A Cost-Effectiveness Analysis
of the Grameen Bank of Bangladesh

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Abstract

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Acknowledgments

Author's Note

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1. Introduction

Microfinance—defined as efforts to improve poor people's access to loans and saving services—may be the fastest-growing and most widely recognized anti-poverty tool. The 200 microfinance organizations surveyed in Paxton (1996) held 13 million loans worth $7 billion and 45 million savings accounts worth $19 billion. Growth will probably continue, and one movement seeks to establish credit as a human right and to raise $20 billion to provide microfinance to 100 million of the world's poorest families by 2005 (Daley-Harris, 2002; 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 female, very poor, and rural. More than 98 percent of payments due had been collected. In 1997, the average disbursement was $170, equivalent to 60 percent of per-capita income. Unlike many development projects, Grameen has thrived, relieving some of the misery caused by floods and cyclones, corruption, purdah norms that constrain women, and abysmal income and wealth.

Worldwide, microfinance has caught fire. In Bangladesh, Grameen clones have more than 2.5 million members. Grameen transplants operate in the United States and

Europe (Conlin, 1998; Rogaly et al., 1999) as well as in Africa, other parts of Asia, and Latin America (Hulme, 1990; Thomas, 1995; Taub, 1998; Wall Street Journal, 1998).

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 microfinance does work, is it so effective that it should crowd out other types of development interventions (Rogaly, 1996)? After all, the poor benefit not only from better financial services but also, for example, from better food, water, roads, or houses.

As it turns out, the cost-effectiveness of Grameen—and of microfinance in general—is unknown. Past attempts to measure subsidies have been flawed (Benjamin, 1994; Hashemi, 1997; Hulme and Mosley, 1996; Khandker et al., 1995; Morduch, 1999b; Yaron et al., 1997). For example, some studies count cash grants as revenue, some forget to impute an opportunity cost to all resources, and all fail to discount cash flows.

Likewise, past attempts (reviewed in Section 5) to measure benefits of Grameen have flaws. For example, some research fails to control for what would have happened in the absence of Grameen, some work does not control for participant self-selection or for non-random placement of branches, and no studies measure more than a few of the multiple aspects of benefits. These shortfalls result not from a lack of competence or effort but rather from the difficulty of measuring impact.

Are subsidies for Grameen well spent? If Grameen, one of the best microlenders, is not worthwhile, then most other microlenders—and microfinance in general—might not be as useful as many people hope.

The cost-effectiveness analysis in this paper uses a present-value framework to compare Grameen's subsidies with its outputs. Cost-effectiveness analysis is used instead of benefit-cost analysis because outputs are much simpler (and less expensive) to measure than benefits. Likewise, subsidy is simpler to measure than social cost.

For Grameen in the time frame 1983-97, subsidy per person-year of membership was about $20. Likewise, subsidy per dollar-year borrowed was about $0.22. The literature suggests that surplus for Grameen users (not measured here) exceeds these levels of subsidy. Thus, subsidies for Grameen have been well spent. Of course, the results apply only to Grameen; other microlenders—and microfinance in general—may or may not be as cost-effective.

Section 2 below outlines how Grameen works. Sections 3 and 4 set up frameworks to measure subsidy and output in microfinance. Section 5 discusses implications for Grameen and for microfinance as a whole.

2. How Grameen works

Now this is how the birth of Grameen came about (Yunus, 1998). A young economist with a freshly minted PhD from the United States had returned to Chittagong University in Bangladesh to help to build his newly created country, but he grew frustrated with abstract theory as he watched people starve during the famine of 1974. 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 $0.64 to the weaver. By 1976, Grameen was born. When it became a bank in 1983, Grameen had 36,000 members and a portfolio of $3.1 million.[1] By 1997, it had 2.3 million members and a portfolio of $260 million.

Behind the miracle story lies the design of products and incentives that allow Grameen to make small loans to poor people without physical collateral. This section describes the design details behind the tale of success.

2.1 Membership

New members are placed in groups of five, with five to eight groups forming a centre. All members in the centre meet with a loan officer weekly. For the first few weeks, they learn Grameen rules, save $0.02 a week, learn to sign their names, and

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[1] All monetary figures are in dollars as of December 1998 ($1 = 48.5 taka).

memorize a set of vows to self-improvement. Each group elects a chair, and each centre elects a chief. New members also must buy a share of stock in Grameen for $2.

2.2 Loans

Lenders seek to manage repayment risk; all borrowers promise to repay, but, whether due to choice or to constraint, some break their promise. To control risk, most lenders require collateral, an asset that the borrower forfeits upon default and that thus motivates repayment. Most formal lenders require physical assets such as land or houses. The poor, however, either lack such assets or cannot afford to lose them.

