

Public Investments Targeted toward Innovation in Risk Transfer

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Introduction

This paper presents a role for public investments in developing countries targeted at innovation in market-based risk sharing via insurance-like mechanisms for natural disasters that impede agricultural investments and development. Insurance markets for natural disaster risk are largely missing in developing countries. Even in developed countries, such insurance for crop failure due to natural disasters exist primarily due to large government subsidies. Such subsidies are expensive, inefficient, and have detrimental implications that make the consequences of future catastrophes worse (Barnett, 1999). In developing countries, fiscal constraints limit the degree to which governments can subsidize markets that would insure against agricultural losses due to natural disasters. Nonetheless, there are specific things that governments can do to facilitate the development of such risk transfer markets. The importance of agricultural risk transfer is understated when viewed in isolation. Well functioning risk transfer markets (such as familiar insurance and commodity exchange markets) can be critical in completing rural financial markets that include savings and credit services. When these risk transfer markets are missing, credit rationing, unfavorable terms of credit, unsecured financial exposure, and household asset depletion are more likely. Without more complete rural financial services, the poor are more likely to be trapped in poverty.

Agricultural Risk Management

Farmers in developing countries use a variety of strategies to address shocks from natural disasters. In the absence of more complete financial services that allow them to smooth income over time, many of these strategies are inefficient. The poor are also likely to be more risk averse. This too means that many labor, informal lending, and land markets in developing countries involve some level of risk premium that is given up by the poor as a means of risk transfer. Share tenancy is perhaps the most commonly used risk transfer mechanism in many developing countries.

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In developing countries, spatially correlated risk exposure creates a significant challenge since participants in consumption-smoothing mechanisms often come from the same region or even the same village (Anderson, 1976). In the wake of a spatially correlated loss event, such as a drought, the demand for credit will increase dramatically driving up interest rates in rudimentary, highly localized, credit markets. In many cultures, villages are organized along extended family networks, so a spatially correlated loss event will simultaneously impact all individuals and put tremendous strains on informal assistance networks. Systems of reciprocity simply break down if everyone has been negatively impacted at the same time. If the risk associated with spatially correlated loss events can be transferred out of the region, local consumption smoothing mechanisms will function more effectively.

The Case for Insurance Risk Transfer

Given that low-income risk-averse farmers participating in these informal markets already pay some form of “risk premium,” the critical challenge is to create more efficient formal risk transfer markets. From a development perspective, those who can transfer some portion of their risk exposure are more likely to engage in productive activities that promise high returns but also greater risk. This can include adopting improved technologies that are more efficient. Thus, effective risk transfer markets encourage investment in productive activities with subsequent economic benefits for producers and local communities (Arrow, 1964; 1996).

Beyond the market growth arguments that can be made for risk transfer, risk markets also have the potential to help the poor. Climatic risks present major problems for poor farmers around the world. Not only do they retard growth by discouraging investment, but they can also trap individuals in poverty as a major weather shock can disrupt progress being made by individual households just beginning to escape the grips of poverty. The literature that describes the link between risk, adverse shocks, and poverty traps is growing (e.g., Dercon, 2005). Studies increasingly find that many of the poor in developing countries are transitory, moving in and out of poverty on a regular basis. Shocks from a wide range of risk-related events send households who are making progress back to the poverty ranks. High transaction costs are often identified as the factor that severely limits the poor’s access to financial services, including risk transfer, and

global markets, resulting in suboptimal risk coping strategies. A number of stylized facts succinctly illustrate the link between risk and poverty traps:

- A minimum asset base is necessary for households to invest in education, accumulate assets, and improve economic well-being;
- Rapid onset shocks can knock households below this minimum asset threshold, resulting in a poverty trap;
- Slow onset shocks can also result in poverty traps depending on the coping strategies available to and chosen by households;
- Households sell assets to maintain minimum levels of consumption — this in turn reduces future streams of income; or
- Households reduce consumption to protect assets — this can impact the human capital needed to generate future income streams.

Market Failure or Market Response?

