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A COST-EFFECTIVENESS ANALYSIS OF THE GRAMEEN BANK OF BANGLADESH

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ABSTRACT

Reports of the feats of the Grameen Bank of Bangladesh have sparked rapid growth in budgets devoted to microfinance as a tool to reduce poverty in both rich and poor countries. But has Grameen been a cost-effective use of scarce funds earmarked for development? To answer this, I compare outputs to social costs in a present-value framework adapted to microfinance organizations. For a social investor in the time frame 1983-97, the cost of a person-year of membership in Grameen was about $20. Likewise, the cost of a dollar-year of borrowed purchasing power was about $0.22. Although I do not measure social benefits, most evidence suggests that benefits exceed these estimates of costs. Grameen—if not necessarily other microfinance organizations—was probably a good social investment.

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1. Introduction

In rich and poor countries worldwide, microfinance—defined as efforts to improve access to loans and to saving services for low-income, low-wealth people—may be the fastest-growing and best-known tool to combat poverty. A survey of 200 of the thousands of microfinance organizations in the third world found 13 million loans worth $7 billion and 45 million savings accounts worth $19 billion (Paxton, 1996). In the United States, the number of microfinance organizations—and their budgets—has grown exponentially in the past decade (U.S. Newswire, 1999; Meyerhoff, 1997; Severens and Kays, 1997; Clark and Huston, 1993). The growth will not stop soon—a new movement seeks more than $20 billion for microfinance for self-employment for 100 million of the poorest families in the world by 2005 (Microcredit Summit, 1996).

The spark for microfinance is the story of the Grameen (*Village*) Bank of Bangladesh. Founded in 1976, by 1997 Grameen had a portfolio of $260 million and 2.3 million members, most of them very poor, more than 90 percent of them women, and all of them rural. More than 98 percent of payments due had been collected, and the average disbursement in 1997 was $170, 60 percent of per-capita income. In a landscape littered with failed development projects, Grameen has thrived and relieved some of the almost constant misery due to floods and cyclones, a corrupt government, norms that

restrict the movement of women, and abysmal income and wealth.

Microfinance has caught fire worldwide. In Bangladesh, clones of Grameen have 2.5 million members. Transplants have been made to Africa, other parts of Asia, and Latin America (Wall Street Journal, 1998; Thomas, 1995; Getubig, Johari, and Thas, 1993; Hulme, 1990). In the United States, the Grameen model has been suggested for the homeless and for the ghetto (Banerjee, 1998; Soloman, 1992; Balkin, 1992 and 1989). Well-publicized experiments run in Chicago and rural Arkansas (Taub, 1998; Mondal and Tune, 1993; Balkin, 1993; Servon, 1992).

Microfinance spread quickly across the globe because few other tools promise to fight poverty as effectively (Morduch, 1999a). But does microfinance really work? And if it does, then is it so effective that it should crowd out other development projects (Buckley, 1997; Rogaly, 1996)? After all, the poor can gain from better financial services, but they can also gain from, for example, better food, water, roads, or shelter.

As it turns out, no one knows whether Grameen—let alone microfinance in general—has been a cost-effective use of scarce resources earmarked to help the poor. All past studies that purport to measure the social costs of Grameen have deep flaws (Khalily, Imam, and Khan, 1999; Morduch, 1999b; Hashemi, 1997; Yaron, Benjamin, and Piprek, 1997; Hulme and Mosley, 1996; Khandker, Khalily, and Khan, 1995; Benjamin, 1994; Yaron, 1992a). Some fail to adjust for cash gifts counted as revenue, some fail to impute an opportunity cost to resources priced outside of the market, and all fail to discount cash flows through time. Likewise, all studies that attempt to

measure the social benefits of Grameen have profound weaknesses (Khandker, 1998 and 1996; Khandker, Samad, and Khan, 1998; Larance, 1998; Morduch, 1998; Pitt and Khandker, 1998; Schuler, Hashemi, and Riley, 1997). Some fail to control for participant self-selection or for non-random placement of branches, some fail to control for what would have happened without Grameen, and all fail to measure more than a few of the multiple aspects of social benefits. These shortfalls are due not to a lack of competence or effort but rather to the difficulty of measurement.

Has Grameen been a good social investment? If Grameen, one of the best microfinance organizations, has not been a good social investment, then it would douse hope for most other microfinance organizations and for microfinance in general.

In this paper, I compare outputs with social costs in the first measurement of the cost-effectiveness of Grameen in a standard present-value framework. I use outputs rather than benefits because outputs are much simpler to measure. I take social costs as the present value of cash flows between public entities and Grameen.

I find that, as seen by a social investor in a time frame that starts in 1983 and ends in 1997, Grameen produced a person-year of membership at a cost of about $20. Likewise, Grameen produced a dollar-year of borrowed purchasing power at a cost of about $0.22. I do not measure social benefits, but most evidence suggests that they exceed these estimates of social costs. Thus, I conclude that Grameen has likely been a good social investment. The results apply only to Grameen; other microfinance organizations—and microfinance as a whole—may or may not be as cost-effective.

The rest of the paper proceeds as follows. Section 2 outlines how Grameen works. Section 3 describes a framework to measure the social benefits of microfinance. I then adjust the framework to measure discounted outputs. Section 4 presents a framework to measure the social costs of subsidized microfinance organizations. Section 5 discusses the meaning of the results for Grameen and for the microfinance movement.

2. How Grameen works

Now this is how the birth of Grameen came about. Fresh from graduate school in the United States, a professor of economics at Chittagong University grew frustrated with abstract blackboard theory as he watched people starve in the famine of 1974 (Yunus, 1998). One day in his quest to find a way to help, he met a bamboo weaver who, for want of less than $1, was enthralled to a moneylender. From his own pocket, the professor lent an average of $0.64 to the weaver and to 41 others. The borrowers repaid their loans and improved their lots, and in 1976, Grameen was born. By the time it became a bank in October 1983, Grameen had 36,000 borrowers and a portfolio of $3.1 million (all monetary figures are in dollars as of December 1998). In 1983-97, the size of Grameen doubled about six times.

Behind the miracle story, however, lies the design of a set of products and incentives that let Grameen make and collect very small loans to very poor people who cannot post physical assets as collateral. This purpose of this section is to describe the nuts and bolts of the operations that drive the tale of success.

2.1 Membership

New members are placed in groups of five, and five to eight groups form a centre. All members in the centre meet with a loan officer weekly. For the first few weeks, they learn about Grameen, save $0.02 a week, learn to sign their names, and memorize a set of vows to self-improvement. Each group elects a chair, and each centre

elects a chief. New members must also buy a share of stock in Grameen for 100 taka or about $2 (1 dollar was worth 48.5 taka in December 1998).

2.2 Loans

Risk haunts lenders; all borrowers promise to repay, but, whether due to choice or to constraint, some break their promise. To control risk, most lenders require that borrowers post collateral, an asset that the borrower loses upon default and that thus motivates repayment. Most formal lenders require assets—such as land, houses, or bank balances—that the poor, because they are poor, either do not have or cannot afford to lose.

The innovation of Grameen—and of most microfinance lenders—is to take as collateral the asset of future access to loans. Thus, microfinance in poor countries works a lot like credit cards in rich countries; most borrowers repay because they want to preserve their future access to loans.

Although Grameen did not invent the threat of termination as an incentive to fulfill contracts (Stiglitz and Weiss, 1983), it did popularize its combination with a second design element: joint liability. This means that default by one group member leads to banishment for all members. This leverage of the threat of termination can reduce risk in three ways (Conning, 1998; Wenner, 1995; Huppi and Feder, 1990). First, joint liability gives members a selfish reason to exclude known bad risks. Knowledge of individual character is costly to outsiders but is often a sunk cost for villagers. Thus

joint liability can cut the costs of the lender to screen potential borrowers. Second, members have an incentive to make sure that their fellows do not squander their loans. This can cut the costs of the lender to monitor active borrowers. Third, members have a reason to coax comrades out of arrears or even to repay their debts for them. This can cut the costs of the lender to enforce repayment. On the downside, joint liability may lead to domino effects in which borrowers who would have repaid choose instead to default because they would lose access anyway due to the default of others (Paxton, Graham, and Thraen, 1999; Besley and Coate, 1995). Also, joint liability may not cut total costs but rather only shift costs from lenders to borrowers.

