Appendices

Appendix 1: Operational Definition and Distinction Between Operational Self-Sustainability Ratio, Financial Self-Sustainability Ratio and Subsidy Dependence Index

Operating self-sufficiency (OSS) is a sustainability ratio which indicates whether or not enough revenue has been earned to cover the MFI's total costs—operational expenses, loan loss provisions and financial costs. A ratio above 100 % indicates that MFI has enough operating income to cover its costs, indicating an operationally self-sustainable status.

$$\textbf{OSS Ratio} = \frac{\textbf{Operating income (Loans + Investments)}}{\textbf{Operating costs + Loan loss provisions + Financing costs}}$$

Financial self-sufficiency (FSS) is a sustainability ratio that allows determination of the extent to which operations of an MFI are becoming (increasingly) self-sustaining. Financial self-sufficiency indicates whether or not enough revenue has been earned to cover both direct costs—including financing costs, provisions for loan losses and operating expenses—and indirect costs, including the adjusted cost of capital.

The adjusted cost of capital is considered to be the cost of maintaining the value of the equity relative to inflation (or the market rate of equity) and the cost of accessing commercial rate liabilities rather than concessional loans.

Adjusted cost of capital = [Inflation rate × (Average equity − Average fixed assets)] + [(Average funding liabilities × Market rate of debt) − Actual financing costs]

$$\textbf{FSS ratio} = \frac{\textbf{Operating income (Loans + Investments)}}{\textbf{Operating costs + Loan loss provisions + Financing costs + Adjusted cost of capital}}$$

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Unless 100 % financial self-sufficiency is reached, the long-term provision of credit services will ultimately be undermined by the impact of inflation and the continued necessity to rely on donor funds.

The Subsidy Dependence Index (SDI) is an often less used measure of sustainability, though it is one of the best indicators of adjusted profitability from a technical standpoint.

It measures how much an MFI would have to increase its lending interest rate to cover all of its costs including adjustments.

An SDI above zero means that the MFI still needs subsidy to operate—i.e. it has not achieved financial sustainability. A two-stage calculation produces first the amount of annual subsidy and then the index.

$$\mathbf{S = A\,(m - c) + \left[(E^{*}m) - P\right] + K} \tag{A.1}$$

where

S = Annual subsidy received by the MFI
A = MFI concessional borrowed funds outstanding (annual average)
m = Interest rate the MFI would be assumed to pay for borrowed funds if access to borrowed concessional funds were eliminated
c = Weighted average annual concessional rate of interest actually paid by the MFI on its average annual concessional borrowed funds outstanding
E = Average annual equity
P = Reported annual before-tax profit (adjusted, when necessary, for loan loss provisions, inflation, and so on)
K = Sum of all other annual subsidies received by the MFI (such as partial or complete coverage of the MFI's operational costs by the state)

$$\mathbf{SDI} = \frac{\mathbf{S}}{\mathbf{LP^{*}i}} \tag{A.2}$$

where

SDI = Index of subsidy dependence of MFI
S = Annual subsidy received by the MFI (see above)
LP = Average annual outstanding loan portfolio of the MFI
i = Weighted average interest yield earned on the MFI's loan portfolio

Appendix 2: Charnes, Cooper and Rhodes Model and Banker, Charnes and Cooper Model Formulation

In 1978, Charnes, Cooper and Rhodes (CCR) formulated the CCR DEA model as a fractional programming, which can be transformed to linear programming as follows:

$$\text{Min}_{\theta,\lambda}\,\theta$$

$$\text{s.t.} - y_i + Y.\,\lambda \geq 0,$$

$$\theta.\,x_i - X.\,\lambda \geq 0, \lambda \geq 0 \tag{A.3}$$

where X and Y are the $K \times N$ input matrix and the $M \times N$ output matrix (for the ith firm, these are represented by the vector x_i and y_i), respectively. λ is a $N \times 1$ vector of constant and θ is a scalar, which stands for efficiency of ith firm. By solving this linear programming model for each of the N firms, the efficiency scores for each of the firms can be obtained. Model (1) is an input orientation DEA model under the assumption of constant returns to scale (CRS).

The CCR model assumes CRS and presupposes that there is no significant relationship between the scale of operations and efficiency. But the CRS assumption is valid only when all firms are operating at an optimal scale. Since in reality firms experience economies or diseconomies of scale, the overall technical efficiency scores that are derived from this model are contaminated with scale efficiencies. Considering this limitation to account, the Banker, Charnes and Cooper (BCC) model was formulated in the year 1984.

