CAPITAL STRUCTURE AND SUSTAINABILITY: AN EMPIRICAL STUDY OF MICROFINANCE INSTITUTIONS

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Abstract—The capital structure of lending institutions has become an increasingly prominent issue in the world of finance. Contemporaneously, microfinance institutions (MFIs) have risen to the forefront as invaluable lending institutions in the development process. Since capital constraints have hindered the expansion of microfinance programs and microfinance organizations have had various degrees of sustainability, the question of how best to finance these organizations is a key issue. This paper explores how changes in capital structure could improve MFI efficiency and financial sustainability. I find causal evidence supporting the assertion that increased use of grants by large MFIs decreases operational self-sufficiency.

I. Introduction

THE capital structure of lending institutions has become an increasingly prominent issue in the world of finance, particularly in the wake of the 2008 banking collapse and the ensuing government bailouts and institutional restructuring efforts. During any time of financial or banking crisis, when bailout funding or aid is available, questions of capital structure become more salient. What is the best mix of debt, equity, and grant funding that will ensure solvency and self-sufficiency? The question of optimal capital structure for lending institutions, particularly ones with access to grant funding, is an open and weighty question.

Within the academy, the issue of optimal capital structure has been studied intensely since Modigliani and Miller published their seminal 1958 paper, "The Cost of Capital, Corporate Finance and the Theory of Investment." There is a considerable amount of literature with respect to the optimal capital structure of corporate firms (e.g., Faulkender & Petersen, 2006; Harris & Raviv, 1991; Titman & Wessels, 1988; Bradley, Jarrell, & Kim, 1984). Depending on the relevant considerations (tax advantages, bankruptcy costs, agency costs, transaction costs, asymmetric information, or corporate control), one can point to an optimal capital structure in terms of a corporate firm's value.

Yet the application of the Modigliani-Miller (MM) theorem and other corporate finance theorems to lending institutions is less straightforward. The basic MM principles are applicable to lending institutions, but only after accounting for the fundamental differences in how lenders and corporations operate (Cohen, 2004). The relationship between the levered and unlevered betas, the manner in which revenues are generated, and the nature of regulation for a lending institution are markedly different from those of corporate firms. As Froot and Stein (1998) and Cebenoyan and Strahan (2004) have shown, risk management objectives also influence the capital structure of lending institutions. Consequently, the theoretical notion of an optimal capital structure for a lending institution is not very well defined. The issue of grant money adds another layer of complication to the capital structure question for lending institutions. Does grant money create moral hazard or incentive issues with respect to banking operations? Thus, within the context of the lending institution capital structure discussion, one is required to consider issues similar to the grant versus concessional loan debate in the foreign aid literature (e.g., Gupta et al., 2003; Schmidt, 1964). This paper attempts to shed light on these issues through a study of microfinance institutions (MFIs).

As in Garmaise and Natividad (2010), which examines the effects of asymmetric information on lending using MFIs, this paper provides an empirical analysis of the effects of capital structure on self-sufficiency and efficiency through a study of MFIs. I take an empirical approach to examining MFI capital structures in order to identify those with the strongest record of performance. Presumably any findings with respect to microfinance institutions could be relevant for other types of lending institutions. Booth, Demirgüç-Kunt, and Maksimovic (2001) demonstrate that many capital structure choices are affected by the same variables in developed and developing countries; lessons learned here also could be applied to our knowledge of optimal capital structure for lending institutions in general, especially during times of crisis when grant money is available.

The remainder of the paper proceeds as follows. Section II describes MFIs and the evolution of microfinance funding sources. Section III describes the data used. Section IV analyzes the relationship between funding sources, sustainability, efficiency, and outreach. Section V concludes.

II. MFIs and the Evolution of MFI Funding Sources

MFIs provide financial services to low-income households in developing countries around the world. In the minds of many, microfinance and microcredit are synonymous. However, microfinance refers to an array of financial services that include credit, savings, and insurance, while microcredit is the provision of credit which is usually used as capital for small business development. MFIs can operate as nongovernmental organizations (NGOs), credit unions, nonbank financial intermediaries, or commercial banks (Bogan, 2011). To cushion themselves from perceived risks due to the target client's lack of collateral as a guarantee against default, MFIs

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TABLE 1.—FUNDING INSTRUMENTS AND SUSTAINABILITY

Instrument	Benefits	Challenges
Grants	Best for start-up or risky institutions when commercial sources unavailable.	Money perceived as "too easy" so no efficiency incentives.
Equity		
Quasi-equity[a]	Source of low-cost funding (similar to concessional debt)	Generally available only to mature institutions.
Local equity capital	Governance role could improve overall management and thus efficiency.	Only licensed financial institutions are eligible. Stockholder demands can cause mission drift that allows inefficient practices.
Traditional equity capital	Allows financial institutions to tap into capital markets. Governance role could improve overall management and thus efficiency.	Only licensed financial institutions are eligible to sell shares on the market. Stockholder demands and diluted ownership can cause long-term inefficiencies due to short-term focus.
Deposits	Over time is a low-cost source of funding. Creates independence from external funding.	Only for regulated institutions. Some institutions may need support to develop products and systems to lower costs and manage growth of deposits.
Debt		
Concessional loans	Source of low-cost funding.	If commercial alternatives exist, can distort domestic markets and reduce incentives to mobilize deposits.
Commercial loans	Source of funds that encourages efficient operations.	None.
Bonds	Allows financial institutions to tap into domestic capital markets, encouraging efficiency.	Requires sufficiently developed secondary market. Dependent on local shocks. May require initial incentives to get started in some markets.

[a] Subordinated debt at a subsidized interest rate that can be converted to equity. Usually medium- to long-term loans designed to be repaid from profits.

are known to charge very high (30%–60%) nominal interest rates (Dehejia, Montgomery, & Morduch, 2005). The loans are short term, the average loan size is very small, and only a few programs require borrowers to put up collateral. (e.g., loans can be as small as $75, repaid over one year). Globally there are more than 67 million households served by microfinance programs (Armendáriz de Aghion & Morduch, 2005). Through MFIs, many would-be entrepreneurs with few assets have been able to escape positions as poorly paid wage laborers or farmers. MFIs have expanded the frontiers of institutional finance and have brought the poor, especially poor women, into the formal financial system by enabling them to access credit in order to fight poverty (Bogan, 2011). "While the full [microfinance] promise is as yet unmet (*profits remain hard to squeeze out and the very poor are tough to reach*), there are a growing number of success stories and, world wide, nearly 70 million low-income individuals are served by microfinance institutions."[1]

Despite the successes of many MFIs, millions of low-income individuals in developing countries still lack access to financial services. High operating costs and capital constraints within the MFI industry have prevented MFIs from meeting the enormous demand. Additionally, Dehejia et al. (2005) show that the demand for credit by the poor is not inelastic. The high interest rates charged may be limiting the ability of MFIs to serve poorer potential clients. Donor agencies, local governments, and others are promoting competition and stressing financial sustainability as ways to maximize the breadth of outreach (Armendáriz de Aghion & Morduch, 2004). As an added level of complexity, MFIs are a unique type of lending institution with risk and return characteristics different from those of standard lending operations.[2] MFIs also have a mission of reducing poverty, not just maximizing firm value. Thus, institutional structure and capital flows to MFIs have become much more critical issues. Focusing on funding sources, this paper investigates the relationship between capital structure, MFI sustainability, efficiency, and outreach to identify opportunities for increasing the sustainability and growth of MFIs. Table 1 qualitatively summarizes how each of the four primary funding sources can affect MFI efficiency (Helms, 2006).

Various theories have been developed to describe under what circumstances an MFI should use a particular type of funding instrument. These ideas regarding MFI funding processes can be categorized into two main frameworks: life cycle theory and profit-incentive theory.

A. *Life Cycle Theory*

Existing research places the evolution of MFI funding sources within the context of an institutional life cycle theory of MFI development (de Sousa-Shields, 2004). According to this framework of analysis, most MFIs start out as NGOs with a social vision, funding operations with grants and concessional loans from donors and international financial

[1] Armendáriz de Aghion and Morduch (2004, p. 135).