Because joint liability lets the poor bank on their social capital (Gomez, 1999; Servon, 1998), it has captured the imagination of the public. Because joint liability involves repeated games between heterogeneous agents with imperfect information, it has drawn attention from theoretical economists (Stiglitz, 1990; Varian, 1990). Joint liability at Grameen, however, is more subtle than the popular perception and more complex than the theory.

First, Grameen staggers disbursements to leverage further the threat of termination. Two members get loans first, then two more members get loans one month later. After one more month, the last member gets a loan (Hashemi, 1997). Because most loans last exactly one year, staggered disbursement reduces the risk of domino default because some borrowers must finish repayment before they know whether their

comrades will default. Furthermore, borrowers who have paid most of their debts have incentives to make sure that their peers also repay on time.

Second, loan officers often do not enforce strict joint liability at the group level. They tend to bend the rules both because they know that some arrears are involuntary and because they are reluctant to kick out good borrowers (Rahman, 1999; Woolcock, 1999). To enforce repayment in the absence of strict joint liability at the group level, loan officers draw on social pressure at the centre level. For example, they may suspend all disbursements at a centre until all debts are up-to-date. They may also scold the women or detain them in the centre longer than normal. In Bangladesh, this shames women and may subject them to the wrath of their husbands when they finally are released (Rahman, 1999; Ito, 1998).

Third, Grameen implicitly promises bigger loans through time. New borrowers get very small loans, but loan size usually grows as they repay and prove their creditworthiness. Most borrowers get a new loan as soon as they cancel their old one.

Fourth and finally, Grameen promises more attractive types of loans to the best borrowers. The most common loan is the “general” loan, but since 1984, Grameen has also made “housing” loans with bigger disbursements, longer terms, and lower interest rates. Recently, Grameen made a quantum leap to loans for college expenses and for cell phones (Zwingle, 1998). Grameen even makes individual loans (Dowla, 1998). Access to these loans is worth a lot to borrowers, so the centres—and especially the centre chiefs—try to maintain a clean record.

2.3 Forced savings

Unlike most microfinance organizations, Grameen takes deposits. In practice, however, saving is compulsory and withdrawals are restricted. The forced savings fund reserves that members can borrow against in emergencies and that Grameen can tap in the case of default. Saving accounts in Grameen resemble insurance contracts more than passbook accounts.

Grameen has four types of forced savings (Morduch, 1999b; Khandker, Khalily, and Khan, 1995). The first two types are not really savings at all but rather fees that members will never get back. After their first loan, members must pay 2 cents each week to support schools run by the centre. They must also pay 0.5 percent of disbursements in excess of $20 into a fund used to cover losses from default.

The last two types of forced savings are real savings. Members must deposit 4 cents each week into Personal Savings. Interest accrues at 8.5 percent, and withdrawals are unrestricted. In addition, 5 percent of each disbursement goes to the Group Fund. It also earns 8.5 percent. Modeled on informal group funds (Bouman, 1995), the Group Fund is supposed to be controlled by the centre and used for emergency loans to members. In practice, loan officers often control the fund, and they use it to insure Grameen against default (Matin, 1997). Grameen also makes loans from the Group Fund after floods. Members cannot withdraw their savings in the Group Fund until they leave Grameen or until they have ten years of membership.

In sum, most “savings” are like fees for insurance or for loan-loss reserves. As members approach ten years of membership, however, the chance to withdraw what has grown to be a large sum serves as a further incentive to repay as promised.

Voluntary savings from members are small. This is unfortunate; to escape from poverty means to build assets, and although some people can build assets through debt, even more people can build assets through savings (Sherraden, 1991). Some of the poor are creditworthy, but all are depositworthy. Grameen could improve its attempts to relieve poverty through the supply of flexible, voluntary savings services decoupled from debt (Rutherford, 1998).

2.4 Non-financial products

Grameen aims to change the social and economic structure of rural Bangladesh. To do this, it supplies, in addition to loans and insurance, what it calls *discipline* (Montgomery, 1996; Khandker, Khalily, and Khan, 1995). This encompasses not only the financial discipline to comply with repayments and forced deposits each week, but also physical discipline: members must sit in straight rows, salute, chant, and sometimes perform calisthenics (Hashemi, 1997).

The vows that members recite also instill discipline in that they foster a break from the social norms that help to perpetuate misery in rural Bangladesh. For example, the resolutions praise small families, prohibit dowry and child marriage, promote gardens, extol education, and exhort members to drink clean water and to use latrines.

Perhaps the most important non-financial service of Grameen is *social intermediation* (Bennett, 1998; Edgcomb and Barton, 1998). In essence, social intermediation produces social capital as a by-product of the requirement to meet once a week. In rural Bangladesh, social capital is scarce; the custom of *purdah* isolates women from men and from markets. Membership in Grameen gives women a socially accepted excuse to gather and to talk (Larance, 1998). The impacts are both psychological and economic; not only do women feel less isolated, but they also strengthen their support networks for when trouble strikes. Financial services prompt the meeting, but any type of frequent meeting would likely have the same effect.

3. A framework to measure social benefits

What are the social benefits of the services just described? This section lays out a framework that integrates six distinct-but-linked aspects of the social benefits of microfinance: worth to users, cost to users, depth, breadth, length, and scope (Schreiner, 1999). Because worth, cost, and depth are difficult to measure, I also show how to adjust the framework to use only measurements of outputs.

3.1 Six aspects of social benefits

3.1.1 Worth to users

Worth to users is defined as their willingness to pay. This does not suppose that users can pay nor that they should pay. Rather, it supposes that a change in well-being due to microfinance can be expressed in terms of dollars. For example, if a woman were willing to bear costs of up to $200 to get a year of membership in Grameen, then she would be just as well off with $200 more income as with a costless year of membership. Worth is a simple concept, but its subjectiveness makes it very difficult to measure. The literature on Grameen does not contain any complete measure of worth to users.

Theoretical models often assume that worth to users is equal to the increase in business profits due to access to finance. In fact, microfinance may improve well-being even if it does not increase business profits, supposing that users even have businesses in the first place. For example, savings may buffer shocks, and loans may fund life-cycle events such as weddings or funerals. Often the most important effect of

microfinance is to help households to diversify their sources of income (Mosley and Hulme, 1998; Raheim and Foster Alter, 1998; Dunn, 1997; Servon, 1996).

3.1.2 Cost to users

Cost to users is defined as the sum of price costs and transaction costs. *Price costs* are defined as direct cash payments to a microfinance organization. Price costs borne by users are revenue for the organization.

Transaction costs are defined as non-price costs. They include both *non-cash opportunity costs*—such as the time to meet each week—and *indirect cash expenses* for such things as transport and documents linked to the use of microfinance. In Grameen, non-cash opportunity costs probably exceed indirect cash expenses. Furthermore, total transaction costs often swamp price costs (Bhatt and Tang, 1998; Adams, 1995; Cuevas, 1988). Transaction costs are not revenue for the organization.

The concepts of *cost to users*, *cost of supply*, and *cost to society* are distinct. *Cost of supply* is the opportunity cost of the resources used to produce microfinance. *Cost to society* encompasses cost to users, cost of supply, and any other costs to non-users. For example, users of microfinance may squeeze non-users out of markets.

3.1.2.1 Estimates of costs to users of Grameen

Transaction costs can be derived from survey data on the miles, minutes, and money needed to use microfinance. No one has estimated Grameen's transaction costs.

Price costs are best estimated not as the nominal stated interest rate but rather as the *real effective interest rate*, defined as the annualized, inflation-adjusted discount rate such that the cash flows from the use of microfinance have a present value of zero. To estimate this for a typical borrower of Grameen requires several assumptions. First, inflation is 5 percent, the average in Bangladesh in 1988-97 (Table 1). Second, the member buys a share for 100 taka when she joins, and gets her first loan four weeks later. Third, she gets 10 "general" loans, each with an annual nominal stated interest rate of 20 percent (14 percent in real terms) and 52 equal installments that start one week after disbursement. Fourth, in the absence of data on loan size by number of past loans, I assume that the first loan is for 1,000 taka and that each subsequent loan increases by 1,500 taka. Fifth, the borrower makes all payments on time, makes no withdrawals from Personal Savings, and does not borrow from the Group Fund. Seventh, the borrower leaves Grameen after ten years, sells her share, and withdraws the $150 that has accumulated in Personal Savings and in the Group Fund.