The innovation of Grameen—and of microfinance in general—is to collateralize the asset of future access to loans. In this sense, microfinance in low-income countries works a lot like credit cards in high-income countries; borrowers repay because they want to preserve 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: default by one group member leads to loss of access for all members. This *joint liability* reduces risk in three ways (Conning, 1998).

First, joint liability gives members an incentive to exclude known bad risks. For outsiders, knowledge of individual character is costly, but, for villagers, it is often a sunk cost. Thus, joint liability can cut the cost to screen potential borrowers.

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Second, joint liability gives members an incentive to make sure that their fellows do not squander their loans. This can cut the cost to monitor borrowers.

Third, joint liability gives members an incentive to coax comrades out of arrears or even to repay their debts for them. Members may also mentor each other. This can cut the cost 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 (Besley and Coate, 1995; Paxton et al., 2000). Also, joint liability may not cut costs but rather only shift them from lenders to borrowers.

Because joint liability lets the poor bank on social capital, it has captured the imagination of the public (Zwingle, 1998). Because joint liability involves repeated games between heterogeneous agents with imperfect information, it has drawn attention from theoretical economists (Ghatak and Guinnane, 1999). At Grameen, however, joint liability is more subtle than the popular perception and more complex than the theory.

First, Grameen staggers disbursements to leverage the threat of termination. Two members get loans first, and then, one month later, two other members get loans. After one more month, the last member gets a loan. 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.

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Furthermore, borrowers who have already paid most of their debt have incentives to make sure that their peers also repay.

Second, loan officers often do not enforce 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. To enforce repayment without strict joint liability at the group level, loan officers use 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 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 (Ito, 1998; Rahman, 1999).

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

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

2.3 Forced savings

Unlike most microfinance organizations, Grameen takes deposits. Most saving, however, is compulsory, and some types of withdrawals are restricted. Savings in Grameen resembles insurance; members can borrow against their savings in emergencies, and Grameen can freeze savings balances in the case of default.

Grameen has four types of forced savings (Morduch, 1999c). The first two types are called 'savings', but they are really fees. After their first loan, members must pay 2 cents each week for schools run by the centre. They must also pay 0.5 percent of disbursements in excess of $20 into a loan-loss fund.

The last two types of forced savings are real savings. Members must deposit four 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'. Modelled on informal group funds (Ardener and Burman, 1995; Rutherford, 2000), it earns 8.5 percent and is nominally 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 from the 'group fund' until they leave Grameen or until they have been members for ten years.

In sum, most 'savings' resemble 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 is a strong incentive to continue to repay as promised.

Voluntary savings from members are small. This is unfortunate; to escape from poverty means to build assets. Although some people can build assets through debt, even more can build assets through savings. Some of the poor are creditworthy, but all are depositworthy. The poor in Bangladesh have a very high demand for saving services (Alamgir and Dowla, 2000). Grameen probably could improve its attempts to relieve poverty if it also had flexible, voluntary savings services decoupled from debt. As Rutherford (1998) says, "Splendid though [Grameen] has been, it could be more splendid." Grameen recently has taken some steps in this direction (Yunus, 2002).

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, what it calls *discipline* (Khandker, et al., 1995). This is not only financial discipline to make repayments and deposits each week, but also physical discipline: members must sit in straight rows, salute, chant, and sometimes do calisthenics (Hashemi, 1997).

The vows that members recite also instill discipline in that they foster a break from some social norms that 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* (Edgcomb and Barton, 1998), creating social capital as a by-product of meetings. In rural Bangladesh, social capital is scarce because <u>purdah</u> norms isolate women. Grameen meetings provide a socially accepted excuse to gather and to talk. The impacts are both psychological and economic; not only do women feel less isolated, but they also strengthen their support networks (Larance, 2001).

3. A framework to measure social benefits

What are the social benefits of Grameen's services? This section lays out a framework that integrates six aspects of social benefits: worth to users, cost to users, depth, breadth, length, and scope. Because worth, cost, and depth are difficult to measure, I adjust the framework to use only measurements of outputs. The framework is general and should be useful for evaluation beyond microfinance.

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 dollar-equivalent terms. For example, if a woman were willing to bear costs of $50 to be a member of Grameen for a year, then she would be just as well off with $50 of additional income as with a costless year of membership. Worth, though simple in concept, is very difficult to measure. The literature on Grameen does not contain any satisfactory measure of worth to users.

