



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Exclusive finance: How unmanaged systemic risk continues to limit
financial services for the poor in a booming sector

Benjamin Collier

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's
2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013.

Copyright 2013 by Benjamin Collier. All rights reserved. Readers may make verbatim copies of this
document for non-commercial purposes by any means, provided that this copyright notice appears
on all such copies.

1 Introduction

This paper considers the influence of international investors and prudential banking standards on the management of systemic risk among financial intermediaries (FIs) providing inclusive finance in developing countries.¹ Inclusive finance describes the provision of financial services to the poor and other marginalized groups typically underserved by financial markets. While inclusive finance intermediaries (IFIs) tend to be evaluated with protocols created for developed country banks, they differ dramatically from those counterparts due to the innovative steps IFIs take to reach markets traditionally thought inviable. Additionally, the context of developing countries alters the systemic risks to which IFIs are vulnerable. Three of the most important systemic risks are price instability such as inflation, political intervention and instability, and natural disasters. Because of the strong, negative relationship between vulnerability and development, public and private policies that do not support the management of systemic risks migrate investment toward the most resilient poor, those that have the greatest chance of participating in traditional financial markets.

Regarding banking regulation and supervision, overwhelmingly developing countries have implemented the Basel Accords to manage systemic credit risks; however, these standards are limitedly effective for IFIs because they differ so greatly from the FIs for whom they were designed. Two significant limitations of this approach emerge. First, as applied to IFIs, the Basel Accords are insensitive to the risks of IFIs and so do not have the capacity to align private and public interests in risk taking. Using a sample of over 900 IFIs, we demonstrate that regulation does not meaningfully influence the capital reserves held by IFIs. Second, the Accords motivate IFIs to rely on minimum capital requirements to manage systemic risk, a management strategy that is costly but limitedly effective when compared to alternatives. Because IFIs take on substantial risk, a management strategy heavily focused on reserving notably reduces the size of IFIs, limiting the expansion of credit markets and the motivation of IFIs to mobilize savings deposits. Moreover, when systemic shocks occur, reliance on capital reserves leads lenders to contract credit after a severe event. Thus, for events such as natural disasters, this approach causes credit markets to shrink precisely when communities need them to grow to finance rebuilding and recovery. In this context, the limited capacity to manage disasters leads many IFIs to avoid lending to vulnerable groups, perpetuating financial exclusion.

In the absence of risk-sensitive regulation, the market motivates systemic risk management. Our results show that higher debt financing costs lead IFIs to hold larger capital reserves. A handful of development banks and socially oriented investment funds guide international investments in inclusive finance. Many of these investors also rely on developed country credit risk protocols to assess developing country IFIs. While their objective is to do good, their scope is more limited than that of regulating supervisors as they must balance social and financial returns. As a result, these investors face difficulty finding investment-worthy opportunities, leading them to concentrate funds in a small number of IFIs in a few countries. Because these investors are few in number

¹We intend to use the term *developing countries* to apply to all countries except developed countries — that is, developing countries include transition and emerging economies. While a precise list of developed countries is not required for this paper, we refer readers to jurisdictions classified as Advanced Economies by the International Monetary Fund (2013) as an illustrative list of developed countries.

and reside in influential jurisdictions in Western Europe and North America, through collaboration they may have the greatest ability to change both private and public policy approaches to inclusive finance. Evidence of this influence seems to be emerging such as the G-20's commitment to financial inclusion, officially begun in Pittsburgh in 2009.

Systemic shocks can be better managed. We recommend a set of banking policies for disaster risk that, if adopted by regulating supervisors and the market, are likely to increase the outreach and sustainability of inclusive finance in many regions. Rather than relying so heavily on capital reserves, supervision that recognizes the benefits of diversification and motivates, when possible, IFIs to transfer severe systemic risks internationally would better serve public and private interests.

This paper is structured as follows. First, we discuss the Basel Accords and their widespread adoption. Second, we review the characteristics of inclusive finance in developing countries and the systemic risks to which it is quite vulnerable. We give special attention to natural disaster risk because it is almost entirely overlooked in developed country assessments of risk and strategies used by IFIs tend to increase their vulnerability to disasters. Third, we examine the determinants of the capital reserves of IFIs. Fourth, we delve into the limitations of current regulatory standards. Finally, we offer recommendations for improving the supervision and enhancing the risk management strategies of IFIs.

2 The Basel Accords and international standards

International banking standards are guided by the Basel Accords. The Basel Committee develops banking regulatory frameworks intended to improve the quality of banking supervision and create continuity across jurisdictions and includes members from 27 middle and high income countries (Basel Committee on Banking Supervision, BCBS, 2011a). The Committee notes that the standards adopted by any jurisdiction are the responsibility of that jurisdiction's policymakers.

The Basel Accords are primarily focused on managing systemic losses from shocks such as a macroeconomic crisis through minimum capital requirements. These requirements are a balance sheet identity in which a certain amount of capital (e.g., equity) must be associated with each asset bearing risk that is held by the FI. These requirements create a buffer against insolvency as portfolio-level losses reduce capital.

The Basel Accords were developed with large international banks housed in developed countries in mind, and they are updated to address the evolving risks faced by these large banks and the shortcomings of the previous versions of the Accords. For example, Basel II codified the methods the most advanced international FIs used to manage risk (Rochet, 2005; Santos, 2001), and Basel III is a response to the evolution of the financial sector in developed countries (Blundell-Wignall et al., 2010). Financial services in developed countries are marked by an increased integration with capital markets, changing the structure of assets, liabilities, and off-balance sheet obligations and the associated risks.

More generally, the history of banking policy reveals that motivations for regulation evolve and tend to be most greatly shaped by economic crises, more reactive than proactive (Allen and Gale,

2003). For example, the Great Depression in the 1930s, the Savings and Loan Crisis in the 1980s and early 1990s, and the 2008 Financial Crisis have been particularly important in shaping U.S. banking policy. The internationally accepted rationale for banking regulation has evolved from 1) protecting depositors to 2) addressing the negative externalities of FI failure in the banking system to 3) addressing negative externalities in the real economy to support economic growth. Thus, Basel III is intended “to improve the banking sector’s ability to absorb shocks. . . reducing the risk of spillover from the financial sector to the real economy,” also stating that “a strong and resilient banking system is the foundation for sustainable economic growth” (BCBS, 2011b, p. 1).

While the Basel Accords may be officially intended for large, international banks, they are being implemented much more broadly. One hundred, thirty-seven of the 143 jurisdictions (96%) responding to the World Bank’s Banking Regulation and Supervision Survey reported that they were using either Basel I or II at the end of 2010.

While some of the largest banks in developing countries are heavily participating in developed country financial markets, many FIs in developing countries are implementing new technologies and approaches in retail banking and FI financing that allow them to reach economic sectors and regions traditionally under-served by financial markets. This inclusive finance market is not only distinct from traditional banking but vastly distinct from developed country financial markets, creating questions about the suitability of a unified banking code.

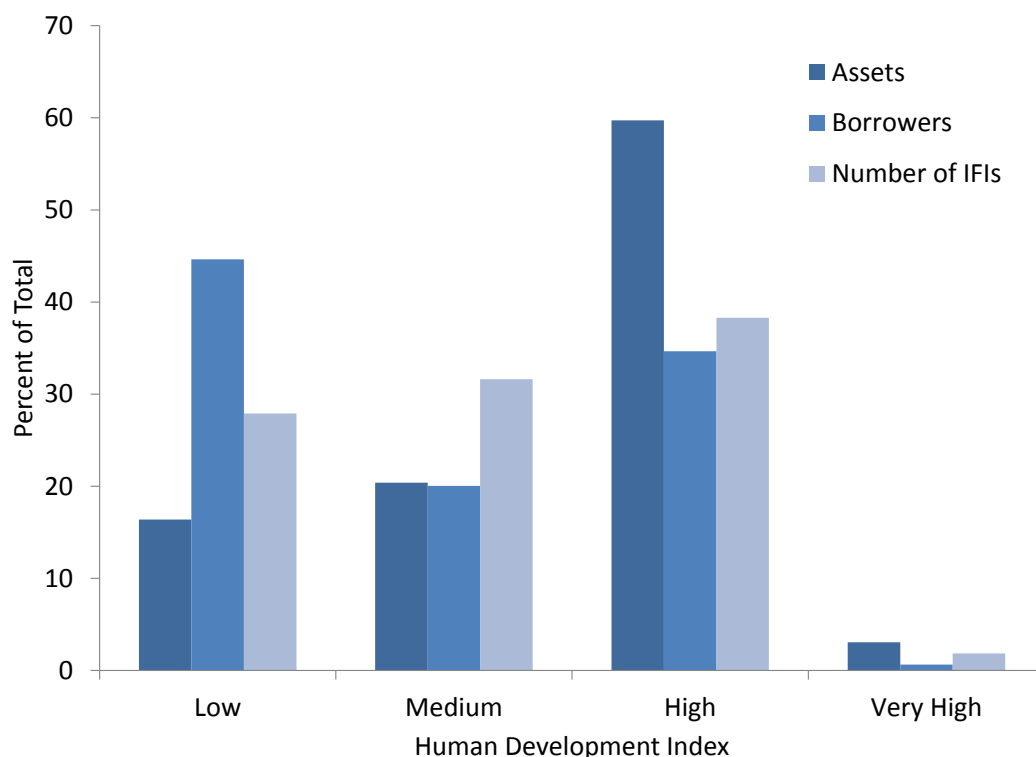
3 Inclusive finance in developing countries

This section highlights some of the characteristics of inclusive finance in developing countries that distinguish it from traditional retail banking in developed countries. It is divided into three parts. First, we describe strategies that IFIs use to overcome problems of information, delivery, and contract enforcement that have precluded access to financial services previously. Second, we note the evolution in international investment in inclusive finance that has increased the volume of funding but is highly concentrated. Third, we discuss systemic shocks that are a greater risk in developing countries and are exacerbated by the operational approaches and financing structures of IFIs.

