Working Papers

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Working Paper No. 99-2
1999

A subsequent version of this paper has been published as:
"The Subsidy Dependence Index and Recent Attempts to Adjust It"
Savings and Development, Vol. 23, No. 4, pp. 375-405

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August 1999

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ABSTRACT

The Subsidy Dependence Index (SDI) is the most common way to measure the importance of public support for Development Finance Institutions (DFIs). We present the SDI and show its equivalence to a subsidy-adjusted measure of return on equity. We then review recent attempts to adjust the SDI. As a whole, the recent measures are either meaningless or answer unimportant questions. Their use does not lead to a better understanding of the social cost of a DFI.

THE SUBSIDY DEPENDENCE INDEX
AND RECENT ATTEMPTS TO ADJUST IT

1. Introduction

For decades, governments and donors have tried to improve social welfare through public support for development finance institutions (DFIs). As with all projects that use public funds, subsidized DFIs are worthwhile in principle as long as their social benefits exceed their social costs. In practice, however, the measurement of social benefits is so complex and thus so expensive that policymakers cannot expect to gain from a full-blown social cost-benefit analysis each time that they must choose whether to spend public funds on support for a DFI or on other ways to help the poor such as improved health care or schools. A less-expensive alternative is a simple measure of social cost. We define *social cost* as the opportunity cost to society of the public funds used by a DFI less what the DFI could pay back to society and still break even in a given time frame. A DFI with no social cost is *subsidy independent*.

The Subsidy Dependence Index (SDI) (Yaron, 1992a and 1992b) measures the social cost of subsidized DFIs in short time frames such as a year. The SDI is useful since it puts a price tag on the development finance produced by a DFI. Government and donors should know this price since funds earmarked for development are scarce. Subsidies for DFIs are not bad unless they could improve social welfare more elsewhere. The measurement of cost is the first step in the wise use of public funds.

The measurement of performance as opportunity cost less profit was proposed long ago as a way to assess not-for-profit hospitals (Jennings, 1993; Wheeler and Clement, 1990; Silvers and Kauer, 1986; Pauly, 1986; Conrad, 1986 and 1984). For-profit firms also use the technique. “Lost in ever darker muddles of accounting” (Tully, 1993), these firms have turned more and more to measures based on opportunity costs. Shareholders know that return on equity (ROE) does not always give a full answer to their question of whether a firm is a good investment. Just as accounting profit and ROE do not tell owners whether a firm creates or destroys private wealth, these common measures do not tell society whether a DFI creates or destroys social welfare.

In this paper, we present the SDI and show its equivalence to a subsidy-adjusted measure of ROE. We then review three recent attempts to adjust the SDI: the Subsidy Dependence Ratio of Khandker, Khalily, and Khan (1995); the Profitability Gap of Sacay (1996); and the SDI of Hulme and Mosley (1996). We make explicit the questions answered by these measures. We argue that the new measures are not useful for the analysis of the performance of subsidized DFIs since the SDI gives a better answer to a more useful question.

2. The Subsidy Dependence Index

The SDI is the ratio of subsidy to revenue from lending (Yaron, 1992a and 1992b). In its focus on opportunity costs instead of prices paid, the SDI is like standard tools of project analysis that answer questions asked by society. Like all yardsticks, the SDI is only as good as its data and assumptions. It serves to carve benchmarks, to track trends, and to compare a DFI with peers. The SDI skips half the story—it measures costs but not benefits. It is much less expensive, however, to measure costs than to measure benefits. Knowledge of costs can improve the use of funds a lot even when benefits are unknown. Even if benefits were known, they would still have to be compared with costs.

The SDI is useful inasmuch as government and donors care about the counterfactual question that it answers. The SDI tells the percentage change in the yield on lending that, all else constant, would allow the DFI to compensate society for the use of public funds and still break even in a short time frame such as a year. The SDI quantifies the matching-grant element in loans from DFIs. It tells how much subsidy society gave the DFI for each dollar of revenue collected from borrowers.

The most common way for donors, governments, and DFIs to gauge performance is a two-pronged framework of social cost as subsidy and of social worth as outreach (Gonzalez-Vega, *et al.*, 1997; Khandker, 1996; Chaves and Gonzalez-Vega, 1996; Christen, *et al.*, 1995; Benjamin, 1994; Yaron, 1994 and 1992a). *Outreach* is the social worth of the output of a DFI in terms of six aspects—depth, worth to users, cost to users, breadth, length, and scope—in a standard framework for project analysis (Schreiner, 1998).

2.1 Subsidy in the SDI

We highlight the economic logic of the SDI by expressing it in terms of flows of subsidized funds.[1] We also show that the SDI does not depend on the specific form in which the DFI receives subsidized funds.

A DFI gets subsidies from the use of subsidized funds. *Subsidized funds* are public funds from government or donors and come in six forms (Table 1 on page 36). Three are *equity grants* that increase net worth but do not directly change the accounting profit reported in the year received. The other three are *profit grants* that do directly increase the accounting profit reported in the year received since they inflate revenues and/or deflate expenses. This increases retained earnings at year-end and thus increases net worth. Compared with the case without the grant, all six forms of subsidized funds increase net worth one-for-one. All six forms have the same social opportunity cost. As in Yaron (1992b), we ignore dividends and taxes on profits for simplicity.

[1] This section is based on Schreiner (1997).

2.1.1 Equity grants

The first two forms of subsidized funds are equity grants *EG*. These cash gifts increase net worth but do not change accounting profit directly. Equity grants are the sum of direct grants *DG* and paid-in capital *PC*:

$$\begin{aligned} \text{Equity grants} &= \text{Direct grants} + \text{Paid-in capital}, \\ \text{EG} &= \text{DG} + \text{PC}. \end{aligned} \tag{1}$$

Direct grants *DG* are cash gifts. Direct grants increase net worth, but they do not pass through the income statement, and hence they do not inflate accounting profit. Direct grants include both gifts in cash and gifts in kind such as computers or trucks that are recorded in the accounts.

Paid-in capital *PC* comes from sales of shares to donors or government. Such a sale is like a direct grant since public funds pay for the shares. Furthermore, most public entities do not act like private owners. We assume that all paid-in capital comes from public sources.

2.1.2 Profit grants

Profit grants *PG* are the third through fifth forms of subsidized funds (Table 1 on page 36). Like all equity grants, all forms of profit grants increase net worth since they inflate accounting profit or reduce accounting loss and wind up in net worth through retained earnings at the end of the year.