3.1.2 Cost to users

Cost to users is defined as the sum of price costs and transaction costs. Price costs are cash payments to a microlender. Price costs for users are revenue for lenders.

Transaction costs are non-price costs and include both non-cash opportunity costs—such as time spent in meetings—and indirect cash expenses for such things as

fares and snacks. In microfinance, transaction costs often swamp price costs (Rojas and Rojas, 1997). Transaction costs for users are not revenue for lenders.

The concept of cost to users differs from cost of supply and subsidy. The opportunity cost of resources used in lending is the cost of supply. Costs borne by non-users—the opportunity cost of public resources used in lending—are subsidies. Costs of supply are covered by price costs borne by users and by subsidies borne by non-users.

3.1.2.1 Estimates of costs to Grameen users

Transaction costs can be estimated from survey data on the miles, minutes, and money involved in the use of microfinance. There are no such estimates for Grameen.

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 that gives the cash flows from the use of microfinance a present value of zero. To estimate this for a typical Grameen borrower requires several assumptions. First, inflation is 5 percent, the average in Bangladesh in 1988-97 (Table 1). Second, a 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, the first loan is for 1,000 taka, and 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'.

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Seventh, the borrower leaves Grameen after ten years, sells her share at par, and

withdraws the $150 accumulated in 'personal savings' and in the 'group fund'.

Given this, the present value of cash flows is zero with a weekly discount rate of

0.00711, implying a real effective interest rate of (52·0.00711 0.05)/(1+0.05)   30

percent. Forced savings makes real effective rates more than twice real stated rates.

The accounting treatment of forced savings also affects Grameen's reported

profit. Grameen counts cash inflows from all types of forced savings as increases in

liabilities. Counting non-reimbursable fees as revenue would increase reported profit.

Why doesn't Grameen do this? It probably wants to hide costs to users and to

post low profits. Low stated interest rates differentiate Grameen from moneylenders.

Furthermore, high profit might prompt the government to collect taxes and donors to

ask whether the poor bear too much cost. The current structure provides strong cash

flows without the appearance of excessive profit nor high stated interest rates.

3.1.2.2 User surplus

User surplus is defined as worth minus cost, the increase in well-being due to

microfinance. In welfare theory, user surplus is the difference between the highest cost

that a user would agree to bear (willingness to pay) and the cost actually borne.

Subsidizing Grameen is worthwhile—social benefits exceed social costs—if user

surplus per output exceeds subsidy per output. This paper measures subsidy per output

and compares it to what can be learned from the literature about surplus per output.

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People join Grameen because they expect positive user surplus. Although actual surplus is difficult to measure, its sign can be inferred; if members do not drop out, then surplus must be positive. Grameen's annual drop-out rate in 1986-94 was about 5 percent (Khandker <u>et al</u>., 1995). This suggests that most members had positive surplus.

3.1.3 Depth

<u>Depth</u> is defined as the social value of surplus that accrues to a given user. In welfare theory, depth is 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 assets worth less than an acre) can join Grameen. In practice, some new members exceed this (Matin, 1998). Still, most members are very poor by any standard.

3.1.4 Breadth

<u>Breadth</u> 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 and centres in more than half the villages in Bangladesh, Grameen has extensive breadth.

3.1.5 Length

<u>Length</u> is the time through which microfinance is supplied. 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 or, in the absence

of perpetual subsidies, the ability to earn enough profit to maintain the real value of equity (Schreiner and Yaron, 2001).

In 1997, Grameen reported before-tax profit of $0.3 million. Without subsidies, losses would be $23 million, and the sum of losses since 1983 would be $183 million (Section 4 below). But Grameen does get subsidies, and it will continue to do so. Even if Grameen lost its subsidies, it probably could adjust and survive long into the future.

3.1.6 Scope

Scope is the types of services supplied. For example, an organization that offers both loans and saving services has greater scope than one that offers only loans. Scope also increases with the variety and flexibility of the terms of financial contracts.

Grameen has great scope in some ways and weak scope in others. It does offer saving services, but most savings are forced, and withdrawal is restricted. For loans, the amount disbursed increases with time, and Grameen has invented new types of loans to complement the 'general' loan. For a given type of loan, however, most contractual terms are the same for all borrowers.

3.2 Benefit-cost analysis and cost-effectiveness analysis

As defined above, depth is the social value of user surplus (that is, worth to users minus cost to users). Breadth is number of users served, length is years of service, and scope is number of types of services. These six aspects can be combined to measure the net 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}. User surplus is then w_{tsn} c_{tsn}.

