CREATING INSURANCE MARKETS FOR NATURAL DISASTER RISK IN LOWER INCOME COUNTRIES: THE POTENTIAL ROLE FOR SECURITIZATION

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CREATING INSURANCE MARKETS FOR NATURAL DISASTER RISK IN LOWER INCOME COUNTRIES: THE POTENTIAL ROLE FOR SECURITIZATION[1]

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Abstract

This paper considers the potential for securitizing index-based insurance products that transfer weather and natural disaster risks from lower income countries. The paper begins with a brief overview of why markets for natural disaster risks are important in lower income countries and a review of some recent activities using index-based weather insurance. Next, the paper explains how natural disaster risks are handled in higher income countries. These examples along with the example of an innovative index-based livestock insurance pilot project in Mongolia illustrate how layers, or tranches, of natural disaster risk can be financed during the product development phase by creating structures similar to the Special Purpose Vehicles used in catastrophe bond, mortgage bond, and the emerging microfinance bond markets. We refer to these investment alternatives as micro-CAT bonds since the principal amounts would be small relative to the existing CAT bond market.

Keywords

Catastrophe risk; index insurance; weather risks; socially responsible investing; reinsurance

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Many lower income countries (LICs) are highly exposed to losses caused by extreme weather events and other natural disasters, yet, insurance markets for transferring these risks are often missing in LICs. It is a working premise of this paper that a lack of domestic capital and limited access to global financial markets restrict opportunities for the *ex ante* transfer of natural disaster risks in many LICs.[2] This paper explores some new approaches to creating insurance markets for natural disaster risk in LICs. The increased use of index-based risk transfer products (IBRTPs) opens the way for these new approaches.

Several authors have addressed the challenges associated with managing catastrophic risk in small LICs (ANDERSEN, 2002; HOFMAN and BRUKOFF, 2006; GURENKO and MAHUL, 2003). ANDERSEN (2002) describes the vulnerability of LICs to natural disasters and the role of donors in facilitating access to global markets for transferring risk while also building risk management capacity at the local level. HOFMAN and BRUKOFF (2006) review a number of public- and private-sector mechanisms that could be used to transfer natural disaster risk, as well as the challenges to the widespread adoption of these mechanisms in LICs. GURENKO and MAHUL (2003) review the problems with *ex post* disaster assistance and discuss how catastrophe insurance pools, catastrophe bonds (CAT bonds), and contingent loans can be used to provide LICs with more efficient and effective *ex ante* financing for disaster relief.

This paper extends the literature on financing natural disaster risks in LICs by presenting conceptual arrangements that use the basic workings of CAT bonds with a unique structure for prefinancing natural disaster risk. Building on the financing structure of the Mongolian Index-based Livestock Insurance (IBLI) pilot, the paper considers the potential for marketing layers, or tranches, of risk to investors — especially during the early stages when the market for transferring risk outside the country is under development. As natural disaster risk transfer markets mature, a wider range of options for financing disaster risk should become more feasible; in particular traditional reinsurers are likely to become more involved. Options for financing natural disaster risks in LICs could eventually include a blend of global reinsurance and securitized risks as is occurring in higher income countries.

1 Natural Disaster Risk Transfer and Economic Development in LICs

By providing opportunities to transfer natural disaster risks out of the local economy, insurance markets can directly spur increased investment by agricultural producers in LICs in riskier but highly productive activities. Emerging evidence suggests that LICs with both banking and insurance markets experience the greatest economic growth (USAID, 2006). Insurance markets can also indirectly stimulate increased investment through linkages to credit markets. Lenders often ration credit in areas that are exposed to spatially correlated natural disaster risks since a widespread natural disaster can simultaneously cause a large number of loan defaults. However, lenders should be more willing to provide loans if borrowers can insure against natural disaster losses. For these reasons, markets for

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[2] To the extent that global reinsurers are willing to participate in experimental programs and provide reinsurance for small volumes of business, this premise may not be correct. Regardless, the purpose of this paper is not to debate that topic. Rather the major objective is to consider alternative mechanisms for financing experimental natural disaster risk transfer products in LICs.

transferring natural disaster risk are important for reducing vulnerability to risk and stimulating economic growth in many LICs.

LICs are disproportionately affected by extreme weather events and other natural disasters. Losses caused by natural disasters, when measured as a percentage of gross national income, are highly negatively correlated with per capita income (LINNEROOTH-BAYER, MECHLER, and PFLUG, 2005). A single natural disaster can stunt economic growth for many years due to lost production, damaged infrastructure, and the diversion of scarce development resources for recovery efforts (CARTER ET AL., 2007). An example is Hurricane Mitch, which struck Honduras in 1998. Four years after the hurricane, the annual GDP in Honduras was still 6 percent less than pre-disaster projections (LINNEROOTH-BAYER, MECHLER, and PFLUG, 2005).

LICs are relatively more susceptible to natural disaster losses in part because their economies are more dependent on agriculture. In LICs, agricultural production accounts on average for almost 23 percent of GDP (WORLD RESOURCES INSTITUTE, 2007). This figure does not include the additional GDP generated by industries that provide agricultural inputs or that transport or process agricultural commodities. Employment in the agricultural sector in LICs is almost two times the GDP contributions. This dependence on agricultural production makes LICs more susceptible to economic losses caused by extreme weather events and other natural disasters.

Extreme weather events and other natural disasters can have devastating effects on private-sector businesses and local governments. Natural disasters destroy both private and public infrastructure. Private entities can experience long periods of business interruption, while local governments are forced to divert scarce resources from long-term investment priorities, such as education or health, to short-run disaster recovery needs.