These assumptions imply that the present value of cash flows is zero when the weekly discount rate is 0.711 percent. The real effective interest rate is $(52 \cdot 0.00711 - 0.05)/(1+0.05) \doteq 30$ percent (Rosenberg, 1996). This matches the estimate in Hossain (1988). Thus the structure of forced savings makes the real effective interest rate more than twice as big as the real stated interest rate.

The structure of forced savings also has a big effect on reported profits. Grameen counts cash inflows from forced savings not as revenue but as increases in liabilities. If

these flows were counted as fees or interest, then revenues would almost double and reported profits would increase more than a hundredfold even though cash flows for users would not change.[1] In fact, the real yield on the portfolio might approach 30 percent, the range in which estimates based on the method of Yaron (1992b) suggest that Grameen might become subsidy-independent (Morduch, 1999b; Schreiner, 1997).

Why doesn't Grameen make this seemingly cosmetic change? In short, Grameen wants to hide costs to users and to post low profits. Low interest rates distance its image from that of the moneylenders that it aims to replace. Furthermore, if Grameen posted huge profits, then the government might make it pay taxes and donors might ask whether the poor bear too much cost. The current structure provides strong cash flows without the appearance of excessive profits or high stated interest rates.

3.1.2.2 Net gain to users

Net gain to users is defined as worth minus cost, the change in well-being due to microfinance. In essence, net gain is like consumer surplus in welfare theory, the difference between the highest cost that a user would agree to bear and the cost borne.

People choose to use microfinance because they expect positive net gains. Although the size of net gain is usually unknown because its measurement requires knowledge of both worth and cost, its sign can be inferred from repeated use; if users go back for more, then net gain must be positive. The annual drop-out rate at Grameen

[1] Of course, expenses would also increase when Grameen refunds Personal Savings and the Group Fund.

from 1986 to 1994 was about 5 percent (Khandker, Khalily, and Khan, 1995). This suggests that most users received positive net gains from membership.

3.1.3 Depth

Depth is defined as the social value of net gains that accrue to a given user. In welfare theory, depth corresponds to the weight of a user in the social-welfare function. If society has a preference for the poor, then poverty is a good proxy for depth.

In principle, only people in households with less than half an acre of land or with assets worth less than an acre of land can join Grameen. In practice, some members have more wealth than this (Matin, 1998; Morduch, 1998). Although most members are not among the poorest of the poor—defined as those with an income less than half the poverty line—most are still very poor, and almost all are women (Hashemi, 1997).

3.1.4 Breadth

Breadth is defined as the number of users. Breadth matters because the poor are many but the development dollars are few. With more than 2.3 million members, more than 2.1 million borrowers, and centres in more than half of the villages in Bangladesh, Grameen has extensive breadth.

3.1.5 Length

Length is defined as the time frame of the supply of microfinance. Expected length matters because society cares about the well-being of the poor both now and in the future. A common proxy for length is the ability to attract grants or soft loans from

government or donors or, in the absence of perpetual subsidies, the ability to earn enough profit to maintain the real value of equity.

In 1997, Grameen reported a before-tax profit of about $300,000. Without subsidies, this profit would become a loss $23 million and the sum of losses since 1983 would be about $183 million (Section 4 below). But Grameen does get subsidies and will continue to do so. Even if Grameen lost its subsidies, I expect that it probably could make the adjustments needed to survive long into the future.

3.1.6 Scope

Scope is defined as the number of types of services supplied. For example, a microfinance organization that offers both loans and savings services has greater scope than one that offers only loans. Furthermore, scope increases with the variety and flexibility of the terms of a given type of financial contract; a one-year loan for $100 is a different product than a two-year loan for $100 (Adams, 1994).

Grameen has great scope in some ways and weak scope in others. It does supply savings services, but almost all savings are forced, and withdrawal is often impossible. For loans, the amount disbursed increases with time, and Grameen has invented new types of loans to complement the workhorse “general” loan. For a given type of loan, however, the term and the repayment plan are fixed for all borrowers.

3.2 Benefit-cost analysis and cost-effectiveness analysis

As defined above, depth is the social value of net gain, and net gain is worth to users minus cost to users. Breadth is number of users, length is years of service, and scope is the number of types of services. Next, I combine these six aspects in a formula that, in principle, could be used to measure the social benefits of microfinance.

Let t index length in years from 1 to T. Let s_t index scope as the number of types of services in year t from 1 to S_t. For a given service s_t in year t, let breadth be N_{ts}, with each user indexed by n_{ts}. Let the worth in year t of product s_t to user n_{ts} be w_{tsn}, and let the cost be c_{tsn}. Net gain is worth w_{tsn} minus cost c_{tsn}.

The depth function $D_{tsn}(w_{tsn} - c_{tsn})$ gives the social value of the net gain from contract s_t for client n_{st} in year t. The general social-welfare function $W(\cdot)$ returns the total social benefits b of net gains across users, services, and time:

$$\text{Social benefits} = b = W[D_{111}(w_{111} - c_{111}), \ldots, D_{TS_TN_{TS_T}}(w_{TS_TN_{TS_T}} - c_{TS_TN_{TS_T}})]. \quad (1)$$

Given a discount factor δ and the assumption that $W(\cdot)$ is additively separable across users, services, and time[2], social benefit b is:

$$\text{Social benefits} = b = \sum_{t=1}^{T} \sum_{s=1}^{S_t} \sum_{n=1}^{N_{ts}} \delta^t \cdot D_{tsn}(w_{tsn} - c_{tsn}). \quad (2)$$

Benefit-cost analysis compares social costs c (Section 4 below) with social benefits b. If $b > c$, then a project passes the benefit-cost test and is deemed a good social investment. The measurement of social benefits b requires knowledge of worth to

[2] Of course, it may not always make sense to sum diverse types of outputs.

users w_{tsn}, of costs to users c_{tsn}, and of the social value of net gains $D_{tsn}(\cdot)$. Such knowledge is difficult to acquire; even an analyst somehow armed with measurements of worth and costs would not know the form of the depth function $D_{tsn}(\cdot)$.

To sidestep these measurement issues, cost-effectiveness analysis compares social costs not with benefits but with outputs. Given that o_{tsn} is the number of outputs of type s_t for user n_{ts} in year t, cost-effectiveness replaces the measurement of social benefits b with the measurement of the number of outputs Ω:

$$\text{Number of outputs} = \Omega = \sum_{t=1}^{T} \sum_{s=1}^{S_t} \sum_{n=1}^{N_{ts}} \delta^t \cdot o_{tsn}. \quad (3)$$

Most analyses look at only one service, so $S_t = 1$ for all t. Also, most microfinance organizations provide data on annual output but not on output for each user. If O_t is the total output of one type of service in a year, then (3) becomes:

$$\text{Number of outputs} = \Omega = \sum_{t=1}^{T} \delta^t \cdot O_t. \quad (4)$$

Define $\bar{b} = b/\Omega$ as (unmeasured) social benefit per unit of output, and define $\bar{c} = c/\Omega$ as (measured) social cost per unit of output. Dividing both sides of the benefit-cost criterion $b > c$ by Ω then gives the cost-effectiveness criterion, $\bar{b} > \bar{c}$. That is, a project passes the cost-effectiveness test if unmeasured average social benefits $\bar{b}$ are judged to exceed measured average social costs $\bar{c}$.

Why is this algebraic rearrangement helpful? After all, knowledge of average social costs does not confer knowledge of average social benefits. In the imperfect world of policy, however, knowledge of average costs may be better than nothing.

Furthermore, people often find it easier to compare unmeasured average benefits with average costs than to compare unmeasured total benefits with total costs. Finally, if average social costs are very high or very low, then policymakers may feel confident enough to judge whether average social benefits probably exceed average social costs.

3.3 Discounted output of Grameen, 1983-97

I estimate social costs c in Section 4 below. Here, I estimate the output Ω produced by Grameen in the time frame 1983-97, the years for which data exist.

