BRIEFING NOTE 1

New Approaches to Designing Index Insurance Insuring against Consequential Losses[‡,†]

June, 2011

Index insurance is an innovative risk transfer tool that has the potential to address financial market failures associated with correlated weather and natural disaster risks threatening the economic well-being of many rural communities in lower income countries. Translating its potential to markets continues to challenge practitioners despite nearly a decade of experimentation. GlobalAgRisk is preparing several themed briefs that propose new thinking and offer guidance to practitioners seeking to develop viable index insurance markets. These briefs draw from ideas presented in our state of knowledge reports funded by The Bill and Melinda Gates Foundation (see the Background Studies box).

Most index insurance applications in lower income countries to date have focused on insuring rural households against reduced yields for a single crop (or enterprise) in a single year. However, the effects of catastrophic weather often are more far-reaching — households and firms can suffer a broad range of losses and costs, not only in the immediate aftermath but also from reduced wealth positions in the long run. In this brief, we discuss a new approach to index insurance design that has the potential to address broader economic consequences of weather risk. Many of these concepts also apply to other natural disaster risks, such as earthquakes.

Although existing applications are too few to draw definitive conclusions, product designs that recognize the many consequential losses individuals and firms are likely to incur in the wake of extreme weather may offer greater value to a wider market compared to products that focus exclusively on returns from a single investment. In certain contexts, framing index insurance in this way could help stimulate demand. From a supply perspective, where applicable, a "consequential loss design" lowers data requirements and allows insurers to tap into a heterogeneous market, which can lead to greater market volume and increased potential for commercial viability. When the local context allows product developers to harness the different advantages associated with consequential loss design, the prospects for creating scalable and sustainable index insurance markets are greatly improved.

Background Studies

- GlobalAgRisk. "State of Knowledge Report — Data Requirements for the Design of Weather Index Insurance." Project report, Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households, The Bill and Melinda Gates Foundation, Seattle, WA, June 30, 2010.
- GlobalAgRisk. "Legal State of Knowledge Report." Project report, Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households, The Bill and Melinda Gates Foundation, Seattle, WA, pending.
- GlobalAgRisk. "State of Knowledge Report — Market Development for Weather Index Insurance Key Considerations for Sustainability and Scale Up." Project report, Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households, The Bill and Melinda Gates Foundation, Seattle, WA, March, 2011.

INDEX INSURANCE, AN INTRODUCTION

Index insurance has been piloted in a number of lower income countries mostly as a means to help farmers manage their exposure to spatially correlated, catastrophic weather risk (see Box 1). In contrast to traditional agricultural insurance that indemnifies the actual losses a policyholder incurs, weather index insurance payouts are triggered when an index (that serves as an indicator of the insured risk) reaches a predetermined threshold (e.g., a rainfall level measured at the weather station). Basing payments on an index has many advantages compared to indemnity-based, multiple peril crop insurance. It eliminates the need for

[‡]Prepared by Nadezda Nikolova summarizing key themes from GlobalAgRisk SKRs, with assistance from Barry Barnett, Jerry Skees, Jason Hartell and Richard Carpenter.

[†]This briefing note is based on research funded by The Bill and Melinda Gates Foundation. The findings and conclusions contained within are those of the authors and do not necessarily reflect positions or policies of The Bill and Melinda Gates Foundation.

Box 1. Poverty Implications of Unmanaged Weather Risk

In rural areas of lower income countries, formal insurance markets for transferring spatially correlated, catastrophic (low-frequency, high-consequence) events are sparse or missing altogether. Most natural hazard risks, including weather risks that result in multiple perils, violate the independence condition of insurability. This and other violations increase the marginal cost of insurance and reduce market supply. In lower income countries, insurance markets commonly fail due to a lack of effective legal systems to enforce contracts, covariate risk, asymmetric information, and high transaction costs.