Inclusive finance is a big sector. For the year of 2011, 1,171 IFIs voluntarily reported to MIX Market (2013), a website dedicated to providing data and research on inclusive finance providers. These IFIs control total assets of \$109 billion and serve 60 million borrowers. As shown in Figure 3, they almost exclusively operate in developing countries. The Human Development Index (HDI) measures health, education, and living standards and divides countries into low, medium, high, and very high categories (United Nations Development Programme, 2013). These four categories are relatively even in terms of numbers of countries. Categories ranking as “high” on the HDI are relatively similar to the World Bank category “upper-middle-income economies” and includes some of the largest IFI markets such as Peru, Bosnia and Herzegovina, and Azerbaijan.

These IFIs are a diverse group. For some, inclusive finance may comprise only a small portion of their portfolio (one IFI in Kazakhstan reports an average outstanding loan value of \$29,000).

Figure 1: Inclusive Finance Presence by Country Development Category



Note: Percentage of assets held, number of active borrowers, and number of inclusive finance intermediaries organized by a country's 2011 HDI category.

Others are highly specialized nonprofits (an IFI in Indonesia reports an average outstanding loan value of \$34). Roughly half are regulated (56%), but regulated IFIs control 88% of total assets in the sample. Legal status is reported in Table 1. While inclusive finance covers too many countries, people groups, geographic regions, economic sectors, financial products, business models, lending strategies, technologies, etc., to be neatly categorized, we provide a reference point for readers that we believe is mostly true most of the time and helps illustrate the challenges and risks facing this sector.

3.1 Lending model

The vast majority of inclusive finance has been microfinance, which is marked by overcoming the transaction costs of providing small-value financial services in data poor environments. Lending is particularly difficult. Moral hazard (e.g., due to a lack of collateral), high administrative costs relative to loan value, and incomplete information regarding borrower quality (e.g., due to a lack of formalized credit scores) make traditional lending infeasible with many clients demanding microloans. Special arrangements such as group lending, frequent repayments (e.g., weekly loan

Table 1: Legal status of MIX Market sample

Legal Status	% of Sample
Bank	9
Credit union & cooperative	18
Nonbank financial intermediary	33
Nongovernmental organization	34
Rural bank	4
Other	2

payments), and other mechanisms help IFIs overcome information problems and allow for (potentially) profitable lending to these clients (Armendáriz and Morduch, 2011). Borrowers are willing to continue to repay their loans as it facilitates access to credit in the future (BCBS, 2010). By demonstrating the ability to repay over time, these borrowers can obtain lower interest rates and larger loans (Baydas et al., 1997).

Agricultural lending is another important area of inclusive finance. The higher prevalence of farming in developing countries increases demand for agricultural loans, especially microloans. Farming creates cashflow constraints that preclude certain microlending structures (e.g., weekly payment) and increases IFI exposure to systemic risks due to weather and commodity price volatility. Information needs are high for agricultural loans. Beyond differences inherent to borrowers, land quality and production strategies can greatly affect credit risk. Since agricultural loans are not organized around ongoing weekly payments or group loans, IFIs use other methods to assess investment performance and monitor borrowers for moral hazard. Agricultural lenders may hire agronomists and maintain small, decentralized offices closer to farmer fields.

Because microlending and agricultural lending are built on information developed from long-term relationships, IFIs providing these services can most easily expand in their region of current operations. These lenders often employ loan officers from the area where they will be lending due to their knowledge of local communities (Baydas et al., 1997). Opening an IFI branch in a new region can be quite daunting as an IFI has little or no information about potential borrowers in that region. Thus, information challenges and costs motivate portfolio concentrations in regions and economic sectors for which they have developed expertise.

3.2 International investments and inclusive finance

Inclusive finance is changing quickly due to the rapid growth of international investments. Cross border funding has grown from \$2 billion in 2005 to \$25 billion in 2011 (Consultative Group to Assist the Poor, CGAP, 2012). Investors are extremely concentrated. Providing over half of total investments, the largest investors are development banks such as KfW in Germany and the International Finance Corporation of the World Bank. Of the development banks, five provide over 70% of cross-border funding (CGAP, 2011a). An increasing amount of investments, currently half of all international investments, are being allocated through microfinance investment intermediaries, private sector investment fund managers such as Blue Orchard and responsAbility. These intermediaries provide investment vehicles for public and private institutional investors with a goal

of generating both financial and social returns. The top 10 investment funds account for 70% of assets under management; all 10 are located in the Netherlands, Switzerland, or Belgium (CGAP, 2011a).

While cross-border funding in inclusive finance has grown quite rapidly, asset managers are finding it difficult to place funds (CGAP, 2011a). Debt investments accounted for about 60% of investments, equity about 13% (CGAP, 2011b). The limited risk capital (such as equity) of IFIs is constraining financial service expansion, yet the pool of IFIs deemed investment-worthy, especially for equity investments, is quite small (CGAP, 2011a). As a result, investors are “aggressively competing” to fund a small number of IFIs (MicroRate, 2011). Ten countries, representing 100 million people in all, receive 60% of cross-border debt financing (CGAP, 2011a). An additional 18% of total investments are in India (CGAP, 2011b). Half of all foreign debt is allocated to 25 IFIs. The other half is divided among 500 IFIs (CGAP, 2011a).

Summarizing, the Basel Committee notes that compared to FIs in developed countries, IFIs tend to “have less diversified loan portfolios, funding sources and geographic scope, making them more vulnerable to adverse economic conditions at the local level” (BCBS, 2010, p. 20).

3.3 Systemic credit risks in developing countries

Three systemic risks emerge as particularly important from a developing country context: price instability, political instability, and natural disasters. Many other aspects of a jurisdiction such as contract enforcement influence the effectiveness. The business models of IFIs are developed to overcome challenges in that regard. Instead, this section focuses on systemic shocks, severe, infrequent events that represent existential threats to IFIs.

Table 2 illustrates the relationship of each of these variable with development using development levels from the HDI. Price instability is measured using the maximum level of annual inflation in each jurisdiction calculated from the consumer price index using data from 2002–2011 (Fund, 2013). We exclude Zimbabwe from the inflation data. Political risk is measured with two variables from the 2011 World Governance Indicators: 1) Political Stability and Absence of Violence, which estimates the likelihood that the government will be destabilized or overthrown, and 2) Government Effectiveness, which estimates the quality of civil services and their independence from political pressures (Kaufmann et al., 2010). Countries are scored on these governance indicators using a scale with a minimum of -2.5 and a maximum of 2.5. Natural disaster risk is measured with two variables: 1) the average proportion of the population affected annually by natural disasters, and 2) the average annual economic damage of disasters as a percent of GDP, using data for 1995–2010 from the Emergency Events Database (EM-DAT, 2013). Values reported in the table are the averages across jurisdictions in each category of development.

Price instability such as inflation is greater in magnitude in developing countries and contributes to both interest and exchange rate risks. The strong linkages between banking and monetary policy make monitoring and managing price instability a priority for developed countries, increasing the capacity of developing countries as well. For example, exchange markets allow FIs to hedge these risks, and the Basel Accords provide guidelines that are relevant to IFIs. Relatively new firms such

Table 2: Systemic Risks by Development Category

	Low	Medium	High	Very High
Inflation (%)	21.62	15.94	16.83	6.95
Political Stability	-0.90	-0.18	-0.13	0.84
Government Effectiveness	-0.94	-0.39	-0.02	1.28
Disasters, Affected (% of Population)	4.42	6.90	1.91	0.42
Disasters, Economic Damage (% of GDP)	20.67	3.85	4.94	2.66

as MFX solutions are creating opportunities for IFIs to hedge for currencies not traded in exchange markets.

Developing countries are more vulnerable to political risk. Political risk is a broad, nebulous category, ranging from regime changes to politically motivated interference in the private sector. For domestic FIs, severe political events may create macroeconomic crises from which these firms cannot diversify. For international investors, insurance for political risks is available, for example from the World Bank. Another example of political risk to the inclusive finance sector is payment holidays supported by politicians in which borrowers decide not to repay their loans as a form of protest (CGAP, 2010).

Finally, developing countries are more vulnerable to natural disasters. Natural disaster risk is given very little attention in developed country standards. The Basel Accords treat natural disasters as an operational risk, suggesting that the Committee’s greatest concerns about these events pertain to the destruction of physical property, management information systems, or lifeline services such as electricity that might impede business. While natural disasters may disrupt operations, their effect on credit risk tends to be of primary concern to IFIs. Because natural disasters have been given so little attention in the banking sector, we highlight this systemic risk, discussing a number of reasons why developing countries tend to be more vulnerable to these events.

