Microcredit and Poverty: When Microcredit Works and When It Doesn't

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Abstract: This paper explores the relationship between microcredit and poverty reduction. To investigate this question, we posit a bare-bone, household model that outlines the economic environment within which various types of family-microenterprises operate. It highlights a number of issues that impinge on household earnings such as the nature of the labor market, technology, product demand and entrepreneurial skills. The paper argues that the impact of microcredit is likely to be different across household types as well as across different economic environments. The paper identifies several important demand and supply constraints to the household's graduation from poverty. These constraints are difficult to overcome in a traditional economic environment, marked by stagnant technology and market saturation.

Keywords: Microcredit, poverty reduction, labor market, and technology.

> "I am working to achieve a world in which there will be a poverty museum in every country, so that people will be able to remember the time when poverty was a widespread affliction. And everyone will wonder why it took so long for this bane of mankind to be finally banished forever."
>
> Professor Muhammad Yunus: E-magazine of Credit Suisse (2008)

1. INTRODUCTION

In the wake of the worst famine of Bangladesh in the post-World War era, Professor Yunus launched, in 1976, a microcredit experiment to assist a group of poor, highly indebted households in Chittagong, Bangladesh (Yunus 2010). This experiment, which later emerged as the Grameen Bank, marked the beginning of the modern-day microcredit movement, which has blossomed into a global phenomenon in the last few decades. While precise data are difficult to obtain, the total volume of microcredit lending (as of February 2011) is reported to be about $65.2 billion, covering more than 94 million borrowers from 1800 microfinance institutions in nearly 130 countries (MIX 2011). This phenomenal success of microcredit in such a short span of time has attracted global attention from policymakers, development economists, and social thinkers—culminating in the award of the Nobel Peace Prize for Professor Yunus and the Grameen Bank in 2006. The idea of microcredit as an important tool of poverty reduction is now widely embraced by individuals of diverse and conflicting ideologies. Its converts include, among others, such liberal economist as Jeffrey Sachs (2005)[1] and rock-singer and social activist Bono[2] on the one hand, and free-market enthusiast and anti-aid best-selling author Moyo (2009)[3] on the other.

Recent years have seen the emergence of a burgeoning literature on microcredit—see, for example, Aghion and Murdoch (2006) and Karlan and Morduch (2010). In popularizing modern-day microcredit, Professor Yunus has had an important role both as an indefatigable interlocutor between the global poor and the international development community, and as the pioneer of clever innovations in credit contracts. These innovations—which include joint liability, peer-monitoring, and dynamic incentives— have helped today's microcredit programs to overcome such issues as adverse selection and moral hazard that traditionally bedeviled the poor people's access to credit.[4] By demonstrating that the poor are bankable, present-day microcredit programs have contributed toward fostering financial inclusiveness to a degree that never existed before.

Notwithstanding the considerable increase in micro-lending, few developing countries have made

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[1]According to Sachs (2005:27), "The key to ending extreme poverty is to enable the poorest of the poor to get their foot on the ladder of development. The ladder of development hovers overhead, and the poorest of the poor are stuck beneath it. They lack the minimum amount of capital necessary to get a foothold, and therefore need a boost up to the first rung."

[2]Bono likens microcredit to a fishing rod, a source of sustainable income, "Give a man a fish, he'll eat for a day. Give a woman microcredit, she, her husband, her children and her extended family will eat for a lifetime" (*New York Times*, September 21, 2005).

[3]Though Bono and Moyo have diametrically opposite views on the role of foreign aid in economic development—one favors and the other opposes foreign aid—they share a similar, positive perspective on microcredit.

[4]Much of the theoretical literature on the subject is devoted to these issues—see, for example, Stiglitz (1990); Besley and Coate (1995); Ghatak (2000); Laffont and N'Guessan (2004); and Rai and Sjostrom (2004).

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significant strides in their fight against poverty. This persistence of stubborn poverty has spawned widespread skepticism, which has been reflected in both public and academic discourses, about the effectiveness of microcredit. For example, in an incisive commentary in *New Yorker* magazine, Surowiecki (2008) echoed this concern, "There's no doubt that microfinance does a tremendous amount of good, yet there are also real limits to what it can accomplish. Microloans make poor borrowers better off. But, on their own, they often don't do much to make poor countries richer." [5]

In a similar vein, a number of recent surveys that reviewed the microcredit studies (for example, Weiss and Montgomery 2004; and Duvenduck *et al*. 2011) recorded a note of caution about the effectiveness of microcredit in poverty reduction. For example, Duvenduck *et al*. (2011:2) concluded that "rigorous quantitative evidence on the nature, magnitude and balance of microfinance impact is still scarce and inconclusive."

The existing literature is both indecisive and highly contentious. A case in point is a pioneering study in Bangladesh by Pitt and Khandker (1998), which found that microcredit had had a broad positive impact on consumption, poverty reduction and non-land asset accumulation. It also reported that microcredit had a favorable gender dimension: microcredit was more beneficial to the family when provided to women than to men—every additional borrowing by women led to an 18 percent increase of annual household expenditure, as compared to an 11 percent increase when borrowed by men.

The Pitt-Khandker results were challenged by Morduch (1998), whose estimates suggested that, even though microcredit helped reduce consumption volatility of the poor, it had no discernible impact on poverty (i.e., increase in consumption). The differences in results, it seems, did not stem from differences in data but from differences in econometric techniques: Pitt and Khandker applied an estimation method that in many ways resembled the regression-discontinuity design, while Morduch used the difference-in-difference approach. In a recent paper, Roodman and Morduch (2014) took another dig at Pitt and Khandker (1998): they claimed that the original results on poverty reduction disappeared after dropping outliers, or when using a robust linear estimator. They insisted that the causal poverty impact of microcredit on poverty could not be established in these data.