BCC model relaxed the restriction of CRS to account for variable returns to scale (VRS) technology by adding convexity constraint to model (A.3). The VRS assumption provides the measurement of pure technical efficiency (PTE), which is the measurement of technical efficiency devoid of the scale efficiency effects. The BCC input orientation DEA model is as follows:

$$\text{Min}_{\theta,\lambda}\,\theta$$

$$\text{s.t.} - y_i + Y.\,\lambda \geq 0.$$

$$\theta.\,x_i - X.\,\lambda \geq 0.$$

$$\sum \lambda = 1, \lambda \geq 0 \tag{A.4}$$

Model (A.3) and model (A.4) can be transformed to output orientation DEA forms as shown in model (A.5) and (A.6), respectively.

$$\text{Max}_{\phi,\lambda}\,\varnothing$$

$$\text{s.t.} - \varnothing.y_i + Y.\,\lambda \geq 0.$$

$$x_i - X.\,\lambda \geq 0.$$

$$\lambda \geq 0 \tag{A.5}$$

$$\text{Max}_{\emptyset,\lambda}\,\emptyset$$

$$\text{s.t.} - \emptyset.y_i + Y.\,\boldsymbol{\lambda} \geq 0$$

$$x_i - X.\,\boldsymbol{\lambda} \geq 0$$

$$\sum \boldsymbol{\lambda} = 1, \boldsymbol{\lambda} \geq 0 \tag{A.6}$$

Where, Y, X, xi, yi and $\boldsymbol{\lambda}$ are defined as previously in model (A.3); $\emptyset$ denotes proportional increase in output, which ranges from one to infinity.

Appendix 3: Interview Guide

1. Is the efficiency and sustainability status of your MFI dependent on any peculiar characteristic of your MFI—like age, credit delivery model, regulatory status, area of operations and size of MFI—or any other factors you consider relevant?
2. In the quantitative phase of the study, portfolio risk factor (portfolio at risk greater than 30 days ratio) was found to share a negative relationship with operational self-sustainability (OSS) ratio of Indian MFIs. Do you confirm the existence of such negative relationship between portfolio risk factor (portfolio at risk greater than 30 days ratio) and OSS ratio of Indian MFIs? If yes, how would you explain this negative association by mapping it to the OSS ratio? If not, how would you explain the alternate relationship?

   Operational Definitions:

$$\text{Portfolio risk factor} = \frac{\text{Portfolio at risk greater than 30 days}}{\text{Gross loan portfolio}}$$

$$\text{OSS ratio} = \frac{\text{Operating income}}{(\text{Operating costs} + \text{Financing costs} + \text{Loan loss provisions})}$$

3. How do you manage portfolio risk in your MFI?
4. In the quantitative phase of the study, growth factor (gross loan portfolio) was found to share a positive relationship with operational self-sustainability (OSS) ratio of Indian MFIs. Do you confirm the existence of such a positive relationship between growth factor (gross loan portfolio) and OSS ratio of Indian MFIs? If yes, how would you explain this positive association by mapping it to the OSS ratio? If not, how would you explain the alternate relationship?

Operational Definitions:

$$\text{Growth factor} = \text{Gross loan portfolio of the MFI}$$

$$\text{OSS ratio} = \frac{\text{Operating income}}{(\text{Operating costs} + \text{Financing costs} + \text{Loan loss provisions})}$$

5. How do you manage growth in portfolio operations in your MFI?
6. In the quantitative phase of the study, development factor (average loan size per borrower) was found to share a negative relationship with operational self-sustainability (OSS) ratio of Indian MFIs. Do you confirm the existence of such a negative relationship between development factor (average loan size per borrower) and OSS ratio of Indian MFIs? If yes, how would you explain this negative association by mapping it to the OSS ratio? If not, how would you explain the alternate relationship?

   Operational Definitions:

$$\text{Development factor} = \text{Average loan size per borrower of the MFI}$$

$$\text{OSS ratio} = \frac{\text{Operating income}}{(\text{Operating costs} + \text{Financing costs} + \text{Loan loss provisions})}$$

7. How do you manage development in your MFI through average loan size per borrower?
8. In the quantitative phase of the study, institutional factor (Self-Help Group Credit Delivery Model) was found to share a negative relationship with operational self-sustainability (OSS) ratio of Indian MFIs. Do you confirm the existence of such a negative relationship between institutional factor (Self-Help Group Credit Delivery Model) and OSS ratio of Indian MFIs? If yes, how would you explain this negative association by mapping it to the OSS ratio? If not, how would you explain the alternate relationship?

   Operational Definitions:

$$\text{Institutional factor} = \text{Self} - \text{Help Group Credit Delivery Model}$$

$$\text{OSS ratio} = \frac{\text{Operating income}}{(\text{Operating costs} + \text{Financing costs} + \text{Loan loss provisions})}$$

9. How do you manage credit delivery model to enhance OSS of your MFI?
10. In the quantitative phase of the study, cost-efficiency factor (operating cost per borrower) was found to be a discriminating factor for the operational self-sustainability (OSS) status of Indian MFIs. Do you confirm the existence of a discriminatory relationship between cost-efficiency factor (operating cost per

borrower) and OSS status of Indian MFIs? If yes, how would you explain this relationship by mapping it to the OSS ratio? If not, how would you explain the alternate relationship?