Market failure has serious poverty implications. Unprotected communities suffer enormous losses of life, assets, and income in the wake of weather-related disasters. The poor are sometimes thrust into permanent poverty traps, having to liquidate productive assets to meet immediate consumption needs. Indirect consequences of unmanaged weather risk also play an important role in creating and perpetuating poverty, as businesses and individuals adopt costly risk management strategies in anticipation of future losses. Banks increase interest rates and ration credit to hedge against poor loan recovery during unfavorable years; farmers diversify into less profitable crops and forego investments in productivity-enhancing technologies. In turn, these low-risk, low-return behavioral responses to weather risk retard economic growth and reduce the resiliency of the local economy to future shocks.

on-site inspections, expedites payments, and lowers transaction costs—especially in remote rural regions lacking transportation infrastructure. Using an index also significantly reduces adverse selection and moral hazard problems related to traditional insurance. While spatial correlation causes traditional crop insurance to falter, it is a necessary condition for index insurance since it improves the likelihood that policyholders' losses will match the losses recorded by the index. Moreover, index insurance is uniquely positioned to transfer spatially correlated weather risk into global markets through private sector risk sharing mechanisms such as reinsurance and catastrophe bonds. For these reasons, index insurance holds considerable potential as a tool for poverty reduction and economic development in lower income countries. However, index insurance has important drawbacks. For example, practitioners must manage basis risk (see Box 2), while understanding that it as an inherent consequence of using index insurance and cannot be completely eliminated.

Box 2. Basis Risk

Basis risk, a well-known consequence of index insurance, refers to a discrepancy between payouts and losses: it is possible that a policyholder does not receive a payout and suffers a loss, or, receives a payout without incurring any loss. While a number of factors can cause basis risk (e.g., distance from the weather station, having another weather event that creates the loss, the insurance contract does not adequately capture the risk, etc.), one source that can never be eliminated arises from the very feature that makes index insurance so effective in the first place—using a third party measure, the index, to determine payments. Although small levels do not interfere with the effectiveness of the instrument, high basis risk can leave policyholders exposed to the insured risk and potentially cause them to be worse off than if they had not purchased the insurance. Demand for index insurance hinges to a large extent on its usefulness and credibility; therefore, although basis risk cannot be fully eliminated, efforts toward reducing it remain important.

Additionally, index insurance requires large start-up investments for product development, capacity building, and educational outreach, driven to a large extent by the reality that index insurance products must respond to a host of geographic, meteorological, cultural, economic, and institutional factors that vary greatly from one locale to another. The need to conform to the local context greatly limits the potential for creating a one-size-fits-all design that can be applied in diverse settings. With this caveat in mind, we discuss the relative merits and limitations of index insurance that mimics indemnity-based crop insurance and propose contexts in which a consequential loss design may prove more advantageous.

INDEX INSURANCE AS REPLACEMENT FOR CROP INSURANCE

Index insurance has been used in higher income countries as an alternative to traditional crop insurance programs beset by inefficiency problems and low participation rates. These early and ongoing applications in data-rich environments rely on aggregate loss indexes, which require area-yield measurements collected over time and with reasonable accuracy (see Box 3).

Encouraged by these positive results and the compelling logic that such insurance could reach small holders, the development community looked to index insurance as one answer to the agricultural insurance vacuum that has stymied progress in insuring crops in the developing world. In an effort to adapt index insurance to settings typically lacking reliable area-yield measurements, practitioners developed weather-based indexes. However, the emphasis on crop yields largely remained, and with it, the emphasis on direct losses in a single year. Hence, most index insurance applications in lower income countries focus on insuring rural households against reduced yields for a single crop.

Crop-specific (or enterprise-specific) index insurance certainly has a place in managing correlated weather risk that creates catastrophic losses for individuals or businesses running highly specialized agricultural operations. For example, pastoralists in Mongolia, who depend on their livestock as a major source of food and income, experience livelihood-threatening losses when harsh weather destroys their herds. Therefore, index insurance that is livestock-mortality specific, such as Index-Based Livestock Insurance supported by the government of Mongolia under a World Bank project where GlobalAgRisk has been actively involved, has the potential to addresses the largest source of risk Mongolian herders face. Another example is a drought product offered in Malawi to vertically integrated firms in the value chain that specialize in tobacco production. In addition, in settings where different enterprises are susceptible to different natural perils, enterprise or entity-specific policies may be the only viable option.

However, models focusing on a single enterprise such as crop yields may not be appropriate in all or even the majority of settings. One of the important advantages of index insurance is that it can potentially accommodate a wide array of applications. This is only possible, however, when the characteristics of the local context and the target market guide product design. Specifically, practitioners must: 1) recognize the geographic differences in household and business production activities, weather risk vulnerabilities, and the availability of weather and loss data; 2) identify and address catastrophic weather risk transfer needs that will enhance existing risk transfer mechanisms; and, 3) strive for innovation, but also recognize the bounds imposed by local institutions. Unless the target market and the local context play the determining role in selecting product design features, index insurance will either prove irrelevant to policyholders or face operational setbacks that might lead to project failure.