Profit grants distort accounting profit P and thus ROE since they depend on the arbitrary choices made in practice by administrators and accountants. Donors can and often do use profit grants to nudge accounting profit higher. In contrast, the SDI recognizes the economic fact that a dollar treated as a profit grant has the same effect on the business performance of a DFI as a dollar treated as an equity grant.

Profit grants are the sum of revenue grants RG, discounts on public debt $A \cdot (m - c)$, and discounts on expenses DX:

$$\begin{aligned} \text{Profit grants} &= \text{Rev. grants} + \text{Discount public debt} + \text{Discount on expenses}, \\ \text{PG} &= \text{RG} + \text{A} \cdot (\text{m} - \text{c}) + \text{DX}. \end{aligned} \tag{2}$$

Revenue grants RG are cash gifts. They are just like equity grants except for the accounting choice to record them as revenue rather than as direct injections to equity. Revenue grants increase net worth, but only after they pass through the income statement and increase reported accounting profit. This is misleading since revenue grants are not the product of business operations.

Discounts on public debt $A \cdot (m - c)$ and discounts on expenses DX are the fourth and fifth forms of subsidized funds. They are non-cash gifts, expenses paid on behalf of the DFI by someone else. Discounts increase the cash held by the DFI since they decrease the cash spent by the DFI.

The discount on public debt $A \cdot (m - c)$ is the opportunity cost of public debt less what the DFI paid, where A is average public debt, c is the rate paid by the DFI, and

m is the opportunity cost of public debt for society:

$$
\begin{aligned}
\text{Discount public debt} &= \text{Ave. public debt} \cdot (\text{Opp. cost public debt} - \text{Rate paid}), \\
&= \left(\frac{A_{start} + A_{end}}{2} \right) \cdot \left[m - \frac{\text{Expense interest for public debt}}{\left(\frac{A_{start} + A_{end}}{2} \right)} \right], \\
&= A \cdot (m - c).
\end{aligned} \tag{3}
$$

Discounts on public debt are subsidized funds that inflate profit and boost net worth since they cut expenses. Public debt is like private debt linked to a grant of $A \cdot (m - c)$ (Inter-American Development Bank, 1994). Unlike the discount on public debt $A \cdot (m - c)$, public debt A itself does not increase net worth directly.

Discounts on expenses DX are costs absorbed by government or donors that the DFI does not record as expenses. Classic examples are technical assistance, free deposit insurance, coverage of organization costs or feasibility studies, debt guarantees, consultant services, classes for loan officers, and travel for employees.

2.1.3 True profit

True profit TP, a non-cash equity grant, is the sixth form of subsidized funds (Table 1 on page 36). It is accounting profit P less profit grants (equation 2 on page 6):

$$
\begin{aligned}
\text{True profit} &= \text{Accounting profit} - \text{Profit grants}, \\
TP &= P - [RG + A \cdot (m - c) + DX].
\end{aligned} \tag{4}
$$

All else constant, true profit is the change in retained earnings that would obtain in the absence of profit grants. Positive true profits are a benefit since society could withdraw them for use elsewhere. Negative true profits (true losses) are social costs.

2.1.4 The formula of the SDI

Yaron (1992a) defines the SDI as the ratio of subsidy S to revenue from lending $LP \cdot i$, where LP is the average loan portfolio and i is the yield on lending:

$$\text{SDI} = \frac{\text{Subsidy}}{\text{Revenue from lending}} = \frac{S}{LP \cdot i}. \tag{5}$$

The SDI is the percentage change in the yield on lending (or, equivalently, in revenue from lending) that, all else constant, would make subsidy zero. For example, an SDI of 1.00 means that an increase in the yield of 100 percent would wipe out subsidy and make the SDI zero. A negative SDI means that the DFI could compensate society for its opportunity cost and still break even. It also means that a subsidy-adjusted ROE would exceed the social opportunity cost.

Yaron (1992a) defines the numerator of the SDI as subsidy *S*:

$$S = m \cdot E + A \cdot (m - c) + K - P, \tag{6}$$

where

S = Subsidy,
m = Opportunity cost of society,
E = Average equity,
A = Average public debt,
c = Rate paid for public debt,
K = Revenue grants and discounts on expenses, and
P = Accounting profit.

K is the sum of revenue grants and discounts on expenses:

$$K = RG + DX. \tag{7}$$

This explicit definition of *K* is useful since two recent proposed adjustments to the SDI omit *K* from subsidy. Given *K*, subsidy *S* (equation 6 on page 8) can be seen as the sum of the opportunity cost of the net worth of a DFI and of profit grants, less the accounting profit available to compensate for this cost and still break even:

$$S = m \cdot E + A \cdot (m - c) + RG + DX - P. \tag{8}$$

It is common practice to measure average stocks as half the sum of the start and end stocks. In this case, average equity *E* is:

$$E = \frac{E_0 + E_1}{2} = \frac{E_0 + E_0 + \Delta E}{2} = E_0 + \frac{\Delta E}{2}. \tag{9}$$

Change in equity ΔE is the sum of the flows of the six forms of subsidized funds:

$$\begin{aligned} \Delta E &= \text{Equity grants} + \text{Profit grants}, \\ &= DG + PC + RG + A\cdot(m-c) + DX + TP. \end{aligned} \tag{10}$$

To show the economic logic of the SDI, we rewrite subsidy S (equation 6 on page 8) using true profit (equation 4 on page 7), K (equation 7 on page 9), average equity E (equation 9 on page 9), and the change in equity ΔE (equation 10 on page 9):

$$\begin{aligned} S &= m\cdot E + A\cdot(m-c) + K - P, \\ &= m\cdot[E_0 + (1/2)\cdot(DG + PC + RG + A\cdot(m-c) + DX + TP)] \\ &\quad + RG + A\cdot(m-c) + DX - [TP + RG + A\cdot(m-c) + DX], \\ &= m\cdot E_0 + (m/2)\cdot[DG + PC + RG + A\cdot(m-c) + DX + TP] - TP. \end{aligned} \tag{11}$$

This formula shows the logic of the SDI in three terms. The first term, $m\cdot E_0$, is the opportunity cost of subsidized funds used through the whole reported period. The second term, $(m/2)\cdot[DG+PC+RG+A\cdot(m-c)+DX+TP]$, is the opportunity cost of fresh subsidized funds received in the course of a period. The third term, TP, is the true profit earned by the DFI that could be used to compensate its owner—society—for the use of its funds. Subsidy S is then unpaid cost less the ability to pay.

This formula also shows that the SDI does not depend on the form of subsidized funds. All forms from past years in E_0 cost m, and all forms of fresh funds cost $(m/2)$. An adjustment for subsidy due to exemption from reserve requirements is described in Benjamin (1994) and Yaron (1992b).