The depth function $D_{tsn}(w_{tsn}$ $c_{tsn})$ gives the social value of the user surplus from contract s_t for client n_{st} in year t. The general social-welfare function $W(\ )$ aggregates social value across users, services, and time:

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

Given a discount factor and the assumption that $W(\ )$ is additively separable across users, services, and time, social benefits b is:

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

Benefit-cost analysis compares subsidy 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. Unfortunately, the test requires knowledge of worth to users w_{tsn}, cost to users c_{tsn}, and the social value of net gains $D_{tsn}(\ )$. This knowledge is rarely available.

As an alternative, cost-effectiveness analysis compares subsidy with outputs, not benefits. Let o_{tsn} be outputs of type s_t for user n_{ts} in year t. Cost-effectiveness replaces

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difficult-to-measure social benefits b with simple-to-measure outputs :

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

Most analyses consider only one service, so $S_t = 1$ for all t. Also, most projects

only have data on aggregate outputs rather than outputs for each user. If O_t is

aggregate output of one type of service in a year, then (3) becomes:

$$\text{Number of outputs} \quad \Omega \quad \sum_{t\,1}^{T} \delta^t \, O_t.\tag{4}$$

Define $\bar{b} = b/$ as (unmeasured) social benefit per unit of output, and define $\bar{c} =$

$c/$ as (measured) subsidy per unit of output. Dividing the benefit-cost criterion $b > c$

by   gives the cost-effectiveness criterion, $\bar{b} > \bar{c}$. A project is deemed cost-effective if

unmeasured average benefits $\bar{b}$ are judged to exceed measured average subsidy $\bar{c}$.

Why bother with cost-effectiveness? After all, knowledge of average subsidy does

not confer knowledge of average benefits. In the imperfect world of policy, however, if

average subsidy is very high or very low, then policymakers may feel confident enough

to judge whether unmeasured average benefits exceed average subsidy.

3.3 Discounted output of Grameen, 1983-97

Section 4 estimates subsidy c. This section estimates output   in 1983-97.

The discount factor $= 1/(1+r)$ is the intertemporal social price. The choice of

the discount rate r is one of the most-debated issues in policy analysis. In practice, the

two biggest entities that do project analyses—the World Bank and the US government—set r at 10 percent per year in real terms (Belli, 1996; US Office of Management and Budget, 1972). This is arbitrary, but with a fixed budget, its consistent use leads to correct choices. 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, this paper focuses on two: person-years of membership and dollar-years borrowed. Membership confers access to all the other services and so in some sense encompasses all of them. Dollar-years borrowed is the best summary of loan size because it accounts for the amount disbursed, the term to maturity, and the repayment pattern (Schreiner, 2001).

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 borrowed is the average net loan portfolio. Discounting these average stocks is more complex than discounting flows. Grameen, like most organizations, reports only year-end stocks (s_t). Assuming linear change, the average discount-weighted stock is not $^{t\ 0.5}(s_t\ s_{t\ 1})/2$ because the discount is a non-linear function of time. Schreiner (1997) shows that:

$$\text{Disc. ave. stock} \quad \delta_t\ (s_t\ t\ \Delta s_t)\ \delta_t\quad \Delta s_t, \text{ where}$$
$$\delta_t\quad (\delta^t\ \delta^{t\ 1})/\ln\delta,$$
$$\Delta s_t\quad s_t\ s_{t\ 1}, \text{ and} \tag{5}$$
$$\delta_t\quad (\ln\delta)^{\ 2}\ \{\delta^t\ (t\ \ln\delta\ 1)\ \delta^{t\ 1}\ [(t\ 1)\ \ln\delta\ 1]\}.$$

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Given $r = 0.10$ in 1983-97, Grameen produced 5.4 million discounted person-years of membership and 0.5 billion discounted dollar-years borrowed (lines Eo and En in Table 5). Is this a lot of output? It depends on the subsidies used to produce it.

4. A framework to measure subsidy

This paper measures subsidy as net discounted cash flows from public entities to Grameen, supposing that Grameen was founded in 1983 and then liquidated in 1997. Subsidy is (net) cost to non-users, and user surplus is (net) benefit to users, so cost-effectiveness analysis compares surplus per output to subsidy per output.

For a publically owned microlender, subsidy c is equity E_0 that public entities put in at time 0, plus discounted net flows of funds FF_t from public entities to the lenders in year t, minus discounted equity E_T that public entities get back at time T:

$$\text{Subsidy} \quad c \quad E_0 \quad \sum_{t\,1}^{T} \delta^t \, FF_t \quad \delta^T \, E_T. \tag{6}$$

Measuring E_0 and E_T is simple; the rest of this section describes measuring FF_t.

