

## Selling Formal Insurance to the Informally Insured

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Nearly three quarters of the 1.3 billion people worldwide living on less than US\$1 per day depend on agriculture for their livelihoods (World Bank 2005). Agricultural activity is inherently risky due to fluctuations in weather conditions or the pest or disease environment for crops. In India, 89% of rural landowners cite drought as the single-most important risk they face (Gine et al 2008). A very large literature in economics has emphasized the importance of risk-sharing networks and other informal insurance schemes in helping rural households cope with shocks. Empirical results from many countries and regions convincingly demonstrate that informal risk sharing is incomplete, especially when it comes to aggregate (rather than idiosyncratic) risk, and rural agrarian households therefore have to continue to bear the burden of uninsured fluctuations in income. In this setting, there ought to be a latent demand for formal insurance products, but somewhat surprisingly, we do not observe thriving insurance markets in rural areas of developing countries. Adverse selection and moral hazard problems complicate the provision of insurance against idiosyncratic farmer-specific risks, but recent innovations in “index insurance” products - such as payment conditional on independently measured rainfall – can, in theory, overcome those challenges.

Surprisingly, the take-up of index insurance products has been very low across different countries and regions and across design variations on the products. Other researchers have hypothesized that liquidity constraints, inappropriate pricing, lack of trust in the insurance seller, and complicated product design helps to explain the lack of enthusiasm for formal insurance products. Our research examines whether the existence of informal insurance crowds out the market for formal insurance, and in the process, provides a rich characterization of the multiple ways that formal insurance products and informal risk sharing networks interact in the market. To do so, our approach combines exogenous natural variation in how well (informally) insured Indian farmers already are that stems from their membership-by-birth into their caste based risk-sharing network, with designed (randomized) variation in the price of the contract offered to those farmers. We first ask whether the presence of informal risk-sharing networks crowds out demand for formal index insurance. Then we ask whether formal index insurance provides some value-added - even in a context where pre-existing informal risk sharing is present - by allowing farmers to take more risk than they otherwise would. Answering this second question is crucially important for growth policy, since rural economic growth requires farmers to invest in riskier technologies and take other risks in their production and input choices that raise expected returns.

We first show, using a theoretical model that allows for both idiosyncratic and aggregate risk, and for the simultaneous presence of informal risk sharing and index insurance, that informal networks will lower the demand for formal insurance *only if* the network indemnifies against aggregate risk, but not if the primary role of the informal network is to insure against idiosyncratic, farmer-specific losses. Informal risk-sharing networks may in fact reduce risk-taking if the network primarily indemnifies against idiosyncratic risk, since other network members who are providing the insurance will exert pressure against individuals taking too much risk. When the formal insurance product is imperfect, in the sense of a potential mismatch between the rainfall-index-based payouts and the actual losses incurred by the policy holder due to the remote location of the rainfall gauge (which is known as “basis risk”), then informal risk sharing can play a positive role in covering household losses and enhancing the benefits of index insurance.

We test these predictions using a combination of non-experimental and experiment-based survey data from rural India that provides information on each household's sub-castes (*jati*) identity. These *jatis* are the relevant informal risk-sharing groups in rural India. Data on aggregate risk and individual financial losses coupled with inter-household loans and transfers allowed us to construct a rich characterization of each *jati* in terms of its ability to indemnify against idiosyncratic and aggregate losses suffered by its members. The experimental component of the research markets an index insurance product to members of these different castes, and finds that the demand for the formal insurance products is affected by the characteristics of these *jatis* in ways predicted by the theory.

We find that *jati*-based networks both compensate for individual losses and pay out on the basis of aggregate (village level) rainfall shocks. We identify from the data certain group level characteristics that differentially affect a *jati*'s ability to indemnify against idiosyncratic versus aggregate shocks, such as diversification into "professional" (i.e. non-agricultural) occupations, average landholding, and presence of other *jati* members in the same village. Having identified these characteristics, we examine whether households from *jatis* with specific risk-sharing attributes are more likely to purchase the formal index insurance contract. As predicted by the model, we find members of *jatis* that already informally provide insurance coverage based on aggregate rainfall shocks are less likely to purchase the index product, but we do not observe the same type of crowding-out for *jatis* that cover idiosyncratic shocks well. In other words, formal and informal insurance are sometimes substitutes, but it depends on what role the informal risk sharing network plays before the formal contract arrives.

We also find that basis risk is a significant impediment to the take-up of the index insurance product, as households more distant from rainfall stations are less likely to purchase the contract. However, as predicted by the theory, this negative effect of basis risk is attenuated for households in *jatis* that more successfully indemnify individual losses. Furthermore, in villages containing a rainfall station (i.e., no basis risk), household demand for index insurance is not affected by the extent to which the informal network is able to indemnify idiosyncratic risk. In summary, we find that informal insurance is both a complement to formal index insurance and a substitute, depending on the level of basis risk and the nature of the informal insurance arrangement.

Finally, we show that a formal index insurance product increases risk-taking in this context. In particular, rice farmers offered the formal index insurance product were more likely to subsequently plant a portfolio of rice varieties that were higher-yield but less drought resistant. Index insurance thus appears to not only improve welfare but to increase average incomes, particularly when the product is well designed (i.e. when rainfall stations are in closer proximity, and basis risk is lower), or when the informal risk-sharing communities are capable of offsetting idiosyncratic household losses at high rates of indemnification.