2.2 The SDI as a subsidy-adjusted ROE

The SDI is equivalent to a subsidy-adjusted ROE (SAROE) since the SDI is negative if and only if an SAROE exceeds the social opportunity cost. The equivalence is useful since ROE is the most common measure of the financial performance of a private firm. Without tax, ROE compares accounting profit with average equity:

$$\text{ROE} = \frac{\text{Accounting profit}}{\text{Average Equity}} = \frac{\text{P}}{\text{E}}. \tag{12}$$

ROE uses accounting profits, and accounting profits depend on whether a gift is treated as an equity grant or as a profit grant. A subsidy-adjusted ROE would compare not accounting profit P but rather true profit TP with average equity E:

$$\text{SAROE} = \frac{\text{True profit}}{\text{Average Equity}} = \frac{\text{TP}}{\text{E}}. \tag{13}$$

A subsidy-adjusted measure of return on assets (SAROA) would replace equity with assets in the denominator. To prove that a negative SDI implies an SAROE higher than the social opportunity cost m and vice versa, we show first that subsidy is the opportunity cost of equity less the true profit available to pay that opportunity cost. This uses the detailed formula for subsidy (equation 11 on page 9) and the formula for the change in equity (equation 10 on page 9):

$$\begin{aligned} S &= m \cdot E_0 + (m/2) \cdot [DG + PC + RG + A \cdot (m - c) + DX + TP] - TP, \\ &= m \cdot E_0 + m \cdot (1/2) \cdot \Delta E - TP, \\ &= m \cdot [E_0 + (1/2) \cdot \Delta E] - TP, \\ &= m \cdot E - TP. \end{aligned} \tag{14}$$

We can now show that a negative SDI implies an SAROE above the social opportunity cost:

$$S \leq 0 \Leftrightarrow m \cdot E - TP \leq 0 \Leftrightarrow m \cdot E \leq TP \Leftrightarrow m \leq \frac{TP}{E}. \tag{15}$$

The SDI answers the same question as an SAROE. The SAROE is useful to compare subsidized DFIs with peers. It is the standard way to benchmark the performance of banks (Christen, 1997).

2.3 A numerical example

In this section, we use the formulas presented above to compute the SDI and an SAROE for a mythical DFI.[2]

2.3.1 Example financial statements

In the balance sheet of the first year of the example DFI (Table 2 on page 37), most assets were loans (lines Ad and Ag). Investments and fixed assets were modest. Cash was 20 percent of assets. Half of liabilities were public debts, and half were

[2] This section is based on Schreiner and Yaron (1998).

deposits and private debt (lines Ah, Ai, and Aj). While public entities owned some shares (line Al), most net worth came from direct grants (line Am). The example DFI was highly subsidized.

The first-year income statement (Table 3 on page 38) shows that the DFI paid 25 in interest for its liabilities (line Bg), spent 600 in operating costs (line Bj), and did not provide for loan losses (line Bi). Revenues from lending and investments were 420+5=425 (lines Ba, Bb, and Bc). Operating revenue less operating costs and financial costs produced an operating margin of 425−(25+600)=-200 (line Bk). This would have been more negative in the absence of the discount on expenses of 100 (line Bn). As it was, this and a revenue grant of 400 (line Bl) let the example DFI boast an accounting profit of 200 (line Bm).

If the gifts from discounts on expenses and revenue grants of 100+400=500 had been called equity grants, then accounting profit would have been negative. Thus measures that use accounting profit would hide the true performance of this subsidized DFI. The accounting treatment of a gift does not change business performance and thus should not change measures of business performance.

2.3.2 Rates of interest from the financial statements

Rates of interest are ratios of flows of revenues and expenses from the income statement to average stocks from the balance sheet. The yield on lending *i* for the example DFI in Year 01 is (420)/[(0+2,100)/2]=0.40 (line Cv of Table 4 of page 39).

The interest rate paid on public debt was (10)/[(0+400)/2]=0.05 (line Cj). Given an opportunity cost to society *m* of 10 percent per year (line Ck), the DFI would pay (0.10)·[(0+400)/2]=20 for equivalent private debt. The discount on public debt is the opportunity cost less what the DFI paid, 20-10=10 (line Cl). The interest rate paid on deposits was (5)/[(0+200)/2]=0.05, and the interest rate paid on private debt was (10)/[(0+200)/2]=0.10. The yield earned on investments *j* was (5)/[(0+200)/2]=0.05.

2.3.3 The SDI of the example DFI in Year 01

The SDI of the example DFI for Year 01 was 1.00 (line Cx of Table 4 on page 39). All else constant, an increase of 100 percent in the yield on lending would let the DFI break even and still pay for the social cost of its funds.

The subsidy on equity is 1,100·0.10=110 (line Ce), the product of average equity *E* of [(0+0+0)+(300+1,700+200)]/2=1,100 (line Cc) and opportunity cost of society *m* of 10 percent (line Cd). The discount on public debt (line Cl) is [(0+400)/2]·(0.10-0.05)=10. This is the product of average public debt *A* (line Ch) and the opportunity cost of society *m* (line Ck) less the rate paid *c* (line Cj). *K* (equation 7 on page 9) is 400+100=500 (line Co), the sum of revenue grants *RG* (line Cm) and discounts on expenses *DX* (line Cn). Accounting profit *P* is 200 (line Cp). Finally, revenue from lending *LP·i* is [(0+2,100)/2]·0.40=420 (line Cw), the product of the average loan portfolio *LP* (line Ct) and the yield on lending *i* (line Cv).

Thus the SDI for Year 01 is (equation 5 on page 8):

$$\begin{aligned} SDI_{01} &= \frac{S}{LP \cdot i} = \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i}, \\ &= \frac{0.10 \cdot 1{,}100 + 200 \cdot (0.10 - 0.05) + 500 - 200}{1{,}050 \cdot 0.40}, \\ &= (110 + 10 + 500 - 200) / 420, \\ &= 420 / 420 = 1.00. \end{aligned} \tag{16}$$

2.3.4 The meaning of the SDI in Year 01

All else constant, the SDI for Year 01 of 1.00 means that the DFI could compensate society for the opportunity cost of the use of its funds and still break even if revenue from lending increased by 100 percent. If the size of the loan portfolio is unchanged, then this would require doubling the yield. In general,

$$\begin{aligned} \text{Subsidy-free yield} &= \text{Actual yield} \cdot (1 + \text{SDI}), \\ &= \text{Actual yield} + \text{Change in yield}. \end{aligned} \tag{17}$$

The SDI is a relative measure of the change in the actual yield that would compensate for subsidies. The actual yield varies through time and across DFIs. Also, nominal yields vary with inflation. Good analysis will thus consider the absolute level of subsidy S, the SDI, the actual yield i, the change in the yield $i \cdot \text{SDI}$, and the subsidy-free yield $i \cdot (1+\text{SDI})$ in real and nominal terms. In this example, the subsidy S is 420, the SDI is 1.00, and the actual yield is 0.40 (line Cy). The change is $0.40 \cdot 1.00 = 0.40$ (line Cz), and the nominal subsidy-free yield is $0.40 + 0.40 = 0.80$ (line Caa). With inflation of 10 percent (line Cbb), the real subsidy-free yield was 64 percent (line Ccc).