4.1 Cash flows from public and private entities

Cash flows from private entities do not enter the subsidy formula. Private entities are assumed to agree to trade their own resources on the market because they figured, in their own benefit-cost analysis, that user surplus is positive. Thus, in the absence of externalities, private trades impose no net costs and thus imply no subsidy.

In contrast, resources allocated by public entities belong to all people in a society. The price charged for the resources, however, is not only set outside the market but may also lack any link to the worth of the resources in alternative uses. Because

the governments and donors who allocate public resources may fail to consider opportunity costs, non-users may bear net costs. Thus, the measurement of subsidy focuses on resources from public entities.

Grameen uses public resources because it sold stocks and bonds to the government of Bangladesh. Likewise, Grameen borrowed from the International Fund for Agricultural Development and from Norway and Sweden. Grameen also has private resources: debt from the Ford Foundation, and funds from Grameen members.

4.2 Financial statements

The cash flows of Grameen come from its financial statements.[2] This is problematic because accounting logic differs from economic logic. Worse, Grameen—like most other microlenders—does not use generally accepted accounting principles. The adjustments below aim to remove most of the effects of this.

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[2] The 1984-85, 1988-93, and 1996-97 financial statements come from Grameen's annual reports. Other years come from Morduch (1999c), Hashemi (1997), and Khandker et al. (1995). Data for 1976-82 are unavailable. To convert stocks in nominal taka to constant dollars, the analysis multiplies nominal taka at time t by the consumer price index in Bangladesh as of 31 Dec 1998. It then divides by the consumer price index as of time t and multiplies by 1/48.5, the exchange rate between dollars and taka on 31 Dec 1998. Conversion of flows assumes that flows take place constantly even though only their sum is reported at year-end (Schreiner, 1997).

4.2.1 The accounting treatment of grants

Grameen treats some grants as liabilities. These funds, however, are really equity because they do not accrue interest and will not be paid back. The adjusted financial statements (Tables 2, 3, and 4), count these so-called liabilities as part of equity grants EG_t (line Di in Table 4). Equity grants are the vast bulk of net worth.

Grameen also counts some grants as revenue (RG_t, line Bp in Table 2). Grants do not result from business operations, so they are not revenue but rather additions to equity. Counting grants as revenue inflates profit and distorts measures of performance.

4.2.2 Discounts on expenses

Almost all microlenders receive some grants in kind. Common examples are fixed assets (land or computers) or services (technical assistance or debt guarantees). Free services are *discounts on expenses* (DX_t). They should be accounted for as an addition to equity balanced by an equal expense. Like Grameen, few microlenders do this, so reported profit is inflated.

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 other unquantified discounts. This paper assumes (incorrectly) 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

Most banks recognize an expense for expected defaults as they disburse loans. This reflects the belief that loan losses are due less to enforcement than to weak screening. Thus, the standard practice is to charge an expense for expected loan losses not to the year when a loan turns sour but rather to the year when it was disbursed.

Grameen adjusts provisions for loan losses up or down each year to ensure that its final reported profit is small. On net through time, Grameen provisioned too little; $20 million in the reported net portfolio of $260 million at the end of 1997 probably will not be collected and yet lacks provisions.

This paper adjusts provisions so that the loan-loss reserve is always 5 percent of the gross loan portfolio (lines Cb and Cc of Table 3).[3] The adjustments include a write-

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[3] Provisions are estimates 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 payments due. At the end of 1997, 'general' loans were 83 percent of the portfolio, and 'housing' loans were most of the remainder. Given that Grameen makes provisions at 5 percent of disbursements for 'housing' loans, provisions as a share of total disbursements should be (1 0.98) 0.83+0.05 0.17 0.025. Because 'general' loans have one-year terms, the amount disbursed in a year is about twice the average balance outstanding. If 'housing' loans also had one-year terms, then provisions as a share of the balance outstanding

off each year of an amount equal to the provision expense in the previous year. This changes the small reported profits into big losses in 1983-94 and big profits in 1995-97.

4.3 Other adjustments

4.3.1 Discount on public debt

The discount on public debt is defined as the savings from borrowing from a public rather than private source. The discount is $D_t (m_t c_t)$, 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. The discount on public debt needlessly corrupts reported profits; with a cash grant of $D_t (m_t c_t)$, an organization could pay for private debt, have the same net cash flows, and yet not artificially depress interest expenses.

Like the choice of the social discount rate r, the choice of the market interest rate m is difficult. For Grameen, the cost of private debt in a free market in unknown because the government sets the market rate and because Grameen's default risk is

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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 of outstanding balances is a reasonable estimate of proper provisions.

unknown. To estimate m, this paper adjusts the prime rate for estimated risk.[4] On

average in 1983-97, this nominal risk-adjusted rate was 17 percent per year.

