects of microcredit entrepreneurship remained underexplored. Our study set out to assess the subjective well-being consequences of microcredit-enabled entrepreneurship in the context of rural Bangladesh, one of the world's poorest and most densely populated countries, where the microcredit movement originated. Building on the life-domain approach to subjective well-being (Cummins, 1996, van Praag and Ferrer-i-Carbonell, 2004) and the theories of procedural utility (Frey et al., 2004) and self-determination (Deci and Ryan, 2000), we proposed a unified conceptual framework where micro-borrowing can affect satisfaction with different life domains (living standards, financial security, achievement in life, health, family life, and community), positive affect (happiness) and negative affect (worry and depression), and, through them, the overall life satisfaction. We also hypothesised that women microcredit entrepreneurs would be particularly likely to experience gains in satisfaction with financial security and achievement in life. Given a common concern in the entrepreneurship literature about causality, we were particularly interested in obtaining causal effects of microcredit entrepreneurship on different manifestations of subjective well-being; to uncover causality, we used the instrumental variable approach.

Several sets of findings emerged, fully or partially confirming our hypotheses. First, we found that satisfaction with most life domains, as well feelings of happiness and worry, are significant predictors of the overall life satisfaction. Second, micro-borrowing increases the level of worry and depression of micro-borrowers. Given that worry feeds into the overall life satisfaction, we conclude that micro-borrowing reduces overall life satisfaction indirectly

– through increased worry. We did not obtain a statistically significant causal effect of micro-borrowing on satisfaction with any of the life domains or happiness, nor did we find a direct causal effect of micro-borrowing on overall subjective well-being, beyond the satisfaction domains that we included in our analysis. Overall, these findings imply that microcredit entrepreneurship results in no gain (if anything, a loss) in life satisfaction, at least when the assumption is made that micro-borrowers are a homogenous group.

However, some important differences emerge if we take into account heterogeneity within the pool of micro-borrowers, in particular the effects of gender and household assets. Specifically, in contrast to their male counterparts, female micro-borrowers do gain in satisfaction with financial security and achievement in life. Also, it is the better-off rather than poorer (as proxied by household assets) micro-borrowers who experience gains in satisfaction with financial security. Given that satisfaction with both financial security and achievement feed into the overall life satisfaction, these findings imply that the subjective well-being of women and the better-off in particular stands to benefit from microcredit-enabled entrepreneurship.

### 6.1. Implications for theory and practice

Our findings have a number of theoretical and practical implications. First, our study has highlighted the importance of studying the different manifestations of subjective well-being in a unified framework. Extant research on the links between subjective well-being and microcredit (Ahmed et al., 2001; Becchetti and Conzo, 2013; Chindarkar, 2012; Fernald et al., 2008) has typically considered one well-being outcome at a time – either evaluative (such as life satisfaction) or negative affect (such as stress). We show that, at least in the context of rural Bangladesh, these outcomes are interrelated and should be analysed jointly, and invite further research on the well-being effects of microcredit to adopt a more holistic conceptual framework. The invitation can be extended to the broader entrepreneurship research, which also has a tendency to focus on separate (even if measured using multi-item scales) subjective well-being outcomes (see e.g. Cardon and Patel, 2015; Stephan and Roesler, 2012; Benz and Frey, 2008; Johansson Sevä et al., 2016; Kautonen et al., 2017; Uy et al., 2013), although several studies have explicitly or implicitly highlighted the links between various manifestations of subjective well-being, such as the role of life satisfaction domains (Binder and Coad, 2016) and stress (Baron et al., 2016) for the overall life satisfaction.

Second, we have tried to integrate insights from the procedural utility and self-determination theories (Frey et al., 2004; Deci and Ryan, 2000), which have also been

applied to the study of entrepreneur subjective well-being (Benz and Frey, 2008; Binder and Coed, 2013; Markussen et al., 2017). As we have shown in our theoretical discussion, the two conceptual frameworks are far from mutually exclusive. Unfortunately, due to data constraints we have not been able to test directly the importance of the components of the self-determination model (autonomy, relatedness and competence) for subjective well-being; we therefore leave the exploration of a more complete integration of the two types of models, as well as a collection of appropriate data, for further research.