2.3.5 The SAROE in Year 01

Accounting profit P was 200 (line Da of Table 5 on page 40), but true profit TP—after deducting revenue grants RG of 400, discounts on public debt $A\cdot(m-c)$ of 10, and discounts on expenses DX of 100—was -310 (line De). Average equity E was 1,100 (line Dh). The SAROE was thus -310/1,100≐-0.28 (line Do). All else constant, this means that the DFI would have consumed about 28 percent of its average net worth had it compensated society for the opportunity cost of the use of public funds. The negative (and meaningful) SAROE stands in stark contrast to the positive (yet meaningless) ROE (line Dn).

2.4 Strengths and limits of the SDI

The SDI has at least nine strengths. First, the SDI quantifies subsidy and shows the extent of subsidy dependence. Often donors and governments do not know just how much DFIs cost society. They need this knowledge to compare DFIs with other uses of public funds. Second, the SDI compares subsidy with revenue from lending. This ratio can be seen as a matching grant, the amount of subsidy S awarded to the DFI by society for each dollar of interest $LP\cdot i$ paid by borrowers. Third, the SDI can track subsidy dependence through time. A DFI may improve whether or not it can declare complete subsidy independence. Fourth, a negative SDI implies an SAROE higher than the opportunity cost of society. Fifth, the SDI shifts the paradigm from prices paid to opportunity costs since prices paid are often distorted by subsidies. Sixth, the SDI highlights the possibility of covering costs with revenue from lending. Seventh, although the SDI does not measure benefits, which is expensive, it does measure costs, which is much less expensive. Eighth, the SDI is simple and well-known. Its use can induce a disciplined approach to the judgement of the social costs of public support for DFIs. Since the data needed should be easy to extract, the SDI can also help to detect weaknesses in accounting systems. Ninth, the SDI can help in the analysis of the sources and uses of subsidy (Yaron, 1992b, p. 24).

The SDI also has at least two limitations. Analysts should know them so that they use the SDI only to answer the question that the SDI addresses. The SDI answers an important question, but it does not claim to answer all important questions.

First, the SDI does not discount flows of funds. In short time frames, this is not a material issue. In long time frames, however, measures of social cost must be based explicitly on a framework that discounts flows of funds (Schreiner, 1997). Like private investors who buy shares in firms, government and donors must judge DFIs not only in their first year, in their most recent year, or in the next year, but also through their whole lifetimes and into the future.

Second, the SDI measures subsidy independence but not private profitability. *Subsidy independence* means that a DFI could pay society for the opportunity cost of its funds and still break even in a period. In contrast, *privately profitable* means that a DFI could maintain its real size even if it had to replace all public funds with funds from the market (Schreiner, 1997). The two concepts are not necessarily the same since the opportunity cost of funds for society may differ from the market price of funds for a DFI without public support.

3. Recent proposed changes to the SDI

The importance of a measure of the social cost of DFIs has prompted several attempts to refine the SDI or to use other standards to judge performance. In this section, we critique three recent proposals. They fix what is not broken, or they tweak the SDI to answer unimportant questions.

3.1 The Subsidy Dependence Ratio of Khandker

In several papers about the performance of DFIs in Bangladesh, Khandker proposes the Subsidy Dependence Ratio (SDR) as an alternative to the SDI (Khandker and Khalily, 1996; Khandker, Khalily, and Khan [KK&K], 1995; Khandker, Khan, and Khalily, 1995). Measures similar to the SDR have been proposed by Holtmann and Mommartz (1996), SEEP (1995), and the Inter-American Development Bank (1994).

The main concern of these authors is that the SDI compares subsidy only with revenue from lending even though DFIs also get revenue from investments in non-loan assets such as treasury bills. In principle, a DFI could decrease its subsidy dependence through increased revenues either from loans or from investments.

Thus the SDR suggests that subsidy be compared with revenue both from loans and from investments. Fixing the fact that the SDR of KK&K omits *K*, if *j* is the yield on investments and if *I* is the average investment, then the SDR is:

$$\text{SDR} = \frac{S}{LP \cdot i + I \cdot j}. \qquad (18)$$

Both the SDR and the SDI have subsidy *S* in the numerator. Like the SDI, the SDR is negative if and only if an SAROE exceeds the social opportunity cost. Thus the SDR and the SDI do not differ in their most important aspect, the measurement of subsidy. They do differ, however, in what they compare with subsidy.

3.1.1 What question does the SDR answer?

The SDR answers the question: How much more revenue from loans and investments would be needed to reach subsidy independence? The meta-question is whether this a useful question.

The SDR does not answer a useful question. While most DFIs have some degree of local monopoly and thus some freedom to set the price of their loans, all DFIs are price-takers in the investment market. If a DFI could get a higher return on investments without more risk, then presumably it would have already done so. Furthermore, the mission of a DFI is not to invest in non-loan assets but rather to lend to a target group.

In general, a DFI can decrease social cost via any increased revenue or decreased expense, so it is indeed useful to compare subsidy not just with revenue from loans but also with other items of revenue and expense. But the biggest, most malleable item is revenue from lending, and lending is the prime purpose of a DFI. All DFIs do invest in order to maintain some liquidity cushion to be prepared to meet demand from clients for loans and withdrawals of deposits, but investment is not the main line of business of a DFI.

The numerator of both the SDR and the SDI is subsidy *S*. The denominator of the SDI is revenue from lending, while the denominator of the SDR is revenue both from lending and from investment. Thus, the SDR is always less than or equal to the SDI. In almost all cases, the need to maintain some liquidity means that investments are non-zero, and so the SDR makes a DFI look less subsidy-dependent than the SDI. If investments are large compared with loans—as is the case in some years for some of the DFIs studied by Khandker *et al.*—then the SDR is a lot less than the SDI. This misleads since the DFI cannot increase the return on its investments at will and since a DFI lives to lend.

