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Papers

Financial services and disaster risk finance: Examples from the community level

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Abstract

Increased attention has recently been given to the possible role of financial services in the management of natural disaster risk. Local communities have been at the forefront of developing innovative disaster risk finance strategies and implementing risk-oriented incentive programs. In view of increasing risks, including the impacts of climate change, such programs will become more important. This paper examines four models and some recent experiences in using financial services at the community level. The paper offers an overview of advantages and limitations of each model to manage disaster risk in communities. Examples include a federal government initiated scheme of social protection funds, a local government risk reduction scheme, an insurance product provided by a non-governmental organization, and a micro-insurance scheme. Finally, the paper offers some directions about specific ways that the public and private sectors, in collaboration with other partners can improve finance alternatives for disaster management at the community level. It appears that a range of follow-up studies and further dialogue is needed, in order to expand the knowledge on what types of risk finance models can help manage and reduce the financial impacts of natural disasters.

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Keywords: Disaster risk; Climate adaptation; Financial services; Community; Developing countries

1. Introduction

This paper offers insights about specific ways that the public and private sectors, and other partners can improve financial services for disaster risk management at the community level. In this paper “financial services (products)” refers broadly to any financial arrangement involving a party outside of the household or community unit, regardless whether it is being provided by the (formal) private financial services sector, or semi- or non-market institutions, such as other financial institutions, government, non-governmental organizations (NGOs), local civil organizations.³ These financial arrangements typically

include credit, savings, investment, and insurance services—services that are part of a spectrum of risk management tools used at the household and community level to manage the threat of natural hazards. Financial services can help absorb and redistribute the cost of hazard-related losses. They may also shape incentives which encourage disaster risk reduction. They may consist of investments in risk reduction through accessible credit, and of risk spreading through insurance mechanisms.

Disaster risk poses serious obstacles to obtaining the Millennium Development Goals. When disasters occur, communities and those organizations which serve them are vulnerable to the costs of sickness, loss of income, and loss of harvests. When catastrophes strike, the risk and impact of sickness is multiplied (PAHO, 1999), loss of income can drive an exposed population into poverty, droughts can

(footnote continued)

differ in cost, aims, benefits and targeted beneficiaries. For a more extensive discussion; see Appendix A.

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³This is not to say that there are no differences between the financial services products delivered by the various organizations. Products may

result in famine (Ribot et al., 1996). Rapid-onset disasters such as flooding, hurricanes and major storms and slow-onset events such as drought are some of the types of weather-related events that challenge communities today (e.g. Amendola, 2004). Particular financial services can offer solutions to help communities adapt to and reduce these types of risk. Traditionally, such financial products are sold by the private financial services sector. Governments, NGOs and local communities however have started to explore the application of (often less formal) financial arrangements.

Economic development, population growth and environmental deterioration may lead to increasing risks. Climate change may lead to more frequent and intense weather events, and awareness is increasing that financial services may have a significant role to play in managing risks that accompany climate change (Vellinga et al., 2001). Already it has become clear that current sources of funding to reduce risks and help communities adapt to climate change are insufficient, and that alternatives need to be explored, including financial services (Bouwer and Aerts, 2006). Vulnerabilities can be reduced by forging greater links between science, disaster risk management and the formal financial services sector by integrating risk management into normal development practice.

In recent years, various international institutions have investigated the role financial services could play in managing disaster risk. Some limited disaster finance schemes have become available, such as partnerships with NGOs, insurance companies, or local savings and credit institutions. Yet many challenges remain:

- Efforts to use financial services in the area of natural disaster risk management currently remain dispersed across disciplines—largely divided between the disaster risk, climate adaptation, and financial services circles—and scales from national to local levels. For instance, disaster risk researchers and practitioners have for many years investigated the use of insurance and other mechanisms to manage disaster impacts as isolated extreme events, not necessarily the manifestations of larger-scale global change (see e.g. Freeman, 2001). Meanwhile, policy for climate change adaptation is currently addressed mostly at the national level, through vulnerability and adaptation studies for National Communications, or through National Adaptation Programs of Action (NAPAs). Yet effective adaptation to climate change occurs at the local level, and therefore is an issue for community policy and action targeted at disaster risk reduction (see e.g. Helmer and Hilhorst, 2006). For the local level, there is limited understanding of how financial services could contribute to risk reduction, and few tools are available to address and fund such actions. It is at present also rather uncommon to link activities in disaster risk reduction with financial services.
- Documentation of local-level experiences and communication between the groups that are mentioned above appears to be limited. There are few clear statements about what still needs to be known to improve the design of products and provision of financial services to communities facing disaster risk (Hoff et al., 2005).
- There appears to be a gap between the supply of and demand for financial services at the local level in developing countries. Providers of financial services could benefit from a better understanding of community level needs to design appropriate financial tools for reducing disaster risk and adaptation to climate change (Hoff et al., 2005; Bouwer and Aerts, 2006).

There is a clear call to redirect efforts from responding to risk, to reducing the risk (Linnerooth-Bayer et al., 2005). At the same time, the public and private sectors, and other organizations today require clear direction about specific ways to improve finance alternatives for extreme weather events at the community level. In particular, there is a need and an opportunity for making financial services an active part of disaster risk reduction and adaptation to climate change.

The remainder of this paper is organized as follows: first discusses four models and current experiences using financial services at the community level. The paper then discusses the costs and benefits of each of the four models presented, including an overview of what products are currently used, and the advantages and limitations of using each of these products to manage disaster risk in communities. Next, the paper analyses some of the major issues each approach could address to facilitate appropriate financial services locally. These issues include attitudes and incentives surrounding the provision and the use of financial services for disaster risk management, the necessary framework including regulatory and legislative structures, and product design and implementation issues. The paper concludes with a discussion of next steps and activities to facilitate the availability and use of financial services to help communities manage and reduce disaster risk.

2. Bringing financial services to communities: some examples

A spectrum of actors can provide financial services for community-level disaster loss management, disaster risk reduction activities, and climate change adaptation. Fig. 1 illustrates this spectrum and how communities in seven Latin American countries responded about how they finance these activities, by type of provider. The numbers presented in Fig. 1 from a study in Latin America serves an illustrative purpose. The situation may differ in other countries and regions. However, the typological classes, and the scale of market and non- or semi-market provision of different financial services products can be applied more generally (Beck et al., 2005a, b, 2004).

2.1. Household risk finance approaches

The survey presented in Fig. 1 in seven Latin American countries indicated a heavy reliance on household resources/savings to manage risk, an approach that may require augmentation from other financial services to effectively address the risk of losses from natural hazards. Other research corroborates these results (Honohan, 2004). In many developing countries, most financial and other resources for disaster risk reduction and adaptation activities come from households—mainly through consumption of available resources or savings. The leading rank of household-level risk finance is revealing: respondents indicated in another survey question that ex-post household disaster finance was considered the most costly and least efficient means of paying for disaster losses (Warner et al., 2005).

Saving money in its many forms, from keeping cash at home to putting money in a formal bank, is a common way for the poor to prepare for or cope with emergencies or crisis. The capacity to save depends on household income. Savings are an effective coping mechanism when income is regular and smooth, and if households have not faced previous cash shortfalls. Savings do not provide optimal risk coverage for the very poor, due to factors such as erratic income flow and limitations in participating in effective financial management schemes (Campbell, 2006). The definition of financial services used in this paper excludes financial arrangements within the household or community unit—such as self-insurance or savings that do not involve the services of an outside party. Mechanisms like self-insurance fit into the spectrum of risk management tools used by households, but do not transfer risk to another party in the case of a natural hazard. Borrowing from informal sector local lenders is also common, even though interest rates can vary from 30% to 120% (Hess, 2003). Beyond household risk finance, initiatives by governments and NGOs are often motivated from a general development perspective rather than a risk management perspective, which may lead to an under-appreciation of the threat of natural disasters to sustain-

able development efforts. At the right side of the spectrum, Micro-Finance Institutions (MFIs) and the private sector provide financial services as for-profit products.