Like most other microlenders, Grameen has public debt. In 1997, it paid 5

percent on average public debt of $187 million; the discount was $23 million (lines Fa-

Fd of Table 6). The sum of discounts on public debt in 1983-97 was $152 million.

4.3.2 True Profit

True profit (TP_t) is defined as what reported profits P_t would be if the lender

counted grants as additions to equity rather than as revenue grants RG_t, discounts on

public debt D_t (m_t c_t), and discounts on expenses DX_t:

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

True profit for Grameen is smaller than reported profit, mostly due to discounts

on public debt. For example, reported profit in 1997 was $0.3 million, but true profit

was –$23 million (line Fh of Table 6).

4.3.3 Ownership of shares

Most microlenders are not-for-profits that do not sell shares nor have formal

owners. Grameen does have shareholders, both public (government) and private

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[4] The algorithm comes from Benjamin (1994). It is assumed that Grameen would

not replace public debt with deposits from members.

(members). This affects cash flows assumed to return to public entities because private

entities will have a legal claim on some share of equity at liquidation.

Paid-in capital may be <u>public</u> (PC_{pubt}) or <u>private</u> (PC_{prit}). Public entities have a

legal claim on a share $_t$ of equity, where $_t = PC_{pubt} / (PC_{pubt} + PC_{prit})$.

The government of Bangladesh bought the first issue of Grameen shares in 1983

(line Fi of Table 6). All subsequent sales have been to members. By 1997, was 0.07,

and equity was \$84 million. If Grameen were liquidated, the government would receive

\$6 million, and the 2.3 million members would pocket \$78 million, or \$34 each. A \$2

share bought in 1987 would have earned a nominal annual return of 33 percent.

4.3.4 Dividends and taxes

Unlike Grameen, some other top microlenders pay dividends, so the framework

here includes this possibility. The paper assumes that dividends Div_t are distributed

throughout the year and that public entities get a share $_t$.

Taxes are cash flows 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 are one more reason for

Grameen to ensure that reported profits are low.

4.4 Grameen's subsidy, 1983-97

Subsidy is net discounted cash flows from public entities to Grameen. The first

outflow is the share of equity at time 0 from public entities, or ^{0} $_0 E_0 = {}_0 E_0$.

Net flows of funds FF_t are the sum of the change in equity grants EG_t, public paid-in capital PC_{pub_t}, revenue grants RG_t, discounts on public debt D_t $(m_t\ c_t)$, and discounts on expenses DX_t, minus the public share of dividends $_t\ Div_t$ and taxes:

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

This accumulated annual flow is discounted by $_t^*$.

At the end of the time frame, public entities get an inflow of $_T\ E_T$. Total subsidy is then discounted outflows minus discounted inflows:

$$\text{Social cost} \quad \beta_0\ E_0 \quad \sum_{t\ 1}^{T} \delta_t\ FF_t \quad \delta^T\ \beta_T\ E_T. \tag{9}$$

Assuming $E_0 = 0$, Grameen's subsidy for 1983-97 was \$107 million (Line Fl in Table 6). To judge whether this is high or low requires a comparison with output.

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5. Cost-effectiveness and discussion

Was Grameen cost-effective? From 1983-97, it used subsidies of $107 million to produce 5.4 million discounted person-years of membership, so the per-unit subsidy was about $20 (line Fm of Table 6). This means that if members, on average in each year, had surplus of at least $20, then Grameen was a cost-effective social investment.

In terms of dollar-years borrowed, Grameen produced 0.5 billion discounted units, so the per-unit subsidy was about $0.22 (line Fn of Table 6). These results are robust to the assumed social discount rate r and market interest rate m (Table 7).

Was Grameen worthwhile? Cost-effectiveness requires that surplus per output $\bar{b}$ exceed subsidy per output $\bar{c}$. Although this paper has not estimated surplus, the weight of the many (admittedly imperfect and incomplete) attempts at impact measurement for Grameen suggests that surplus did indeed exceed subsidy.

5.1 Evidence of user surplus at Grameen

This section briefly reviews the best papers from the extensive literature on Grameen's impact. While none of the estimates are exactly equivalent to user surplus, they still help to inform a broad judgement about whether surplus exceeded subsidy.

5.1.1 Drop-out rate

At the most basic level, a low drop-out rate signals that user surplus is positive. Of course, surplus could be positive but yet not positive enough to exceed subsidy.