For example, the SDR gives an unfair assessment of Grameen Bank, probably the best-known DFI in the world (Yaron, Benjamin, and Piprek, 1997, p. 146):

> [The SDR] results in an understatement of Grameen's dependence on subsidies, particularly during its initial years of operation, when a larger share of its financial resources was invested in the capital market. The measure therefore also underestimates the subsequent progress Grameen made in reducing its dependence on subsidies as the share of funds invested in the capital market declined relative to the share of funds loaned to clients. Following [the logic of the SDR], a microfinance institution could appear increasingly independent of subsidies simply by reducing its loans outstanding.

3.1.2 How is the SDR motivated?

KK&K justify the SDR as follows (1995, p. 46):

> As part of a prudent risk-reducing policy, a financial institution may diversify its financial resources to maximize expected return and profit. This needs to be taken into account while calculating the SDI. Otherwise, even if everything else remains the same, a portfolio mix can yield a higher profit for a program that diversifies resources compared to a program that only lends, and consequently, [the] SDI differs by program.

While it is true that more loans may mean more losses if the rush to lend more leads to more default, the claim of KK&K is specious on three counts. First, the fact that the SDI differs across DFIs is not a weakness but a strength. A measure that did not differ would be useless. Second, the SDI does indeed account for the diversification of assets since subsidy *S* in the numerator includes profit and thus, by definition, all revenues from all sources, including revenue from investments. Third, if the denominator should include revenue both from lending and from investment, then the same logic would dictate that it also include all other types of revenues and expenses, that is, profit. Low profits would render the SDR very high, and negative profits would render it meaningless.

KK&K also offer a second motivation of the SDR (1995, p. 47):

> To the extent that a program always minimizes its income risk through portfolio diversification, the SDR appears more consistent than the SDI with such a practice, and consequently is subject to less variation over time and across programs.

We debunk this claim on two counts. First, few DFIs minimize income risk. Indeed, KK&K say that DFIs “maximize expected return and profit” (p. 46), which would require anything but to minimize risk. Second, variation in how funds are split between investment and lending over time and across programs has the same effect on the numerator of both the SDR and the SDI. The fact that the denominator of the SDR is always greater than or equal to the denominator of the SDI means that the SDR will be less than or equal than the SDI. While this does indeed imply that the SDR has less variation than the SDI, the reduced sensitivity also means that the SDR is less useful as a tool to assess performance since it dampens differences.

Finally, KK&K claim that the SDI prescribes higher yields on lending as the only way to reduce subsidy dependence. This is simply not true (Yaron, 1992a and 1992b). Increased yields on lending may indeed often be the easiest, quickest, and most practical way to decrease subsidy dependence, but a strong DFI that pursues efficiency will also use economies of scale through growth, high recuperation, decreases in operating costs, and increases in deposit mobilization. For the example DFI and for the sample of DFIs in Benjamin (1994), subsidy independence resulted not so much from increased interest rates as from improved efficiency with age and growth.

3.1.3 What is the SDR for the example DFI?

The SDR has the same numerator as the SDI but a bigger denominator:

$$
\begin{aligned}
SDR_{01} &= \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i + I \cdot j}, \\
&= \frac{0.10 \cdot 1{,}100 + 200 \cdot (0.10 - 0.05) + 500 - 200}{1{,}050 \cdot 0.40 + 100 \cdot 0.05}, \qquad (19) \\
&= 420 / 425 \doteq 0.988.
\end{aligned}
$$

The SDI was 420/420=1.00 (line Cx of Table 4 on page 39), so the SDR is less than the SDI. The SDI says that the example DFI could be subsidy-independent if the yield on lending increased by 100 percent. In contrast, the SDR says that the example DFI could be subsidy-independent if the yields both on lending and on investment increased by 99 percent. Most DFIs are price makers for their loans and price takers for their investments. Thus a DFI could probably increase the yield on lending but not the yield on investments.

To see how the SDR misleads, suppose that the example DFI got an extra direct grant *DG* of 1,000 at the start of Year 01 and invested all of it at a yield *j* of 5 percent. We make the strong assumption that the new direct grant does not increase expenses. Accounting profits grow by 1,000·0.05=50. Average equity grows by 1,025, the 1,000 granted at the start of the year plus half of 50, the extra profit from the investment in the course of the year. The DFI used more public funds but did not produce any more development finance. The SDI increases by 0.13, from 1.00 to 1.13:

$$\begin{aligned} SDI'_{01} &= \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i}, \\ &= \frac{0.10 \cdot (1{,}100 + 1{,}025) + 200 \cdot (0.10 - 0.05) + 500 - (200 + 50)}{1{,}050 \cdot 0.40}, \\ &= 472.5 / 420 \doteq 1.13. \end{aligned} \tag{20}$$

The SDR, in contrast, increases just 0.007, from 0.988 to 0.995:

$$\begin{aligned} SDR'_{01} &= \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i + I \cdot j}, \\ &= \frac{0.10 \cdot (1{,}100 + 1{,}025) + 200 \cdot (0.10 - 0.05) + 500 - (200 + 50)}{1{,}050 \cdot 0.40 + (100 + 1{,}000) \cdot 0.05}, \\ &= 472.5 / 475 \doteq 0.995. \end{aligned} \tag{21}$$

Social cost increased from 420 to 472.5, and the DFI produced the same amount of development finance. How has the performance of the DFI changed? The SDI suggests that performance worsened a lot. In contrast, the SDR suggests that performance barely changed.

If $(m-j)/j$ is less than the SDR, then investments of extra direct grants will decrease the SDR even though subsidy dependence increases. In the example above, $m=0.10$, $j=0.05$, so the investment of extra direct grants increased the SDR slightly since $(0.10-0.05)/0.05 = 1 > SDR \doteq 0.988$. But it is not uncommon to find $(m-j)/j <$ SDR. For example, if the return on investments j increased from 0.05 to 0.06, then $(0.10-0.06)/0.06 \doteq 0.667 < SDR \doteq 0.988$. An investment of extra direct grants still causes the SDI to increase, from 1.00 to 1.10:

$$
\begin{aligned}
SDI^{//}_{01} &= \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i}, \\
&= \frac{0.10 \cdot (1{,}100 + 1{,}030) + 200 \cdot (0.10 - 0.05) + 500 - (200 + 60)}{1{,}050 \cdot 0.40}, \\
&= 463 / 420 \doteq 1.10.
\end{aligned} \tag{22}
$$

The SDR, however, *decreases*, from 0.988 to 0.953:

$$
\begin{aligned}
SDR^{//}_{01} &= \frac{m \cdot E + A \cdot (m - c) + K - P}{LP \cdot i + I \cdot j}, \\
&= \frac{0.10 \cdot (1{,}100 + 1{,}030) + 200 \cdot (0.10 - 0.05) + 500 - (200 + 60)}{1{,}050 \cdot 0.40 + (100 + 1{,}000) \cdot 0.06}, \\
&= 463 / 486 \doteq 0.953.
\end{aligned} \tag{23}
$$

The investment of extra subsidized funds increased social cost from 420 to 463. The SDI increased to reflect this, but the SDR, in stark contrast, decreased. The SDR claims that subsidy dependence decreased even though more public resources were used to produce the same number of loans and the same value of loans outstanding with the target group. Hence the SDR misleads and should not be used to measure of subsidy dependence.