Box 3. Two Types of Indexes

Index insurance products that offer protection from weather risk rely on two types of indexes: indexes that aggregate losses over a group (or aggregate loss indexes) and weather-based indexes. Aggregate loss indexes use regionally recorded losses, such as area yield or livestock mortality, as a proxy for the losses of individual policyholders in the group. The Group Risk Plan (GRP) in the U.S. uses historic county-yield data for a specific crop as the index for calculating payouts. The Mongolian Index-Based Livestock Insurance (IBLI) uses government estimates of soum-level (county-level) livestock mortality by species. With these products, the large scale of aggregate data reduces the likelihood of any individual policyholder significantly influencing a payout.

Weather-based indexes use measurements of weather events that correlate with losses of the policyholder as the basis for an insurance payout. The weather index serves as an indicator or predictor of the risk event itself, e.g., rainfall measurements as an indicator of drought or flood. In lower income countries, weather data are often easier to obtain and may be less prone to manipulation than aggregate data on crop yields; thus weather indexes are used more commonly.

Potential Disadvantages of Tying Index Insurance to a Crop

Framing index insurance as crop insurance may be problematic for several reasons. First, index insurance that protects crop yields faces untenable basis risk problems when diversified farming strategies and data constraints render the index an incomplete proxy for loss. This will often be the case in lower-income settings, particularly for products targeting households.

Crop-based index insurance implicitly assumes that crop yields appropriately capture farmers' loss exposure. While this is generally true for higher income countries, it is less true for the developing world. Agricultural production in developed countries is highly specialized, characterized by homogeneous input packages and abundant data on farm yields and income. This ensures a high correlation between farm yields and the well-being of individual farmers and, hence, the effectiveness of the risk protection offered. Specialization, however, is more an exception than the rule in the developing world, while data constraints remain endemic.

Most households in lower income countries do not rely solely on income generated by planting a single crop. Rather, they tend to engage in multi-cropping and often have diversified livelihood portfolios that include labor activities other than farming. In addition, accurately linking losses to weather outcomes requires historical measurements on individual yields, which are simply not available in most lower income settings. It is difficult to design an index that effectively proxies for insureds' losses in light of multi-cropping, income diversification, and data limitations. As noted, not having a contract that adequately captures the risks farmers face leads to serious basis risk problems.

In addition, attempts to make statistical inference on how an index relates to household losses while working with limited samples can further exacerbate basis risk and lead to potentially overselling the benefits of index insurance (see Box 4).

Box 4. Compensating for Missing Yield Data

1) Overfitting in-sample data
Overfitting in-sample data is one unintended outcome of attempts to closely mimic indemnity-based crop insurance in data-sparse environments. Practitioners sometimes develop complex statistical models within the available data to show that the index explains a large part of the in-sample variability in crop yields. A concern with such approaches is that in-sample statistical relationships may not hold out-of-sample. As a result, indemnities associated with contracts based on an overfit model may not match losses nearly as well as the model would suggest. Of particular concern is that, relative to more understandable and direct models, complex, overfit models run the danger of underestimating basis risk.

2) Using crop growth simulation models
Practitioners also use crop growth simulation models to compensate for missing historical data on household yields. Crop growth models simulate the relationship between various inputs (including weather variables) and test plot yields for specific crop varieties, farm practices, and regions. Practitioners then use this information to design the indemnity structure for an index insurance contract. As with overfitting, external validity is one major concern about this procedure, for two reasons. First, crop growth simulations models may not work well outside of the specific context in which they were developed; and second, crop growth models are less useful for predicting the effects of extreme weather events on yields—the very domain of index insurance.

The common theme that emerges from basing contract design on models that overfit available data or rely exclusively on crop growth models is the danger of inadvertently overselling the potential benefits of index insurance, since both procedures run the risk of underestimating the true basis risk that will occur out-of-sample. If index insurance is sold based on unrealistic expectations, practitioners will lose credibility that may be difficult to regain in the future, thus undermining any efforts for long-term scalability and sustainability.

Second, tying coverage to a specific crop could limit market scope. Households that plant crops other than those targeted by the insurance, as well as non-farmers, such as shopkeepers and laborers, whose income is highly correlated with the insured event, are entirely excluded. In addition, crop or enterprise specific products exclude those risk aggregators that have risk exposures extending beyond failed crops.[1] Risk aggregators often face business interruption costs and other consequential losses in the wake of extreme weather.

INDEX INSURANCE FOR CONSEQUENTIAL LOSSES

Viewing index insurance as an alternative to traditional crop insurance was an important first step in the evolution of its use. However, considering some of the limitations associated with that viewpoint alone, recasting index insurance more broadly merits consideration.

