



# **Risk Management and Coping Mechanisms In Developing Countries**

**Commissioned Review**

Foresight, Government Office for Science

# Contents

<b>1. Description of Risk Management and Coping Mechanisms in Developing Countries .....</b>	<b>3</b>
<b>2. An assessment of the effectiveness of these mechanisms .....</b>	<b>6</b>
<b>3. The scope for introducing financial instruments .....</b>	<b>8</b>
<b>4. Empirical evidence .....</b>	<b>11</b>
<b>References .....</b>	<b>13</b>

# **Risk Management and Coping Mechanisms In Developing Countries**

**Jan Willem Gunning**

27 November 2012

Report produced for the Government Office of Science, Foresight project 'Reducing Risks of Future Disasters: Priorities for Decision Makers'

# I. Description of Risk Management and Coping Mechanisms in Developing Countries

People in developing countries live in a very risky environment: they often experience droughts, floods and devastating health or price shocks. Climatic risks loom large since poor countries rely heavily on agriculture. Health risks are much more threatening than in rich countries, reflecting the importance of infectious and poverty-related diseases in societies with very weak health care delivery.

Many such risks have been known for generations and societies have adapted to them, often in quite ingenious ways. Adaptation mechanisms are usually classified in two ways depending on whether

- they can be used individually or require social interaction
- they aim at reducing risk exposure (*risk management*) or at reducing the impact of a given risk exposure (*risk coping*).

In a rural society a farm household can manage risk through diversification by engaging in a variety of economic activities, by farming plots in different locations, or by letting some household members migrate to a city to participate in the urban economy. Just as in the case of a diversified financial portfolio such diversification reduces the volatility of household income provided the incomes generated by different activities or different plots are imperfectly correlated. This is an example of individual risk management. Rural households in developing countries often take diversification quite far. They pay a high price for such risk management by foregoing the gains from specialization (Collier and Gunning, 1999).

In areas with rain fed agriculture the vagaries of the timing and quantity of rainfall present formidable risks. The standard way of dealing with such weather risks is consumption smoothing, a form of risk coping. This involves saving and dissaving: in a good year a household stores part of the harvest in order to be able to maintain food consumption in bad years. Alternatively, part of the harvest is sold and used to acquire an asset which can be exchanged for food in a bad year. Financial assets are rarely used; jewellery (in many parts of Asia) and livestock (in many parts of Africa) are the assets most commonly used for

consumption smoothing (Burger *et al.*, 1998). Clearly, the use of such assets requires the social interaction of market exchange, unlike the use of food stocks.

In many developing countries there is relatively little use of *formal* credit for risk coping since households do not own assets which are suitable as collateral or the creditor cannot rely on well functioning legal institutions for a credit contract backed by collateral. Informal lending and borrowing, however, is a major way of coping with risk.

Many informal institutions involve risk pooling and can therefore be seen as forms of risk coping with social interaction. Health risks are often dealt with by *labour sharing* which entitles a household with an ill worker to assistance in the form of labour by others, e.g. during harvesting. Sometimes credit is arranged in such a way that repayment is only due when the borrower has a normal income (*contingent credit*). This enables a debtor to postpone repayment of his debt when he has suffered a shock, thereby shifting part of the risk to the creditor (Udry, 1994). Such an informal institution can be seen as a mixture of credit and insurance. In the Shona culture of Zimbabwe a special form of contingent credit is based on bride wealth. The payment of bride wealth (in the form of livestock) is drawn out over an extended period, often decades. As a result, marriages create a complicated network of creditor (the bride's family) and debtor (the groom's family) positions in the community. These positions are considered contingent. As a result a negative shock can be dealt with by calling in a debt, i.e. an as yet unpaid part of the agreed bride wealth. If the debtor himself has suffered a shock the claim is passed on in the network until it arrives at a debtor who is able to pay. This is therefore a highly sophisticated form of risk pooling at the village level (Dekker and Hoogeveen, 2002).

These examples illustrate the diversity of the institutions which have emerged to deal with risk. They also share a number of common features. First, the benefits which these institutions confer come at a cost, for example the gains from specialization given up under diversification. Such an implicit insurance premium is part of the hidden cost of risk. Secondly, informal risk pooling arrangements typically cover only small areas: at the local level they can succeed because it is easy to verify whether "insurance claims" such as the call for assistance under labour sharing are legitimate. Moral hazard is therefore not an issue. However, this is also a serious limitation: a larger risk pool cannot be formed since verification breaks down in the absence of formal institutions such as credit rating agencies and legal enforcement. The

implication is that such institutions can deal well with idiosyncratic risks (with verification supported by personal observation) but they break down in the case of covariant risks (such as a tsunami): risk pooling at the local level then fails since most participants would require assistance at the same time.