High transactions costs preclude many markets from emerging but this does not necessarily mean that governments should intervene. For example, insurance products for high-frequency, low-magnitude losses are seldom offered because the transactions costs associated with loss adjustment would make the cost of the insurance prohibitive for most potential purchasers. In general, farmers will use other risk management mechanisms to cover these losses. They likely do need insurance that will protect against low-frequency, high-magnitude loss events. However, many decision makers tend to underestimate their exposure to catastrophic loss and are unwilling to pay the full costs of an insurance product to financially protect against extreme but devastating events.

The cognitive complexity and ambiguity surrounding any assessment of low-frequency, high-magnitude events may merit special consideration. Still, when risk transfer markets appear incomplete, it is important to carefully diagnose the cause of the problem before concluding that government is better positioned to address the problem than private entities. For example, the provision of individual, farm-level, or revenue insurance products is rarely provided in the private sector typically due to information asymmetries that cause moral hazard and adverse selection problems. It is unlikely that a government

provider would have any advantage over a private insurer in addressing these information asymmetries. Additionally, government involvement is unlikely to contribute to reducing the effects of cognitive complexity that limit the demand for agricultural insurance.

Constructive Public Investments Targeted to Create Risk Transfer Markets

Asymmetric information, correlated loss risk, cognitive errors, high transaction costs, and ambiguity have contributed to the lack of private agricultural insurance markets in most countries. A major challenge for low income countries is to develop an appropriate risk management framework to address these concerns without repeating the inefficiencies imbedded in many agricultural insurance schemes in developed countries. An effective framework must be designed to manage correlated risks that accompany many low-probability, high-consequence events and to mitigate risks at various levels of the economy (micro/meso/macro). We assume that most governments consider at least three criteria when considering alternatives for addressing agricultural risk management needs: 1) fiscal constraint; 2) social relief for serious catastrophes; and 3) a desire to facilitate more market-oriented risk transfer. We stress the importance of identifying risk layers and constructing appropriate government roles for each of those risk layers. In so doing, governments can attempt to segregate social welfare programs that use public funds to respond to low-probability, high-magnitude events from more market-based insurance programs that can be facilitated with less government fiscal exposure, making certain that these two forms of government intervention are complementary and not working at cross purposes. In what follows is a focus on government facilitation of index insurance products.

Market-based Risk Transfer Instruments: Index Insurance Alternatives

Index insurance products are contingent claims contracts that are less susceptible to some of the problems that plague multiple-peril, farm-level crop insurance products. With index insurance products, payments are based on an independent measure that is highly correlated with farm-level yield or revenue outcomes. Unlike traditional crop insurance that attempts to measure individual farm yields or revenues, index insurance makes use of variables that are exogenous to the individual policyholder — such as area-level yield, or some objective weather event such as rainfall — but have a strong correlation to farm-level losses.

For most insurance products a precondition for insurability is that the loss risk for each exposure unit be uncorrelated (Rejda, 2001). For index insurance, a precondition is that risk be spatially correlated. When yield losses are spatially correlated, index insurance contracts can be an effective alternative to traditional farm-level crop insurance. Because it protects against spatially correlated losses, index insurance facilitates risk trading locally among individuals who may expect to experience different levels of loss when the underlying loss event occurs. Index products also facilitate trading in more formal financial markets where investors may hold index contracts as another investment in a diversified portfolio. In fact, index contracts may offer significant diversification benefits since the returns should be generally uncorrelated with returns from traditional debt and equity markets.

Indexed insurance products can offer many advantages over traditional, multiple-peril crop insurance programs. Principle among these is that they are less susceptible to asymmetric information and moral hazard problems which reduce the need for mitigating deductibles or other co-payments. Index insurance also involves significantly less administrative costs due to the absence of individual loss adjustment activities which further helps to reduce the cost of the insurance. However, index insurance has a number of limitations, the most important of which is the presence of sometimes politically unacceptable basis risk resulting from local deviation in loss from the underlying index, particularly if there are no or few institutions to facilitate the local sharing or aggregation of loss. Hence, when using a highly aggregate index, it is usually not advisable to sell contracts directly to farmers.