On the other hand, Pitt (2014) contended that the Roodman and Morduch claims were vitiated by flawed econometrics and by a lack of due diligence in formulating and interpreting statistical models. At the end, the whole debate turned into an arcane controversy about econometric techniques.

It seems that much of the empirical literature that relies on observational data was often marred by various technical issues—such as endogeneity, identification strategies and choice of instrumental variables. These econometric issues were part of the reason for the current popularity a body of studies that apply the method of randomized control trials (RCTs)[6], which can potentially overcome some of the technical econometric problems that plagued the earlier empirical studies.

However, the RCT-based studies have not lived up to the initial enthusiasms generated by its protagonists, as they have their own Achilles heels. First, while RCTs can yield unbiased estimates under ideal circumstances; however, many RCTs, including those concerning microcredit, do not seem to measure up to the ideal design required for unbiased results (Deaton, 2012).[7] Deaton succinctly summarized the issues as follows: There are actually two stages of selection in RCTs. The first stage starts with the entire population from which a group is chosen; this group is then randomly divided in the second stage into the study and control groups. Selection in the first stage, which is often be determined by convenience or politics, is not random— and not representative of the entire population. In addition, the studied populations in RCTs are often very small, which means that an outlier in the study group can have a huge distortionary effect.

[5]This skepticism has led many economists to argue that microcredit has little or nothing to do with economic development. For example, Bateman and Chang (2009) argue that the recent miraculous economic transformation of China and other East Asian economies took place without the visible help of microcredit. While this may be true, it does not, however, mean that , as argued by many protagonists of microcredit, that it could not— or would not— play a role in promoting inclusive development in future.

[6]Some recent RCT studies that address the question of the socio-economic impact of microcredit include: Karlan and Zinman (2009) on the Philippines; Banerjee *et al.* (2009) on India; Tarozzi, Desai and Johnson (2015) on Ethiopia; Attanasio *et al*. (2015) on Mongolia; Crépon *et al*. (2015) on Morocco; Angelucci, Karlan and Zinman (2015) on Mexico; and Augsburg *et al*. (2015) on Bosnia-Herzegovina.

[7]See the web posting of the proceedings of the Conference on Debates on Development, organized by New York University Development Research Institute, March 12, 2012. Available at: http://nyudri.org/initiatives/deaton-v-banerjee/ (accessed on July 21, 2012).

Second, a quick review of recent RCT studies on microcredit would suggest that they are far from homogenous: they differ significantly amongst themselves not only in the quality of intervention—the design, delivery and targeting of the credit—but also in terms of outcomes. For example, some recent studies suggest that credit has had a whole set of income/consumption outcomes (which ranged from negative to zero to positive effects); similarly, microcredit has had a discernible simulative effect on business in some instances, while it had a much more muted or even adverse effect on others (Quibria, 2015). Given the diversity of outcomes, one cannot help wonder about external validity: how generalizable are these outcomes?[8]

Third, even if the results of these RCT studies are taken at face value, they provide little insight about causality: they measure only the "average effect" of microcredit at a particular time and place.[9] However, the average masks the individual variations within the sample. As many case studies and casual empiricism attest, individuals have differed amongst themselves in their effective use of microcredit, thereby arriving at different outcomes. There are many failures as well as successes.

As the above discussion suggests, the existing empirical literature has yielded few robust results and shed little light on clarifying the salient policy issues. This inconclusiveness of the literature reflects its weaknesses in framing the questions as well as the coarseness of available tools for analysis. With its focus on the "average", the empirical literature has suffered twin failures: first, it failed to go beyond the averages to identify the characteristics of successful cases and explore policy options; second, it failed to recognize the fact that the impact of microcredit, like most other development interventions, is context-specific (contingent on the supporting environment) and not amenable to easy statistical encapsulation.[10]

In this paper, we seek to broaden the scope of the inquiry. Rather than asking the usual binary question—whether or not microcredit is effective in reducing poverty—we reframe the question: under what conditions does microcredit work? In so doing, we explore the various links between microcredit and poverty reduction.[11] In this, we limit ourselves to income-poverty, which is an obvious simplification— as poverty is a multi-dimensional concept.

To investigate this question, we rely on arguments that are based on a bare-bone model. The purpose of this article is, however, not to make a contribution to the repertoire of high theory of development economics, but to sort out the broad arguments germane to the question and to provide a taxonomy of cases where microcredit works. Therefore, the model has been kept deliberately threadbare. It abstracts from such considerations as imperfect information and uncertainty, issues that have featured prominently in existing theoretical works, as cited earlier. While these aspects are important to address the question of the failure of the rural credit markets and ways to overcome it, we believe that they are less central to the subject of this paper. Instead, this paper highlights such issues as the nature of the labor market, technology, product demand and entrepreneurship. We will argue that these are the aspects that have a critical bearing on household poverty in an impoverished, rural setting.

The organization of the paper is as follows. Section II spells out the basic model and traces its implications for household incomes and poverty. Section III explores numerically the link between microcredit and graduation from poverty under a set of plausible assumptions. Section IV extends the basic model to examine the economic effects of expanding microcredit programs on microenterprises. Section V provides a brief summary of conclusions.

[8]As expected, diverse socio-economic environments—which are undergirded by different sectoral and economy-wide policies, political regimes, social norms and the level of economic development —are likely to yield dissimilar outcomes to microcredit. As many of those aspects of socio-economic environments cannot be randomized, it is not surprising that the recent RCT studies yield an exotic-mix of results, which seem to have little external validity, and hence, are not susceptible to easy generalization.

[9]In a recent article, Rashid (2014) argues that RCTs, rather than bringing clarity, has turned out to be a distraction from important policy issues.