This is the fundamental problem of informal risk management and coping mechanisms (Dercon, 2004a).

There are two other limitations. First, these mechanisms are based on familiarity with the probability of rainfall or common diseases. They cannot cope with rapid change such as the onset of HIV/AIDS when the relevant distribution is still unknown. Secondly, they can handle relatively small and frequent events but break down in the face of large risks (since the risk sharing group is too small to deal with such a shock) or a rare event (since the effectiveness of informal mechanisms must be frequently observed to establish credibility). It follows that however one chooses to define disasters informal mechanisms are ill suited to deal with them.

## 2. An assessment of the effectiveness of these mechanisms

As noted above informal risk sharing and coping mechanisms involve an implicit insurance premium: the farmer who deals with risk by diversifying accepts a lower mean income in return for reduced volatility. There is much anecdotal evidence on such implicit insurance premiums (Collier and Gunning, 1999) but no systematic quantification. This limits the usefulness of many studies on the potential demand for formal insurance: the true cost and scope of informal alternatives is not clear.

If risk management and coping mechanisms are ineffective then households may bear high welfare costs in terms of the volatility of their consumption, in particular food consumption. A recent concern is that such welfare costs are particularly high if risk affects the incentives to save and invest. In developed economies households can use relatively safe assets for consumption smoothing. An increase in risk then induces an increase in “precautionary saving”. In many developing countries the assets used for consumption smoothing are themselves subject to substantial risk. Livestock, for example, may fall ill, die or be stolen, or, on the positive side, yield offspring. If assets themselves are subject to risk then an increase in risk may lead to lower saving (Gunning, 2009). In this way shocks can have long lasting effects ((Elbers *et al.* 2007)).

Such effects are difficult to quantify. Randomized controlled trials (RCTs) of insurance have started only recently. An RCT comparison of savings rates in “treatment” and “control” groups (those with and without insurance) is informative only after households have adjusted their behaviour to the introduction of insurance. Obviously, this may take many years. The alternative is to use panel data to estimate a structural model of household behaviour under risk and use this to estimate the effect of changes in risk on saving.

One such study, for rural households in Zimbabwe, finds very large long-run effects (Elbers *et al.*, 2007). These households can only deal with risk through consumption smoothing using livestock. Under these circumstances there is considerable investment in the long run (over a 50 year period). However, if these households would have been fully covered by actuarially fair insurance then they would have chosen to accumulate about *twice* as much over this period.

As a result, they would have grown much faster out of poverty. There are somewhat lower, but similar estimates for rural Ethiopia (Pan, 2009).

These estimates suggest that current arrangements in poor countries are quite ineffective: they condemn households not only to high volatility but also to much lower growth. Conversely, the payoff to effective risk management and coping institutions (e.g. through formal insurance and reinsurance) extends well beyond the welfare benefits of reduced volatility: it is likely to enable households to break out of persistent poverty.

There is supporting evidence, also for Zimbabwe, of the long run effects of malnutrition (Alderman *et al.*, 2006). It is well known that when very young children are exposed to malnutrition during a drought they later catch up, but only partly. The Zimbabwe evidence shows that there are substantial permanent effects, not just in terms of height but also schooling and income later in life. As in the case of foregone drought these effects can be seen as the long run costs of ineffective risk management and coping.

While such effects are extremely important the quantitative evidence is still remarkably thin: “More empirical work on the short- and long-term consequences of uninsured risk on poverty and growth in the developing world is a priority.”(Dercon, 2004a, p. 441.)

The literature focuses on the effectiveness of risk management and coping at the household level. But risk also poses a macroeconomic issue, notably in terms of public finance. In Africa the need to provide food relief often has a devastating impact on the government budget. After a drought and floods in 2001-2 Malawi had to borrow massively at rapidly rising interest rates. As a result the country came close to a financial crisis (Syroke and Nucifora, 2010).

### 3. The scope for introducing financial instruments

Credit and insurance both face fundamental problems in developing countries. Credit is problematic because usually borrowers cannot offer adequate collateral, particularly when there is no private land ownership in the Western sense of the word. As a result the borrower has limited credibility and this deters the creditor. For insurance the problem is on the other side of the market: the insurer demands premium payment up front in exchange for a promise of compensation in certain contingencies, e.g. a particular climatic event in the case of catastrophe insurance. Clearly this promise is not credible if there is no well functioning legal system to enforce the contract: the person considering whether to take out insurance will recognize that the insurer has little incentive to indemnify him in case of a loss (e.g. illness) and will therefore refuse the contract (Dercon *et al.*, 2011).