3.2 The Profitability Gap of Sacay

Four concerns prompted Sacay (1996) to propose the Profitability Gap (PG) as an alternative to the SDI. First, Sacay wanted to compare subsidy with the equity of the DFI. Second, Sacay wanted to account for the subsidies implicit when a government allows a DFI to fall below minimum legal standards for capital adequacy. Third, Sacay said that the SDI is insensitive to the rate paid on public debt c. Fourth, Sacay said that the SDI assumes that subsidy can be decreased only by increases in the yield on lending.

These concerns are unfounded (Belli, 1996). First, the SDI is already equivalent to an SAROE. Second, most DFIs meet legal capital requirements. For those DFIs that do not, the PG proposed by Sacay counts some subsidies twice. Third, both the SDI and the PG are sensitive to c. Fourth, the SDI does not claim that the only way to remove subsidy is to increase the yield on lending.

3.2.1 What question does the PG answer?

The PG answers the question: How far from a target SAROE is a DFI that gets subsidies from an exemption from legal capital standards? The meta-question is whether this a useful question.

Given a target SAROE of m, which for Sacay may or may not be an opportunity cost from any point of view, the PG is:

$$PG = m - \frac{P - A \cdot (m - c) - \max(0, E^{\min} - E)}{E + \max(0, E^{\min} - E)}, \tag{24}$$

where $E^{\min}$ is the minimum equity required by law and

$$\max(0, E^{\min} - E) = \begin{cases} 0 & \text{if } 0 \geq E^{\min} - E, \\ E^{\min} - E & \text{if } E^{\min} - E > 0. \end{cases}$$

Sacay calls max(0, $E^{\min}-E$) the *capital deficiency*. If capital exceeds the legal minimum, then the legal capital deficiency is zero. Otherwise, the deficiency is the legal minimum less actual equity.

With no capital deficiency, $E^{\min}-E \leq 0$ and so max(0, $E^{\min}-E$)=0. The PG is then:

$$\begin{aligned} PG_{\text{No deficiency}} &= m - \frac{P - A \cdot (m - c) - 0}{E + 0}, \\ &= \frac{E \cdot m + A \cdot (m - c) - P}{E}. \end{aligned} \tag{25}$$

The numerator of the PG with no capital deficiency, except for the lack of K, is the same as subsidy S in the SDI formula. Without K, donors could force the PG as low as they like with profit grants (Schreiner and Yaron, 1998). We adjust the PG to prevent this:

$$PG'_{\text{No deficiency}} = \frac{E \cdot m + A \cdot (m - c) + K - P}{E} = \frac{S}{E}. \tag{26}$$

With no capital deficiency, the PG compares subsidy *S* with equity rather than with revenue from lending. Just like the SDI, the PG is negative if and only if a subsidy-adjusted ROE exceeds the opportunity cost *m*:

$$\text{PG} \leq 0 \Leftrightarrow \frac{m \cdot E - TP}{E} \leq 0 \Leftrightarrow m \cdot E - TP \leq 0 \Leftrightarrow m \cdot E \leq TP \Leftrightarrow m \leq \frac{TP}{E}. \qquad (27)$$

For a DFI with a capital deficiency, the PG proposed by Sacay is:

$$\begin{aligned} \text{PG}^{/}_{\text{Deficiency Sacay}} &= m - \frac{P - A \cdot (m - c) - K - (E^{min} - E)}{E + (E^{min} - E)}, \\ &= \frac{E^{min} \cdot m + A \cdot (m - c) + K - [P - (E^{min} - E)]}{E^{min}}. \end{aligned} \qquad (28)$$

The PG proposed by Sacay would adjust capital up to its legal minimum, taking the needed capital from profit. This profit is then not available to compensate for subsidies. While it does make sense to charge an opportunity cost *m* against the full minimum capital requirement E^{min}, it does not make sense to take $E^{min}-E$ from profit *P*. In effect, the PG proposed by Sacay imputes a social cost of $1+m$ for each dollar of capital deficiency. Sacay suggests that society somehow loses more than a dollar when a DFI uses a dollar of public funds for a period. In fact, all forms of subsidized funds have an opportunity cost of *m*, even those subsidized funds from exemption from minimum-capital requirements. Thus the correct PG with capital deficiency should just replace E with E^{min}:

$$PG^{/}_{deficiency} = \frac{E^{min} \cdot m + A \cdot (m - c) + K - P}{E^{min}}. \tag{29}$$

None of the six example DFIs in Sacay (1996) had capital deficiencies. Whether the level of capital is adequate or deficient, the social opportunity cost of funds used by a DFI should be adjusted to reflect the risk due to its leverage (Benjamin, 1994).

3.2.2 Sensitivity to the rate paid on public debt *c*

Sacay says that the PG—but not the SDI—is sensitive to changes in the rate paid on public debt *c*. This is an odd claim, since both the PG and the SDI use the same measure of subsidy. In fact, as long as subsidy *S* uses annual average equity *E* and not start equity E_0, then both the PG and the SDI do depend on *c* (equation 11 on page 9):

$$S = m \cdot E_0 + (m/2) \cdot [DG + PC + RG + A \cdot (m - c) + DX + TP] - TP. \tag{30}$$

Since true profit *TP* depends on $A{\cdot}m$, not $A{\cdot}c$, subsidy decreases as c increases:

$$\frac{\partial S}{\partial c} = -A \cdot (m/2). \tag{31}$$

This makes sense; all else constant, a DFI that pays more for public debt gets a smaller discount on public debt and so fewer subsidized funds enter net worth. For the example DFI, *S* was 420 when *c* was 0.05 (lines Cj and Cq of Table 4 on page 39). If *c* increases to 10 percent, then subsidy *S* decreases from 420 to 419.5:

$$
\begin{aligned}
S &= m \cdot E_0 + (m/2) \cdot [DG + PC + RG + A \cdot (m - c) + DX + TP] - TP, \\
&= 0.10 \cdot 0 + (0.10/2) \cdot [1{,}700 + 300 + 400 + 200 \cdot (0.10 - 0.10) + 100 + (-310)] - (-310), \\
&= 0.05 \cdot 2{,}190 + 310, \\
&= 419.5.
\end{aligned}
\tag{32}
$$

3.2.3 Decreased subsidy dependence through an increased yield on lending

In contrast to the claims of Sacay (1996), the SDI does not assume that an increased yield on lending is the only way to decrease subsidy dependence. Among a host of factors, the SDI depends on loan recuperation, deposit mobilization, and administrative costs. The classic statement of the SDI repeatedly insists that a DFI can decrease its subsidy dependence in many ways (Yaron, 1992b, pp. 5, 7, 23).