[10]The situation is similar to many other development interventions. For example, the macroeconomic evidence on aid effectiveness has been highly contentious and yielded few generalizable results—see, for example, Quibria (2014). Yet, there are many cases of successful transition from aid. The success of foreign aid, akin to microcredit, has been to a large extent context-specific.

[11]Theoretical work on this topic is almost non-existent, an exception being Ahlin and Jiang (2008) who explore the long-run impact of microcredit on individual economic outcomes. In the context of an occupational choice model that differentiates technologies into a hierarchy of three categories—subsistence, self-employment and entrepreneurship—Ahlin and Jiang (2008) argue that microcredit opens up self-employment opportunities for many who would otherwise work for wages ; this in turn lowers the use of both the least-productive subsistence technology and the most-productive entrepreneurial technology. They note that while the long-run impact of microcredit on economic development is indeterminate, it has a salutary effect on poverty and income inequality. It may be mentioned here that the current paper is significantly different from the Ahlin and Jiang (2008) paper both in terms of focus and method.

2. THE BASIC MODEL

A. Assumptions

Assume a rural household with two adult members—a male and a female. Each household is endowed with a unit of labor, and each member owns ½ of the unit. The female does not work outside the home but organizes a microenterprise with the microcredit available to her. In many traditional societies, female labor is non-traded in the market place[12] but products of home-based microenterprises are marketed. This is a salient assumption of the current model.[13] The male can work outside the home at an exogenously given wage rate ($\overline{w}$). Besides working as a casual worker in the rural labor market, the male may participate—depending on the marginal return—in the home-based microenterprise with the female. The wage rate for a casual worker can be at the subsistence or the below-subsistence level, depending on the state of the economy. Casual rural workers, who represent the bottom rung of the rural poor, often earn a below-subsistence wage rate in many poor countries. This wage rate can be lower than the poverty-threshold, which is for simplicity assumed to be z. In other words, we shall assume that the poverty line for a household of two (husband and wife) is given by z.

B. Household Optimization

Next, we will assume that the household decision-making process entails a two-stage optimization. In the first stage, the household makes a decision with respect to credit. In the second stage, it makes a decision with respect to the allocation of male effort between the home enterprise and the (outside) casual labor market. At the first stage, it is assumed the female can avail herself of microcredit to organize a microenterprise[14], although the microcredit institution fixes the amount and the interest rate. Let us assume that the production function of the microenterprise is given by:

$$Q = A\pi K^{a} L^{(1-a)}$$

where Q, A, K, L denote output, the technological progress parameter, the amount of loan provided to the household and the amount of labor allocated to the microenterprise respectively. Finally, π represents an entrepreneurial efficiency factor that augments output. It is assumed that π directly reflects entrepreneurial abilities: the more entrepreneurial the female is, the higher the value of π. In the following, we shall assume that $\pi = 1$. This is the case of a representative microentrepreneur with an "average "level entrepreneurial ability. We shall relax this assumption in a subsequent section.

The above production of the microenterprise can be expressed in intensive form:

$$q = Ak^{a}$$

With k being the amount of loan per worker provided to the family microenterprise. As is obvious, the higher the level of A, the greater the productivity. Finally, it is assumed that $0 \prec a \prec 1$, which means that the productions function exhibits the usual neoclassical property of diminishing marginal productivity. With the above assumptions, the net income of the microenterprise (w)--which is the difference between the net revenue (Apk^{a}) and the interest cost of the loan (rk), where p is the price of output and r is the interest rate— is given by:

$$w \equiv Apk^{a} - rk \qquad (1)$$

At the first stage, if the borrower is given the option to maximize the net-income, she would borrow k up to the point where the marginal productivity of capital is equal to or the less than the interest rate: $Apak^{a-1} \leq r$.

Denote the value of k, where this marginal-productivity condition is satisfied, as k^{*}. In other words,

[12]As Mammen and Paxson (2000: 141) have noted, women are primarily engaged in family enterprises in poor countries for a number of reasons: "At one extreme, laws may restrict women from working outside the home; Afghanistan offers a current example. Custom or social norms may also limit the ability of women to accept paid employment, especially in manual jobs. Finally, off-farm jobs may be less compatible with child rearing, creating fixed costs of working off-farm." However, even though social norms may prohibit women from participating in paid employment in rural areas, it is not uncommon in many countries, including Bangladesh, for women to participate in paid employment in urban areas—e.g., the garment industry, where the labor forces is overwhelmingly female. Usually, social norms are more binding in rural than in urban areas.

[13]This model highlights female self-employment in the household, which is a critical element of the microcredit story of many countries. Despite the salience of self-employment in the real world, there is not much analysis of it in economics. In his Nobel lecture, Yunus (2007: 54) laments this lacuna: "I have tried to demonstrate that credit for the poor can generate self-employment and generate income for them. By recognizing the household as the production unit and self-employment as a natural way for people to make a living, the economic literature has missed out an essential feature of economic theory."

[14]The model assumes that microcredit is used only for productive purposes. This simplifying assumption, which precludes the possibility of credit being used for inter-temporal consumption smoothing, helps us to focus sharply on the role of credit in addressing long-term poverty.

$$k^* = \arg\max\ [\ Apk^a - rk\ ] \tag{2}$$

And the corresponding value of w is given by:

$$w^* \equiv\ w(\ k^*|\ r, A, p) \equiv [\ Apk^{*a} - rk^*\ ] \tag{3a}$$

It may be noted that w^* is the maximized value of net earnings of the microenterprise (henceforth abbreviated as NEM) if there were no credit rationing; it essentially represents the implicit wage rate. When the female receives no credit, she cannot organize the microenterprise and NEM reduces to zero. Thus:

$$w^*(0|\ r, A, p) = 0 \tag{3b}$$

The above discussion leads us to the following Proposition:

Proposition 1: In a traditional rural environment, the home-based microenterprise provides an indirect mechanism for trading non-marketed female labor in the market. Without access to microcredit, female labor and entrepreneurship skills remain largely untapped—except for the purposes of household chores and other home-based non-pecuniary activities.

