

## **A Cost-Effectiveness Analysis of the Grameen Bank of Bangladesh**

*Mark Schreiner\**

*Reports of the success of the Grameen Bank of Bangladesh have led to rapid growth in funding for microfinance. But has the Grameen Bank been cost-effective? This article compares output with subsidy for the bank in a present-value framework. For the timeframe 1983-97, subsidy per person-year of membership in Grameen was about \$20, and subsidy per dollar-year borrowed was about \$0.22. Although the article does not measure consumer surplus for Grameen users, the evidence in the literature suggests that surplus probably exceeds subsidy. The Grameen Bank – if not necessarily other microlenders – was probably a worthwhile social investment.*

Microfinance – defined as efforts to improve poor people's access to loans and savings services – may be the fastest growing and most widely recognised anti-poverty tool. The 200 microfinance organisations 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% of payments due had been collected. In 1997, the average disbursement was \$170, equivalent to 60% of per-capita income. Unlike many development projects, the Grameen Bank has thrived, relieving some of the misery caused by floods and cyclones, corruption, purdah norms that constrain women, and abysmal poverty.

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

---

\* Senior Scholar, Center for Social Development, Washington University in St Louis, MO, USA. This article extends part of his doctoral dissertation. He is grateful for help from Asif Dowla, Leslie Enright, Claudio Gonzalez-Vega, Douglas Graham, Iftekhar Hossain, Mrinalini Lhila, Jonathan Morduch, Michael Sherraden, Jacob Yaron, and the Division of Asset Building and Community Development of the Ford Foundation.

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 the Grameen Bank – 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 the final section of this article) to measure benefits of the Grameen Bank 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 the Grameen Bank 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 article uses a present-value framework to compare the bank'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 the Grameen Bank in the timeframe 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 the 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 the Grameen Bank; other microlenders – and microfinance in general – may or may not be as cost-effective.

The next section outlines how the Grameen Bank works. The two following sections set up frameworks to measure subsidy and output in microfinance. The final section discusses implications for the Grameen Bank and for microfinance as a whole.

## **How the Grameen Bank 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.<sup>1</sup> 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 the Grameen Bank to make small loans to poor people without physical collateral. This section describes the design details behind the tale of success.

---

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

## 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 per week, learn to sign their names, and memorise a set of vows for self-improvement. Each group elects a chairperson, and each centre elects a chief. New members must also buy a share of stock in Grameen for \$2.

## Loans

Lenders seek to manage repayment risk; all borrowers promise to repay, but, whether by choice or due 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 jeopardise them.

The innovation of Grameen – and of microfinance in general – is to collateralise the asset of future access to loans. In this sense, microfinance in low-income countries works much like credit cards in high-income countries; borrowers repay because they want to preserve future access to loans.

Although the Grameen Bank did not invent the threat of termination as an incentive to fulfil contracts (Stiglitz and Weiss, 1983), it did popularise 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 of screening potential borrowers. Second, joint liability gives members an incentive to make sure that their fellows do not squander their loans. This can cut the cost of monitoring 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 of enforcing repayment.

On the downside, joint liability may lead to domino effects in which borrowers who would have repaid choose instead to default because they will 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 the Grameen Bank, 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 repaying before they know whether their comrades will default.

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, the Grameen Bank 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, it has made loans for college expenses and cell phones. It 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.

### *Forced savings*

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

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

The last two types of forced savings are real savings. Members must deposit 4 cents per week into 'personal savings'. Interest accrues at 8.5%, and withdrawals are unrestricted. In addition, 5% of each disbursement goes to the 'group fund'. Modelled on informal group funds (Ardener and Burman, 1995; Rutherford, 2000), it earns 8.5% and is nominally controlled by the centre and used for emergency loans to members. In practice, loan officers often control the fund and use it to insure the bank against default (Matin, 1997). Grameen also makes loans from the 'group fund' after floods. Members cannot withdraw from the 'group fund' until they leave the bank 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 savings services (Alamgir and Dowla, 2000). The Grameen Bank could probably 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 has recently taken some steps in this direction (Yunus, 2002).

### *Non-financial products*

The Grameen Bank 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 instil 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 the practice of 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 the Grameen Bank is *social intermediation* (Edgcomb and Barton, 1998), creating social capital as a by-product of meetings. In rural Bangladesh, social capital is scarce because purdah 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 their support networks are also strengthened (Larance, 2001).