Another common coping strategy is to share risk with extended family or with neighbors. Such sharing may include migrant remittances that may account for a considerable share of household income after a disaster (Inter-American Development Bank/Multilateral Investment Fund, 2004). However, remittances are limited by charges made by intermediaries. Reducing charges on remittances—often used for ex-ante risk reduction as well as post-disaster recovery—would likely increase the use of this alternative as part of a household's risk management toolbox. To overcome the low market value of their assets and to spread risk more efficiently, the needy often organize themselves into community groups such as cooperatives. However, an event such as a major natural disaster could simultaneously affect all members of the group. This covariate risk prevents the poor from spreading the negative impacts of disasters with immediate family members or neighbors (Dannenmann and Warner, 2004).

There is a need to overcome obstacles to providing affordable and appropriate financial services at the local level—and from actors which are best suited to manage and finance disaster risk and risk reduction. The discussion below illustrates innovative solutions initiated by different actors throughout this spectrum—with examples from federal and local governments, NGOs, and MFIs—to help communities more efficiently and effectively pay for disaster risk reduction. Appendix A provides an analysis of financial services models.

2.2. Federal government-initiated scheme

El Salvador's Social Protection Funds FISDL (www.fisd.gov.sv). Social investment funds (SIFs) provided by the federal government have been used in El Salvador to provide rapid assistance to poor communities. Social investment funds provide resources for small construction works, such as retrofitting or adjustment of structures to

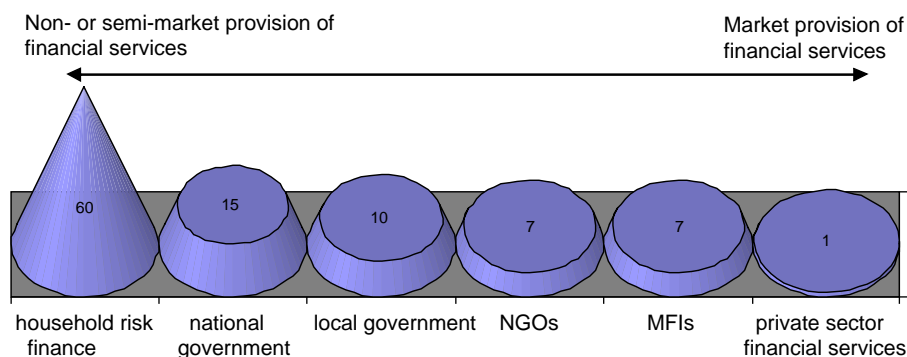


Fig. 1. Spectrum of financial services provided, by actor and by concentration of current initiatives in seven Latin American countries (Bolivia, Peru, El Salvador, Honduras, Mexico, Dominican Republic, Jamaica). Numbers indicate the percentages of efforts as estimated by local, regional and national level policymakers (from Warner et al., 2005).

extreme weather conditions. SIFs mobilize and disburse government resources and expand operations rapidly at the local level, maintain direct contact with poor communities, operate in a decentralized manner, and work closely with civil society organizations and local governments (Cruz, 2005). The funds contribute to damage prevention activities and financial schemes aimed at risk reduction. SIFs reduce vulnerability by creating employment, generating social services for the poor, and widening community-based civic action. This program is efficient and effective because of clearly defined responsibilities for all parties involved, including a transparent monitoring and reporting system (Ammann et al., 2003). For instance, recipient communities must account for use of all funds received. Additionally, it may be important to independently study how such funds are distributed spatially and across social groups. There are indications that equitable allocation is an issue in some government efforts aimed at providing relief aid (see Wisner, 2001).