3.3.1 Natural disasters and developing countries

Disaster vulnerability in developing countries is a consequence of both the more frequent occurrence of hazards as well as the context (demography, geography, infrastructure, etc.). First, developing countries tend to participate in at-risk sectors such as agriculture (Loayza et al., 2012). Agriculture accounts for 22% of GDP and 53% of the labor force for countries ranked “low” on the HDI, compared to 2% of GDP and 5% of the labor force for “very high” HDI countries.²

Second, underdeveloped financial services contribute to higher vulnerability. Households and firms in developing countries are dramatically less likely to be insured (Re, 2012). Instead, households tend to be more interdependent, especially in rural communities. Some communities develop complex risk sharing arrangements that facilitate management of idiosyncratic risks (Fafchamps and Lund, 2003); however, these arrangements tend to break down during natural disasters as many individuals in the community need help concurrently (Townsend, 1994).

²From World Bank (2012) and HDI (2012) data

Third, many cities in developing countries are struggling to accommodate rapid urbanization, leading the urban poor to settle undesirable land such as in low-lying areas and steep hillsides (Stern, 2008). These communities are also vulnerable due to members residing in less durable structures as well as a lack of public sanitation and other services.

Fourth, the outreach of social safety nets is often limited. While international aid agencies partially offset insufficient developing country relief budgets, aid can be slow. For example, Lentz et al. (in press) estimate emergency food aid shipments arrive over five months, on average, after aid is requested.

Finally, not only are these countries more vulnerable to disaster events but severe weather tends to occur more frequently. Many developing countries are in tropical regions, which experience higher temperatures but also greater rainfall variability (Brown and Lall, 2006). Rainfall is often concentrated in a single season, increasing the risk of drought, excess rain, and flooding.

Vulnerability to disasters is expected to increase due to the interplay of climate change and evolving demographics in developing countries (Samson et al., 2011). Developing countries tend to be in regions that will be most affected by changing climate, those with higher temperatures and more variable rainfall (Stern, 2008). Extreme events are expected to occur more frequently (Nicholls et al., 2007). Population growth will increasingly strain natural resources. The poor are expected to be most severely affected because not only are they currently the most vulnerable but their capacity to adapt is limited. Because the poor are a key demographic for inclusive finance, natural disaster vulnerability will increase for IFIs.

Recent macroeconomic research suggests that severe disasters tend to negatively affect growth when losses exceed a country's capacity to reconstruct following the event (Noy, 2009; Loayza et al., 2012; von Peter et al., 2012; Hallegatte et al., 2007). This reinvestment capacity is positively associated with development indicators such as literacy rates, income per capita, and institutional quality. The risk of a disaster overwhelming a country's capacity to reinvest is also greater in smaller countries where opportunities to diversify are limited (Noy, 2009). For example, the 2010 earthquake in Haiti generated losses equal to 173% of GDP (U.S. Department of State, 2011). Losses from Hurricane Mitch in Honduras were about 73% of GDP (Inter-American Development Bank, 2000). Hurricane Hugo caused losses to Montserrat of about 500% of GDP (World Bank, 1998). In contrast, in the U.S. losses from Hurricane Katrina were 0.6% GDP, but in absolute terms were greater than the losses from the Haiti earthquake and Hurricanes Mitch and Hugo combined (Pielke et al., 2008).

The capacity of the financial sector to reinvest after an event seems to be particularly relevant to limiting its economic consequences. Noy (2009) finds that the level of domestic credit is positively associated with reinvestment capacity, but the size of a domestic stock market is not. This result suggests that capacity to reinvest for micro, small, and medium enterprises in affected communities may be particularly important for economic recovery from a disaster, making the resilience of IFIs to natural disasters a consequential public policy issue.

3.3.2 Implications of disaster risk for IFIs

The heightened vulnerability of households and firms are aggregated in the portfolios of IFIs. Moreover, the arrangements needed to serve poor clients such as lending without collateral increase solvency risk during a crisis. Disasters can create both asset losses and liquidity shortages for IFIs. For deposit-taking FIs, liquidity shortages occur due to depositors withdrawing their funds to manage the disaster, borrowers failing to repay loans, and an increased prevalence of bank runs. Liquidity risk represents a relatively greater precipitant of banking crises in some developing countries due to a 1) history of liquidity shortages, 2) lack of credible deposit insurance, 3) currency mismatches, 3) lack of liquid financial markets, and 4) inability of the central bank to act as the lender of last resort (Tanveronachi, 2009).

Disasters can lead to IFI asset losses as problem loans are written down or written off. These losses destroy risk capital, which can quickly make IFIs over-leveraged or insolvent. For example, Caprio and Klingebiel (1996) cite drought as a precipitant of banking crises in Kenya (where eight FIs and one mortgage lender were liquidated from 1986-1989) and Senegal (where six FIs were liquidated and three were restructured and recapitalized from 1988-1991). IFIs may also be vulnerable to contagion. Because obtaining better access to credit in the future is the repayment incentive for some borrowers, doubts regarding the long-term viability of an FI reduce incentives for these borrowers to repay loans (BCBS, 2010).

Limited access to capital reduces opportunities for managing a crisis. IFIs that are heavily financed by a handful of international investors can also be vulnerable to liquidity and capital shortages. International investors face an information problem regarding the solvency of affected IFIs and so may be unwilling to reinvest. IFIs that are neither liquidated nor fully recapitalized must pursue a slow process of deleveraging by originating fewer loans and building equity through retained earnings (Peek and Rosengren, 1995). Thus, as IFIs shrink to align their assets with their smaller capital bases, communities can enter a credit crunch at a moment when credit is greatly needed for relief and recovery (Collier and Skees, 2012). For example, an analysis of the effects of a 2010 earthquake on Indonesian IFIs providing microfinance demonstrates that one year after the earthquake, these IFIs tended to have higher rates of nonperforming loans than before the earthquake and that the average portfolio growth was negative for IFIs in the affected regions (Microfinance Innovation Center for Resources and Alternatives, MICRA, 2011). The sunk information costs IFIs invest in their borrowers and prevalence of uncollateralized loans for some IFIs can change the way they respond to borrowers, restructuring loans with protracted terms that extend the effects of the event for years in local communities (Collier et al., 2011). Thus, volatility in banking capital has the potential to create cyclical access to credit in local communities. Moreover, the *risk* of these systemic shocks can be sufficient to prevent IFIs from developing credit markets for vulnerable regions and economic sectors.

4 Determinants of IFI capital reserves

Given the importance supervisors and investors place on capital reserves, we examine those of IFIs reporting to MIX Market. Using data from 912 IFIs for 2011, we evaluate the capital-to-asset ratio, the proportion of equity to total assets for each IFI. This ratio is an important indicator of risk that overcomes the data limitations that preclude calculating regulatory capital and weighting assets based on risk, necessary steps to identifying capital ratios. The mean capital-to-asset ratio in the sample is 34% (the median is 26%). We also include measures of the three systemic risks to which developing country credit markets tend to be quite vulnerable: price instability, political instability, and natural disaster risk. The measures of systemic risk are described in Section 3.3.

4.1 Model Estimation

We use a beta regression to estimate the model because the capital-to-asset ratio lies on the standard unit interval (0,1). Using linear regression in this context risks introducing heteroscedasticity because dependent variable values tend to cluster and avoid the upper and lower limits (Ferrari and Cribari-Neto, 2004).

We estimate the model including variables describing IFIs and their environment. Unless otherwise specified the data are provided by MIX Market:

- Size and financial performance: assets, return on assets (ROA), ratio of financial expenses to assets
- Structure: average loan balance per borrower as a percent of gross national income (GNI) per capita, regulated (yes, no), legal status
- Portfolio quality: portfolio at risk (PAR) greater than 90 days, ratio of loan writeoffs to loan portfolio value, ratio of loan loss provisioning to assets
- Systemic risks: inflation, political stability, government effectiveness, and the number of people affected and economic damages from natural disasters.
- Jurisdiction: regulatory quality and region
 - Regulatory quality: a measure of the effectiveness of governments to develop regulations and policies that promote private sector development, using 2011 data from the World Governance Indicators

For detailed definitions and more information on these variables, we refer readers to the original databases.³ Appendix 1 provides additional information regarding the model fit.

³EM-DAT: www.emdat.be/criteria-and-definition; International Monetary Fund, International Financial Statistics www.imf.org/external/data.htm; MIX Market: www.mixmarket.org/about/faqs/glossary; World Governance Indicators www.govindicators.org

4.2 Results

Table 3 summarizes estimation results. We interpret risk as the primary driver of many of the results. First, the capital-to-asset ratio is negatively associated with portfolio quality as measured by the proportion of the loan portfolio written off, though not by provisioning levels or PAR. FIs often have flexibility to lower PAR and provisioning through loan restructuring, limiting the information these commonly used metrics provide. Second, the capital-to-asset ratio is negatively related to the size of the FI. Presumably as an FI grows, it reduces its geographic and economic sector concentrations through diversification, allowing it to operate with a relatively smaller capital base. Third, the positive association between ROA and the capital-to-asset ratio is likely due to economic underpinnings that create a strong positive relationship between risk and return. Thus, it seems to be an additional indication that the risk measures do not fully account for the contribution of risk to capital reserve allocations. These risks are likely broader than credit risks and include a number of operational risks that are difficult to measure in a global database such as strength of institutional governance and integrity of management information systems.