## **A framework to measure social benefits**

What are the social benefits of the Grameen Bank's services? This section sets 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.

### *Six aspects of social benefits*

**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 the Grameen Bank does not contain any satisfactory measure of worth to users.

**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 the 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.

**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 the Grameen Bank.

Price costs are best estimated not as the nominal stated interest rate but rather as the real effective interest rate, defined as the annualised, 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%, the average in Bangladesh in 1988-97 (IMF, various years). 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% (14% in real terms) and 52 equal instalments 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’. Sixth, the borrower leaves the bank 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  $(52 \cdot 0.00711 - 0.05) / (1 + 0.05) = 30\%$ . Forced savings make real effective rates more than twice real stated rates.

The accounting treatment of forced savings also affects Grameen’s reported profit. The bank 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 the Grameen Bank 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 or high stated interest rates.

**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.

Subsidising Grameen is worthwhile – social benefits exceed social costs – if user surplus per output exceeds subsidy per output. This article measures subsidy per output and compares it to what can be learned from the literature about surplus per output.

People join the Grameen Bank 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 the surplus must be positive. Grameen's annual drop-out rate in 1986-94 was about 5% (Khandker et al., 1995). This suggests that most members had a positive surplus.

**Depth** Depth 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 the Grameen Bank. In practice, some new members exceed this (Matin, 1998). Still, most members are very poor by any standard.

**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 and centres in more than half the villages in Bangladesh, the Grameen Bank has extensive breadth.

**Length** Length 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, the Grameen Bank 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 (see next section). But Grameen does get subsidies, and it will continue to do so. Even if it lost its subsidies, it probably could adjust and survive long into the future.

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

The Grameen Bank has great scope in some ways and weak scope in others. It does offer savings 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.

### *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 the number of users served, length is the years of service, and scope is the 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 user surplus from contract  $s_t$  for client  $n_{st}$  in year  $t$ . The general social-welfare function  $W(\cdot)$  aggregates social value across users, services, and time:

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

Given a discount factor  $\delta$  and the assumption that  $W(\cdot)$  is additively separable across users, services, and time, social benefits  $b$  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 subsidy  $c$  (see next section) 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  $D_{tsn}(\cdot)$ . 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 difficult-to-measure social benefits  $b$  with simple-to-measure outputs  $\Omega$ :

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

Most analyses 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:

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

Define  $\bar{b} = b/\Omega$  as (unmeasured) social benefit per unit of output, and define  $\bar{c} = c/\Omega$  as (measured) subsidy per unit of output. Dividing the benefit-cost criterion  $b > c$  by  $\Omega$  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 policy-makers may feel confident enough to judge whether unmeasured average benefits exceed average subsidy.

### *Discounted output of the Grameen Bank, 1983-97*

The following section estimates subsidy  $c$ . This section estimates output  $\Omega$  in 1983-97.

The discount factor  $\delta = 1/(1+r)$  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% 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 the Grameen Bank, this article 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. The Grameen Bank, like most organisations, reports only year-end stocks ( $s_t$ ). Assuming linear change, the average discount-weighted stock is not  $\delta^{t-0.5} \cdot (s_t - s_{t-1})/2$  because the discount is a non-linear function of time. Schreiner (1997) shows that:

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

Given  $r = 0.10$  in 1983-97, the Grameen Bank produced 5.4 million discounted person-years of membership and 0.5 billion discounted dollar-years borrowed (lines Eo and En in Appendix Table 4). Is this a lot of output? It depends on the subsidies used to produce it.

### A framework to measure subsidy

This article measures subsidy as net discounted cash flows from public entities to the Grameen Bank, supposing that the bank 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 with subsidy per output.

For a publicly 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  $T$ :

$$\text{Subsidy} = c = E_0 + \sum_{t=1}^T \delta^t \cdot FF_t - \delta^T \cdot E_T. \tag{6}$$

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

### 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 which 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.

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

### *Financial statements*

The cash flows of the Grameen Bank come from its financial statements.<sup>2</sup> 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.

**The accounting treatment of grants** The Grameen Bank 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 (Appendix Tables 1, 2, and 3) count these so-called liabilities as part of equity grants  $EG_t$  (line Di in Table 3). Equity grants are the vast bulk of net worth.