Third, our study reveals some adverse well-being effects (greater feelings of worry and depression) of microcredit-enabled entrepreneurship. This finding most likely reflects the problems of debt that are brought about by microcredit in a poor, traditional setting (Barenjee and Jackson, 2017; Guerin et al., 2014; Sandberg, 2012), which, in turn, are likely to be different from the type of stress experienced by entrepreneurs in developed countries (Cardon and Patel, 2015; Baron et al., 2016). Nevertheless, policymakers interested in the successful implementation of microcredit programs, could pay particular attention to the adverse mental health consequences of micro-borrowing. It is important not to leave the resolution of such issues to micro-borrower groups, which instead of provide support, comfort and advice can be a source of pressure that exacerbates mental health issues (Karim, 2008; Montgomery, 1996).

Fourth, and on a more positive note, the finding that micro-borrowing improves satisfaction with financial security and achievement in life for women suggests that microcredit may be delivering on its promises of greater autonomy and empowerment for poor women in developing countries. This finding is important in the context of recent critiques of microcredit, supported by the lack of evidence of transformative effects of micro-borrowing on outcomes such as consumption and income (Banerjee et al., 2015). For the broader happiness and development literature (see e.g. Nikolova, 2016), this would support the view that the overlap between monetary and subjective well-being outcomes is far from perfect. For policymakers, this could provide additional grounds for continuing microcredit policies, especially if the aim is to empower women, although the adverse mental health consequences of micro-borrowing, which according to our findings are relevant to both women and men, should still remain part of any policy response.

Fifth, our empirical findings provide some evidence for an improvement in satisfaction with financial security for individuals who are more asset rich. We believe this may relate to the distinction between necessity and opportunity entrepreneurs. Specifically, we expect opportunity borrowers to be individuals who are not the poorest of the poor but are

rather credit-constrained in terms of expanding their current business. For these individuals an additional source of guaranteed credit will improve financial security. However, for necessity borrowers, who are mostly very poor and therefore not prime candidates for entrepreneurial success (due to lack of human capital and other skills), microcredit is not expected to improve their income or financial security significantly. This interpretation of the finding echoes Binder and Coed (2013), Binder and Coed (2016) and Block and Koellinger (2009) finding that, in developed countries, subjective well-being gains are experienced by opportunity and not necessity entrepreneurs.

Finally, at the empirical level, our study presents an instrumental variable approach to uncover causal effects of microcredit entrepreneurship on subjective well-being. In particular, we introduce a novel instrumental variable which correlates strongly with whether an individual is a microcredit borrower and arguably satisfies the exogeneity assumption required for effective instrumental variable. This is made possible because of the richness of the data in terms of its census like coverage and the inclusion of precise geospatial data on household location. As new datasets become available offering this type of geospatial information, we expect other studies to build on the instrument we present here for studying causal effects of microcredit, and more generally entrepreneurship, on subjective well-being and other outcome variables of interest.

## 6.2. Limitations and directions for future research

Our work is not without limitations, some of which open directions for future research. First, all the subjective well-being measures we use are single-question-based. While such single-item measures are not without criticism, especially among scholars of psychometric research, they have been shown to possess high degree of test-retest reliability (Youngblut and Casper, 1993) and are highly correlated with multi-item scales allowing the use of the single item (Abdel-Khalek, 2006; Cheung and Lucas, 2014; Zimmerman et al., 2006; Wanous et al., 1997). The single-item measures are standard ways to capture subjective well-being across social sciences (in particular, economic and sociology), especially where large-scale survey data are analysed; they have been extensively validated via psychological and brain-scan research, and shown to be reliable, consistent and comparable measures of individual well-being (Frey and Stutzer, 2002; Layard, 2005; Graham, 2009; Helliwell and Barrington-Leigh, 2010; Diener et al., 2012). Recent OECD guidelines on capturing subjective well-being in large national and international surveys recommend using a (single-item) life satisfaction question as a core measure of subjective well-being and complement it with