The discount factor δ defines the worth of output one year in the future in terms of output now. To use δ requires a choice of a social discount rate r, where $\delta = 1/(1+r)$. The exact choice of r is one of the most-debated issues in policy analysis (Brent, 1996; Katz and Welch, 1993; Markandya and Pearce, 1991). In practice, however, the two biggest entities that do project analyses—the World Bank and the U.S. government—set r at 10 percent per year in real terms (Belli, 1996; U.S. Office of Management and Budget, 1972). This is arbitrary, but with a fixed budget, its consistent use leads to the correct choice of projects. Furthermore, funds seem to run out before projects whose benefits exceed costs at $r = 0.10$ (Quirk and Terasawa, 1991).

Of all the outputs of Grameen, I focus only on two: person-years of membership and dollar-years of borrowed purchasing power. Membership confers access to all other services and so in some sense encompasses all of them. Dollar-years of borrowed purchasing power is the best summary of the extent of the use of loans because it

accounts for the amount disbursed, the term to maturity, and the repayment pattern.

In a given year, the raw number of person-years of membership is the average number of members, and the raw number of dollar-years of borrowed purchasing power is the average net loan portfolio. Thus both outputs are average stocks.

It is more complex to discount average stocks than to discount flows. Grameen, like most microfinance organizations, reports stocks only at the start (s_{t-1}) and end of a year (s_t). With linear change between the two endpoints, the daily average discount-weighted stock is not simply $\delta^{t-0.5} \cdot (s_t - s_{t-1})/2$ because the discount is a non-linear function of time. Results in Schreiner (1997) imply:

$$\begin{aligned} \text{Disc. ave. stock} &= \delta_t^* \cdot (s_t - t \cdot \Delta s_t) + \delta_t^{**} \cdot \Delta s_t, \text{ where} \\ \delta_t^* &= (\delta^t - \delta^{t-1})/\ln \delta, \\ \Delta s_t &= s_t - s_{t-1}, \text{ and} \\ \delta_t^{**} &= (\ln \delta)^{-2} \cdot \{\delta^t \cdot (t \cdot \ln \delta - 1) - \delta^{t-1} \cdot [(t-1) \cdot \ln \delta - 1]\}. \end{aligned} \tag{5}$$

For $r = 0.10$ in the time frame 1983-97, Grameen produced about 5.4 million discounted person-years of membership (line Eo in Table 5). Likewise, it produced about 0.5 billion discounted dollar-years of borrowed purchasing power (line En).

Is this a lot of output or a little? To compare the amount of output to the cost of its production, the next section estimates the social cost of Grameen.

4. A framework to measure social costs

I estimate social cost as the sum of all discounted cash flows from public entities to Grameen minus all discounted cash flows from Grameen back to public entities, supposing that Grameen was founded in 1983 and liquidated at the end of 1997. Previous studies use *ad hoc* frameworks that ignore the need to discount.

Suppose that a microfinance organization is publicly owned. Then, given the same discount factor δ used for output, the simplest expression of social cost is the equity E_0 that public entities put in the organization at the start of the time frame, plus the discounted fresh flows of funds FF_t between public entities and the organization in year t, minus the discounted equity E_T that public entities get back from the organization at the end of the time frame:

$$\text{Social cost} = E_0 + \sum_{t=1}^{T} \delta^t \cdot FF_t - \delta^T \cdot E_T. \qquad (6)$$

Measurement of the first and third terms (E_0 and E_T) is simple; measurement of the second term (FF_t) is complex. The rest of this section describes how to do this for Grameen as well as for most other microfinance organizations.

4.1 Cash flows with public and private entities

The formula for social cost excludes all cash flows with private entities. I assume that private entities do their own cost-effectiveness analysis to judge whether a trade will give them net gains. That is, assuming away externalities, the measure of social

cost here ignores all private trades because they produce, at worst, a net gain of zero.

In contrast, funds allotted to microfinance organizations by employees of public entities belong not to these employees but rather to society. The price charged—which for gifts is zero—is not only set outside the market but may also lack any link to the social worth of funds in alternative uses. The usefulness of cost-effectiveness analysis is precisely as a check on the wisdom of choices made by public servants who do not themselves bear most of the consequences of their choices.

Public entities are defined as those funded involuntarily by taxpayers. Private entities are funded voluntarily. In the case of Grameen, the government of Bangladesh bought stock and bonds. Likewise, Grameen borrowed from the public International Fund for Agricultural Development and from the public development agencies of Norway and Sweden. It has private debt from the Ford Foundation. Finally, all cash flows between Grameen and its members are private. Members choose to join because they expect that their benefits will exceed their costs.

4.2 Financial statements

I derive the cash flows of Grameen from its financial statements.[3] This is a weak link in the framework; accounting logic is seldom economic logic (Schreiner and Yaron, 1998). To complicate matters, Grameen, like most other microfinance organizations, does not follow generally accepted accounting principles. The adjustments below aim to remove most of the effects of this window-dressing.

4.2.1 The accounting treatment of grants

Grameen treats some grants not as equity but as liabilities. These funds are, however, more like equity because they do not accrue interest and because they have no set payback date. In the adjusted financial statements (Tables 2, 3, and 4), I count these so-called liabilities as part of equity grants EG_t (line Di in Table 4). Equity grants are the vast bulk of the net worth of Grameen.

Grameen does count some gifts as equity grants EG_t, but it also counts some gifts as revenue grants (RG_t, line Bp in Table 2). Grants are not the direct result of business operations, so they do not qualify as revenue and should be counted as

[3] For 1984-85, 1988-93, and 1996-97, I use financial statements from the annual reports of Grameen. Data for the rest of the years are from Morduch (1999b), Hashemi (1997), and Khandker, Khalily, and Khan (1995). Data for 1976-82 are unavailable. The purchasing power of taka changed with time, so I convert all figures to constant dollars. For stocks, I first multiply nominal taka at time *t* by the consumer price index in Bangladesh as of December 31, 1998. I then divide by the consumer price index as of time *t* and multiply by 1/48.5, the exchange rate between dollars and taka on December 31, 1998. For flows, I use the method in Schreiner (1997) that accounts for the fact that flows take place constantly but are reported only at the end of the year.

injections to equity (*e.g.*, Stickney and Weil, 1994). The arbitrary choice to count some grants as revenue inflates profit and thus blurs the picture of business performance.

4.2.2 Discounts on expenses

Almost all microfinance organizations receive some grants in kind. Common examples are fixed assets (land, buildings, or computers) and services (technical assistance, deposit insurance, debt guarantees, or classes to train loan officers). Free services are *discounts on expenses* (DX_t). They should be accounted for as injections to equity equal to the market value of the service that is then offset by an equal expense. Few organizations do this, however, and this inflates profits.

Grameen is exempt from reserve requirements on deposits; this is a discount on expenses because it reduces the cost of funds. The annual reports also hint at—but do not quantify—other discounts on expenses. I assume that discounts on expenses for Grameen are zero in all years (line Bu of Table 2).

4.2.3 Expenses for provisions for loan losses

At disbursement, most banks recognize an expense for expected defaults (Koch, 1992). This reflects the belief that loan losses are caused not by weak enforcement of repayment but rather by weak screening of borrowers. Thus standard practice is to charge an expense for expected loan losses not to the year when a loan turned sour but rather to the year when the loan was made.

Grameen adjusts provisions for loan losses so as to post a small profit each year. If profits with proper provision would have been negative, then Grameen reduced provisions. If profits with proper provisions would have been very high, then Grameen increased provisions. On net through time, Grameen provisioned too little; its reported net portfolio of $260 million probably has $20 million which it will not collect and for which it has not yet made provisions.

I adjust provisions so that the loan-loss reserve is always 5 percent of the gross loan portfolio (lines Cb and Cc of Table 3).[4] I also write off each year an amount equal to the provision expense in the previous year. This changes the small reported profits into big losses in 1983-94 and into big profits in 1995-97. The accumulated losses due to proper provisions make total equity negative in 1987 (line Dp of Table 4).

[4] Provisions are estimates of the share of loans that, although good now, will someday go bad. Data on cumulative disbursements and repayments for "general" loans suggest that, as widely reported, Grameen has collected about 98 percent of funds disbursed and due. At the end of 1997, "general" loans were 83 percent of the portfolio, and "housing" loans were the bulk of the rest. Because Grameen makes provisions at 5 percent of disbursements for "housing" loans, provisions as a share of total disbursement should be $0.02 \cdot 0.83 + 0.05 \cdot 0.17 \doteq 0.025$. Because "general" loans have one-year terms, the amount disbursed in a year is about twice the balance outstanding. If "housing" loans also had one-year terms, then provisions as a share of the balance outstanding would be twice provisions as a share of disbursements, or 5 percent. In fact, "housing" loans have longer terms, so the balance outstanding is less than twice disbursement. In most years, however, Grameen has grown, and growth tends to make disbursements exceed twice the balance outstanding. Thus, 5 percent is a reasonable estimate of proper provisions as a share of balance outstanding. Morduch (1999b) uses a different technique but comes up with this same figure.