[2] Whereas the loans of most U.S. lending institutions are characterized by large markets, large loan sizes, long maturities, and proven loan performances, microfinance receivables are highly granular, uncollateralized, and short term. While most microloans are uncollateralized, MFIs have used social sanctions and denial of future credit as a substitute for the traditional form of collateral. Additionally, with their regular repayment schedules, MFIs are envisaged as being able to screen out undisciplined borrowers as well as allowing the institution to get hold of cash flows before they are consumed or diverted. Depending on the geographic region, maturities of microloans vary between three and twelve months, and their average loan size ranges from $50 to $1,000. Due to the small size of the individual loans, the loan servicing process is labor intensive, creating high transaction costs.

institutions that effectively serve as the primary sources of risk capital for the microfinance sector. Thus, the literature on microfinance devotes considerable attention to this process of "NGO transformation" as a life cycle model outlining the evolution of a microfinance institution (Helms, 2006).[3] Generally the life cycle theory posits that the sources of financing are linked to the stages of MFI development. Donor grants and soft loans comprise the majority of the funding in the formative stages of the organization.[4] As the MFI matures, private debt capital becomes available, but the debt structures have restrictive covenants or guarantees. In the last stage of MFI evolution, traditional equity financing becomes available (Fehr & Hishigsuren, 2004).

Farrington and Abrams (2002) provide evidence that supports the life cycle theory, noting an increase in competition in MFIs as they increase in number and documenting a spread in regulation facilitating a change in the capital structure of the industry. They discuss several key trends that have emerged: (a) the tendency toward increased leveraging of capital (e.g., nonprofit foundations now have an average leverage of 4.5 times the value of their equity compared to previous average leverage levels of around 1.3 times their equity), (b) the rise in the practice of accepting public deposits, and (c) a shift away from subsidized donor money toward commercial funding.

Despite the support for the life cycle approach, there is also evidence that countervailing factors shape the funding sources and instruments available to MFIs. These factors show through in considerable regional variation in MFI funding patterns; regional variations that have been influenced by historical factors, including traditional patterns of savings and lending; and variations in regulatory environments. Whereas MFIs in several Latin American countries have made progress in the transition to regulation and market funding (Jansson, 2003; Conger, 2003), unregulated and NGO structures still predominate in the Middle East, North Africa, Eastern Europe, and Central Asia. Such institutions face limitations in financing options, with no license for taking public deposits and no shareholder structure for attracting equity other than donations. In addition, Banerjee, Munshi, and Duflo (2003) have shown that the maturity of the capital markets within a country can affect the allocation of funding or other resources.

B. Profit-Incentive Theory

In contrast to the life cycle theory, the profit-incentive theory posits that MFI use of commercial funding sources (at any stage of development) will enable MFIs to meet the "microfinance promise." Reliance on commercial funding is beneficial along two dimensions: outreach and efficieny. Since donor funds are limited in amount, reliance on donor funding limits the ability of MFIs to expand to meet rising demand for services. There is also a question as to whether reliance on donor funds allows MFIs to avoid pressures to operate efficiently. Commercially funded MFIs respond to the profit incentive, working to increase revenues and decrease expenses so that they can have revenues sufficient to cover all operating expenses. MFIs with access to donor funds may not respond to these pressures to operate efficiently or may deliberately choose outreach over efficiency by serving poorer or rural clients with higher delivery costs (Armendáriz de Aghion & Morduch, 2005). Concerns over the dangers of excessive subsidization in microfinance have been prevalent since the 1980s, and as a result, the goal of serving the poor has been twinned with the goal of long-term financial self-sufficiency for some time (Morduch, 2005). In recent years, there has been increasing internal and external pressure for the MFIs to decrease dependence on subsidized or grant funding. For example, some non-profit organizations like ACCION International have been helping MFIs obtain equity financing, debt financing, and other commercial funding instruments. By enabling MFIs to link directly with investors and commercial banks, these types of organizations strive to help MFIs become independent of donor funds.[5] For example, over the past decade, ACCION has been highly influential in encouraging donors to subsidize start-up costs only and pushing for MFIs to have a commercial focus (Armendáriz de Aghion & Morduch, 2004).

Despite keen interest in possible links between funding sources and operational sustainability and in studies of relative profitability of individual institutions, there have been no systematic studies for a large group of MFIs that provide robust evidence of how variations in funding or institutional structure affect MFI performance. This paper aims to analyze the factors that influence the success of MFIs. Rather than accept the idea that financial sustainability, efficiency,

[3] An alternative model, based on changing market share, though well developed in the finance literature, appears less relevant for microfinance. The microfinance market is not yet a mature market and remains dynamic in terms of both the range of customers and the evolution of instruments. Consequently, the concept of market share is elusive. Market share is also less useful conceptually since it fails to capture a defining set of characteristics for MFIs that emerged from diverse informal arrangements and pre-existing institutions. Moreover, the market share approach does not allow for changes in financial performance that may be associated with growth in the size of the individual MFI, even if the growth in the market outpaces the growth of an individual institution.

[4] Soft loans are loans with subsidized interests rates obtained from multilateral banks (e.g., the World Bank, the Inter-American Development Bank), government aid agencies (e.g., U.S. Agency for International Development, U.K. Department for International Development), foundations (e.g., Ford Foundation), and apex organizations (e.g., Women's World Banking ACCION).

[5] The ACCION Gateway Fund, LLC invests in microfinance institutions with a proven track record of financial viability. ACCION International has sponsored the creation of ACCION Investments, an investment company with $19.5 million in committed capital, designed to make equity and quasi-equity investments in Latin America, the Caribbean and Africa. The AfriCap Microfinance Fund, an investment fund cofounded by ACCION and Calmeadow, a Canadian microfinance institution, is dedicated to financing commercial microfinance institutions in Africa. The Latin America Bridge Fund, established in 1984, is the first-ever loan guarantee fund for MFIs. By providing standby letters of credit, the Bridge Fund enables ACCION's Latin American partner programs to borrow from local banks. ACCION's Financial Services Department helps partner programs obtain emergency funding packages during periods of macroeconomic upheavals and liquidity crises. In addition, the Financial Services Department works with international financial organizations and private investors to secure funding for microfinance institutions.

and outreach are directly related to particular stages of a life cycle pattern of funding, this paper explores the role that individual funding instruments play in determining the success of microfinance institutions.

III. Data

To investigate the optimal capital structure for MFIs, I use panel data on MFIs in Africa, East Asia, Eastern Europe, Latin America, the Middle East, and South Asia for the years 2003 and 2006. The MFI data were collected from individual institutions as reported to MIX Market.[6] Specifically, for the capital structure variables, I use data hand-collected from MFI annual reports supplied to MIX Market. I use data from all of the MFIs with over $US1.3 million in total assets, at least a level 3 diamond disclosure rating on MIX Market, and audited financial statements that are in English, French, or Spanish.[7] As with Cull, Demirgüc-Kunt, and Morduch, (2009), an advantage of the sample is that the MFIs are contained in the sample due in large part to their ability to deliver quality data. A disadvantage is that the data are not representative of all MFIs. However, the institutions collectively serve a large proportion of microfinance customers worldwide. Moreover, I test for and find no evidence of sample selection bias in the data set.[8]

The analysis concentrates on outreach, efficiency, and financial sustainability. Given that the MFI data are collected from MIX Market, I utilize the MIX Market definitions of financial and operational sustainability:[9]

- Operational self-sufficiency measure is defined as

$$\frac{\text{Total financial revenue}}{\text{Financial expense} + \text{ operating expense} + \text{loan loss provision expense}}.$$

- Operational sustainability is defined as having an operational self-sufficiency level of 100% or more.
- Financial sustainability is defined as having an operational self-sufficiency level of 110% or more.

Additional data on country macroeconomic variables (foreign direct investment, GDP, GDP growth, and inflation) were collected from the World Bank key development data and statistics web site.[10]

[6] www.mixmarket.org. MIX Market defines an MFI as "an organization that offers financial services to the very poor."

[7] MIX Market classifies MFIs according to the level of information disclosure provided. Level 1 indicates general information provided. Level 2 indicates level 1 information and outreach and impact data provided. Level 3 indicates level 1–2 information and financial data provided. Level 4 indicates level 1–3 information and audited financial statements provided. Level 5 indicates level 1–4 information and adjusted data provided.