(single-item) measures of positive and negative affect (happiness, sadness, stress, etc.) whenever possible (OECD, 2013).<sup>17</sup>

Second, while we have tried to establish causal relationships with the instrumental variable approach, our empirical analysis relies on cross-sectional data that were not specifically collected to test our hypotheses. We believe that long-panel datasets that have information on individuals' transition to and from microcredit (in addition to data on comparable non-participants) would offer yet another way of understanding and mitigating selection and omitted variable biases when conducting these studies. In particular, when such datasets are available for developing countries with a detailed questionnaires on the type of (e.g. duration, amount, type of entrepreneurship, business performance metrics, etc.) and reasons (necessity, opportunity, previous debt etc.) for taking the microcredit loan, we can be more confident about our claims.<sup>18</sup> For instance, when presenting the theories on how microcredit may affect different life domains, we were able to present the pros and cons (i.e. different mechanisms), and then based on earlier contextual findings in the literature reasonably conjecture our testable hypotheses. However, if we had questions that directly sought responses from the individuals, such as whether women feel more financially secure or enjoy higher autonomy because of microcredit, we could be more certain about differentiating between different theoretical mechanisms. Additionally, data on whether microcredit borrowers were already entrepreneurs when taking the loan or what fraction of time is spent on microcredit-fueled business activities versus other income generating activities, would be useful. We hope that future researchers will collect such data to have a more nuanced understanding of the causal mechanisms.

In terms of extending the scope of our work in future research, we believe the theoretical and empirical approach we develop here may be extended to studying entrepreneurial activities, in addition to only microcredit based entrepreneurship, more broadly in different economic and cultural contexts. Also, we did not include eudaemonic evaluations in our theoretical or empirical framework but it should be investigated in the more holistic paradigm of subjective well-being and overall life satisfaction.

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<sup>17</sup> See Appendix A in Stone and Mackie (2014) for a summary of questions that have been used to capture subjective well-being in various large national and international surveys.

<sup>18</sup> Note that the dataset we use for our empirical analyses collected information on the duration and size of the microcredit loan. However, these data are very noisy and deemed not accurate enough for inclusion in our empirical exercises.

### 6.3 Conclusion

Using a theoretical framework encompassing various dimensions of subjective well-being, and the instrumental variable approach to uncover causal effects, our study shows that, in the context of rural Bangladesh, microcredit borrowing has an indirect negative effect on the entrepreneurs' overall life satisfaction, through the increased levels of worry. We also find that female micro-borrowers experience an improvement in their satisfaction with financial security and achievement in life, while micro-borrowers with higher levels of household assets experience an improvement in satisfaction with financial security. These findings call for policies that mitigate the adverse psychological states associated with microcredit entrepreneurship as well as provide greater support for the poorest entrepreneurs. The positive effects for women would indicate that, in a poor, traditional context, microcredit is delivering on its promises to empower women through entrepreneurship.

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Figure 1. Aggregated Life Domain and Affect Model of Overall Life Satisfaction