Operational Definitions:

$$\text{Cost-efficiency factor} = \text{Operating cost per borrower of the MFI}$$

$$\text{OSS ratio} = \frac{\text{Operating income}}{(\text{Operating costs} + \text{Financing costs} + \text{Loan loss provisioning})}$$

11. How do you manage operating costs in your MFI?
12. How do you manage financing costs in your MFI?

Appendix 4: Summary of the Qualitative Data Collected During the Interviews

Table A.1 Qualitative data collected from MFI A

	MFI		
	MFI A		
Factors	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Portfolio risk factor	PAR > 30 days shares a negative relationship with OSS as it has a positive association with loan loss provisions	Prevent vulnerability to default by providing capacity building and welfare services to clients	
Growth factor	Gross loan portfolio shares a positive relationship with OSS as it has a positive association with operating income	Balance growth with portfolio risk Increase of credit officer productivity to achieve growth must not compromise portfolio quality Awareness of the positive association between credit officer productivity and portfolio risk required	To fix the problem of multiple lending, which is an adverse effect of MFI's growth, a credit information bureau needs to be place at the earliest

(continued)

Table A.1 (continued)

	MFI		
	MFI A		
Factors	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Institutional factor	Though SHG credit model has higher group formation cost, which can be reduced by NGO-MFI Partnerships	SHG is used as credit is not the only missing link to development for our clients High cost on SHG formation is reduced by outsourcing this task to NGOs for nominal fees	
Development factor	Larger sized loan will have higher screening and monitoring cost, which means higher operating costs on these loans	Progressively increases loan size based on client needs because small loan size will not always fulfil client needs	
Cost-efficiency factor	Since operating costs account for nearly 2/3 of an MFI's cost, a lower operating cost per borrower, can distinguish an MFI's sustainability status	NGO-MFI partnerships reduce group formation cost. Similarly use of MIS reduce operating costs and avoid the need for manual data entry. Increase of credit officer productivity by recruiting staff who share the same household economics of the clients are also a means used for reducing operating costs. Financing costs are low, because the reputation of the MFI being a low cost player, who charges low interest rate, helps to negotiate with investors to lend funds at low rate	The ceilings imposed on interest rates and financial margins, reduces the incentive for attaining cost-efficiency and levying low interest rate. Therefore the regulators should reward low cost MFIs, which charge interest rate below the ceiling, by granting them the permission to source funds from banks at below base rate

Table A.2 Qualitative data collected from MFI B

	MFI		
	MFI B		
Factors	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Portfolio risk factor	PAR > 30 days and loan loss provisions are directly related	Providing welfare services to clients can enable them to run sustainable microenterprises, preventing any probable loan defaults Following-up of defaulting loans and enforcement of joint-liability principle are means to address delinquency	Formation of a well-functioning complaint redressal system like that of an ombudsman to handle client complaints related to over-bearing and coercive recovery practices
Growth factor	With higher gross loan portfolio, there will be higher operating income	Achieve vertical expansion through market penetration in existing markets. Achieved through rendering of standardized products and enhanced credit officer productivity	
Institutional factor	SHG model has higher group formation cost, but with NGO-MFI partnerships we reduce this cost	SHG model is used because our customers need not just financial inclusion but also social inclusion SHG model spends more time on nurturing the group and empowering the clients than the Grameen model, thereby equipping the clients to indulge in sustainable income-generating activities The higher cost on group formation gets reduced by entering into NGO-MFI partnerships, to handle the group formation tasks	
Development factor	Larger sized loans have higher operating cost, because higher levels of monitoring will be needed on them	Small loan size will induce tendency among clients to go for multiple lending. So we progressively increase loan size to meet the growing financial needs of our clients	

(continued)

Table A.2 (continued)

	MFI		
	MFI B		
Factors	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Cost-efficiency factor	Operating cost being the largest denominator of the OSS ratio, a lower operating cost per borrower can differentiate its sustainability status	Enhancing credit officer productivity is a means used for operating cost reduction. The use of back-end MIS with a personal digital assistant, helps to reduce operating cost by 5 %. It helps to gain a 360° view of the five factors identified as crucial for sustainability. Portfolio buy-out model is used to liquidate loans and source finance at a discounted rate from the banks	