Structured Disaster Response to Complement Private Products

Given that ambiguity loading and cognitive failure are more problematic for extreme tail risk, governments and non-governmental organizations could be involved in facilitating transfers of these risks through appropriate layering or segmentation of index insurance contracts. Such systems could be designed for either put option risk (e.g., severe shortfalls in the underlying index) or call option risk (e.g., severe excesses in the underlying index). Gains in cognitive recognition and a lessening of the ambiguity problem may occur if the tail of the loss distribution — that segment containing the fewest observations, greatest uncertainty, and highest losses — can be layered out and transferred using indexed insurance products. Doing

so would remove much of the justification for very high ambiguity loads on insurance products that cover losses throughout the remainder of the distribution.

A key would be to make certain that the transfers do not involve risks that are more frequent. If such risks are removed without the individual bearing some cost, the cognitive failure argument for intervention breaks down and one can imagine that the same problem of undue risk-taking in more risky regions will become a concern (Milete, 1999). Three distinct risk layers can be identified and illustrated (Figure 1):

- For frequent and low-consequence risk, those exposed should absorb the risk using savings and loans;
- For less frequent, but moderate-consequence risks, market instruments should be used; and
- For less frequent high-consequence risks, governments and the international community may have a role.

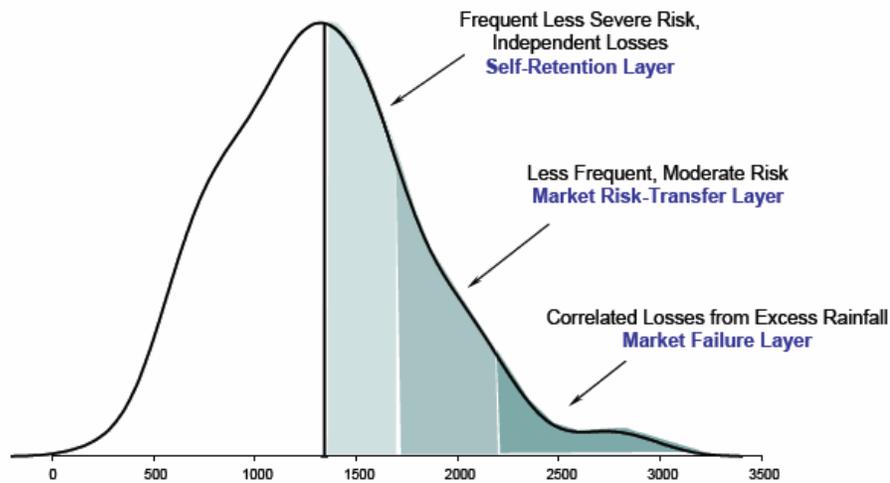


Figure 1: Risk Segmentation — Sample Rainfall Distribution Showing Layering of Excess Rainfall Risk by Rainfall Levels

Advantages of Structured Risk Layering

The major advantages of offering structured risk layering that uses weather index contracts include:

- Structured rules allow for better planning than ad hoc disaster payments;

- Structured rules can account for low-probability events explicitly, attempting to address the ambiguity loading and cognitive failure problem, and provide for a structure that provides more equity in expected payouts;
- Governments can set catastrophic social intervention levels and rules that complement the development of private insurance products;
- Governments can estimate their own exposure associated with the market failure layer, and plan for the fiscal costs accordingly; and
- Having localized catastrophic risk transfer can provide for some level of protection when extreme events are not widespread enough to command national attention that results in ad hoc disaster payments.

The story of layering risk does not end here. Even if a local insurance company offers a number of layered rainfall insurance contracts in the region in such a fashion that each one has a limited exposure, the portfolio of these contracts would very likely have a long tail of extreme losses. This is relatively easy to understand given that extreme rainfall in even an expanded region would likely be correlated and that a company with a national book of crop insurance could still suffer losses in excess of premiums.

Once again, layering the risk of the losses is a critical means of financing these large losses. Reinsurance is employed to accomplish this task. The easiest way to consider the role of reinsurance is to consider that the insurer of events that create a loss function would purchase insurance on these losses. For example, insurers may decide that they could build adequate reserves that would cover losses beyond 105 percent of premiums; however, they would be unable to cover losses beyond that point. They could purchase a “stop loss” contract to pay for all losses beyond 105 percent of the premium. More complex arrangements allow for quota shares, whereby the local insurance provider shares both premiums and losses with a global reinsurance market.