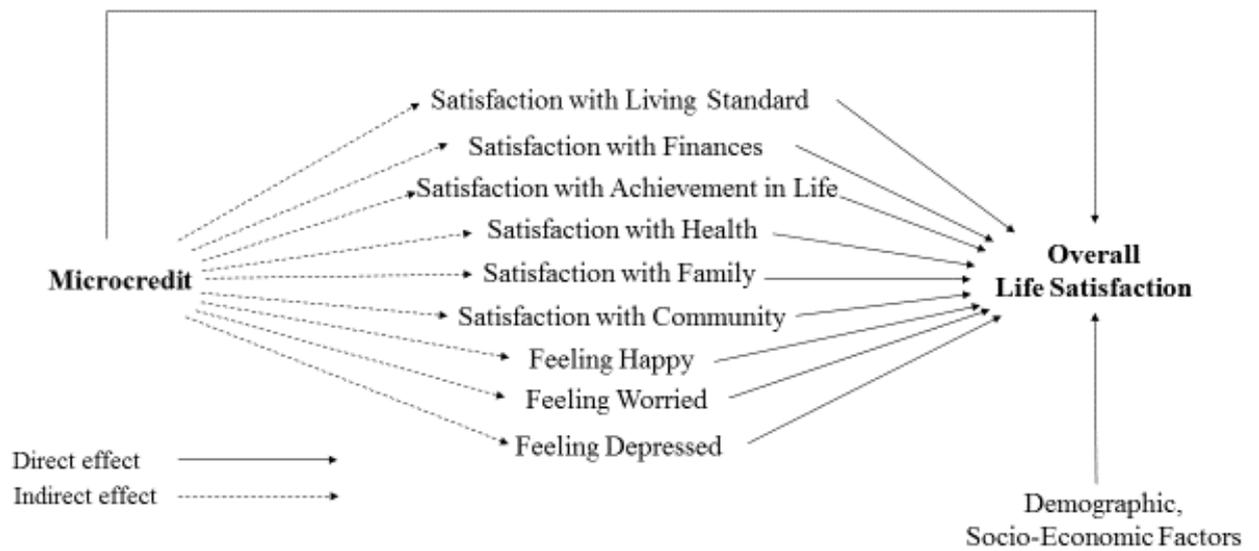
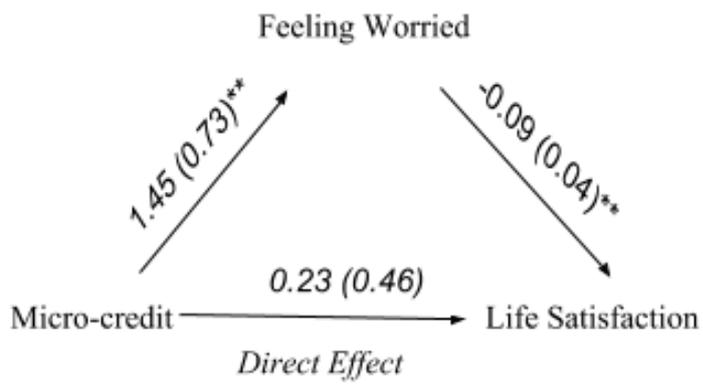


Figure 2. Direct and Indirect Effect of Micro-credit on Overall Life Satisfaction



Note: \*\* Statistically significant under a 95% confidence interval  
Standard errors in parenthesis

**Table 1. Subjective well-being outcomes: correlation matrix**

	Overall life satisfaction	Satisfaction with living standard	Satisfaction with financial security	Satisfaction with achievement	Satisfaction with health	Satisfaction with family	Satisfaction with community	Feeling happy	Feeling worried
Satisf. with living standard	0.51***								
Satisf. with financial security	0.47***	0.64***							
Satisfaction with achievement	0.51***	0.57***	0.53***						
Satisfaction with health	0.30***	0.37***	0.36***	0.40***					
Satisfaction with family	0.39***	0.42***	0.40***	0.50***	0.34***				
Satisfaction with community	0.36***	0.43***	0.42***	0.47***	0.25***	0.40***			
Feeling happy	0.34***	0.30***	0.28***	0.28***	0.30***	0.22***	0.22***		
Feeling worried	-0.17***	-0.16***	0.00	0.00	-0.07**	0.04	0.09***	-0.43***	
Feeling depressed	-0.21***	-0.15***	-0.08*	-0.10***	-0.09***	0.03	0.02	-0.36***	0.70***

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 2. Socio-demographic characteristics and subjective well-being outcomes for the full sample of respondents included in empirical analysis, and for micro-credit borrowers and non-borrowers**