[8] In the robustness checks section (section IVA), I perform a Heckman two-stage estimation procedure to test for sample selection bias.

[9] While I utilize the definitions from our primary data source, I later test the sensitivity of the results to these definitions with an ordered probit model.

[10] http://web.worldbank.org.

TABLE 2.—MICROFINANCE INSTITUTION: DESCRIPTIVE STATISTICS

	Percentage of Sample
Lending methodology	
Individual	37.22
Individual/village	0.45
Individual/group	45.74
Individual/group/village	2.69
Group	7.17
Village	6.73
Charter type	
Bank	10.13
Cooperative or credit union	15.03
NGO	33.39
Nonbank	35.13
Rural bank	3.80
Regulated	65.00
Nonprofit	61.76
Accepts deposits	63.99

While I focus on the largest MFIs in terms of total assets, there is substantial variation in the types of institutions contained in the data set. Tables 2 and 3 provide descriptive and summary statistics for the sample. When these general statistics are broken down by region, we observe some interesting regional differences (see figures 1 to 4). Africa has the highest percentage of unsustainable MFIs (38.02%), the highest percentage of portfolio at risk[11] (7.03 percent), and the lowest average return on assets[12] (0.38%). The East Asia and Pacific region has the lowest percentage of unsustainable MFIs (6.67%). The Eastern Europe and Central Asia region has the highest return on assets (5.25%), the lowest percentage of portfolio at risk (3.16%), and the highest average cost per borrower (US$273.27). South Asia has the lowest average cost per borrower (US$36.83). With respect to capital structure, there do not seem to be any regional patterns in the raw data.[13]

IV. Econometric Analysis

A. Capital Structure and Sustainability

Operational Self-Sufficiency and Financial Sustainability. As a first step, I use the data to test the life cycle theory of MFI financing (discussed in section II) where stages in the life cycle are defined by the number of years that the MFI has been operating (de Sousa-Shields & Frankiewicz, 2004). I divide the sample into three groups corresponding to the de Sousa-Shields and Frankiewicz (2004) life cycle stages (new, young, and mature) and create dummy variables for each of these three stages in order to analyze the relationship between life cycle stage and sustainability. For the life cycle definitions, I use standard benchmarks for new

[11] Portfolio at risk ratio = (Portfolio at risk greater than 30 days)/(gross loan portfolio). Portfolio at Risk Greater Than 30 Days is the value of all loans outstanding that have one or more installments of principal past due more than thirty days. This includes the entire unpaid principal balance, both the past due and future installments but not accrued interest. It does not include loans that have been restructured or rescheduled.

[12] Return on assets = (Net operating income, less taxes)/(period average assets).

[13] The percentages are averages for 2003 and 2006 by region.

TABLE 3.—MFI SUMMARY STATISTICS

Variable		Mean Value	s.d.	Minimum	Maximum
Debt relative to assets (%)	2003	34.64	26.21	0.00	100.00
	2006	5.30	9.68	0.00	55.21
	Full sample	29.86	26.60	0.00	100.00
Deposits relative to assets (%)	2003	21.90	27.92	0.00	100.00
	2006	31.74	28.45	0.00	88.66
	Full sample	24.27	28.32	0.00	100.00
Grants as a % of assets	2003	13.60	28.60	0.00	232.28
	2006	5.91	13.96	0.00	104.10
	Full sample	11.07	25.00	0.00	232.28
Retained earnings as a % of assets	2003	7.37	20.46	−173.97	113.02
	2006	7.75	15.19	−86.90	66.51
	Full sample	7.53	18.45	−173.97	113.02
Share capital as a % of assets	2003	15.48	21.25	0.00	101.34
	2006	20.89	45.71	0.00	337.94
	Full sample	17.55	32.87	0.00	337.94
Assets (US$000)	2003	38,900	231,000	318	3,440,000
	2006	78,400	390,000	2,260	5,500,000
	Full sample	57,200	315,000	318	5,500,000
Return on assets (%)[a]	2003	2.78	8.52	−65.63	23.10
	2006	3.55	7.58	−77.88	23.18
	Full sample	3.19	8.04	−77.88	23.18
Portfolio at risk (%)[b]	2003	5.09	6.08	0.00	32.89
	2006	4.75	7.97	0.00	84.24
	Full sample	4.91	7.12	0.00	84.24
Percentage financially sustainable	2003	59.60	49.15	0.00	100.00
	2006	70.04	45.89	0.00	100.00
	Full sample	64.63	47.85	0.00	100.00
Percentage operationally sustainable	2003	75.76	42.93	0.00	100.00
	2006	87.36	33.28	0.00	100.00
	Full sample	81.36	38.98	0.00	100.00
Percentage unsustainable	2003	24.24	42.93	0.00	100.00
	2006	12.64	33.28	0.00	100.00
	Full sample	18.64	38.98	0.00	100.00
Percentage with no credit rating	2003	69.39	46.16	0.00	100.00
	2006	77.15	42.05	0.00	100.00
	Full sample	73.10	44.38	0.00	100.00
Active borrowers (000s)	2003	63	336	0.15	3,493
	2006	148	719	0.73	6,909
	Full sample	105	557	0.15	6,909
Borrowers below poverty line (%)	2003	48.89	36.75	0.00	100.00
	2006	49.00	42.51	0.00	76.00
	Full sample	48.90	36.66	0.00	100.00
Average cost per borrower (US$)	2003	135.41	140.46	4.00	872.00
	2006	179.23	152.43	3.00	879.00
	Full sample	159.97	148.76	3.00	879.00

[a]Return on assets = (Net operating income, less taxes)/(period average assets).

[b]Portfolio at risk ratio = (Portfolio at risk greater than 30 days)/(gross loan portfolio). Portfolio at risk greater than 30 days is the value of all loans outstanding with one or more installments of principal past due more than thirty days. This includes the entire unpaid principal balance—both past due and future installments but not accrued interest. It does not include loans that have been restructured or rescheduled.

(0–4 years), young (5–8 years), and mature (over 8 years) MFIs. With these benchmarks, 57.3% of the sample is mature, 28.8% of the sample is young, and 13.9% of the sample is new. From the regression results presented in table 4, one initially observes that the life cycle stage variables are significantly related to both operational self-sufficiency and financial sustainability.[14] However, the R^2 in the OLS regression is very low, indicating that this model specification has limited explanatory power.

The results shown in table 4 indicate that age of the MFI is related to operational self-sufficiency. However, if other independent variables are added to the simple regression models, the stage dummy variables are not at all significant.[15] The

[14] Standard errors are adjusted (clustered) to account for the fact that there can be multiple observations for a specific MFI. These results are sensitive to the definitions of each life cycle stage. If the MFIs are grouped based on like characteristics, stages would be defined as follows: new MFIs as MFIs that were established after 1983, young MFIs as MFIs established between 1974 and 1983, and mature MFIs as MFIs established prior to 1974. Using these classifications, 5.4% of the sample would be mature, 6.5% of the sample would be young, and 88.1% new. With this alternative definition, the life cycle stage variables would not be significantly related to either operational self-sufficiency or financial sustainability. If the MFIs are divided into three equal life cycle groups based on asset size, the life cycle stage variables are not significantly related to operational self-sufficiency but are related to financial sustainability.

[15] When the variables debt relative to assets, grants as a percentage of assets, share capital as a percentage of assets, deposits relative to assets, accepts deposits dummy, bank dummy, NGO dummy, log of assets, log of borrowers, log of savers, and year 2006 dummy are added to the regression model, the young stage dummy and the mature stage dummy are not significant, with t-statistics of 0.97 and 0.55, respectively. When these variables are added to the probit model, the young stage dummy and the mature stage dummy are not significant, with z-statistics of 0.97 and 0.58 respectively.