To summarize, financial constraints associated with catastrophic loss can be eased through risk segmenting, risk pooling, and risk transfer. Each of the following points deserves thorough consideration when designing a risk management framework:

- Market-based risk transfer — using insurance and reinsurance;
- Pooling and transferring risk, whereby government facilitates risk pooling among companies within the country and then sells the tail risk to the global reinsurance markets;
- Government-packaged risk transfer — government contracts that can be auctioned or sold to (re)insurers;
- Government subsidies on only the most extreme risks;
- Premium subsidies — to be avoided due to cost and poor incentives; and
- Risk aggregation using intermediaries is important in some circumstances when using market-based risk transfer mechanisms — small households may not be able to use risk transfer instruments directly.

Linking Index Insurance with Lending Activities

The value of index insurance is enhanced when it is blended with banking and credit services. The role of index insurance is to manage the correlated risk of widespread crop losses by shifting it to those willing and better able to assume those risks, generally financial and reinsurance markets. In turn, the local banking sector should be able to work with individual producers to help them manage idiosyncratic and basis risk; if a producer has an independent loss when the index insurance does not pay, it should be possible to borrow from the bank to smooth that shock. By combining insurance with banking in this manner, it is possible to remove one of the main concerns associated with index insurance (Skees and Barnett, 2006).

Other types of arrangements that more intimately links credit services with index insurance can also be imagined. For example, lenders could purchase an index position corresponding to their loan portfolio to help offset the real costs associated with creditor default and debt restructuring when a catastrophe occurs and with the costs associated with regulatory requirements for provisioning when repayment is in the arrears. A precautionary position could also be taken to soften real liquidity problem as depositors also withdraw savings during harsh times. Other formal arrangements with a more contractual structure might involve a choice of catastrophic insurance products directly tied to individual lending with simple loss adjustment rules.

Summary

Insurance for natural hazard risk is indeed complex. For this reason, government involvement to facilitate markets for crop insurance has typically been unsuccessful and/or quite expensive. The problems of correlated risks, cognitive failure, and high transaction costs are used to explain why true markets for these risks have not emerged. Index insurance products offer some hope for dealing with problems associated with monitoring and high transaction costs to mitigate moral hazard and adverse selection problems that plague traditional multiple-peril crop insurance.

Other institutional arrangements need to be considered that would mitigate the basis risk that may accompany index insurance products. Some of the conceptual thinking to date focuses on the use of risk aggregators who could, in turn, develop both formal and informal mechanisms for addressing basis risk. These mechanisms may involve mutual insurance companies and also banks that offer contingent loans to individuals who suffer hardships when the index insurance does not pay. The notion of blending index insurance with lending instruments merits more serious consideration. Once again, banks should be well suited to handle small event risks that are generally associated with basis risk.

The concept of layering risk that is written on a standard measure, using the same rate-making producers opens many possible avenues for securitizing weather risks. Some of the ideas are only the beginning: one can envision many possible ways to trade correlated risk dynamically; ultimately improving the pricing and efficiency of a weather market that is currently underdeveloped globally.

Finally, there are additional important roles for government in initiating support for the underlying infrastructure that enables innovation in agricultural risk transfer, and specifically index insurance alternatives. This includes the initial research to identify key catastrophic weather events that correlate strongly with agricultural production and income in different types of agricultural regions and to support the physical infrastructure of weather monitoring stations and other technologies on which to index weather events. Educational efforts need to be undertaken not just for rural people to understand the value of weather insurance but also for banking and insurance professionals to enable them to engage meaningfully with global donor and reinsurance partners. Similarly, an appropriate legal and regulatory framework for indexed weather

insurance should be in place to protect the interests of potential policyholders and to ensure compliance of intermediate risk aggregators with international accounting and provisioning norms that will smooth access to global reinsurance markets. Government may also choose to underwrite the insurance in some way until a sufficient volume of business has been established when international reinsurers or banks are willing to come in and assume the underwriting role for themselves.

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