	Full sample			Micro-credit borrower?	
	N	Mean	Std. dev.	No (61%)	Yes (39%)
<b>A. SOCIO-DEMOGRAPHIC CHARACTERISTICS</b>					
Age	1024	42.25	15.27	44.21	39.18***
Female	1042	0.45	-	0.45	0.43
Marital Status					
<i>Married</i>	1042	0.92	-	0.89	0.96***
<i>Single</i>	1042	0.02	-	0.02	0.01
<i>Widowed, divorced or separated</i>	1042	0.06	-	0.08	0.02***
Household head	1042	0.94	-	0.94	0.91**
Household size	1042	4.20	1.68	4.23	4.15
Education					
<i>No education</i>	1037	0.64	-	0.63	0.68*
<i>Some/Completed Primary</i>	1037	0.19	-	0.18	0.22*
<i>Some/Completed Secondary</i>	1037	0.13	-	0.15	0.09***
<i>Higher Secondary or more</i>	1037	0.03	-	0.04	0.02*
Economic Status Index <sup>a</sup>	1042	-0.13	0.94	-0.01	-0.31***
Subjective religiosity <sup>b</sup>	1024	2.15	0.56	2.20	2.07***
<b>B. SUBJECTIVE WELL-BEING</b>					
<i>Life satisfaction</i> <sup>c</sup>	1042	3.16	1.07	3.20	3.09*
<i>Satisfaction with living standard</i> <sup>c</sup>	1011	3.21	0.97	3.24	3.18
<i>Satisf. with financial security</i> <sup>c</sup>	908	3.09	1.03	3.12	3.04
<i>Satisf. with achievement in life</i> <sup>c</sup>	899	3.18	0.89	3.20	3.15
<i>Satisfaction with health</i> <sup>c</sup>	1011	3.06	1.09	3.00	3.14**
<i>Satisfaction with family life</i> <sup>c</sup>	1004	3.60	0.98	3.60	3.60
<i>Satisfaction with community</i> <sup>c</sup>	958	3.44	0.91	3.43	3.45
<i>How frequently felt happy yesterday</i> <sup>d</sup>	945	3.16	1.34	3.12	3.21
<i>How frequently felt worried yesterday</i> <sup>d</sup>	865	2.22	1.36	2.12	2.35***
<i>How frequently felt depressed yesterday</i> <sup>d</sup>	808	1.82	1.18	1.79	1.86

Notes: \*\*\*, \*\* and \* indicate the statistical significance (for *p-values* lower or equal to 0.01, 0.05 and 0.1, respectively) of the difference between the non-borrower and borrower sub-sample averages (based on the two-sample mean comparison t-test).

Variable values: <sup>a</sup> mean=0, standard deviation =1

<sup>b</sup> not very religious = 1, moderately religious = 2, very religious = 3

<sup>c</sup> not at all satisfied = 1, ..., completely satisfied = 5

<sup>d</sup> not at all = 1, ..., all day = 5

Age and household size are continuous variables; all other variables are 0/1 indicator variable.

**Table 3. Micro-credit borrowing, satisfaction with life domains, and positive and negative affect, instrumental variable results**