At the household level, natural disaster risk also contributes to chronic poverty. Approximately 1 billion people live on less than US$1 per day. Three-quarters of these "poorest of the poor" live in rural areas of LICs (CHEN and RAVALLION, 2007) and over one-half depend on agriculture or agricultural labor as their primary livelihood strategy (INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT, 2001). Extreme weather events and other natural disasters can destroy productive household assets that have been accumulated at high opportunity cost (CARTER ET AL., 2007; CARTER and BARRETT, 2006; MCPEAK and BARRETT, 2001; DERCON, 1998). Recognizing the potential for such losses, households are prone to choose livelihood strategies that reduce risk exposure but likely also generate lower expected returns (CARTER and BARRETT, 2006; DERCON, 2005; ROSENZWEIG and BINSWANGER, 1993).

By reducing exposure and vulnerability to natural disaster risks at all levels, the availability of risk transfer markets can create a more stable and attractive environment for investment. Using financial markets to prefinance natural disaster risk can create more stability in an economy following a natural disaster by reducing the government's fiscal burden and providing a guaranteed source of relief funds. Likewise, the ability of rural businesses and agricultural intermediaries to protect themselves against economic shocks from natural disaster risks supports the sustainability and growth of the rural economy and should encourage greater investment in the rural sector. Finally, access to insurance or other means of transferring disaster risk can encourage households to invest in higher-return activities by reducing their exposure to natural disaster risk, thereby improving their access to credit.

2   Missing Insurance Markets for Natural Disaster Risks in LICs

While markets for transferring weather and natural disaster risks are important for economic development in LICs, these markets are often underdeveloped or missing due to asymmetric information, high transaction costs, and exposure to spatially correlated losses (SKEES and BARNETT, 2006). Also, governments in most LICs are unable to provide subsidies for these

markets as is done in many higher income countries (HESS ET AL., 2005). While difficulties with weather insurance markets (e.g., crop insurance) exist to some degree in any setting, they can be insurmountable when attempting to provide insurance to poor households in LICs (BARNETT, BARRETT, and SKEES, 2006).

Asymmetric information problems are inherent to various types of insurance products. Careful underwriting of risk exposure and monitoring of policyholder behavior are necessary to address asymmetric information problems. However, there is a large fixed-cost component to underwriting and monitoring activities so, for small insurance policies, underwriting and monitoring costs are extremely large relative to the insured value. Similarly, there is a large fixed-cost component to the transaction costs of selling insurance policies and adjusting any claims. For small insurance policies, these costs are also large relative to the insured value.

Because natural disaster losses tend to be spatially correlated, insurers cannot effectively pool these losses within the region or often times, even within the country. Thus, insurers are reluctant to offer coverage against natural disaster losses unless they can obtain reinsurance to transfer these spatially correlated losses into international markets. However, due to extreme uncertainty about the probability of occurrence, reinsurers will sometimes refuse to cover catastrophic loss exposure due to natural disasters. Even if reinsurance is offered, premium rates will be loaded to account for the extreme uncertainty. Reinsurers will also conduct due diligence on the insurer's book of business. All of these costs must eventually be passed on to policyholders. The result is that insurance against correlated natural disaster losses is often either unavailable or unaffordable in LICs.

3   Markets for Natural Disaster Risk in High and Middle Income Countries

Even in higher income countries, financing correlated losses is a major challenge for any form of insurance that covers losses caused by extreme weather events and other natural disasters. Correlated risks result in large numbers of claims at the same time in the same geographic area. This means that if a major loss event occurs in the early years of establishing any form of indemnity fund or reserves, premiums may not be adequate to cover losses. Indemnities for a single event can exceed premiums collected in a single year by several times. It requires careful planning to ensure that adequate capital is available when major loss events create claims that exceed premiums. These issues are critical to the financial viability of any insurance company offering insurance against adverse weather events.

Reinsurance is the most common mechanism for transferring large risks from primary insurers to international markets. While reinsurance is a very effective means of transferring risk, it does have some limitations. The reinsurance market is thin and there is limited price transparency. Also, there are significant transaction costs to reinsurance. Each reinsurance contract is customized, requiring costly legal fees. Conducting due diligence on the primary insurer's book of business is costly. Finally, after the reinsurance contract is in place, the reinsurer must engage in costly monitoring to reduce moral hazard.

In the case of catastrophic weather risks, an "ambiguity" load is often added to reinsurance premiums. In this context, ambiguity refers to the tremendous uncertainty that exists about the likelihood and magnitude of extreme weather events. To be cautious, reinsurers load premium rates to account for this ambiguity. Reinsurance pricing is also very volatile. Following a major loss event, premiums tend to rise dramatically in the affected markets. Over time, premiums gradually fall until the next big loss event. For example, following very active hurricane seasons in 2004 and 2005, reinsurance prices increased dramatically for 2006 in U.S. and Mexican markets. Compared to 2005, reinsurance prices increased 76 percent in the United States, and 129 percent in Mexico, while reinsurance prices in other parts of the world rose only 2 percent (GUY CARPENTER, 2007).

A number of scholars have also expressed concern that the lack of understanding of the risks and events being insured may result in relatively high prices (CAMERER and KUNREUTHER, 1989; HOGARTH and KUNREUTHER, 1989). FROOT (1999) provides more in-depth analysis of this issue for catastrophe reinsurance with a list of explanations for this phenomenon: 1) the market power of reinsurers; 2) high moral hazard and adverse selection problems at the insurance level; and 3) inefficient corporate structure within the reinsurance industry.