4.3 Other adjustments

4.3.1 Discount on public debt

The *discount on public debt* is defined as the savings that result from borrowing from a public source rather than from a private source. The discount is $D_t \cdot (m_t - c_t)$, where D_t is average public debt, c_t is the average interest rate paid for public debt, and m_t is the market interest rate for private debt of like risk. The market rate m_t always exceeds the public rate c_t; if not, the organization would eschew public debt. The discount on public debt needlessly corrupts reported profits; with a cash equity grant of $D_t \cdot (m_t - c_t)$, an organization could pay for private debt, have the same net cash flows, and yet not depress interest expenses (Inter-American Development Bank, 1994).

The choice of the market interest rate m is as difficult as the choice of the social discount rate r. For Grameen, the cost to replace public debt with private debt in a free market in unknown because the government pegs the market rate at 14 percent and because the default risk of Grameen is unknown. To estimate m, I use an algorithm from Benjamin (1994) that adjusts the prime rate for estimated risk. On average in 1983-97, this risk-adjusted rate was 17 percent per year in nominal terms.

Like most other microfinance organizations, Grameen uses a lot of public debt. In 1997, Grameen paid 5 percent for an average public debt of $187 million; the implied discount was $23 million (lines Fa-Fd of Table 6). The undiscounted sum of these

subsidies from 1983-97 was $152 million. I assume that Grameen would not replace public debt with deposits from members.

4.3.2 True Profit

True profit (TP_t) is defined as what reported profits P_t would be without the arbitrary choice to count some grants not as injections to equity but rather as revenue grants RG_t, discounts on public debt $D_t \cdot (m_t - c_t)$, or discounts on expenses DX_t:

$$\text{True profit}_t = TP_t = P_t - [RG_t + D_t \cdot (m_t - c_t) + DX_t]. \quad (7)$$

In all years, true profit for Grameen is much smaller than reported profit, mostly due to large discounts on public debt. For example, reported profit in 1997 was $300,000, but true profit was -$23 million (line Fh of Table 6).

4.3.3 Ownership of shares

Most microfinance organizations are not-for-profits that do not sell shares nor have formal owners. The shareholders of Grameen, however, are both public (the Bangladesh government) and private (members). This affects the cash flows that are assumed to come back to public entities at the end of the time frame because private entities will have a legal claim on some share of equity at liquidation.

Define *public paid-in capital* (PC_{pubt}) as the stock of paid-in capital from public entities at time *t*, and define *private paid-in capital* (PC_{prit}) likewise. Public entities at time *t* have a legal claim on a share β_t of equity, where $\beta_t = PC_{pubt} / (PC_{pubt} + PC_{prit})$ and where all values are in nominal terms.

The government of Bangladesh bought all of the first issue of Grameen shares in

1983 (line Fi of Table 6). All subsequent sales were to members. By 1997, β was 0.07, and equity was $84 million. If Grameen had been liquidated, the government would have received $6 million, and the 2.3 million members would have pocketed $78 million, or $34 each. This means that a $2 share bought in 1987 would have earned a nominal annual return of 33 percent. This handsome return is not due to the profitability of Grameen but rather to grants from public entities that bolstered equity but that then became the legal property of private shareholders.

4.3.4 Dividends and taxes

Unlike Grameen, some of the other top microfinance organizations in the world have paid dividends, so the framework includes this possibility. I assume that dividends Div_t are distributed throughout the year and that public entities get a share β_t.

Taxes are cash flows from a microfinance organization back to public entities. Until September 1996, Grameen was tax-exempt. In 1997, Grameen made provisions for tax on reported profits at the standard corporate rate of 40 percent. Of course, taxes provide Grameen with one more reason to keep reported profits low.

4.4 The social cost of Grameen, 1983-97

The social cost of a microfinance organization is discounted cash flows from public entities minus discounted cash flows back to public entities (equation 6). The first outflow is the share of equity at time 0 that comes from public entities, $\delta^0 \cdot \beta_0 \cdot E_0 = \beta_0 \cdot E_0$. Seen from the start of the time frame, this is not a sunk flow because society

could have used it in some other development project.

After the start, outflows of fresh funds FF_t from public entities are the sum of the change in equity grants ΔEG_t, the change in public paid-in capital ΔPC_{pubt}, revenue grants RG_t, discounts on public debt $D_t \cdot (m_t - c_t)$, and discounts on expenses DX_t, less the public share of dividends $\beta_t \cdot Div_t$ and taxes:

$$FF_t = \Delta EG_t + \Delta PC_{pub_t} + RG_t + D_t \cdot (m_t - c_t) + DX_t - \beta_t \cdot Div_t - Tax_t. \quad (8)$$

This accumulated annual flow is discounted by δ_t^* (Schreiner, 1997).

At the end of the time frame, public entities receive as in inflow a share β_T of end equity E_T. Total social cost is then discounted outflows minus discounted inflows:

$$\text{Social cost} = \beta_0 \cdot E_0 + \sum_{t=1}^{T} \delta_t^* \cdot FF_t - \delta^T \cdot \beta_T \cdot E_T. \quad (9)$$

Assuming $E_0 = 0$, the social cost of Grameen for the time frame of 1983-97 was $107 million (Line Fl in Table 6). To judge whether this is high or low requires a comparison of cost with output.

5. Results and discussion

Was Grameen cost-effective? From 1983-97, it used $107 million to produce 5.4 million discounted person-years of membership, so the per-unit social cost was about $20 (line Fm of Table 6). This means that if members, on average in each year, were willing to bear at least $20 more cost than what they did in fact bear, then Grameen was a good social investment. In terms of dollar-years of borrowed purchasing power, Grameen produced 0.5 billion discounted units, so the per-unit social cost was about $0.22 (line Fn of Table 6). Average social costs peaked in 1992.

These results are robust to the assumed social discount rate r and market interest rate m (Table 7). For most reasonable pairs of m and r, the social cost per person-year of membership is $15-25. Results are much more sensitive to m than to r.

Was Grameen a bargain or a swindle? The cost-effectiveness criterion requires that social benefits per unit of output $\bar{b}$ exceed social costs per unit of output $\bar{c}$. Although I have not estimated social benefits, the preponderance of the many imperfect and incomplete attempts to measure benefits strongly suggests, in my judgement, that social benefits did indeed exceed estimated average costs.

5.1 Evidence of benefits of Grameen

At the least, low drop-out rates (Khandker, Khalily, and Khan, 1995) signal that average social benefits at Grameen were positive. If worth to users did not exceed cost

to users, then they would drop out. Of course, a positive sign on average net gain is necessary but not sufficient for the size of average net gain to exceed average costs.

Several qualitative studies find that Grameen and/or its clones in Bangladesh empower women (Amin, Becker, and Bayes, 1998; Hashemi, Schuler, and Riley, 1996). For example, Larance (1998) finds that the weekly meetings help women to stretch and to strengthen their support networks beyond their kin groups. They also offer women a chance to gather in public and to hear their first names spoken with respect.[5] According to Larance (1998, p. 30), "These findings suggest that the social implications of microcredit lending can be as powerful as—or even more powerful than—the economic implications." Both types of impacts are real and important even though both types remain unmeasured, at least in terms that can be directly compared with costs.

Schuler and Hashemi (1994) and Schuler, Hashemi, and Riley (1997) find that Grameen increases the use of contraception. Although Grameen does not supply family-planning services, members do vow to keep their families small, and loan officers may prefer to lend to members with few children because they believe that children increase default risk. Increased contraception has social benefits, albeit unquantified and perhaps unquantifiable. Still, the gains are probably smaller than claimed; these studies do not control for the chance that Grameen purposely puts branches in towns whose residents are already more likely to use contraception nor for the chance that the

[5] Empowerment is not costless; conflicts related to Grameen sometimes prompt husbands to beat their wives (Rahman, 1999; Schuler, Hashemi, and Badal, 1998).

women who join Grameen are also already more likely to use contraception. Pitt and Khandker (1996) control for non-random placement and for self-selection and find that Grameen does not affect contraception.