2.3. Local government-initiated scheme

Risk reduction and risk pooling/insurance scheme at the community level. Since 1999, the city of Manizales, Colombia, has used a risk pool/insurance mechanism to pay for disaster risk reduction. This city of approximately 380,000 inhabitants is located in the Andes mountains and faces a number of hazards, including landslides and flooding, earthquakes and extreme climate variability. The city-wide risk pool has established a detailed inventory of building types (parcel by parcel). This inventory has allowed scheme managers to estimate possible losses and evaluate options for covering the potential costs and financing risk reduction. A notable point in this case is the championing role played by the mayor's office. The combination of ex ante risk reduction and an accompanying financial plan, and strong advocacy within the ranks of municipal leadership make this an interesting case. However, this program has not yet been fully documented in the literature, and requires evaluation in terms of its effectiveness and efficiency for reducing risks (personal communication of Koko Warner with Mayor Eugenio Nestor Ramirez, Colombia, March 2005). Successful risk pooling schemes require robust estimates of probable losses as well as strong advocacy among local authorities to prioritize risk reduction and appropriate adaptation.

2.4. NGO-initiated scheme

The Development of Humane Action (DHAN) Foundation (www.dhan.org) helps disadvantaged people organize community groups for risk management purposes. DHAN provides a variety of programs and services for its members, including financial services like micro-insurance to insure members against natural hazards. As a local NGO in India, DHAN has the relationships with communities groups to set up risk management schemes

for almost 15,000 community groups, called Kalanjams, which comprise smaller units of 15–20 poor women. Through these units, the DHAN Foundation reaches over 250,000 families in India.

DHAN required financial backing and certain expertise about financial services for improved risk management, in particular, in relation to the deficit rainfall insurance product that they developed (Karthikeyan, 2005). To allow insurance products to serve this high volume of customers, DHAN sought out a Dutch reinsurer to negotiate with local insurers to provide policies for members of the large schemes like DHAN. The partnership with the reinsurer was facilitated through the Micro-Insurance Association Netherlands (www.mian.nl). MIAN offers clients a variety of financial service products, technical support for claims administration and training programs to develop local insurance capacity, and community education programs through DHAN channels. NGOs can help private financial services companies overcome obstacles such as client awareness of financial services, illiteracy, and articulation of product demand. For example, the DHAN foundation developed street plays to illustrate to spectators how micro-insurance schemes help solving problems related to disaster risk. Information shared in this way has proved effective in increasing understanding and demand for micro-insurance products for disaster management (Karthikeyan, 2005).

2.5. Micro-finance initiated scheme

MFIs provide a variety of financial services to communities in developing countries. Micro-finance clients form groups that share the responsibility of paying interest and principle of small loans with other members. Micro-credits have become a mainstream product throughout the world, which has been underscored by the award of the Nobel Peace Prize to Mr. Mohamed Yunus and the Grameen Bank in 2006. Micro-insurance products offered by Opportunity International (www.opportunity.org) help such groups better manage their risks and also benefit micro-credit operations by preventing loan default in the case of an unexpected event. The loans from Opportunity International in Malawi are provided with a compulsory insurance component, the premium of which is added to the interest rate of the loan (Mapfumo, 2005). Such product bundling reduces the risk of loan default in the event of a disaster, and the risk that clients must assume the burden of yet another loan to cover the loss of assets and original loan principle.

Like NGOs, MFIs have strong links to local clients and are able to efficiently administer group policies. Partnerships with private sector companies help MFIs overcome specific challenges. MFIs are not necessarily experts in designing and providing insurance services. MFIs may lack the actuarial basis for computing premiums and contributions; however, they may still offer insurance products. These institutions may attempt to adopt products of formal insurance firms, using the same premium and benefits

without adjusting these to customer demand in specific markets. Micro-insurance provided by MIFs might not be always feasible because they have a smaller and possibly more homogenous risk pool, and they lack reserves and reinsurance. MFIs face high covariant risk when disasters affect all of the community groups with outstanding loans. To successfully provide insurance, MFIs must achieve a certain scale in numbers of policies and clients in order to reduce variability in the portfolio. By seeking formal insurance and reinsurance partners, MFIs may be able to better transfer risk once scale is achieved (Dannenmann and Warner, 2004).