Now by simply applying the envelope theorem, it can be easily shown that NEM has the following properties:

$$\partial w^*/\partial r \prec 0 \ \text{ for } \ \forall r \in (0, \bar{r}) \tag{3c}$$

$$\partial w^*/\partial k \succ 0 \ \text{ for } \ \forall k \in (0, k^*) \tag{3d}$$

$$\partial w^*/\partial A \succ 0\ \ \&\ \ \partial w^*/\partial p \succ 0 \tag{3e}$$

Eq. (3c) indicates that an increase in the interest rate decreases NEM. This is a maximum $r = \bar{r}$, such that $k^* = 0$ and $w^* = 0$. Eq. (3d) states that an increase in the size of the loan increases NEM as long as the household remains credit-constrained--i.e., the available credit $k \prec k^*$. Finally, Eq. (3e) states that NEM is positively related to the productivity of microenterprise (the state of technology) and the price of the product produced by the microenterprise.

In the second stage, the household decides on the allocation of marketable labor. While female labor is sunk in the home enterprise, the male effort is divided between home enterprise and casual work, depending on the relative "lucrativeness" of these two options. Assume that the male allocates a portion of his labor e to the home-enterprise and the remainder $(1/2 - e)$ to the casual labor market place at a wage rate $\bar{w}$. In other words, the household devotes in aggregate $(1/2 + e)$ units of effort to the home enterprise and $(1/2 - e)$ unit of effort to the wage labor market.[15] The optimizing decision of the household can be expressed as follows: [16]

To choose $e \in [0, 1/2]$

to maximize $y \equiv (1/2 + e)w^* + (1/2 - e)\bar{w}$

Denoting $e^* = \arg\max[\, y = (1/2 + e)w^* + (1/2 - e)\bar{w}]$, we can characterize the properties of the optimal solution as follows:

$$w^* - \bar{w} \prec 0 \ \text{ for } \ e^* = 0 \tag{4a}$$

$$w^* = \bar{w} \ \text{ for } \ e^* \in (0, 1/2) \tag{4b}$$

$$w^* - \bar{w} \succ 0 \ \text{ for } \ e^* = 1/2 \tag{4c}$$

Eqs. (4a)- (4c) define the optimal value of e^* and the relationship between NEM to the casual wage rate. Substituting e^* into y, we can derive its maximized value y^*, which we call net household income (NIH). The above can be summarized as follows:

$$y^* = \left\{ \begin{array}{l} (1/2)(\bar{w} + w^*) with (w^* \prec \bar{w}) \\ \bar{w} \\ w^* with (w^* \succ \bar{w}) \end{array} \right\} if \left\{ \begin{array}{l} e^* = 0 \\ e^* \in (0, 1/2) \\ e^* = 1/2 \end{array} \right\} \tag{4d}$$

The above discussion can be summarized as follows:

Proposition 2: To maximize income, the household allocates its labor between the home-based microenterprise and the casual labor market, based on its calculus of marginal returns. When the marginal return from the microenterprise falls short of the casual wage rate, the household continues to devote all of its male labor to the casual labor market and its income level remains constrained to the market wage rate. When the marginal return from the microenterprise, exceeds the casual wage rate, the household devotes all its male labor to the microenterprise, and NEM equals NIH.

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[15] This basic framework excludes the possibility of hired workers, i.e., nonfamily workers working in microenterprises. This assumption is motivated by the observation that most microenterprises, which are supported by tiny loans, are typically small and managed exclusively by family labor. However, we shall relax this assumption in a latter section to explore the possibilities of replication and scaling up.

[16] Without any loss of generality, the current optimizing problem can be reformulated as a single-stage optimizing program (see, Appendix, which is available on request). However, the approach taken in the text affords easy intuitive economic explanation of the underlying economic logic.

C. Household Income Function and Poverty

Case (i) illustrates the worst case scenario, where NEM—the marginal return from microenterprise— is very low, even compared with the earnings of the male worker in the casual labor market. In this situation, the male continues to work outside home for a wage-income and NIH—net household income—is: $y^* = (1/2)w + (1/2)\overline{w} \prec \overline{w}$. Recall that the poverty threshold for a family is z. With $\overline{w} \prec z$, it is obvious: $y^* \prec \overline{w} \prec z$. In this instance, NIH falls short of the poverty threshold. Nevertheless, this situation represents an improvement for the family over the case where there is no microcredit. Without microcredit, the female income (implicit wage) is $w = 0$ and NIH reduces to $y^* = (1/2)\overline{w} \prec \overline{w} \prec z$.

Case (ii) illustrates the situation where NEM is, at the margin, equal to the casual wage rate for the male. In this situation, the male member can either work in the microenterprise or in the casual labor market (or a combination of the two). NIH is given by $y^* = \overline{w} \prec z$. once again, the family remains mired in poverty, as NIH falls short of the poverty threshold.

Case (iii) represents the best of the three scenarios, where the male's marginal earnings from work at the microenterprise exceed the wage rate as a casual worker in the rural labor market. In this instance, the male works full-time at the microenterprise and NIH is given by $y^* = w \succ \overline{w}$**.** However, even in this case, the household may not necessarily escape poverty, as the household income may not be high enough— due to low prices and productivity—to exceed z, the poverty line. Moreover, even when $w^* \succ \overline{w}$, it may unleash economic forces that may bring w^* down to the level of $\overline{w}$.