Many settings in lower income countries could benefit from flexible designs that address the needs of a heterogeneous market, as well as reduce quantitative data requirements. One way to achieve this is to experiment with product designs that account for broader economic consequences of weather risk rather than limit index insurance to direct losses only. Such products appear to be most suitable for regions exposed to a major peril that creates losses of catastrophic proportions across a variety of enterprises. For example, a consequential loss design is particularly suitable for the northern regions of Peru, where catastrophic flooding associated with severe El Niño events results in widespread losses that affect that region's entire economy (see Box 5). Specific to agricultural production, consequential loss design applies to settings where costs incurred due to weather risk are not necessarily linked to crop yields. In the Central Highlands of Vietnam, for example, coffee farmers can largely avert potential drought-related yield shortfalls with extra irrigation; however, this management strategy can be quite costly. Therefore, a drought does not necessarily lead to significant yield losses, but does result in added costs for supplying additional moisture to crops.

Interviews with household members during the risk assessment phase make a strong case for consequential loss insurance. When these individuals comment on the financial impacts of weather-related disasters, the discussion extends well beyond the impact on crop yields. They talk about reduced income due to depressed output prices when destroyed infrastructure limits market access, job loss, lower crop quality, diminished livestock production, etc. They mention increased expenses due to higher prices of inputs and consumption goods, increased vulnerability to disease and pests, higher irrigation costs, etc. And they enumerate various asset losses: destroyed buildings, lost livestock, destroyed crops, washed away topsoil, depleted savings, family members who have died or

[1] The term risk aggregator refers to firms whose business is negatively affected by correlated weather risk, either through direct losses or through the effect of the catastrophe on their clients, employees, etc. Examples include rural banks and microfinance institutions, members of the value chain, farmer associations, etc.

Box 5. El Niño Insurance in Northern Peru

In the coastal regions of northern Peru, El Niño can bring catastrophic rainfall and flooding. GlobalAgRisk has developed an index insurance product (El Niño Insurance) based on sea surface temperature (SST) in the equatorial Pacific, which are indicators of El Niño Southern Oscillation (ENSO) cycles. El Niño Insurance is based on the average November and December SST for ENSO region 1.2 measured by the U.S. National Oceanic and Atmospheric Administration.

The initial vision for El Niño Insurance was to protect microfinance institutions from business interruption costs, particularly the risk of loan defaults, thus stimulating an increase in agricultural lending to smallholder farmers. However, risk assessments revealed the many additional costs associated with catastrophic El Niño—damaged or destroyed crops and fruit trees, erosion of soils and riverbanks, a breakdown in transportation due to damaged roads and bridges, increased incidences of disease, and disruptions in commerce. When individuals and local markets suffer in this fashion, many in the agricultural value chain and other sectors also incur added costs and consequential losses. El Niño Insurance is therefore now being written as a contingency insurance (also referred to as fixed sum insurance) policy that can potentially be used by any legal entity or individual in Peru exposed to the losses and additional costs due to catastrophic flooding as predicted by extreme November and December ENSO 1.2 measures. The insurance actually pays before the extreme flooding reaches full force making this the first regulated "forecast insurance" in the world.

Because damages are truly ubiquitous, the consequential loss product applies to various enterprises with different exposures to catastrophic El Niño risk. Local MFIs, for example, could treat an insurance payout as new equity on their balance sheets, bolstering their capital adequacy ratio during a time when it would otherwise be reduced by delinquent or defaulted loans and savings withdrawals. An insured institution would be in a stronger position following El Niño to make new loans during a critically important time and increase investments for years afterwards in comparison to an institution without insurance. Conversely, fisheries off the northern coast, which suffer catch reductions due to the high SST associated with extreme El Niño, could use the payment to offset losses and additional costs. Fruit export associations that contract with farmers in Peru could use insurance payouts to hire farmers whose crops are damaged by El Niño to assist with flood risk mitigation and/or recovery activities. This would allow the associations to maintain relationships with the farmers and support a swift return to full production.

been injured, etc. In short, catastrophic weather events affect firms and households in many different ways, reducing both returns on investments and wealth positions.