3. Main issues and the way forward

Four main issues require attention to make financial services more widely available for disaster risk reduction at the community level. These issues revolve around attitudes and incentives, legal and regulatory frameworks, roles of partners, and the financial products themselves.

3.1. Attitudes and incentives

Current attitudes and incentives towards, risk management and risk financing practice heavily favor ex post solutions, i.e. after a disaster strikes. These solutions include waiting for international donors or federal governments to provide resources for emergency response. Although there is a widespread realization that risk reduction is the preferred ideal priority, crisis management receives operational priority and commands greatest financial resources. Disincentives for utilizing ex ante financial services for more proactive risk management and risk reduction include: difficulty of obtaining resources before a catastrophic event, lack of information about financial services and lack of consensus about alternatives, and a lack of awareness of financial services products. To change these attitudes and incentives, governments should reconsider post-disaster policies that undermine incentives to reduce risk. Instead, supporting ex ante action on disaster risk reduction, possibly linked to access to desired social products, could achieve improved results. Similarly, aim for similar results, for example through food support on the condition that children are sent to school, which is practiced for instance in the “Fome Zero” (Zero Hunger) program in Brazil. Cost benefit analyses could provide guidance about the benefits of disaster risk reduction, and guidance on the role that financial services could play in transferring risk and risk reduction. Finally, greater promotion and public awareness of financial services products could reduce the disincentives for ex ante disaster risk finance and risk reduction.

3.2. Legal and regulatory frameworks

Many needs must be addressed to strengthen the legal and regulatory frameworks to facilitate risk reduction and

adaptation through financial services. Some countries lack sufficient legal and regulatory frameworks for financial services. Without this framework, formal sector insurance and banking cannot lawfully operate, depriving communities of this important source of finance and risk transfer capacity. Mutual benefit groups may still be able to provide financial services locally if legal and regulatory rules are not in place.

Countries also vary widely in the legal and regulatory frameworks that they have in place, creating a complex landscape for companies wishing to provide financial services for disaster risk reduction that also captures scale. While the Basel Convention provides guidelines for worldwide banking services, no such international coordination exists for the insurance industry. Insurance regulation is currently mostly determined at the national level. Country-to-country differences provide opportunities for general financial services, but complicate setting up multi-country disaster risk management schemes or transferring risk across regions to diversify portfolios and more efficiently manage risk.

Taxes can make up a large share of financial services costs. Favorable tax treatment or other incentives for products that encourage risk reduction could facilitate more widespread use of financial services products.

3.3. Partner roles

The potential exists to expand provision of financial services throughout the general typology presented in Fig. 1. There is a need to shift the financing of risk towards those parties which are best able to absorb or transfer that risk—probably to those parties lying farther to the right in the spectrum of Fig. 1. The main challenges in this process are to effectively reach and work with community groups, and to increase private sector participation. Recent experience may show that forming partnerships can provide a solution to both challenges. The cooperation of the formal financial services sector with local community networks can bring different competences and different fields of expertise together. This is apparent in the work of Interpolis and MIAN in India, and also in the recent efforts of the Munich Re Foundation in reducing risks in developing countries. Current efforts include support for a flood warning system in Mozambique and local drinking water supply through fog nets in Eritrea.

Partnerships offer a way to provide financial services products that suits the beneficiaries, and which are mutually advantageous. Involvement of partners with strong ties to recipient communities address problems of adverse selection and moral hazard, a major obstacle to formal sector products. Community groups for instance raise awareness among potential clients about using insurance products to reduce disaster risk, thereby lowering product marketing costs. These groups aggregate risk and facilitate the administration of services like premium and claims payments. Strong community ties also strengthen

the ability of partners to understand product demands of potential clients. In these partnerships, responsibilities and roles must be clearly defined, with each partner contributing its comparative advantage to the scheme. Partnerships can also provide a venue for broader private sector participation.