In the economic sphere, the first study to use a control group found that membership in Grameen increased annual household income by 43 percent (Hossain, 1988). Pitt and Khandker (1998) used different data and controlled for unobserved heterogeneity at the individual, household, and village levels. They found that annual household expenditure increased by $18 for each additional $100 of cumulative disbursement. If this effect persists through time and if the average effect exceeds the marginal effect, then the average increase in household expenditure by itself would provide at least $0.09 of the benefit required to compensate for the average social cost of $0.22 per dollar-year of borrowed purchasing power.

Pitt and Khandker (1998) also found that non-land assets of women increased by $27 for each additional $100 of cumulative disbursement. Furthermore, a 1 percent increase in cumulative disbursement to a woman increased the likelihood of school attendance by 0.028 for boys and by 0.019 for girls. These benefits, big as they may be, are not directly comparable to measures of average cost.

Morduch (1998) points out a flaw in Pitt and Khandker (1998); controls include only households with less than half an acre of land even though new members of Grameen often own more than half an acre (Matin, 1998). To correct this, Morduch drops from the sample Grameen households with more than half an acre. He also

replaces Pitt and Khandker's complex weighted exogenous sampling maximum likelihood/limited information maximum likelihood/fixed effects estimator with a simple difference-in-differences estimator. Finally, Morduch estimates the effects not of borrowing but of eligibility to borrow. The benefits found by Pitt and Khandker (1998) disappear; access does not increase expenditure nor school attendance. Access to Grameen did, however, smooth consumption and labor supply across seasons. This makes sense; loans help households to diversify activities (Rutherford, 1998), and Grameen also supplies implicit insurance. For households near subsistence, a strengthened buffer between them and hunger can be almost priceless.

Finally, Khandker, Samad, and Kahn (1998) use this same data, but they do not drop Grameen households above the half-acre cut-off. They find that the presence of a Grameen branch in a village increases the average wage by 14 percent and production per household by 50 percent.

Each of these attempts to measure social benefits has weaknesses. If any one of the positive estimates are correct, however, then Grameen probably had more average social benefits than average social costs. Although the gains are probably smaller than the biggest estimates, Grameen most likely did have positive impacts in all these areas. I find it difficult to imagine how Grameen could not affect the lives of its members. My guess is that Grameen was a cost-effective social investment. My aim here has been to make explicit the logic and assumptions that support this subjective judgement so that future work can improve it.

5.2 Implications for microfinance as a whole

What does the likely cost-effectiveness of Grameen mean for the worldwide microfinance movement that Grameen inspired and still leads? If Grameen, one of the best microfinance organizations, were a bad investment, then it would probably make sense to give up hope for most of the thousands of others. But Grameen probably was a good investment.

Does this mean that most other microfinance organizations are also good investments? No. Although Grameen's badness would condemn them, Grameen's goodness does not necessarily save them. One happy ending does not a microfinance movement make, and most organizations do not perform as well as Grameen. Yet they may still be good investments. Grameen offers hope; just as it did well, microfinance may yet succeed.

Future work should aim to replace hope with knowledge. For Grameen, I have guessed that unmeasured benefits exceed measured costs. The size of the difference is unknown, however, and even costs are unknown for other microfinance organizations. Cost-effectiveness analysis is an inexpensive first step to improve allocations. For example, average costs may be compared across organizations with similar products, users, and contexts. All else constant, society would prefer suppliers with lower average costs. Furthermore, although cost-effectiveness analysis does not identify those

organizations with the highest benefits net of costs, it can help to detect grossly inefficient cases where average costs likely exceed all reasonable estimates of benefits.

Finally, the research agenda should include a framework to measure two types of costs and benefits external to the users of a given organization. The first type of externalities affects the family of users or the local competitors of users. The second type of externalities accrues worldwide. The best (and worst) microfinance organizations inspire (and thwart) efforts and budgets far beyond their own markets and borders. For example, Grameen may be a good social investment for its users, but it may be a bad social investment for the world if the microfinance movement that it inspired turns out to be a worse way to help the poor than the projects that were left unfunded due to the growth of microfinance.

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Table 1: Macroeconomic variables for Bangladesh and U.S.A., 1983-97

Line	For the year ended Dec. 31	Source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	Bangladesh																
Aa	Exchange rate (Tk/$)	Data	25.2	26.0	31.0	30.8	31.2	32.3	32.3	35.8	38.6	39.0	39.9	40.3	40.8	42.5	45.5
Ab	Bangladesh inflation	Data	12.0	8.6	18.4	10.6	11.1	5.9	8.6	11.8	1.9	1.5	4.0	4.7	3.6	4.1	3.6
Ac	Bangladesh inflation (Port. wgt. ave.)	Data	12.0	8.0	21.8	12.1	14.4	8.8	9.5	13.4	2.2	0.8	4.3	5.0	3.8	4.3	5.3
Ad	Bangladesh prime (Simple ave.)	Data	12.0	12.0	12.0	12.0	12.0	12.0	12.0	14.3	16.0	15.1	15.0	14.5	14.0	14.0	14.0
Ae	Bangladesh prime (Port. wgt. ave.)	Data	12.0	12.0	12.0	12.0	12.0	12.0	12.0	14.6	15.9	15.0	15.0	14.4	14.0	14.0	14.9
Af	Population (millions)	Data	93.9	95.6	97.4	99.2	101	103	105	107	109	111	113	115	120	122	124
Ag	GNP/capita (Dec. 1998 $)	Data	210	233	243	249	240	252	256	286	286	270	261	254	270	279	288
	USA																
Ah	USA inflation	Data	3.8	3.9	3.8	1.1	4.3	4.5	4.6	6.1	3.1	2.9	2.7	2.7	2.5	3.3	1.4
Ai	USA inflation (Port. wgt. ave.)	Data	3.8	3.6	3.8	1.3	12.8	4.5	4.5	6.0	3.1	2.8	2.6	2.7	2.5	3.3	1.8
Aj	USA prime (Simple ave.)	Data	NA	NA	10.0	8.4	8.2	9.2	10.9	10.0	8.6	6.3	6.0	7.0	8.8	8.3	8.4
Ak	USA prime (Port. wgt. ave.)	Data	NA	NA	9.9	8.3	8.3	9.4	10.9	10.0	8.4	6.2	6.0	7.2	8.8	8.3	9.0
Al	USA T-bill rate (Simple ave.)	Data	8.6	9.6	7.5	6.0	5.8	6.6	8.1	7.5	5.5	3.5	3.0	4.2	5.5	5.0	5.1
Am	USA T-bill rate (Port. wgt. ave.)	Data	8.7	9.6	7.4	5.9	5.9	6.8	8.1	7.5	5.4	3.4	3.0	4.3	5.5	5.0	5.4