Many risk aggregators also experience weather risk exposure that extends well beyond yields of a particular crop or similarly narrow portfolio investments. Banks and microfinance institutions, for example, are quite vulnerable to weather and natural disaster perils that result in spatially correlated losses. If a severe drought occurs, many borrowers are likely to experience repayment difficulties concurrently. Such risks may cause banks to restrict or ration their services as a way to reduce their exposure. Evidence of this behavior was seen in northern Peru following the severe 1997–1998 El Niño. Some of the banks in the affected regions suffered increased default rates and other liquidity problems for years afterward. Following that experience, banks reduced the size of their agricultural lending portfolios, leaving some farmers without the ability to access credit and limiting the banks' profitability from an otherwise productive sector.

Risk aggregating firms in the value chain may likewise be vulnerable to catastrophic weather and natural disaster events. Processors, exporters, etc., could experience disruptions to their business, such as a sharp reduction in the supply or quality of a commodity, or limited access to transportation. Lost revenue may then threaten a firm's capacity to keep laborers employed or fulfill contract obligations.

Advantages of Insuring Broadly against Consequential Losses

Designing and presenting index insurance in terms of the many consequences associated with extreme weather could ease important supply-side constraints and stimulate demand.

Supply Side

Consequential loss design lowers quantitative data requirements and can lead to improved product feasibility. Focusing on consequential losses has important data implications. Moving away from crop yields relaxes quantitative data constraints by reducing the need for sparse or missing historical household yield data for designing the index so as to mitigate basis risk. Instead, qualitative information obtained through carefully structured interactions with local experts and stakeholders during risk assessment takes on an important role in understanding the relationship between the index and losses (see Box 6).

Implicit in this risk assessment approach is the recognition that weather risk and resulting losses occur in a larger system affected by various factors: households' livelihood strategies, geography, weather patterns, population dynamics, industry growth, cultural values, etc. As practitioners develop an understanding of the risk in the local context, themes are likely to emerge that guide priorities in product development. Because index insurance is offered in regions where the target market has limited or no experience with insurance, the onus is on practitioners

to identify the needs of the local clientele and to design products with a vision for the different ways in which extreme weather events retard economic growth.

Demand Side

Consequential loss design has the potential to increase market volume. Framing index insurance in terms of consequential losses has the potential to create value for a large number of customers, which has positive implications for achieving market volume, both in terms of massification (i.e., number of policies sold) and the amount of insurance purchased.

Massification potential improves because the flexibility of consequential loss design renders index insurance appealing to a broader clientele. Policyholders can individualize coverage according to the unique set of risks they face and use indemnities according their own needs and priorities. In Vietnam, for example, GlobalAgRisk designed a product for coffee farmers in the Central Highlands that insures against consequential losses from early season drought. Instead of insuring crop yields specifically (which, according to risk assessment surveys, farmers would not be willing to purchase because they use irrigation to mitigate drought-induced yield losses), the product protects farmers from income shortfalls due to reduced crop quality and extra costs for additional irrigation when early rains fail. In addition, GlobalAgRisk's El Niño Insurance in Peru demonstrates the benefits of having a flexible use of indemnity funds. Because the insurance contract does not restrict the payment to specific types of losses, the product can be purchased to protect against any loss of revenue or extra costs that occur as a result of the ensured event. For example, local microfinance institutions can use the insurance payment to fund the extra costs of locating capital and managing liquidity shortfalls, and restructuring loans resulting from the floods associated with catastrophic El Niño.

Likewise, extending index insurance access to anyone anticipating losses due to a weather peril—irrespective of scale, sector, or industry—improves the potential for massification by tapping into a market that includes a wide range of potential clients that would otherwise be excluded. Within the micro scale, a consequential loss product can be extended to households that plant a variety of crops or derive their income from nonagricultural activities that correlate with the weather risk. Within the meso scale, a consequential loss product would be quite relevant to a wide variety of risk-aggregating firms. Risk aggregators, who use risk pooling to manage idiosyncratic risks but are highly exposed to correlated weather risk, present an important, yet minimally explored, market for index insurance (see Box 7).

Box 6. Supplementing Available Quantitative Data with Qualitative Information Obtained during Risk Assessment

To avoid potential pitfalls associated with complex modeling and crop growth simulation, we recommend a risk assessment process that supplements the limited available quantitative data with qualitative information collected rigorously from local sources. High-quality data obtained in this fashion can give valuable evidence as to individual loss experiences that cannot be captured with incomplete or missing quantitative data. Furthermore, local stakeholders are well positioned to understand the vulnerabilities of their community to future catastrophic weather events. In addition, households, businesses, scientists with specialized knowledge, etc., can help identify events that create large losses and report high-loss years that can be used to corroborate sparse historical data. Importantly, they can help guide product design by voicing what type of weather risk concerns them most.