In such circumstances local leaders who come out in support of an insurance initiative can confer the necessary credibility. For example, recently a rural health insurance program in Kwara, Nigeria was enthusiastically adopted because of strong support by the local emir whereas uptake of the same insurance programme was quite low in neighbouring areas where no such support was given.

Another limitation is that while people practice risk sharing they often find it difficult to understand formal insurance. In particular, they often see the premium as a deposit. The need to continue paying a premium when no claims have been made for some time is therefore seen as unfair. More generally, in many societies people are willing to participate in insurance only if full reciprocity is ensured. There is also evidence that people who are entitled to claim fail to do so, apparently because they do not understand the contract (Platteau, 1997).

The combination of these two limitations creates a problem for contract design (De Bock and Gelade, 2012). Where credibility is an issue it is desirable that payouts are frequently observed. One can design a contract where partial compensation is offered for modest risks and full compensation only for very serious events. However, this leads to complicated contracts and low uptake. There is therefore a trade off between credibility and contract understanding.

Introducing formal insurance where informal risk sharing institutions continue to function can be problematic. Notably, if participants in group insurance have an outside option because they are entitled to informal assistance then welfare improving insurance may fail: individuals have no incentive to contribute although everybody would gain under full participation. While there is a theoretical literature on such co-existence problems, there is very little evidence (except from a few field experiments, e.g. Janssens and Kramer, 2011). Conversely, participants in informal institutions may discourage others from leaving the group to take up formal insurance fearing that this would make the remaining risk pool too small (De Bock and Gelade, 2012).

Nevertheless, risk sharing instruments for natural disasters such as droughts have developed very rapidly (Skees *et al.*, 2004). For example payments to holders of catastrophe bonds are linked by a formula to an “index”, an agreed measure of rainfall, wind speed, floods or earth quakes. Since the index cannot easily be manipulated index insurance can better deal with adverse selection and moral hazard problems than traditional crop insurance. In addition, since the contract does not depend on individual circumstances it can be widely and cheaply marketed.

Index insurance for natural disasters such as earthquakes or typhoons are being marketed in developing countries, but so far on a modest scale. The main limitation to its development is underinvestment (relative to developed countries) in information on the probability of risks. On the other hand developing countries offer diversification benefits and are therefore increasingly seen by insurers as an attractive addition to their portfolio.

In the case of rainfall index insurance the initial enthusiasm (notably after the World Food Program introduced index-based famine insurance in Ethiopia in 2005) has waned. It has become clear that the lack of correlation between individual outcomes and the performance of the index ('basis risk') can make index insurance quite unattractive. Indeed some calculations suggest that some major rainfall index insurance contracts should be refused by a rational client (Clarke, 2011).

It has been suggested (e.g. by Skees *et al.*, 2004) that the problem of basis risk can be overcome by letting a group of households cover their systemic risk by jointly buying index insurance and using informal arrangements to distribute payments within the group. The

informal distribution would then deal with basis risk assuming individual circumstances are public knowledge within the group.

This is an example of a more general principle. In the case of disasters, i.e. large covariant risks, neither formal nor informal risk management and coping mechanisms can work very well in isolation. Informal mechanisms are restricted in size because of their reliance on personal observation and enforcement through repeated interaction. Formal mechanisms are handicapped by poor contract enforcement and by the high cost of verification in developing countries. Clearly, it is possible in principle to combine the strengths of the two systems by relying on informal systems for idiosyncratic risks (including basis risk) and using a formal contract to link the local risk pool to a larger one. The formal contract then amounts to re-insurance. For example, a local bank may facilitate local risk sharing through deposit taking and lending while covering systemic risk by taking out insurance against a bank run. However, so far relatively little use has been made of re-insurance. An interesting example is Fonden, a natural disaster relief fund in Mexico which has bought cover for large earth quakes, partly through re-insurance and partly through a catastrophe bond tied to a Richter-based index (Lloyd's and Micro Insurance Centre, 2012).

At the national level the traditional approach has relied on post-disaster financial support from donors to governments. This channel is slow, unreliable and costly since disaster relief is usually at the expense of development finance for long run development (Cummins and Mahul, 2008). In recent years *ex ante* risk management is growing rapidly but it is often limited to covering the risks of government. For example, in Malawi the government uses a weather index based insurance contract to transfer the risk of drought to international markets (Syroke and Nucifora, 2010).