This may happen for the following reasons: When $w^* \succ \overline{w}$, this might induce more families to seek borrowing from microcredit institutions. As Section V shows, an increase in the number of borrowers leads to an increase in the output of the microenterprises; this in turn leads to a decrease in the price (p), reflecting the facts that microenterprise output is largely internationally non-traded and that their domestic market is limited. Next, as Eq. (3e) shows, with a decrease in p, there will be a decrease in w^*. Thus, the dynamics of the situation may induce $w^* \to \overline{w}$. It may be noted in passing that the reverse dynamics may not work when $w^* \prec \overline{w}$. The reason for this asymmetry is as follows. When $w^* \prec \overline{w}$, it does not induce the female borrower to exit the credit market because such a move—which will reduce her income level to naught—would be worse than the status quo.

Proposition 3: Assuming that the household wants to maximize its income, NIH will remain equal to or below the casual labor market wage rate, as long as the household depends on casual work. As the casual wage rate is low in most developing countries, the household income level is likely to fall below the poverty line. When the household is fully engaged in the microenterprise, its income will exceed the casual wage rate. Even in such a case, the dynamics of the situation may unleash economic forces that may bring NIH to the casual wage level. If NIH exceeds the casual wage level, even then it may, however, not necessarily exceed the poverty line.

D. Properties of NIH and Implications for Policy

Assuming the best-case scenario (where all the family efforts are devoted to the microenterprise), we can define NIH, which identifies the maximum household income y^* as: $y^*(r, k, A, p) = \max[Apk^a - rk]$.

It can be shown by simple application of the envelope theorem that y^* has the following properties:

$$\partial y^* / \partial r \leq 0 \text{ for } \forall r \in (0, \overline{r}) \quad (5a)$$

$$\partial y^* / \partial k \geq 0 \text{ for } \forall k \in (0, k^*) \quad (5b)$$

$$\partial y^* / \partial A \succ 0 \ \& \ \partial y^* / \partial p \succ 0 \quad (5c)$$

The above properties of NIH suggest:

Proposition 4: Reducing the interest rate and relaxing the credit constraint will increase NIH, the household income. Similarly, an increase in the price(s) of the product(s) produced by the microenterprise and an increase in its productivity will contribute to increasing NIH.

The last two factors—price and productivity—have a crucial bearing on the economic wellbeing of households. The first relates to the nature of goods and services households produce and their demands. If these goods and services are essentially internationally non-traded, it means that their prices are determined locally and nationally. These prices are likely to remain low due to the low purchasing power of the people, reflecting poverty and low income of the society. One way out of this conundrum of depressed domestic

demands and consequent low prices is to change the orientation and product-mix of these microenterprises, away from non-traded domestic goods to traded international goods. However, this is not something easily achieved. Apart from education and skills, it requires improved access to market information and technology as well as greater linkages with the international economy—including integration with international supply chains—than currently exist in poorer societies. Indeed, much of the growth and prosperity of East Asian small enterprises can be traced to their ability to liberate themselves from the shackles of depressed domestic demands; this was accomplished through various types of integration—horizontal (clustering and networking) and vertical (sub-contracting)—both local and international (Hayami 2006). This indicates that while micro-intervention is important, it needs to be supplemented by supportive policies at the macro-level.

The second factor relates to the low productivity of the microenterprise due to traditional and primitive technology that keeps the household income level low. The solution to this problem lies in the adoption and application of new, improved technologies in microenterprises.[17] No doubt, the advent of some kind of "general purpose technology" that brings about quantum shifts in the production functions of the microenterprises can transform these enterprises both technologically and economically.

In this connection, an insight of Schultz (1964) from his famous book, *Transforming Traditional Agriculture,* is germane to the current discussion. According to Schultz, finance can play only a supportive, but not a transformative, role in alleviating poverty; the latter has to be played by innovative technologies—such as the high-yielding seed-fertilizer technology in agriculture — that can significantly augment productivity and growth. A similar argument was made by de Soto (2009): "Production always takes priority over finance. As Adam Smith and Karl Marx both recognized, finance supports wealth creation, but in itself creates no value." If this line of argument is correct, then microcredit can play an important, but supportive, role in alleviating poverty—the prime impetus for growth and poverty reduction has to come from productivity-augmenting new technologies that apply to microenterprises. While technology has a critical bearing on poverty, the impact may not be instantaneous; it can take time for technology to get diffused, adapted and mastered by the poor before they experience sustained improvements in productivity to be able to cross the poverty threshold.

E. Entrepreneurial Ability and Poverty

In the basic model earlier, we have assumed a homogeneous borrower of "average' ability. Next we introduce the possibility of heterogeneous microentrepreneurs of different abilities and explore its implications for poverty reduction. Recall that the production function of the microenterprise is represented by $q = A\pi k^a$, where π represents an entrepreneurial "efficiency factor" that augments output.

To analyze further, let us assume without any loss of generality that the entrepreneurial efficiency factor π is related to entrepreneurial ability ξ by the simple function $\pi = \exp(\xi)$. Further assume that $\xi \in (-\infty, \infty)$ and $\xi \sim N(0,1)$; that is, ξ follows a standard normal distribution with mean 0 and variance 1.

Assume further that there is no credit constraint and both husband and wife are fully employed in the microenterprise. Noting that $\pi = \exp(\xi)$, NIH for the household with female entrepreneurial ability ξ can be expressed as:

$$y^*(\xi) = \exp(\xi)(1-a)Apk^{*a} \tag{6a}$$

Note that for the "average" microentrepreneur, $\pi = \exp(0) = 1$ and the corresponding NIH and optimal $k*$ are denoted by:

$$y^*(0) = (1-a)Apk^{*a} \equiv w* \tag{6b}$$

$$k*(0) = \arg\max(Apk^a - rk) \tag{6c}$$

Assume further $y^*(0) \equiv w* \prec z$, where z is the poverty line. In other words, the income of the average entrepreneur falls short of the poverty line. Also note that when $\xi = \infty$, then $y*(\infty) = \infty$.