The risks of price shocks, political instability, and natural disasters do not do not influence IFI capital-to-asset ratios. IFIs do not seem to take these risks into account when making capital allocations. Taken in conjunction with the results from the previous paragraph, this result suggests that IFIs are managing their capital to address other risks, perhaps more frequent, less severe threats. Thus, surveying managers at several African IFIs, Castellani et al. (2009) find that while these IFIs are exposed to natural disasters, they do not actively manage these risks, relying on the hope for external contingent aid to recapitalize if a disaster occurs.

The capital-to-asset ratio is significantly positively associated with financial expenses and negatively associated with being regulated. Regarding financial expenses, firms are motivated to choose a cost-minimizing financing structure (Modigliani and Miller, 1958). Thus, IFIs facing high debt financing costs tend to fund operations through equity. We interpret this result as the market recognizing high levels of risk for these IFIs, pricing it into debt investments, and so motivating IFIs to operate with high capital-to-asset ratios. Regarding the influence of regulation, the result that regulated IFIs operate with smaller capital reserves seems to be a consequence of omitted variables. We know of no regulation that explicitly encourages IFIs to hold lower capital-to-asset ratios; therefore, we believe this surprising result is due to differences in regulated and unregulated IFIs for which the model does not account. IFIs operating in jurisdictions of higher regulatory quality do tend to hold higher capital-to-asset ratios, potentially suggesting that stronger regulating institutions impose more stringent standards.

5 Inclusive finance and regulation

Since markets are motivating IFI capital reserves, a logical consideration is whether public intervention is needed for this sector. In our view, yes, it is. The same rationale motivating international standards apply — that negative externalities in the banking sector affect the real economy. While

Table 3: Determinants of capital-to-asset ratios

Mean model with logit link					
Coefficients	Estimate	Std.Error	z value	Pr(> z)	
(Intercept)	3.330	0.359	9.285	0.000	***
ln(Assets)	-0.195	0.021	-9.220	0.000	***
ROA	2.621	0.398	6.592	0.000	***
Financial Expenses/Assets	-16.098	1.093	-14.732	0.000	***
Loan Balance/GNI per Capita	-0.058	0.036	-1.606	0.108	
Provisions/Assets	0.470	1.181	0.398	0.691	
PAR>90	-0.084	0.556	-0.151	0.880	
Writeoff Ratio	2.168	0.658	3.293	0.001	***
Inflation	0.004	0.004	1.106	0.269	
Political Stability	0.063	0.068	0.921	0.357	
Government Effectiveness	-0.029	0.121	-0.244	0.807	
Disasters: Affected	-1.315	1.326	-0.991	0.321	
Disasters: Economic Damage	0.070	0.044	1.578	0.115	
Regulated (0=no,1=yes)	-0.207	0.091	-2.266	0.023	**
Regulatory Quality	0.247	0.117	2.114	0.035	**
Region (Reference: Latin Am. & Carr.)					
Africa	-0.044	0.126	-0.349	0.727	
East Asia and the Pacific	-0.134	0.128	-1.049	0.294	
Eastern Europe and Central & Asia	0.411	0.105	3.908	0.000	***
Middle East and North Africa	0.876	0.186	4.701	0.000	***
South Asia	0.155	0.202	0.769	0.441	
Legal Status (Reference: Nonbank FI)					
Bank	-0.240	0.116	-2.066	0.039	**
Credit Union / Cooperative	-0.401	0.108	-3.724	0.000	***
NGO	0.069	0.088	0.780	0.436	
Rural Bank	-0.256	0.214	-1.196	0.232	
Other	0.631	0.271	2.328	0.020	**
Phi coefficients (precision model)					
(Intercept)	-1.555	0.511	-3.041	0.002	***
ln(Assets)	0.227	0.031	7.343	0.000	***

Beta regression, dependent variable: capital-to-asset ratio

Type of estimator: maximum likelihood

Log-likelihood: 321.8 on 27 Df

Pseudo R-squared: 0.463

Number of iterations: 35 (BFGS) + 3 (Fisher scoring)

IFIs may not represent systemically important institutions to the global economy, their resilience influences the well-being of the economies of the communities and regions they serve.

Socially oriented international investors such as development banks are motivated by both financial and social gains. In principle, their interests are better aligned with the public's than would be an investor exclusively financially motivated; however, the balance between financial and social objectives is not always clear for these investors. For example, several microfinance investment intermediaries have reported to us that they can manage systemic risks such as disasters through global diversification. This approach understandably protects the fund's investors; however, it does nothing to address the hardships of the affected region, illustrating the limit of these investors' purview. While these fund managers hope to do good, their ultimate responsibility is to their shareholders, not the countries in which they invest. Recent microfinance bubbles in India, Nicaragua, Morocco, Bosnia and Herzegovina, and Pakistan, which developed in part due to the exuberance of social investors, illustrate this point and highlight the shortcomings of market discipline

and the many social consequences of these crises (CGAP, 2010; Polgreen and Bajaj, 2010).

Thus, the need seems to exist for a public agent to represent the interests of the local credit market and its associated economy. Given its wide adoption, a logical consideration is whether the Basel Accords represent an effective framework for managing the systemic risks faced by IFIs. For example, because IFIs engage in high risk activities, perhaps the Basel Accords could be used but with more stringent requirements, e.g., 20% minimum capital requirements rather than 8%. In our view, no, the Accords do not represent an effective framework as it would be applied to IFIs. The wide adoption of the Basel Accords has led to the quite important outcome of a greater and more consistent risk capacity among FIs in developing countries; however, it is also riddled with problems. This section describes specific elements of the Accords, focusing on two limitations.

First, the Basel Accords are not sensitive to the risks faced by IFIs. Policy mechanisms (e.g., taxes, quotas, etc.) address externalities by aligning FI objectives with social welfare. In this case, the emphasis on the negative externalities of FI failure implies that FIs want to take on more risk than is socially optimal so effective policy mechanisms would increase the cost of risk-taking and/or reward risk reduction. Because the Accords are insensitive to the systemic risks of IFIs, they do not have the capacity to align the public and private rewards of risk taking.

Second, the Basel Accords do not offer flexibility in managing risk for IFIs. Public intervention to address market failures comes at an opportunity cost. Similar to financing an FI, financing systemic risk management can often be done using a blend of mechanisms. Allowing for an effective blend can lower the cost of managing the risk, creating a Pareto improvement over more restrictive approaches. Because the Accords do not offer flexibility in managing systemic risk to IFIs, they unnecessarily increase its social cost.

5.1 Flexibility in systemic risk management

Mechanisms and strategies to manage systemic risks fit into three broad categories: diversification, risk transfer (e.g., insurance and debt instruments), and reserving; the Basel Accords motivate IFIs in developing countries to rely exclusively on capital reserves to manage systemic risks. Minimum capital requirements (reserves) tend to be the most generalizable strategy as they create protection against any source of loss. Two simplifying assumptions underlie the risk measurement and capital requirements of the Accords: 1) borrowers are exposed to a single systemic risk factor; and 2) the portfolio is asymptotically fine-grained so that the FI is not exposed to the undiversified risks of borrowers — that is, the Law of Large Numbers is not undermined by portfolio concentrations (Blundell-Wignall et al., 2010; Gordy, 2003; Tirole, 1994). In principle, these conditions could hold for large, global banks. Those banks theoretically would be able to manage all systemic risks through diversifications except a global business cycle, which would be managed via minimum capital requirements (Gordy, 2003). IFIs do not meet the basic theoretical assumptions underlying this approach. Empirical evidence, including research published by the Basel Committee, shows that many of these FIs are exposed to a variety of localized risks and manage portfolios with large concentrations but are only limitedly exposed to global business cycles (BCBS, 2010; Griffith-Jones et al., 2003).

These simplifying assumptions reduce the assessment burden on supervisors and IFIs, but come at a substantial private and public cost. First, they assume away a need to encouraging diversification, the cornerstone of portfolio risk management (Markowitz, 1952). Second, while capital reserves are effective for protection against relatively small systemic events, reliance on capital reserves to manage large shocks tends to contribute to cyclical credit provision, as described above. Large systemic events that destroy FI capital motivate FIs to contract credit to realign their capital ratios to target levels (Collier, 2013). Moreover, for capital constrained IFIs, reliance on capital reserves limits the size of an IFI.

Based on shortcomings of Basel I, Basel II and III offer increased flexibility for FIs to use their internal models to assess and manage risk. For example, FIs using these more advanced approaches can manage a portion of operational risks using insurance. Unfortunately, the technical requirements for these more advanced methods preclude their use among almost all developing country FIs (BCBS, 2010). As a telling anecdote, Peru has adopted regulations closely aligned with Basel II. In 2012, the Peruvian regulator told us that *no* Peruvian FI had the capacity to use the sophisticated methodologies in Basel II. Peru has a large banking sector, strong regulator, and sophisticated FIs. Instead, IFIs operating under Basel II use the “Standardized Approach” for managing credit risk. The Standardized Approach is roughly equivalent to the methodologies used in the 1980s under Basel I, offering crude rules for assessing risk and very little flexibility in managing it.