The Grameen Bank also counts some grants as revenue ( $RG_t$ , line Bp in Appendix Table 1). 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.

**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 the Grameen Bank, few microlenders do this, so reported profit is inflated.

The Grameen Bank 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 article assumes (incorrectly) that discounts on expenses for the Grameen Bank are zero in all years (line Bu of Appendix Table 1).

---

2. The 1984-5, 1988-93, and 1996-7 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 December 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 December 1998. Conversion of flows assumes that flows take place constantly, even though only their sum is reported at year-end (Schreiner, 1997).

**Expenses for provisions for loan losses** Most banks recognise 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.

The Grameen Bank 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 article adjusts provisions so that the loan-loss reserve is always 5% of the gross loan portfolio (lines Cb and Cc of Appendix Table 2).<sup>3</sup> The adjustments include a write-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 1995-7.

### *Other adjustments*

**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 organisation 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 the Grameen Bank, the cost of private debt in a free market is unknown because the government sets the market rate and because Grameen's default risk is unknown. To estimate  $m$ , this article adjusts the prime rate for estimated risk.<sup>4</sup> On average in 1983-97, this nominal risk-adjusted rate was 17% per year.

Like most other microlenders, the Grameen Bank has public debt. In 1997, it paid 5% on average public debt of \$187 million; the discount was \$23 million (lines Fa-Fd of Appendix Table 5). The sum of discounts on public debt in 1983-97 was \$152 million.

---

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% of payments due. At the end of 1997, 'general' loans were 83% of the portfolio, and 'housing' loans were most of the remainder. Given that Grameen makes provisions at 5% of disbursements for 'housing' loans, provisions as a share of total disbursements should be  $(1-0.98) \cdot 0.83 + 0.05 \cdot 0.17$  about equal to 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 would be twice provisions as a share of disbursements, or 5%. 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% of outstanding balances is a reasonable estimate of proper provisions.

4. The algorithm comes from Benjamin (1994). It is assumed that the Grameen Bank would not replace public debt with deposits from members.

**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  $D_t \cdot (m_t - c_t)$ , and discounts on expenses  $DX_t$ :

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

True profit for the Grameen Bank 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 Appendix Table 5).

**Ownership of shares** Most microlenders are not-for-profits that do not sell shares or have formal owners. The Grameen Bank does have shareholders, both public (government) and private (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 public ( $PC_{\text{pubt}}$ ) or private ( $PC_{\text{prtt}}$ ). Public entities have a legal claim on a share  $\beta_t$  of equity, where  $\beta_t = PC_{\text{pubt}} / (PC_{\text{pubt}} + PC_{\text{prtt}})$ .

The government of Bangladesh bought the first issue of Grameen shares in 1983 (line Fi of Appendix Table 5). All subsequent sales have been to members. By 1997,  $\beta$  was 0.07, and equity was \$84 million. If the Grameen Bank 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%.

**Dividends and taxes** Unlike the Grameen Bank, some other top microlenders pay dividends, so the framework here includes this possibility. The article assumes that dividends  $Div_t$  are distributed throughout the year and that public entities get a share  $\beta_t$ .

Taxes are cash flows back to public entities. Until September 1996, the Grameen Bank was tax-exempt. In 1997, it made provisions for tax on reported profits at the standard corporate rate of 40%. Of course, taxes are one more reason for the Grameen Bank to ensure that reported profits are low.

### *Grameen's subsidy, 1983-97*

Subsidy is net discounted cash flows from public entities to the Grameen Bank. The first outflow is the share of equity at time 0 from public entities, or  $\delta^0 \cdot \beta_0 \cdot E_0 = \beta_0 \cdot E_0$ .

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

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

This accumulated annual flow is discounted by  $\delta_t^*$ .

At the end of the timeframe, public entities get an inflow of  $\beta_T \cdot E_T$ . Total subsidy is then discounted outflows minus discounted inflows:

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

Assuming  $E_0 = 0$ , the Grameen Bank's subsidy for 1983-97 was \$107 million (Line Fl in Appendix Table 5). To judge whether this is high or low requires a comparison with output.

## Cost-effectiveness and discussion

Was the Grameen Bank cost-effective? During the period 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 Appendix Table 5). This means that if members, on average in each year, had surplus of at least \$20, then the bank was a cost-effective social investment.