	Satisfaction with living standard	Satisfaction with financial security	Satisfaction with achievement	Satisfaction with health	Satisfaction with family	Satisfaction with community	Feeling happy	Feeling worried	Feeling depressed
<b>Micro-credit borrower</b>	-0.199 (0.356)	0.107 (0.383)	-0.138 (0.354)	0.165 (0.451)	0.678 (0.442)	-0.120 (0.350)	-0.108 (0.584)	1.453** (0.729)	2.475*** (0.871)
Age	-0.011 (0.010)	-0.013 (0.012)	-0.015 (0.010)	-0.017 (0.012)	-0.018* (0.011)	-0.006 (0.010)	-0.010 (0.015)	0.025 (0.017)	0.016 (0.021)
Age squared	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Female	0.187*** (0.071)	0.329*** (0.080)	0.154** (0.064)	-0.278*** (0.081)	0.060 (0.079)	0.002 (0.064)	0.076 (0.106)	0.358*** (0.121)	0.148 (0.145)
Marital status (ref.: Married)									
<i>Single</i>	-0.530** (0.238)	-0.219 (0.242)	-0.454** (0.182)	-0.409 (0.250)	-0.169 (0.253)	-0.312 (0.221)	-0.767** (0.315)	0.997*** (0.347)	0.769** (0.350)
<i>Widow/Divorced/Separated</i>	-0.324** (0.151)	-0.301* (0.181)	-0.289* (0.159)	0.075 (0.190)	-0.069 (0.172)	-0.078 (0.144)	-0.065 (0.238)	0.108 (0.284)	0.089 (0.290)
Household head	0.047 (0.116)	0.145 (0.158)	0.079 (0.112)	-0.268* (0.146)	0.007 (0.158)	0.053 (0.118)	0.037 (0.206)	0.568*** (0.219)	0.433* (0.233)
Household size	0.001 (0.019)	0.019 (0.020)	0.018 (0.018)	-0.018 (0.021)	0.020 (0.020)	-0.014 (0.017)	0.000 (0.027)	0.028 (0.031)	-0.019 (0.035)
Education (ref.: No education)									
<i>Primary</i>	-0.033 (0.074)	-0.066 (0.083)	-0.081 (0.071)	-0.110 (0.082)	-0.216*** (0.080)	0.015 (0.067)	-0.239** (0.117)	0.006 (0.136)	-0.053 (0.160)
<i>Secondary</i>	-0.075 (0.115)	-0.044 (0.118)	-0.015 (0.098)	-0.060 (0.130)	-0.169 (0.123)	-0.191* (0.104)	-0.003 (0.159)	0.096 (0.185)	0.216 (0.222)
<i>Higher Secondary +</i>	-0.134 (0.165)	-0.100 (0.178)	-0.111 (0.189)	0.146 (0.178)	-0.158 (0.175)	-0.084 (0.182)	-0.039 (0.240)	0.133 (0.249)	0.464 (0.303)
Economic status index	0.101*** (0.038)	0.106*** (0.040)	0.102*** (0.038)	0.089* (0.046)	0.150*** (0.045)	0.070* (0.038)	0.099* (0.058)	-0.055 (0.074)	0.059 (0.089)
Subjective religiosity	0.160*** (0.058)	0.285*** (0.065)	0.058 (0.054)	0.125* (0.067)	0.238*** (0.062)	0.149*** (0.054)	-0.062 (0.086)	0.217** (0.097)	0.095 (0.116)

Village fixed effects	Yes	Yes	Yes						
Constant	2.825*** (0.351)	2.121*** (0.395)	3.034*** (0.325)	3.704*** (0.412)	3.008*** (0.377)	3.030*** (0.325)	3.312*** (0.579)	-0.537 (0.600)	-0.438 (0.707)
<b>Instrument: Average micro-credit participation rate of 10<sup>th</sup> to 29<sup>th</sup> neighbouring households</b>									
<i>Cragg-Donald F Stat.</i>	27.31	28.03	21.80	25.82	24.01	28.45	21.47	16.43	15.39
Observations	981	879	876	985	973	930	919	842	788
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Heteroscedasticity-standard errors in parentheses.