5.2 Risk sensitivity

Capital requirements in the Basel Accords are for *risk weighted* assets. Risk weights are derived from the recognition that asset holdings differ in their level of risk and so require different levels of reserving. A risk weight acts as a scaling factor on the value of the risky asset in determining capital requirements. A wealth of literature exists on risk weights because Basel I relied on this approach (e.g., Repullo and Suarez, 2004; Rochet, 2005; Santos, 2001). To summarize, properly calibrated risk weights are theoretically plausible but very challenging to implement. Based on the negative externalities assumption, FIs want to take on more risk than is socially optimal so they are motivated to circumvent regulation that limits their risk taking. When risk weights are insensitive to differences across assets, opportunities for capital arbitrage emerge (Kim and Santomero, 1988; Rochet, 1992). Evaluating the performance of Basel I from 1988 to 1996, a report from the Basel Committee (1999) concludes that through capital arbitrage via *cherry picking* (i.e., choosing the riskiest borrowers in a risk category) and holding risk off-balance-sheet, FIs were subverting capital requirements in a way that made them limitedly meaningful.

The risk weights applied to IFIs under the Standardized Approach are insensitive to the risks of FI borrowers. The loan categories are amazingly broad as loans across almost all economic sectors fall in the same category. For example, loans to individuals or small businesses carry a risk weighting of 75% and loans to corporations carry risk weights of 100%. Thus, the Standardized Approach suggests that a loan to a farmer in Ghana, a fisher in Guatemala, and a florist in Germany all carry the same systemic risk exposure.

5.3 IFIs and the Basel Accords: Implications for Portfolio Allocation

Given the limitations of the Basel Accords for IFIs, we explore potential implications of their use in this sector. This section models the informational challenges facing IFIs and their tendency to lead to portfolio concentrations. We then use this model as a starting point for assessing the influence of the Basel Accords.

Consider a representative IFI that is contemplating expanding the geographical scope of its operations. The IFI currently operates in a region exposed to a single systemic risk ψ . The IFI can originate new loans in its current region l_ψ and/or lend to the same type of borrowers in a neighboring region l_χ , which faces a different systemic risk χ .⁴ The IFI faces information costs $C(l_\chi)$ in expanding to the new region associated with acquiring and monitoring new clients, infrastructure investments, etc. These costs increase at an increasing rate ($C' > 0, C'' > 0$). For example, the IFI can monitor borrowers in the new region operating near its current branches by mobilizing its field officers; however, to monitor more of the new region, the IFI would need to open branches there.

The IFI is a price-taking firm that maximizes a quadratic mean-variance utility, offering single-period loans. The IFI solves

$$\max_{l_\psi \geq 0, l_\chi \geq 0} \mu - \frac{\lambda}{2} \Sigma \quad (1)$$

$$\text{where } \mu = E[R_\psi]l_\psi + E[R_\chi]l_\chi - r(l_\psi + l_\chi - K) - C(l_\chi),$$

$$\Sigma = l_\psi^2 \sigma_\psi^2 + l_\chi^2 \sigma_\chi^2 + 2l_\psi l_\chi \sigma_{\psi\chi},$$

λ is a measure of the magnitude of risk aversion, R_i is the return on loans exposed to systemic risk i , $R_i \geq -1$, r is the interest rate paid on IFI liabilities, K is the level of equity held by the IFI, and $\sigma_\psi^2, \sigma_\chi^2$, and $\sigma_{\psi\chi}$ are the respective variances and covariances of returns on loans exposed to the systemic risks ψ and χ . For simplicity, we assume the expected returns in each region are the same ($E[R_\chi] = E[R_\psi]$) and some lending will occur in both regions. Solving this maximization yields

$$C'(l_\chi) = \lambda(l_\psi \sigma_\psi^2 - l_\chi \sigma_\chi^2 + (l_\chi - l_\psi) \sigma_{\psi\chi}). \quad (2)$$

The IFI equates the portfolio benefits of lending in the new region to the marginal cost of information. In this way, the cost of information motivates IFIs to increase regional and economic sector concentrations.

Given this foundation, we impose the Basel Accords on this IFI. As Section 4 illustrates, markets tend to recognize more risk for IFIs than is addressed with an 8% minimum capital requirement. Therefore, we assume the regulator, using the Accords as a framework, imposes more stringent minimum capital requirements. For example, IFIs in Peru have traditionally faced a minimum requirement of 14%.

⁴For ease of exposition, we assume that systemic risks ψ and χ are normally distributed.

With an imposed minimum capital requirement of δ , the IFI's problem is

$$\begin{aligned} \max_{l_\psi \geq 0, l_\chi \geq 0} \quad & \mu - \frac{\lambda}{2} \Sigma \\ \text{s.t.} \quad & \frac{K}{\boldsymbol{\omega}^T \mathbf{L}} \geq \delta \end{aligned} \quad (3)$$

where $\boldsymbol{\omega}$ and \mathbf{L} represent n by 1 vectors of risk weights and loan values held in different risk classes, respectively. Because negative externalities motivate IFIs to take on more risk than regulators like if regulations were calibrated effectively, we treat the constraint as binding. We can write this equation as a Lagrangian

$$\mathcal{L} = \mu - \frac{\lambda}{2} \Sigma + \gamma \left(\frac{K}{\boldsymbol{\omega}^T \mathbf{L}} - \delta \right). \quad (4)$$

Proposition 1: The Basel requirements do not affect geographic concentrations or concentrations among loans with the same risk weight. First, we consider how the requirements outlined in the Basel Accords might affect the concentration of risk in the portfolio associated with borrowers of a similar type. As a reminder, categories are very broad under the Standardized Approach; all loans to individuals and small businesses receive the same risk weight. Thus, all of the borrowers for some IFIs will fall into the same loan type. The modeled IFI lends to small enterprises in both regions, which receive a risk weight of ω_s . Including the capital requirement and continuing to hold the simplifying assumption that the expected returns across regions are equal, we re-derive the first order conditions and use a substitution to yield

$$C'(l_\chi) - \gamma \frac{K}{(\boldsymbol{\omega}^T \mathbf{L})^2} \omega_s = \lambda(l_\psi \sigma_\psi^2 - l_\chi \sigma_\chi^2 + (l_\chi - l_\psi) \sigma_{\psi\chi}) - \gamma \frac{K}{(\boldsymbol{\omega}^T \mathbf{L})^2} \omega_s. \quad (5)$$

Because loans in each region are made to borrowers with the same risk weight and capital requirements are calculated at the portfolio level, the imposed capital requirement affects each region equally and thus fall out of the equation. This yields

$$C'(l_\chi) = \lambda(l_\psi \sigma_\psi^2 - l_\chi \sigma_\chi^2 + (l_\chi - l_\psi) \sigma_{\psi\chi}) \quad (6)$$

which reproduces the portfolio allocation from Equation (2), before the capital requirement was introduced. Thus, these capital requirements do not affect portfolio allocation across geographic regions or borrowers in the same loan category. The IFI continues to build a portfolio concentration in the region exposed to risk ψ to avoid the cost of expanding to the new region.

Proposition 2: The Basel requirements can create deadweight losses by reallocating credit where risk weights are “cheapest.” Differing risk weights can change loan allocations *across* loan categories even though the risk weights in the Basel Accords are unaffected by changes in the systemic risks faced by developing country IFIs (e.g., $\frac{\partial \omega_s}{\partial \sigma_\psi} = 0$). As an example, we consider an IFI that holds two classes of assets — say, loans to corporations l_c and loans to small enterprises

l_s . Before risk weights are imposed, the optimal loan allocation across asset classes results in

$$E[R_s] - E[R_c] = \lambda(l_s\sigma_s^2 - l_c\sigma_c^2 + (l_c - l_s)\sigma_{cs}). \quad (7)$$

Rather than lending exclusively to borrower class that provides the highest expected return, the IFI balances the spread in expected returns with the risk reduction benefits of diversifying across loan types. Now, we include the Basel-style risk weights, leading to a first order condition of

$$E[R_s] - E[R_c] = \lambda(l_s\sigma_s^2 - l_c\sigma_c^2 + (l_c - l_s)\sigma_{cs}) - \gamma \frac{K}{(\boldsymbol{\omega}^T \mathbf{L})^2} (\omega_c - \omega_s) \quad (8)$$

where ω_c and ω_s are the risk weights for corporate and small enterprise loans respectively. The risk weights migrate capital away from efficient market allocations toward loans where the capital charges are lowest relative to the risk. This reallocation is associated with a deadweight loss in social welfare and a cross-subsidization of credit from loan categories with “expensive” risk weights to those with “cheap” ones. Given that the credit markets in many developing countries are underdeveloped, this deadweight loss and arbitrary reallocation are troubling.