As a response to volatile reinsurance markets, CAT bonds emerged in the mid- to late 1990s as an alternative means to transfer catastrophic risk. These risk-linked securities transfer specific types of catastrophic risk from the holder to the investor.

Scholars have described the evolution of this new form of risk financing as the convergence of reinsurance and capital markets (COLE and CHIARENZA, 1999; DOHERTY, 1997; LAMM, 1997). CAT bonds involve the creation of a marketable security that is tied to a specific catastrophic event and is financed by premiums flowing from contingent claims transactions — generally traditional insurance or reinsurance transactions. If the catastrophic event does not occur, the investor receives a rate of return that is generally a few hundred basis points higher than the LIBOR.[3] If the catastrophic event does occur, the investor loses the interest and some predefined portion (up to 100 percent) of the principal invested. The funds are then used by the seller of the CAT bond to pay claims to policyholders.

Since the volume of capital markets is many times that of the entire reinsurance industry, access to capital markets could compensate for some of the limitations of traditional reinsurance. For example, in 2005 the U.S. General Accountability Office (GAO) reported that insurers were beginning to believe that "the presence of catastrophe bonds as an alternative means of transferring risk may have moderated reinsurance premium increases over the years." (GAO, 2005: 27)

A defining characteristic of CAT bonds is that the occurrence of a prespecified catastrophic event will cause the investor to lose some, or all, of the principal. However, CAT bonds differ based on how the catastrophic event is measured. Indemnity-triggered CAT bonds measure the occurrence of the catastrophic event based on losses actually incurred by the seller. A limitation of indemnity-triggered CAT bonds is that, as with reinsurance, the purchaser will insist on conducting due diligence on the sellers' book of business. This adds transaction costs and also requires the seller to disclose potentially proprietary underwriting information. Also, due to the potential for moral hazard, the purchaser will also have to monitor the activities of the seller — adding further transaction costs.

In recent years, the use of indemnity-based triggers has declined relative to contracts that utilize various index-based triggers. Index-based CAT bonds do not define the triggering catastrophic event based on losses incurred by the seller but rather, based on some objective measure that is highly correlated with losses incurred. An example is parametric triggered CAT bonds that trigger principal forfeitures based on physical parameters such as weather variables (TURVEY and CHANTARAT, 2006). Modeled loss-triggered CAT bonds trigger principal forfeitures based on loss predictions from a statistical model that incorporates one or more physical parameters (e.g., weather variables). Industry loss-triggered CAT bonds trigger principal forfeitures based on the average loss experience for an industry in a region rather than losses experienced only by the seller of the bond. Another example is hybrid-triggered CAT bonds, which require more than one underlying index to trigger before the principal is forfeited.

Index-based CAT bonds are simply a specific form of a more general class of financial instruments we refer to as index-based risk transfer products (IBRTP). Other examples of

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[3] London Interbank Offered Rate (LIBOR) is a daily reference rate based on the interest rates at which banks offer to lend unsecured funds to other banks in the London wholesale or "interbank" money market.

IBRTPs include products such as weather derivatives, weather index insurance, and area-yield insurance. As with other IBRTPs, index-based CAT bonds have the advantage of much lower transaction costs relative to traditional reinsurance or indemnity-triggered CAT bonds. The use of index-based CAT bonds also reduces moral hazard which may be of particular importance in areas where regulatory oversight and monitoring of the insurance sector is less developed. CAT bonds that use direct parametric measures (referred to as indexes in this paper) comprised about 30 percent of CAT bond risk capital in 2006. Hybrid products that use some form of indexing comprised another 37 percent in 2006 (GUY CARPENTER, 2007).

Indemnity-triggered or index-based CAT bonds can be sold for different layers (or tranches) of risk, much like reinsurance. For example, to protect against flood losses in a given region, an insurer may sell parametric triggered CAT bonds based on aggregate rainfall over a period of time measured at a specified weather station. By selling CAT bonds with different trigger levels of aggregate rainfall, the seller can match the proceeds from the CAT bonds with expected losses due to different levels of rainfall.

The market for CAT bonds in the United States, Western Europe, and Japan, has been growing since the first transactions in the mid-1990s. In 2006 the market nearly doubled from the previous year, with 20 issues worth nearly US$5 billion (figure 1). Following the record losses from Hurricane Katrina, reinsurance premiums increased dramatically in some markets, leading to greater interest in the use of CAT bonds to transfer hurricane risk. This increased demand led to higher yields on CAT bonds which, in turn, generated more interest from investors. Standardization and experience with these instruments have also contributed to the growth of this market as investors become more familiar and comfortable with CAT bonds. Importantly, reinsurance companies are also using CAT bond markets to reduce some of their extreme exposure.