In terms of dollar-years borrowed, the Grameen Bank produced 0.5 billion discounted units, so the per-unit subsidy was about \$0.22 (line Fn of Appendix Table 5). These results are robust to the assumed social discount rate  $r$  and market interest rate  $m$  (Appendix Table 6).

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

### *Evidence of user surplus at the Grameen Bank*

This section briefly reviews the best papers from the extensive literature on the Grameen Bank'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.

**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 the Grameen Bank in 1986-94 of about 5%. Thus, the surplus was positive for most users.

**Empowerment** Several studies find that the Grameen Bank 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 them a chance to gather in public and to hear their first names spoken with respect.<sup>5</sup> 'These findings

---

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

suggest that the social implications of microcredit lending can be as powerful as the economic implications' (Larance, 2001: 16).

Latif (1994) and Schuler and Hashemi (1994) find that the Grameen Bank, while not supplying family-planning services, increases the use of contraception, perhaps because members vow to keep their families small. Nevertheless, these studies probably overstate the impact, as they do not control for non-random branch placement or 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.

**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%.

Pitt and Khandker (1998) use different data and controlled for unobserved heterogeneity at the individual, household, and village levels.<sup>6</sup> 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 the Grameen Bank 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 et al. (1998) find that the presence of a Grameen branch increases the average wage in a village by 14% and increases production per household by 50%. Unfortunately, this result could also be explained by non-random placement of branches (Sharma and Zeller, 1999; Ravallion and Wodon, 1997).

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

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

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.

**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

---

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

broad evidence, this article concludes that the Grameen Bank probably was cost-effective. Like all conclusions on cost-effectiveness, this is inevitably a subjective judgement. It is to be hoped that the logic and assumptions that support this conclusion are explicit and so will facilitate discussion and further refinements.

### ***Policy implications for microfinance***

**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.

**Grameen's cost-effectiveness and microfinance worldwide** What does the Grameen Bank'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 the Grameen Bank probably was cost-effective.

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

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

**Spillovers** This article 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 offset the benefits of microfinance to users.

Worldwide, spillovers of subsidised microfinance have two effects. First, for-profit lenders may adopt innovations – such as joint-liability groups – pioneered by subsidised microlenders. Compared with 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. The Grameen Bank is cost-effective, but the microfinance movement that it inspired may or may not turn out to be.

**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 the mystique of microfinance 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 ongoing 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 characterised 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 the Grameen Bank inform this debate? Unlike the stereotypical (and hypothetical) microlenders in the subsidy and market camps, the Grameen Bank 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. The Grameen Bank 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 savings services provide ample scope.

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

The Grameen Bank realised that efficiency was not incompatible with its social mission; helping the poor is no excuse for waste. Because it 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.<sup>7</sup> The result was that subsidies did not leak to employee perquisites but rather financed expansion and kept costs to users low. The Grameen Bank’s unusual ability to do this appears to derive from its founder and his recognition that doing good is not easy.

Furthermore, the bank used a low-cost lending method (joint-liability groups) implemented by low-cost, loyal workers.<sup>8</sup> Thus, it could charge prices low enough to reach the poor yet high enough to approach profitability.

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

In short, the Grameen Bank avoided the typical tragedy of development projects; the technical aspects are willing, but the implementing organisation is weak. It also avoided the for-profit flaw of ignoring the poor. In both cases, the bank did this largely because it explicitly tried to. Institution-building has no formula, aside from making it a

---

7. ‘Grameen II’, the latest re-engineering project, is an example (Yunus, 2002).

8. Employees are hired straight out of college, receive extensive training and constant ongoing reinforcement of the importance of both mission and efficiency, and are paid salaries on a par with their likely employment alternatives in the civil service.

conscious and continuous part of the strategic plan. The subsidy camp focuses on the poor rather than on the organisation, while the market camp focuses on the organisation rather than on the poor. The Grameen Bank's lesson is that trying to do both provides the best chance to achieve both.