Proposition 3: The Basel requirements limit access to credit. Capital requirements limit the supply of credit. We have modeled the capital requirement as an optimization constraint and shadow price interpretations of the Lagrange multiplier γ apply. This cost of the supply constraint is passed on to borrowers via the lending interest rate. We continue with our example of the representative IFI that only lends to corporations and small enterprises. We can derive the competitive interest rate charged by this representative IFI via its first order condition with respect to small enterprise loans

$$R_s = r + \lambda(l_s\sigma_s^2 + l_c\sigma_{cs}) + \gamma \frac{K}{(\boldsymbol{\omega}^T \mathbf{L})^2} \omega_s. \quad (9)$$

In this equation, r represents the cost of funds for the IFI which is passed on to borrowers, $(l_s\sigma_s^2 + l_c\sigma_{cs})$ represents the incurred risk from making the loan for the IFI, λ is its risk premium rate, and $\gamma \frac{K}{(\boldsymbol{\omega}^T \mathbf{L})^2} \omega_s$ represents a type of tax on borrowers due to the scarcity of IFI capital associated with the capital regulation. In this framework, increases in the capital requirement δ result in higher interest rates ($\frac{\partial R}{\partial \gamma} \frac{\partial \gamma}{\partial \delta} > 0$). Given a declining demand function for credit, such as

$$R_s = \eta - \theta l_s \quad (10)$$

where η and θ are parameters, increases in the capital requirement also translate into lower equilibrium quantities of credit ($\frac{\partial l}{\partial \delta} < 0$). As empirical support, the Basel Committee, evaluating data from 1988 to 1996, finds some evidence in developed countries that increases in capital requirements associated with Basel I limited access to credit and reduced growth in certain economic sectors (BCBS, 1999).

6 Alternatives to the status quo and recommendations

The limitations of the Basel Accords can represent a quandary for developing country policymakers as they consider adopting new versions of the Accords. Simmons (2001) describes their adoption as a paradigm in which developing countries benefit from cooperating with a dominant power, a coalition between the U.S. and Great Britain. Adoption of the Accords both communicates positive characteristics about the developing country jurisdiction and so may increase international investment (Simmons, 2001) and protects the overseas operations of domestic FIs (Chey, 2007).

The context has changed in important ways since Simmons (2001). The 2008 financial crisis revealed significant shortcomings of the Basel Accords for addressing the risks of the world's largest banks, requiring more tailored measures specific to the risks of these banks. That crisis also pushed investors to developing and emerging markets where returns were higher in the years following the crisis. Second, inclusive finance has emerged as viable business, increasing funding opportunities. Microfinance investment vehicles are a powerful example. Domestic banks are acquiring successful IFIs, and large IFIs make public offerings (Aagaard, 2011). Finally, the financial sectors in Asia and Latin America have grown tremendously. These events reduce the dominance of New York and London, lowering incentives to emulate.

For regulators interested in tailoring prudential standards to better meet the needs of their jurisdictions, collective action may reduce further the consequences of deviating from international standards. For example, regulators could coordinate regionally to develop alternative prudential standards. Jurisdictions within the same region are often at similar stages of development and vulnerable to the same risks.

Because the business models of IFIs require them to take substantial risks, the cost of adopting the minimum capital requirements of Basel I and II may be relatively low. Regulators seemingly have plenty of room to innovate, using the Basel Accords as a foundation on which to build a broader set of risk management mechanisms. Adherence to Basel III may come at a higher cost. Basel III increases the capital charges for risk taking, imposes a leverage ratio, requires higher quality capital, creates standards for liquidity risk management, and adds countercyclical buffers. Each of these is in response to the 2008 Financial Crisis and, if adopted, comes at some opportunity cost. A wholesale adoption of Basel III is almost certainly not in the interest of most developing countries.

Coordination also seems in the interest of inclusive finance investors. Investors and credit rating agencies can also fall in the trap of taking risk criteria for developed countries and applying them to IFIs in developing countries where different risks dominate. For example, we highlight our experiences with two internationally active firms, a large, socially oriented investment fund and a credit rating agency for FIs in northern Peru, which is exposed to severe flooding from El Niño. Each acknowledged that these IFIs are highly vulnerable to severe El Niño events, but each also reported that this vulnerability does not affect their evaluation because natural disaster risk did not fit neatly into their evaluation protocols. Additionally, the fund manager told us that he perceives the vulnerability to natural disasters of the IFIs in which he invests; however, he stated that his institution has a very imprecise notion of this risk.

While managers of socially oriented investment funds may see addressing systemic risks in developing country credit markets as outside of their purview, bad publicity after credit bubbles or natural disasters can quickly undermine their business model. Also, facilitating risk management would seem to create new investment opportunities. Since international investment in inclusive finance is concentrated in a handful of development banks and investment funds, coordination may be possible at relatively low cost. Institutions and initiatives such as CGAP , MicroRate, and the Principles for Investors in Inclusive Finance support the sector through monitoring. These institutions are headquartered in the U.S. and Western Europe; specialized regional institutions may also be needed.

6.1 Enhancing risk estimates

While creating risk-based requirements may be challenging, almost any sensitivity to risk would seem to improve on an arbitrary, fixed level of reserving irrespective of the risk. A starting point for calibrating loss protection requirements would be the available historic data (even if it is limited), which the regulator could adjust qualitatively, and the use of stress test scenarios. Different loss protection requirements could be set for different economic sectors and geographic regions based on the risk in each. Loss protection requirements could be set with conservative floors (e.g., some stringent minimum capital requirement) in recognition of the uncertainty associated with estimating systemic risk.

Bankers and supervisors need tenable and accurate approaches for assessing and monitoring risk. Many complex methodologies (e.g., the Internal Ratings Based approach of Basel II) are neither tenable nor advisable for IFIs. These methodologies are often data intensive and many IFIs have very limited data. Moreover, complex methodologies often rely on simplifying assumptions to make them tractable; however, in real-world applications these assumptions can be egregiously violated. For example, Szegö (2002) describes the many limitations of value-at-risk, a risk assessment approach used in Basel II, noting that it fails to meet even the most basic requirements of a risk measure except under very restrictive assumptions.

When sectors adopt certain standards, a culture can easily emerge of accepting the approach without question. This dynamic may be worse when the methods are complex as evaluating these models may be beyond the technical capacity of many members in the sector. Black-box risk software exacerbates the problem by separating the end user from the steps in deriving model results. Still, blindly accepting sector norms is not limited to complex methods. Whatever risk assessment and monitoring methods policymakers choose contribute to the norms of the sector and so should be chosen carefully so that they are relevant to the risks. A basic method that provides a rough but accurate estimate of risk is preferable to a complex one that provides a precise but inaccurate estimate.

6.2 Increasing flexibility in risk management

Capital reserves are a flexible mechanism that can address FI losses from a variety of risks and are thus deserve to be an important component of risk management mechanism for all FIs, especially

for managing small systemic shocks. More comprehensive risk management strategies that also rely on diversification and risk transfer likely represent a Pareto improvement over relying on capital reserves alone. Risk transfer is particularly well-suited to address infrequent, severe systemic shocks of specific concern. Both of these mechanisms reduce portfolio risk and so have the added benefit of reducing volatility in access to credit.

Diversification. Offsetting the cost of diversification through prudential requirements can align IFI interests with those of the public. For example, returning to the model in Section 5.3, suppose the regulator allows the representative IFI to meet prudential standards using a combination of capital reserves and diversification. Without diversification, minimum capital requirements are δ , but risk reduction through diversification lowers the capital requirement by $F(\Sigma)$, which is a function of portfolio risk Σ . The socially optimal policy would equate the marginal regulatory benefit to the IFI of diversification ($\partial F/\partial l_\chi \gamma$) to the marginal cost of information required to diversify ($\partial C/\partial l_\chi$). Adding this regulatory structure to Equation (5) yields

$$l_\chi \sigma_\chi^2 - l_\chi \sigma_{\chi\psi} = l_\psi \sigma_\psi^2 - l_\psi \sigma_{\chi\psi}. \quad (11)$$

The IFI chooses the risk minimizing portfolio.

Peru is implementing an approach in this spirit. Traditionally, the regulator has maintained a 14% minimum capital requirement for IFIs; however, it is moving to a system of a minimum capital requirement of 10% and four percentage points of potential additional capital requirements based on risk. Two percentage points of these additional capital requirements are based on geographic and economic sector concentrations (Superintendencia de Banca, Seguros, y AFP, 2011). Thus, an IFI that minimizes its portfolio concentrations via diversification has the potential to lower its minimum capital requirement by two percentage points. This change would allow an IFI to increase its loan allocations by about 12%.

Risk transfer. Risk transfer is a specific form of asset diversification in that the returns of risk transfer products such as insurance are negatively related to other assets in the portfolio. Systemic risks such as natural disasters are best addressed by transferring them internationally where counterparties have the capacity to diversify globally. Portfolio guarantees and similar instruments make payments based on portfolio-level loan losses. These mechanisms can create moral hazard for IFIs so finding counterparties, especially internationally, at risk transfer rates acceptable to IFIs may be quite challenging.

