Special issue "Risk Considerations and Insurance in Developing Countries" of the Geneva Risk and Insurance Review

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Economic growth has led to advances in health, safety, and longevity in many countries over the last fifty years. Prosperity worldwide varies widely, however. The United Nations classifies countries as having economies of three different types based on their economic conditions: developed economies, economies in transition, and developing economies. There is disagreement over the classification of countries by their level of economic development with other organizations, including the World Bank and the International Monetary Fund. Broadly, developing countries are characterized by lower-income and wealth levels per capita than developed countries.

Developing countries are more likely than others to have agrarian-based economies with less developed industrial and commercial sectors. Individuals and economic entities in developing countries face more significant risks to their well-being than those living in more advanced economies. The greater degree of risk can be both a consequence of limited income and wealth and a contributor to those circumstances, as risk can impede economic advancement. Health risks, for instance, can

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be greater for individuals living in countries with less access to clean water, safe transportation, clean air, and medical care. A less healthy workforce, in turn, is less able to generate economic progress. Making matters worse, individuals in developing economies also have a more limited ability to dampen and cope with shocks given the lack of comprehensive social safety nets and the prevalence of incomplete markets to hedge risk.

The Geneva Risk and Insurance Review, recognizing the challenges faced by developing countries striving to advance the well-being of their populations, devotes the current issue to examining risks confronting developing countries. The papers in this issue were selected from papers presented on this topic at a research colloquium at St. John's University's Maurice R. Greenberg School of Risk Management, Insurance, and Actuarial Science in February 2020. Soon after the colloquium, the COVID-19 pandemic, which originated in a developing country, led to a significant economic contraction worldwide, affecting all nations regardless of their level of economic development. Though no attendees at the colloquium, of whom we are aware, contracted COVID-19 at the meeting; the virus, which has as of this writing claimed over five million lives worldwide, has in some sense contributed to our topic by emphatically making the point that risks confronting developing countries should be of concern to all of us.

The essays in this special issue address a broad range of topics. Some papers are theoretical, and others are primarily empirical. A variety of different risks in different countries are considered. The lessons to be drawn from the study of these risks are widely applicable. Given the exposure of households to weather shocks in developing economies, the special issue has a strong focus on agricultural insurance and the decision-making process of rural households.

In the first essay, *Enrico Biffis, Erik Chavez, Alexis Louaas, and Pierre Picard* investigate how parametric insurance can reduce moral hazard when bundled with loans to small farmers. They show that this bundled design leads to a reduction in collateral costs making loans more affordable. With increased access to capital, farmers can invest in technology to expand their production. Without insurance, the higher cost of borrowing money reduces the adoption of technology. The paper thereby highlights the important role that insurance plays in economic development.

In the second essay, *Sebastian Awondo and Genti Kostandini* use portfolio theory to derive optimal semi-variance portfolios of drought-tolerant maize varieties. The essential argument to their approach recognizes that yield-rainfall correlations differ amongst and between maize varieties. These complex covariance relationships can be combined to optimally select amongst a portfolio of alternative maize varieties a risk-minimizing optimal portfolio that outperforms or stochastically dominates (on a risk-return basis) naive portfolios of, say, equal weights. The results indicate that purchasing insurance on a crop-by-crop (or variety by variety) basis without considering covariance in time or space is inefficient. The authors use a hierarchical Bayes spatial model to measure correlation and covariance to derive maize yields conditioned on various predictors and observed spatial yield covariances. They then use Monte Carlo to capture the weather index (rainfall) effects on those yields. The resulting weather-linked covariances are then used in a (target) semi-variance optimization model, showing that different risk profiles across agronomic zones

are optimal. In other words, a one-size-fits-all strategy to manage drought-tolerant maize is inferior to risk-targeted selections of maize conditioned on localized rainfall and crop resilience. Not only does this 'whole farm' approach lead to substantially higher profitability, but also lower insurance premiums.