FIGURE 1.—MFI SUSTAINABILITY

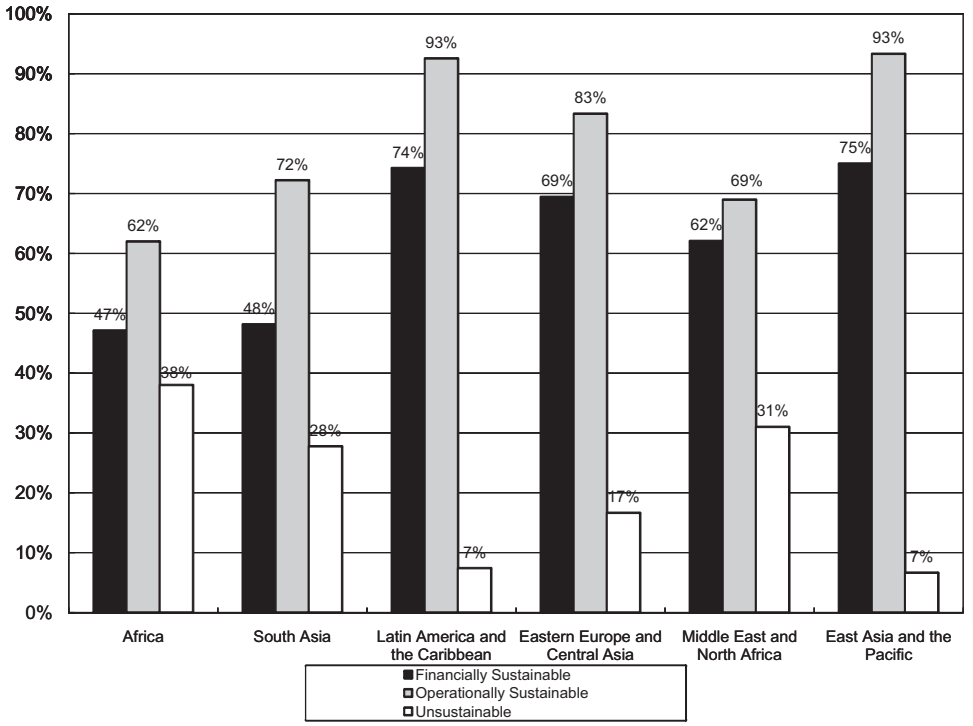
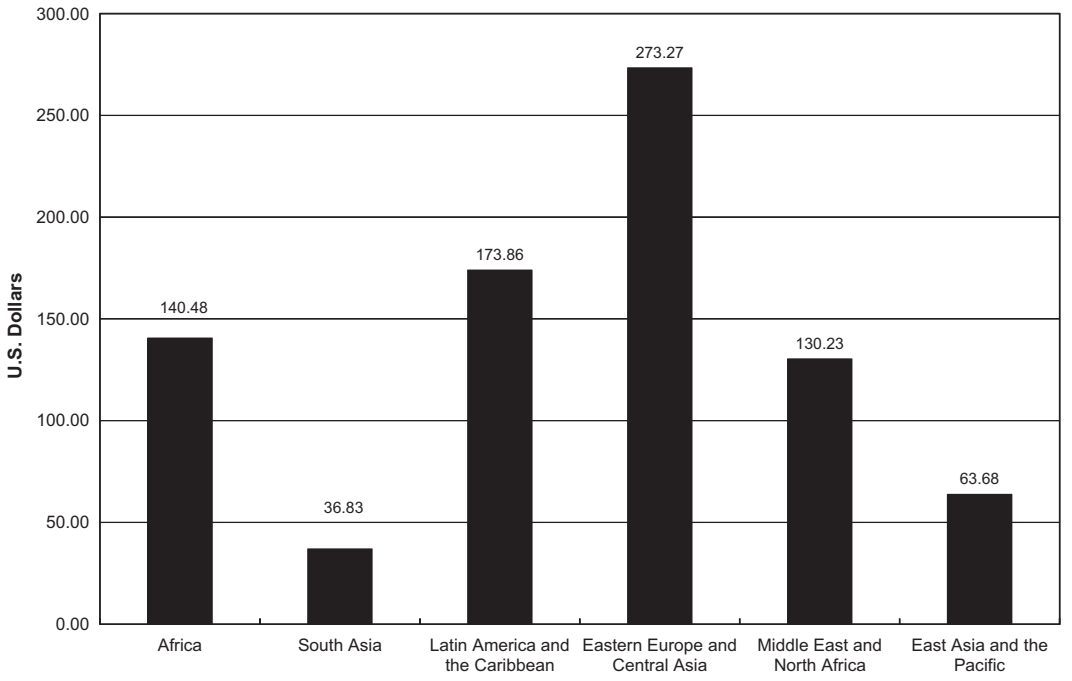


FIGURE 2.—AVERAGE MFI COST PER BORROWER



descriptive statistics in the previous subsection lead us to a more comprehensive model specification to test further the link between sustainability, MFI capital structure, and various MFI characteristics.

Equation (1) is an OLS regression model designed to examine the relationship between the level of operational self-sufficiency and various MFI characteristics. The independent variables include MFI capital structure variables (e.g., debt