It can be easily seen that $y*(\xi) = \exp(\xi)(1-a)Apk^{*a}$ is a continuous and increasing function of ξ, over the interval $[0,\infty]$. Further note that $z \in (w*,\infty)$, then the application of the mean-value theorem implies that there exists $\xi* \in (0,\infty)$ such that $y^*(\xi*) = z$.

Noting that $k^*(\xi) = \arg\max[\exp(\xi)Apk^a - rk]$, it can be demonstrated in a fairly straight-forward way that

[17] Some critics of microcredit—for example, Bateman and Chang 2009— argue that microfinance creates an environment that hinders the adoption of new innovation, perpetuates primitive technology and thwarts industrial upgrading.

$k^*(\xi)$ is a monotonically increasing function of ξ. It can also be easily shown that: $k*(\xi)=\exp[\xi/(1-a)]k*(0)\succ k*(0)$ for $\forall\xi\succ 0$. This implies that individuals with higher entrepreneurial skills will borrow more and scale up their business operations.

In the basic model, we have assumed that the entrepreneur is endowed with an average level of entrepreneurial ability and does not hire any outside worker. However, this may not be a realistic assumption for successful entrepreneurs with above average levels of entrepreneurial abilities. To incorporate hired labor, we need to add more structure to the current bare- bone model. Assume that the microenterprise makes a return above the casual wage rate-- i.e., $w^*\succ\overline{w}$ -- and wants to scale up her business. To scale up, she needs to hire outside workers; however, this involves two types of costs—wage cost and the cost of monitoring hired workers. For illustrative purposes, assume that, when n units of labor are hired, the enterprise incurs the market wage bill ($\overline{w}n$) and the monitoring cost (δn^2), where $\delta\succ 0$. It is assumed that the monitoring cost is strictly convex, implying that as more workers are hired, the marginal monitoring cost increases. Finally, δ can be interpreted a conversion factor that translates the psychological cost of monitoring into monetary cost. With these assumptions, the NIH of the scaled-up enterprise is given by $y**(\xi)=y*(\xi)+y*(\xi)n-(\overline{w}n+\delta n^2)$.

Note that $y**(\xi)$ denotes the NIH from the scaled-up enterprise, which is the sum of the NIH from the original enterprise (the first term) and the NIH from the expansion of business. The second term in the RHS denotes the income from scaling up and the third term inside the parenthesis indicates the total labor costs. Straight-forward maximization would yield the optimal amount of labor hired:

$$n*(\xi)=[y*(\xi)-\overline{w}]/2\delta$$

As the above closed-form solution for $n*(\xi)$ indicates, scalability is fundamentally determined by the entrepreneurial ability in relation to different elements of costs for hired workers.

The above leads us to the next observation:

Proposition 5: In an unfavorable economic environment, the "average" microentrepreneur is likely to be mired in poverty. That does not, however, preclude the possibility that those with higher than average entrepreneurial abilities—belonging to the right-tail of the normal distribution—will be able to escape poverty even in the face of an adverse environment. There will be some individuals with high-levels of entrepreneurial abilities who will be able to expand business beyond the basic household level with hired workers. The level of scalability will depend positively on individual entrepreneurial skills and negatively on the wage and monitoring costs.

The above observation is corroborated by a whole slew of "real life" microcredit success stories, even in poor countries across the world--see, for example, Accion International and others (2010). This happens even when the overwhelming majority of individuals — even within the same program—stumble and fail to cross the poverty line.

3. MICROCREDIT AND POVERTY: NUMERICAL ILLUSTRATIONS

The following explores numerically the link between NIH and poverty graduation. In doing so, we will concentrate on the best-case scenario of the basic model: it assumes an entrepreneur of average ability with no credit constraint; and both husband and wife are fully employed in the microenterprise. In this case, NIH is given by:

$$y^*=Apk^{*a}-rk^*=(1-a)Apk^{*a} \quad (7a)$$

For a particular household whose income is below the poverty line, the Watts' measure of poverty—see, for example, See Zheng (1993)— is given by the logarithm of the poverty-line over its actual income: $M\equiv\ln z-\ln y^*$.

Next, we define $G\equiv y^*/z$, which is the relative income of the poor as a proportion of the poverty line. This relative income of the poor, which is also known as the welfare ratio in the literature (see, Blackorby and Davidson, 1987), reflects the extent of income shortfall (of the poor) from the poverty line. The Watts-index of poverty can thus be expressed as:

$$M=-\ln(y^*/z)\equiv-\ln G \text{, with } G\in(0,1) \quad (7b)$$

This shows that as the relative income of the household increases (implying a lower shortfall from the poverty line), the poverty index decreases.