## References

- Alamgir, D. and Dowla, A. (2000) 'From Microcredit to Microfinance: Evolution of Savings Products by MFIs in Bangladesh'. St Mary's City, MD: St Mary's College of Maryland (mimeo).
- Amin, R., Becker, S. and Bayes, A. (1998) 'NGO-Promoted Microcredit Programs and Women's Empowerment in Rural Bangladesh: Quantitative and Qualitative Evidence', *Journal of Developing Areas* 32 (2): 221-36.
- Ardener, S. and Burman, S. (1995) *Money-Go-Rounds: The Importance of Rotating Savings and Credit Associations For Women*. Oxford: Berg.
- Belli, P. (1996) *Handbook on Economic Analysis of Investment Operations*. Washington, DC: Operations Policy Department, World Bank.
- Benjamin, M. P. Jr. (1994) 'Credit Schemes For Microenterprises: Motivation, Design, and Viability'. PhD dissertation. Georgetown University, Washington, DC.
- Besley, T. and Coate, S. (1995) 'Group Lending, Repayment Incentives, and Social Collateral', *Journal of Development Economics* 46: 1-18.
- Conlin, M. (1999) 'Peer-group micro-lending programs in Canada and the United States', *Journal of Development Economics* 60: 249-69.
- Conning, J. (1998) 'Outreach, Sustainability and Leverage in Monitored and Peer-Monitored Lending', *Journal of Development Economics* 60: 51-77.
- Daley-Harris, S. (2002) *Pathways Out of Poverty: Innovations in Microfinance for the Poorest Families*. Bloomfield, CT: Kumarian Press.
- Dowla, A. U. (1998) 'Micro Leasing: The Grameen Bank Experience'. St Mary's City, MD: St Mary's College of Maryland (mimeo).
- Edgcomb, E. and Barton, L. (1998) 'Social Intermediation and Microfinance Programs: A Literature Review'. Washington, DC: Development Alternatives (available at [www.mip.org/pdfs/mbp/social.pdf](http://www.mip.org/pdfs/mbp/social.pdf)).
- Ghatak, M. and Guinnane, T. W. (1999) 'The Economics of Lending with Joint Liability: Theory and Practice', *Journal of Development Economics* 60: 195-228.
- Hashemi, S. M. (1997) 'Building Up Capacity for Banking with the Poor: The Grameen Bank of Bangladesh', in H. Schneider (ed.), *Microfinance for the Poor?*. Paris: OECD.
- Hashemi, S. M., Schuler, S. R. and Riley, A. P. (1996) 'Rural Credit Programs and Women's Empowerment in Bangladesh', *World Development* 24 (4): 635-53.
- Hossain, M. (1988) *Credit For Alleviation of Rural Poverty: The Grameen Bank in Bangladesh*. Research Report No. 65. Washington, DC: International Food Policy Research Institute.
- Hulme, D. (1990) 'Can the Grameen Bank be Replicated? Recent Experiments in Malaysia, Malawi, and Sri Lanka', *Development Policy Review* 8 (3): 287-300.
- Hulme, D. and Mosley, P. (1996) *Finance Against Poverty*. London: Routledge.
- International Monetary Fund (various years) *International Financial Statistics*. Washington, DC: IMF.