3.3 The average SDI of Hulme and Mosley

Two important works compute four-year averages of SDIs for ten DFIs around the world (Mosley and Hulme, 1998; Hulme and Mosley, 1996, p. 44). The wider results of these works depend on the computed average SDIs since they help to determine which DFIs are analyzed as ones with a focus on growth and sustainability.

The average SDIs computed by Hulme and Mosley have two problems. First, their formula for the average SDI destroys its interpretation as the percentage increase in revenue that would make subsidy zero. Second, the formula used for the one-year SDI does not seem meaningful.

3.3.1 The ratio of averages and the average of ratios

The ratio of averages is not the same as the average of ratios:

$$\frac{\left(\frac{a+b}{2}\right)}{\left(\frac{c+d}{2}\right)} \neq \frac{\left(\frac{a}{c}+\frac{b}{d}\right)}{2}. \tag{33}$$

The SDI is a ratio. Hulme and Mosley computed the average SDI as the average of ratios, the right-hand side of equation 33. But just the ratio of averages—the left-hand side of equation 33—keeps the meaning of the SDI as the percentage increase in lending that, all else constant, would make the sum of subsidy through the years zero.

For the first two years of the example DFI, the average SDI computed as the average of ratios (right-hand side of equation 33 on page 31) is:

$$\frac{\left(\frac{a}{c}+\frac{b}{d}\right)}{2} = \frac{\left(\frac{S_1}{LP_1 \cdot i_1}+\frac{S_2}{LP_2 \cdot i_2}\right)}{2} = \frac{\left(\frac{420}{420}+\frac{540}{1{,}080}\right)}{2} = 0.75. \tag{34}$$

A 75-percent increase in the yield on lending would increase profit in the first year by 0.75·420=315. Using start equity E_0 and not average equity E, this leaves a subsidy of 420−315=105. In the second year, profits would increase by 0.75·1,080=810. This leaves a subsidy of 540−810=−270. The sum of subsidy in the two years is not zero but rather 105−270=−165.

In contrast, the ratio of averages (left-hand side of equation 33 on page 31) is:

$$\frac{\left(\frac{a+b}{2}\right)}{\left(\frac{c+d}{2}\right)} = \frac{S_1 + S_2}{LP_1 \cdot i_1 + LP_2 \cdot i_2} = \frac{420 + 540}{420 + 1{,}080} = 0.64. \tag{35}$$

A 64-percent increase in the yield on lending would increase profit in the first year by 0.64·420=268.8. Using start equity E_0 and not average equity E, this leaves a subsidy of 420−268.8=151.2. In the second year, profits would increase by 0.64·1,080=691.2. This leaves a subsidy of 540−691.2=−151.2. The sum of subsidy in the two years is now zero.

In any case, the SDI should not be averaged across years since it is meaningful just in short time frames. In long time frames, a full picture of subsidy dependence requires a measure that discounts flows by when they take place in time (Schreiner, 1997). If, as in Hulme and Mosley, the SDI is averaged through a long time frame anyway, then the analyst should divide the sum of subsidy in all years by the sum of revenue from lending in all years. This would preserve the common interpretation of the SDI.

3.3.2 The loan portfolio *LP* as a proxy for public debt *A*

Public debt *A* is a liability of a DFI, and the loan portfolio *LP* is an asset. In general, there is no good reason why the two should be equal, and they rarely are. Hulme and Mosley (1996, p. 92), however, report a formula to measure subsidy dependence that replaces *A* with *LP*. Subsidy for Hulme and Mosley (SHM) also changes the expression ($m-c$) in the discount on public debt to ($c-m$):

$$\text{SHM} = \frac{m \cdot E + LP \cdot (c-m) + K - P}{LP \cdot i}. \tag{36}$$

These amendments might be typographical errors. In later work, Mosley and Hulme (1998, p. 789) write out the standard SDI formula, although they do not explicitly say that this is the formula that they used in their work. Hulme and Mosley have not responded to repeated written requests for clarification.

We cannot follow the logic that supports the formula reported in Hulme and Mosley (1996). The switch of c and m would make the discount on public debt negative. In our view, it also does not make sense to replace public debt A with the loan portfolio LP. The social opportunity cost should be charged against the public funds used by a DFI, not against the funds loaned by a DFI to the target group. Otherwise, a DFI that did not lend would have less subsidy than one that did lend.

4. Conclusion

We have presented the Subsidy Dependence Index (SDI) of Yaron (1992a and 1992b), shown its economic logic, and proven its equivalence to a subsidy-adjusted ROE. We have also argued that three recent proposals do not improve on the SDI as a measure of social cost or of subsidy dependence. In fact, each new adjustment has weaknesses that make it less useful than the SDI.

The Subsidy Dependence Ratio (SDR) of Khandker ignores the mission of a DFI and ignores that a DFI is a price-taker on non-loan investments. The SDR makes a DFI appear to be closer to subsidy independence than it is. The SDR can show decreased subsidy dependence even as a DFI uses more and more public funds to maintain the same number of loans and value of loan portfolio for the target group. Such illusions do not help to choose the best way to allot scarce public funds among different projects so as to improve the welfare of the poor in the best way. As proposed by Sacay, the Profitability Gap (PG) doubele-counts any subsidies from exemption from minimum-capital requirements. As corrected here, the PG is equivalent to an SAROE and thus provides no new information not already in the SDI. Finally, the average SDI of Hulme and Mosley has an unknown interpretation since it muddles the formula for subsidy dependence and since it takes average of ratios instead of the ratio of averages. For all three attempts to adjust the SDI, what is good is not new, and what is new is not good.

The SDI measures the social cost of subsidized DFIs. The purpose of the measurement of social cost is not to purge subsidies but rather to help donors and governments to make informed choices about the best way to spend scarce public funds earmarked to help the poor. Disciplined use of the SDI cannot but help to improve how funds are spent.