Next we explore the impact of productivity growth on graduation from poverty. To do so, we will assume:

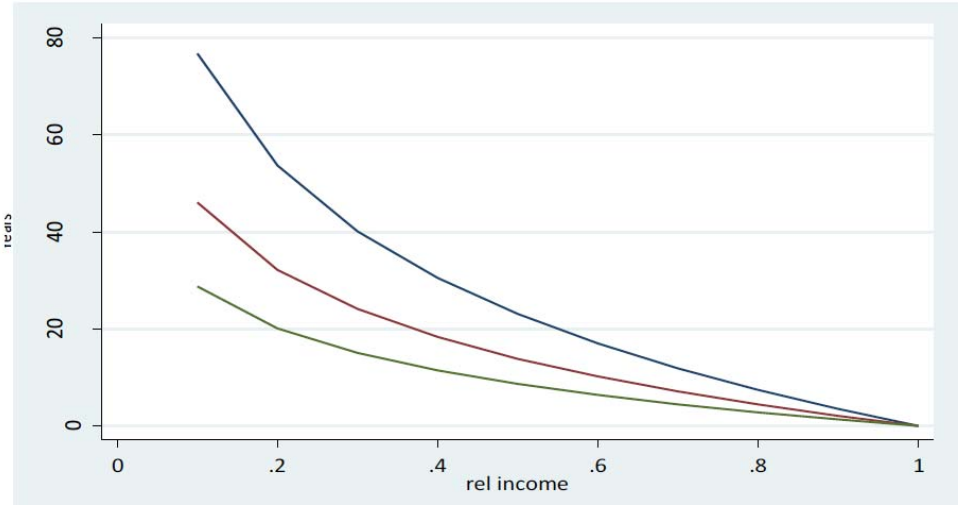

Figure 1: Productivity Growth and Poverty-Exit Time.

$$A(t) = A(0)(1+\mu)^t \qquad (7c)$$

That is, A, the productivity parameter, grows over time at a rate μ. Substituting (7c) into (7b), one can find the values of t when the household will be able to overcome poverty, starting at various levels of relative income. Three parameter values for productivity increase for the poor are set at 3%, 5% and 8% per annum. Figure **1** shows the exit time t is for different relative income levels. Two observations are in order regarding the figure. First, the figure refers to the average microenterprise, whose income is below the poverty line. In other words, the analysis does not apply to individuals with exceptional entrepreneurial abilities whose welfare ratios exceed unity. Second, we have assumed a fairly high rate of continuous productivity growth for microenterprises over the years. However, even with such optimistic assumptions—as the numerical simulations in the diagram indicate—it takes the household a fairly long time to claw its way out of poverty when the initial poverty-gap is significant.

Next, we note the role of entrepreneurship in overcoming poverty. The relative income of a poor microenterprise household with an entrepreneurial efficiency π is given by:

$$G \equiv (1-a)Ap\pi k^{*a}/z .$$

Recall that entrepreneurial efficiency factor π is related to entrepreneurial ability by $\pi = \exp(\xi)$. It is further assumed $\xi \in (-\infty, \infty)$ and $\xi \sim N(0,1)$ such that $Mean(\xi) = 0$ and $Variance(\pi) = 1$. Thus, the relative income of the "average" microenterprise household, with $\pi = \exp(0) = 1$, is given by $G^* \equiv (1-a)Apk^{*a}/z$.

It can be easily seen that $G = G^*\pi$. If $G = 1$, then $G^*\pi = 1$, which defines the relationship between relative income and the level of entrepreneurial efficiency required to overcome poverty. This implies that the poorer the economic environment (with lower productivity and output prices), the higher the level of entrepreneurial ability required to overcome poverty.[18] In a richer society with higher productivity and higher output prices, it is possible even for a person with an average entrepreneurial ability to escape poverty.[19]

Table **1** illustrates the idea with numerical values. In a richer economic environment, an individual with an average ability can overcome poverty (the last column in the table), while in a poorer society with a harsher economic environment, it requires a much higher level of entrepreneurial ability to accomplish the same. As one moves farther toward the columns to the left—indicating a harsher economic environment—one requires higher and higher levels of entrepreneurial efficiency to overcome poverty. However, these levels of efficiency can be acquired by individuals of exceptionally high levels of entrepreneurial ability, which only exist in the extreme tail end of the normal distribution.

[18]The critical role of economic environment in entrepreneurial success was most eloquently expressed by Warren Buffet, one of the most successful entrepreneurs in today's world: "I personally think that society is responsible for a very significant percentage of what I've earned. If you stick me down in the middle of Bangladesh or Peru or someplace, you'll find out how much this talent is going to produce in the wrong kind of soil." Cited in Collins *et al*. (2004:17).

[19]In other words, this implies that as economic development takes place, the earnings of the average entrepreneur increases; so do the rates of success of microcredit. It was corroborated by Ahlin, Lin and Miao (2011), who note that the success of microcredit depends on the economic environment— defined by the state of the macro economy and its institutional infrastructure.

Table 1: Entrepreneurship Ability Required to Overcome Poverty for Various Welfare Ratios

Welfare Ratio	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
Entrepreneurship Efficiency	10	5	3.3	2.5	2	1.7	1.4	1.3	1.1	1
Entrepreneurial Ability	2.30	1.60	1.19	.916	.693	.531	.337	.262	0.95	0

A quick summary of our earlier discussion is provided below:

Proposition 6: Even in the best-case scenario where the male member is fully employed in the microenterprise, it may take periods of sustained productivity growth for the poor household to graduate from poverty—the transition period being dependent on the household's position in the poverty scale. Similarly, if the household finds itself situated at the bottom end of the poverty scale, it may take much higher than average entrepreneurial abilities—which lie in the extreme tail of the normal distribution— to overcome poverty.

4. MICROCREDIT AND MARKET SATURATION

In this section, we will discuss briefly how the expansion of microcredit can lead to reductions in the incomes of the existing microenterprises through market saturation—a perverse possibility noted, among others, by Osmani (1989) and Bateman and Chang (2009).

To illustrate this, we will deviate from the simplifying assumption of a competitive product market. Rather than assuming that the price of the microenterprise product is exogenously fixed, we will posit the Cournot-type competition among microenterprises. Under Cournot competition, a microenterprise maximizes its income based on the assumption that its maximizing decision does not affect the decisions of its competitors. The results reported below follow directly from the standard Cournot model.