Figure 1:   Growth in CAT Bond Market (1997–2006)
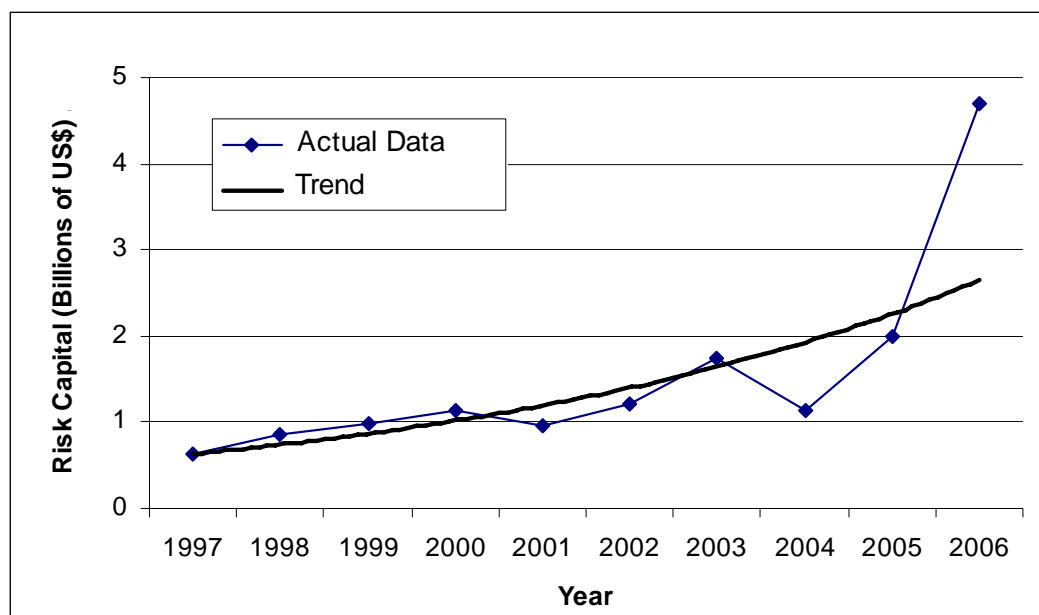
Source: Authors' representation based on GUY CARPENTER, 2007, page 5

In 2006 Mexico became the first middle income country to issue CAT bonds to provide disaster financing in the event of a high magnitude earthquake. The bonds were underwritten by SwissRe and issued by CAT-Mex, Ltd. The CAT bonds provide US$160 million in contingent disaster financing for the most catastrophic layer of risk: earthquakes of 8.0 or greater on the Richter scale that occur in a defined zone in Mexico. An index insurance contract provides up to an additional US$290 million for earthquakes of the same magnitude

occurring in either of two other zones. Under the structure of this bond, if an earthquake of this magnitude occurs, investors lose their entire principal, which is transferred to the government for disaster relief. At issue, the bonds were offered at 235 basis points above LIBOR. The Mexican government paid US$26 million to secure this financing arrangement (CARDENAS, 2006; MALKIN, 2006). These CAT bonds were structured to complement a World Bank loan of up to US$180 million that is triggered by earthquakes of magnitude 7.0 or greater on the Richter scale. By layering these catastrophic risks and transferring them into international markets, Mexico can maintain a smaller disaster reserve fund, allowing more of the country's limited financial resources to be invested in health, education, infrastructure, and other public needs.

While there will always be an important role for reinsurance in transferring the risk of extreme weather events and other natural disasters, CAT bond markets are evolving into a cost-effective and efficient means of transferring catastrophic risks. Since the average CAT bond term is 3 years, the price and terms of the contract are stable for multiple years. Additionally, there is little credit risk. Just as is done when securitizing credit risks, funds are secured in a Special Purpose Vehicle (SPV) so payment upon a triggering event is assured. CAT bonds do have important limitations. There are significant transaction costs to establishing CAT bonds. These costs include risk analysis, product design, legal fees, and the establishment of SPVs. They also include the special regulatory considerations that are needed to protect investors. Regulatory burdens can increase when attempting to protect individual investors as opposed to institutional investors.

4   Emergence of Risk Transfer Markets for Natural Disaster Risk in LICs

In recent years, a number of promising approaches have emerged to assist LICs in transferring natural disaster risk. Most of these have required significant support from donors to pay for the large upfront costs of developing these markets in countries that have previously had little access to risk-transfer for natural disasters. Largely due to World Bank efforts, index-based rainfall insurance in India has been expanding since its introduction in 2003. These policies are sold to small farm households by both private-sector insurance companies and the parastatal insurance company — the Agricultural Insurance Company of India. In Malawi, the World Bank has also been involved in introducing index-based drought insurance that is tied to both lending and the sale of seed. A number of other World Bank pilot projects are in development to expand the use and applications of index-based insurance for weather risks in LICs (HESS ET AL., 2005).

One of the most recent examples of a much larger index-based insurance project is the World Bank facilitated Caribbean Catastrophic Risk Insurance Facility (CCRIF). The CCRIF is designed to provide Caribbean countries with ready liquidity in the event of a hurricane or earthquake (WORLD BANK, 2007). Parametric triggers are used to make timely payments in each individual country using information from a third party such as the U.S. Geological Survey or the U.S. National Oceanic and Atmospheric Administration (NOAA). Donor funds are paying for much of the development costs of this risk-pooling facility. Each country pays a premium rate that is consistent with the underlying parametric risk for the country. Furthermore, each country can select the sum insured. Payments will be made based on the country's choice of parametric measures, trigger levels, and sum insured. The countries involved in the CCRIF are pooling their risk exposure to reduce the variability in losses. The CCRIF is to be reinsured by a major reinsurer. By pooling their loss exposure, the member countries can reduce the premium cost of reinsurance. Structures such as the CCRIF allow smaller countries to pool their risks and obtain sufficient scale so that other approaches to risk financing become feasible, including the potential to securitize some of the risks using instruments such as CAT bonds.