As to increased transaction value, if buyers understand that the insurance can be used to protect against a range of losses, they should be willing to purchase more of the insurance. Economic theory on risk aversion supports this notion.

Finally, not having to tie coverage to crop losses simplifies contract design, which helps make index insurance more transparent and accessible. As noted, crop specific contracts often rely on complex indexes composed from several variables and obtained through complex econometric modeling. This creates an educational barrier that could undermine client confidence in the product and adversely affect demand. Consequential loss products, on the other hand, use simple indexes, such as cumulative rainfall or wind speed, and are easy to relate to a target market lacking scientific literacy.

Consequential loss design may help lower basis risk. Index insurance for consequential losses may be better positioned to address different sources of basis risk compared to products that focus strictly on crop yields. As discussed, complex models designed to explain in-sample yield variability with limited data often introduce a separate source of basis risk. Furthermore, in rural areas of lower income countries, yield losses, which represent only one aspect of a household's portfolio risk, are often not the most important indicator of their well-being. Any product that fails to protect against the most salient livelihood threats will by design suffer large basis risk. Lastly, because losses due to extreme weather are context-specific, determined by physical as well as human factors, policyholders will experience different

Box 7. The Importance of Risk Aggregators for Developing Index Insurance Markets

Opening the door to risk aggregating firms increases the potential success of index insurance, in particular because risk aggregator products face fewer supply-side constraints compared to household products by having less stringent data requirements and being less costly to transact. Policies offered to risk aggregators are also larger in value, which further improves cost-efficiency and enhances the attractiveness of these products to commercial insurers and reinsurers. As a result, risk aggregator products are better positioned to achieve rapid scale-up, thus capturing the attention of regulatory authorities who are integral to long-term product and market sustainability.

losses from one another as well as across events. Since it is often unclear how an event will affect specific aspects of their wealth positions, a more general product that allows policyholders to address a host of potential problems resulting from the peril is more likely to shield them from losses they actually experience than a product covering a single investment.

An important caveat is that, like any other index insurance design, consequential loss index insurance is also generally ineffective for high-frequency, low-consequence events. Because index insurance works best for high-magnitude events that result in widespread losses, designing contracts that pay when conditions are truly catastrophic is the best way to minimize basis risk.

Developing consequential loss index insurance necessitates extensive outreach to clients; informed clients are more likely to understand and value index insurance. Client engagement and education—an important aspect of any index insurance product development—is particularly relevant to consequential loss designs. Before clients can choose the sum insured or decide how index insurance complements their existing risk management portfolios, practitioners must first help them determine their risk exposures and think about the different strategies they use to deal with consequences of adverse weather. Extensive outreach activities place consumers in a better position to recognize the value of index insurance. In Peru, for example, one-on-one analysis and risk modeling with agricultural lenders has helped them quantify costs associated with strategies to cope with weather risk in the absence of index insurance, such as restricting lending to select sectors, which reduces their profits. These exercises often precipitate awareness-raising discussions that help clients more fully appreciate the unique role that index insurance plays in managing spatially correlated, catastrophic risks.

Classifying Consequential Loss Contracts

A critical first stage in the development of any new financial services product in a country is to assess whether the product is permitted under the laws of the country and how it will be classified and supervised by the relevant authorities. Index insurance is no different.

Perhaps because of its short history, few countries have enacted legislation that expressly recognizes index risk transfer products as a form of insurance and few, if any, regulatory authorities have considered the characteristics required for an index product to be classified as insurance or established specific regulatory requirements for index insurance. Furthermore, despite the relatively large number of pilot projects introduced to test index insurance as a concept, the status of index insurance has not yet been accepted, or even considered, at an international level, whether by the International Association of Insurance Supervisors (IAIS) or other international bodies.

In the circumstances, there is a risk that specific insurance supervisory authorities will either be hesitant to approve index-based products as insurance or will approve products that do no not possess the essential features of an insurance contract. In any event, it is the courts and not insurance supervisors that are the final arbiters of legal status under a country's law and, even though an insurance supervisor may approve an index insurance product, this does not prevent a court subsequently making a different determination perhaps much later. The legal and regulatory risks attached to index insurance therefore pose a real threat to market development and must be addressed from a product's inception.