Table A.3 Qualitative data collected from MFI C

	MFI		
	MFI C		
Factor	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Portfolio risk factor	When PAR > 30 days decreases, loan loss provision expenses also reduces	Prevent risk at early stage, by training credit officers in surrogate credit assessment and customer-centric product development. This will ensure smooth recoveries without use of any coercive practices. Monitor portfolio at risk >30 days ratio and write-off ratio. Ideally these risk indicators should be 10 % or below, to ensure control of risk within acceptable parameters	
Growth factor	Gross loan portfolio shares a positive relationship with OSS as it has a negative relationship with operating costs	Decide growth strategy after understanding the costs involved in expansion and the available capital support	

(continued)

Table A.3 (continued)

	MFI		
	MFI C		
Factor	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Institutional factor	SHG model has higher operating cost, as the group formation cost is higher in it than in the Grameen model	Grameen model is used because it is more institutional oriented, with less operating cost in group formation	
Development factor	It is more cumbersome to monitor a large sized loan and this results in higher operating costs	Providing small loan size alone does not mean an MFI is fulfilling its developmental mission of reaching the poor. True development lies in being able to cater to the clients' increasing financial needs, without having them resort to other informal sources	
Cost-efficiency factor	Operating cost is a major component of the OSS ratio. So a lower operating cost per borrower ratio, can differentiate sustainability	Ensuring efficient fund circulation, by keeping the overnight cash at its minimum is a means used for reducing operating costs. Enhanced credit officer productivity and use of MIS also helps to reduce operating cost. Securitization of loans to banks is done for reducing cost of funds	

Table A.4 Qualitative data collected from MFI D

	MFI		
	MFI D		
Factor	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Portfolio risk factor	There is a direct relationship between PAR > 30 days and loan impairment expenses	Train field officers to assess the income of the clients and design financial products in tune with the cash-flow patterns of the clients, to prevent risk Provide insurance coverage to clients to prevent loss on account of uncontrollable factors adversely affecting repayment	

(continued)

Table A.4 (continued)

	MFI		
	MFI D		
Factor	Mapping to OSS ratio to explain the relationship	Strategy used for managing the factor	Policy suggestion
Growth factor	Gross loan portfolio shares a positive relationship with OSS as it has a negative relationship with total costs of MFI	Achieve horizontal growth through replication of successful branch model Achieved through providing customized products	
Institutional factor	Group formation cost and time is higher in SHG model than in the Grameen model	Grameen model is used because it forms groups and immediately disburses loans As the group formation time and cost is far less in Grameen compared to SHG model, the overall operating costs are low	
Development factor	Larger sized loans will require more screening efforts and this will result in higher operating costs	Clients resort to multiple borrowings from informal sources and moneylenders for meeting their growing non-productive and non-routine expenses. This is despite the fact that the interest rates charged by these sources are higher than that levied by MFIs. This is so because the former sources do not impose any constraints on loan size	To remove caps imposed by regulator on MFI loan size, as it will induce the tendency for multiple borrowings among the clients. Only a flexible loan size that matches the repayment capacity and financial needs of the clients will result in true development, not mere provision of small-sized loans
Cost-efficiency factor	Operating cost being the largest chunk of an MFI's cost structure, its sustainability will be differentiated on this basis	Operating costs are reduced by increasing the borrower to credit officer ratio and by the use of a MIS. MIS have reduced operational expenses close to 5 %. Portfolio buy-out model is used for reducing cost of funds	The present regulation for deposit mobilization needs relaxation to account for rating the uncollateralized model in which an MFI operates. This is essential for enhancing deposit mobilization, which can serve as source of capital for the MFI

Appendix 5

Table A.5 Group formation process in 14 days

Phases	Process
Village/slum selection phase (3 days)	In case of vertical growth: select area within 20 km of an existing branch office
	In case of horizontal growth: select area where branch replication is possible
	Target areas with 240 households such that there is minimum of 60 client potential in a village & minimum of 3,000–4,000 client potential in a slum
	Assess market potential based on secondary data collected from government offices
Introductory phase (2 days)	Open to all village/slum dwellers
	Give overview of MFI and loan products to potential target clients
Client selection phase (3 days)	Target economically active poor woman (in the age group 18–55 years), i.e. either self-employed or wage labourer
	Monthly income criteria: individual <Rs1,500; family <Rs2,500
	Resident of village/slum for at least one preceding year, not owning a large house
	Willing to be a guarantor for other women in the group
Group formation phase (1 day)	Out of the eligible clients, groups comprising of five self-chosen members, who reside in the same village are formed
	Who share same socio-economic background and have mutual trust
	No more than one member from the same household in a group
	Each group elects its own leader among the members
	Four groups federate to form a centre, headed by centre leader
Group training phase (5 days)	A 5-day training in the local language with easy, numerical illustrations on products to ensure that clients understand the MFI's product, joint-liability concept, terms and conditions and the credit discipline expected of them
	Group recognition test to ensure that clients know and trust their group members