## 4. Empirical evidence

The empirical literature focuses on three issues: the behavioural changes induced by insurance, the determinants of take up of new insurance products, and the costs of uninsured risk.

The evidence on behavioural changes is as yet unconvincing since change is measured over very brief periods while behavioural change is likely to evolve over many years, certainly if insurance products are unfamiliar and initially not fully credible. This would require a long running panel data set to assess to what extent and in what way people change their economic behaviour in response to the introduction of new risk management and coping instruments. Such data sets are now being collected.

There is a much larger literature on take up rates, typically focusing on health Xinsurance rather than disaster insurance. Here the evidence is somewhat mixed. Many studies report very low take up even for heavily subsidised insurance (i.e. with a premium set far below the actuarially fair rate). In fact take up is often low even for initially *free* insurance (De Bock and Gelade, 2012 citing Cole *et al.*, 2011, Bonan *et al.*, 2011 and Thornton *et al.*, 2010). However, Cai *et al.* (2010) report 90% take up in China, also for heavily subsidised insurance.

It is not yet clear why take up rates are low. Dercon *et al.* (2011) show that many of the standard results in the economics of risk can be reversed under imperfect credibility; this is relevant for many developing countries with weak contract enforcement and regulation. Under these circumstances insurance can be unattractive for *more* risk averse households. They find evidence for this in rural Kenya using experimental data on risk attitudes to explain uptake of health insurance.

Low uptake may also reflect lack of understanding of the product or liquidity problems. There is growing evidence that training in financial literacy has a positive effect on uptake (Cole *et al.*, 2011). For households with severe problems of liquidity management problems even a very low premium can present an insurmountable problem. This suggests that take up would improve if the premium could be paid in frequent (e.g. monthly) instalments but, obviously this could increase transaction costs (Churchill and Garand, 2012; Kramer, 2012). Use of cell phones (as e.g. currently practiced in the Philippines) can overcome this problem.

Table 2. Cost of risk: a review

Theme	Selected references	Nature of the Evidence
Ex-ante risk management mechanisms	Reviews in: Morduch (1995) Dercon (2005)	Risk management is common, via diversification or entry into low risk, low return activities. Risk reduction at the cost of lower mean incomes . Lower mean consumption spending due to precautionary savings. Poverty persistence.
Ex-post risk coping mechanisms	Reviews in Townsend (1995) Morduch (1999) Dercon (2005)	Evidence of use of assets to smooth consumption, and informal sharing of risk within communities; overall only partial smoothing of shocks, especially related to covariate shocks
Impact beyond consumption or income	Asset accumulation Rosenzweig and Wolpin (1993), Elbers, Gunning, Kinsey (2007), Elbers, Gunning, Pan (2008), Pan (2008)  Nutrition and Health Gertler and Gruber (2002) Hoddinott and Kinsey (2001), Dercon and Hoddinott (2005), Lybbert <i>et al.</i> (2004), Alderman <i>et al.</i> (2006)	Lower accumulation of assets due to risk, mainly due to ex-ante responses; effects of portfolio composition of assets, such as higher liquid assets rather than higher return illiquid assets. losses in health and nutrition, especially due to large shocks, such as drought or catastrophic events.

Source: Dercon and Kirchberger (2008).

Dercon and Kirchberger (2008) review the evidence on the cost of uninsured risk. There is growing evidence that households rely heavily on consumption smoothing and that they forego attractive investment opportunities because of the need to remain liquid. Most importantly, risk reduces long run growth (as in the Elbers *et al.* Zimbabwe study discussed above) and smoothing is very imperfect so that droughts result in serious health and nutrition shocks with long run consequences.