However, while the private sector has been involved as a partner in some cases, the private sector has not initiated schemes to serve communities. Because many factors required for formal financial services, such as information symmetry at the community level, monitoring, targeting, etc. are not in place at the local level in developing countries, the private sector may be reluctant to take the lead in initiatives. Governments and international organizations can help overcome these obstacles that discourage engagement of the private sector. The impetus to move forward lies with partners such as governments, NGOs, the international humanitarian community, and other international organizations.

3.4. Products

A wealth of knowledge exists about how to design financial services products. Clients show a willingness to pay for financial services, which is proportional to their income. This has for instance been shown for health insurance for the poor, where up to 2.5% of household income might be used for financial services, depending on the level of income (Asenso-Okyere et al., 1997).

Products must carefully balance cost and benefits of the services. Initial experience in developing countries suggest that product demand follows a specific order, again depending on the level of income: first, clients demand life and accident insurance. Next, they demand income insurance and livelihood protection in the form of crop insurance in poor rural areas and access to credit for investment. As the development process continues and average incomes rise, client demand for health care and, finally, property insurance grows.

An essential factor in designing products for the local level (especially in developing countries) lies in finding ways to aggregate, diversify, and administer risk-management products. Products should have a simple structure and be easy to administrate. Products may be bundled, such as in our example from the MFI Opportunity International. Another challenge is to build geographical spread and differentiation between types of disaster-related risks into the financial services portfolios. Involvement of private sector partners can facilitate further aggregation of risk from local to global levels, thus spreading risk to wider markets than might be possible otherwise.

3.5. The way forward

A range of follow-up projects, studies, and further dialogue is needed to continue building on the momentum gained to date. Such research and activities will help

expand knowledge about what types of disaster risk finance models work, improve actual projects, and build capacity at the community level to manage and reduce the financial impacts of natural disasters. Next steps would include:

- Survey of local-level financial services beneficiaries to gauge perception of benefits and costs of financial schemes for disaster risk reduction.
- Explore development of financial products:
 - Risk swaps between regions, for instance between flooding and drought risks.
 - Develop simple products for farmers (water scarcity or abundance), with a general global application.
- Deepen and expand overview of risk financing strategies.
- Explore risk pooling schemes and risk layering among different partners from local to global. An example is the Munich Climate Insurance Initiative (MCII; www.climate-insurance.org), a platform for exploring insurance-related mechanisms to manage climate events (Gurenko, 2007).
- Perform a comparative cost benefit analysis of a community-level disaster risk finance scheme, over a 5-year period comparing with a community that used no such scheme.
- Organize partnerships, documentation, and greater dialogue and pilot projects in disaster risk finance.

Acknowledgments

This paper greatly benefited from the presentations and discussions at the session on financial services and community level adaptation that took place on June 22 and 23, 2005 at the Red Cross Work Conference on Climate Change and Disaster Risk Reduction, The Hague, The Netherlands. The information printed in Section 3 of this paper reflects many of the ideas and suggestions produced during this session. The valuable comments and suggestions from Ben Wisner and Aniello Amendola helped to improve a previous version of this paper. Any points of view or errors that may occur in this paper, however, remain the responsibility of the authors.

Appendix A. Analysis of financial services models

Fig. 2 illustrates the trade-offs of financial services, by type of provision model. Different models of financial service provision reach the informal sector in different ways. Fig. 2 is a preliminary analysis of practitioner observations rather than a rigorous statement of reality. The relative positioning of financial services schemes in each quadrant reflects practitioner feedback about the advantages and limitations of each type of financial service model. Note, however, that the quadrant order does not reflect a particular preference for either of the systems. More research is needed about the underlying factors that