Khandker et al. (1995) report an annual drop-out rate at Grameen in 1986-94 of about 5 percent. Thus, surplus was positive for most users.

5.1.2 Empowerment

Several studies find that Grameen and its clones empower women (Amin et al., 1998; Hashemi et al., 1996). For example, the weekly meetings help women strengthen support networks beyond kin groups and offer women a chance to gather in public and to hear their first names spoken with respect.[5] 'These findings suggest that the social implications of microcredit lending can be as powerful as the economic implications' (Larance, 2001, p. 16).

Latif (1994) and Schuler and Hashemi (1994) find that Grameen, while not supplying family-planning services, increases the use of contraception, perhaps because members vow to keep their families small. Still, these studies probably overstate impact, as they do not control for non-random branch placement nor for member self-selection. Pitt et al. (1999) do control for these factors, and they find that Grameen does not affect the use of contraception.

5.1.3 Income and assets

In the economic sphere, the first study to use a control group (Hossain, 1988) found that Grameen membership increased annual household income by 43 percent.

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[5] Empowerment is not costless; husbands sometimes beat their wives over conflicts related with Grameen (Rahman, 1999; Schuler et al., 1998).

Pitt and Khandker (1998) used different data and controlled for unobserved heterogeneity at the individual, household, and village levels.[6] They found that annual household expenditure increased by $18 for each additional $100 of cumulative disbursement. If this effect persists and if the average effect exceeds the marginal effect, then the increase in expenditure by itself would provide at least $0.09 per dollar-year borrowed to balance the subsidy of $0.22. Pitt and Khandker (1998) also find that the value of women's non-land assets increased by $27 for each additional $100 disbursed.

Using the same data, McKernan (2002) finds that participation in Grameen increases average monthly profits from self-employment from about $45 to about $80. Average monthly income for a four-person household in the sample is about $73, so this is a very large effect that, if correct, would by itself more than compensate for subsidy.

Khandker <u>et al</u>. (1998) find that the presence of a Grameen branch increases the average wage in a village by 14 percent and increases production per household by 50 percent. Unfortunately, this result could also be explained by non-random placement of branches (Sharma and Zeller, 1999; Ravallion and Wodon, 1997).

5.1.4 Health

Pitt and Khandker (1998) find that a 1 percent increase in cumulative disbursement to a woman increases the likelihood of school attendance of daughters by 1.9 percent and of sons by 2.8 percent. These benefits are large.

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[6] Morduch (1998) and Pitt (1999) debate caveats to Pitt and Khandker (1998).

Pitt et al. (2003) use the same data and find that a 10-percent increase in disbursement to women (but not to men) increases the average arm circumference of daughters by 0.45 cm and of sons by 0.39 cm and increases the average height of daughters by 0.36 cm and of sons by 0.50 cm.

Finally, Nanda (1999) uses the same data and finds that Grameen membership increases women's demand for formal health care. Nanda even claims that a dollar spent on microcredit has the same effect on the usage of formal health care as a dollar used to establish health clinics.

5.1.5 Judgement from evidence in the literature

Each estimate of impact in this brief review has weaknesses. If any one of them is correct, however, then surplus probably exceeds subsidy. Although the true effects may be smaller than the largest estimates, it is difficult to imagine how impacts could not be positive in all these areas. Given this broad evidence, this paper concludes that Grameen probably was cost-effective. Like all conclusions on cost-effectiveness, this is inevitably a subjective judgement. Hopefully, the logic and assumptions that support this conclusion are explicit and so will facilitate discussion and further refinements.

5.2 Policy implications for microfinance

5.2.1 Use of cost-effectiveness analysis

Cost-effectiveness analysis is an inexpensive first step to improve the allocation of public resources in microfinance. In particular, it is much simpler—and often more

useful—than impact studies. For example, governments or donors could compare average costs across microlenders with similar products, users, and contexts, giving preference to low-cost suppliers. Although this does not identify those lenders who produce the greatest net social benefits, it can help to detect grossly inefficient cases.

5.2.2 Grameen's cost-effectiveness and microfinance worldwide

What does Grameen's cost-effectiveness mean for the worldwide microfinance movement that Grameen inspired? If Grameen, one of the best microlenders, were not cost-effective, then there would be little hope for most of the thousands of other microlenders. But Grameen probably was cost-effective.

Unfortunately, this does not mean that other microlenders are cost-effective. Although Grameen's failure would likely condemn them, Grameen's success does not necessarily save them. One happy ending does not a microfinance movement make, and very few microlenders perform as well as Grameen. Still, microfinance as a whole may be worthwhile, and even if it is not currently worthwhile, it is improving and may in time become worthwhile. Grameen offers no answers, but it does offer hope; it did well, and so might microfinance in general.