In the following essays in the special issue, experimental economics methods take center stage with three essays tackling questions on the relationship between financial literacy and insurance, the willingness to pay for insurance, and the elicitation of risk preferences.

In the third essay, *Glenn Harrison, Karlijn Morsink, and Mark Schneider* focus on the relationship between financial literacy and parametric insurance uptake. As a precursor to the implementation of field experiments in Africa, the authors run numerous experiments on university students to identify (in hypothetical settings) the importance of incentivized measures for general understanding and domain-specific knowledge on the purchase of parametric insurance. The degree of understanding new concepts is critical to widespread adoption and scaling up. *Harrison et al.* combine paradigms from several fields of inquiry, including economics and psychology, in their experimental designs. They conclude that financial literacy matters, but not in a generic way. Financial knowledge will lead to welfare improvements, but the more significant welfare gains accrue to those with a greater understanding of actuarial constructs. Those that do tend to be more prudent and reserved and less likely to over-insure, leading to significant welfare losses. In essence, *Harrison et al.* show that respondents who played the odds had greater economic and welfare-enhancing outcomes than those who attempted to beat the odds. The implications in terms of risk and development are that potential farmers need to be educated of the true odds of particular outcomes rather than simply describing a parametric product at the technical scale. For example, their research has led to a financial literacy campaign for rolling out index insurance in Ethiopia to include instruction in the local language, risk representations by drawing balls from a bag, using images of currency that are easily understood rather than numbers and tables, using images of (cattle) sickness and loss and so on. The core takeaway in terms of risk and development is that as much effort must be placed on local culture, demography, and relevant risks, as in the design of the insurance itself. For successful implementation, both aspects must be in play.

In the fourth essay, *Hong Fu, Yuehua Zhang, Yinuo An, Li Zhou, Yanling Peng, Rong Kong, and Calum G. Turvey* consider how belief formation about risk can influence insurance markets. Individuals often make insurance purchase decisions based on experience and emotions, such as beliefs that there has been a change in the probability of loss. Specifically, in this paper, the authors investigate how those beliefs influence farmers' willingness to pay (WTP) for crop insurance. They conducted in-the-field choice experiments in China to assess whether WTP is shaped by objective risks, i.e., those related to historical probabilities and subjective risks, those related to future probabilities. They deploy three variants of the choice experiment using a priming mechanism on objective and subjective beliefs plus a control. They find that the cuing frame matters because there are distinct differences in WTP within five attributes and across variants. Their results suggest that farmers' frame of reference towards objective and subjective risks can affect insurance demand.

Closing the series of papers on the risk faced by rural households, in the fifth essay, *Mariell Brunette* and *Jonas Ngouhouo-Poufoun* explore how individual risk preferences are elicited through a classic Ordered Lottery Selection with five gambles compared to one with nine gambles. Under the null hypothesis that risk preferences should be consistent, the authors deploy a field experiment to 1002 rural households in the Congo basin using matchboxes to represent probabilities and payoffs to the lottery choices. They find that 42.81% of respondents had consistent risk aversion results, 11.8% switched from risk aversion in the classical 5-gamble model to risk loving in the extended 9-gamble model. Weak inconsistency was found for 34.53% of respondents who deviated only moderately from the 5-gamble game. The remaining 11.5% were regarded as false neutrals because they exhibited risk-neutral aversion in the 5-gamble experiment but were stated to be risk loving in the 9-gamble model. A key driver of the observed inconsistencies appears to be education, with greater consistency found for more educated (high school or better) respondents. Nonetheless, the experiment provides a cautionary tale about design. In theory, there should be no reason for any inconsistency at all, and the fact that such a significant number revealed inconsistent measures of relative risk aversion offers an important caveat to experimental work and the elicitation of risk aversion measures. In terms of insurance economics, measuring risk attitudes becomes critically important, especially if degrees of risk aversion are under or over-estimated by choice of experiment.