- Ito, S. (1998) 'The Grameen Bank and Peer Monitoring: A Sociological Perspective'. Brighton: University of Sussex (mimeo).
- Khandker, S. R., Samad, H. A. and Khan, Z. (1998) 'Income and Employment Effects of Micro-credit Programmes: Village-Level Evidence from Bangladesh', *Journal of Development Studies* 35 (2): 96-124.
- Khandker, S. R., Khalily, B. and Khan, Z. (1995) *Grameen Bank: Performance and Sustainability*. Discussion Paper No. 306. Washington, DC: World Bank.
- Larance, L. Y. (2001) 'Fostering Social Capital through NGO Design: Grameen Bank Membership in Bangladesh', *Journal of International Social Work* 44 (1): 7-18.
- Latif, M. A. (1994) 'Programme Impact on Current Contraception in Bangladesh', *Bangladesh Development Studies* 22 (1): 27-61.
- Matin, I. (1998) 'Mis-targeting by the Grameen Bank: A Possible Explanation', *IDS Bulletin* 29 (4): 51-8.
- Matin, I. (1997) 'Repayment Performance of Grameen Bank Borrowers: The "Unzipped" State', *Savings and Development* 22 (4): 451-72.
- McKernan, S.-M. (2002) 'The Impact of Micro-Credit Programs on Self-Employment Profits: Do Non-Credit Program Aspects Matter?', *Review of Economics and Statistics* 84 (1): 93-115.
- Microcredit Summit (1996) 'The Microcredit Summit Declaration and Plan of Action', *Journal of Developmental Entrepreneurship* 1 (2): 131-76.
- Morduch, J. (1999a) 'The Microfinance Promise', *Journal of Economic Literature* 37 (4): 1569-614.
- Morduch, J. (1999b) 'The Role of Subsidies in Microfinance: Evidence from the Grameen Bank', *Journal of Development Economics* 60: 22-48.
- Morduch, J. (1999c) 'The Grameen Bank: A Financial Reckoning'. Princeton, NJ: Princeton University (available at [www.wps.princeton.edu/~rpds/macarthur/downloads/gb5ana.pdf](http://www.wps.princeton.edu/~rpds/macarthur/downloads/gb5ana.pdf)) (mimeo).
- Morduch, J. (1998) 'Does Microfinance Really Help the Poor? New Evidence from Flagship Programs in Bangladesh'. Princeton, NJ: Princeton University (available at [www.wps.princeton.edu/~rpds/macarthur/downloads/avgimp~6.pdf](http://www.wps.princeton.edu/~rpds/macarthur/downloads/avgimp~6.pdf)) (mimeo).
- Nanda, P. (1999) 'Women's Participation in Rural Credit Programmes in Bangladesh and Their Demand for Formal Health Care: Is There a Positive Impact?', *Health Economics* 8: 415-28.
- Paxton, J. (1996) *A Worldwide Inventory of Microfinance Institutions*. Washington, DC: World Bank, Sustainable Banking with the Poor.
- Paxton, J., Graham, D. and Thraen, C. (2000) 'Modeling Group-loan Repayment Behavior: New Insights from Burkina Faso', *Economic Development and Cultural Change* 48 (3): 639-55.
- Pitt, M. M. (1999) 'Reply to Jonathan Morduch's "Does Microfinance Really Help the Poor? New Evidence from Flagship Programs in Bangladesh"'. Providence, RI: Brown University (available at <http://pssc3.pssc.brown.edu/%7Emp/reply.pdf>) (mimeo).
- Pitt, M. M., Khandker, S. R., Chowdhury, O. H. and Millimet, D. (2003) 'Credit Programs for the Poor and the Health Status of Children in Rural Bangladesh', *International Economic Review* 44 (1): 87-118.
- Pitt, M. M., Khandker, S. R., McKernan, S.-M. and Latif, M. A. (1999) 'Credit Programs for the Poor and Reproductive Behavior in Low-Income Countries: Are