Derivatives, which are the more common form of index contract, are a wholly unsuitable form of risk transfer product for consumers, small businesses and other non-sophisticated counterparties. Even if the development and sale of derivatives is regulated and supervised in a country, it is likely that derivatives will be regulated as an investment product and the regulatory and supervisory objectives will therefore be different. If the significant benefits of index insurance are to be extended to consumers and small businesses, it is essential that the index contract is positioned as an insurance product within the country's legal and regulatory framework. Given the very different characteristics of index products, contract design requires careful consideration to minimize the legal and regulatory risks.

Insurance contracts designed to protect against risks to property and business interruption are traditionally

written as indemnity insurance contracts. Indemnity contracts have the following characteristics:

- In order to receive a payment under the contract, the insured must have sustained loss or damage, which is subject to proof and is often subject to assessment;
- The insured may only be indemnified in relation to the loss sustained, and with limited exceptions, cannot recover more than the actual loss;
- The contract must specify a maximum sum insured or upper limit;
- In most countries, the insured is required to have insurable interest in the subject matter of insurance at the time of the loss.

Index contracts, by contrast, have the following characteristics:

- Payment is made against an index;
- There is no requirement for the insured to prove the amount of loss, the loss sustained, or for assessment of the loss;
- There is not even any requirement for the insured to sustain a loss;
- Payout amount depends only on the premium paid and value of the index.

It is clear that index contracts do not meet the basic criteria for a traditional indemnity insurance contract due to:

- There being no requirement for the insured to have sustained, or to prove, a loss;
- The fact that the payment made may exceed the insured's actual loss.

It is therefore necessary to consider whether it is possible to classify index insurance as any other type of insurance contract. Although the discussion above focuses on "index insurance", as noted, contracts can be written based on two different types of indexes: 1) aggregate loss indexes, such as area yield and livestock mortality, and 2) indirect loss indexes, such as drought or flood indexes.

Under an aggregate loss index, the aggregate loss can be considered as a proxy for individual loss. An argument can be made for positioning an appropriately designed aggregate loss index contract as a new type of valued policy.[2]

Under a valued policy, the payment on an insured loss is based on the parties' pre-agreed estimate of the value of the property insured. If there is a total loss, the payment made under the policy is the pre-agreed estimate of value. If there is a partial loss, the payment is that proportion of the pre-agreed value that equates to the proportion of the loss. For example, if there is a 50 percent loss, the payment made under the contract is 50 percent of the pre-agreed value. The pre-agreed estimate must not be manifestly excessive.

Under an aggregate loss index contract, although the parties do not pre-agree the value of the property insured, or even the loss, it can be argued that they pre-agree a method of determining total and proportional loss by the use of an aggregate index which serves as a proxy for individual loss. Provided that there is a reasonable correlation between the aggregate index and individual loss, the contract will have characteristics of a valued policy, although it does require the concept to be extended. If there is not a reasonable correlation between the aggregate index and individual loss, there is a risk that any payment made would be considered excessive.

However, no such argument can reasonably be made for indirect loss indexes. Although attempts are often made to fit data to show a correlation between, for example, a drought or flood index and individual loss, the reality is that an indirect loss index is not being used as a proxy for individual loss and attempts to demonstrate such a correlation can generally result in an overfitting of data. For that reason, we take the view that an indirect loss index contract cannot reasonably be classified as a valued policy. It is therefore necessary to consider whether an indirect loss index can be classified as any other type of insurance contract.

Most countries explicitly recognise a type of non-indemnity insurance which may be called contingency insurance or, in some countries, fixed sum insurance. Under a non-indemnity insurance contract, the payment to the insured is made on the basis of the premium paid. The most common form of non-indemnity insurance is life insurance. There is no requirement for the person entitled to the payment under a life insurance contract (the beneficiary) to prove the amount of the loss sustained due to the death of the person whose life is insured, or even that the beneficiary has sustained any loss. Other examples of contingency insurance or fixed sum insurance are accident policies, which pay a pre-determined fixed sum on the occurrence of a particular injury, for example the loss of a finger, and some health policies

[2] It is not absolutely clear whether a valued policy is an indemnity or a non-indemnity insurance contract. However, on balance, we consider that a valued policy has more of the characteristics of an indemnity policy than a contingency policy. For further detail please see Legal State of Knowledge Report.

which pay a fixed sum for each day that the insured person is in the hospital.

Given that index insurance has similar characteristics, i.e., that payment is dependent solely on the premium paid and the value of the index (the index serving to determine both whether an insured event has occurred and as the multiplier for payment), it may be possible to position index insurance as a form of contingency or fixed sum insurance. However, this does require a shift in thinking as non-indemnity insurance is traditionally limited to personal lines of cover, such as life, health and personal accident insurance. It also requires a review of the legal and regulatory framework of the country for which the product is being developed, as the current laws in a country may not allow such a classification.