Source: IMF and World Bank, various issues

Table 2: Adjusted income statement of Grameen, 1983-97

Line	For the year ended Dec. 31	Source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Ba	Rev. Lending	Data	0.01	1.22	1.65	1.80	2.43	3.87	5.07	5.98	8.05	13.5	27.3	41.2	46.7	40.5	49.9
Bb	Rev. investments	Data	0.04	0.63	1.40	1.87	2.24	1.80	2.35	3.55	4.13	4.6	4.4	6.7	4.7	10.0	12.0
Bc	Exp. Int. deps.	Data	0.02	0.10	0.19	0.31	0.47	0.72	1.03	1.44	1.86	2.6	3.9	6.7	8.7	9.2	11.7
Bd	Exp. Int. private debt	Data	0.00	0.03	0.09	0.00	0.14	0.14	0.16	0.12	0.15	0.9	1.3	1.4	0.2	0.3	0.2
Be	Exp. Int. public debt	Data	0.06	0.70	1.10	0.97	0.69	0.81	1.05	1.14	0.93	0.9	2.8	7.5	8.0	8.2	8.4
Bf	Fin. margin	Ba+Bb-(Bc+Bd+Be)	(0.03)	1.02	1.67	2.40	3.38	4.00	5.18	6.83	9.23	13.6	23.7	32.2	34.5	32.7	41.7
Bg	Rev. Other op.	Data	0.00	0.00	0.00	0.03	0.02	0.02	0.08	0.08	0.20	0.2	0.3	0.7	0.5	0.3	0.4
Bh	Exp. Other op.	Data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bi	Exp. Loan-loss prov.	Data	0.22	0.40	0.46	0.64	1.12	1.64	2.12	2.47	2.88	5.2	10.8	13.1	12.7	12.1	14.3
Bj	Exp. Extraord. write-offs (net)	Data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	(0.1)	(0.1)	(0.1)
Bk	Exp. Personnel	Data	0.08	0.49	1.18	1.79	2.44	2.78	3.79	4.96	7.25	10.1	15.0	14.7	16.8	18.3	21.6
Bl	Exp. administration	Data	0.09	0.24	0.39	0.52	0.89	1.91	2.83	3.31	3.03	3.2	3.9	5.8	4.2	4.5	5.1
Bm	Exp. Depreciation	Data	0.01	0.04	0.05	0.10	0.07	0.10	0.25	0.32	0.46	0.5	0.5	1.5	0.6	0.7	0.7
Bn	Op. Margin	Bf+Bg-(Bh+Bi+Bj+Bk+Bl+Bm)	(0.41)	(0.15)	(0.41)	(0.62)	(1.13)	(2.41)	(3.74)	(4.15)	(4.19)	(5.1)	(6.1)	(2.2)	0.8	(2.4)	0.4
Bo	Rev. Extraord. (net)	Data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.5	0.5	0.0	0.0	0.0	0.0
Bp	Rev. grants, RG	Data	0.01	0.03	0.00	0.00	0.11	1.16	1.87	2.20	1.98	1.6	2.2	1.9	2.0	2.4	2.9
Bq	Net income before taxes, P	Bn+Bo+Bp	(0.40)	(0.11)	(0.41)	(0.62)	(1.01)	(1.25)	(1.87)	(1.95)	(2.02)	(3.0)	(3.3)	(0.3)	2.8	0.1	3.3
Br	Taxes on net income, Tax	Data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Bs	Dividends declared, Div.	Data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Bt	Change Retained earnings, RE	Bq-(Br+Bs)	(0.40)	(0.11)	(0.41)	(0.62)	(1.01)	(1.25)	(1.87)	(1.95)	(2.02)	(3.0)	(3.3)	(0.3)	2.8	0.1	3.2
Bu	Note: Disc. op. exp., DX	Data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Grameen and calculations of the author. Monetary figures in millions of Dec. 1998 $.

Table 3: Adjusted assets and liabilities of Grameen, 1983-97

Line	For the year ended Dec. 31	Source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Ca	Cash and short-term invest.	Data	2.2	8.5	10.2	17.8	15.1	14.4	21.1	31.1	40.7	38	53	86	96	145	107
Cb	Port. (gross)	Data	4.1	8.9	10.2	12.1	21.1	34.8	45.5	51.5	65.1	119	234	254	253	236	265
Cc	Reserve loan losses	Data	(0.2)	(0.4)	(0.4)	(0.6)	(1.1)	(1.6)	(2.1)	(2.3)	(2.9)	(5)	(11)	(13)	(13)	(12)	(13)
Cd	Port. (net), LP	Cb+Cc	3.9	8.5	9.8	11.5	20.0	33.2	43.4	49.2	62.2	113	223	242	240	224	252
Ce	Fixed assets (net)	Data	0.1	0.2	0.4	1.3	2.3	3.8	4.9	7.2	9.2	11	13	13	14	15	16
Cf	Long-term invest.	Data	0.0	0.0	0.0	0.0	0.0	5.2	8.5	7.2	5.1	3	3	0	0	0	0
Cg	Other assets	Data	0.2	1.4	2.3	3.3	5.2	3.2	5.1	7.1	3.7	3	2	25	44	34	31
Ch	Total Assets	Ca+Cd+Ce+Cf+Cg	6.4	18.7	22.7	33.8	42.7	59.8	83.1	102	121	169	294	365	394	419	406
Ci	Dep. libs	Data	1.0	2.0	3.4	4.8	7.7	10.8	15.3	20.4	27.1	39	69	78	82	87	99
Cj	Private debt	Data	0.1	0.1	2.0	0.2	2.1	0.6	2.0	1.8	1.8	2	2	2	4	11	6
Ck	Public debt	Data	4.6	15.8	16.7	27.8	31.5	40.3	52.0	49.8	48.6	48	137	197	195	197	177
Cl	Other Libs.	Data	0.0	0.0	0.0	0.8	1.9	2.3	3.0	4.6	4.9	7	16	27	36	35	40
Cm	Total Libs.	Ci+Cj+Ck+Cl	5.8	17.9	22.2	33.5	43.2	54.0	72.4	76.7	82.4	96	224	305	318	330	322

Source: Grameen and calculations of the author. Monetary figures in millions of Dec. 1998 $.

Table 4: Adjusted equity of Grameen, 1983-97

Line	For the year ended Dec. 31	Source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Da	Start Retained earnings	Dc(t-1)	0.00	(0.40)	(0.52)	(0.92)	(1.55)	(2.56)	(3.81)	(5.68)	(7.63)	(9.7)	(12.6)	(15.9)	(16.2)	(13.4)	(13.4)
Db	Change Retained earnings, RE	Bt	(0.40)	(0.11)	(0.41)	(0.62)	(1.01)	(1.25)	(1.87)	(1.95)	(2.02)	(3.0)	(3.3)	(0.3)	2.8	0.1	3.2
Dc	End Retained earnings	Da+Db	(0.40)	(0.52)	(0.92)	(1.55)	(2.56)	(3.81)	(5.68)	(7.63)	(9.65)	(12.6)	(15.9)	(16.2)	(13.4)	(13.4)	(10.2)
Dd	Start Reserves and adj.	Df(t-1)	0.00	0.20	0.23	0.16	0.15	0.19	0.30	(0.06)	(0.99)	(1.5)	(1.7)	(3.8)	(6.6)	(8.1)	(10.6)
De	Change Reserves and adj.	Data	0.20	0.03	(0.08)	(0.01)	0.04	0.10	(0.35)	(0.94)	(0.46)	(0.3)	(2.1)	(2.8)	(1.5)	(2.5)	(4.1)
Df	End Reserves and adj.	Dd+De	0.20	0.23	0.16	0.15	0.19	0.30	(0.06)	(0.99)	(1.45)	(1.7)	(3.8)	(6.6)	(8.1)	(10.6)	(14.7)
Dg	Start Equity grants	Di(t-1)	0.00	(0.17)	(0.27)	(0.30)	(0.07)	(0.15)	6.83	13.49	30.87	45.6	83.0	84.7	76.3	91.0	105.8
Dh	Change Equity grants, EG	Data	(0.17)	(0.10)	(0.03)	0.22	(0.07)	6.98	6.66	17.37	14.76	37.4	1.7	(8.4)	14.7	14.8	(4.2)
Di	End Equity grants	Dg+Dh	(0.17)	(0.27)	(0.30)	(0.07)	(0.15)	6.83	13.49	30.87	45.62	83.0	84.7	76.3	91.0	105.8	101.6
Dj	Start Paid-in cap. public	Dl(t-1)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0	1.0	1.0	1.0	1.0	1.0
Dk	Change Paid-in cap. public, PCpub	Data	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Dl	End Paid-in cap. public	Dj+Dk	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0	1.0	1.0	1.0	1.0	1.0
Dm	Start Paid-in cap. private	Do(t-1)	0.00	0.00	0.37	0.57	0.79	1.02	1.51	1.97	1.97	3.1	4.0	4.1	5.7	5.9	6.0
Dn	Change Paid-in cap. private, PCpri	Data	0.00	0.37	0.21	0.21	0.23	0.49	0.46	0.00	1.14	0.9	0.0	1.6	0.2	0.1	0.3
Do	End Paid-in cap. private	Dm+Dn	0.00	0.37	0.57	0.79	1.02	1.51	1.97	1.97	3.11	4.0	4.1	5.7	5.9	6.0	6.3
Dp	Total Equity	Dc+Df+Di+Dl+Do	0.63	0.81	0.51	0.32	(0.50)	5.83	10.73	25.21	38.63	73.6	70.0	60.2	76.4	88.9	84.1

Source: Grameen and calculations of the author. Monetary figures in millions of Dec. 1998 $.