- the Reported Causal Relationships the Result of Heterogeneity Bias?', *Demography* 36 (1): 1-21.
- Pitt, M. M. and Khandker, S. R. (1998) 'The Impact of Group-based Credit Programs on Poor Households in Bangladesh: Does the Gender of the Participants Matter?', *Journal of Political Economy*, 106 (5): 958-96.
- Quirk, J. and Terasawa, K. (1991) 'Choosing a Government Discount Rate: An Alternative Approach', *Journal of Environmental Economics and Management* 20: 16-28.
- Rahman, A. (1999) 'Micro-credit Initiatives for Equitable and Sustainable Development: Who Pays?', *World Development* 27 (1): 67-82.
- Ravallion, M. and Wodon, Q. (2000) 'Banking on the Poor? Branch Placement and Non-farm Rural Development in Bangladesh', *Review of Development Economics* 4 (2): 121-39.
- Rogaly, B. (1996) 'Micro-finance Evangelism, "Destitute Women", and the Hard Selling of a New Anti-poverty Formula', *Development in Practice* 6 (2): 100-12.
- Rogaly, B., Fisher, T. and Mayo, E. (1999) *Poverty, Social Exclusion, and Microfinance in Britain*. London: Oxfam.
- Rojas, M. and Rojas, L. A. (1997) 'Transaction Costs in Mexico's Preferential Credit', *Development Policy Review* 15 (1): 23-46.
- Rosenberg, R. (1994) 'Beyond Self-sufficiency: Licensed Leverage and Microfinance Strategy' (mimeo).
- Rutherford, S. (2000) *The Poor and Their Money*. Delhi: Oxford University Press.
- Rutherford, S. (1998) 'The Savings of the Poor: Improving Financial Services in Bangladesh', *Journal of International Development* 10 (1): 1-15.
- Schreiner, M. (2001) 'Seven Aspects of Loan Size', *Journal of Microfinance* 3 (2): 27-47.
- Schreiner, M. (1997) 'A Framework for the Analysis of the Performance and Sustainability of Subsidized Microfinance Organizations with Application to BancoSol of Bolivia and to the Grameen Bank of Bangladesh'. PhD dissertation. Columbus, OH: The Ohio State University (available at [www.microfinance.com/English/Papers/Dissertation\\_Complete.pdf](http://www.microfinance.com/English/Papers/Dissertation_Complete.pdf)) (mimeo).
- Schreiner, M. and Yaron, J. (2001) 'Development Finance Institutions: Measuring Their Subsidy'. Washington, DC: World Bank.
- Schuler, S. R., Hashemi, S. M. and Badal, S. H. (1998) 'Men's Violence Against Women in Bangladesh: Undermined or Exacerbated by Microcredit Programmes?', *Development in Practice* 8 (2): 148-57.
- Schuler, S. R. and Hashemi, S. M. (1994) 'Credit Programs, Women's Empowerment, and Contraceptive Use in Rural Bangladesh', *Studies in Family Planning* 25 (2): 65-76.
- Sharma, M. and Zeller, M. (1999) 'Placement and Outreach of Group-Based Credit Organizations: The Cases of ASA, BRAC and PROSHIKA in Bangladesh', *World Development* 27 (12), 2123-36.
- Stiglitz, J. E., and Weiss, A. (1983) 'Incentive Effects of Terminations: Applications to the Credit and Labor Markets', *American Economic Review* 73 (5): 912-27.
- Taub, R. P. (1998) 'Making the Adaptation Across Cultures and Societies: A Report on an Attempt to Clone the Grameen Bank in Southern Arkansas', *Journal of Developmental Entrepreneurship* 3 (1): 53-69.

- Thomas, J. J. (1995) 'Replicating the Grameen Bank – the Latin American Experience', *Small Enterprise Development* 6 (2): 16-6.
- US Office of Management and Budget (1972) *Discount Rates to be Used in Evaluating Time-distributed Costs and Benefits*. Circular No. A-94 (rev.), Washington, DC.
- Wall Street Journal* (1998) 'Microcredit Arrives in Africa, but Can It Match Asian Success?', 29 September, Section A, p.1.
- Yaron, J., Benjamin, M. and Piprek, G. (1997) *Rural Finance: Issues, Design, and Best Practices*. Washington, DC: World Bank.
- Yunus, M. (2002) 'Grameen Bank II: Designed to Open New Possibilities' (available at [www.gfusa.org/monthly/june/news.shtml](http://www.gfusa.org/monthly/june/news.shtml)).
- Yunus, M. (1998) 'Poverty Alleviation: Is Economics Any Help? Lessons from the Grameen Bank Experience', *Journal of International Affairs* 52 (1): 47-65.
- Zwingle, E. (1998) 'Women and Population', *National Geographic* 198 (4): 36-55.

**Appendix Table 1: Adjusted income statement of Grameen Bank, 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	0.4
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 \$.

**Appendix Table 2: Adjusted assets and liabilities of Grameen Bank, 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 \$.

**Appendix Table 3: Adjusted equity of Grameen Bank, 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	DI(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
DI	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 + DI+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 \$.

**Appendix Table 4: Discounted outputs of Grameen Bank, 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
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 (1000s)	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 (1000s)	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	In 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 (1000s)	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 \$.

**Appendix Table 5: Subsidy and cost-effectiveness of Grameen Bank, 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 debts (\$)	$Fl/En$	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

**Appendix Table 6: Sensitivity of average cost per person-year of membership**

r	m															
	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
<b>0.00</b>	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
<b>0.02</b>	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
<b>0.04</b>	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
<b>0.06</b>	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
<b>0.08</b>	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
<b>0.10</b>	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
<b>0.12</b>	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
<b>0.14</b>	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
<b>0.16</b>	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
<b>0.18</b>	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
<b>0.20</b>	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
<b>0.22</b>	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
<b>0.24</b>	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
<b>0.26</b>	7.5	8.3	9.9	11.5	13.1	14.7	16.3	17.9	19.5	21.0	22.7	24.3	25.8	27.5	29.1	30.7
<b>0.28</b>	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
<b>0.30</b>	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.