## References

- Alderman, H., J. Hoddinott and B. Kinsey (2006), 'Long-term Consequences of Early Childhood Malnutrition', *Oxford Economic Papers*, vol. 58, pp. 450-474.
- Bock, O. de and W. Gelade (2012), 'The Demand for Micro-Insurance: a Literature Review', draft, Department of Economics, Namur.
- Bonan, J., O. Dagnelie, P. LeMay-Boucher and M. Tenikue (2011), 'Is It All About Money? A Randomized Evaluation of the Impact of Insurance Literacy and Marketing Treatments on the Demand for Health Microinsurance in Senegal', mimeo, ILO, Microinsurance facility.
- Burger, K., J.W. Gunning and B. Kinsey (1998), 'Coping with Drought in Zimbabwe: Survey Evidence of Responses of Rural Households to Risk', *World Development*, vol. 26, 1998, pp. 89-110.
- Cai, H., Y. Chen, H. Fang, and L.A. Zhou (2010), 'Microinsurance, Trust and Economic Development: Evidence from a Randomized Natural Field Experiment', mimeo.
- Churchill, C. (ed.) (2012), *Protecting the Poor: A Microinsurance Compendium*, vol. 1, Munich Re and ILO.
- Churchill, C. and D. Garand (2012), 'Strategies for Sustainability', in: Churchill (ed.), pp. 564-582.
- Clarke, D. (2011), 'A Theory of Rational Hedging', mimeo, University of Oxford.
- Cole, S., X. Gine, J. Tobacman, P. Topalova, R. Townsend, and J. Vickery (2011), 'Barriers to Household Risk Management: Evidence from India ', Harvard Business School Finance Working Paper No. 09-116.
- Collier, P. and J.W. Gunning (1999), 'Explaining African Economic Performance', *Journal of Economic Literature*, vol. 37, 1999, pp. 64-111.

- Cummins, J.D. and O. Mahul (2008), *Catastrophe Risk Financing in Developing Countries: Principles for Public Intervention*, Washington, DC: World Bank.
- Dekker, M. and H. Hoogeveen (2002), 'Bride Wealth and Social Security in Rural Zimbabwe', *Journal of African Economies*, vol. 11, pp. 114-145.
- Dercon, S. (2004), 'Risk, Insurance, and Poverty: a Review', ch. 1 in S. Dercon (ed.), *Insurance against Poverty*, Oxford: Oxford University Press.
- Dercon, S. (2004a), 'Risk, Poverty and Public Action', ch. 19 in S. Dercon (ed.), *Insurance against Poverty*, Oxford: Oxford University Press.
- Dercon, S. and M. Kirchberger with J.W. Gunning and J.-P. Platteau (2008), 'Literature Review on Microinsurance', Geneva: ILO Microinsurance Facility, Working Paper no. 1.
- Dercon, S., J.W. Gunning and A. Zeitlin (2011), 'The Demand for Insurance under Limited Credibility: Evidence from a Field Experiment in Kenya', CSAE, University of Oxford, November.
- Elbers, C., J.W. Gunning and B. Kinsey (2007), 'Growth and Risk: Methodology and Micro Evidence', *World Bank Economic Review*, vol. 21, pp. 1-20.
- Gunning, J.W. (2010), 'Risk and Savings: a Taxonomy', *Economics Letters*, vol. 107, 2010, pp. 39-41.
- Janssens, W. and Kramer, B. (2012), "The Social Dilemma of Microinsurance: A framed Field Experiment on Free-riding and Coordination in Microcredit Groups", ILO Microinsurance Innovation Facility Research Paper, No. 22.
- Kramer, B. (2012), 'Consumption-Savings Decisions under Loss Aversion and Liquidity Constraints', mimeo, Tinbergen Institute.
- Lloyd's ad Micro Insurance Centre (2012), *Insurance in Developing Countries: Exploring Opportunities in Microinsurance*.

Pan, L. (2009), *Poverty, Risk and Insurance: Evidence from Ethiopia and Yemen*, Tinbergen Institute Research Series, PhD Thesis nr. 448.

Platteau, J.-P. (1997), 'Mutual Insurance as an Elusive Concept in Traditional Rural Communities', *Journal of Development Studies*, vol. 33, pp. 764-796.

Skees, J., P. Varangis, D.F. Larson and P. Siegel (2004), 'Can Financial Markets be tapped to Help Poor People Cope with weather Risks', ch. 18 in S. Dercon (ed.), *Insurance against Poverty*, Oxford: Oxford University Press.

Syroke, J. and A. Nucifora (2010), 'National Drought Insurance for Malawi', World Bank Policy Research Working paper 5169.

Thornton, R.L., L.E. Hatt, E.M. Field, M. Islam, F. Solís Diaz and M.A. González (2010), 'Social Security Health Insurance for the Informal Sector in Nicaragua: a Randomized Evaluation', *Health Economics*, vol. 19, pp. 181-206.

Udry, C. (1994). 'Risk and Insurance in a Rural Credit Market: an Empirical Investigation in northern Nigeria', *Review of Economic Studies*, vol. 61, pp. 495-526.

© Crown copyright 2010

Foresight

1 Victoria Street

London SW1H 0ET

[www.foresight.gov.uk](http://www.foresight.gov.uk)

URN 12/1309