FIGURE 3.—MFI PROFITABILITY

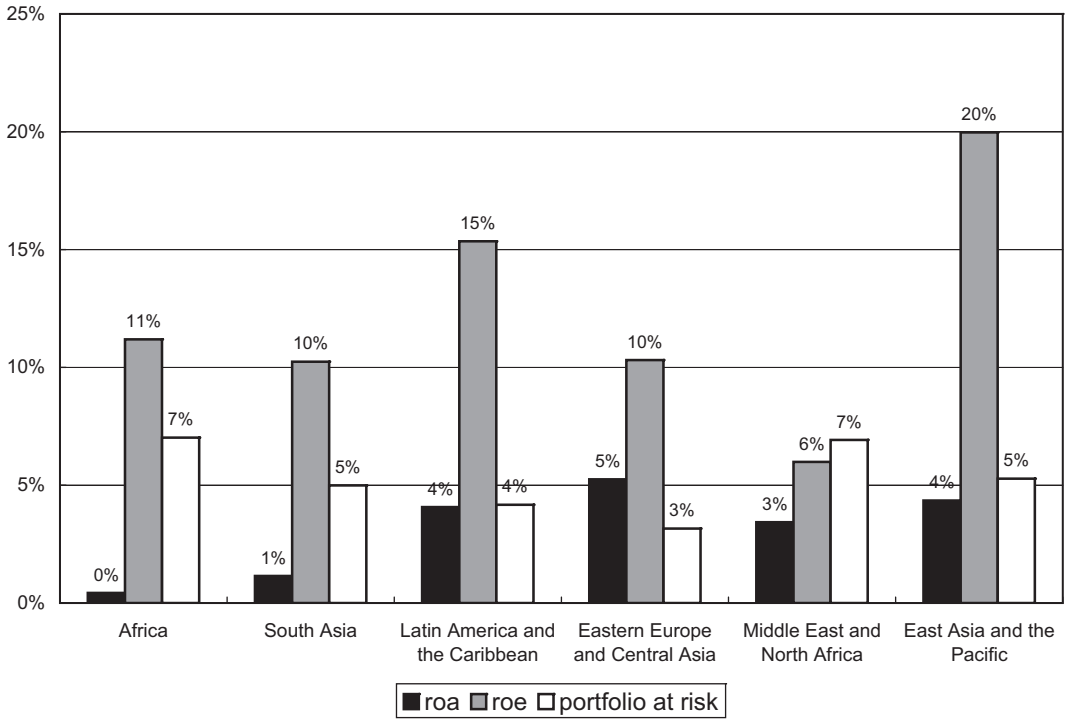


FIGURE 4.—MFI FUNDING SOURCES

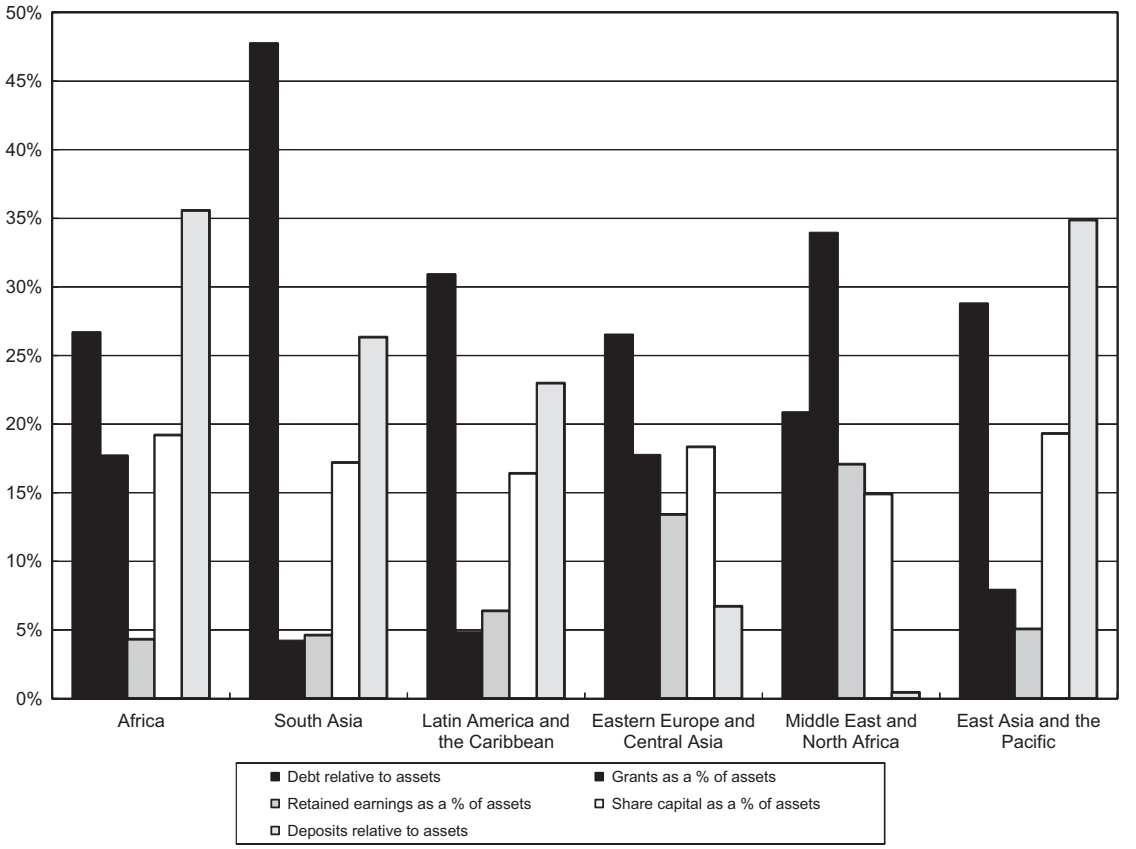


TABLE 4.—LIFE CYCLE THEORY MODELS

Dependent Variable	Operational Self-Sufficiency Regression	Financial Sustainability Probit
Young Stage dummy	15.76	0.43
	(5.10)	(0.17)
Mature stage dummy	56.30	0.74
	(39.64)	(0.17)
Intercept	105.86	−0.15
	(4.46)	(0.15)
Observations: 574		
R^2: 0.0019		
LL: −361.17		

Standard errors in parentheses.

relative to assets,[16] grants as a percent of assets, shareholder capital as a percent of assets, deposits relative to assets),[17] MFI characteristics variables (e.g., a dummy variable for whether the MFI is classified as a bank, a dummy variable for whether the MFI accepts deposits, the MFI age,[18] log of assets, log of number of borrowers, log of number of savers, region dummy variables), and country-level macroeconomic indicators (e.g., foreign direct investment, GDP, and inflation).[19] A detailed description of all of the variables used can be found in appendix A.

$$Operational\ Self-Suff_i = \beta_0 + \sum_{j=1}^{4} \beta_j X + \sum_{k=5}^{22} \beta_k Y + \sum_{l=23}^{27} \beta_l Z + \epsilon_i, \quad (1)$$

where X represents MFI capital structure variables, Y represents MFI characteristic variables, and Z represents country-level macroeconomic indicators.

Table 5 shows the results of equation (1).[20] In table 5, in each version of the OLS regression, we see that log of assets is highly significant and positively related to operational self-sufficiency. This indicates that larger institutions, as measured by assets, have increased self-sufficiency likely associated with delivery of services to a larger group of clients or with extending credit in the form of larger loans to clients.

Grants as a percentage of assets is significant at the 1% level and negatively related to operational self-sufficiency in versions A, B, and C. It is negative and significant at the 5% level in version D. From this result, we see that source of funding is important. Subsidized funding, rather than having a positive impact on operational self-sufficiency, has a negative effect. Share capital as a percentage of assets also is significant at the 1% level and negatively related to operational self-sufficiency in versions A, B, and C. Share capital is negative and significant at the 5% level in version D. Debt relative to assets is negative and significant only in version A of equation (1). The NGO dummy variable is significant with respect to the relationship with operational self-sufficiency. However, the significance of the NGO dummy variable disappears in version D of equation (1). The no credit rating dummy variable is negative and significant in version C at the 10% level. None of the regional dummy variables are significant in versions B, C, and D. The country-level macroeconomic indicator variables are not highly significant in any of the versions of the regression.[21]

Given the discussion above, there could be a concern that operational self-sufficiency is actually affected by the type of borrower, not the number of borrowers. Perhaps servicing lower-income clients is more costly and hence drives down operational self-sufficiency. For a smaller sample of the MFIs, there are data on the percentage of clients below the poverty line.[22] I do not include this variable in the main model specification since there are data for less than 20% of the MFIs in the sample. The small sample size decreases the power of the test. Yet we still can use this smaller sample to give some confirmation that adding the percentage of clients below the poverty line variable does not significantly alter our results in table 5. When added to equation (1), the percentage of clients below the poverty line variable is not significant.[23] Notably, in the small sample specification, grants as a percentage of assets still is significant at the 1% level and negatively related to operational self-sufficiency.[24]

MFI sustainability is generally considered at two levels: operational sustainability and financial sustainability (Morduch, 1999). Using the MIX Market definitions presented in section III, I also analyze the effect of capital structure variables on an MFI's ability to cross that key threshold for which it could survive without obtaining capital and other inputs at concessional rather than market rates. Equation (2) is a probit model in which the dependent variable is whether an MFI is financially sustainable and the independent variables are MFI capital structure variables, MFI characteristic variables, and country level macroeconomic indicators:

$$Financial\ Sustainability\ Dummy_i = \beta_0 + \sum_{j=1}^{4} \beta_j X + \sum_{k=5}^{22} \beta_k Y + \sum_{l=23}^{27} \beta_l Z + \epsilon_i, \quad (2)$$

[16] Soft loans are not included in debt since MIX Market adjusts the operational self-sufficiency measure to account for soft loans.

[17] Retained earnings is the omitted variable.

[18] I also test the model using a nonlinear transformation of the age variable (i.e., age squared) and find consistent results.

[19] I include these macroeconomic variables since there is preliminary evidence (Ahlin & Lin, 2006) that macroeconomic factors could have an affect on MFI performance. I lag the macroeconomic factors by one year unless otherwise indicated. I also test the model using contemporaneous macroeconomic factors and find consistent results.

[20] All standard errors are in parentheses and are adjusted (clustered) to account for the fact that there can be multiple observations for a specific MFI. Only key coefficients are presented. However, the full set of results is available on request.

[21] I check for the existence of multicollinearity between the macroeconomic indicator variables using the variance inflation factor (VIF). $VIF_j < 5\ \forall j$, suggesting there is no evidence of multicollinearity. When I compare the samples used in versions C and D, a Chow test F-statistic of 1.56 indicates that one cannot reject the hypothesis of structural stability between the two samples (99th percentile critical value $F_{20,100} = 2.07$).

[22] MIX Market defines "below the poverty line" as living on less than US$2 a day.

[23] The variable has a coefficient of 0.06 with a standard error of 0.28.

[24] The variable coefficient is −104.32 with a standard error of 25.37.