Of course, Grameen's success cannot be simply exported. As Hulme (1990) cautions, Grameen is not a blueprint but rather a source of broad lessons which must be adapted to local contexts.

5.2.3 Spillovers

This paper assumes that spillover effects of microfinance on non-users—except as embodied in subsidies—are zero. In fact, microfinance's long-term worthwhileness will hinge on spillovers. Thus, the research agenda should include measuring spillovers.

In users' households, children experience both benefits (increased income) and costs (increased workloads at home as adults spend time in a microenterprise). In users' villages, existing businesses must compete with users' businesses, and displacement costs to non-users may partially off-set benefits of microfinance to users.

Worldwide, spillovers of subsidized microfinance have two effects. First, for-profit lenders may adopt innovations—such as joint-liability groups—pioneered by subsidized microlenders. Compared to donors and governments, private lenders may multiply access to microfinance (Rosenberg, 1994). Of course, not-for-profit lenders may also adopt microfinance innovations to reach poorer segments than for-profit lenders.

Second, the best (and worst) microlenders inspire (and thwart) development efforts and budget allocations far beyond their own borders. Grameen is cost-effective, but the microfinance movement that Grameen inspired may or may not turn out to be.

5.2.4 Market versus subsidy

Wide agreement about what microfinance should do—improve the poor's well-being—contrasts with wide disagreement about how to do it. Part of microfinance's

mystique is that it might be able to survive without subsidy. The central debate is whether microlenders should be expected to outgrow subsidies and enter the market.

The *subsidy approach* targets very poor clients who are costly to serve and who thus may require on-going subsidies. The *market approach* targets less-poor clients who are less costly to serve and who thus may represent a profitable niche. The debate's two poles can be simplistically characterized in terms of surplus, depth, breadth, length, and scope. The subsidy approach assumes that great depth and great per-user surplus can compensate for narrow breadth, short length, and limited scope. The market approach assumes that wide breadth, long length, and ample scope can compensate for shallow depth and low per-client surplus.

How does Grameen inform this debate? Unlike the stereotypical (and hypothetical) microlenders in the subsidy and market camps, Grameen is strong in all aspects. For example, the review above suggests that user surplus is high. Likewise, depth is great, as most users are poor, rural women. Grameen also has great length; subsidies probably will not be removed, but even if they are, Grameen is close enough to true profitability that it could make a few adjustments and continue. Breadth is great as well, and Grameen's loans and saving services provide ample scope.

Grameen reconciles the subsidy and market approaches because it is subsidized yet permanent and because it is (almost) profitable yet serves the very poor. How does it do this?

Grameen realized that efficiency was not incompatible with its social mission; helping the poor is no excuse for waste. Because Grameen wanted both to be efficient and to serve the poor, it worked to design (and redesign) incentive structures that rewarded—sometimes in a precarious balance—both these goals.[7] The result was that subsidies did not leak to employee perquisites but rather financed expansion and kept costs to users low. Grameen's unusual ability to do this appears to derive from its founder and his recognition that doing good is not easy.

Furthermore, Grameen used a low-cost lending method (joint-liability groups) implemented by low-cost, loyal workers.[8] Thus, Grameen could charge prices low enough to reach the poor yet high enough to approach profitability.

Most important, Grameen simply wanted to grow. Its employees could have had a quiet life with its subsidies and 10,000 (or 100,000) members. Instead, Grameen pushed to reach millions, even though this put more pressure on its employees.

In short, Grameen avoided the typical tragedy of development projects; the technical aspects are willing, but the implementing organization is weak. Grameen also avoided the for-profit flaw of ignoring the poor. In both cases, Grameen did this largely

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[7] "Grameen II", the latest reengineering project, is an example (Yunus, 2002).

[8] Employees are hired straight out of college, receive extensive training and constant on-going reinforcement of the importance of both mission and efficiency, and receive salaries on par with their likely alternatives in the civil service.

because it explicitly tried to. Institution building has no formula, aside from making it a conscious and continuous part of the strategic plan. The subsidy camp focuses on the poor rather than on the organization, while the market camp focuses on the organization rather than on the poor. Grameen's lesson is that trying to do both provides the best chance to achieve both.

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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: Subsidy 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	Subsidy	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	Subsidy/person-year of membership ($)	Fl/(Eo/1000)	NA	12.8	12.3	12.8	14.0	14.9	18.7	20.6	23.3	23.9	26.3	23.3	20.9	20.9	20.8	19.8
Fn	Subsidy/dollar-year of debt ($)	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

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.