5   Extending the Mongolian IPLI Project to Securitize Weather Risk in LICs

While the details for the CCRIF structure are being settled as this paper is written, it is useful to turn to the case of Mongolia to highlight key ideas. The CCRIF could offer similar opportunities to what are being presented here using the Mongolia project. Livestock in Mongolia are highly vulnerable to extreme weather events, locally known as dzud. Dzud is a series of compounded weather events that create poor conditions for grazing livestock. For example, in 2001 a major dzud (summer drought followed by a harsh winter) led to widespread livestock losses. Mongolia lost nearly one-third of all cattle and yak. Specific areas of the country experienced even higher livestock losses in 2001 and 2002.

The government of Mongolia entered into a loan agreement with the World Bank as a means of financing a tranche of extreme risk in a pilot project for index-based livestock insurance (IBLI). The IBLI policy is sold to individual herders but payments are based on an aggregate index of livestock mortality at the soum (county) level. IBLI is being pilot-tested in three different aimags (provinces/states). The Base Insurance Product (BIP) pays an indemnity anytime mortality in the soum exceeds either 6 or 10 percent (depending on the policyholder's choice). Payments from the BIP reach a maximum when the soum livestock mortality rate exceeds a prespecified level (25 percent in one aimag and 30 percent in the other two aimags). For herders purchasing the BIP, the government provides an additional benefit to pay for all loses beyond those covered by the BIP. This is done to clearly separate the government social role from the market-based BIP product.

Since the same underlying parametric index (aggregate livestock mortality) is used for the BIP in each soum, it was possible to create a unique pooling arrangement for the participating insurance companies. Given that each insurance company is selling the same index insurance policy (though perhaps in different soums), they are willing to participate in a collective pool of these policies without needing to perform due diligence on each other's book of business. It is also useful to recognize that every insurance company is selling a uniform product at the same premium rate for the risk portion of the premium and that the actuarial development was performed by an independent third party. The pool, known as the Livestock Insurance Indemnity Pool (LIIP), is funded from two sources. Each year, before any BIP policies are sold, every participating insurance company seeds the LIIP with a capital infusion that is approximately 40 percent of their expected BIP premiums for that year. This capital infusion is known as the Guaranteed Indemnity Contribution (GIC). The second source of funds is that participating insurance companies deposit the premiums received (minus their administrative load) from the sale of BIP policies into the LIIP. Insurance companies are allowed to place their own administrative load on the premiums charged to herders. The administrative load part of the collected premiums is directly transferred to the insurance companies.

Given the experimental nature of the project, it was not practical to secure reinsurance. Thus, the Mongolian government is providing reinsurance on the LIIP at favorable terms. Herder premium rates were developed using 33 years of historic mortality data and standard actuarial procedures to risk-load for the catastrophic risk represented in these data. In 2006 and 2007 the government stop loss was set at 105 percent of the total contributions to the LIIP. On average, approximately 35 percent of the premiums deposited in the LIIP is used to build a reinsurance reserve, however the percentage varies by company depending on the riskiness of their book of BIP policies. The reserve can build value over time (i.e., any unused funds will remain in the reinsurance reserve from one year to the next). This is important, as it affords the opportunity to create a more sustainable insurance program. Finally, if the BIP reserve is exhausted in any given year, the World Bank contingent loan is called to pay all remaining losses.

After the reinsurance contribution is made, the remaining funds in the LIIP (105 percent of herder premiums) earn interest over the entire insurance cycle. Even in a catastrophic year

when all of the funds in the LIIP are needed to pay herder indemnities, insurance companies will recover the interest earnings. Each insurance company owns a share of underwriting gains in the LIIP that is equal to their portion of premium sales. Insurance companies are provided software to evaluate their risk-return profile given their book of business (i.e., their premium volume by soum and species) and their capital-at-risk, which is equal to the prepaid indemnity contributions. While the pilot has organized the LIIP account to be closed out at the end of each insurance cycle, more complex structures are more desirable to impose a proper discipline for reserving.

The structure of the IBLI financing is presented in figure 2. There are three distinct tranches within this structure: Tranche 1 — the LIIP which is a prepaid indemnity pool similar in structure to an SPV; Tranche 2 — a reinsurance tranche or layer that pays for losses that exceed the funds available in the LIIP (105 percent of herder paid premiums) up to the point where the BIP reinsurance reserve funds are exhausted (alternatively, the upper bound could be explicitly established); and Tranche 3 — a catastrophe reinsurance reserve (currently financed by the World Bank contingent loan) for losses beyond those which can be paid under Tranche 1 and 2. At the current time for the Mongolian project, Tranche 1 is the commercial tranche. However, depending on how the herder premium is distributed, any combination of the tranches could be made commercial (Tranche 1 only; Tranche 1 and 2 only; or Tranche 1, 2, and 3).