TABLE 5.—KEY COEFFICIENTS OF OPERATIONAL SELF-SUFFICIENCY REGRESSION

Dependent Variable: Operational Self-Sufficiency	A		B		C		D	
	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.
Debt relative to assets	−38.8198***	12.6710	−18.1370	13.3127	−17.3849	14.3360	−11.2095	15.4327
Deposits relative to assets	−44.4106**	19.8046	−25.4233	19.8527	−20.7064	18.1340	−17.2139	19.1679
Grants as a percentage of assets	−43.4290***	10.2600	−31.0312***	10.3410	−33.5888***	10.9490	−26.6238**	11.4537
Share capital as a percentage of assets	−64.4035***	13.8761	−52.9884***	12.8519	−47.4221***	13.5109	−28.4187**	14.4939
Log of assets	7.1177***	2.5950	7.7599***	3.1003	8.4054***	3.3879	8.9628**	4.1079
Accepts deposits	−1.2032	7.6419	2.6782	7.8982	5.3158	7.6912	2.4180	8.1947
Bank dummy	2.9584	5.1975	−3.4314	6.6085	−3.2189	6.7302	2.5767	8.8354
NGO dummy	19.3164***	5.6367	21.1447***	5.9389	22.3973***	6.8681	9.2786	9.3968
MFI age	−0.0121	0.2048	−0.1552	0.2198	−0.0640	0.2164	0.0457	0.2887
Log of number of borrowers	1.6802	2.2653	1.5092	2.5462	0.4893	2.6933	0.0487	3.4629
Log of number of savers	0.1029	0.8883	0.2420	0.9443	−0.4115	0.8614	−0.8674	1.0101
Year 2006 dummy	−21.7520**	11.0839	−10.4048	11.8190	−4.5893	11.3370	−3.1860	11.4115
					0.5424	6.1444	0.4999	8.6548
					−9.0013*	5.2401	−8.7342	6.3280
							11.5255	7.7732
							4.7191	6.6048
							−12.6727	16.7614
Region control variables	No		Yes		Yes		Yes	
Macroeconomic indicator								
Control variables	No		Yes		Yes		Yes	
Observations	210		200		184		140	
R^2	0.3251		0.3514		0.3748		0.3093	

Significant at the ***1% level, **5% level, and *10% level.

where X represents MFI capital structure variables, Y represents MFI characteristic variables, and Z represents country-level macroeconomic indicators.

The probit model results are consistent with the OLS regression results. Log of assets is positively related to financial sustainability. Both grants as a percentage of assets and share capital as a percentage of assets are negatively related to financial sustainability. The NGO dummy variable is positively related to financial sustainability. The regulated dummy variable and the no-credit rating dummy variable are negative. The region dummy variables and the country-level macroeconomic indicator variables are not at all significant in any of the versions of the probit model. The full set of results can be found in table 11 in appendix B in the online supplement.[25] (Tables 11 to 15 are in appendix B.)

I find strong empirical support for the notion that asset size is significantly and positively related to self-sufficiency.[26] Also, there are capital structure variables that are strongly associated with self-sufficiency. Grants as a percentage of assets and share capital as a percentage of assets are negatively and significantly related to self-sufficiency. The fact that grants relative to assets is negatively related to self-sufficiency is a particularly meaningful result given that it supports the profit-incentive view that MFIs should rely less on grants, soft loans, and other types of donor funds. This result, as I demonstrate in the next section, is robust to different estimation approaches at meaningful levels of both magnitude and statistical significance. The significant and negative relationship of share capital as a percentage of assets is consistent with Osterloh and Barrett (2007), who show that financial service association (FSA) microfinance models, which harness local equity capital by selling shares (which confer membership that includes access to loans and savings services), do not demonstrate sound screening and lending practices. Thus, share capital that includes local equity capital would not generate the profit incentive efficiencies of the typical lending institution.[27]

Robustness checks. *Fixed effects.* Since regional differences with respect to MFI sustainability and profitability are reflected in the raw data, I perform a region fixed-effects regression to control for any cultural, political, or environmental differences by region that may affect operational self-sufficiency. The results of the fixed-effects regression are consistent with the previous results in that log of assets is positively and significantly (at the 1% level) associated with increased operational self-sufficiency. Also, grants as a percentage of assets and share capital as a percentage of assets are significant at the 1% level and negatively related to operational self-sufficiency (see table 12 in appendix B). I also perform a country fixed-effects regression to control

[25] As a robustness check, I test the sensitivity of the results to the definitions of operational and financial sustainability by using an ordered probit model. With this specification, the dependent variable is a categorical variable in which Y = 0 if the MFI is unsustainable, Y = 1 if the MFI is only operationally sustainable, and Y = 2 if the MFI is financially sustainable. The independent variables are MFI capital structure variables, MFI characteristic variables, and country-level macroeconomic indicators. The coefficients of the ordered probit regression are consistent with the results in table 11.

[26] As a robustness check, I regress the MFI capital structure variables on the log of assets and find no significant relationship between the capital structure variables and size of assets. The capital structure variables had the following t-statistics: debt relative to assets (−0.13), deposits relative to assets (1.20), grants as a percentage of assets (−0.64), and share capital as a percentage of assets (−0.16).

[27] Equity holders that are not also borrowers have significant control rights and profit motives. The share capital variable includes both traditional and local equity capital.

for specific country factors, like regulation and government stability, that could affect operational self-sufficiency. These results, also presented in table 12, show that grants as a percentage of assets and share capital as a percentage of assets are both negatively related to operational self-sufficiency and highly significant (p-values of 0.0060 and 0.0050, respectively). Log of assets is positive and significant at the 5% level. I also perform an MFI fixed-effects regression. However, with so few degrees of freedom, none of the coefficients are significant in the MFI fixed-effects regression.

Random effects. While a fixed-effects model can account for regional, country, or MFI differences, a random-effects model may be better suited to the data. A random-effects model could control for the potential correlation that could exist between regressors and for unobservable individual country effects. As with our original model, grants as a percentage of assets and share capital as a percentage of assets are negatively related to operational self-sufficiency and are significant at the 1% level. Debt relative to assets is also negative and significant at the 5% level. The results from this random-effects model are aligned with our original model specification and reinforce the view that capital structure is a key issue with respect to operational self-sufficiency. However, a Hausman specification test suggests that a fixed-effect specification is the more appropriate model.

Other performance measures. In this section, I focus on operational self-sufficiency since it is typically used as the standard measure of MFI performance. However, as with general lending institutions, there are other metrics by which performance and institutional health are measured. For my sample of MFIs, I also analyze the relationship between debt-to-equity ratio and the capital structure variables as well as return on assets (ROA) and the capital structure variables.[28] Both the regression using debt-to-equity as the dependent variable and using ROA as the dependent variable generate results consistent with table 5 (See table 13 in appendix B).

MFI charter type. For a sample of MFIs similar to the one used here, Cull et al. (2009) analyze differences in costs, loan size, and so forth by type of MFI. Consequently, another source of concern could be the potentially endogenous relationship between operational self-sufficiency, capital structure, and charter type of the MFI (NGO, bank, nonbank financial institution, credit union). While I do control for charter type in equations (1) and (2) with dummy variables, I look further at this issue below.

Table 6 presents selected MFI summary statistics by MFI charter type.[29] Additionally, I segment the data based on charter type and perform an OLS regression using each subsample. The results shown in table 7 show that grants as a percentage of assets and share capital as a percentage of assets are negative and significant at the 1% level in both the bank subsample and the NGO subsample. Grants as a percentage of assets is negative in both the nonbank and credit union subsamples but is not significant. Share capital as a percentage of assets is negative and significant at the 1% level in the nonbank subsample. While the point estimates for share capital as a percentage of assets is positive in the credit union subsample, it is not significant with a p-value of 0.8330. This provides further support for the idea that the relationship between grants as a percentage of assets and operational self-sufficiency is not solely driven by the fact that NGOs may operate under a mandate to serve riskier segments of the population.