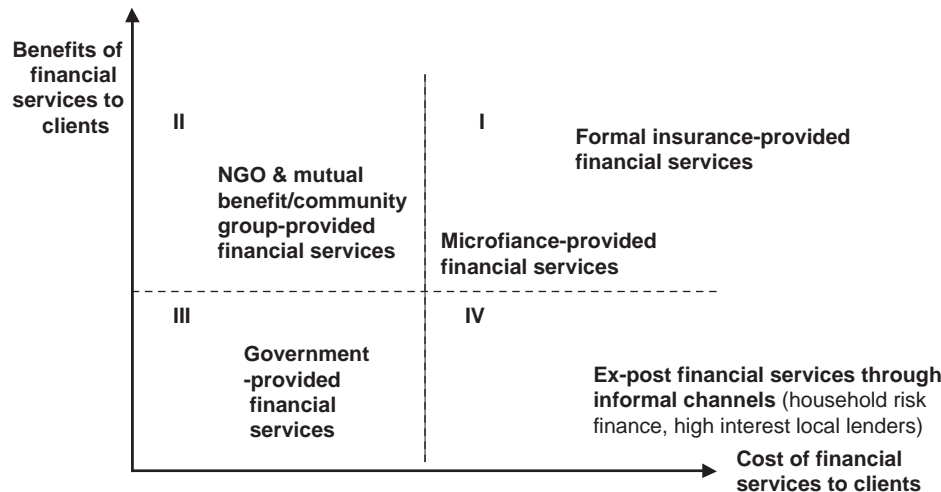


Fig. 2. Preliminary analysis of financial services, by type of provision model.

affect the trade-offs of various financial schemes at the community level.

Quadrant I: Services in this quadrant carry relatively high premiums/interest rates and offer more extensive coverage. Financial services in quadrant I benefit from larger risk pools and optimization of actuarially feasible benefits. MFIs that provide financial services operate in the lower left part of quadrant I. MFIs use the actuarial and financial services technology of formal sector companies and reach the informal sector with low transaction and marketing costs by working closely with community groups.

Quadrant II: Services in quadrant II are often smaller scale operations. NGOs and mutual benefit/cooperative organizations offer lower costs and benefits for clients than formal sector products. Like MFIs, NGOs and mutual benefit organizations keep administration costs low by working with community groups. These groups have sufficient social capital to experiment with financial products: group ownership of the risk substitutes for the high reserves needed to buffer against design flaws during the experimental stage of product development. They may also receive government subsidies. Financial services in this quadrant have smaller and possibly more homogenous risk pools, and can lack reserves and financial capacity.

Quadrant III: Services in quadrant III are often subsidized or provided directly at no cost by the government. Mandatory financial schemes may be poorly tailored to client needs, with low benefits. Programs provide services with social components such as poverty reduction, safe housing, infrastructure, and clean water. Strong links to communities are needed to prevent misuse of funds, and therefore targeting and monitoring are key. Programs may be subject to periodic changes in government budgets.

Quadrant IV: The majority of current disaster and adaptation practices in communities cluster in quadrant IV: ex-post financial services through informal services. These services include foregoing current and future

consumption, and relying on high-interest local lenders such as loan sharks. This high-cost, low-benefit strategy can enhance future vulnerability to extreme events and prevent wealth accumulation and economic development of households and communities.