Continuing on the theme of coping with risks derived from weather shocks, *Nekeisha Spencer* and *Eric Strobl* study the relationship between poverty and hurricane strikes in Jamaica in the sixth essay. In a thought-provoking essay that takes advantage of methodological tools from meteorology, climate science, and economics, the authors quantify the impact that past hurricanes have had on Jamaican households and provide an assessment of the potential consequences of future hurricanes in a warming world. While the paper concludes with a dire warning given the potential of future hurricanes to increase poverty further, it also offers a way forward by showing that improvements in building construction can considerably dampen the effect of future hurricanes. Readers familiar with this literature will also find numerous methodological refinements in this article. These refinements include using damage functions with construction-type specific thresholds, applying small area poverty estimation, and using synthetic hurricane tracks from General Circulation Models.

Next, the special issue turns to the interplay between regulation and insurance markets in developing economies. In the seventh essay, *Wei Zheng*, *Yi Yao*, *Peng Shi*, *Yinglu Deng*, and *Hao Zheng* investigate how deregulation focused on increasing competition, and consumer choice affects the insurance market. In particular, the paper asks how the China Insurance Regulatory Commission's 2015 liberalization granting automobile insurers more discretion in policy design, underwriting, and ratemaking influenced policyholders' behavior. The authors use a large industry dataset of more than seven million automobile insurance policies from 63 major automobile insurers operating in China to study policyholders' switching behavior among insurance providers. They further analyze the switching pattern among different types of insurers according to the insurer's

size, the company's business structure, the jurisdiction's market power, and the customer's risk type. Overall, the empirical results suggest that the reform has led to higher market competition and more diversified consumer choices. They also find that the average premium dropped significantly after the reform for all three jurisdictions implementing the reform. But the effects were heterogenous—the average premium for the high-risk customers increased, while the average premium for the low-risk customers decreased substantially.

In the eighth essay, *Patricia Born*, and *Douglas Bujakowski*, focus more broadly on the role governmental policies and regulations play in the development of insurance markets. They examine the development of insurance markets in post-communist European countries between 2008 and 2017 with a particular focus on variations that arose in their regulations. They find that insurance consumption is influenced by licensing and trade practices, monetary stability, consumer protections, and government transfers. The paper highlights that governmental policy plays an essential role in the development of insurance markets.

Finally, the special issue turns to the effects of expanding social safety nets. In the last essay, *Simona Helmsmüller* and *Andreas Landmann* investigate how the provision of free health insurance alters the health care utilization patterns of the poorest population in Pakistan. Despite Pakistan being the fifth-most populous nation and having a health care system that faces many of the same challenges as India, we know surprisingly little about the impact of reforms that aim to expand health insurance coverage in this region. The authors bring to bear new evidence from a large-scale program that offered fully subsidized insurance for hospitalization to the poorest quintile of the population in one of the four provinces of Pakistan. Evidence from both a regression discontinuity design and propensity score matching shows that the program does not lead households to increase health care utilization, but it does lead them to substitute public for private providers. This finding is important given the prevalence of dual systems where public and private providers participate in the same market.

We end this editorial with a reminder that there are still many open issues in this literature. In our view, a particularly fruitful avenue of research is documenting the ways households, firms, and governments cope with covariate risks and establishing how markets and social safety nets should be redesigned to better deal with these types of shocks. The recent experience of the COVID-19 pandemic and the looming crisis created by climate change emphasize the urgency of advancing the frontier in this field of research.

This special issue was made possible by the hard work of the authors. We are grateful for their contributions. We also owe a debt of gratitude to the many scholars who generously agreed to serve as anonymous reviewers and to the co-editors of the Geneva Risk and Insurance Review, *Michael Hoy* and *Alexander Muermann*, who entrusted us with guest editing this special issue. We are grateful for their time and the constructive comments and suggestions that improved the overall quality of the papers. We hope that readers will enjoy and be inspired in their work by the essays that constitute this special issue.