Disaster-based mechanisms such as index insurance may be particularly valuable for managing natural disaster risks.⁵ Index insurance is designed on a specific, objective measure of the natural disaster of concern. For example, a measure insuring against hurricane risk could make payouts based on sustained windspeed. Index insurance has several benefits over traditional insurance including 1) reduced moral hazard and adverse selection, which reduces the cost of the insurance,

⁵Index insurance is a specific example of a class of parametric risk transfer mechanisms which can potentially be structured in several ways including as derivatives.

and 2) quicker payouts as they are made based on the objective index (Collier et al., 2009). This timely insurance payout comes as a sum of cash to the FI that could both address immediate liquidity needs and offset capital losses due to loan write downs, putting IFIs in a stronger position to operate after a severe event. Index insurance against severe El Niño is now being used by an FI to protect its portfolio as it expands lending in northern Peru (Collier and Skees, 2012). The primary weakness of index insurance is basis risk — the risk of a mismatch between the severity of the natural disaster and losses. Because of basis risk, index insurance cannot fully protect an FI from its exposure to a specific disaster. Similar to using insurance in other contexts, index insurance is best used as a component of a broader risk management strategy that would also include capital reserves and other mechanisms.

In the long-term, debt and insurance-like hybrid instruments may be particularly useful for addressing medium to large systemic shocks. For example, Contingent capital is a debt instrument that transforms into capital based on a certain event (Hanson et al., 2010). So far contingent capital has been issued by large, publicly traded FIs (e.g., UBS, Credit Suisse, Lloyd’s Banking Group, Rozankys, 2011). Contingent capital mechanisms would make the counterparty an owner in the FI when its capital ratio is low, when the FI is most at risk. These mechanisms seem most likely to emerge following the development of risk transfer markets for IFIs.

6.2.1 Illustrating the benefits of risk transfer

To illustrate the benefits and limitations of risk transfer, we develop the following model. Suppose a representative FI holds a certain amount of equity capital \bar{K} , and as part of its risk evaluation, the FI considers the size of loss it can sustain without becoming insolvent. While the amount of equity is fixed, we assume the FI can take on as much debt as it would like via deposits and interbank loans so the research question for the FI can be reformulated as how large a loan portfolio it can manage and remain solvent under a certain loss scenario. The FI has a large exposure to systemic risk ϕ which we will call *cyclone risk* and an exposure to a variety of other systemic risks to which it is either limitedly vulnerable or the risk is remotely probable (e.g., global business cycle, political regime change, alien invasion, etc.), which we denote using the vector \mathbf{v} . The realization of one of these systemic risks causes some portion $z(\phi, \mathbf{v})$ of the value of the loan portfolio to be lost. The FI conducts a type of stress test where it considers the possibility of an event that creates loan losses of up to a rate of z^* .

First, we consider a scenario where the FI incurs losses at z^* due to a cyclone and the only mechanism available to the FI to manage the event is capital reserves. The FI remains solvent up to the point where its assets equal its liabilities, i.e., equity is zero. Equity evolves according to the process

$$K_{t+1} = K_t + RL_t - rD_t - z(1 + R)L_t \quad (12)$$

where R is the lending interest rate, r is the interest rate on FI liabilities, and K_t , L_t , and D_t are FI equity, loans, and liabilities in period t , respectively. FI losses are generated from revenue and asset losses $z(1 + R)L_t$. By setting $K_{t+1} = 0$ and using the FI’s budget constraint $L_t = D_t + \bar{K}$,

we can derive the IFI's loss management capacity per unit of loans, denoted θ^K in this scenario,⁶ given the fixed level of equity

$$\theta^K = \frac{(1+r)\bar{K}}{L_t} + R - r. \quad (13)$$

The capacity of the IFI to manage losses is limited to its starting capital and returns from lending. This can be rewritten to identify the loan portfolio that this loss management capacity can support

$$L_t^K = \frac{(1+r)\bar{K}}{\theta^K - (R-r)} \quad (14)$$

This analysis implies that the IFI must maintain a certain capital ratio ($\frac{\bar{K}}{L_t^K}$) to remain solvent in the event of z^* losses.

Second, we consider the capacity of the IFI to manage losses using capital reserves and insurance against cyclone risk. The insurance payout takes the following form $I(z(\phi)) = z(\phi)(1+R)L$ where $z(\phi)$ denotes losses due to cyclones. This insurance can be purchased at the premium rate p so that the total premium is pI . The cost of the insurance enters the IFI's equity transition function (12) and the expenditure enters the budget constraint as funds that could have been used for lending go toward the insurance $L_t + pI(z) = D_t + \bar{K}$. Theoretically, the IFI could fully transfer its risk through the insurance so that it would not require any capital reserves. If so, the loan portfolio could be infinitely large; however, given that the IFI is exposed to a variety of systemic risks, the regulator determines that only a portion β of its loan losses can be managed using insurance.⁷ Following (13), we can derive the capacity of the IFI to manage losses using capital reserves and insurance, which we denote θ^{K+I}

$$\theta^{K+I} = \theta^K + \frac{(1-p(1+r))\beta I}{L_t} \quad (15)$$

which can be solved to determine the size of loan portfolio this risk management strategy can support L^{K+I} . Because $p(1+r) < 1$ for any case where the IFI chooses to buy insurance, the second term on the right hand side is positive. Thus, a risk management strategy of blending capital reserves and insurance improves the capacity of the IFI to manage losses and so increases the size of the loan portfolio that this IFI can maintain (i.e., $L^{K+I} > L^K$).

As a third scenario, we consider the case where the IFI insures against its cyclone risk but an (improbable) uninsured systemic event such as political regime change occurs, denoted v_1 , which causes losses at the level z^* . The loss capacity in this scenario, which we denote as $\theta^{K+I|v_1}$, is

$$\theta^{K+I|v_1} = \theta^K - \frac{p(1+r)\beta I}{L_t} \quad (16)$$

which is the lowest across the three examples. This result illustrates a more general principle that insuring against a specific systemic risk reduces the capacity of an FI to manage other risks.⁸

⁶ $\theta^K \equiv z(1+R)$

⁷An insurer offering loss-based risk transfer would also prefer for the IFI to manage some of its risk via reserves as a form of deductible that reduces moral hazard.

⁸Miranda and Gonzalez-Vega (2011) find a similar result for borrowers.

Insurance is best used for low probability, high severity systemic risks, and the proportion of losses that can be managed with risk transfer (β) should be set based on the relative importance of the insured risk to the other risks faced by the IFI. Yet, there is a limitation to the risks that an IFI can manage and operate profitably. The opportunity cost of managing highly improbable events is so great that the socially optimal banking policy will allow for some IFI failures.

Because index insurance makes payments based on a measure of the risk event, modelling its benefits requires another step. To capture basis risk, we assume an imperfect relationship between the systemic risk and IFI losses $z = g(\phi) + \varepsilon$ where ε is an error term. While this creates greater uncertainty about the relationship between insurance payouts and losses, it is worth noting that establishing capital requirements based on the systemic risks faced by the IFI also requires estimating the relationship between systemic risks and IFI losses, which will include some error. In sum, risk transfer can benefit IFIs, especially when attracting equity capital is difficult and/or costly, but should be implemented carefully.

7 Conclusion

The many and growing resources devoted to increasing financial inclusion are encouraging as the collective actions of bankers, policymakers, and investors can benefit the many who have been excluded from financial markets. Systemic risk remains a significant constraint in access to financial services that is largely overlooked by the banking environment that sets priorities for risk management. Interjurisdictional coordination among policymakers and among market decision makers such as investors is needed and is beginning to occur with initiatives such as the Principles for Investors in Inclusive Finance, coordinated by the PRI Initiative. The recommendations presented here have the potential to increase the outreach and responsiveness of inclusive finance through a more resilient banking environment.

Appendix 1: Model Estimation for IFI Capital-to-Asset Ratios

This model is a variable dispersion beta regression with a logit link. Parameters are estimated through maximum likelihood. The logit link allows for interpretation of estimation coefficients as log odds ratios. We use the methodology for beta regression outlined in Cribari-Neto and Zeileis (2009), the results of which are shown in Table 3.

The beta regression originally proposed by Ferrari and Cribari-Neto (2004) assumes a constant precision parameter, which describes the dispersion of the dependent variable. Simas et al. (2010) show that a more general model in which the precision parameter is allowed to vary reduces estimation bias. Given the large size differences in IFIs in the data set, the total assets managed by the IFI at the 10th and 90th percentiles, respectively, are \$827,629 and \$165,459,216, we allow the precision parameter to vary based on the log of asset size. A likelihood ratio test demonstrates that this second estimation, which allows for variable dispersion, provides a better fit and so is used for the analysis, see Table 4.