**Table 4. The determinants of overall life satisfaction, instrumental variable results**

	Dependent variable: Overall life satisfaction		
	(1)	(2)	(3)
<b>Micro-credit borrower</b>	-0.172 (0.392)	0.165 (0.485)	0.232 (0.461)
Satisfaction with living standard	-	-	0.191*** (0.069)
Satisfaction with financial security	-	-	0.100* (0.056)
Satisfaction with achievement	-	-	0.184*** (0.069)
Satisfaction with health	-	-	0.008 (0.047)
Satisfaction with family	-	-	0.137*** (0.053)
Satisfaction with community	-	-	0.068 (0.057)
Feeling happy	-	-	0.060* (0.036)
Feeling worried	-	-0.103*** (0.036)	-0.091** (0.044)
Feeling depressed	-	-0.106** (0.042)	-0.027 (0.042)
Age	-0.028*** (0.011)	-0.025** (0.011)	-0.024** (0.011)
Age squared	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)
Female	0.255*** (0.076)	0.403*** (0.078)	0.211*** (0.079)
Marital status (ref.: Married)			
<i>Single</i>	-0.674*** (0.250)	-0.422 (0.273)	0.078 (0.269)
<i>Widow/Divorced/Separated</i>	-0.286* (0.159)	-0.368** (0.158)	-0.042 (0.141)
Household head	0.135 (0.142)	0.207 (0.142)	0.124 (0.155)
Household size	0.022 (0.020)	0.009 (0.021)	0.001 (0.020)
Education (ref.: No education)			
<i>Primary</i>	-0.103 (0.083)	-0.067 (0.083)	-0.053 (0.082)
<i>Secondary</i>	0.084 (0.117)	0.053 (0.118)	0.094 (0.113)
<i>Higher Secondary +</i>	0.156 (0.182)	0.198 (0.204)	0.205 (0.194)
Economic status index	0.117*** (0.042)	0.101** (0.048)	0.022 (0.040)
Subjective religiosity	0.112* (0.060)	0.108* (0.060)	0.045 (0.058)
Village fixed effects	Yes	Yes	Yes

Constant	3.092*** (0.397)	3.055*** (0.410)	0.894* (0.464)
<hr/>			
<i>Instrument 1<sup>st</sup> stage</i>			
<i>Cragg-Donald F Statistic</i>	28.66	15.08	13.57
<hr/>			
Observations	1,009	779	635
Prob > F	0.000	0.000	0.000
<hr/>			

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Heteroscedasticity-standard errors in parentheses. Instrument: Average micro-credit participation rate of 10<sup>th</sup> to 29<sup>th</sup> neighbouring households.

**Table 5. Micro-credit, life satisfaction domains, and positive and negative affect; instrumental variable results for interactions with gender (Panel A) and economic status index (Panel B)**

	Satisfaction with living standard	Satisfaction with financial security	Satisfaction with achievement	Satisfaction with health	Satisfaction with family	Satisfaction with community	Feeling happy	Feeling worried	Feeling depressed
<b>A. INTERACTION WITH GENDER</b>									
Micro-credit borrower	-0.472 (0.437)	-0.327 (0.467)	-0.503 (0.399)	0.255 (0.509)	0.504 (0.462)	-0.162 (0.421)	-0.090 (0.657)	1.266 (0.783)	2.484*** (0.865)
Micro-credit borrower X Female	0.820 (0.551)	1.391** (0.662)	1.493** (0.700)	-0.297 (0.701)	0.563 (0.727)	0.134 (0.507)	-0.061 (0.954)	0.655 (1.442)	-0.039 (1.744)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Instrument 1<sup>st</sup> stage Cragg-Donald F Statistic</i>	13.66	13.98	8.574	12.69	11.88	14.24	10.50	7.117	5.148
<i>Observations</i>	981	879	876	985	973	930	919	842	788
<i>Prob &gt; F</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
<b>B. INTERACTION WITH ECONOMIC STATUS INDEX</b>									
Micro-credit borrower	-0.160 (0.370)	0.223 (0.395)	-0.129 (0.379)	0.296 (0.470)	0.674 (0.452)	-0.062 (0.356)	-0.007 (0.647)	1.545* (0.791)	2.518*** (0.929)
Micro-credit borrower X Economic status index	0.126 (0.246)	0.473* (0.252)	0.030 (0.291)	0.506 (0.308)	-0.017 (0.273)	0.261 (0.223)	0.258 (0.483)	0.348 (0.657)	0.191 (0.776)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Instrument 1<sup>st</sup> stage Cragg-Donald F Statistic</i>	12.46	13.54	9.736	12.39	11.41	14.05	8.318	7.348	7.402
<i>Observations</i>	981	879	876	985	973	930	919	842	788
<i>Prob &gt; F</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Heteroscedasticity-standard errors in parentheses. Instrument: Average micro-credit participation rate of 10<sup>th</sup> to 29<sup>th</sup> neighbouring households. The same socio-demographic controls as in Tables 3 and 4 are included in all regressions; complete econometric output is available from authors on request.