TABLE 6.—SELECT SUMMARY STATISTICS BY MFI CHARTER TYPE

	Mean Value			
	Bank	Nonbank	Credit Union	NGO
Debt relative to assets (%)	26.84	32.52	15.69	33.09
Deposits relative to assets (%)	44.93	17.22	51.93	8.21
Grants as a percentage of assets	2.43	12.45	3.11	16.39
Share capital as a percentage of assets	29.15	14.09	18.19	15.09
Assets (US$000)	266,000	30,600	54,300	16,600
Portfolio at risk (%)	4.80	4.33	6.82	4.16
Accepts deposits (%)	96.00	64.29	90.00	34.38
MFI age	13.55	9.67	14.66	12.49
Active borrowers	514,360	47,367	19,247	90,479
Savers	1,185,671	17,013	62,867	25,430

Survivor bias. Three aspects of the data set necessitate addressing the issue of sample selection bias: participation in the database is voluntary, MFIs are contained in the sample due in large part to their ability to deliver quality data, and the sample contains the larger MFIs (total assets size greater than US$1.3 million). Given the possibility of life cycle funding processes, survivor bias could exist. One could conjecture that some MFIs were able to become part of the sample due to receiving a particular type of funding at an earlier stage, enabling them to survive and grow in asset size. I test for survivor bias to enable one to draw conclusions about the larger population of all MFIs. Under the assumption that MFI age and asset size do determine if an MFI is included in the data set, the Heckman two-stage procedure still yields results consistent with table 5. Thus, there is no evidence of sample selection bias.[30]

Grant timing, MFI stages, and the economic environment. Scholars and practitioners alike have advanced the idea that grants are most beneficial when used to fund start-up costs and younger MFIs (Morduch, 2005). Hence, I directly analyze the relationship between an MFI receiving grant funding during an early stage and both concurrent and subsequent performance. When I add interactions terms to the main model to account for MFI stage and grant funding (Received grants $\times$ New Stage; Received Grants $\times$ Young Stage), there is a

[28] Both debt-to-equity and ROA are standard measures for the long-term health of an institution. Debt-to-equity ratios are used to provide an indication of the long-term solvency of a firm. ROA is used to measure how effectively a firm's assets are being used to generate profits.

[29] Table 14 in appendix B shows that MFI type is correlated with deposits relative to assets but is not highly correlated with any other capital structure variables.

[30] The grants as a percentage of assets coefficient is negative, with a p-value of 0.001. Additional results available on request.

TABLE 7.—OPERATIONAL SELF-SUFFICIENCY REGRESSION BY CHARTER TYPE

	Bank	NGO	Nonbank	Credit Union
Debt relative to assets	−25.5103	−39.3206*	−8.1103	−38.3561
	(21.0320)	(20.1038)	(17.2303)	(100.7340)
Deposits relative to assets	−19.5099	−71.8021	−23.0904	−63.5387
	(18.7632)	(67.8491)	(27.6688)	(72.8929)
Grants as a percentage of assets	−5,703.8600***	−38.0953***	−24.5055	−53.6009
	(752.8742)	(11.1259)	(21.6072)	(261.4397)
Share capital as a percentage of assets	−85.9303**	−51.6702***	−44.2677***	46.3410
	(33.5739)	(17.7955)	(17.5209)	(216.9684)
Log of assets	5.9476*	9.2266*	18.3874***	−10.2047
	(3.4441)	(5.0324)	(5.1123)	(7.0308)
Accepts deposits	20.8661*	4.1089	0.4306	−163.3288***
	(10.9216)	(13.3282)	(9.4724)	(49.5447)
MFI age	0.0816	−1.1951	−0.6048	−0.0413
	(0.1308)	(0.6715)	(0.7504)	(0.5102)
Log of number of borrowers	−8.5973***	2.5522	7.8972**	8.0879
	(2.7816)	(4.2563)	(3.5425)	(5.9325)
Log of number of savers	−4.6611***	0.8550	−1.1692	26.2520**
	(1.3526)	(1.9417)	(1.1261)	(12.4344)
Year 2006 dummy	−9.7507	10.0215	−42.6822*	−12.8543
	(12.3768)	(18.6536)	(22.8308)	(17.6950)
Macroeconomic indicator				
Control variables	Yes	Yes	Yes	Yes
Observations	25	71	68	21
R^2	0.9730	0.4022	0.5226	0.9581

Significant at the ***1% level, **5% level, and *10% level. Standard errors in parentheses.

negative but nonsignificant relationship between concurrent operational self-sufficiency and new or young MFIs receiving grants. Conversely, there is a positive relationship between subsequent performance and an MFI receiving grants at an early stage (Previously Received Grants × New Stage; Previously Received Grants × Young Stage). However, empirical support for the connection between previous grant funding and MFI stage is not strong since there are a limited number of observations for previous grant funding in the data set and the results are not significant.

The timing of receiving grants with regard to country economic crises also could influence operational self-sufficiency. If the funding is received during a difficult economic period, this could affect the chances for MFI survival. Using country real exchange rate devaluations as a proxy for country economic crises in the main model, I analyze the relationship between operational self-sufficiency and an MFI receiving grant funding during an economic crisis in its country.[31] I investigate the relationship by testing a number of different proxies for country economic difficulties: (a) any currency devaluation in the current year, (b) any currency devaluation in the previous year, (c) a 5% or greater currency devaluation in the current year, (d) a 5% or greater currency devaluation in the previous year, (e) a 10% or greater currency devaluation in the current year, and (f) a 10% or greater currency devaluation in the previous year. Generally there is a negative relationship between an MFI receiving grant funding during an economic crisis in its country and operational self-sufficiency. This relationship is significant for the 10% or greater currency devaluation in the previous-year dummy variable (p-value of 0.072) and any currency devaluation in the current-year dummy variable (p-value of 0.096). It is weakly significant for the 5% or greater currency devaluation in the current-year dummy variable (p-value of 0.122) and weakly significant for the 5% or greater currency devaluation in the previous year dummy variable (p-value of 0.132).[32]

Instrumental variables two-stage least-squares regression. While the previous analyses have enabled me to draw a clear link between grants as a percentage of assets and MFI operational self-sufficiency, I have not yet established a causal relationship between these two variables. If grants and operational self-sufficiency are in fact jointly determined by some unobserved variable, then an instrumental variables (IV) two-stage least-squares approach can break the simultaneity circle. Similarly, an IV two-stage least-squares approach can address the question of causality for share capital as a percentage of assets and operational self-sufficiency.

Regression and correlation results demonstrate that the country-level macroeconomic indicators are not correlated with operational self-sufficiency.[33] However, intuitively it makes sense that macroeconomic variables like GDP growth affect investment in a country and thus the amount of money that flows to businesses in the form of grants or equity investments. I find the GDP growth lagged variable and the inflation

[31] Currency devaluation information was obtained from the World Development Indicators data compiled by the World Bank (http://data.worldbank.org/indicator). Currency devaluation is a widely use measure to identify country economic difficulties (see Frankel & Rose, 1996).

[32] Additional results available on request.

[33] I regress the macroeconomic indicator variables on the operational self-sufficiency measure and find no significant variables. Also, the VIFs indicate that the insignificant t-ratios are not due to multicollinearity.

TABLE 8.—INSTRUMENTAL VARIABLES TWO-STAGE LEAST-SQUARES REGRESSION

	First Stage				Second Stage	
	Coefficient	s.e.	Coefficient	s.e.	Coefficient	s.e.
Grants as a percentage of assets						
Share capital as a percentage of assets						
Debt relative to assets	−0.4879***	0.0958	−0.2494***	0.0749	−107.5212*	59.4052
Deposits relative to assets	−0.3530**	0.1521	−0.1635	0.1189	−212.7763	296.5451
Log of assets	−0.0151	0.0218	0.0155	0.0171	−96.9639	85.9285
Accepts deposits	0.1435**	0.0655	−0.0347	0.0512	−61.1537	60.0598
Bank dummy	−0.0763	0.0715	0.0511	0.0559	7.1941	5.7513
NGO dummy	0.0326	0.0644	0.0649	0.0503	2.6738	16.0102
MFI age	−0.0002	0.0020	−0.0026	0.0016	7.8708	18.4380
Log of number of borrowers	0.0304	0.0193	−0.0266	0.0150	22.5778	23.4611
Log of number of savers	−0.0117	0.0082	0.0013	0.0064	−0.3997	0.8234
Year 2006 dummy	−0.2312**	0.1027	−0.1676	0.0803	0.0862	8.4316
Regulated dummy	−0.0128	0.0556	−0.0313	0.0434	−1.8101	1.5569
No credit rating Dummy	−0.0587	0.0455	0.0434	0.0356	−52.1321	57.5951
Nonprofit dummy	−0.0293	0.0689	−0.1133**	0.0538	−4.0417	12.4043
MFI country GDP growth	−0.0109	0.0102	0.0181**	0.0080	−4.4934	13.7647
MFI country inflation	−0.0014	0.0063	−0.0001	0.0049	−11.5280	35.0436
MFI country GDP growth—*lagged*	0.0171*	0.0098	−0.0048	0.0077	2.9854	4.8850
MFI country inflation—*lagged*	0.0120***	0.0049	0.0002	0.0038	0.2104	0.8891
Intercept	0.2955	0.2850	0.2974	0.2227	97.5827	99.0008
Observations	170		170		170	
R^2	0.4208		0.5085		0.9080	

Significant at the ***1% level, **5% level, and *10% level.

lagged variable to be suitable instruments for grants as a percentage of assets and share capital as a percentage of assets. I next perform a two-stage least-squares regression using both lagged GDP growth and lagged inflation as instruments for MFI grants as a percentage of assets and share capital as a percentage of assets (see table 8).[34] In the second stage, grants as a percentage of assets is negative and has a p-value of 0.0700, indicating that having grants as a larger percentage of assets decreases the operational self-sufficiency of MFIs.[35] Share capital as a percentage of assets is negative but not at all significant with a p-value of 0.4730.