Table 4: Likelihood ratio test

	#Df	Log Likelihood	Df	χ^2	Pr(> χ^2)
Beta regression	26	299.06			
Variable dispersion beta regression	27	321.79	1	45.463	0.00

References

- Aagaard, P. (2011). The global institutionalization of microcredit, *Regulation & Governance* 5(4): 465–479.
- Allen, F. and Gale, D. (2003). Capital adequacy regulation: In search of a rationale, *Economics for an imperfect world: Essays in honor of Joseph Stiglitz* pp. 83–109.
- Armendáriz, B. and Morduch, J. (2011). *The economics of microfinance*, MIT Press.
- Baydas, M., Graham, D. and Valenzuela, L. (1997). Commercial banks in microfinance: New actors in the microfinance world, *Microenterprise Best Practices report*, Bethesda, Maryland: Development Alternatives Inc .
- BCBS (1999). *Capital Requirements and Bank Behavior: The Impact of the Basle Accord*, Basel Committee on Banking Supervision, Bank for International Settlements.
- BCBS (2010). *Microfinance Activities and the Core Principles for Effective Banking Supervision*, Basel Committee on Banking Supervision, Bank for International Settlements.
- BCBS (2011a). About the Basel Committee. Basel Committee on Banking Supervision, Bank for International Settlements.
URL: <http://www.bis.org/bcbs>
- BCBS (2011b). *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*, Basel Committee on Banking Supervision, Bank for International Settlements.
- Blundell-Wignall, A., Atkinson, P. et al. (2010). Thinking beyond Basel III: Necessary solutions for capital and liquidity, *OECD Journal: Financial Market Trends* 2010(1).
- Brown, C. and Lall, U. (2006). Water and economic development: The role of variability and a framework for resilience, *Natural Resources Forum*, Vol. 30, Wiley Online Library, pp. 306–317.
- Caprio, G. and Klingebiel, D. (1996). *Bank insolvencies: cross country experience*, number 1620, World Bank Publications.
- Castellani, D., Chiodi, S. and Viganó, L. (2009). La gestione dei rischi di disastro negli intermediari di microfinanza. Quaderno di Dipartimento, N 9/2009, Dipartimento di Economia Aziendale, University of Bergamo.

- CGAP (2010). Growth and vulnerabilities in microfinance. Focus Note 61, Consultative Group to Assist the Poor.
- CGAP (2011a). Foreign capital investments in microfinance: Reassessing financial and social returns. Consultative Group to Assist the Poor.
- CGAP (2011b). Trends in cross-border funding. Consultative Group to Assist the Poor.
- CGAP (2012). Current trends in cross-border funding for microfinance. Consultative Group to Assist the Poor.
- Chey, H.-K. (2007). Do markets enhance convergence on international standards? the case of financial regulation, *Regulation & Governance* **1**(4): 295–311.
- Collier, B. (2013). Disaster-related credit risk: Natural disasters as systemic shocks in developing and emerging economies. Working Paper, Global Centre on Disaster Risk and Poverty.
- Collier, B., Katchova, A. and Skees, J. (2011). Loan portfolio performance and El Niño, an intervention analysis, *Agricultural Finance Review* **71**(1): 98–119.
- Collier, B. and Skees, J. (2012). Increasing the resilience of financial intermediaries through portfolio-level insurance against natural disasters, *Natural Hazards* **64**(1): 55–72.
- Collier, B., Skees, J. and Barnett, B. (2009). Weather index insurance and climate change: Opportunities and challenges in lower income countries, *The Geneva Papers* **34**(3): 401–424.
- Cribari-Neto, F. and Zeileis, A. (2009). Beta regression in R. Department of Statistics and Mathematics, WU Vienna University of Economics and Business.
URL: <http://cran.r-project.org/web/packages/betareg/vignettes/betareg.pdf>
- EM-DAT (2013). The OFDA/CRED International Disaster Database. Université Catholique de Louvain, Brussels.
URL: www.emdat.be
- Fafchamps, M. and Lund, S. (2003). Risk-sharing networks in rural Philippines, *Journal of Development Economics* **71**(2): 261–287.
- Ferrari, S. and Cribari-Neto, F. (2004). Beta regression for modelling rates and proportions, *Journal of Applied Statistics* **31**(7): 799–815.
- Fund, I. M. (2013). International financial statistics.
URL: imf.org/external/data.htm
- Gordy, M. (2003). A risk-factor model foundation for ratings-based bank capital rules, *Journal of Financial Intermediation* **12**(3): 199–232.
- Griffith-Jones, S., Segoviano, M. and Spratt, S. (2003). Basel II and developing countries: Diversification and portfolio effects.

- Hallegatte, S., Hourcade, J.-C. and Dumas, P. (2007). Why economic dynamics matter in assessing climate change damages: illustration on extreme events, *Ecological Economics* **62**(2): 330–340.
- Hanson, S., Kashyap, A. and Stein, J. (2010). A macroprudential approach to financial regulation, *Journal of Economic Perspectives* **25**: 3–28.
- IMF (2013). World economic outlook: Hopes, realities, risks. International Monetary Fund.
- Inter-American Development Bank (2000). Central America After Hurricane Mitch: The challenge of turning a disaster into an opportunity.
URL: <http://www.iadb.org/regions/re2/consultativegroup/background2.htm>
- Kaufmann, D., Kraay, A. and Mastruzzi, M. (2010). The worldwide governance indicators: methodology and analytical issues, *World Bank policy research working paper* (5430).
- Kim, D. and Santomero, A. (1988). Risk in banking and capital regulation, *The Journal of Finance* **43**(5): 1219–1233.
- Lentz, E. C., Passarelli, S. and Barrett, C. B. (in press). The timeliness and cost effectiveness of the local and regional procurement of food aid, *World Development* .
- Loayza, N. V., Olaberría, E., Rigolini, J. and Christiaensen, L. (2012). Natural disasters and growth: Going beyond the averages, *World Development* .
- Markowitz, H. (1952). Portfolio selection, *Journal of Finance* **7**(1): 77–91.
- MICRA (2011). Mapping report of microfinance institutions partners to support Resilient Village–Earthquake Safe House Project funded by Australian Indonesian Facility for Disaster Reduction (AIFDR) in West Sumatera. Prepared by Yayasan MICRA, Rating and Appraisal Unit, Microfinance Innovation Center for Resources and Alternatives.
- MicroRate (2011). The state of microfinance investments in 2011. MicroRate’s 6th Annual Survey and Analysis of MIVs.
- Miranda, M. and Gonzalez-Vega, C. (2011). Systemic risk, index insurance, and optimal management of agricultural loan portfolios in developing countries, *American Journal of Agricultural Economics* **93**(2): 399.
- MIX Market (2013). MIX Market MFI data.
URL: <http://www.mixmarket.org>
- Modigliani, F. and Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment, *The American economic review* **48**(3): 261–297.
- Nicholls, N., Chidthaisong, A., Hegerl, G., Heimann, M., Hoskins, B., Joos, F. et al. (2007). Technical summary, *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, New York, pp. 20–91.

- Noy, I. (2009). The macroeconomic consequences of disasters, *Journal of Development Economics* **88**(2): 221–231.
- Peek, J. and Rosengren, E. (1995). Bank regulation and the credit crunch, *Journal of Banking & Finance* **19**(3-4): 679–692.
- Pielke, R., Gratz, J., Landsea, C., Collins, D., Saunders, M. and Musulin, R. (2008). Normalized hurricane damage in the United States: 1900–2005, *Natural Hazards Review* **9**: 29.
- Polgreen, L. and Bajaj, V. (2010). India microcredit faces collapse from defaults, *New York Times* **18**: A5.
- Re, S. (2012). World insurance in 2011: non-life ready for take-off.
URL: swissre.com/sigma
- Repullo, R. and Suarez, J. (2004). Loan pricing under basel capital requirements, *Journal of Financial Intermediation* **13**(4): 496–521.
- Rochet, J. (1992). Capital requirements and the behaviour of commercial banks, *European Economic Review* **36**(5): 1137–1170.
- Rochet, J. C. (2005). Prudential policy, *Monetary and Economic Studies* **23**(S1): 93–119.
- Rozanksy, G. (2011). The loss absorbancy requirement and contingent capital under Basel III.
URL: <http://blogs.law.harvard.edu/corpgov>
- Samson, J., Berteaux, D., McGill, B. and Humphries, M. (2011). Geographic disparities and moral hazards in the predicted impacts of climate change on human populations, *Global Ecology and Biogeography*.
- Santos, J. (2001). Bank capital regulation in contemporary banking theory: A review of the literature, *Financial Markets, Institutions & Instruments* **10**(2): 41–84.
- Simas, A. B., Barreto-Souza, W. and Rocha, A. V. (2010). Improved estimators for a general class of beta regression models, *Computational Statistics & Data Analysis* **54**(2): 348–366.
- Simmons, B. A. (2001). The international politics of harmonization: the case of capital market regulation, *International Organization* **55**(03): 589–620.
- Stern, N. (2008). The economics of climate change, *The American Economic Review* **98**(2): 1–37.
- Superintendencia de Banca, Seguros, y AFP (2011). Resolución SBS numero 8425–2011, reglamento para el requerimiento de patrimonio efectivo adicional.
- Szegö, G. (2002). Measures of risk, *Journal of Banking & Finance* **26**(7): 1253–1272.
- Tanveronachi, J. (2009). Implications of Basel II for financial stability: Clouds are darker for developing countries, *PSL Quarterly Review* **26**: 121–146.

Tirole, J. (1994). On banking and intermediation, *European Economic Review* **38**(3-4): 469–487.

Townsend, R. (1994). Risk and insurance in village India, *Econometrica: Journal of the Econometric Society* pp. 539–591.

United Nations Development Programme (2013). Human development report 2013: the rise of the South.

URL: hdr.undp.org/en/reports/global/hdr2013

U.S. Department of State (2011). Background note: Haiti.

URL: <http://www.state.gov/r/pa/ei/bgn/1982.htm>

von Peter, G., von Dahlen, S. and Saxena, S. C. (2012). Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes. Bank for International Settlements Working Paper.

World Bank (1998). Wider Caribbean financial sector review, increasing competitiveness and financial resource management for economic growth. Report No. 17556-LAC.