Figure 2:   Financing Structure of the Index-based Livestock Insurance in Mongolia
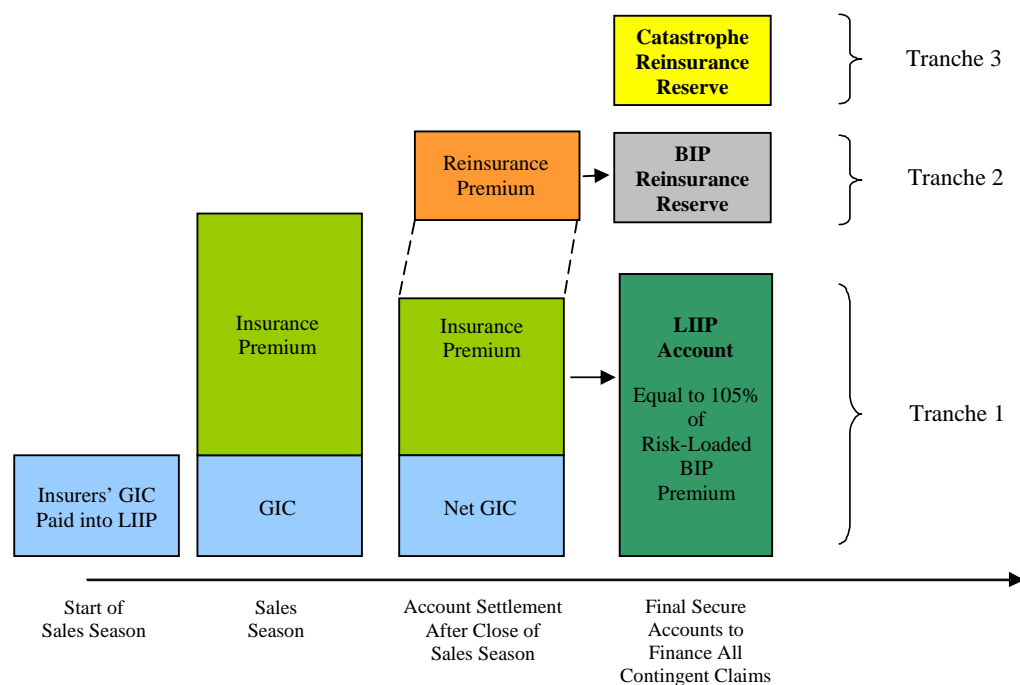
Source: Authors' representation

The structure can be replicated for any index-based insurance product. For example, if a country offers drought insurance using local weather stations or even satellite data with models to estimate soil moisture, these index-based contracts could be organized with a structure similar to that presented for Mongolia. This structure is more rigid than many other forms of regulation as it both ring-fences this unique line of insurance from other areas of the insurers' business, and it completely protects all indemnity payments so that policyholders are

not left unprotected if an insurance company fails and cannot pay indemnity obligations.[4] Of more interest for this paper, this structure develops clear rules for paying losses and clearly defines the financing for each tranche. In principle, each of these tranches could be securitized. Given the data and the portfolio model, a risk-rating entity could provide an initial rating for each tranche. At the outset, one could also provide market-based pricing for these debt instruments.

Each of the insurance companies own a share of Tranche 1 (the LIIP) based on their share of premium collected from herders. The LIIP can be thought of as an SPV (much like those used for CAT bonds or the securitization of loan portfolios) albeit organized and controlled by the government. The commitment of the government of Mongolia and the World Bank loan imposes significant discipline on the management of the LIIP account. Given the structure of this unique SPV, it would be very straightforward to allow an insurance company to sell any portion of their LIIP share at any time, from the point of BIP sales to the settlement of payments. Of course, the value would be significantly driven down in a year of massive dzud. There is no good reason to require the insurance company to continue to hold their share of the LIIP through the complete insurance cycle. This flexibility could easily allow the insurance company to remove their capital at any time. An insurance company could decide after the sales season that they have too much capital at risk in the LIIP or they could be in a position where they would like to liquidate part of their LIIP investment to use in alternative investments.

Given the experimental nature of the pilot, the Mongolian government and the World Bank currently hold the risk for Tranches 2 and 3. However, should the pilot prove successful (and with some minor modifications that clearly define the boundaries of each tranche), Tranches 2 and 3 could also be financed in the private sector through reinsurance or securitized instruments like CAT bonds. Given sufficient historic data and portfolio models that evaluate the spatial distribution of sales against the historic losses, one can estimate the risk profile for any one of the three tranches presented in figure 1. As updated information regarding potential losses from the underlying index becomes available, the risk-return profile for each tranche could be dynamically recalculated, allowing for continuous trading of securities based on each tranche.

6 Marketing Tranches of Risks for Natural Disaster Risks in LICs

The structure presented in figure 2 opens the way for micro-CAT bonds[5] that could also be used to transfer correlated, catastrophic risks out of LICs and into global capital markets. If such instruments can be established, this should help stimulate more risk transfer opportunities (e.g., insurance markets) within the country. For LICs, micro-CAT bonds could offer some important advantages relative to traditional reinsurance. Of course, the issue of who will pay the transaction costs of establishing and reviewing the type of structure that is presented in figure 2 is a paramount consideration. Donors and LIC governments will likely have to incur these costs.

In considering a structure of the type presented in figure 2, an important question is how to market this type of risk. As the scale of use and the comfort with this type of structure increases, one can expect global reinsurance markets to become involved. This section describes how individual and institutional investors could also become financially involved in

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[4] The reader should bear in mind that this aspect of the project to protect the herders is unique. This may not be the best policy if one considers other individuals who have different types of insurance from the same company. They may need an equal claim to assets in the event that the insurance company becomes insolvent.

[5] We use the term "micro-CAT bond" because investing is of such small volume that it may not be of interest to either the CAT bond market or to a global reinsurer. One should also recognize that the level of risk in Tranche 1 is actually not catastrophic.

experimental projects that develop natural disaster risk transfer markets in LICs. These investments offer the opportunity to support the emergence of insurance markets for natural disaster risks in LICs by easing a common constraint to market development — access to capital. This involvement could be structured with an institutional investor or it could be more direct as described below. The challenge of attracting institutional investors remains the high transaction costs associated with the due diligence on structuring and rating the tranches to determine an appropriate return. More intriguing is the open question of how to involve the individual investor. However, regulation to protect individual investors may also be an insurmountable burden.