For brevity of space, we will limit ourselves to the best-case scenario where the male member of the family works for the household enterprise. We will further assume that there are n identical microenterprise units, which are producing a homogeneous good whose market demand is given by a linear demand function. It is a standard simplifying assumption:

$$p = u - vS \tag{8a}$$

where p indicates price; $u, v \succ 0$ are demand parameters; and $S = \sum_{i=1}^{n} q_i$ denotes aggregate demand and $S_{-i} = S - q_i = \sum_{i \neq j} q_i$, aggregate demand for all microenterprise units other than unit i.

Next, we derive the cost function of the i-th microenterprise unit, which is defined as: $C(q_i, r) = \min\{rk_i : Ak_i^a \geq q\}$. Optimization of the problem yields a simple solution: $C(q_i) = aq_i$. The cost function is a linear function of q_i and independent of r.

The net income of the i-th microenterprise is given by:[20]

$$y_i = pq_i - aq_i \tag{8b}$$

Under the Cournot-Nash assumption, differentiating eq. (8b) with respect to q_i yields the first-order condition for maximizing income for the i-th microenterprise, which can be rearranged as: $q_i = \{(u-a) - vq_{-i}\}/2v$.

As all enterprises are identical, then: $q_1 = q_2 = q_3 = ... = q_n = q$ and $q_{-i} = (n-1)q$

Each enterprise produces a quantity given by:

$$q = [(u-a)/2v] - [(n-1)q/2]$$

Further manipulation yields the following:

$$q = (u-a)/[(n+1)v] \tag{8c}$$

Total output of all the microenterprises together is given by:

$$S = nq = [n(u-a)]/[(n+1)v] \tag{8d}$$

[20] Alternatively, eq. (8b) can be been written as $y_i = pq_i - rk_i$. However, we decided to express it in terms of the cost function: $y_i = pq_i - aq_i$ for ease of algebraic manipulation.

Price is given by:

$$p = (a + na)/[(n+1)v] \tag{8e}$$

Finally, the net income of each enterprise is given by:

$$y = (u-a)^2/[(n+1)^2 v] \tag{8f}$$

From above equations it can be seen that the values of p and y decrease and the values of q and S increase as n increases. The above results can be summarized as follows:

Proposition 7: As more households are given access to credit, it leads to the emergence of more microenterprises; assuming a Cournot-competitive market structure and linear, downward-sloping demand, an increase in the number of microenterprises leads to greater output for the microenterprise sector, but less output, price and NIH for the existing microenterprises.

This suggests that even though microcredit is good for households previously excluded from credit, it is not necessarily beneficial for the existing microenterprises due to market saturation. Bateman and Chang (2009) argue that the advocates of microcredit tend to overlook this problem of negative demand externality—i.e., the possibility of economic immiserization of the existing microenterprises due to the expansion of the credit program.

An obvious solution to this conundrum would entail expanding demand through access to the international market; this would in most instances involve enhancing international competitiveness by changing the product mix and improving quality of products of microenterprises. However, enhancing international competitiveness is easier said than done; it requires a nurturing economic environment, sustained by congenial macroeconomic, trade and sector policies. Without such a supportive environment, these microenterprises—with little or no forward and backward linkages—are likely to remain forever "micro", without ever generating much output or employment (Chowdhury, 2009).

5. CONCLUSIONS

The paper has shown that access to microcredit has increased the money income of beneficiary households by creating self-employment for the female members in societies where female-work remains largely non-marketed. While microfinance can potentially help improve the economies of poor households by allowing them to utilize their female labor as well as explore their entrepreneurial abilities, it has not necessarily afforded them an expeditious escape out of poverty. The crux of the problem lies in the economic environment within which the poor households operate. To begin with, the immediate factors that affect their incomes adversely are the credit-limits and relatively high interest rates charged by the microcredit institutions.[21] Even in the absence of difficult credit-market conditions, there are other challenging constraints to expanding the incomes of microenterprises. Of these constraints, two are fundamental to the process of graduation of the households from poverty.

The first relates to the supply side of the equation that keeps the productivity of these microenterprises low. All microenterprises are engaged in activities where traditional and primitive technologies predominate. This absence of modern technology — which partly reflects the lack of skills and education of the microentrepreneurs, required to adopt new technology—keeps the productivity of the microenterprises low. Next, the other fundamental constraint relates to the demand side of the equation, where the products produced by microenterprises fetch low prices. Most products of these rural microenterprises are (internationally) non-traded domestic goods, whose prices are often low by world standards, due to a combination of weak purchasing power and insufficient domestic demands. Paradoxically, the explosive growth of microcredit programs can further exacerbate this price problem. An easy availability of microcredit can lead to the mushrooming of microenterprises, and the consequent hyper-competition can lead to a glut of traditional rural consumption goods. The entry of new microenterprises tends to decrease economic returns to the existing enterprises, as this contributes to the glut in the markets they operate. In short, while microcredit can help facilitate the development of new microenterprises, it does not necessarily ensure reasonable financial returns, which are essentially

[21] This is not to denigrate the importance of financial inclusiveness that microfinance has fostered in many developing countries. Despite their deficiencies, microcredit institutions certainly represent an improvement over the old system of usurious rural moneylenders in developing countries.

determined by the economic environment (that is defined by the technology and the market conditions) in which the microenterprises operate.

The escape from the twin challenges of low technology and weak domestic demand lies in enhancing productivity through access to improved and innovative technology on the one hand, and in promoting greater economic openness that enables integration with the global markets and networks, on the other. However, addressing these twin problems is not easy, as they constitute the crux of the development challenge facing the poor countries. Nevertheless, without addressing these problems, the dream of consigning poverty to museums is likely to remain only a pious hope for some time to come.

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