References

- Amendola, A., 2004. Management of change, disaster risk, and uncertainty: an overview. *Journal of Natural Disaster Science* 26 (2), 55–61.
- Ammann, W., Dannenmann, S., Warner, K., Zosso, G., Schilling, A., Korup, O., Hammer, J., Ferroni, M., 2003. Evaluation of Inter-American Development Bank's Operational Policy on Natural and Unexpected Disasters (OP-704 and Action Plan). Re-292. Office of Evaluation, Inter-American Development Bank, Washington, DC.
- Asenso-Okyere, W.K., Osei-Akoto, I., Anum, A., Appiah, E.N., 1997. Willingness to pay for health insurance in a developing economy. A pilot study of the informal sector of Ghana using contingent valuation. *Health Policy* 42 (3), 223–237.
- Beck, T., Demirguc-Kunt, A., Levine, R., 2004. Finance, Inequality and Poverty: Cross Country Evidence. World Bank Policy Research Working Paper 3338. World Bank, Washington, DC.
- Beck, T., Martinez Peria, M.S., Demirguc-Kunt, A., 2005a. Reaching out: access to and use of banking services across countries. World Bank Policy Research Working Paper 3754. World Bank, Washington, DC.
- Beck, T., Martinez Peria, M.S., Demirguc-Kunt, A., 2005b. Reaching out: access to and use of banking services across countries. World Bank Policy Research Working Paper 3754. World Bank, Washington, DC.
- Bouwer, L.M., Aerts, J.C.J.H., 2006. Financing climate change adaptation. *Disasters* 30 (1), 49–63.
- Campbell, J.Y., 2006. Household finance. *Journal of Finance* 61 (4), 1553–1604.
- Cruz, O.N., 2005. Social investment funds to help communities reduce disaster risk and facilitate climate adaptation. Presentation at the Red Cross Work Conference on Climate Change and Disaster Risk Reduction, The Hague, 22 June 2005.
- Dannenmann, S., Warner, K., 2004. Solidarity and opportunity: the potential of insurance for disaster risk management in developing countries, Conference Proceedings and Workshop Report. ProVention Consortium, October 2004, Zurich.
- Freeman, P.K., 2001. Hedging natural catastrophe risk in developing countries. *The Geneva Papers on Risk and Insurance: Issues and Practice* 26 (3), 373–385.

- Gurenko, E. (Ed.), 2007. Special Edition on Climate Insurance. *Climate Policy*, 6. Forthcoming.
- Helmer, M., Hilhorst, D., 2006. Natural disasters and climate change. *Disasters* 30 (1), 1–4.
- Hess, U., 2003. Innovative Financial Services for Rural India: Monsoon-Indexed Lending and Insurance for Smallholders. World Bank, Washington, DC.
- Hoff, H., Warner, K., Bouwer, L.M., 2005. The role of financial services in climate adaptation in developing countries. *Vierteljahrshefte zur Wirtschaftsforschung* 74 (2), 196–207.
- Honohan, P., 2004. Financial Sector Policy and the Poor: Selected Issues and Evidence. World Bank Working Paper 43. World Bank, Washington, DC.
- Inter-American Development Bank/Multilateral Investment Fund, 2004. Sending Money Home: Remittances to Latin America and the Caribbean, Washington, DC.
- Karthikeyan, M., 2005. Piloting deficit rainfall insurance with the support of people mutuals. Presentation at the Red Cross Work Conference on Climate Change and Disaster Risk Reduction, The Hague, 22 June 2005.
- Linnerooth-Bayer, J., Mechler, R., Pflug, G., 2005. Refocusing disaster aid. *Science* 309, 1044–1046.
- Mapfumo, S., 2005. What are the opportunities to help communities reduce disaster risk and adapt to climate change using microfinance? Presentation at the Red Cross Work Conference on Climate Change and Disaster Risk Reduction, The Hague, 22 June 2005.
- PAHO, 1999. Huracanes Georges y Mitch 1998. Pan American Health Organisation, Washington, DC.
- Ribot, J.C., Magalhaes, A.R., Panagides, S., 1996. Climate Variability, Climate Change and Social Vulnerability in the Semi-arid Tropics. Cambridge University Press, Cambridge.
- Vellinga, P., Mills, E., Berz, G., Bouwer, L.M., Huq, S., Kozak, L.A., Palutikof, J., Schanzenbächer, B., Benson, C., Bruce, J., Frerks, G., Huyck, P., Kovacs, P., Olsthoorn, X., Pears, A., Shida, S., Dlugolecki, A., 2001. Insurance and other financial services. In: McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., White, K.S. (Eds.), *Climate Change 2001: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, pp. 417–450.
- Warner, K., Dannemann, S., Ammann, W., 2005. Risk reduction (dis)incentives: findings of a survey in Latin America. In: Jeggle, T. (Ed.), *Know Risk*. Tudor Rose, London, pp. 50–51.
- Wisner, B., 2001. Risk and the neoliberal state: why post-Mitch lessons didn't reduce El Salvador's earthquake losses. *Disasters* 25 (3), 251–268.