In any case, any one of the three tranches presented in figure 2 of this paper offers the opportunity for investing in an instrument similar to a securitized loan portfolio or a CAT bond. The challenge is how would any of the micro-CAT bonds be marketed and how would one have some assurance that the proper structure is in place to package IBRTPs for natural disasters? Donors have demonstrated a willingness to incur the costs of developing pilot programs for the transfer of weather and natural disaster risks in LICs. Without such donor support, very little of the activity to date would have occurred. Public good arguments can be used to justify public or donor support targeted at facilitating the development of new natural disaster risk transfer markets for LICs. To that end, the International Finance Corporation (IFC) of the World Bank Group has been working to become a share owner in a Global Index Reinsurance Facility (GIRIF). The GIRIF would consist of:

1. *"a commercial risk-taking company to underwrite indexable weather and other indexable natural catastrophe risks in developing countries, and*

2. *a technical assistance/donor funding pool to develop the technical parameters of the business."*[6]

Given the use of reliable index-based contracts that are more likely to be free of moral hazard and adverse selection, these market developments may also attract more investors from the outside. It will be necessary for these markets to develop some level of scale before global reinsurance markets will be willing to fully participate. It is also extremely important that the regulatory environment is strong, to increase confidence both inside and outside the LIC about the sustainability of the emerging insurance markets for natural disaster risks. The financing structure for the IBLI presents one example for how to create an SPV-like structure that is needed to gain the confidence of outside investors.

Returning to how one might finance the LIIP account (Tranche 1) in the Mongolian project, it would be quite feasible to organize the sale of shares that are currently held by insurance companies. Consider simply organizing 100 certificates, each representing a 1 percent share of the proceeds from this SPV. It should be possible to allow anyone to purchase any of these shares at any point in time. Of course, there is no reason to restrict the ownership of shares to a fixed percentage (i.e., 1 percent); any fraction would be easy to implement. It would be important to track the total volume to make certain that a clearly defined business entity or individual owns every portion of the SPV. Owners could include other investors in Mongolia, global reinsurers, or a broader global community of investors. Again, the shares could conceivably be sold at any time during the insurance cycle. The price would change based on the expectations regarding mortality in different regions of Mongolia. A more practical application would be a shorter period of sales that coincides with the sales closing period.

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6   This information was taken from the IFC website on May 30, 2007
    http://www.ifc.org/ifcext/spiwebsite1.nsf/2bc34f011b50ff6e85256a550073ff1c/0c3e26c0a76328ec85257235 005bad08?opendocument

7   Institutional and Socially Responsible Investors

There are obvious questions and challenges to the ideas presented in this paper. As was pointed out above, in the Mongolian case only Tranche 1 is commercial at this stage. Thus, any investors may be attracted to Tranche 1, which offers the potential for a positive return. Tranche 2 will grow into a more commercial venture if reserves are built over time and if there is imposed an upper limit to when payments from this tranche stop and payments from Tranche 3 begin. For those tranches that are not commercial, one can raise the question regarding how socially responsible investors might be willing to become involved. Maybe some groups or individuals would be willing to invest in social tranches knowing that they would have the risk of losses with a rate of return lower than market rates, simply in the name of helping develop these markets. Another challenge is to ensure that the opportunity for investing in any of these tranches is made with the lowest transaction costs possible.

It is useful to review some of the progress made on other fronts to provide context for these ideas. Socially responsible investing that supports social, environmental, and corporate responsibility shows a growing interest, and in recent years new investment instruments have emerged, allowing investors to support the poor in LICs while still making a return. For example, the Calvert Group, Ltd (www.calvert.com) offers socially responsible mutual funds made up of companies that have been selected according to various social criteria. Calvert also offers other unique on-line arrangements that direct socially responsible investors to community-based investments in development (http://www.calvertgiving.org/).

The securitization of microfinance portfolios also provides a venue for socially responsible investors to diversify their investment portfolio while also supporting development in LICs. There is a growing demand for capital in the microfinance markets of the world. Some argue that the demand is significantly greater than the supply. Microfinance institutions (MFIs) have learned that using capital markets rather than relying on donor grants and loans can be a more flexible and sustainable source of capital. For example, Compartamos is one of the largest MFIs in Mexico. Compartamos first securitized a portion of their portfolio in local currency in 2002. That endeavor was well received by both individual and institutional investors and allowed the MFI to greatly expand their lending operations. In 2004 they issued a second bond (US$44 million) for institutional investors to further expand their capital and lending capability. The transactions were underwritten by Banamex, a Mexican subsidiary of Citigroup. There are also a growing number of MFI investment funds that comprise a pool of smaller MFIs. Blue Orchard Microfinance Securities issued the first cross-border microfinance securitization in 2004 with a US$40 million bond issued to benefit a pool of MFIs in nine countries (INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH, 2007; MEEHAN, 2004).

The largest securitization by an individual MFI took place in Bangladesh in 2006 with the Bangladesh Rural Advancement Committee (BRAC). BRAC has more than 5 million borrowers with an average loan size of US$162. BRAC has arranged to securitize US$180 million of their loan portfolio over 6 years in local currency at a cost of 12 percent, which is about 2 percent lower than could be achieved by borrowing that amount through commercial banks (INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH, 2007)

A significant example to the ideas presented in this paper is the use of the Internet to attract individual investors. Kiva organizes peer-to-peer lending between socially responsible investors in higher income countries and individual entrepreneurs in LICs through Web-based transactions. While there are important distinctions between this and what is being proposed in this paper, Kiva is a noteworthy development. Kiva began in March, 2005, and since then more than 60,000 people have lent over US$6 million to small businesses and entrepreneurs in LICs (http://www.kiva.org/). The growth of Kiva speaks to the willingness of people to

make investments even without a financial gain since Kiva lenders receive no return on their loans and there is the risk of default (although repayment rates thus far are excellent).