B. *Capital Structure and Costs*

One of the primary findings in tables 5 and 8 is that grants as a percentage of assets is negatively related to operational self-sufficiency. While I have addressed the concern that grants as a percentage of assets was serving as a proxy for servicing more costly, lower-income borrowers, it is still important to test the connection between capital structure and cost per borrower. I use the following OLS regression model to test the link between cost per borrower, MFI capital structure, and MFI characteristics:

[34] To further support the assertion that lagged GDP growth and inflaction are uncorrelated with financial revenues, financial and operating expenses and loan loss provisions, I also include the contemporaneous (nonlagged) values of GDP growth and inflation as explanatory variables. In the first-stage regressions, an underidentification test rejects the null hypothesis of underidentification.

[35] Given that I used more than one instrument, I perform a formal overidentification test to ensure that my instruments are not direct determinants of operational self-sufficiency and find no overidentifying restrictions.

TABLE 9.—AVERAGE COST PER MFI BORROWER REGRESSION: KEY COEFFICIENTS

Dependent Variable: Cost per Borrower	Coefficient	s.e.
Debt relative to assets	10.89	55.75
Deposits relative to assets	−12.46	79.57
Grants as a percentage of assets	60.63*	32.59
Share capital as a percentage of assets	92.69	56.82
Log of assets	11.15	8.64
Accepts deposits dummy	1.94	27.85
Bank dummy	28.10	52.43
NGO dummy	−35.62	36.13
MFI age	0.84	0.99
Log of number of savers	−1.65	3.81
Year 2006 dummy	60.28	53.85
Regulated dummy	51.84**	24.66
No credit rating dummy	−9.61	22.76
Nonprofit dummy	3.70	29.03
Group lending dummy	0.93	18.85
Securitization dummy	−83.20	85.10
Region control variables	Yes	
Macroeconomic indicator control variables	Yes	
Observations	118	
R^2	0.4187	

Significant at the ***1% level, **5% level, and *10% level.

$$COSTBORROWER_i = \beta_0 + \sum_{j=1}^{4} \beta_j X + \sum_{k=5}^{22} \beta_k Y + \sum_{l=23}^{27} \beta_l Z + \epsilon_i, \quad (3)$$

where X represents MFI capital structure variables, Y represents MFI characteristic variables, and Z represents country-level macroeconomic indicators.

Table 9 shows the results of equation (3). Grants as a percentage of assets is positively related to cost per borrower

TABLE 10.—CAPITAL STRUCTURE AND OUTREACH REGRESSIONS: KEY COEFFICIENTS

Dependent Variable: Log of Number of Borrowers	Coefficient	s.e.
Debt relative to assets	0.19	0.57
Deposits relative to assets	0.31	0.68
Grants as a percentage of assets	0.01	0.31
Share capital as a percentage of Assets	−0.20	0.41
Log of assets	0.77***	0.10
Operational self-sufficiency	0.00	0.00
Accepts deposits dummy	−0.42	0.28
Bank dummy	−0.21	0.39
NGO dummy	0.72***	0.28
MFI age	−0.01	0.01
Log of number of savers	0.01	0.03
Year 2006 dummy	0.19	0.45
Regulated dummy	−0.11	0.24
No credit rating Dummy	0.02	0.19
Nonprofit dummy	−0.20	0.27
Group lending dummy	0.37***	0.15
Securitization dummy	0.46	0.75
Region control variables	Yes	
Macroeconomic indicator control variables	Yes	
Observations	140	
R^2	0.7242	

Significant at the ***1% level, **5% level, *10% level.

and has a p-value of 0.065. This provides some further support for the idea that reliance on donor funds eliminates the motivation for MFIs to operate efficiently and provides evidence that MFIs are not currently realizing efficiencies due to economies of scale. Additionally, there is evidence that grants as a percentage of assets is positively and significantly linked to an MFI having a greater portfolio at risk ratio (see table 15 in appendix B).

C. *Capital Structure and Outreach*

When attempting to identify changes in capital structure that could improve MFI sustainability, it is important not to do so in a vacuum. If, for instance, grants negatively affected sustainability but enabled MFIs to expand their outreach such that they can loan to more poor people, then that effect should be considered when developing any normative implications from the analysis. With this in mind, I use an OLS model to look at the relationship between the identified independent variables and the number of MFI borrowers,

$$BORROWERS_i = \beta_0 + \sum_{j=1}^{4} \beta_j X + \sum_{k=5}^{22} \beta_k Y + \sum_{l=23}^{27} \beta_l Z + \epsilon_i, \quad (4)$$

where X represents MFI capital structure variables, Y represents MFI characteristic variables, and Z represents country-level macroeconomic indicators. The dependent variable is the log of the number of MFI borrowers.

From table 10, we see that the log of assets is positively related to number of borrowers, but there is no significant relationship between any of the capital structure variables and the number of borrowers of an MFI. Additionally, for a smaller sample of MFIs, I analyze the relationship between an MFI receiving donor funds and loaning money to the more desperately poor. Using "percentage of clients below the poverty line" as the dependent variable in equation (4), I test whether there is a link between grants as a percentage of assets and the type of MFI outreach. Since the data are for less than 20% of the MFIs in the sample, the standard errors are large. Nonetheless, grants as a percentage of assets is negatively related to percent of very poor borrowers with a p-value of 0.3760.

V. Conclusion

While most information on the capital structure of MFIs is highly fragmented, this paper attempts to synthesize the information to better understand the link between capital structure and MFI performance. The life cycle theory is the most popular explanation of the link between capital structure, sustainability, efficiency, and outreach. However, it does not seem to tell the entire story with respect to MFI financing. The life cycle model has little explanatory power, while other economic and financial variables explain a great deal.

Various factors other than life cycle stage seem to be associated with MFI performance. My results indicate that the size of an MFI's assets and an MFI's capital structure are associated with performance. I find that for MFIs, asset size does matter in terms of both sustainability and outreach. Grants as a percentage of assets is significant and negatively related to sustainability but is positively related to MFI cost per borrower. Using an IV analysis, I also find causal evidence to support the assertion that the use of grants drives down operational self-sufficiency. This reinforces the view that the long-term use of grants may be related to inefficient operations due to lack of competitive pressures associated with attracting market funding. Notably, the results do not indicate that grants are related to greater or more costly outreach. Thus, grants could hinder the development of MFIs into competitive, efficient, sustainable operations. Many development and donor organizations already believe that only by weaning off donor dependency and adopting a commercial orientation can these MFIs truly attract the capital and savings base they need to scale up their microloan portfolios, increase sustainability, lower lending rates, increase outreach, and start meeting the demand. To address the capital constraint issues of most MFIs, "smart subsidies" or innovative financing instruments, or both, may be required for larger MFIs.[36]

Additionally, the findings can provide some useful insights that could have policy implications for MFIs and for lending institutions in general. During times of financial crises, in which grant (bailout) money can become increasingly more

[36] Morduch (2005) defines "smart subsidies" as "well-designed subsidies that can potentially 'crowd in' donor funds. Particular emphasis is put on subsidies that are (1) transparent, (2) rule-bound, and (3) time-limited."

available, lending institutions, governments, and donor agencies alike should be aware of the potential negative effects of long-term grants on lending institution sustainability and efficiency. Littlefield and Kneiding (2009) and others champion the idea that increased funding for MFIs during times of economic crisis is necessary but should be short term in nature. This view is reinforced by the findings of this paper, which demonstrate that grants as a percent of assets decrease operational self-sufficiency.

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