It is important to appreciate that the use of the term "contingency insurance" can lead to confusion as, in some countries, insurers sell specific types of insurance policies called "contingency insurance" policies. These policies may also be called "event insurance." Typically they are used to cover the losses caused due to the occurrence or non-occurrence of a specific event due to one or more specified contingencies. For example, the costs associated with the cancellation of a concert due to the illness or death of the performer or the cancellation of a wedding due to the illness of the bride or some other specified contingency. They may also be written to cover the payment of a lottery prize or to cover the costs of litigation. These contingency insurance policies are usually written as indemnity policies. In relation to index insurance, the term "contingency insurance" is used to describe the type of non-indemnity insurance, such as a life policy, under which the payment made is determined by the premium paid and the actual measure of the index; there is no requirement to establish actual loss or the amount of any loss sustained.

It is critical that an index contract is appropriately designed if it is to be positioned as contingency or fixed sum insurance. In particular, given that there is no requirement to establish actual loss, insurable interest becomes a matter of significant importance in most countries. In the case of El Niño Insurance in Peru, for example, among a number of potential insurable interest choices, the decision was made to restrict the sale of the policy to persons who are exposed either: 1) to losses sustained, or additional costs incurred, due to extreme flooding in the northern coastal region of Peru as a consequence of an extreme El Niño; or 2) to losses sustained, or additional costs incurred, due to adverse changes in the fishery (e.g., reduced catch and increased costs) off the coast of Peru due to high sea surface temperatures caused by the occurrence of an extreme El Niño. The Peruvian regulator has approved El Niño Insurance as contingency insurance.

In addition to enabling an index contract to be positioned as insurance, writing the index contract as contingency or fixed sum insurance carries additional advantages. For example, it is the policyholder who chooses the appropriate level of insurance protection, which implicitly forces the policyholder to make a determination of his or her own risk exposure given the events that are tied to the index.

It is important to caution practitioners that we are not aware of any legislation or legal cases that have sought to define index insurance as either a form of valued policy or contingency (fixed sum) insurance. This is a complex and untested area requiring new thinking and approaches that will undoubtedly challenge conventional definitions, which carries a degree of legal and regulatory uncertainty and risk. However, the consequences of attempting to regulate index tied products as derivatives may carry far greater consumer protection risks in emerging markets. Thus, GlobalAgRisk believes that working to classify index-based risk transfer products as insurance products is critically important for emerging markets.

CONCLUSION

To be scalable and sustainable, index insurance must be framed in a way to offer value to prospective clients, while being responsive to the constraints of the local context. Index insurance for consequential losses has the potential to stimulate market volume by opening the door to a variety of clients whose income, costs, or ending wealth are affected by specific adverse weather (and natural disaster) events. In addition, the flexible design of contingency or fixed sum insurance for business interruption and other consequential losses and costs could prove more effective for transferring insureds' risk exposure than crop- or enterprise-specific insurance, particularly when a major natural disaster is truly catastrophic and losses occur across a variety of enterprises. Finally, framing index insurance in terms of the many consequences of extreme weather relaxes data constraints that present an important challenge to crop-based insurance designs. This is because the index no longer has to proxy for crop yield losses, which is difficult to do with incomplete or missing samples of historical crop yields. It is important to note, however, that consequential loss policies are expected to perform best when a peril causes losses many different enterprises, the likelihood for which increases with the severity of the peril.

Summary of Key Advantages Associated with Consequential Loss Design

Consequential loss design may ease supply-side constraints by:

1. Improving the potential for market volume, thus increasing efficiency gains and prospects for commercial viability
2. Lowering data limitations
    - Consequential loss contract design has less need for long series of quantitative data on yields and losses and for complex modeling.

Consequential loss design may stimulate demand by:

1. Extending index insurance access to a broad and varied clientele
    - Anyone with an insurable interest can purchase the insurance, including households and risk aggregators that face multiple sources of livelihood and/or business interruption risk due to severe weather or natural disaster events.
2. Offering additional value
    - Clients can select their own coverage and prioritize indemnities as they see fit;
    - Indemnities are more likely to approximate losses (i.e., basis risk is lower);
    - Contract structure is more transparent and client friendly;
    - Client perception of the value of index insurance is improved through risk assessment, outreach, and modeling, which are necessary steps in the product development process.