In summary, the growing number of microfinance investment funds and securitizations as well as the activity that is emerging on the Internet, like Kiva, the Grameen Foundation (http://www.grameenfoundation.org), and some of the activity managed by Calvert (http://www.calvert.com), speak to the potential market for social investing in natural disasters given the right platform, infrastructure, credibility, and marketing.

Returning to the Mongolian structure presented in figure 2, each of the three tranches represents a form of an SPV, albeit that Tranche 1 is the only commercial tranche at this point. To the extent that the control of each tranche is placed in a stronger legal and regulatory framework, such as under the control of the state bank of the LIC, this may increase the confidence of investors. The CAT bond element that may be missing in the short term is the necessary rating by a financial rating institution. Portfolio software developed by a third party can provide indicative pricing; still, it would require some faith on the part of the socially responsible investors that the project and the structure are sound. Evidence from the investment activity presented above gives some indication that socially responsible investors are willing to use their money based upon a large degree of faith. Thus, one can consider that the tranches presented in figure 2 could be sold as micro-CAT bonds marketed to either institutional or individual investors. Again, each of these tranches can be developed with more or less commercial versus social objectives. To the extent they are clearly commercial, they could attract both reinsurers and institutional investors.

As Kiva, Grameen Foundation, and Calvert have demonstrated, the proper presentation can attract socially responsible investors. To the extent that socially responsible investors gain confidence that the investments satisfy their desire to contribute to development in LICs and, in the case of the Calvert offerings, to diversify their investment portfolios, there could be a strong market for these activities. The individual integrity of projects that have strong accountability and transparency should be of the most interest to this class of investor. This feedback should also enhance the incentives for those working on these types of projects to ensure that they are developed in a sustainable fashion.

As an extension of the ideas presented in this paper, securitization of natural disaster risks in LICs could also offer a different approach for people to give money for natural disaster relief. While the idea of providing disaster relief with these types of index-based weather insurance is also being tested (as in the Ethiopia World Food Program, and with the Mexican FONDEN program), it is useful to consider how individuals may be willing to "lend" money via structures similar to those presented in this paper. Many concerned citizens provide contributions after natural disasters occur in LICs. These *post hoc* responses, while well-intentioned, are provided without the benefit of *ex ante* rules and structure, increasing the likelihood of such funds being used inappropriately. These same individuals may be persuaded that their good intentions could also be served by investing in the early development phases of an insurance project that is targeted at transferring natural disaster risks from the poor. Such a project would have predefined rules about how funds are distributed after the disaster. These instruments must have clear rules regarding who will receive the benefits. The transparency of when and how funds would be used when a disaster strikes provides a strong incentive for those who are concerned about what happens to any charitable donations for disaster relief after a major event has occurred. Micro-CAT bonds that are linked to products that use a parametric index should be more attractive to a broader class of investors as these instruments are less prone to moral hazard and adverse selection problems. Additionally, many of the parametric indexes are likely to trigger payments more rapidly than many other systems designed to get cash after a disaster to those who lose crops, livestock, or assets (GOES AND SKEES, 2003).

8   Conclusion

Progress has been made in the development and use of CAT bonds in higher income countries, which allow equity investors to prefinance the losses from major catastrophes. In the most extreme cases, money invested in a CAT bond will only be used to cover catastrophic losses, and investors forfeit their capital. If there is no catastrophe, investors receive the principle and a high rate of interest. Extending these ideas, this paper introduces the potential for micro-CAT bonds to prefinance losses from natural disasters in LICs. The increased activity using IBRTPs for natural disaster risks in LICs opens the way for this approach. Such index insurance is less prone to the traditional problems of adverse selection and moral hazard. To the extent that the transaction costs are lower, aggregate indexes for weather, earthquakes, and even hurricanes and typhoons could offer a feasible path to a new generation of micro-CAT bond products in LICs.

This paper uses the structure of the Mongolian IBLI project to demonstrate how a pool of index insurance products could be carefully regulated while also developing the needed structure to introduce micro-CAT bonds. While CAT bonds have high transaction costs in setting up the SPVs and developing the rating as a means of determining the price, it is argued that micro-CAT bonds could be marketed to both institutional investors and a broad class of socially responsible investors under a project structure similar to that of the Mongolian IBLI project and using an internet platform similar to that used by Calvert, the Grameen Foundation, and Kiva.

Finally, these ideas are presented to spur new thinking about how to facilitate insurance markets for natural disaster risks in LICs. The use of micro-CAT bonds is unlikely to provide large capacity as the market grows. That is not the intent. Rather the intent is to provide nascent insurance markets in LICs with access to capital. In LICs the lack of access to global reinsurers and capital markets is a constraint to insuring against natural disaster risk. Micro-CAT bonds could crowd-in a capital market in such a fashion that the more developed and much larger reinsurance market would become significantly involved. Micro-CAT bonds provide the opportunity to get limited venture capital of a broad class of investors into well-structured pilot tests that use index-based insurance to transfer extreme weather and natural disaster risk in LICs.

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