Type	Notation	Type of grant
1. Direct grant	DG	Equity grant (EG)
2. Paid-in capital	PC	
3. Revenue grant	RG	Profit grant (PG)
4. Discount on public debt	$A \cdot (m - c)$	
5. Discount on expenses	DX	
6. True profit	TP	Equity grant (EG)

Table 1: Types of subsidized funds

Line	As of		12/31/00	12/31/01	12/31/02	12/31/03
	Assets					
Aa	Cash	Data	0	600	700	800
Ab	Loan portfolio (gross)	Data	0	2,100	3,300	5,200
Ac	Reserve for loan losses	Data	0	0	0	0
Ad	Loan Portfolio (net), LP	Ab+Ac	0	2,100	3,300	5,200
Ae	Investments, I	Data	0	200	400	600
Af	Fixed assets (net)	Data	0	100	200	200
Ag	Total assets	Aa+Ad+Ae+Af	0	3,000	4,600	6,800
	Liabilities					
Ah	Deposit libs.	Data	0	200	400	600
Ai	Private debt	Data	0	200	300	400
Aj	Public debt, A	Data	0	400	800	1,200
Ak	Total liabilities	Ah+Ai+Aj	0	800	1,500	2,200
	Equity					
Al	Paid-in capital, PC	Data	0	300	645	910
Am	Direct grants, DG	Data	0	1,700	2,000	2,300
An	Retained earnings	An(t-1)+Bm	0	200	455	1,390
Ao	Total equity	Al+Am+An	0	2,200	3,100	4,600
Ap	Total equity and libs.	Ak+Ao	0	3,000	4,600	6,800

Source: Example of authors. Money figures in constant units.

Table 2: Balance sheet

Line	For the year ending		12/31/00	12/31/01	12/31/02	12/31/03
Ba	Rev. from lending, LP*i	Data	0	420	1,080	1,700
Bb	Rev. investments, I*j	Data	0	5	15	25
Bc	Total rev. operations	Ba+Bb	0	425	1,095	1,725
Bd	Exp. int. deposit libs.	Data	0	5	15	25
Be	Exp. int. private debt	Data	0	10	25	35
Bf	Exp. int. public debt, A*c	Data	0	10	30	50
Bg	Total int. exp.	Bd+Be+Bf	0	25	70	110
Bh	Financial margin	Bc-Bg	0	400	1,025	1,615
Bi	Exp. prov. reserve for loan loss	Data	0	0	0	0
Bj	Exp. admin.	Data	0	600	1,170	1,080
Bk	Operating margin	Bh-(Bi+Bj)	0	(200)	(145)	535
Bl	Rev. grants, RG	Data	0	400	400	400
Bm	Accounting profit, P	Bk+Bl	0	200	255	935
	Memo item:					
Bn	Discounts on expenses, DX	Data	0	100	100	100

Source: Example of authors. Money figures in constant units.

Table 3: Income statement

Line		For the year ending	12/31/00	12/31/01	12/31/02	12/31/03
Ca	Start equity	Al(t-1)+Am(t-1)+An(t-1)		0	2,200	3,100
Cb	End equity	Al+Am+An		2,200	3,100	4,600
Cc	Ave. equity, E	(Ca+Cb)/2		1,100	2,650	3,850
Cd	Opp. cost of society, m	Data		0.10	0.10	0.10
Ce	Subsidy on equity, E*m	Cc*Cd		110	265	385
Cf	Start public debt	Aj(t-1)		0	400	800
Cg	End public debt	Aj		400	800	1,200
Ch	Ave. public debt, A	(Cf+Cg)/2		200	600	1,000
Ci	Exp. int. public debt, A*c	Bf		10	30	50
Cj	Rate paid public debt, c	Ci/Ch		0.05	0.05	0.05
Ck	Opp. cost public debt, m	Data		0.10	0.10	0.10
Cl	Disc. public debt, A*(m-c)	Ch*(Ck-Cj)		10	30	50
Cm	Rev. grants, RG	Bl		400	400	400
Cn	Discounts on expenses, DX	Bn		100	100	100
Co	K	Cm+Cn		500	500	500
Cp	Accounting profit, P	Bm		200	255	935
Cq	Subsidy, S	Ce+Cl+Co-Cp		420	540	0
Cr	Start loan portfolio (net)	Ad(t-1)		0	2,100	3,300
Cs	End loan portfolio (net)	Ad		2,100	3,300	5,200
Ct	Ave. loan port. (net), LP	(Cr+Cs)/2		1,050	2,700	4,250
Cu	Rev. from lending, LP*i	Ba		420	1,080	1,700
Cv	Yield on lending, i	Cu/Ct		0.40	0.40	0.40
Cw	Rev. from lending, LP*i	Ct*Cv		420	1,080	1,700
Cx	Subsidy Dependence Index, SDI	Cq/Cw		1.00	0.50	0.00
Cy	Yield on lending, i	Cv		0.40	0.40	0.40
Cz	Change in yield	Cy*Cx		0.40	0.20	0.00
Caa	Nominal subsidy-free yield	Cy+Cz		0.80	0.60	0.40
Cbb	Inflation	Data		0.10	0.10	0.10
Ccc	Real subsidy-free yield	(Caa-Cbb)/(1+Cbb)		0.64	0.45	0.27

Source: Example of authors. Money figures in constant units.

Table 4: Subsidy Dependence Index

Line	For the year ending		12/31/00	12/31/01	12/31/02	12/31/03
Da	Accounting profit, P	Bm		200	255	935
Db	Rev. grants, RG	Bl		400	400	400
Dc	Discount public debt, A*(m-c)	Cl		10	30	50
Dd	Discounts on expenses, DX	Bn		100	100	100
De	True profit, TP	Da-(Db+Dc+Dd)		(310)	(275)	385
Df	Start equity	Ao(t-1)		0	2,200	3,100
Dg	End equity	Ao		2,200	3,100	4,600
Dh	Ave. equity, E	(Df+Dg)/2		1,100	2,650	3,850
Di	Start assets	Ag(t-1)		0	3,000	4,600
Dj	End assets	Ag		3,000	4,600	6,800
Dk	Ave. assets	(Di+Dj)/2		1,500	3,800	5,700
Dl	ROA	Da/Dk		0.13	0.07	0.16
Dm	Subsidy-adjusted ROA	De/Dk		(0.21)	(0.07)	0.07
Dn	ROE	Da/Dh		0.18	0.10	0.24
Do	Subsidy-adjusted ROE	De/Dh		(0.28)	(0.10)	0.10

Source: Example of authors. Money figures in constant units.

Table 5: Subsidy-adjusted ROE and subsidy-adjusted ROA

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