Table 5: Discounted outputs of Grameen, 1983-97

Grameen: Discounted outputs

Line	For the year ended Dec. 31	Source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Ea	Net portfolio outstanding	Cd	1.95	3.92	8.52	9.75	11.5	20.0	33.2	43.4	49.2	62.2	113	223	242	240	224	252
Eb	Members outstanding (thousands)	Data	30.4	58.3	121	172	234	339	490	662	870	1,066	1,424	1,815	2,013	2,066	2,060	2,273
Ec	Change in portfolio in year	Ea-Ea(t-1)	NA	1.966	4.598	1.238	1.773	8.508	13.17	10.24	5.711	13.06	51.04	110	18.26	-1.516	-15.61	27.4
Ed	Change in members in year (thousands)	Eb-Eb(t-1)	NA	27.9	62.73	50.57	62.72	104.8	151.2	171.9	207.3	196.9	358	390.5	198.2	52.53	-6.151	213
Ee	Social discount rate, r	Data	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Ef	Social discount factor, Delta	1/(1+Ee)	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909	0.909
Eg	Natural log of Delta	ln Ef	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095	-0.095
Eh	Year t	Eh(t-1)+1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ei	Delta^t	Ef^Eh	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.350	0.319	0.290	0.263	0.239
Ej	Delta*t	[Ei-Ei(t-1)]/Eg	NA	0.954	0.867	0.788	0.717	0.651	0.592	0.538	0.489	0.445	0.405	0.368	0.334	0.304	0.276	0.251
Ek	Delta**t	Eg^(-2)*{Ei*(Eh*Eg-1)-Ei(t-1)*[(Eh-1)*Eg-1]}	NA	0.469	1.294	1.964	2.502	2.926	3.253	3.495	3.667	3.779	3.84	3.858	3.842	3.797	3.728	3.64
El	Disc. portfolio	Ej*(Ea-Eh*Ec)+Ek*Ec	NA	2.78	5.36	7.19	7.61	10.2	15.7	20.6	22.6	24.7	35.3	61.6	77.6	73.2	64.2	59.8
Em	Disc. members	Ej*(Eb-Eh*Ed)+Ek*Ed	NA	42.1	77.3	115	145	186	245	310	374	430	503	594	639	620	570	544
En	Accum. disc. portfolio	En(t-1)+El	0	2.78	8.14	15.3	22.9	33.2	48.9	69.5	92.1	117	152	214	291	365	429	489
Eo	Accum. disc. members (thousands)	Eo(t-1)+Em	0	42.1	119	234	380	566	811	1,120	1,494	1,924	2,427	3,022	3,661	4,281	4,850	5,394

Source: Grameen and calculations of the author. Monetary figures in millions of Dec. 1998 $.

Table 6: Social cost and cost-effectiveness of Grameen, 1983-97

Line	For the year ended Dec. 31	Source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Fa	Ave. Public debt, D	[Ck(t-1)+Ck]/2	NA	2.30	10.2	16.2	22.2	29.6	35.9	46.2	50.9	49.2	48.2	92.6	167	196	196	187
Fb	Rate paid public debt, c	Be/Fa	NA	0.03	0.07	0.07	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.05
Fc	Market rate for private debt, m	Data	NA	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Fd	Disc. public debt, D*(m-c)	Fa*(Fc-Fb)	NA	0.33	1.03	1.66	2.82	4.35	5.29	6.80	7.51	7.43	7.24	13.0	20.9	25.3	25.1	23.4
Fe	Net income before taxes, P	Bq	NA	(0.40)	(0.11)	(0.41)	(0.62)	(1.01)	(1.25)	(1.87)	(1.95)	(2.02)	(2.99)	(3.31)	(0.26)	2.78	0.07	3.32
Ff	Rev. grants, RG	Bp	NA	0.01	0.03	0.00	0.00	0.11	1.16	1.87	2.20	1.98	1.61	2.25	1.91	1.97	2.44	2.90
Fg	Disc. op. exp., DX	Bu	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fh	True profit, TP	Fe-(Ff+Fd+Fg)	NA	(0.74)	(1.17)	(2.07)	(3.44)	(5.48)	(7.70)	(10.5)	(11.7)	(11.4)	(11.8)	(18.5)	(23.1)	(24.5)	(27.4)	(22.9)
Fi	Public share of paid-in capital, Beta	Data	0	1.00	0.71	0.60	0.51	0.43	0.32	0.25	0.25	0.16	0.12	0.12	0.08	0.08	0.08	0.07
Fj	Beta0*E0	Fi0*Dp0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fk	Accum. disc. fresh funds	Fk(t-1)+Ej*(Dh+Dk+Bp+Fd+Bu-Fi*Bs-Br)	0	1.11	1.94	3.23	5.41	8.27	16.2	24.5	37.7	48.5	67.2	73.4	78.2	91.0	103	108
Fl	Social cost	Fj+Fk-Fi*Ei*Dp	NA	0.54	1.47	3.01	5.30	8.41	15.2	23.1	34.8	45.9	63.8	70.5	76.7	89.3	100.9	107
Fm	Social cost/person-year of membership ($)	Fl/(Eo/1000)	NA	12.8	12.3	12.8	14.0	14.9	18.7	20.6	23.3	23.9	26.3	23.3	20.9	20.9	20.8	19.8
Fn	Social cost/dollar-year of debt ($)	Fl/En	NA	0.19	0.18	0.20	0.23	0.25	0.31	0.33	0.38	0.39	0.42	0.33	0.26	0.24	0.24	0.22

Source: Grameen and calculations of the author. Monetary figures in millions of Dec. 1998 $.

Table 7: Sensitivity of average cost per person-year of membership

	m															
r	0	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
0.00	5.1	5.8	7.4	9.0	10.6	12.2	13.8	15.3	16.9	18.5	20.1	21.7	23.2	24.8	26.4	28.0
0.02	5.4	6.2	7.7	9.3	10.9	12.5	14.0	15.6	17.2	18.8	20.4	21.9	23.5	25.1	26.7	28.2
0.04	5.7	6.5	8.0	9.6	11.2	12.8	14.3	15.9	17.5	19.0	20.6	22.2	23.8	25.3	26.9	28.5
0.06	6.0	6.8	8.3	9.9	11.5	13.0	14.6	16.2	17.7	19.3	20.9	22.4	24.0	25.6	27.1	28.7
0.08	6.2	7.0	8.6	10.2	11.7	13.3	14.9	16.4	18.0	19.6	21.1	22.7	24.3	25.8	27.4	29.0
0.10	6.5	7.3	8.8	10.4	12.0	13.5	15.1	16.7	18.2	19.8	21.4	22.9	24.5	26.1	27.6	29.2
0.12	6.7	7.5	9.1	10.6	12.2	13.8	15.3	16.9	18.5	20.0	21.6	23.1	24.7	26.3	27.8	29.4
0.14	6.9	7.7	9.3	10.8	12.4	14.0	15.5	17.1	18.7	20.2	21.8	23.4	24.9	26.5	28.1	29.6
0.16	7.1	7.9	9.4	11.0	12.6	14.1	15.7	17.3	18.8	20.4	22.0	23.6	25.1	26.7	28.3	29.8
0.18	7.2	8.0	9.6	11.1	12.7	14.3	15.9	17.4	19.0	20.6	22.2	23.7	25.3	26.9	28.5	30.0
0.20	7.3	8.1	9.7	11.3	12.9	14.4	16.0	17.6	19.2	20.7	22.3	23.9	25.5	27.1	28.6	30.2
0.22	7.4	8.2	9.8	11.4	13.0	14.5	16.1	17.7	19.3	20.9	22.5	24.0	25.6	27.2	28.8	30.4
0.24	7.5	8.3	9.9	11.4	13.0	14.6	16.2	17.8	19.4	21.0	22.6	24.2	25.8	27.4	28.9	30.5
0.26	7.5	8.3	9.9	11.5	13.1	14.7	16.3	17.9	19.5	21.1	22.7	24.3	25.9	27.5	29.1	30.7
0.28	7.5	8.3	9.9	11.5	13.1	14.7	16.3	17.9	19.6	21.2	22.8	24.4	26.0	27.6	29.2	30.8
0.30	7.5	8.3	9.9	11.5	13.1	14.7	16.4	18.0	19.6	21.2	22.8	24.4	26.1	27.7	29.3	30.9

Source: Author's calculations.